FCC Week 2018

Report of Contributions

Contribution ID: **1** Type: **not specified**

CEPC Parameter Choice and Combined Magnet Lattice Design

Tuesday, April 10, 2018 5:01 PM (1 minute)

An analytical electron positron circular collider optimized design method has been developed with carb-waist collision and CEPC parameters for Higgs, W and Z have been given by this method. For the lattice of CEPC collider ring, the combined magnet (dipole+sextupole)scheme has been developed to reduced the power consumption of the stand-alone sextupoles. The power consumption of the original sextupoles can be reduced by 75% even more. The design of the special twin aperture dipoles with sextupole component was given. Based on multi-sextupole optimization, the dynamic aperture for the combined magnet scheme is even better than the original lattice.

Primary author: Dr WANG, Dou (IHEP)

Presenter: Dr WANG, Dou (IHEP)

Session Classification: Poster session

Track Classification: FCC-ee ACC

Contribution ID: **2** Type: **not specified**

Additive Manufacturing of niobium for superconducting RF applications

Tuesday, April 10, 2018 4:10 PM (20 minutes)

“Superconducting Radio Frequency (SRF) components made of bulk niobium could profit from the novel shapes, parts number reduction of assemblies, and cost and lead time decrease from Additive Manufacturing with Selective Laser Melting (SLM). However, pure niobium is not available on this technology thus far. In the framework of FCC Special Technologies, a project aims at developing pure niobium for SRF applications.
This study introduces the first parts manufactured in pure niobium and presents an extensive physical and mechanical characterisation of the material. The process chain is covered, starting from the characterisation of powder coming from different routes, then the development method for the process parameters, and finally a post-processing heat treatment with titanium gettering to improve the purity of the material.
The parameters developed enable the manufacturing of fully dense niobium components with densities over 99.9%. The heat treatment reduced Oxygen impurities from 600 ppm to just 17 ppm, leading to an increase by a factor of 10 the Residual Resistivity Ratio (RRR) to reach 75. The materials exhibit a supercritical transition temperature Tc of 9.2K. Finally complex parts were manufactured such as 6GHz half-cells and the HOM coupler for the crab cavity DQW.
These findings demonstrate the feasibility of niobium in SLM for the manufacturing of complex components. The preliminary purification heat treatment by titanium gettering shows very encouraging results.”

Primary author: GERARD, Romain (CERN)

Presenter: GERARD, Romain (CERN)

Session Classification: SRF

Track Classification: SRF

Contribution ID: **3** Type: **not specified**

Superconducting Shield (SuShi) septum - towards a full prototype

Wednesday, April 11, 2018 8:30 AM (20 minutes)

A bulk superconducting magnetic shield can create the sharp transition between the high-field and no-field zones of septum magnets. This technique promises to reach significantly higher fields than what is possible with current technology, without compromising compactness. The experimental results with three different shield materials will be presented and compared. Simulation results explaining the observed relaxation phenomena in MgB_2 will be shown. A fully fledged prototype - including the shield and a compact, simple and cheap magnet - will be proposed and its conceptual design will be presented.

Primary author: Dr BARNA, Daniel (Hungarian Academy of Sciences (HU))

Presenter: Dr BARNA, Daniel (Hungarian Academy of Sciences (HU))

Session Classification: Special Technologies

Track Classification: STP

Contribution ID: **4** Type: **not specified**

HEP and collider activities in the Americas

Monday, April 9, 2018 6:00 PM (25 minutes)

Presenter: MCBRIDE, Patricia (Fermi National Accelerator Lab. (US))

Session Classification: Plenaries

Contribution ID: **5** Type: **not specified**

HEP and collider activities in Asia

Monday, April 9, 2018 6:25 PM (25 minutes)

Primary author: Prof. TAYLOR, Geoffrey Norman (University of Melbourne (AU))

Presenter: Prof. TAYLOR, Geoffrey Norman (University of Melbourne (AU))

Session Classification: Plenaries

Contribution ID: **6** Type: **not specified**

HEP and collider activities in Europe & Strategy update

Monday, April 9, 2018 6:50 PM (25 minutes)

Presenter: D'HONDT, Jorgen (Vrije Universiteit Brussel (BE))

Session Classification: Plenaries

Contribution ID: **7** Type: **not specified**

Summary of the APPEC Strategy Update

Monday, April 9, 2018 7:15 PM (25 minutes)

Primary author: DE KLEUVER, Job (NWO Institutes / APPEC)

Presenter: DE KLEUVER, Job (NWO Institutes / APPEC)

Session Classification: Plenaries

Contribution ID: **8** Type: **not specified**

The PSI CCT programme

Wednesday, April 11, 2018 8:30 AM (20 minutes)

We present the status of the Canted-Cosine-Theta (CCT) design of an FCC-hh / HE-LHC dipole, its magnetic and mechanical properties, as well as its protectability. We will develop on the strengths and challenges of this design and lay out the R&D plan at Paul Scherrer Institute to address the challenges, together with first practical results.

Primary author: AUCHMANN, Bernhard (CERN)

Co-authors: BROUWER, Lucas (Lawrence Berkeley National Laboratory); CALZOLAIO, Ciro (Paul Scherrer Institut); CASPI, Shlomo (Lawrence Berkeley National Lab. (US)); FELDER, R.; GAO, J.; MONTENERO, Giuseppe; SANFILIPPO, Stephane (Paul Scherrer Institut); SIDOROV, S.; TERVOORT, Theo (ETH Zurich); ZOLLER, C.

Presenter: AUCHMANN, Bernhard (CERN)

Session Classification: Magnets

Track Classification: EuroCirCol

Contribution ID: **9** Type: **not specified**

Civil engineering developments

Wednesday, April 11, 2018 8:30 AM (25 minutes)

This presentation covers the development of the design of the civil infrastructure required for the FCC-hh, FCC-ee and FCC-eh machines. This includes the refinement of the design of specific structures, such as the experimental and junction caverns, as well as major design updates, for example, the inclusion of an inclined access tunnel. The feasibility and expected construction techniques of the most challenging features of the underground infrastructure will be presented along with an update on the changes to the position and depth of the tunnel. This presentation also includes the civil engineering requirements for the HE-LHC study.

Primary author: STANYARD, Joanna Louise (CERN)

Co-author: OSBORNE, John Andrew (CERN)

Presenter: OSBORNE, John Andrew (CERN)

Session Classification: Infrastructure and operation

Track Classification: I&O

Contribution ID: **10** Type: **not specified**

Design features and microstructure of the commercially produced high Jc internal tin Nb3Sn strands with one common diffusion barrier

Tuesday, April 10, 2018 11:24 AM (18 minutes)

The possibility to create the reliable and solid magnet system of FCC project working with reasonable margin is defined by the development of the internal tin Nb3Sn wires with combination of contradicting properties including the non-Cu critical current density larger than 3000 A/mm2 (12 T&4.2 K) altogether with low effective diameters of the Nb3Sn filaments (down to 20 μm) and high RRR of stabilizing copper. This challenging set of parameters has to be met in a commercially produced wires with strong limitation on the cost of their production. The analysis of the design features of such internal tin Nb3Sn wires has been done and some considerations on the possibilities to attain the required set of parameters has been given. Some of the proposed designs of the internal tin strands with one common diffusion barrier has been verified by the production in industrial conditions. The effective separation of the groups of the filaments inside the each of the sub elements assembled inside the diffusion barrier has been shown. The formation of Nb3Sn microstructure in the tightly packed bundles of Nb filaments during the reaction heat treatment has been experimentally investigated. The possibility to form the well separated Nb3Sn macro filaments with predominantly defined dimension of cross section around 20 μm has been confirmed. The microstructure of the Nb3Sn macro filaments was shown to be non-uniform and consisted of the zones of columnar structure and the peripheral zones of large equiaxed grains. The correlation of Nb3Sn macro filaments microstructure with heat treatment parameters is discussed. The ways of further optimization of Internal tin Nb3Sn strands with common diffusion barrier for attaining of the FCC complete set of parameters are outlined.

Primary author: PANTSYRNY, Victor (Bochvqr Institute)

Presenter: PANTSYRNY, Victor (Bochvqr Institute)

Session Classification: Magnets

Track Classification: EASItrain

Contribution ID: **11** Type: **not specified**

Annealing Effects on Residual Resistivity Ratio of Internal Tin Nb3Sn-wires with Distributed Barriers

Tuesday, April 10, 2018 6:06 PM (1 minute)

One of the critical parameters of the high Jc internal tin Nb3Sn strands designated for the high field magnets of the FCC project is essentially high RRR value exceeding 150. In this work Oxygen free high-purity copper with RRR>400 was used for production of internal tin Nb3Sn wires of 0,7 and 1 mm in dia with 37 sub-elements in distributed diffusion Nb-barriers. Final reactions from 25 to 100 hours were given at 665 oC to investigate the changes in RRR-values. It was shown that target for RRR-level of 150 is realized for duration time not more than 50 and 25 hours for strands with 1 and 0.7 mm in dia accordingly. It has been shown that RRR is affected by tin diffusion through weak regions of Nb-barriers. It was revealed, that irregularity shape of diffusion barriers has been the decisive factor that influenced on the time limit at the chosen temperature of final stage of reaction heat treatment. The model for RRR-degradation due to tin diffusion into copper matrix is proposed.

Primary author: ABDYUKHANOV, Ildar (VNIINM (Bochvar Institute))

Co-authors: ALEKSEEV, Maxim (Bochvar Institute of Inorganic Materials); RUSLAN, Aliev (Bochvar Institute of Inorganic Materials); KRYLOVA, Maria (Bochvar Institute of Inorganic Materials); LUKYANOV, Pavel (Bochvar Institute of Inorganic Materials); MAREEV, Konstantin (Bochvar Institute of Inorganic Materials); NOVOSILOVA, Daria (Bochvar Institute of Inorganic Materials); PANTSYRNY, Victor (Bochvqr Institute); POLIKARPOVA, Maria (Bochvar Institute of Inorganic Materials); POTAPENKO, Mickael (Bochvar Institute of Inorganic Materials); SILAEV, Alexander (Bochvar Institute of Inorganic Materials); TSAPLEVA, Anastasia (Bochvar Institute of Inorganic Materials); ZUBOK, Evgeniy (Bochvar Institute of Inorganic Materials); ZERNOV, Sergey (TVEL)

Presenter: ABDYUKHANOV, Ildar (VNIINM (Bochvar Institute))

Session Classification: Poster session

Track Classification: Magnets

Contribution ID: **12** Type: **not specified**

Production of Nb3Sn superconductors produced by the "internal tin" method.

Tuesday, April 10, 2018 6:05 PM (1 minute)

In this study we consider the results of development and production low temperature superconductors on base of Nb3Sn by the "internal tin" method with critical current density more than 2450 A/mm2. The obtained superconductors of 1.0 to 0.7 mm in diameter of different layouts have been subjected to reaction by various regimes for the formation of the superconducting compound, and then their critical characteristics were investigated. The influence of different regimes and design features of heat treatment on obtained level of critical current density, residual resistance ratio and microstructure of annealed strands was studied. It has been installed the relationship between temperature and duration of reaction and the sizes and shapes of the superconducting Nb3Sn grains in the manufactured superconductors.

Primary author: ABDYUKHANOV, Ildar (VNIINM (Bochvar Institute))

Co-authors: ALEKSEEV, Maxim (Bochvar Institute of Inorganic Materials); ALIEV, Ruslan (Bochvar Institute of Inorganic Materials); KRYLOVA, Maria (Bochvar Institute of Inorganic Materials); LUKYANOV, Pavel (Bochvar Institute of Inorganic Materials); MAREEV, Konstantin (Bochvar Institute of Inorganic Materials); NOVOSILOVA, Daria (Bochvar Institute of Inorganic Materials); PANTSYRNY, Victor (Bochvqr Institute); POLIKARPOVA, Maria (Bochvar Institute of Inorganic Materials); POTAPENKO, Mickael (Bochvar Institute of Inorganic Materials); SILAEV, Alexander (Bochvar Institute of Inorganic Materials); TSAPLEVA, Anastasia (Bochvar Institute of Inorganic Materials); ZUBOK, Evgeniy (Bochvar Institute of Inorganic Materials); ZERNOV, Sergey (TVEL)

Presenter: ABDYUKHANOV, Ildar (VNIINM (Bochvar Institute))

Session Classification: Poster session

Track Classification: Magnets

Contribution ID: **13** Type: **not specified**

Micro-to-nanoscale characterisation of superconducting radio frequency cavity coatings for the Future Circular Collider using advanced focused ion beam microscopy

Tuesday, April 10, 2018 1:50 PM (20 minutes)

In order to achieve the performance required for the Future Circular Collider (FCC) Superconducting Radio Frequency (SRF) cavities, new superconducting thin films are being investigated. The functionality of the cavities are particularly dependent upon the reliability of these films at the micro and nanoscale. Therefore, in order to gain insight into their characteristics, the advanced capabilities of CERN's recently acquired Focused Ion Beam (FIB) – Scanning Electron Microscope (SEM) have been exploited.

Analysis of Nb, Ta, Nb3Sn and V3Si thin films produced using high-power impulse and direct current magnetron sputtering has been performed through FIB cross sectional milling, scanning transmission electron microscopy, transmission energy dispersive X-ray spectroscopy and ring-core residual stress analysis. This experimentation has revealed the impact of different coating temperatures, pressures and voltages on the films and has facilitated optimisation of the new manufacturing approaches in order to produce more reliable and better quality coatings.

Along with an overview of the capabilities of the FIB-SEM system, the results of this investigation will be compared to other recent superconducting thin film studies. The influence of the microstructure and topology of the substrate material will also be discussed.

Primary author: LUNT, Alexander (CERN)

Co-authors: ABAJO CLEMENTE, Carolina (CERN); BUSOM DESCARREGA, Josep (CERN); ILYINA-BRUNNER, Katsiaryna (CERN); LEAUX, Floriane (CERN); ROSAZ, Guillaume Jonathan (CERN); SGOBBA, Stefano (CERN)

Presenter: LUNT, Alexander (CERN)

Session Classification: SRF

Track Classification: SRF

Contribution ID: **14** Type: **not specified**

Surface quality and improvements on the SRF cavity manufacturing by electrohydraulic forming

Tuesday, April 10, 2018 2:30 PM (20 minutes)

In the framework of the FCC study, niobium-coated copper cavities are considered to operate at 400 MHz. Electrohydraulic forming (EHF) is a potential alternative to conventional shaping methods of copper half cells, through which geometrical precision, a good repeatability and a reduced spring back can be achieved.

Material characterisation by hardness measurements, Electron Backscatter Diffraction (EBSD), Focused Ion Beam (FIB) and Scanning Transmission Electron Microscope (STEM) allowed to assess the forming effect of EHF. Results are compared with conventional spinning and some differences are found: improved roughness, a more uniform dislocation distribution, a homogeneous microstructure with no gradient in grain size and a non-perceptible affected layer are shown in the first tens of micrometers of the EHF samples.

Improvements to the process have been implemented: a new configuration of the EHF electrodes, water filtering to avoid ferromagnetic particles observed in the water after shaping during first trials.

Numerical simulations were performed to optimise the thickness at the iris, and enhanced results were obtained starting from copper discs of 3.4mm. An improved tooling was designed for machining the extremities.

Primary author: ABAJO CLEMENTE, Carolina (CERN)

Co-authors: AVRILLAUD, Gilles (BMAX); CANTERGIANI, Elisa (Bmax); RAVELAU, Frederic (BMAX); ATIEH, Said (CERN); BERTINELLI, Francesco (CERN); CHERIF, Ahmed (CERN); FAVRE, Gilles (CERN); GARCIA-TABARES VALDIVIESO, Elisa (CERN); LEAUX, Floriane (CERN); LUNT, Alexander (CERN); MOTSCHMANN, Fritz (CERN); TRUBACOVA, Pavlina (CERN)

Presenter: ABAJO CLEMENTE, Carolina (CERN)

Session Classification: SRF

Track Classification: SRF

Contribution ID: **15** Type: **not specified**

Mechanical behaviour of MQXF epoxy impregnated Nb3Sn cables

Tuesday, April 10, 2018 5:21 PM (1 minute)

In the framework of the FCC study, the Nb3Sn technology plays a crucial role for high-field superconducting magnets. The new generation Nb3Sn cable greatly contributes to bring the magnetic field produced by the superconducting dipole magnets to the 16 T level; nevertheless, its mechanical properties are unknown making it difficult to predict the mechanical behaviour of the magnet structure. For this reason, an extended experimental campaign on specimens made from a stack of 10 Nb3Sn cables was launched at CERN. The 10 stack can be considered a representative sample of the magnet coil because it is produced following the same construction process: curing, reaction and impregnation. The experimental campaign consists of compression tests along the three sample directions at room temperature. Multiple loading and unloading cycles were performed as occurs for real magnet coils. A dedicated test bench was designed to measure the vertical and lateral deformations of the sample. This work presents the features of the experimental setup and the stress-strain relationships. The experimental results show a not linear elastic behaviour of the cable stack and its stiffness is strongly depended by the stress level in all loading directions. Moreover, the transverse-longitudinal strain relationships give further information about the complex behaviour of the Nb3Sn cable stack because cables slipping phenomena can be observed.

Primary author: FICHERA, Claudio (CERN)

Co-authors: BERTARELLI, Alessandro (CERN); FERRACIN, Paolo (CERN); GUINCHARD, Michael (CERN); SACRISTAN DE FRUTOS, Oscar

Presenter: FICHERA, Claudio (CERN)

Session Classification: Poster session

Track Classification: Magnets

Contribution ID: **16** Type: **not specified**

FCC-ee Feedback System Design Update

Wednesday, April 11, 2018 2:25 PM (15 minutes)

The bunch by bunch feedback systems for FCC-ee shall be designed on the basis of the experience developed working on the lepton circular colliders in the last two decades. Along the past years a common way to approach these systems has been carried on for PEP-II, KEKB, DAFNE, and, later, for SuperB and SuperKEKB. Nevertheless the advance of the technology as well as the very high performance required by FCC-ee specifications recommend to evaluate improved project scenarios.

Three compatible but with different complexity level designs are presented in this proposal in order to be able to damp instability grow rates slower than 10 revolution turns (first option), or up to 3 revolution turns (second option) or even faster than 1 revolution turn (third option). Anyway an R&D program plan will be necessary for the first two design options. The third and more advanced project scheme will require very strong R&D efforts.

Primary author: DRAGO, Alessandro (INFN)

Presenter: DRAGO, Alessandro (INFN)

Session Classification: FCC-ee accelerator

Track Classification: FCC-ee ACC

Contribution ID: **17** Type: **not specified**

Advanced Power-Quality Technologies for Future Circular Collider (FCC)

Wednesday, April 11, 2018 2:20 PM (20 minutes)

Power quality is today a primary concern for the operation of CERN's particle accelerators, and its importance will even increase for the FCC. Nowadays, transient voltage dips, generally coming from the 400 kV network, frequently cause undesired stops of the accelerators and, consequently, are a major contributor for accelerator downtime. Due to its much larger extent, the FCC will be exposed to a higher number of transient network disturbances, which are typically caused by thunderstorms.

The FCC powering systems needs to take into account the mitigation of these transient disturbances. In this presentation, the following three potential solutions will be analysed to mitigate the transient voltage dips: Dynamic Voltage Restorer (DVR) technology, High-Voltage DC (HVDC) back-to-back link and finally the use of a Medium-Voltage DC (MVDC) distribution network. All three solutions would require associated energy storage systems to allow the continuation of FCC operation during transient voltage dips.

For each solution, the main system design will be presented, advantages and disadvantages be discussed and the expected performance compared.

Primary author: HOHN, Thomas (Graz University of Technology (AT))

Co-authors: BLANQUEZ DELGADO, Francisco Rafael (CERN); BURNET, Jean-Paul (CERN); KAHLE, Karsten (CERN)

Presenter: HOHN, Thomas (Graz University of Technology (AT))

Session Classification: Infrastructure and operation

Track Classification: I&O

Contribution ID: **18** Type: **not specified**

CSR suppression in the FCC-ee injector bunch compressor

Thursday, April 12, 2018 9:10 AM (15 minutes)

Coherent Synchrotron Radiation (CSR) encountered in the FCC-ee injector bunch compressor can lead to transverse emittance dilution, undoing some of emittance reduction from the damping ring. The bunch compressor is required to reduce the RMS bunch length from 5 mm to 0.5 mm, prior to injection into the linac. This is achieved through a dogleg comprised of two triple-bend achromats (TBA) tailored to accomplish this compression. Despite the fact that the final bunch length is relatively long (compared to FEL linacs for example, where CSR is a commonly encountered problem), CSR is still capable of increasing the transverse emittance by 30% if left unchecked. This is due to the large R56 required, resulting in strong bending, and considerable CSR effect. Methods for suppressing the CSR-induced emittance growth through cancelling of the CSR kicks have already been demonstrated in the FEL community. In this paper we present a modification to this analysis, taking into account the variation of the CSR kick strength along the length of the bunch. The non-zero transverse dispersion at the centre dipole of each TBA leads to a distorted CSR kick, that can only be cancelled through correct choice of phase advance and correct division of compression between the two TBAs. Using this modified CSR-kick cancellation approach, the CSR-induced emittance growth can be significantly reduced.

Primary author: CHARLES, Tessa (University of Melbourne (AU))

Co-authors: BOLAND, Mark James (Australian Synchrotron (AU)); OIDE, Katsunobu; ZIMMERMANN, Frank (CERN)

Presenter: CHARLES, Tessa (University of Melbourne (AU))

Session Classification: FCC-ee injector

Track Classification: FCC-ee INJ

Contribution ID: **19** Type: **not specified**

A-15 inhomogeneity – the underestimated enemy of high-performance Nb3Sn wires

Tuesday, April 10, 2018 8:50 AM (20 minutes)

We present a study on performance limitations and effects on pinning force scaling behavior of A-15 phase inhomogeneity, in particular Sn concentration gradients, in commercial PIT and RRP Nb3Sn wires. Our results were obtained from SQUID magnetometry, scanning Hall probe microscopy, and numerical simulations. Our key findings are that even small radial Sn concentration gradients inside sub-elements cause a significant spatial variation of the critical current density, and that the local superconducting properties of individual sub-elements exhibit a much larger deviation than suggested by SEM examinations of wire cross sections. We point out the potential performance gain achievable by reducing the A-15 inhomogeneity, and discuss the pitfalls in pinning force scaling analysis related to Sn concentration gradients.

Primary author: BAUMGARTNER, Thomas (TU Wien, Atominstitut)

Co-authors: EISTERER, Michael (Vienna University of Technology (AT)); PFEIFFER, Stephan (TU Wien); Dr BERNARDI, Johannes; SCHEUERLEIN, Christian (CERN); BALLARINO, Amalia (CERN)

Presenter: BAUMGARTNER, Thomas (TU Wien, Atominstitut)

Session Classification: Magnets

Track Classification: EASItrain

Contribution ID: **20** Type: **not specified**

Maintenance aspects and operational cycle

Wednesday, April 11, 2018 3:30 PM (25 minutes)

This contribution presents FCC-hh operational schedule, turnaround cycle and availability goals. To maximize the physics output, the plan is to limit considerably the reserved time for maintenance and commissioning in the FCC schedule. The possibility of performing the annual maintenance stop in two months is discussed. FCC is designed to achieve about 50 % physics efficiency, which implies a strong dependence of integrated luminosity production on the turnaround time and injector chain performance. The challenges related to this target are analysed. Despite the increasing complexity of the FCC machine, the goal is to maintain the same operational availability achieved for LHC operation. This contribution identifies the key impact factors and systems based on LHC experience and illustrates possible solutions and areas for further studies to improve availability.

Primary author: NIEMI, Arto (CERN)

Co-author: APOLLONIO, Andrea (CERN)

Presenter: NIEMI, Arto (CERN)

Session Classification: Infrastructure and operation

Track Classification: I&O

Contribution ID: **21** Type: **not specified**

First Test of a HTS Demonstrator Coil in the 11 T Background Field of the SULTAN Facility

Tuesday, April 10, 2018 5:22 PM (1 minute)

In the framework of the EuCARD-2 WP-10 program, CERN has produced two sets of High Temperature Superconductor (HTS) insert-magnets wound with ReBCO-Roebel cable, named FeaTHeR-M2 and FeaTHeR-M0. FeaTHeR-M2 is an aligned block magnet designed to generate 5 T in a 40 mm aperture, whereas FeaTHeR-M0 are sub-scale planar racetrack coils designed to test fabrication techniques and gain experience in quench detection and protection.
The SULTAN facility has been recently upgraded in order to test the FeaTHeR-M0 coils at variable temperature. An insert cryostat has been constructed and successfully commissioned in SULTAN, enabling the test of samples in helium gas at temperatures between 4.8 and 50 K. The cryostat is equipped with HTS current feedthroughs, which can provide 9.5 kA at 50 K to the sample while minimizing the heat leak to the Nb-Ti transformer of SULTAN.
The first of these CERN HTS demonstrator coils, FeaTHeR-M0.4, has been tested in SULTAN with a background field of 10.9 T. The tests were limited by the apparent resistance across the coil, which increased dramatically after the tests at high field.
This work is partly supported by EuCARD-2, which is co-funded by the partners and the European Commission through the Capacities 7th Framework Programme under the Grant Agreement GA312453.

Primary author: SARASOLA, Xabier (EPFL)

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Presenter: SARASOLA, Xabier (EPFL)

Session Classification: Poster session

Track Classification: Magnets

Contribution ID: **22** Type: **not specified**

RF performance of high temperature superconducting coated conductor (HTS-CC) as beam screen for FCC-hh

Tuesday, April 10, 2018 5:19 PM (1 minute)

The baseline design of the FCC-hh beam screen is based on an octagonal shaped stainless-steel tube coated in its interior with copper. The surface impedance of the beam screen has a strong impact on the beam stability. In the foreseen operating temperature range from 40 K to 60 K the intended coating might not guarantee an impedance sufficiently low for a stable beam. This motivates the exploration of high-temperature superconducting coated conductor (HTS-CC) tapes as an alternative coating approach. It promises a lower surface impedance than copper under the required operating conditions. Therefore, we determine the suitability by validating the RF-performance of existing HTS-CCs as a function of temperature and magnetic fields, using a microwave non-contact dielectric loaded resonator technique and further, by developing a surface impedance measurement facility. First results will be discussed and compared to existing data for conventional metallic coating.

Primary author: KRKOTIĆ, Patrick (ALBA)

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Presenter: KRKOTIĆ, Patrick (ALBA)

Session Classification: Poster session

Track Classification: STP

Contribution ID: **23** Type: **not specified**

Electron cloud scaling: from LHC to FCC-hh

Thursday, April 12, 2018 3:30 PM (15 minutes)

Electron clouds pose an intensity and luminosity limitation for proton beams in LHC and its upgrades.
The limitations are due to electron cloud induced heat loads, instabilities and also incoherent beam intensity effects. At present, electron cloud induced effects are well controlled in LHC using different counter-measures, like for example coatings and bunch filling pattern, together with state-of-the-art simulation tools.
Compared to LHC the FCC-hh should have a smaller and complex beam screen, optimized for absorption of synchrotron radiation.
As in the LHC, the electron cloud build-up depends on the details of the secondary emission yield (SEY) of the beam pipe surface. Using a simplified SEY model together with the detailed geometry of the FCC-hh screen in our simulation tool [1] we study the influence of the beam energy on the electron cloud build-up and the resulting wakefields. We also compared the resulting tune spreads and beam intensity thresholds to results obtained for LHC, using the same simulation models.

[1] – https://github.com/openecloud/openecloud

Primary author: ASTAPOVYCH, Daria (TU Darmstadt)

Co-author: BOINE-FRANKENHEIM, Oliver (TU Darmstadt)

Presenter: ASTAPOVYCH, Daria (TU Darmstadt)

Session Classification: FCC-hh accelerator

Track Classification: EuroCirCol

Contribution ID: **24** Type: **not specified**

Rare top quark decays at a 100 TeV proton-proton collider

Wednesday, April 11, 2018 2:45 PM (15 minutes)

Investigating the physics of the top quark at the Future Circular hadron-hadron Collider (FCC-hh) is a very exciting prospect. Considering that at the FCC-hh the QCD top-quark production cross section will be 40 times larger than in the LHC, there is a lot of potential for unveiling possible connections with Beyond-the-Standard Model phenomena. In this talk we will discuss the sensitivity of the FCC-hh towards very rare top decays, strongly suppressed within the SM. In the first part, we will focus on the feasibility of measuring the branching ratio for the "radiative" process t -> bWZ within the SM and extended Higgs scenarios. In the second part, we will elaborate on the prospect of measuring the decay t -> hc showing that the potential for improvement with respect to the LHC.

Primary author: PAPAEFSTATHIOU, Andreas (University of Amsterdam (NL))

Co-author: TETLALMATZI-XOLOCOTZI, Gilberto (Nikhef)

Presenter: PAPAEFSTATHIOU, Andreas (University of Amsterdam (NL))

Session Classification: FCC-hh physics & experiments

Track Classification: FCC-hh Phy/Exp

Contribution ID: **25** Type: **not specified**

MDI: trapped modes and other power losses

Wednesday, April 11, 2018 2:05 PM (20 minutes)

We analyze effects of the Higher Order Modes (HOM) heating in the FCC ee Interaction Region (IR). Interacting beams excite electromagnetic waves in the complicated geometry of the beam chamber. We discuss a possibility to design a chamber with a minimum RF impedance and suggest using HOM absorbers in the IR to capture the main part of the excited electromagnetic waves.

Primary author: Dr NOVOKHATSKI, Alexander (SLAC National Accelerator Laboratory)

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Presenter: Dr NOVOKHATSKI, Alexander (SLAC National Accelerator Laboratory)

Session Classification: FCC-ee accelerator

Track Classification: FCC-ee ACC

Contribution ID: **26** Type: **not specified**

MDI design for CEPC double ring

Tuesday, April 10, 2018 5:00 PM (1 hour)

With the discovery of the Higgs boson at around 125GeV, a circular Higgs factory design with high luminosity (L ~ 10^34 cm^-2 s^-1) is becoming more popular in the accelerator world. The CEPC project in China is one of them. Machine Detector Interface (MDI) is the key research area in electron-positron colliders, especially in CEPC, it is one of the criteria to measure the accelerator and detector design performance. Because of the limitation from the existing tunnel, many equipment including magnets, beam diagnostic instruments, masks, vacuum pumps, and components of the detector must coexist in a very small region. In this paper, MDI design will be reported for the Interaction Region (IR) design for CEPC double ring.

Primary author: BAI, Sha (IHEP)

Co-authors: YU , Chenghui; GAO, Jie (Institute of High Energy Physics, China); WANG, Yi-wei

Presenter: BAI, Sha (IHEP)

Session Classification: Poster session

Track Classification: FCC-ee ACC

Contribution ID: **27** Type: **not specified**

Improved Concept of HE-LHC Beam Dump

Thursday, April 12, 2018 8:30 AM (20 minutes)

High energy upgrade is foreseen for LHC in the future. At the High-Energy LHC (HE-LHC), the proton beam energy is increased to an upgrade value of 13.5 TeV. The dedicated beam dump per ring must absorb 1.3 GJ energy carried by the proton beam and concentrated in the small region around the beam axis. Beam dilution system is foreseen in order to reduce maximum deposited energy density to an acceptable level. The maximum energy deposition of all bunches occurs at the same longitudinal position inside the standard absorber. That region experiences an enormous temperature rise compared with the surrounding parts of the absorber. We propose an improved type of beam absorber which spreads out the deposited energy in different longitudinal positions from the front surface of the absorber, thereby reducing the maximum temperature. Two different types of absorbers are considered: multi-material mosaic and distorted shapes, respectively.

Primary author: APYAN, Armen

Co-authors: GODDARD, Brennan (CERN); ZIMMERMANN, Frank (CERN); OIDE, Katsunobu

Presenter: APYAN, Armen

Session Classification: Special Technologies

Track Classification: STP

Contribution ID: **28** Type: **not specified**

Trigger & Data Acquisition at FCC-hh

Thursday, April 12, 2018 11:30 AM (20 minutes)

Data acquisition has always been a significant challenge at a hadron collider. The combination of high luminosity and finely segmented detectors yields data rates that far exceed what can be stored permanently. The problem has traditionally been solved using a trigger system, that performs event selection online. In many cases, the trigger system has relied on dedicated detectors, or detectors designed with the trigger in mind.
Based on the state of the art in the field, we present the nature of the trigger challenge for FCC-hh. Possible trigger architectures will be discussed, together with relative rates and performance of selected physics benchmark channels.

Primary author: BOLOGNA, Simone (University of Bristol (GB))

Co-authors: SPHICAS, Paris (CERN/Athens); BROOKE, Jim (University of Bristol (GB)); Prof. NEWBOLD, Dave (University of Bristol (GB) / Rutherford Appleton Laboratory (GB))

Presenter: BOLOGNA, Simone (University of Bristol (GB))

Session Classification: FCC-hh physics & experiments

Track Classification: FCC-hh Phy/Exp

Contribution ID: **29** Type: **not specified**

Radiation environment assessment in the Experimental Insertion Region

Wednesday, April 11, 2018 4:15 PM (20 minutes)

In the past years, a considerable amount of work has been performed in Radiation-to-Electronics (R2E) field for LHC. The CERN's R2E-project is currently involved in the study of the critical areas for electronics for FCC. Indeed, FCC will require a significant amount of electronic components in the accelerator tunnel and in the side galleries to control and monitor different systems, e.g. power converters, QPS, interlocks, etc. An "a priori" evaluation of the radiation environment, the technology that would be required, the failure rate and the possible mitigation actions become strategic for the design, the future operation and the long-term planning of such complex accelerator. Finally, the R2E-project has an important role in the coordination with all the other groups involved in the conceptual design study. In this work, the evaluation of the radiation levels in the Experimental Insertion Region (EIR) will be presented. FLUKA Monte Carlo simulation includes a detailed model of the detector, the inner triplet (L* = 40m) and the D1-D2 region for a total geometry length of ~500m. The latest design of the civil infrastructures is considered for a realist description of the EIR tunnel. p-p collisions at IP are considered as a source term. Finally, the relevant quantities of interest in the R2E field, i.e. the Total Ionizing dose (Cumulative Effects), the High Energy Hadrons fluence (Single Event Effects) and 1MeV-neutron equivalent fluence (Displacement Damage), are evaluated in the tunnel.

Primary author: Dr INFANTINO, Angelo (CERN - EN/STI-FDA)

Co-authors: BESANA, Maria Ilaria (CERN); CERUTTI, Francesco (CERN); KEINTZEL, Jacqueline (Vienna University of Technology (AT))

Presenter: Dr INFANTINO, Angelo (CERN - EN/STI-FDA)

Session Classification: Infrastructure and operation

Track Classification: I&O

Contribution ID: **30** Type: **not specified**

Radiation environment assessment in the FCChh and FCCee machines

Thursday, April 12, 2018 10:30 AM (18 minutes)

FCC will require a significant amount of electronic components in the accelerator tunnel and in the side galleries to control and monitor different systems, e.g. power converters, QPS, interlocks, etc. An "a priori" evaluation of the radiation environment, the technology that would be required, the failure rate and the possible mitigation actions become strategic for the design, the future operation and the long-term planning of such complex accelerator. The CERN's R2E-project is currently involved in the study of critical areas for electronics for FCC, thanks to the solid experience cumulated with the LHC. This work presents a general overview of the radiation levels expected in both the hh and ee machine, evaluated through FLUKA Monte Carlo simulation. With regard to FCChh, the radiation levels in the Experimental Insertion Region (triplet-D2 region, L* = 40m), in the arc and in the betatron cleaning insertion will be discussed. Particular attention will be given to the impact of the radiation environment to the design of the infrastructure and to the effects on electronics (cumulative and stochastic effects), with respect to LHC and Hi-Lumi. The relevant quantities for R2E, i.e. the Total Ionizing dose, the High Energy Hadrons (>20 MeV) and 1MeV-neutron equivalent fluence, are considered for the discussion. The FCCee radiation environment assessment will be mainly focused on synchrotron radiation. Finally, a few considerations on the HE-LHC will be provided.

Primary author: INFANTINO, Angelo (CERN - EN/STI-FDA)

Co-authors: GARCIA ALIA, Ruben (CERN); BRUGGER, Markus (CERN); CERUTTI, Francesco (CERN)

Presenter: INFANTINO, Angelo (CERN - EN/STI-FDA)

Session Classification: Special Technologies

Track Classification: STP

Contribution ID: **31** Type: **not specified**

Numerical and experimental studies of the magnetic shielding performance of an MgB2 tube for the superconducting shield septum project

Tuesday, April 10, 2018 5:02 PM (1 minute)

The SuShi septum project aims to realize a high-field, compact septum magnet using a superconducting shield to create a zero-field region within a strong magnetic field. One of the candidate materials is MgB2, a cheap and easy-to-handle material. A first prototype has been tested in a spare corrector magnet (MCBY) of the LHC. Experimental results of this test will be presented and compared to detailed numerical simulations. In particular, superconducting parameters and ultimate shielding performance of the material are estimated, and the observed relaxation phenomena are explained using computer models.

Primary author: NOVAK, Martin

Co-authors: BARNA, Daniel (Hungarian Academy of Sciences (HU)); Mr BRUNNER, Kristof (Hungarian Academy of Sciences (HU)); ATANASOV, Miroslav Georgiev (CERN); BAJAS, Hugo (CERN); BAJKO, Marta (CERN); Dr PETRONE, Carlo (CERN); GIUNCHI, Giovanni (EDISON SpA)

Presenter: NOVAK, Martin

Session Classification: Poster session

Track Classification: STP

Contribution ID: **32** Type: **not specified**

Performance based safety design and results on cryogenics hazards

Thursday, April 12, 2018 8:30 AM (25 minutes)

In the process of defining project alternatives for the cross section of the tunnel, safety aspects are an important factor. However, because of the unique nature of this infrastructure, the prescriptive requirements specified in the applicable legislative references often appear inappropriate. For some specific risks, identified in a hazard register, a set of standard best practices are not available. Therefore, in order to mitigate these risks, CERN's HSE Unit has proposed the application of a performance-based design approach.
This presentation will introduce the performance-based design method and summarise the different safety studies and risk assessments performed, revealing which safety features and dimensions the tunnel cross-section shall have in order to fulfil the integrity of the Safety Objectives. The contribution includes results from the studies related to the cryogenic hazards.

Primary author: HENRIQUES, Andre (CERN)

Co-authors: LA MENDOLA, Saverio (CERN); SANZ ULL, Alejandro (Eindhoven Technical University (NL))

Presenter: HENRIQUES, Andre (CERN)

Session Classification: Infrastructure and operation

Track Classification: I&O

Contribution ID: **33** Type: **not specified**

Quench Protection of CCT-Type High-Field Magnets for Accelerators

Tuesday, April 10, 2018 5:23 PM (1 minute)

An innovative high-field superconducting dipole magnet of Canted-Cosine-Theta (CCT) type has been proposed for Future Circular Collider (FCC) design. The unique mechanical structure intercepts the accumulated forces lowering the stress on the windings. Nevertheless, the former itself also becomes a barrier for heat to quickly propagate in case of a quench. To succeed in the CCT-type magnet design and construction, the quench protection is a challenging part which requires detailed investigation on the electrothermal behavior of this magnet. The potential detection & protection concepts is being studied on both aspects of multiphysics simulations and experiments on the short models that are planned to be built at the Paul Scherrer Institut (PSI). The results will allow us to validate the conceptual design and feasibility of the construction of a fast and efficient quench protection system of CCT-type magnets for accelerators.

Primary author: GAO, Jiani (Paul Scherrer Institut)

Co-authors: AUCHMANN, Bernhard (CERN); ROLANDO, Gabriella (CERN); BROUWER, Lucas (Lawrence Berkeley National Laboratory); CASPI, Shlomo (Lawrence Berkeley National Lab. (US)); MONTENERO, Giuseppe; NEGRAZUS, Marco (Paul Scherrer Institute); SANFILIPPO, Stephane (Paul Scherrer Institut)

Presenter: GAO, Jiani (Paul Scherrer Institut)

Session Classification: Poster session

Track Classification: Magnets

Contribution ID: **34** Type: **not specified**

Muon system

Thursday, April 12, 2018 11:10 AM (20 minutes)

The design of a muon detector and first-level muon trigger system for the FCC-hh baseline experiment is presented. Drift-tube chambers operated with Ar:CO2 (93:7) gas mixture at 3 bar provide a robust and cost effective solution for precise track point and angle measurement over large areas (about 1200 square meters) with the required resolution of better than 50 μm and 70 μrad, respectively. To achieve this precision, only one layer of chambers is needed which, for this purpose, consist of two quadruple-layers of drift tubes separated by a 1 m high spacer frame. The wire positioning accuracy has to be better than 20 μm. This is feasible in mass production with the construction technique developed for the small-diameter Muon Drift Tube (sMDT) chambers used for the upgrade of the ATLAS muon spectrometer at High-Luminosity LHC (HL-LHC). With continuous triggerless readout, the drift-tube chambers also provide a highly selective first-level muon trigger which will be applied in ATLAS at HL-LHC. Each drift-tube chamber is combined with a double layer of thin-gap RPC chambers which provide bunch crossing identification with better than 1 ns time resolution, muon trigger seeds and coordinate measurement along the tubes. A complete layout of this detector technology has been developed for the barrel and endcap regions. The diameter of the aluminum drift tubes varies from 30 mm in the barrel and part of the endcaps to 15 mm in the innermost endcap regions depending on the background rates. The performance determined from detailed simulations is discussed. Prototype chambers are under construction for the ATLAS upgrades and have been tested in the CERN Gamma Irradiation Facility up to background rates well above the ones expected in the muon detector at FCC-hh.

Primary author: KROHA, Hubert (Max-Planck-Institut fur Physik (DE))

Co-authors: KORTNER, Oliver (Max-Planck-Institut fur Physik (DE)); RICHTER, Robert (Max--Planck-Institut fur Physik (DE))

Presenter: KROHA, Hubert (Max-Planck-Institut fur Physik (DE))

Session Classification: FCC-hh physics & experiments

Track Classification: FCC-hh Phy/Exp

Contribution ID: **35** Type: **not specified**

HTS Tl-based coatings for the FCC-hh beam screens

Tuesday, April 10, 2018 10:45 AM (15 minutes)

HTS coatings have recently been proposed for beam impedance mitigation in the FCC beam screen. One of the candidate materials that can still work under the exceptional conditions of 50K, 16T, above 10^5 A/cm^2 is the Tl cuprate TlSr2Ca2Cu3Ox (Tl-1223) that with a Tc of about 120 K, very high Hc2 and Hirr, and moderate anisotropy is a promising material for such application. This possibility is currently being explored by CNR-SPIN, TU Wien, and CERN in a joint project. In this contribution the progress at CNR-SPIN on the realization of the samples will be discussed. This method is based on the co-deposition of the metals by an electrochemical process followed by a high temperature (HT) heat treatment in order to form the superconducting phase. Nitrates of the metals are dissolved in DMSO and the deposition on conducting substrates is performed in a flat three electrodes cell. The main advantage of this low cost technique is that it is very fast and can be easily scaled up to produce coatings on arbitrary shaped pieces. We will show studies on the effect of the silver substrates surface morphology and microcrystalline structure. New approaches in order to reduce or prevent Tl evaporation during the HT heat treatment will also be addressed. The Effect of these parameters on the superconducting measurements will be reported.

Primary author: LEVERATTO, Alessandro (CNR-SPIN)

Co-authors: EISTERER, Michael (Vienna University of Technology (AT)); HOLLEIS, Sigrid (TU Wien); CALATRONI, Sergio (CERN); Dr BELLINGERI, Emilio (CNR-SPIN); FERDEGHINI, Carlo (CNR); PUTTI, Marina (University of Genova); VAGLIO, Ruggero (Universiy of Napoli Federico II); BERNARDI, Johannes; BAUMGARTNER, Thomas (TU Wien, Atominstitut)

Presenter: LEVERATTO, Alessandro (CNR-SPIN)

Session Classification: Special Technologies

Track Classification: EuroCirCol

Contribution ID: **36** Type: **not specified**

Accelerating cavity and HOM coupler design study for the Higgs and top operation modes of FCC-ee

Tuesday, April 10, 2018 9:15 AM (15 minutes)

The design study for the future circular collider (FCC) includes an electron-positron collider with beam energies ranging from 45.6 to 182.5 GeV in order to study the properties of the Z, W and H bosons and the top quark with high precision. In order to accelerate the particles to the required energy, an RF system is needed to provide the accelerating voltage for the four machine setups. Designing a single RF system that can serve for all four scenarios is not efficient. Generally speaking, these four energy setups can be divided into two categories: high current setups that are characterized by low voltage and high current, i.e. Z and W, and high energy setups that are characterized by low beam current but high accelerating voltage, i.e. H and tt. In this contribution, we will present the design of an accelerating cavity and higher order mode couplers, considering mainly the requirements of the H and tt operation modes of FCC-ee.

Primary author: GORGI ZADEH, Shahnam (Rostock University (DE))

Co-authors: CALAGA, Rama (CERN); GERIGK, Frank (CERN)

Presenter: GORGI ZADEH, Shahnam (Rostock University (DE))

Session Classification: SRF

Track Classification: SRF

Contribution ID: **37** Type: **not specified**

CDR Design of CEPC Superconducting RF System

Tuesday, April 10, 2018 8:30 AM (15 minutes)

CEPC is a 100 km double-ring circular electron-positron collider operating at 90-240 GeV center-of-mass energy of Z-pole, WW pair production threshold, and Higgs resonance. The conceptual design report (CDR) of CEPC will be completed in mid-2018 as an important step to move the project forward. In this talk, the CDR layout design and configuration of CEPC superconducting RF system will be introduced. According to CEPC physics operation model with long Higgs run first, the Higgs, W and Z mode will use the same RF cavity to achieve their luminosity goals, which is different from the FCC-ee approach. The design consideration for beam-cavity interaction with both fundamental and higher order modes are discussed, including the special issue with W and Z parking cavities and Higgs half-fill beam gap. The operation of Booster fast RF voltage ramp with narrow-band cavity is discussed. The SRF technology design and R&D progress is also shown at last with some high light on the Fe-based pnictide thin film study.

Primary author: ZHAI, Jiyuan (IHEP)

Presenter: ZHAI, Jiyuan (IHEP)

Session Classification: SRF

Track Classification: SRF

Contribution ID: **40** Type: **not specified**

FCC-hh machine design overview

Monday, April 9, 2018 11:00 AM (30 minutes)

Primary author: SCHULTE, Daniel (CERN)

Presenter: SCHULTE, Daniel (CERN)

Session Classification: Plenaries

Track Classification: FCC-hh ACC

Contribution ID: **41** Type: **not specified**

FCC-ee machine design overview

Monday, April 9, 2018 11:30 AM (30 minutes)

Primary author: BOSCOLO, Manuela (INFN e Laboratori Nazionali di Frascati (IT))

Presenter: BOSCOLO, Manuela (INFN e Laboratori Nazionali di Frascati (IT))

Session Classification: Plenaries

Track Classification: FCC-ee ACC

Contribution ID: **42** Type: **not specified**

HE-LHC machine overview

Monday, April 9, 2018 12:00 PM (30 minutes)

Primary author: ZIMMERMANN, Frank (CERN)

Presenter: ZIMMERMANN, Frank (CERN)

Session Classification: Plenaries

Track Classification: HE-LHC

Contribution ID: **44** Type: **not specified**

Civil engineering, Infrastructure & operation overview

Monday, April 9, 2018 2:00 PM (25 minutes)

Primary author: MERTENS, Volker (CERN)

Presenter: MERTENS, Volker (CERN)

Session Classification: Plenaries

Track Classification: I&O

Contribution ID: **45** Type: **not specified**

Special technologies R&D overview

Monday, April 9, 2018 2:25 PM (25 minutes)

Primary author: JIMENEZ, Jose Miguel (CERN)

Presenter: JIMENEZ, Jose Miguel (CERN)

Session Classification: Plenaries

Track Classification: STP

Contribution ID: **46** Type: **not specified**

16 T magnet R&D overview

Monday, April 9, 2018 2:50 PM (20 minutes)

Primary author: IZQUIERDO BERMUDEZ, Susana (CERN)

Presenter: IZQUIERDO BERMUDEZ, Susana (CERN)

Session Classification: Plenaries

Track Classification: Magnets

Contribution ID: **47** Type: **not specified**

SRF R&D overview

Monday, April 9, 2018 3:10 PM (20 minutes)

Primary author: VALENTE-FELICIANO, Anne-Marie (Jefferson Lab)

Presenter: VALENTE-FELICIANO, Anne-Marie (Jefferson Lab)

Session Classification: Plenaries

Track Classification: SRF

Contribution ID: **48** Type: **not specified**

FCC-hh and HE-LHC experiments & detectors overview

Monday, April 9, 2018 4:00 PM (30 minutes)

Primary author: ZABOROWSKA, Anna (CERN)

Presenter: ZABOROWSKA, Anna (CERN)

Session Classification: Plenaries

Track Classification: FCC-hh Phy/Exp

Contribution ID: **49** Type: **not specified**

FCC-ee experiments & detectors overview

Monday, April 9, 2018 4:30 PM (30 minutes)

Primary author: D'ENTERRIA, David (CERN)

Presenter: D'ENTERRIA, David (CERN)

Session Classification: Plenaries

Track Classification: FCC-ee Phy/Exp

Contribution ID: **51** Type: **not specified**

FCC-eh and LHeC experiments & detectors overview

Monday, April 9, 2018 5:00 PM (30 minutes)

Primary author: MELLADO GARCIA, Bruce (University of the Witwatersrand)

Presenter: MELLADO GARCIA, Bruce (University of the Witwatersrand)

Session Classification: Plenaries

Track Classification: FCC-eh

Contribution ID: **52** Type: **not specified**

Microstructural Analysis of Tl-1223 Superconducting Layers for the FCC Beam Screen

Tuesday, April 10, 2018 5:00 PM (1 minute)

A part of the FCC-hh design study explores different superconducting materials, which could be suitable to function as a coating on the beam screen, held at 50 K. Such a superconducting coating should be able to carry the beam image currents and lower the beam impedance in order to guarantee a high beam stability margin. Our study focuses on the still technologically unexploited thallium-based cuprates. For the development of the coating thin films of Tl-1223 are grown on untextured silver substrates. We present the microstructural analysis of these Tl-based films, performed with Scanning Electron Microscopy and Transmission Electron Microscopy where the chemical composition of the superconducting grains and especially the formation of the Tl-1223 phase is demonstrated. Furthermore, we present superconducting properties of the Tl-based films which are investigated by means of magnetization measurements and Scanning Hall Probe Microscopy. With magnetic field mapping we can investigate the global critical current homogeneity and compare microstructural features with the current distribution in superconducting grains and across grain boundaries.

Primary author: HOLLEIS, Sigrid (TU Wien)

Co-authors: BAUMGARTNER, Thomas (TU Wien, Atominstitut); BERNARDI, Johannes; WHITMORE, Karin (TU Wien); Mrs MOROS, Alice (Technische Universität Wien); LEVERATTO, Alessandro (CNR-SPIN); BELLINGERI, Emilio (CNR-SPIN); CALATRONI, Sergio (CERN); EISTERER, Michael (Vienna University of Technology (AT))

Presenter: HOLLEIS, Sigrid (TU Wien)

Session Classification: Poster session

Track Classification: FCC-hh ACC

Contribution ID: **53** Type: **not specified**

Development of Silicon Detectors for Tracking and Timing within the RD50 Collaboration

Thursday, April 12, 2018 3:30 PM (30 minutes)

This talk summarizes the results and activities of the RD50 collaboration in the development of silicon detectors for hadron colliders. The focus of the collaboration is the improvement of the detectors' radiation hardness, with an emphasis on high-luminosity LHC applications. The radiation damage mechanisms of silicon detectors are introduced, together with the activities to develop models and simulations to describe their effects. Several detector technologies are being studied within the collaboration. Tracking detectors, both monolithic and hybrid, are under development. The hybrid detectors are produced both with planar and 3D sensors, while the monolithic devices are produced using CMOS processes. The status of the radiation hardness of these detectors is summarized. Timing detectors with intrinsic gain are also being developed. A summary of their performance and radiation hardness is given. Finally, the required R&D and a possible R&D roadmap for radiation-hard silicon detectors applications in FCC-hh are discussed.

Primary author: CENTIS VIGNALI, Matteo (CERN)

Presenter: CENTIS VIGNALI, Matteo (CERN)

Session Classification: Common detector technology

Track Classification: Common detector

Contribution ID: **54** Type: **not specified**

Toward the production of the first 1-m long Canted-Cosine-Theta (CCT) model magnet at PSI

Tuesday, April 10, 2018 5:59 PM (1 minute)

The Canted-Cosine-Theta (CCT) PSI magnet program aims at demonstrating that the CCT technology has the potential for the development of 16 T dipole magnets, required for the "near" future of circular colliders. The first step in this direction is the implementation of a Nb3Sn 1-m-long, 2-layer CCT single-aperture dipole model, referred to as Canted Dipole One (CD1) which is designed to achieve a peak field in the bore of ~11 T. The in-house assembly of CD1 requires to setup at PSI a number of fabrication steps. In this poster, the authors review the status of advancement of the production process of Nb3Sn CCT model magnets at PSI.

Primary author: MONTENERO, Giuseppe

Co-authors: CALZOLAIO, Ciro (Paul Scherrer Institut); FOLDER, Roland (PSI); SANFILIPPO, Stephane (Paul Scherrer Institut); SIDOROV, Serguei (PSI); AUCHMANN, Bernhard (CERN); BROUWER, Lucas (Lawrence Berkeley National Laboratory); CASPI, Shlomo (Lawrence Berkeley National Lab. (US))

Presenter: MONTENERO, Giuseppe

Session Classification: Poster session

Track Classification: Magnets

Contribution ID: **55** Type: **not specified**

REBa2Cu3O7 coated conductors for the FCC-hh collider beam screen

The baseline design of the FCC-hh beam screen is based on an octagonal shaped stainless steel tube coated in its interior with copper. The surface impedance of the beam screen has a strong impact on the beam stability. In the foreseen operating temperature range between 40 K and 60 K the intended coating might not guarantee an impedance sufficiently low for a stable beam. This motivates the exploration of high-temperature superconducting coated conductor (HTS-CC) tapes as an alternative coating approach since they promise lower surface impedance than copper under the required operating conditions. HTS-CC are a approx. 1 micron thick epitaxial layer of ReBa2Cu3O7-x (Re = Y, Gd) deposited on top of flexible metallic substrates (typically stainless steel or hastelloy) which are produced in kilometers length. We are investigating the capabilities of HTS-CCs as a beam screen under the extreme conditions of FCC-hh. Characterisation of samples from different manufacturers under RF fields, intermediate temperature and high magnetic fields has started. The surface resistance is evaluated using the classic fluxon model. Also the secondary electron yield of these samples is being measured. Samples will also be irradiated with synchrotron radiation and their superconducting properties re-measured following irradiation. Finally a setup to characterise the strain field distribution in the HTS-CCs after welding to the vacuum chamber in order to detect possible disturbances of the electric current field density and possible mechanical fatigue is under construction.

Primary author: PUIG, Teresa (ICMAB)

Co-authors: KRKOTIĆ, Patrick (ALBA); PEREZ, Francis (ALBA Synchrotron - CELLS); PONT, Montse (CELLS-ALBA); CALATRONI, Sergio (CERN); CHIGGIATO, Paolo (CERN); GARCIA-TABARES VALDIVIESO, Elisa (CERN); TABORELLI, Mauro (CERN); GUTIERREZ, Joffre (ICMAB); GRANADOS, Xavier (ICMB); ROMANOV, Artur (ICMAB); GONZALEZ, Pedro (Institut de Fisica d'Altes Energies); KOROLKOV, Ilya (The Barcelona Institute of Science and Technology (BIST) (ES)); MIQUEL, Ramon (IFAE); O'CALLAGHAN, Joan (UPC)

Presenter: PUIG, Teresa (ICMAB)

Session Classification: Special Technologies

Track Classification: EuroCirCol

Contribution ID: **57** Type: **not specified**

Magnetron sputtering of Nb3Sn thin films on copper for SRF applications

Tuesday, April 10, 2018 10:48 AM (18 minutes)

Niobium coated copper accelerating cavities have demonstrated their strong potential in accelerators such as LEP, LHC and HIE-ISOLDE and could become a technology of choice for such a machine as the FCC.
On the way of further improving thin-film coated copper cavities performances one proposes to substitute niobium by a superconductor that could lead to a higher quality factor as well as a higher operational accelerating gradient. The intermetallic compound Nb3Sn due to its very low Bardeen-Cooper-Schrieffer (BCS) surface resistance and high superheating field is considered as an ideal candidate. The 18.3 K critical temperature of Nb3Sn could also facilitate cavity operation at 4.2 K and thereby reduce cryogenic cooling costs.
This research aims to study the properties of Nb3Sn thin films deposited on copper samples using direct current magnetron sputtering system with a stoichiometric target Nb:Sn (ratio 3:1). The dependence of the morphology, microstructural and superconducting properties of the films on the deposition and annealing parameters has been investigated, along with the influence of the copper substrate. The potential of the coating method has been validated by the production of high-quality Nb3Sn films on copper with critical temperatures up to Tc ~ 17.4 K.

Primary author: ILYINA-BRUNNER, Katsiaryna (CERN)

Co-authors: BUSOM DESCARREGA, Josep (CERN); CALATRONI, Sergio (CERN); GERARDIN, Alexandre (CERN); LEAUX, Floriane (CERN); LUNT, Alexander (CERN); ROSAZ, Guillaume Jonathan (CERN); SUBLET, Alban Rene Maurice (CERN); TABORELLI, Mauro (CERN); VENTURINI DELSOLARO, Walter (CERN); VOLLENBERG, Wilhelmus (CERN); BONURA, Marco; SENATORE, Carmine (University of Geneva)

Presenter: ILYINA-BRUNNER, Katsiaryna (CERN)

Session Classification: SRF

Track Classification: SRF

Contribution ID: **58** Type: **not specified**

Lattice Design of CEPC Collider Ring for the Concept Design Report

Wednesday, April 11, 2018 3:50 PM (15 minutes)

CEPC is the future Circular Electron and Positron Collider proposed by China to mainly study the Higgs boson. This paper will present the bean optics design of the collider ring for the concept design report. The compatible beam optics for W and Z mode will be presented as well.

Primary author: WANG, Yiwei

Co-authors: BAI, Sha (IHEP); GAO, Jie (Institute of High Energy Physics, China); WANG, Dou (IHEP); WEI, Yuanyuan (Chinese Academy of Sciences (CN)); YU , Chenghui; ZHANG, Yuan

Presenter: WANG, Yiwei

Session Classification: FCC-ee accelerator

Track Classification: FCC-ee ACC

Contribution ID: **59** Type: **not specified**

Simulations of polarization levels in FCC e+e-

Thursday, April 12, 2018 10:30 AM (15 minutes)

For precise beam energy measurements at 45 and 80 GeV
the use of resonant depolarization
has been suggested for FCC e+e-.

The principle behind resonant depolarization is that a
vertically polarized beam excited through an oscillating horizontal magnetic field
gets depolarized when the excitation frequency is in a given relationship with the beam energy.

The studies of the possibility of self-polarized leptons have been
pursued for the current 45 and 80 GeV optics.
In this talk results of simulations in presence of quadrupole misalignments and
beam position monitors (BPMs) errors are presented.

Primary author: GIANFELICE-WENDT, Eliana (Fermi National Accelerator Lab. (US))

Presenter: GIANFELICE-WENDT, Eliana (Fermi National Accelerator Lab. (US))

Session Classification: FCC-ee accelerator

Track Classification: FCC-ee ACC

Contribution ID: **60** Type: **not specified**

Impedance model and single-beam collective effects

Wednesday, April 11, 2018 1:30 PM (20 minutes)

FCC-ee is a high luminosity lepton collider designed to cover the beam energy range from the Z pole (45.6 GeV) to the top pair threshold (175 GeV). One of the major issues for this machine is represented by collective effects due to electromagnetic fields generated by the interaction of the beam with the vacuum chamber, which could produce instabilities and limit the machine performance. This contribution focuses on the impedance model and collective effects at Z running: we present the contributions to the total impedance budget of some important vacuum chamber components and their effects on the beam dynamics. A particular attention is given to the resistive wall impedance representing the main source of wakefield in the machine: the presence of a NEG coating needed for pumping and electron cloud mitigation makes this impedance responsible of quite low intensity thresholds in both longitudinal and transverse planes. In this context, thin NEG film coatings have been investigated to find the minimum effective thickness ensuring a good activation performance and a low SEY for electron cloud suppression.

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Presenter: BELLI, Eleonora (Sapienza Universita e INFN, Roma I (IT))

Session Classification: FCC-ee accelerator

Track Classification: FCC-ee ACC

Contribution ID: **61** Type: **not specified**

Fire safety assessment for FCC

Thursday, April 12, 2018 8:55 AM (25 minutes)

The fire safety assessment for the FCC tunnel has been carried by means of Performance Based Design (PBD) analysis. Following this methodology, the FCC baseline design was challenged with different accidental fire scenarios representing credible fires in the underground tunnel structure to quantify the effectiveness of the foreseen fire protection measures. The safety goals for Life, Environment, Property Protection and Continuity of Operations in case of a fire event were evaluated linking them to several performance criteria.
In this talk, we will cover an overview of the fire safety assessment process, as well as an introduction to the CFD methods used to quantify the outcome of the accidental scenarios. Finally, we will present the conclusions on the safety measures required to fulfil the stablished safety objectives.

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Presenter: RIOS RUBIRAS, Oriol (CERN)

Session Classification: Infrastructure and operation

Track Classification: I&O

Contribution ID: **62** Type: **not specified**

CEPC linac design

Wednesday, April 11, 2018 4:05 PM (15 minutes)

Circular Electron-Positron Collider (CEPC) is a 100 km ring e+ e- collider for a Higgs factory. The injector of CEPC is composed of linac and booster. The linac is a normal conducting S-band linac with frequency in 2856.75 MHz and provide electron and positron beam at an energy up to 10 GeV with bunch charge larger than 1.5 nC and repetition frequency in 100 Hz. The linac design will be detailed discussed, including electron bunching system, positron source design, electron linac and positron linac. Positrons are generated using a 4 GeV electron beam with bunch charge 10 nC hit tungsten target and one preliminary damping ring design will be presented.

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Presenter: CAI, Meng (Institute of High Energy Physics)

Session Classification: FCC-ee accelerator

Track Classification: FCC-ee ACC

Contribution ID: **63** Type: **not specified**

Nuclear beams at HE-LHC

Tuesday, April 10, 2018 1:30 PM (20 minutes)

We take a first look at the performance of the HE-LHC as a heavy-ion collider, based on the beams foreseen to be available during the high-luminosity heavy-ion phase of the LHC that will start in 2021. Like the FCC, the HE-LHC benefits from the faster radiation damping of heavy ions but beam losses due to collimation and ultraperipheral collisions at the interactions points will require special attention.

Primary author: JOWETT, John (CERN)

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Presenter: JOWETT, John (CERN)

Session Classification: HE LHC

Track Classification: HE-LHC

Contribution ID: **64** Type: **not specified**

CEPC CDR Status and the Perspectives towards TDR

Wednesday, April 11, 2018 3:30 PM (20 minutes)

In this talk CEPC CDR design status with timeline will be presented which includes parameters, beam-beam simulation, collidering ring lattice design, dynamic apertures, booster design, SCRF system design for both collider ring and booster, linac injector design, MDI design, power consumption, site selections, etc. As for CEPC R&D status and plan for TDR will be presented also. Other issues such international collaboration will be addressed.

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Presenter: Prof. WANG, Yifang (IHEP, CAS)

Session Classification: FCC-ee accelerator

Track Classification: FCC-ee ACC

Contribution ID: **65** Type: **not specified**

EP System Design and Development Progress at IHEP

Tuesday, April 10, 2018 5:59 PM (1 minute)

Nowadays, electropolishing (EP) becomes a necessary method for Nb cavity treatment for either high gradient or high quality factory requirements. So, an EP system was development at IHEP, CAS. In this paper, the design of the system will be discussed in details. The time schedule and progress of the system manufacture will be reported. Besides, several key points will be also mentioned in the paper.

Primary author: JIN, Song

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Presenter: JIN, Song

Session Classification: Poster session

Track Classification: STP

Contribution ID: **66** Type: **not specified**

Results from Radiation Protection Studies

Wednesday, April 11, 2018 4:35 PM (25 minutes)

The studies for the Future Circular Collider have converged to a baseline layout and to technical concepts, as the foundation for the conceptual design report. Radiation Protection studies have accompanied the definitions of the civil engineering layout and engineering choices in the different parts of the FCC study. We will present the results of the studies performed for the radiation protection assessment and the recommendations to be included in the conceptual design report. We will summarise the challenges and raise awareness of accelerator and experiment designers for radiation protection and optimisation requirements for the next stages of the project.

Primary author: WIDORSKI, Markus (CERN)

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Presenter: WIDORSKI, Markus (CERN)

Session Classification: Infrastructure and operation

Track Classification: I&O

Contribution ID: **67** Type: **not specified**

GPU Accelerated Weak-Strong Simulations of Beam Quality Degradation Mechanisms due to Strong Head-on Beam-beam Interactions and Application to the FCC-hh

Tuesday, April 10, 2018 5:59 PM (1 minute)

The beam-beam interaction is one of the most severe limitations on the performance of circular colliders, as it is an unavoidable strong nonlinear effect. As one aspires for greater luminosity in future colliders, one will simultaneously achieve stronger beam-beam interactions. We study the limitations caused by strong incoherent head-on beam-beam interactions, using a new GPU-based code (CABIN) allowing for a detailed description of the long term particle trajectories in 6D phase space. The evolution of the beam emittance and beam intensity has been monitored to study the impact quantitatively, while frequency map analysis has been performed to understand the impact qualitatively. Results from CABIN has shown good quantitative agreement with dedicated experiments in the LHC. Schemes devised to cancel beam-beam driven resonances, by use of specific intermediate phase advances between the interaction points, work very well with zero crossing angle. Due to lack of symmetry, these schemes have an almost negligible impact with a significant crossing angle. The hourglass effect has been found to reduce the detrimental effects caused by the chromaticity and vice versa. The optimal level of the hourglass effect has been achieved when β^* is 1.5 times greater than the RMS bunch length. With the FCC baseline parameters, based on LHC tunes, a realistic maximum total beam-beam tune shift has been found at approximately 0.02. Alternatives to reach the ultimate goal of 0.03 are discussed.

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Co-author: BUFFAT, Xavier (CERN)

Presenter: FURUSETH, Sondre Vik (Norwegian University of Science and Technology (NO))

Session Classification: Poster session

Track Classification: FCC-hh ACC

Contribution ID: **68** Type: **not specified**

Physics with heavy ions at FCC-hh

Wednesday, April 11, 2018 8:50 AM (20 minutes)

This presentation will review the projected accelerator performance and the physics opportunities for a heavy-ion programme at FCC-hh [1]. In addition, the status of the FCC-hh detector design studies will be discussed.

Operating FCC-hh with heavy-ion beams would provide Pb-Pb and p-Pb collisions at center of mass energy of 39 and 63 TeV per NN pair, respectively. Current estimates indicate that a luminosity of about 30/nb could be integrated during a one-month Pb-Pb run, that is more than one order of magnitude above the maximum projections for the LHC. The FCC-hh beams could also be used for fixed-target collisions, either with beam extraction or gaseous target.

The Quark-Gluon Plasma state produced in Pb-Pb collisions at 39 TeV is expected to have initial temperature and energy density substantially larger than at LHC energy, a stronger flow field and freeze-out volume twice as large. The larger temperature could entail novel features, like e.g. abundant in-medium production of charm quarks. The latter could determine an increase in the number of degrees of freedom of the QGP and provide a new tool to study its temperature evolution. New, rarer, hard probes would be available, like boosted top quarks, which could give access to the time-evolution of the medium opacity.

The physics of high gluon densities at small Bjorken-x and the onset of saturation can be studied using pA, AA, and gamma-A collisions. The FCC-hh will provide access to the region down to x<10−6 with perturbative probes like heavy quarks and quarkonia and to the region of high Q2 down to x~10−4 with W, Z and top. High-energy photon-photon interactions in ultraperipheral AA collisions will also enable the study of very rare processes such as light-by-light scattering and gamma-gamma to W+W−.

[1] A. Dainese et al., Heavy ions at the Future Circular Collider, arXiv:1605.01389

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Presenter: DAINESE, Andrea (INFN - Padova (IT))

Session Classification: FCC physics

Track Classification: Physics

Contribution ID: **69** Type: **not specified**

Towards an affordable FCC: TMC superconducting wires as alternative?

Tuesday, April 10, 2018 2:26 PM (18 minutes)

Ternary Molybdenum Chalcogenide (TMC) superconductors were intensely studied until the mid 1990s. Although TMC's are low temperature superconductors (Tc ≤ 15 K), they show upper critical fields up to 60 T. R&D for TMC superconducting wires were carried out by academia and industry, e.g. Alstom (F), Mitsubishi (J) and Plansee (A). Recently it was found that the $/kgpriceandthe/$kAm performance index of TMC superconducting wires are almost one order of magnitude less than HTS tapes/wires. TMC may even be competitive in the field range above 15 T. Other advantages with respect to HTS are: isotropic physical properties, round or rectangular cross sections of wires, no reaction heat treatment, cabling like common stainless steel cables, yield strength above 800 MPa, no limitation of filament size, etc.
The most promising process for TMC superconducting wires was developed by Plansee over about 15 years. The matrix of such a wire is stainless steel with TMC filaments protected by a molybdenum diffusion barrier acting also as a stabilizer (instead of copper). Wire drawing was carried out on a production line for molybdenum wires and unit lengths up to 1 km were achieved. Today, further industrial development of these wires seems to be worth and would be beneficial for FCC and industry.
In this contribution, the status of TMC superconducting wires is reviewed. Experimental evidence is given how the critical current density, not yet optimized, can be improved substantially by replacing the usual Powder In Tube (PIT) process. The new process, documented in a PCT patent application (pending), deals with the extrusion and wire drawing of TMC bulk material (instead of powder) allowing critical current densities well in the scope of FCC.

Primary author: SEEBER, Bernd (University of Geneva)

Presenter: SEEBER, Bernd (University of Geneva)

Session Classification: Magnets

Track Classification: EASItrain

Contribution ID: **70** Type: **not specified**

Development for cooling and ventilation systems

Wednesday, April 11, 2018 1:30 PM (25 minutes)

New inputs from different actors have triggered modifications in the design of the cooling and ventilation infrastructure for the FCC. In this presentation, the new parameters and constraints will be shown as well as the current technical proposals to fulfil the new and the still-valid previous requirements. Among other topics, the author will focus, in particular, on the ventilation of the tunnel to manage emergency cases such as smoke detection or oxygen deficiency and on the ventilation of areas with high heat loads. The presentation will also assess the implementation of a new water treatment to reduce water consumption by reducing cooling towers blowdown.

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Co-author: PEON, Guillermo (CERN)

Presenter: NONIS, Mauro (CERN)

Session Classification: Infrastructure and operation

Track Classification: I&O

Contribution ID: **71** Type: **not specified**

Geodesy and Geodetic Infrastructure

Wednesday, April 11, 2018 8:55 AM (20 minutes)

Geodesy and the associated geodetic infrastructure are essential to all the CERN Survey team activities, and much of it is necessary for the civil engineering teams for new projects too –albeit to a lower precision. The reference systems and the materialisation of those systems, the theoretical location of the new installations in those systems, and fieldwork control installations must all be in place before the civil engineering works can begin.
As for the accelerators and experiments, alignment tolerances drive the geodetic solutions selected, since they can also influence the form of the accelerator lines.
The latest studies and activities will be presented, together with concepts: for the geodetic surface reference and site densification networks; control baselines for gyro-theodolites and electronic distance measurement (EDM) instruments; the transfer of surface point locations into the underground tunnels; and the extension of the CERN reference systems and surfaces across the extended site. A facility for instrument calibration, control and testing, is proposed; adapted for the longer distances over which the Survey team measurement instruments and systems must work. Known issues will be highlighted and some potential solutions presented.

Primary author: JONES, Mark (CERN)

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Presenter: JONES, Mark (CERN)

Session Classification: Infrastructure and operation

Track Classification: I&O

Contribution ID: **72** Type: **not specified**

Collimation efficiency with imperfections

Tuesday, April 10, 2018 2:20 PM (20 minutes)

The future circular collider (FCC-hh) with proton beam energy of 50 TeV and total stored energy of 8.4 GJ requires a collimation system with very high cleaning efficiency to prevent quenches of the superconducting magnets. Collimation performance can be strongly affected by collimator imperfections such as gap errors, jaws deformations, tilt and misalignments. Tracking simulations in SixTrack are presented to study the cleaning efficiency deterioration of the present collimation layout due to imperfections.

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Presenter: SERLUCA, Maurizio (Centre National de la Recherche Scientifique (FR))

Session Classification: FCC-hh accelerator

Track Classification: EuroCirCol

Contribution ID: **73** Type: **not specified**

Dynamic aperture at injection and 3.3 TeV energy choice

Tuesday, April 10, 2018 3:30 PM (25 minutes)

The Nb3Sn dipole design for the hadron machine option of the Future Circular Colliders enters in an intense and long R&D phase. As a result, more realistic dipole field quality evaluations are available for beam dynamics studies. In this paper we discuss the impact of the main dipole field quality on the first and second order design of the hadron machine and on its dynamic aperture.

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Presenter: DALENA, Barbara (Université Paris-Saclay (FR))

Session Classification: FCC-hh injector

Track Classification: EuroCirCol

Contribution ID: **74** Type: **not specified**

Collider Availability Modelling and Potential Applications in Industry

Tuesday, April 10, 2018 5:20 PM (1 minute)

This contribution presents our collider availability model used in FCC study. The model represents failure logics, operations and calculates the integrated luminosity productions, which is one of the key performance indicator for colliders. The operation phases are essential part of the collider model, as several steps are required to prepare the collider for collisions. This means that the luminosity production is not linearly dependent on availability and must be modelled separately. The models allows deriving availability budgets for FCC systems to guide their designs and testing different operation scenarios. We see high potential in applying combined reliability and operation models also in process and manufacturing industry. In this field, often the key performance indicator is the process performance. This can be modelled similarly to the luminosity production in the collider model. Our collaboration between CERN, Tampere University of Technology and Ramentor lead to development of an Open Modelling Approach for Availability and Reliability of Systems (OpenMARS). It answers the modelling needs of today's complex and dynamic systems. The approach is based on ELMAS (Event Logic Modelling and Analysis Software), which Ramentor has used successfully in various industry sectors. For analysis of the OpenMARS models, we developed a calculation engine, which permits efficient parallel simulation in a distributed computing cluster.

Primary author: PENTTINEN, Jussi-Pekka (Ramentor Oy)

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Presenter: PENTTINEN, Jussi-Pekka (Ramentor Oy)

Session Classification: Poster session

Track Classification: I&O

Contribution ID: **75** Type: **not specified**

Two beam stability and Landau damping

Thursday, April 12, 2018 4:10 PM (25 minutes)

In proton colliders, Landau octupoles are used to provide the necessary Landau damping of transverse coherent beam instabilities driven by the impedance. During the operational cycle the tune spread provided by the Landau octupoles may be modified when in presence of beam-beam interactions. Transverse beam stability studies for the FCC-hh operational cycle will be explored using Landau octupoles alone and in presence of beam-beam long range and head-on interactions. In addition, the possibility to use an electron lens to provide the necessary tune spread for beam stability will be analysed and compared to the octupole magnets case. Based on these studies an optimum operational scenario will be proposed to guarantee the maximum stability during the entire FCC-hh operational cycle.

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Presenter: TAMBASCO, Claudia (EPFL - Ecole Polytechnique Federale Lausanne (CH))

Session Classification: FCC-hh accelerator

Track Classification: EuroCirCol

Contribution ID: **76** Type: **not specified**

Multigigabit Wireless Data Transfer for High Energy Physics Applications

Tuesday, April 10, 2018 5:03 PM (1 minute)

The volume of data produced at the Large Hadron Collider (LHC) is immense and represent a considerable processing challenge. Moreover the LHC and future hadronic colliders are the most demanding environments, with respect to ultra-low latencies, ultra-high data rate, reliable indoor coverage and harsh radiation environment, in the world.
Any technology meeting the above conditions will have to satisfy the standard requirements of energy efficiency, low cost and security. Today, the data transmission in HEP experiments is based on wire and optical readout architecture. We propose the use of wireless data transmission described here as a third option. We present some selected physics cases and an overview of the status of our ASIC development and first ideas for wireless read out and control.

Primary author: LOCCI, Elizabeth (Université Paris-Saclay (FR))

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Presenter: LOCCI, Elizabeth (Université Paris-Saclay (FR))

Session Classification: Poster session

Track Classification: FCC-hh Phy/Exp

Contribution ID: **77** Type: **not specified**

Electron cloud

Thursday, April 12, 2018 2:45 PM (15 minutes)

Electron clouds can cause several unwanted effects, in particular beam instabilities, emittance growth and tune shifts, as well as additional heat load on the cryogenic system and vacuum degradation. These effects can most efficiently be mitigated by suppressing the formation of electron clouds. In this contribution we present the required conditions for sufficient electron cloud suppression in the FCC-hh, based on simulation studies of electron cloud build-up and its effect on beam stability.

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Co-author: RUMOLO, Giovanni (CERN)

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Session Classification: FCC-hh accelerator

Track Classification: EuroCirCol

Contribution ID: **78** Type: **not specified**

The US-MDP 15 T cosinetheta models

Wednesday, April 11, 2018 11:00 AM (30 minutes)

US Magnet Development Program (MDP) is developing a 15 T Nb3Sn dipole demonstrator for a post-LHC pp Collider. The magnet design is based on 60-mm aperture 4-layer shell-type coils, graded between the inner and outer layers to maximize the magnet performance. An innovative mechanical structure based on aluminum IC-clamps and a thick stainless steel skin was developed to preload brittle Nb3Sn coils and support larger Lorentz forces at high fields. To study mechanical properties of this structure as well as to optimize the magnet assembly and coil pre-load procedures, the structure was assembled with aluminum cylinders serving as “dummy” coils. These cylinders were instrumented with strain gauges to monitor radial and azimuthal and axial stresses during structure pre-loading. This report describes the 15 T dipole demonstrator design, magnet fabrication status, and mechanical model test results.

Primary author: ZLOBIN, Alexander (Fermilab)

Presenter: ZLOBIN, Alexander (Fermilab)

Session Classification: Magnets

Track Classification: EuroCirCol

Contribution ID: **79** Type: **not specified**

Constraining Dimension-Eight Operators for Anomalous Neutral Triple Gauge Boson Interactions at FCC-hh

Tuesday, April 10, 2018 5:59 PM (1 minute)

We probe the effects of dimension-eight operators giving rise to anomalous neutral triple gauge boson interactions of Z⊠⊠ and Z⊠Z vertices in l-l+⊠ production (pp⟶ l-l+⊠) at 100 TeV centre of mass energy of future circular hadron collider, namely FCC-hh. The analysis is performed on transverse momentum of photon and angular distribution of charged lepton in the final state including a realistic detector effects. Sensitivity limits for CP-even couplings are obtained at 95% C.L. and compared bounds from ATLAS and CM

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Session Classification: Poster session

Track Classification: Physics

Contribution ID: **80** Type: **not specified**

Search for Heavy Right Handed Neutrinos at the FCC-ee

Tuesday, April 10, 2018 4:10 PM (20 minutes)

The Standard Model of particle physics is still lacking an understanding of the generation and nature of neutrino masses. A favorite theoretical scenario (the see-saw mechanism) is that both Dirac and Majorana mass terms are present, leading to the existence of heavy partners of the light neutrinos, presumably massive and nearly sterile. These heavy neutral leptons (HNLs) can be searched for at high energy lepton colliders of very high luminosity, such as the Future electron-positron e^+e^- Circular Collider, FCC-ee. A first look at the FCC-ee sensitivity in direct search for heavy neutrino decays is presented, which appears very promising due to the long lifetime of heavy neutrinos for small mixing angles. A sensitivity down to a heavy-light mixing of 10^{-12} is obtained, covering a large phase-space for heavy neutrino masses between 10 and 80 GeV$/c^2$. The synergy with a possible future beam-dump experiment, SHiP, would allow to explore most of the parameter space for HNLs of the νMSM, a minimal Standard Model extension aimed at simultaneously explaining the matter-antimatter asymmetry of the Universe and the phenomenon of neutrino oscillation, while also providing a light dark matter candidate.

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Presenter: GRAVERINI, Elena (Universitaet Zuerich (CH))

Session Classification: FCC-ee physics & experiments

Track Classification: FCC-ee Phy/Exp

Contribution ID: **81** Type: **not specified**

Electromagnetic calorimetry based on liquid argon for the FCC-hh experiments

Thursday, April 12, 2018 9:25 AM (20 minutes)

"Calorimetry with liquid argon as the active medium has been chosen as the baseline technology for large parts of the FCC-hh calorimeters. This includes the barrel electromagnetic (EM) calorimeter, the endcap EM and hadronic calorimeter and the forward calorimeter. These calorimeters have to meet the requirements of high radiation hardness and must be able to deal with a very high number of collisions per bunch crossings (pile–up). An excellent energy and angular resolution for a wide range of electrons' and photons' momentum is needed in order to meet the demands based on the physics benchmarks. The detector layout in the barrel region combines the concept of a highly granular calorimeter with precise energy measurements. It has been optimised since the last FCC Week and all recent results of the performance studies will be presented. Moreover, the study includes the influence of the noise in the detector, coming from the electronics and from the pile-up.
"

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Presenter: ZABOROWSKA, Anna (CERN)

Session Classification: FCC-hh physics & experiments

Track Classification: FCC-hh Phy/Exp

Contribution ID: **82** Type: **not specified**

Dynamic Aperture, ideal and with errors

Wednesday, April 11, 2018 9:25 AM (20 minutes)

FCC-ee will be a precision measurement tool for Z, W, H and t physics with expected luminosities of 2.07 × 10^36 cm−2 s−1 at the Z-pole and 1.3 × 10^34 cm−2 s−1 at the $t\bar{t}$ threshold. In order to achieve the foreseen luminosities, a vertical β^* of 1 mm to 2 mm is mandatory. Dynamic aperture and frequency maps for the 97.75 km machine are studied. Furthermore, effects of machine misalignments on dynamic and momentum aperture are presented and estimations for the required tolerances are given.

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Presenter: TYDECKS, Tobias (CERN)

Session Classification: FCC-ee accelerator

Track Classification: FCC-ee ACC

Contribution ID: **83** Type: **not specified**

Quantum Excitation due to Classical Beamstrahlung in FCCe+e-

Tuesday, April 10, 2018 5:59 PM (1 minute)

"In the collisions of proposed future circular colliders, like FCCee and CEPC, the beamstrahlung regime is classical, i.e. wit for a constant electromagnetic field a simple relation exists between the average photon energy u and the average squared photon energy u^2, which is the same as for standard synchrotron radiation in storage rings. This relation breaks down, however, if the electromagnetic field is not constant in time and position, as is the case for a beambeam collision. We derive an analytical expression for u^2/u^2, considering the case of Gaussianbunch collisions with crossing angle (and possibly crab waist). We compare our result with the photon energies obtained in beambeam simulation for FCCee at beam energies of 45.6 GeV and 175 GeV, using the two independent codes BBWS and Guineapig. Finally, we reoptimize the FCC-ee parameters of a possible monochromatization scheme for direct Higgs production at 125 GeV, derived previously, by applying the refined expression for the rms photon energy."

Primary author: Mr VALDIVIA GARCIA, Marco Alan (Universidad de Guanajuato (MX))

Co-authors: EL KHECHEN, Dima (CERN); ZIMMERMANN, Frank (CERN); OIDE, Katsunobu (High Energy Accelerator Research Organization (JP))

Presenter: Mr VALDIVIA GARCIA, Marco Alan (Universidad de Guanajuato (MX))

Session Classification: Poster session

Track Classification: FCC-ee ACC

Contribution ID: **84** Type: **not specified**

Beam-gas background characterization in the FCC-ee IR

Wednesday, April 11, 2018 10:55 AM (20 minutes)

Beam-gas induced background has been studied for the MDI region of the FCC-ee at all the operating running energies. Beam loss maps with characterization of the lost particles and full analysis is perfomed with MDISim. Vacuum requirement in the upstream region before the IR and the IR itself is presented. The loss particles can eventually be tracked in the geant4 detector model and luminosity calorimeter.Benchmarking with MOLFLOW code is discussed as well.

Primary author: Dr COLLAMATI, Francesco (INFN Roma I (IT))

Co-authors: BURKHARDT, Helmut (CERN); KERSEVAN, Roberto (CERN); BOSCOLO, Manuela (INFN e Laboratori Nazionali di Frascati (IT)); LUCKHOF, Marian (Hamburg University (DE)); BLANCO GARCIA, Oscar Roberto (LNF/INFN)

Presenter: Dr COLLAMATI, Francesco (INFN Roma I (IT))

Session Classification: FCC-ee accelerator

Track Classification: FCC-ee ACC

Contribution ID: **85** Type: **not specified**

Progress on Nb3Sn conductor development in Japan

Tuesday, April 10, 2018 11:06 AM (18 minutes)

"The development of Nb3Sn high-field conductor has been executed based on a CERN-KEK collaborative agreement.The scope of the development programme of Nb3Sn high-field conductor is to develop, produce, in representative lengths, and characterize Nb3Sn strand with enhanced characteristics. The final goal is to achieve, in representative unit lengths of material, the following development targets on the basis of magnets performance, for the Nb3Sn conductor:
a) A non-copper critical current density at 4.2 K and 16 T (Jc (4.2 K, 16 T)) of at least 1500 A/mm2;
b) A strand diameter of not more than 1 mm;
c) A fraction of stabilizer to superconductor in the strand of about 1;
d) An equivalent diameter of the superconducting Nb3Sn filaments of less than 50 m;
e) A low electrical resistivity of the copper stabilizer of the strand, i.e. a Residual Resistivity Ratio (RRR) of the copper after strand reaction of above 150.
Based on the agreement, KEK started the R&D program in collaboration with Japanese universities; Tohoku University and Tokai University, and Japanese manufacturers; JASTEC and Furukawa electric. Two technologies are chosen as primary candidates, one is the JASTEC distributed Tin (DT) method and the other is Nb tube method by Furukawa. Several R&D wires were already produced and intense characterization of the wires were made by Japanes collaboraters as well as by CERN.
The current status of the program will be reported.
"

Primary author: OGITSU, Toru

Co-authors: SUGANO, Michinaka; NAKAMOTO, Tatsushi (KEK); BALLARINO, Amalia (CERN); BENEDIKT, Michael (CERN); Dr HOPKINS, Simon (CERN); OGURO, Hidetoshi (Tokai University); AWAJI, Satoshi (Tohoku University); SAKAMOTO, Hisaki (Furukawa Electric Co., Ltd); SHIMIZU, Hitoshi (Furukawa electric (JP)); FUKUMOTO, Yoshito (JASTEC); KAWASHIMA, Shinya (JASTEC); SAITO, Kazuyoshi (JASTEC)

Presenter: OGITSU, Toru

Session Classification: Magnets

Track Classification: EASItrain

Contribution ID: **86** Type: **not specified**

Single beam collective effects overview

Thursday, April 12, 2018 1:50 PM (20 minutes)

The impedance model together with the status of electron cloud simulations for FCC-hh will be presented. Thresholds for transverse coupled bunch instabilities, for mode coupling instabilities and the requirements for Landau damping in FCC-hh will be discussed and compared to LHC.

Primary author: BOINE-FRANKENHEIM, Oliver (TU Darmstadt)

Co-authors: ASTAPOVYCH, Daria (TU Darmstadt); ARSENYEV, Sergey (CERN); KORNILOV, Vladimir (GSI Helmholtzzentrum Darmstadt, Germany); METHER, Lotta (EPFL - Ecole Polytechnique Federale Lausanne (CH)); SCHULTE, Daniel (CERN); RIEMANN, Bernard (TU Dortmund University); NIEDERMAYER, Uwe (TU-Darmstadt)

Presenter: BOINE-FRANKENHEIM, Oliver (TU Darmstadt)

Session Classification: FCC-hh accelerator

Track Classification: EuroCirCol

Contribution ID: **87** Type: **not specified**

Study on tin and titanium diffusion characteristics for Nb3Sn strand for FCC conductor

Tuesday, April 10, 2018 5:59 PM (1 minute)

Nb3Sn wire is the proposed type II superconductor to be used as the superconducting dipole magnet in Future Circular Collider (FCC) for its superior superconducting properties at high magnetic field (16T). Heat treatment and phase formation of Nb3Sn internal tin superconductors are quite complicated due to the need to convert low melting temperature tin-rich phases to high temperature copper-rich Cu-Sn phases. The Sn and Ti diffusion is influenced by many factors that the ratio of Cu, Nb and Sn in the non-Cu area on the initial cross-sectional design, and the total strain of Nb during the manufacturing process and the size, quantity, and microstructure of the Nb filaments in the final diameter of the wire. In this study, we investigate that the effect of these design parameters and heat treatment conditions on the Sn and Ti diffusion of Nb3Sn strand, and the structure and morphology of Nb3Sn superconducting wire with high Jc performance have been studied by SEM and EDS.

Primary author: KIM, Jiman (Kiswire Advanced Technology Ltd)

Co-authors: SHIN, Iksang (Kiswire Advanced Technology Ltd); NA, Sinhye (Kiswire Advanced Technology Ltd)

Presenter: KIM, Jiman (Kiswire Advanced Technology Ltd)

Session Classification: Poster session

Track Classification: Magnets

Contribution ID: **88** Type: **not specified**

Development status of Nb3Sn strand for FCC

Tuesday, April 10, 2018 11:42 AM (18 minutes)

Superconducting wire having high critical current density(Jc) under high magnetic field(16T) is required for fabrication of dipole magnet for FCC project. Currently, Nb3Sn wire is the most promising as a superconducting wire satisfying such a requirement, but in order to reduce amount and manufacturing cost, improvement of Jc is necessary. For this purpose, a preliminary development program of high Jc Nb3Sn wire is in progress between CERN and KAT (Kiswire Advanced Technology Ltd.). In this study, we suggested three different designs which have Nb filaments with different size and number, and fabricated samples using the internal tin method. In addition, the effect of heat treatment schedule on Jc was investigated.

Primary author: KIM, Jiman (Kiswire Advanced Technology Ltd)

Presenter: KIM, Jiman (Kiswire Advanced Technology Ltd)

Session Classification: Magnets

Track Classification: EASItrain

Contribution ID: **89** Type: **not specified**

Higgs and Electroweak symmetry breaking at the FCC-hh

Wednesday, April 11, 2018 1:50 PM (30 minutes)

The future circular hadron-hadron collider FCC-hh is expected to produce collisions at the unrivaled center of mass energy of sqrt(s) = 100 TeV and to deliver an integrated luminosity of few tens of ab-1. As a result, billions of Higgs bosons will be produced. Having at disposal such humongous samples opens a wide range of possibilities in the realm of precision Higgs measurements. The Top Yukawa and the Higgs self-coupling can be potentially measured respectively to percent level precision. In addition final states involving Higgs bosons can be studied in highly boosted kinematical regimes where the impact of systematic uncertainties can be reduced. Large statistics also offer the possibility of studying rare decays, in particular the Higgs coupling to light quarks.

Primary author: SELVAGGI, Michele (CERN)

Presenter: SELVAGGI, Michele (CERN)

Session Classification: FCC-hh physics & experiments

Track Classification: FCC-hh Phy/Exp

Contribution ID: **90** Type: **not specified**

Heavy resonance searches at the FCC-hh

Wednesday, April 11, 2018 3:30 PM (30 minutes)

"The feasibility of a future proton-proton collider (FCC-hh), with center of mass energies up to 100 TeV and unprecedented luminosity is currently being studied.
By delivering an integrated luminosity of few tens of ab-1, such a machine will provide an outstanding discovery potential for new physics, far beyond the reach of high luminosity or high energy LHC. In this talk we will discuss searches of heavy resonances decaying into leptons, tops, bosons and light quarks. Depending on the final state and the assumed model, the discovery reach and exclusion potential for heavy resonances ranges from 20 to 45TeV. We will also discuss why studying heavy resonances provides an important handle to constrain the detector design and performance, such as the muon resolution at high transverse momentum, or the calorimeter containment and granularity."

Primary author: HELSENS, Clement (CERN)

Presenter: HELSENS, Clement (CERN)

Session Classification: FCC-hh physics & experiments

Track Classification: FCC-hh Phy/Exp

Contribution ID: **91** Type: **not specified**

QCD and photon-photon physics at FCC-ee

Tuesday, April 10, 2018 4:30 PM (20 minutes)

By collecting tens of ab^-1 integrated luminosity in the range of center-of-mass energies sqrt(s) =90–350 GeV, the FCC-ee offers unique physics opportunities for precise measurements of QCD phenomena and of photon-photon collisions through, literally, billions of hadronic final states as well as unprecedented large fluxes of quasireal photons radiated from the e+e- beams. We succinctly summarize the FCC-ee perspectives for high-precision extractions of the QCD coupling, for detailed analyses of parton radiation and fragmentation, and for SM and BSM studies through γγ collisions.

Primary author: D'ENTERRIA, David (CERN)

Co-author: SKANDS, Peter (Monash University (AU))

Presenter: D'ENTERRIA, David (CERN)

Session Classification: FCC-ee physics & experiments

Track Classification: FCC-ee Phy/Exp

Contribution ID: **92** Type: **not specified**

Experimental Insertions

Tuesday, April 10, 2018 10:30 AM (25 minutes)

This talk will give an overview of the developments and the achievements of the Experimental Insertions of FCC-hh.

Primary author: MARTIN, Roman (CERN)

Co-authors: SERYI, Andrei (University of Oxford (GB)); HOFER, Michael (Vienna University of Technology (AT)); CRUZ ALANIZ, Emilia (University of Oxford JAI); ZIMMERMANN, Frank (CERN); BESANA, Maria Ilaria (CERN); SCHULTE, Daniel (CERN); BENEDIKT, Michael (CERN); BURKHARDT, Helmut (CERN); LANGNER, Andy Sven; RIEGLER, Werner (CERN); APPLEBY, Robert Barrie (School of Physics and Astronomy Schuster Laboratory-University o); BUFFAT, Xavier (CERN); INFANTINO, Angelo (CERN - EN/STI-FDA); CERUTTI, Francesco (CERN); VAN RIESEN-HAUPT, Leon; RAFIQUE, Haroon (University of Manchester/Cockcroft Institute); TOMAS GARCIA, Rogelio (CERN); BARRANCO GARCIA, Javier (EPFL - Ecole Polytechnique Federale Lausanne (CH)); ABELLEIRA, Jose (JAI Oxford); GONCALVES JORGE, Patrik (EPFL); PIELONI, Tatiana (EPF Lausanne); TAMBASCO, Claudia (EPFL - Ecole Polytechnique Federale Lausanne (CH)); BOSCOLO, Manuela (INFN e Laboratori Nazionali di Frascati (IT)); COLLAMATI, Francesco (INFN Roma I (IT)); NEVAY, Laurie (Royal Holloway University of London)

Presenter: MARTIN, Roman (CERN)

Session Classification: FCC-hh accelerator

Track Classification: EuroCirCol

Contribution ID: **93** Type: **not specified**

Exploring the high field potential of Nb3Sn Strand

Tuesday, April 10, 2018 8:30 AM (20 minutes)

Significant progress has been made in the last year in advancing the critical current density of RRP® and PIT Nb3Sn strand by more efficient use of the non-Cu volume used to make the Nb3Sn. For RRP® we show how changing the intermediate heat treatment step to better mix the Cu and Sn and avoid unnecessary Nb dissolution can enable critical current density values above 2900 A/mm2 (12 T, 4.2 K) for sub elements as small as 35 μm in diameter. We also show how design changes for PIT conductors have significantly increased the volume fraction of Nb3Sn, driving Jc up to nearly 2700 A/mm2 (12 T,4.2 K). However, the performance of both types of strands is still well below the FCC goals, and strand for FCC will need to be targeted for 16-18 T performance, not 12-15 T. For high field performance, it becomes more important to optimize the irreversibility field of the conductor. In particular, doping is crucial to increasing the upper critical field of Nb3Sn and we show how EXAFS can be used to identify the lattice locations of the dopant atoms in high performance Nb3Sn strand. For the first time we show that Ta atoms can occupy either the Nb or Sn sites and thus that the Ta atoms compete with the diffusing Sn for the Sn sites during reaction. By contrast, Ti always sits on Nb sites, perhaps explaining the faster and more homogeneous reaction we find for Ti doping. It does seem that the disorder potential of double-doped (Ta+Ti) with higher Kramer field (Hk) and upper critical field (Hc2) extrapolations deserves further examination for FCC use. We also include our first characterizations of ZrO2 containing strands where we find, for now significantly depressed Hc2 values, in spite of their enhanced pinning site density.

Primary author: LEE, Peter (Florida State University)

Co-authors: LARBALESTIER, David (National High Magnetic Field Laboratory); SEGAL, Chris (National High Magnetic Field Laboratory); SANABRIA, Charlie (NHMFL); TARANTINI, Chiara (AS-C-NHMFL, Florida State University); HEALD, Steve (Argonne National Lab (US))

Presenter: LEE, Peter (Florida State University)

Session Classification: Magnets

Track Classification: EASItrain

Contribution ID: **94** Type: **not specified**

Internal Oxidation at Unige

Tuesday, April 10, 2018 9:10 AM (20 minutes)

Primary author: SENATORE, Carmine (University of Geneva)

Presenter: SENATORE, Carmine (University of Geneva)

Session Classification: Magnets

Track Classification: EASItrain

Contribution ID: **95** Type: **not specified**

Mechanical properties of Nb3Sn: overview of wires and cables characteristics

Tuesday, April 10, 2018 9:30 AM (20 minutes)

Primary author: BORDINI, Bernardo (CERN)

Presenter: BORDINI, Bernardo (CERN)

Session Classification: Magnets

Track Classification: EASItrain

Contribution ID: **96** Type: **not specified**

Report on FCC Conductor Workshop at CERN

Tuesday, April 10, 2018 10:30 AM (18 minutes)

Primary author: BALLARINO, Amalia (CERN)

Presenter: BALLARINO, Amalia (CERN)

Session Classification: Magnets

Track Classification: EASItrain

Contribution ID: **97** Type: **not specified**

Characterization of FCC conductor at CERN

Tuesday, April 10, 2018 10:48 AM (18 minutes)

Primary author: HOPKINS, Simon (CERN)

Presenter: HOPKINS, Simon (CERN)

Session Classification: Magnets

Track Classification: EASItrain

Contribution ID: **98** Type: **not specified**

Development of Nb3Sn wire at Bruker

Primary author: SCHLENGA, Klaus (Bruker EST)

Presenter: SCHLENGA, Klaus (Bruker EST)

Session Classification: Magnets

Track Classification: EASItrain

Contribution ID: **99** Type: **not specified**

Update on the potential of Bi-2212 for high field magnet use

Tuesday, April 10, 2018 1:30 PM (20 minutes)

"Making HTS conductors constrained by the poor superconducting properties of grain boundaries suitable for high field magnet and especially for accelerator use has been a 30 year odyssey. At the NHMFL we have placed particular emphasis on Bi-2212 because of its round-wire, multifilament architecture. Over the last several years we have shown that it can be processed into high Jc forms that can be used for small high field magnets at >30 T, that its flexible architecture can be realized industrially, that its overall wire Jc can exceed that of any other HTS conductor (except for REBCO in H||ab orientation) and that it is functionally isotropic, possessed of a low hysteretic loss (very similar to ITER Nb3Sn conductors) with a high conductivity normal matrix without any need for a diffusion barrier. At 20 T, 4.2 K its supercurrent Jc has now reached 6000 A/mm2 (whole wire Jc ~1200 A/mm2 with present 20% fill factors) in industrially produced wires of lengths > 1 km. In short, both for solenoids tested at the NHMFL, and in racetrack coils made by Shen at LBL, the promise of Bi-2212 for high field applications made major strides in 2017. I will summarize recent progress in the Bi-2212 effort at the NHMFL and our interactions with B-OST, US powder producers and LBL relevant to this effort.

We would like to thank our collaborators at Bruker-OST, nGimat, MetaMateria and LBL and funding support from the U.S. Department of Energy, Office of High Energy Physics under Award Number DE-SC0010421. A portion of this work was performed at the National High Magnetic Field Laboratory, which is supported by National Science Foundation Cooperative Agreement No. DMR-1157490 and the State of Florida. "

Primary author: LARBALESTIER, David (National High Magnetic Field Laboratory)

Co-authors: HELLSTROM, Eric (Florida); KAMETANI, Fumitake (Florida State University (US)); JIANG, Jianyi (Florida State University); TROCIEWITZ, Ulf (NHMFL)

Presenter: LARBALESTIER, David (National High Magnetic Field Laboratory)

Session Classification: Magnets

Track Classification: EASItrain

Contribution ID: **100** Type: **not specified**

Overview of conductor R&D at Fermilab

Tuesday, April 10, 2018 1:50 PM (18 minutes)

Primary author: BARZI, emanuela (Fermilab)

Presenter: BARZI, emanuela (Fermilab)

Session Classification: Magnets

Track Classification: EASItrain

Contribution ID: **102** Type: **not specified**

Status of the CDR

Tuesday, April 10, 2018 3:30 PM (10 minutes)

Primary author: TOMMASINI, Davide (CERN)

Presenter: TOMMASINI, Davide (CERN)

Session Classification: Magnets

Track Classification: EuroCirCol

Contribution ID: **103** Type: **not specified**

Block-coil

Tuesday, April 10, 2018 3:40 PM (25 minutes)

Primary author: ROCHEPAULT, Etienne (Université Paris-Saclay (FR))

Presenter: ROCHEPAULT, Etienne (Université Paris-Saclay (FR))

Session Classification: Magnets

Track Classification: EuroCirCol

Contribution ID: **104** Type: **not specified**

Common-coil

Tuesday, April 10, 2018 4:05 PM (25 minutes)

Primary author: TORAL, Fernando (Centro de Investigaciones Energéti cas Medioambientales y Tecno)

Presenter: TORAL, Fernando (Centro de Investigaciones Energéti cas Medioambientales y Tecno)

Session Classification: Magnets

Track Classification: EuroCirCol

Contribution ID: **106** Type: **not specified**

Costheta

Tuesday, April 10, 2018 4:30 PM (25 minutes)

Primary author: CAIFFI, Barbara (INFN e Universita Genova (IT))

Presenter: CAIFFI, Barbara (INFN e Universita Genova (IT))

Session Classification: Magnets

Track Classification: EuroCirCol

Contribution ID: **107** Type: **not specified**

FCC cryostat design

Wednesday, April 11, 2018 8:50 AM (15 minutes)

Primary author: PARMA, Vittorio (CERN)

Presenter: PARMA, Vittorio (CERN)

Session Classification: Magnets

Track Classification: EuroCirCol

Contribution ID: **108** Type: **not specified**

EuroCirCol 16 T dipole magnet quench protection

Wednesday, April 11, 2018 9:05 AM (25 minutes)

One of the aspects studied during the design of the 16 T Nb3Sn dipole magnets was their safety during quenches occurring in magnet operation and testing. To ensure that the foreseen quench protection technologies can limit the magnet temperatures and voltages to safe values, several criteria related to quench protection were included in the magnet design. As the magnet designs matured, detailed protection schemes including quench heaters and/or CLIQ (Coupling Loss Induced Quench) were developed. In this presentation, we show the final proposed protection schemes with CLIQ, which is the baseline option, and the protection schemes using quench heaters, which can provide a back-up solution in case future experiments will show some unexpected behaviour related to the novel CLIQ technology. We consider the Cosθ, Block, and Common-coil magnets developed within the EuroCirCol collaboration.

Primary author: SALMI, Tiina-Mari (Tampere University of Technology, Finland)

Co-author: PRIOLI, Marco (CERN)

Presenter: SALMI, Tiina-Mari (Tampere University of Technology, Finland)

Session Classification: Magnets

Track Classification: EuroCirCol

Contribution ID: **110** Type: **not specified**

Cost model

Wednesday, April 11, 2018 9:45 AM (15 minutes)

Primary author: SCHOERLING, Daniel (CERN)

Presenter: SCHOERLING, Daniel (CERN)

Session Classification: Magnets

Track Classification: EuroCirCol

Contribution ID: **111** Type: **not specified**

CERN R&D magnets

Wednesday, April 11, 2018 10:30 AM (30 minutes)

Primary author: IZQUIERDO BERMUDEZ, Susana (CERN)

Presenter: IZQUIERDO BERMUDEZ, Susana (CERN)

Session Classification: Magnets

Track Classification: EuroCirCol

Contribution ID: **112** Type: **not specified**

The US-MDP canted cosinetheta models

Wednesday, April 11, 2018 11:30 AM (15 minutes)

Primary author: CASPI, Shlomo (Lawrence Berkeley national laboratory USA)

Presenter: CASPI, Shlomo (Lawrence Berkeley national laboratory USA)

Session Classification: Magnets

Track Classification: EuroCirCol

Contribution ID: **113** Type: **not specified**

The CEA 16T model for the FCC

Wednesday, April 11, 2018 11:45 AM (15 minutes)

Primary author: ROCHEPAULT, Etienne (Université Paris-Saclay (FR))

Presenter: ROCHEPAULT, Etienne (Université Paris-Saclay (FR))

Session Classification: Magnets

Track Classification: EuroCirCol

Contribution ID: **114** Type: **not specified**

The US MDP

Wednesday, April 11, 2018 1:30 PM (20 minutes)

Primary author: PRESTEMON, Soren (LBNL)

Presenter: PRESTEMON, Soren (LBNL)

Session Classification: Magnets

Track Classification: Magnets

Contribution ID: **115** Type: **not specified**

R&D for the SPPC magnets

Wednesday, April 11, 2018 1:50 PM (20 minutes)

Primary author: XU, Qingjin (IHEP)

Presenter: XU, Qingjin (IHEP)

Session Classification: Magnets

Track Classification: Magnets

Contribution ID: **117** Type: **not specified**

Review of coil characterization

Wednesday, April 11, 2018 2:30 PM (15 minutes)

Presenter: LACKNER, Friedrich (CERN)

Session Classification: Magnets

Track Classification: Magnets

Contribution ID: **118** Type: **not specified**

6 T fast pulsed superconducting dipoles for the SPS

Wednesday, April 11, 2018 2:45 PM (15 minutes)

Primary author: KOVALENKO, Alexander (Joint Institute for Nuclear Research)

Presenter: KOVALENKO, Alexander (Joint Institute for Nuclear Research)

Session Classification: Magnets

Track Classification: Magnets

Contribution ID: **119** Type: **not specified**

Other magnets parameters

Wednesday, April 11, 2018 3:30 PM (15 minutes)

Primary author: SCHOERLING, Daniel (CERN)

Presenter: SCHOERLING, Daniel (CERN)

Session Classification: Magnets

Track Classification: Magnets

Contribution ID: **120** Type: **not specified**

Main quadrupoles

Wednesday, April 11, 2018 3:45 PM (15 minutes)

Primary author: LORIN, Clement (Université Paris-Saclay (FR))

Presenter: LORIN, Clement (Université Paris-Saclay (FR))

Session Classification: Magnets

Track Classification: Magnets

Contribution ID: **122** Type: **not specified**

Low-luminosity D1 for FCC

Wednesday, April 11, 2018 4:15 PM (15 minutes)

Primary author: OGITSU, Toru

Presenter: OGITSU, Toru

Session Classification: Magnets

Track Classification: Magnets

Contribution ID: **123** Type: **not specified**

Low-luminosity D2 for FCC

Wednesday, April 11, 2018 4:30 PM (15 minutes)

Primary author: FARINON, Stefania (INFN e Universita Genova (IT))

Presenter: FARINON, Stefania (INFN e Universita Genova (IT))

Session Classification: Magnets

Track Classification: Magnets

Contribution ID: **124** Type: **not specified**

Triplets

Wednesday, April 11, 2018 4:45 PM (15 minutes)

Primary author: KASHIKHIN, Vadim (Fermilab)

Presenter: KASHIKHIN, Vadim (Fermilab)

Session Classification: Magnets

Track Classification: Magnets

Contribution ID: **125** Type: **not specified**

Virtual reality experiments for evacuation in the FCC

Thursday, April 12, 2018 9:20 AM (25 minutes)

Evacuation is one of the biggest challenges for the fire safety design for the Future Circular Collider (FCC). The configuration of the accelerator, where the distance to the nearest exit to the surface might be up to several kilometers, requires an evacuation design that ensures the occupants move away from the location of the fire, even if they do not know where it is located. An evacuation experiment was designed developing a realistic computer-generated model of the accelerator in virtual reality (VR). The goal of the VR experiment was the testing of the effectiveness of a set of evacuation features for way-finding. Different evacuation features were included in the VR scenarios, including alarm bells, flashing lights on compartmentation walls similar to the one developed for the CERN's Super Proton Synchrotron (SPS) - emergency signage, etc. A modified version of the Train Inspection Monorail (TIM) was also tested in order to study its possible suitability to provide information about the direction occupants should go in case of evacuation. Results and recommendations of the VR evacuation experiments will be presented.

Primary author: ARIAS OSUNA, Silvia Alejandra

Co-authors: RONCHI, Enrico (Lund University); WAHLQVIST, Jonathan (Lund University); RIOS RUBIRAS, Oriol (CERN); LA MENDOLA, Saverio (CERN)

Presenter: ARIAS OSUNA, Silvia Alejandra

Session Classification: Infrastructure and operation

Track Classification: I&O

Contribution ID: **126** Type: **not specified**

Hands-on demonstration of virtual reality experiment

Thursday, April 12, 2018 9:45 AM (15 minutes)

Primary author: ARIAS OSUNA, Silvia Alejandra

Presenter: ARIAS OSUNA, Silvia Alejandra

Session Classification: Infrastructure and operation

Track Classification: I&O

Contribution ID: **127** Type: **not specified**

Conceptual powering layout for FCC-hh, FCC-ee, and HE-LHC

Wednesday, April 11, 2018 1:55 PM (25 minutes)

Primary author: BOZZINI, Davide (CERN)

Presenter: BOZZINI, Davide (CERN)

Session Classification: Infrastructure and operation

Track Classification: I&O

Contribution ID: **128** Type: **not specified**

Energy management and efficiency

Wednesday, April 11, 2018 2:40 PM (20 minutes)

Primary author: MERTENS, Volker (CERN)

Presenter: MERTENS, Volker (CERN)

Session Classification: Infrastructure and operation

Track Classification: I&O

Contribution ID: **129** Type: **not specified**

The survey and alignment of the FCC

Wednesday, April 11, 2018 9:15 AM (20 minutes)

"The CERN Survey team is involved at all stages of the construction of a new particle accelerator and its experimental detectors. From very early, when the geodetic aspects are quite important to determine the location of the structure and the preparation of the civil engineering works, up to the final alignment of the components, the Survey team is involved in all activities necessary to achieve the alignment of accelerator and experimental detectors components within sub-millimetre tolerances.
The presentation will focus on the alignment tolerances, the metrological aspects during the assembly phase, the different steps of the alignment in tunnel and the maintenance of this alignment in a new tunnel especially in the areas where the alignment accuracy is quite tight and the access conditions very harsh from the radiation point of view. The proposed alignment solutions will be presented for the three FCC options, as well as the latest studies, the unresolved issues and the options to resolve them."

Primary author: MISSIAEN, Dominique (CERN)

Co-authors: JONES, Mark (CERN); IBARROLA SUBIZA, Nerea (CERN)

Presenter: MISSIAEN, Dominique (CERN)

Session Classification: Infrastructure and operation

Track Classification: I&O

Contribution ID: **130** Type: **not specified**

Transport and logistics concept

Wednesday, April 11, 2018 9:35 AM (25 minutes)

Logistics is of great importance for the construction, assembly and operation of the FCC. During the planning, construction and assembly of LHC, logistics already proved to be one of ten key factors. For the planning of FCC several logistics aspects were analysed or discussed:
1. Supply strategies for FCC cryo-units;
2. Locations for the storage, assembly and testing facilities;
3. Transport scenarios for cryo-units, including analysis of stresses and possibility of intercontinental transport;
4. Design concept for a special purpose vehicles for the underground transportation and handling of cryo-units;
5. Supply scenarios considering the overall FCC construction schedule.

Primary author: NETTSTRAETER, Andreas (FIML Dortmund)

Co-authors: WOHLFAHRT, Andreas (Fraunhofer IML); PRASSE, Christian (Fraunhofer Institut for Material Flow and Logistics); KUHLMANN, Gerd (Fraunhofer IML); HORSTMANN, Konstantin (Fraunhofer IML); BEISSERT, Ulrike (Fraunhofer IML)

Presenter: NETTSTRAETER, Andreas (FIML Dortmund)

Session Classification: Infrastructure and operation

Track Classification: I&O

Contribution ID: **131** Type: **not specified**

Transient modes and their impact on the cryoplant size and operation margins

Wednesday, April 11, 2018 10:30 AM (25 minutes)

Primary author: TAVIAN, Laurent Jean (CERN)

Presenter: TAVIAN, Laurent Jean (CERN)

Session Classification: Infrastructure and operation

Track Classification: EASItrain

Contribution ID: **132** Type: **not specified**

Industrial engineering study of FCC-hh refrigerators

Wednesday, April 11, 2018 10:55 AM (25 minutes)

A 100 TeV hadron collider in a 100 km long tunnel is selected as the baseline of the overall infrastructure for the present FCC study. The cooling requirements for FCC-hh cryogenic system are challenging with a very large refrigeration capacity (100 kW equivalent at 4.5 K) up to 3 to 4 times larger than the present state-of-the-art and a non-conventional thermal load distribution with very large synchrotron radiation to the beam screens (50% of total heat loads). Based a reference solution proposed by the international FCC cryogenic team (CERN, TUD, CEA, WUT) to cool FCC-hh superconducting magnets and beam screens, an engineering study is undergoing with the cryogenic world-leader industries (Linde, Air Liquide) to assess industrial solutions of FCC-hh refrigerators and to confirm the innovative technologies which have to be developed in the coming years. The presentation will present the main results of this on-going industrial engineering study and highlight the identified R&D efforts in the coming years to develop reliable and efficient FCC cryogenic system.

Primary author: MILLET, Francois

Presenter: MILLET, Francois

Session Classification: Infrastructure and operation

Track Classification: EASItrain

Contribution ID: **133** Type: **not specified**

Cool-down and transient operation with the Nelium cycle

Wednesday, April 11, 2018 11:20 AM (20 minutes)

The mixed refrigerant turbo Brayton cycle with neon and helium was initially designed to cool the beam screens of the FCC in a temperature range from 40 K to 60 K. The current cryogenic design of this cycle for the FCC-hh can use refrigeration above 25 K for other purposes as well, e.g. for the cool-down of the magnets, thus saving large amounts of LN2 required otherwise, or transient operation which occurs during the beam cycles. These operations force a considerable load change to the Nelium cycle. This presentation covers strategies for both scenarios. Furthermore, the acquisition of the cost intensive neon is covered.

Primary author: KLOEPPEL, Steffen (TU Dresden)

Co-authors: HABERSTROH, Christoph (TU Dresden); QUACK, Hans (TU Dresden)

Presenter: KLOEPPEL, Steffen (TU Dresden)

Session Classification: Infrastructure and operation

Track Classification: EASItrain

Contribution ID: **134** Type: **not specified**

Staging and design of the cryogenic system for FCC-ee and HE-LHC

Wednesday, April 11, 2018 11:40 AM (20 minutes)

Primary author: TAVIAN, Laurent Jean (CERN)

Presenter: TAVIAN, Laurent Jean (CERN)

Session Classification: Infrastructure and operation

Track Classification: EASItrain

Contribution ID: **135** Type: **not specified**

Conclusions on availability studies for the Future Circular Collider

Wednesday, April 11, 2018 3:55 PM (20 minutes)

This contribution will present the conclusions from the availability studies for the Future Circular Collider and the estimated performance in terms of luminosity production. A final assessment of availability budgets for individual system will be given, providing guidelines to support system design in the future. Emphasis will be put on the recommendations for further studies and R&D in the domain of reliability engineering applied to particle accelerators.

Primary author: APOLLONIO, Andrea (CERN)

Co-authors: NIEMI, Arto (CERN); GUTLEBER, Johannes (CERN)

Presenter: APOLLONIO, Andrea (CERN)

Session Classification: Infrastructure and operation

Track Classification: I&O

Contribution ID: **136** Type: **not specified**

Coating studies on 6 GHz seamless cavities

Tuesday, April 10, 2018 1:30 PM (20 minutes)

A key challenge for the next accelerators is the cost reduction. Bulk niobium cavities performances are closer to their theoretical limits and an alternative technology is mandatory. Niobium thin film copper cavities are the most explored solution, but the Q-slope problem, characteristic of these resonators, limits the applications where high accelerating fields are requested.
In this work an original approach is adopted in order to enhance the performances of sputtered cavities, exploring the possibility to sputter 70 micron thick films to mitigate the Q-slope in Niobium sputtered copper cavities. Different strategies have been used for stress reduction: deposition at high temperature (550 ℃), deposition of thick films at the zero stress pressure point, and the development of a multilayer deposition procedure. Rf tests at 4,2 K and 1,8 K on 6 GHz resonant cavities demonstrate the possibility to mitigate the Q-slope in sputtered cavities with thick films.

Primary author: PIRA, Cristian (LNL-INFN)

Co-authors: CHYHYRYNETS, Eduard (LNL-INFN); PALMIERI, Enzo (INFN); STIVANELLO, Fabrizio (LNL-INFN); CALDAROLA, Giovanni (LNL-INFN); VAGLIO, Ruggero (Universiy of Napoli Federico II)

Presenter: PIRA, Cristian (LNL-INFN)

Session Classification: SRF

Track Classification: SRF

Contribution ID: **137** Type: **not specified**

IDEA Dual-Readout calorimetry hardware

Tuesday, April 10, 2018 6:00 PM (1 minute)

Dual-Readout calorimetry is a relatively new calorimetric technique able to overcome the non-compensation problem by means of two independent scintillation and Cherenkov light signal detections. Scintillating photons provide a signal proportional to the whole energy deposition in the calorimeter while Cherenkov photons emitted in clear fibers provide a signal almost exclusively related to the electromagnetic component (electrons and positrons).
Fluctuations in the electromagnetic and non-electromagnetic component of hadronic induced showers represent the major limit to reach resolutions needed in experiments at future leptonic colliders. With a Dual-Readout calorimeter, by looking at the two independent signals, it is possible to estimate, event by event, the electromagnetic fraction and to correctly reconstruct the primary hadron energy. The expected energy resolution for single hadron detection, together with the excellent particle identification capability, makes a Dual-Readout fiber calorimeter one of the most promising options for future leptonic colliders.
In this poster, we review the main benefits and open problems of a new Silicon photomultiplier-based (SiPMs) readout system tested with electrons at the SPS-H8 line. Thanks to their high photon detection efficiency, high granularity and compactness, SiPMs represent the best readout solution in order to bring this technique into future collider experiments.

Primary author: PEZZOTTI, Lorenzo (Universita and INFN (IT))

Co-authors: ANTONELLO, Massimiliano (Università degli Studi e INFN Milano (IT)); CACCIA, Massimo (Universita & INFN, Milano-Bicocca (IT)); FERRARI, Roberto (INFN Pavia (IT)); SANTORO, Romualdo (Università degli Studi dell'Insubria)

Presenter: PEZZOTTI, Lorenzo (Universita and INFN (IT))

Session Classification: Poster session

Track Classification: FCC-ee Phy/Exp

Contribution ID: **139** Type: **not specified**

Top threshold scan strategy

Tuesday, April 10, 2018 2:30 PM (20 minutes)

Primary authors: SIMON, Frank (Max-Planck-Institut fuer Physik); AZZI, Patrizia (INFN Padova (IT))

Presenters: SIMON, Frank (Max-Planck-Institut fuer Physik); AZZI, Patrizia (INFN Padova (IT))

Session Classification: FCC-ee physics & experiments

Track Classification: FCC-ee Phy/Exp

Contribution ID: **140** Type: **not specified**

Probing Top FCNC Anomalous Couplings at Future Circular Hadron Collider

Tuesday, April 10, 2018 5:59 PM (1 minute)

We analysed anomalous top FCNC couplings via the production of single top quark in association with a photon at 100 TeV centre of mass energy. In our analysis, we consider the invariant mass distributions of reconstructing top quark mass; one lepton and missing energy transfer reconstructing W, and one b-tagged jet for lvb⊠ final state, and one b-tagged jet and two other jets reconstructing W for jjb⊠ final state for the signal and main SM background. The sensitivity to anomalous couplings tq⊠ with an integrated luminosity of 1 ab-1 is examined with the simulation including realistic detector effects.

Primary author: DENIZLI, Haluk (Abant Izzet Baysal University)

Co-authors: SENOL, Abdulkadir (Abant Izzet Baysal University); KARADENIZ, Ozgun (Abant Izzet Baysal University); YÜKSEL OYULMAZ, Kaan; CAKIR, Orhan (Ankara University (TR)); TURK CAKIR, Ilkay (Istanbul Aydin University); YILMAZ, Ali (Giresun Universitesi)

Presenter: DENIZLI, Haluk (Abant Izzet Baysal University)

Session Classification: Poster session

Track Classification: Physics

Contribution ID: **141** Type: **not specified**

First HE-LHC impedance model and aspects of single beam stability

Thursday, April 12, 2018 4:24 PM (18 minutes)

A first version of the HE-LHC impedance was derived from the LHC and HL-LHC impedance models. In these models, two main sources of impedance are considered: the beam screen and the collimation system. The proposed injection energies were evaluated with respect to impedance and transverse beam stability. Because of the tighter physical gaps in the collimators at top energy (13.5 TeV), the impedance budget is higher. Its impact on beam stability needs to be addressed as it could prevent reaching the nominal beam parameters.

Impedance simulations were performed for four different cases: for three different injection energies (450 GeV, 900 GeV and 1.3 TeV per beam) and for the top energy case (13.5 TeV per beam). These models were then used to estimate the single beam instability thresholds and the possible mitigation techniques. This first assessment of beam stability didn't show serious hindrance to reach the nominal beam parameters. However the impedance budget should be followed-up to keep a reasonable safety margin for the beam stability.

Primary author: AMORIM, David (CERN / Universite Grenoble-Alpes (FR))

Co-authors: ANTIPOV, Sergey (CERN); ARSENYEV, Sergey (CERN); BIANCACCI, Nicolo (CERN); BUFFAT, Xavier (CERN); OEFTIGER, Adrian (CERN); METRAL, Elias (CERN); SALVANT, Benoit (CERN); METHER, Lotta (EPFL - Ecole Polytechnique Federale Lausanne (CH)); PIELONI, Tatiana (EPF Lausanne); TAMBASCO, Claudia (EPFL - Ecole Polytechnique Federale Lausanne (CH))

Presenter: AMORIM, David (CERN / Universite Grenoble-Alpes (FR))

Session Classification: HE LHC

Track Classification: HE-LHC

Contribution ID: **142** Type: **not specified**

Robotics inspections, maintenance and early intervention for the FCC

Thursday, April 12, 2018 2:10 PM (20 minutes)

Intelligent robotic systems are becoming essential for inspection and measurements in harsh environments, such as the European Organization for Nuclear Research accelerators complex. Aiming at increasing safety and machine availability, robots can help to perform repetitive or dangerous tasks, reducing the risk of personnel exposure to radiation and the time for interventions. In this work, a preliminary study of novel robotic systems for inspections, maintenance and early intervention for the FCC is presented. The proposed systems will be able to perform autonomous tasks such radiation measurements, in-situ tele-operations, quick intervention in case of fire and will escort personnel to the closest exits in case of human dangers.

Primary author: DI CASTRO, Mario (CERN)

Co-authors: Dr BUONOCORE, Luca Rosario (CERN); MASI, Alessandro (CERN)

Presenter: DI CASTRO, Mario (CERN)

Session Classification: Special Technologies

Track Classification: STP

Contribution ID: **143** Type: **not specified**

Measurement of the Higgs Self-Coupling at the FCC-hh Collider

Wednesday, April 11, 2018 2:20 PM (25 minutes)

An important test of the Standard Model (SM) electroweak symmetry breaking sector is the measurement of the Higgs self-interactions. Sensitivity to the Higgs self-coupling for mH = 125 GeV is evaluated through the measurement of the non-resonant di-Higgs production final states. The considered decay channels are HH⟶ bb\gamma\gamma, 4b+jet, bb\tau\tau, and bbVV, where V=W and Z. For the non-resonant SM signal in an ideal detector parametrization, a precision of O(3%) on the SM cross-section can be estimated, roughly corresponding to a precision of O(5%) on the Higgs trilinear coupling for the bb\gamma\gamma channel. For the other channels precisions ranging from O(10-40%) can be achieved. The parton-level generation of the signal and the backgrounds is performed by using MadGraph5_aMC@NLO and the Delphes fast parametrisation of the FCC-hh detector is used.

Primary author: BRAIBANT-GIACOMELLI, Sylvie (Universita e INFN, Bologna (IT))

Co-authors: Dr DE FILIPPIS, Nicola (Politecnico e INFN Bari (IT)); TESTA, Marianna (INFN e Laboratori Nazionali di Frascati (IT)); DI MICCO, Biagio (Universita' degli Studi di Roma Tre e Istituto Nazionale di Fisica Nucleare (INFN)); Dr ORTONA, Giacomo (Centre National de la Recherche Scientifique (FR))

Presenter: Dr ORTONA, Giacomo (Centre National de la Recherche Scientifique (FR))

Session Classification: FCC-hh physics & experiments

Track Classification: FCC-hh Phy/Exp

Contribution ID: **144** Type: **not specified**

Study on Fabrication of 650MHz 5cell Waveguide HOM SRF Cavities

Tuesday, April 10, 2018 5:00 PM (1 hour)

A 650MHz 5cell waveguide HOM Cavity was fabricated at IHEP. Due to the waveguide structure, the cavity will be a good candidate for high HOM power machines. In this paper, we will report progress of the cavity fabrication, and preparation for post-treatment and vertical test. Lessons we learnt during process will also be discussed. Some new fabrication procedures will also be presented.

Primary author: JIN, Song

Co-authors: GAO, Jie (Institute of High Energy Physics, China); GONG, Dianjun (Institute of High Energy Physics); LIU, Zhenchao (Institute of High Energy Physics); SHA, Peng (Institute of High Energy Physics); ZHENG, Hongjuan (IHEP); ZHAI, Jiyuan (IHEP); ZHAO, Tongxian (Institute of High Energy Physics)

Presenter: JIN, Song

Session Classification: Poster session

Track Classification: STP

Contribution ID: **145** Type: **not specified**

Top squark searches at 100 TeV

Wednesday, April 11, 2018 4:00 PM (20 minutes)

A proton-proton collider at 100 TeV center-of-mass energy opens up new territory at the energy frontier. Measurements in this energy regime would allow us to test the structure of the Standard Model (SM) with unprecedented precision, as well as enable searches for physics beyond the SM (BSM) involving very massive particles. One of the most appealing BSM theories is supersymmetry (SUSY). The hunt for top squarks at 100 TeV is of critical importance not only for understanding the naturalness of the electroweak scale, but also for the viability of SUSY in general. However, searching for top squarks in this energy frontier is very challenging. Methods used to search for top squarks at lower mass scales are no longer viable. For
instance, the reconstruction of top quarks from decays of top squarks via techniques used at the LHC (e.g. jet substructure) is inefficient. Breakthroughs are needed in both detector design and object reconstruction. Moreover, the production of SM processes that are "rare processes" at the LHC will be enhanced, leading to new backgrounds. In this work we present new developments in object reconstruction and analysis methods tailored to top squarks searches at 100 TeV. Results are interpreted in the context of simplified models of direct top squark production along with implications for the final design of the detectors.

Primary author: GOUSKOS, Loukas (Univ. of California Santa Barbara (US))

Co-authors: SUNG, Allan; INCANDELA, Joseph (Physics Department)

Presenter: GOUSKOS, Loukas (Univ. of California Santa Barbara (US))

Session Classification: FCC-hh physics & experiments

Track Classification: FCC-hh Phy/Exp

Contribution ID: **146** Type: **not specified**

Mapping synchrotron radiation in an updated FCC-hh vacuum chamber

Tuesday, April 10, 2018 5:59 PM (1 minute)

At high proton-beam energies, beam-induced synchrotron radiation is an important source of heating, of beam-related vacuum pressure increase, and of primary photoelectrons, which can give rise to an electron cloud. We present the synchrotron radiation map computed by Synrad3D for the latest shape of the FCC-hh vacuum chamber with a sawtooth surface instead of a wedge.

Primary author: GUILLERMO CANTON, Gerardo (Centro de Investigación y de Estudios Avanzados del IPN (MX))

Co-authors: BELLAFONT, Ignasi; KERSEVAN, Roberto (CERN); ZIMMERMANN, Frank (CERN)

Presenter: GUILLERMO CANTON, Gerardo (Centro de Investigación y de Estudios Avanzados del IPN (MX))

Session Classification: Poster session

Track Classification: FCC-hh ACC

Contribution ID: **147** Type: **not specified**

Detector qualification with Higgs bosons in the jets and missing energy final state

Tuesday, April 10, 2018 5:25 PM (1 minute)

This work presents a study of Higgs boson production in jets and missing energy final states at the FCC-ee collider. In particular, we explore how different detector parameters and the beam strahlung affect the sensitivity of Higgs boson coupling measurements.

Primary authors: PETERS, Krisztian (DESY); VON AHNEN, Janik (DESY)

Presenters: PETERS, Krisztian (DESY); VON AHNEN, Janik (DESY)

Session Classification: Poster session

Track Classification: FCC-ee Phy/Exp

Contribution ID: **148** Type: **not specified**

Parameters and Layout

Tuesday, April 10, 2018 8:30 AM (20 minutes)

Primary author: SCHULTE, Daniel (CERN)

Presenter: SCHULTE, Daniel (CERN)

Session Classification: FCC-hh accelerator

Track Classification: EuroCirCol

Contribution ID: **149** Type: **not specified**

Arc Design and Lattice Integration

Tuesday, April 10, 2018 8:50 AM (25 minutes)

The FCC-hh (Future Hadron-Hadron Circular Collider) is one of the options considered for the next generation accelerator in high-energy physics as recommended by the European Strategy Group. In this overview we will describe the status and the evolution of the design of optics integration of FCC-hh, focusing on design of the arcs, alternatives, and tuning procedures.

Primary author: Dr CHANCE, Antoine (CEA Irfu)

Co-authors: DALENA, Barbara (Université Paris-Saclay (FR)); HOLZER, Bernhard (CERN); SCHULTE, Daniel (CERN); BOUTIN, David (CEA)

Presenter: Dr CHANCE, Antoine (CEA Irfu)

Session Classification: FCC-hh accelerator

Track Classification: EuroCirCol

Contribution ID: **150** Type: **not specified**

Alignment

Tuesday, April 10, 2018 9:15 AM (20 minutes)

"The FCC-hh (Future Hadron-Hadron Circular Collider) is one of the options considered for the next generation accelerator in high-energy physics as recommended by the European Strategy Group, and the natural evolution of existing LHC. The evaluation of the various magnets mechanical error and field error tolerances in the arc sections of FCC-hh, as well as an estimation of the correctors strengths necessary to perform the error corrections, are important aspects of the collider design.
In this study an exploration of mechanical error, dipolar and quadrupolar field error tolerances is presented, with the possible consequences on the correctors technological choice and on the beam screen design. Different correction schemes of the linear coupling (with skew quadrupoles) and of the beam tunes (with normal quadrupoles) are compared. Also a combined correction scheme including the interaction regions is tested."

Primary author: BOUTIN, David (CEA)

Co-authors: Dr CHANCE, Antoine (CEA Irfu); DALENA, Barbara (Université Paris-Saclay (FR)); HOLZER, Bernhard (CERN); SCHULTE, Daniel (CERN)

Presenter: BOUTIN, David (CEA)

Session Classification: FCC-hh accelerator

Track Classification: EuroCirCol

Contribution ID: **151** Type: **not specified**

Dynamic aperture at collision

Tuesday, April 10, 2018 10:55 AM (20 minutes)

Dynamic aperture studies have been performed on the FCC-hh lattice at different energies to study the stability of the beam and the effect of different errors. Initial studies for the FCC-hh lattice at collision energy with errors on the triplet showed a very low dynamic aperture, most likely affected by the large integrated quadrupole length of the quadrupoles and the high beta function at its location. Several techniques were implemented to increase the dynamic aperture including: correction of the spurious dispersion, installation of non-linear correctors and changing the phase between the interaction points. The use of these techniques increased the dynamic aperture and allowed for a more comprehensive study. This work presents the last results obtained for dynamic aperture at collision energy including errors on the triplet, separation/recombination dipoles and errors in the arcs, with particular emphasis on the effect of the non-linear correctors and change of phase.

Primary author: CRUZ ALANIZ, Emilia (University of Oxford JAI)

Co-authors: SERYI, Andrei (University of Oxford (GB)); DALENA, Barbara (Université Paris-Saclay (FR)); TOMAS GARCIA, Rogelio (CERN); MARTIN, Roman (CERN)

Presenter: CRUZ ALANIZ, Emilia (University of Oxford JAI)

Session Classification: FCC-hh accelerator

Track Classification: EuroCirCol

Contribution ID: **152** Type: **not specified**

Beam loss studies in IP

Tuesday, April 10, 2018 11:15 AM (20 minutes)

Primary author: CERUTTI, Francesco (CERN)

Presenter: CERUTTI, Francesco (CERN)

Session Classification: FCC-hh accelerator

Track Classification: EuroCirCol

Contribution ID: **153** Type: **not specified**

Flat beam alternative

Tuesday, April 10, 2018 11:35 AM (20 minutes)

Energy deposition simulations have been run with FLUKA for the estimation of the maximum dose on the HE-LHC final-focus magnets. For this purpose, the FCC-hh magnet model has been used and scaled appropriately according to the HE-LHC requirements. The results of these simulations are discussed, including the requirements on shielding thickness as well as its influence on the optics design. In addition, the flat beam parameter choice is explained here, comparing its luminosity evolution with that of the nominal round optics.

Primary author: ABELLEIRA, Jose

Co-authors: SERYI, Andrei (University of Oxford (GB)); CERUTTI, Francesco (CERN); VAN RIESEN-HAUPT, Leon; BESANA, Maria Ilaria (CERN)

Presenter: ABELLEIRA, Jose

Session Classification: FCC-hh accelerator

Track Classification: EuroCirCol

Contribution ID: **154** Type: **not specified**

Energy collimation system insertions

Session Classification: FCC-hh accelerator

Track Classification: EuroCirCol

Contribution ID: **155** Type: **not specified**

Betatron collimation system insertions

Tuesday, April 10, 2018 1:55 PM (25 minutes)

Primary author: MOLSON, James (CERN)

Presenter: MOLSON, James (CERN)

Session Classification: FCC-hh accelerator

Track Classification: EuroCirCol

Contribution ID: **156** Type: **not specified**

Status of collimation system studies

Tuesday, April 10, 2018 1:30 PM (25 minutes)

Primary author: BRUCE, Roderik (CERN)

Presenter: BRUCE, Roderik (CERN)

Session Classification: FCC-hh accelerator

Track Classification: EuroCirCol

Contribution ID: **157** Type: **not specified**

Beam loss in collimators

Tuesday, April 10, 2018 2:40 PM (20 minutes)

The collimation system intercepts the beam halo by absorbing part of the induced shower and retaining the rest in the warm segment of the ring in order to protect the downstream superconducting (SC) magnets from quenching. The FCC-hh betatron cleaning insertion region (2.7 km long) features primary collimators (TCP), secondary collimators (TCSG) and active absorbers (TCLA), whose design have been inspired by the LHC and are required to sustain - for at least 10 seconds - the impact of about 12 MW, corresponding to a beam lifetime of 12 minutes. Particle tracking simulations followed by shower simulations represent a proven tool for quantifying the power deposition on the concerned elements along the line. In this study, short TCPs were considered in order to reduce the power deposition by diminishing the shower development inside the absorbing material. Moreover, thick jaws were implemented aiming to prevent an excessive direct power deposition density in the cooling system. A layout option excluding the most loaded TCP was also investigated. Encouraging results were achieved, both in terms of collimator resistance and warm magnet protection, and input was provided for a first thermomechanical analysis.

Primary author: VARASTEH, Mohammad (CERN)

Co-authors: MEREGHETTI, Alessio (CERN); MIRARCHI, Daniele (CERN); SKORDIS, Eleftherios (CERN); CERUTTI, Francesco (CERN); BESANA, Maria Ilaria (CERN); BRUCE, Roderik (CERN)

Presenter: VARASTEH, Mohammad (CERN)

Session Classification: FCC-hh accelerator

Track Classification: EuroCirCol

Contribution ID: **158** Type: **not specified**

Longitudinal dynamics and RF requirements

Thursday, April 12, 2018 1:30 PM (20 minutes)

Primary author: KARPOV, Ivan (CERN)

Presenter: KARPOV, Ivan (CERN)

Session Classification: FCC-hh accelerator

Track Classification: EuroCirCol

Contribution ID: **159** Type: **not specified**

Impedance of cold beamscreen

Thursday, April 12, 2018 2:10 PM (15 minutes)

In comparison to the LHC beamscreen, the FCC beamscreen is more compact, has much larger pumping holes for achieving high vacuum, and incorporates a surface treatment for electron cloud mitigation. All of these factors can dramatically increase coupling impedance of the beamscreen. The impact on the coupled bunch and the single bunch instabilities is analysed. The necessary pumping hole shielding is estimated. Suggestions are made on minimizing the impedance due to the surface treatment. Impedance of interconnects between the dipole magnets is assessed.

Primary author: ARSENYEV, Sergey (CERN)

Co-author: SCHULTE, Daniel (CERN)

Presenter: ARSENYEV, Sergey (CERN)

Session Classification: FCC-hh accelerator

Track Classification: EuroCirCol

Contribution ID: **160** Type: **not specified**

Feedback

Thursday, April 12, 2018 2:25 PM (20 minutes)

Transverse feedback systems are used for injection oscillation damping and transverse coupled bunch instability mitigation. The FCC-hh sets new challenges in comparison to the LHC due to the more rigid beam during the injection and the faster coupled bunch instability growth rate, which mitigation relies increasingly on the transverse feedback system. In this presentation, the performances of the FCC-hh transverse feedback system concepts are evaluated and discussed.

Primary author: KOMPPULA, Jani Paavo Olavi (CERN)

Co-authors: KOTZIAN, Gerd (CERN); LI, Kevin Shing Bruce (CERN); HOFLE, Wolfgang (CERN)

Presenter: KOMPPULA, Jani Paavo Olavi (CERN)

Session Classification: FCC-hh accelerator

Track Classification: EuroCirCol

Contribution ID: **161** Type: **not specified**

Beam-beam effects

Thursday, April 12, 2018 3:45 PM (25 minutes)

Primary author: PIELONI, Tatiana (EPF Lausanne)

Presenter: PIELONI, Tatiana (EPF Lausanne)

Session Classification: FCC-hh accelerator

Track Classification: EuroCirCol

Contribution ID: **162** Type: **not specified**

FCC-hh injection and extraction: insertions and requirements

Tuesday, April 10, 2018 3:55 PM (25 minutes)

"The design of the FCC-hh extraction systems is driven by the challenge to safely extract the 50 TeV proton beam. The new baseline for the beam dump system design foresees a fast single plane extraction realized by a highly segmented kicker system and a combination of SuShi (Superconducting Shield) and superconducting Cosine-Theta septa. In the dumpline a focusing structure is included to reduce the hardware requirements on the dilution kicker system.
The layout changes and resulting hardware requirements for septa, dilution and extraction kicker magnets will be presented and the implications for failure scenarios and protection devices evaluated. It is proposed to consider multiple abort gaps to enable a faster beam abort and reduce the impact on the machine in case of failures. Technical implications of this proposal will be discussed. Several alternative layout and hardware solutions are summarized and compared to the baseline solution.

Primary author: RENNER, Elisabeth (Vienna University of Technology (AT))

Co-authors: LECHNER, Anton (CERN); GODDARD, Brennan (CERN); BARNA, Daniel (Hungarian Academy of Sciences (HU)); CARLIER, Etienne (CERN); BURKART, Florian; BARNES, Mike (CERN); ATANASOV, Miroslav Georgiev (CERN); VAN TRAPPEN, Pieter (CERN); KRAMER, Thomas (CERN); BARTMANN, Wolfgang (CERN)

Presenter: RENNER, Elisabeth (Vienna University of Technology (AT))

Session Classification: FCC-hh injector

Track Classification: EuroCirCol

Contribution ID: **163** Type: **not specified**

3.3 HEB options

Tuesday, April 10, 2018 4:40 PM (20 minutes)

Primary author: GODDARD, Brennan (CERN)

Presenter: GODDARD, Brennan (CERN)

Session Classification: FCC-hh injector

Track Classification: EuroCirCol

Contribution ID: **164** Type: **not specified**

FCC-hh protection absorbers and the dump

Tuesday, April 10, 2018 4:20 PM (20 minutes)

The FCC proton beams pose a severe challenge for the robustness of the beam dump and respective protection devices. Depending on the local beta-function, already a single 50 TeV bunch could induce damage in typical absorber materials currently employed in the LHC machine (e.g. Graphite or carbon composites). In order to safely absorb the FCC beams in a LHC-like dump or beam-intercepting devices, the beams need to be sufficiently diluted across the absorber front face. This study presents the baseline design of the FCC-hh dump core and protection devices and quantifies the expected energy deposition and temperatures. The implications for the extraction system design and consequences of different failure scenarios are discussed.

Primary author: LECHNER, Anton (CERN)

Co-authors: SANZ ULL, Alejandro (Eindhoven Technical University (NL)); PERILLO MARCONE, Antonio (CERN); GODDARD, Brennan (CERN); RENNER, Elisabeth (Vienna University of Technology (AT)); CALVIANI, Marco (CERN); VARASTEH, Mohammad (CERN); Dr GILARDONI, Simone (CERN); BARTMANN, Wolfgang (CERN)

Presenter: LECHNER, Anton (CERN)

Session Classification: FCC-hh injector

Track Classification: EuroCirCol

Contribution ID: **165** Type: **not specified**

FCC-hh transfer line and injection design

Wednesday, April 11, 2018 3:30 PM (25 minutes)

Primary author: RENNER, Elisabeth (Vienna University of Technology (AT))

Presenter: RENNER, Elisabeth (Vienna University of Technology (AT))

Session Classification: FCC-hh injector

Track Classification: FCC-hh INJ

Contribution ID: **166** Type: **not specified**

Faster ramping of LHC in 2017 and prospects for lower energy injection into LHC in 2018

Wednesday, April 11, 2018 3:55 PM (25 minutes)

Primary author: MILANESE, Attilio (CERN)

Presenter: MILANESE, Attilio (CERN)

Session Classification: FCC-hh injector

Track Classification: FCC-hh INJ

Contribution ID: **167** Type: **not specified**

Summary of bunch spacing options

Wednesday, April 11, 2018 4:20 PM (20 minutes)

Session Classification: FCC-hh injector

Track Classification: FCC-hh INJ

Contribution ID: **168** Type: **not specified**

Overall machine protection

Wednesday, April 11, 2018 4:40 PM (20 minutes)

Primary author: NIE, Yuancun (CERN)

Presenter: NIE, Yuancun (CERN)

Session Classification: FCC-hh injector

Track Classification: FCC-hh INJ

Contribution ID: **169** Type: **not specified**

Conference opening

Monday, April 9, 2018 8:30 AM (10 minutes)

Primary author: VAN DIJCK, Jose (Royal Netherlands Academy of Arts and Sciences (NL))

Presenter: VAN DIJCK, Jose (Royal Netherlands Academy of Arts and Sciences (NL))

Session Classification: Plenaries

Contribution ID: **170** Type: **not specified**

Opening address

Monday, April 9, 2018 8:40 AM (10 minutes)

Primary author: BENTVELSEN, Stan (Nikhef National institute for subatomic physics (NL))

Presenter: BENTVELSEN, Stan (Nikhef National institute for subatomic physics (NL))

Session Classification: Plenaries

Contribution ID: **171** Type: **not specified**

Opening address

Monday, April 9, 2018 8:50 AM (10 minutes)

Primary author: GIANOTTI, Fabiola (CERN)

Presenter: GIANOTTI, Fabiola (CERN)

Session Classification: Plenaries

Contribution ID: **172** Type: **not specified**

Physics at FCC

Monday, April 9, 2018 9:00 AM (1 hour)

Primary author: RUDERMAN, Joshua Thomas (NYU)

Presenter: RUDERMAN, Joshua Thomas (NYU)

Session Classification: Plenaries

Contribution ID: **173** Type: **not specified**

Study status and further plans

Monday, April 9, 2018 10:00 AM (30 minutes)

Primary author: BENEDIKT, Michael (CERN)

Presenter: BENEDIKT, Michael (CERN)

Session Classification: Plenaries

Contribution ID: **174** Type: **not specified**

Gravitational waves: a new route to fundamental physics and cosmology

Wednesday, April 11, 2018 5:30 PM (25 minutes)

Primary author: Prof. VAN DEN BROECK, Chris (NIKHEF)

Presenter: Prof. VAN DEN BROECK, Chris (NIKHEF)

Session Classification: Plenaries

Contribution ID: **175** Type: **not specified**

High Energy Physics detector R&D

Wednesday, April 11, 2018 5:55 PM (25 minutes)

Primary author: Prof. KOFFEMAN, Els (University of Amsterdam)

Presenter: Prof. KOFFEMAN, Els (University of Amsterdam)

Session Classification: Plenaries

Contribution ID: **176** Type: **not specified**

Research in High Magnetic Fields

Wednesday, April 11, 2018 6:20 PM (25 minutes)

Primary author: Prof. CHRISTIANEN, Peter (High Magnetic Field Laboratory, Radboud University Nijmegen)

Presenter: Prof. CHRISTIANEN, Peter (High Magnetic Field Laboratory, Radboud University Nijmegen)

Session Classification: Plenaries

Contribution ID: **177** Type: **not specified**

Superconductivity R&D in the Netherlands

Wednesday, April 11, 2018 6:45 PM (25 minutes)

Primary author: Dr DHALLÉ, Marc (University of Twente)

Presenter: Dr DHALLÉ, Marc (University of Twente)

Session Classification: Plenaries

Contribution ID: **178** Type: **not specified**

Summary FCC-ee machine design

Friday, April 13, 2018 8:30 AM (20 minutes)

Primary author: LEVICHEV, Evgeny (Budker Institute of Nuclear Physics (RU))

Presenter: LEVICHEV, Evgeny (Budker Institute of Nuclear Physics (RU))

Session Classification: Summaries

Track Classification: FCC-ee ACC

Contribution ID: **179** Type: **not specified**

Summary FCC-hh machine design

Friday, April 13, 2018 8:50 AM (20 minutes)

Primary author: DALENA, Barbara (Université Paris-Saclay (FR))

Presenter: DALENA, Barbara (Université Paris-Saclay (FR))

Session Classification: Summaries

Track Classification: FCC-hh ACC

Contribution ID: **180** Type: **not specified**

Summary HE-LHC machine design

Friday, April 13, 2018 9:10 AM (20 minutes)

Primary author: VAN RIESEN-HAUPT, Leon

Presenter: VAN RIESEN-HAUPT, Leon

Session Classification: Summaries

Track Classification: HE-LHC

Contribution ID: **181** Type: **not specified**

Summary infrastructure & operation

Friday, April 13, 2018 9:30 AM (15 minutes)

Primary author: STANYARD, Joanna Louise (CERN)

Presenter: STANYARD, Joanna Louise (CERN)

Session Classification: Summaries

Track Classification: I&O

Contribution ID: **182** Type: **not specified**

Summary special technologies

Friday, April 13, 2018 9:45 AM (15 minutes)

Primary author: JIMENEZ, Jose Miguel (CERN)

Presenter: JIMENEZ, Jose Miguel (CERN)

Session Classification: Summaries

Track Classification: STP

Contribution ID: **183** Type: **not specified**

Summary 16 T magnet

Friday, April 13, 2018 10:00 AM (15 minutes)

Primary author: SCHOERLING, Daniel (CERN)

Presenter: SCHOERLING, Daniel (CERN)

Session Classification: Summaries

Track Classification: Magnets

Contribution ID: **184** Type: **not specified**

Summary SRF

Friday, April 13, 2018 10:15 AM (15 minutes)

Presenter: JENSEN, Erk (CERN)

Session Classification: Summaries

Track Classification: SRF

Contribution ID: **185** Type: **not specified**

Options for the FCC Superconducting RF System

Tuesday, April 10, 2018 8:45 AM (15 minutes)

Primary author: BUTTERWORTH, Andy (CERN)

Presenter: BUTTERWORTH, Andy (CERN)

Session Classification: SRF

Track Classification: SRF

Contribution ID: **186** Type: **not specified**

Beam-cavity interaction challenges for FCC_ee cavities

Tuesday, April 10, 2018 9:00 AM (15 minutes)

Primary author: KARPOV, Ivan (CERN)

Presenter: KARPOV, Ivan (CERN)

Session Classification: SRF

Track Classification: SRF

Contribution ID: **187** Type: **not specified**

RF feedback design and performance

Tuesday, April 10, 2018 9:30 AM (15 minutes)

Primary author: HOFLE, Wolfgang (CERN)

Presenter: HOFLE, Wolfgang (CERN)

Session Classification: SRF

Track Classification: SRF

Contribution ID: **188** Type: **not specified**

Recent SRF R&D results at Fermilab

Tuesday, April 10, 2018 10:30 AM (18 minutes)

Superconducting accelerating cavities are the technology of choice for many modern and future particle accelerators. Increasing their efficiency is therefore crucial to minimize the power consumption during their operation and therefore significantly cut the cost and enabling the realization of more powerful machines.
The efficiency of niobium superconducting RF cavities can be maximized in the medium field range by introducing a of small amount of nitrogen, with the so-called N-doping and N-infusion treatments. Recent results obtained with these treatments will be discussed, underlying their potential for different kind of machines.
The talk will also show how performance of niobium cavities processed with state-of-the-art surface treatments varies as a function of the resonance frequencies, between 650 MHz and 3.9 GHz. Recent progress in Nb3Sn coating will be also discussed.

Primary author: MARTINELLO, Martina (Fermilab - IIT)

Co-authors: ROMANENKO, Alexander (Fermilab); GRASSELLINO, Anna; CHECCHIN, Mattia (FNAL); POSEN, Sam (Fermilab)

Presenter: MARTINELLO, Martina (Fermilab - IIT)

Session Classification: SRF

Track Classification: SRF

Contribution ID: **189** Type: **not specified**

NB/Cu coating studies at CERN

Tuesday, April 10, 2018 11:06 AM (18 minutes)

Primary author: ROSAZ, Guillaume Jonathan (CERN)

Presenter: ROSAZ, Guillaume Jonathan (CERN)

Session Classification: SRF

Track Classification: SRF

Contribution ID: **190** Type: **not specified**

ECR: From samples to cavities

Tuesday, April 10, 2018 11:24 AM (18 minutes)

Primary author: VALENTE-FELICIANO, Anne-Marie (Jefferson Lab)

Presenter: VALENTE-FELICIANO, Anne-Marie (Jefferson Lab)

Session Classification: SRF

Track Classification: SRF

Contribution ID: **191** Type: **not specified**

Recent results on a multi-cell 800 MHz bulk Nb cavity

Tuesday, April 10, 2018 11:42 AM (18 minutes)

Primary author: MARHAUSER, Frank (JLAB)

Presenter: MARHAUSER, Frank (JLAB)

Session Classification: SRF

Track Classification: SRF

Contribution ID: **192** Type: **not specified**

Quadrupole resonators characterisation

Tuesday, April 10, 2018 2:10 PM (20 minutes)

Niobium on Copper (Nb/Cu) is being considered as the current technology of choice for the realization of superconducting radio frequency (SRF) accelerating cavities for the future circular collider (FCC). It provides, in fact, a significant reduction of the costs involved [1]. This conclusion assumes the feasibility of niobium coated copper cavities with RF performances at T=4.5 K and 400 MHz, such that the cryogenic power consumption is comparable to the bulk Nb technology at 800 MHz and T=2 K. The cryogenic power consumption depends on the surface resistance Rs of the superconducting material employed, and thence on the ability of making high quality Nb coatings. Alternative superconducting materials can enable the possibility to further reduce the power consumption significantly. In this respect, materials in the A15 family, like Nb3Sn, are among the most promising.
In this work, we have investigated the RF performances of both Nb and Nb3Sn films coated on a copper substrate, employing a quadrupole resonator cavity (QPR). The QPR allows for the measurement of the Rs of small samples at different temperatures, frequencies and RF field values [2]. The main results will be presented in comparison with those from a Nb bulk sample, measured with the same technique.

References:

[1] S. Aull, O. Brunner, A. Butterworth, and N. Schwerg, FCC-DRAFT-TECH-2017-002 (2017)

[2] T. Junginger, W. Weingarten, and C. Welsh, Rev. Sci. Instr. 83, 063902 (2012)

Primary author: ARZEO, Marco (CERN)

Co-authors: VALENTE-FELICIANO, Anne-Marie (Jefferson Lab); ROSAZ, Guillaume Jonathan (CERN); ILYINA-BRUNNER, Katsiaryna (CERN); AULL, Sarah (CERN); VENTURINI DELSOLARO, Walter (CERN)

Presenter: ARZEO, Marco (CERN)

Session Classification: SRF

Track Classification: SRF

Contribution ID: **193** Type: **not specified**

N-doping Research at IHEP

Tuesday, April 10, 2018 3:30 PM (20 minutes)

Recently, nitrogen doping (N-doping) technology has been proved to increase Q value of superconducting cavity obviously, which lowers the BCS resistance of Nb. After N-doping, Q of 9-cell 1.3 GHz cavity can be increased to 3E10 at Eacc = 16 MV/m, while 1.5*1010 without N-doping. Since 2013, there have been over 60 cavities nitrogen doped at FNAL, JLAB and Cornell. The Circular Electron Collider (CEPC) has been proposed by IHEP in China, while requests Q=4E10@Eacc=22 MV/m for 650 MHz 2-cell cavity. Bulk Nb N-doped has been adopted for these cavities, as well as Shanghai Coherent Light Facility (SCLF). So research of N-doping has been going on since 2015. Experiments of niobium samples have showed that nitrogen concentration at niobium surface increased a lot after N-doping. After then, two 650 MHz single-cell cavities completed vertical tests, which have shown Q increase at low fields.

Primary author: SHA, Peng (IHEP, CAS (China))

Co-authors: LIU, Baiqi (IHEP, CAS (China)); DONG, Chao (IHEP, CAS (China)); LIN, Haiyin (IHEP, CAS (China)); ZHENG, Hongjuan (IHEP, CAS (China)); ZHAI, Jiyuan (IHEP, CAS (China)); MI, Zhenghui (IHEP, CAS (China)); LI, Zhongquan (IHEP, CAS (China))

Presenter: SHA, Peng (IHEP, CAS (China))

Session Classification: SRF

Track Classification: SRF

Contribution ID: **194** Type: **not specified**

Innovative crab cavity design for FCC_hh

Tuesday, April 10, 2018 3:50 PM (20 minutes)

Primary author: GRUDIEV, Alexej (CERN)

Presenter: GRUDIEV, Alexej (CERN)

Session Classification: SRF

Track Classification: SRF

Contribution ID: **195** Type: **not specified**

Advanced techniques for high efficiency klystron simulations

Tuesday, April 10, 2018 4:30 PM (20 minutes)

Primary author: CAI, Jinchi (CERN)

Presenter: CAI, Jinchi (CERN)

Session Classification: SRF

Track Classification: SRF

Contribution ID: **196** Type: **not specified**

A large signal code for the optimization and design of high efficiency Klystron

Tuesday, April 10, 2018 5:00 PM (1 hour)

A code called KlyC is developed in CERN for the optimization and design of high efficiency Klystron based on new bunch mechanisms. This paper demonstrates the basic algorithm of the code and introduce its graphical user interface. After that, the design of FCC prototype Klystron based on KlyC will be presented. The benchmark and diagnosis of this device will also be attached to validate KlyC as a useful tool for high efficiency designers.

Primary author: CAI, Jinchi (CERN)

Co-author: SYRATCHEV, Igor (CERN)

Presenter: CAI, Jinchi (CERN)

Session Classification: Poster session

Track Classification: SRF

Contribution ID: **197** Type: **not specified**

Preliminary investigations of Rutherford cable splicing techniques for high field accelerator magnets

Tuesday, April 10, 2018 5:00 PM (1 hour)

High field accelerators magnets will require coil grading, and thus low resistance joints (splices), in order to increase the magnetic field and decrease magnet cost. These joints must have low resistance (<1 nΩ) and reasonably good mechanical strength. Three techniques have been initially considered by the Applied Superconductivity group of the Swiss Plasma Center for the preparation of joints between Nb3Sn Rutherford cable: 1) Soldering (PbSn or SnAg alloys) 2) Diffusion bonding and 3) Diffusion bonding between electroplated cables (in order to fill up gaps between strands). Many test joints were prepared using these methods. Initial investigations included examinations of cross sections (cut by electro-erosion) and measurements of resistance up to 1 kA at 4.2 K in 15 T background. These investigations allowed selecting the most promising techniques for further developments and tests at higher currents. All soldered joints had resistance lower than 2 nΩ; diffusion bonding technique gives the lowest resistance (<1 nΩ) only if the applied pressure is sufficiently high and these samples showed also very good reproducibility. The use of Cu foils in between the cables also improves the bond strength, without increasing the joint resistance. The most promising joints were later tested in the SULTAN facility up to 20 kA at 5 K and in 10.8 T background field.

Primary author: KUMAR, Mithlesh (PSI - Paul Scherrer Institut)

Co-authors: IZQUIERDO BERMUDEZ, Susana (CERN); TOMMASINI, Davide (CERN); BRUZZONE, Pierluigi (EPFL-SPC); D'AURIA, Vincenzo (SPC-EPFL); UGLIETTI, Davide

Presenter: KUMAR, Mithlesh (PSI - Paul Scherrer Institut)

Session Classification: Poster session

Track Classification: Magnets

Contribution ID: **198** Type: **not specified**

NEG Coatings and laser surface engineering (LASE) electron cloud mitigation techniques

Tuesday, April 10, 2018 11:00 AM (20 minutes)

Non-evaporable getter coating of vacuum chamber of particle accelerators was invented approximately 20 year ago by C. Benvenuti at CERN. This technology have already demonstrated its benefits an many machines: ESRF, Elettra, Diamond, Soleil, LHC, MAX-IV, etc. The NEG coatings are very effective vacuum solution, the UHV/XHV conditions could be reached in fully coated vacuum chamber of particle accelerator with much less effort and costs comparing to conventional technology, this only requires a 24-h bakeout to 150 ℃ and small UHV pumps for hydro carbonates and noble gases. Furthermore, NEG coating can also provide low SEY (\delta_max =~ 1) to mitigate the electron cloud and the beam induced multipacting problems. Surface resistance of NEG coating could be varied in wide rage with NEG morphology and chemical composition. Thus, NEG coating provides a complex solution for a few problems.

Primary author: Dr MALYSHEV, Oleg (STFC Daresbury Laboratory)

Co-authors: HANNAH, Adrian (science technology facilities council); SIRVINSKAITE, Ruta (STFC); VALIZADEH, Reza (STFC Daresbury Laboratory)

Presenter: Dr MALYSHEV, Oleg (STFC Daresbury Laboratory)

Session Classification: Special Technologies

Track Classification: EuroCirCol

Contribution ID: **199** Type: **not specified**

New LASE surfaces obtained with various lasers and their parameters for e-cloud mitigation

Tuesday, April 10, 2018 6:01 PM (1 minute)

The vacuum chamber surface characteristics such as the photon and secondary electron yields (PEY and SEY) are critical for formation of an electron cloud, this is a serious problem that effects proton and positron accelerators. A few years ago it was discovered by us that Laser Ablation surface engineering (LASE) could provide surfaces with SEY<1. These LASE surfaces are the baseline design for the FCC electron cloud mitigation. However these surfaces should be better optimised for the FCC application: Surface resistance should be reduced to minimise the beam impedance in a LASE treated chamber, Pumping and desorption properties at cryogenic temperatures should be verified and the generation of particulates must be eradicated to avoid UFO problem in the beam chamber. In this talk we will report a number of new surfaces created using the LASE technique with different laser parameters (wavelength, scan speed, pitch, repetition rate, power, and pulse length) and their effect on the SEY, surface resistance and vacuum properties etc. of the surfaces created.

Primary author: SIAN, Taaj (STFC)

Co-authors: MALYSHEV, Oleg (STFC Daresbury Laboratory); VALIZADEH, Reza (STFC Daresbury Laboratory)

Presenter: SIAN, Taaj (STFC)

Session Classification: Poster session

Track Classification: EuroCirCol

Contribution ID: **200** Type: **not specified**

A facility for studying SEY from LASE surfaces at cryogenic temperatures

Tuesday, April 10, 2018 6:02 PM (1 minute)

The Future Circular Collider (FCC-hh) will have a beam screen with T between 20 and 60 K. Electron cloud mitigation will be critical for the FCC-hh and it has been specified that the wall material needs to have a Secondary Electron Yield (SEY) < 1. Since the LASE surfaces with SEY<1 are the baseline electron cloud mitigation technique, it is critically important to study the behaviour of the LASE surfaces at cryogenic temperatures with and without cryosorbed gas. The FCC-hh beam screen made of copper laminated stainless steel will be partially treated with LASE in two (in dipoles) or four (in quadrupoles) strips. In this talk we will report the design and commissioning of the cryogenic facility for SEY studies at Daresbury Laboratory and the first results of LASE samples at 20-60 K with and without cryosorbed gasses on the surface.

Primary author: SIAN, Taaj (STFC)

Co-authors: MALYSHEV, Oleg (STFC Daresbury Laboratory); PATTALWAR, Shrikant Manowar (STFC Daresbury Laboratory (GB)); VALIZADEH, Reza (STFC Daresbury Laboratory)

Presenter: SIAN, Taaj (STFC)

Session Classification: Poster session

Track Classification: EuroCirCol

Contribution ID: **201** Type: **not specified**

Single Production of Charged Higgs Boson at Future Circular Hadron Collider

Wednesday, April 11, 2018 4:35 PM (15 minutes)

Possible extensions of the Higgs sector can be searched for a wide range of parameter space in the high energy proton-proton collisions. We have studied the charged Higgs boson single production within the framework of two Higgs doublet model in the proton-proton collisions at the FCC-hh collider. The production of charged Higgs boson through pp->H±X process is explored in the mass range 0.5 to 2 TeV using multi-jets final states with one electron or muon and missing transverse momentum. Using the relevant SM backgrounds from the lepton+jets final states, we obtain a significant coverage of the parameter space and distinguish the charged Higgs boson-top-bottom interaction for a mass up to 2 TeV.

Primary author: TURK CAKIR, Ilkay (Istanbul Aydin University)

Co-authors: CAKIR, Orhan (Ankara University (TR)); YILMAZ, Ali (Giresun Universitesi); DENIZLI, Haluk (Abant Izzet Baysal University); SENOL, Abdulkadir (Abant Izzet Baysal University)

Presenter: TURK CAKIR, Ilkay (Istanbul Aydin University)

Session Classification: FCC-hh physics & experiments

Track Classification: FCC-hh Phy/Exp

Contribution ID: **202** Type: **not specified**

Microstructural TEM Investigation of Nb3Sn Superconductors for FCC

Tuesday, April 10, 2018 6:03 PM (1 minute)

We present results of microstructural examinations of grain size distribution, grain geometry, compositional gradients and local texture performed on Nb3Sn wires of various manufacturing techniques. Measurements were conducted using high-resolution TEM (transmission electron microscopy), EDX (energy-dispersive X-ray spectroscopy) and TKD (transmission Kikuchi diffraction). Findings include residuals of heat treatments and Sn gradients across subelements as well as single grains which are needed to correlate with magnetic measurements.
Feasibility of increasing the high field critical currents to the FCC target was previously demonstrated by means of fast neutron irradiation which produces defects in the crystal structure that serve as additional pinning centers. In the present study, the underlying mechanisms are investigated through microstructural TEM analysis in order to establish a link between defect density and critical current. Examinations of the defect structure were performed on Nb3Sn wires using weak-beam dark-field microscopy before and after irradiation in a nuclear research reactor.
This understanding of the correlation between microstructure and macroscopic performance will be required for manufacturing such high-performance superconductors in an industrial process.

Primary author: PFEIFFER, Stephan (TU Wien)

Co-authors: BALLARINO, Amalia (CERN); SCHEUERLEIN, Christian (CERN); BAUMGARTNER, Thomas (TU Wien, Atominstitut); BERNARDI, Johannes; EISTERER, Michael (Vienna University of Technology (AT)); STÖGER-POLLACH, Michael (TU Wien)

Presenter: PFEIFFER, Stephan (TU Wien)

Session Classification: Poster session

Track Classification: EuroCirCol

Contribution ID: **203** Type: **not specified**

The micro-Resistive-WELL (μ-RWELL) detector for large area muon systems at future Circular Colliders

Tuesday, April 10, 2018 5:59 PM (1 minute)

The μ-RWELL has been conceived as a compact, simple and robust Micro-Pattern Gaseous Detector for large area HEP applications in a harsh environment. The detector amplification stage is realized with a polyimide foil micro-patterned with a blind-hole matrix embedded through a thin DLC resistive layer in the readout PCB. The introduction of this layer, mitigating the transition from streamer to spark, allows to achieve large gains (>104).
Different PCB layouts have been studied: the simplest one, based on a single-resistive layer with edge grounding, has been designed for low-rate applications (<30-40 kHz/cm2); while more sophisticated schemes are under study for high-rate purposes (>1 MHz/cm2).
The single-resistive layer scheme has been tested and validated, being ready for applications in HEP (CMS, SHiP).
High rate versions of the μ-RWELL are under development at LNF-INFN in collaboration with the CERN PCB-Workshop and are suitable for large area muon systems at future hadron colliders.
After an introduction on the principle of operation of the detector, we will present an overview of the performance: gain, space and time resolution, rate capability and aging studies. We will discuss the preliminary results of a recent analysis based on the micro-TPC mode, allowing a uniform space resolution of better than 100μm for non-orthogonal. An overview of the different architectures under study for the high rate version of the detector will be eventually presented.

Primary author: Dr BENCIVENNI, Giovanni (INFN e Laboratori Nazionali di Frascati (IT))

Co-authors: DE OLIVEIRA, R. (CERN); LAVEZZI, L. (IHEP); Dr RANIERI, Antonio (INFN Bari); BORGONOVI, Lisa (Universita e INFN, Bologna (IT)); BRAIBANT-GIACOMELLI, Sylvie (Universita e INFN, Bologna (IT)); CHHIBRA, Simranjit Singh (Universita e INFN, Bologna (IT)); GIACOMELLI, Paolo (INFN Sezione di Bologna); CIBINETTO, Gianluigi (INFN Ferrara); FARINELLI, Riccardo (Universita e INFN, Ferrara (IT)); FELICI, Giulietto (INFN e Laboratori Nazionali di Frascati (IT)); GATTA, Maurizio (INFN e Laboratori Nazionali di Frascati (IT)); GIOVANNETTI, M. (INFN LNF); MORELLO, Gianfranco (INFN e Laboratori Nazionali di Frascati (IT)); POLI LENER, Marco (INFN e Laboratori Nazionali di Frascati (IT)); MAGGIORA, Marco (Universita e INFN Torino (IT)); OCHI, Atsuhiko (Kobe University (JP))

Presenter: Dr BENCIVENNI, Giovanni (INFN e Laboratori Nazionali di Frascati (IT))

Session Classification: Poster session

Track Classification: FCC-hh Phy/Exp

Contribution ID: **205** Type: **not specified**

Experimental Interaction Region Optics for the High Energy LHC

Thursday, April 12, 2018 2:06 PM (18 minutes)

The High Energy LHC (HE-LHC) is one option for a next generation hadron collider explored in the FCC-hh programme. The core concept of the HE-LHC is to install FCC-hh technology magnets in the LHC tunnel. The higher beam rigidity and the increased radiation debris, however, impose severe challenges on the design of the triplet for the low beta insertions. In order to achieve 25 cm beta* optics and survive a lifetime integrated luminosity of 10/ab a new longer triplet was designed that provides sufficient shielding and enough beam stay clear. This triplet has been designed using complimentary radiation studies to optimise the shielding. The optics for the rest of the interaction region had to be adjusted in order to host this more rigid beam and longer triplet whilst leaving enough room for crab cavities. Moreover, the effects non-linear errors in this longer and stronger triplet have on the dynamic aperture together with techniques how these can be mitigated will be outlined. An alternative flat beam optics will also be presented.

Primary author: VAN RIESEN-HAUPT, Leon

Co-authors: SERYI, Andrei (University of Oxford (GB)); ABELLEIRA, Jose; CRUZ ALANIZ, Emilia (University of Oxford JAI)

Presenter: VAN RIESEN-HAUPT, Leon

Session Classification: HE LHC

Track Classification: HE-LHC

Contribution ID: **206** Type: **not specified**

Polarization studies for FCCee and CEPC

Thursday, April 12, 2018 11:30 AM (15 minutes)

Both future 100 km in circumference electron-positron colliders CEPC and FCC-ee want know beams energies with the extreme precision of 1-2 ppm. This can be done only with the help of the well-known resonant depolarization technique. Still, some beam parameters of these machines, like energy spread and radiative damping decrements, becomes so high near or above 80 GeV per beam, that it is required special consideration and tricks to overcome all the difficulties. The author has written a simple spin tracking code, which simulates main features of the resonant depolarization process in presence of continuous energy diffusion due to synchrotron radiation fluctuations. By running this code with different beam parameters it was shown that resonant depolarization technique works at 80 GeV only if the synchrotron oscillation frequency tune is chosen above 0.075. The alternative to the resonant depolarization technique approach, based on detection of free precession of spins flipped into the horizontal plane, was proposed by the author and the related results are analyzed. As it was shown, the applicability of this method is limited only by the attainable statistical accuracy of the turn by turn measurement of the longitudinal polarization component. Future longitudinal laser polarimeters shall provide the needed for such measurements sensitivity in the order of 0.01-0.02 per one turn.

Primary author: KOOP, Ivan (BINP)

Presenter: KOOP, Ivan (BINP)

Session Classification: FCC-ee accelerator

Track Classification: FCC-ee ACC

Contribution ID: **207** Type: **not specified**

Key Technology Development CEPC Accelerator

Tuesday, April 10, 2018 5:59 PM (1 minute)

CEPC is a 100 km circular electron-positron collider operating at 90-240 GeV center-of-mass energy of Z-pole, WW pair production threshold, and Higgs resonance. CEPC and its successor SPPC, a 100 TeV center-of-mass super proton-proton collider, will ensure the elementary particle physics a vibrant field for decades to come. To reduce the overall cost, partial double ring scheme was proposed as the alternative, which has a significant impact on the cavity operation and beam dynamics. The conceptual design report (CDR) of CEPC will be completed by the end of 2017 as an important step to move the project forward. In this presentation, the progress of CEPC accelerator key technology R&D status will be shown, including SRF cavity, High efficiency klystron, large scale cryogenics etc.

Primary author: CHI, Yunlong (Institute of High Energy Physics)

Presenter: CHI, Yunlong (Institute of High Energy Physics)

Session Classification: Poster session

Track Classification: FCC-ee ACC

Contribution ID: **208** Type: **not specified**

Design of FCC-ee collider ring top-up injection

Wednesday, April 11, 2018 2:40 PM (15 minutes)

FCC-ee collider rings necessitate top-up injection due to the short luminosity lifetime. Previous studies revealed that the conventional and multipole-kicker injection schemes are applicable. The designs of the injection straight section based on these schemes have been elaborated and will be presented. Further investigations, including feasibility of injection devices, filling scheme, failure scenarios, will be discussed.

Primary author: AIBA, Masamitsu (Paul Scherrer Institut (CH))

Presenter: AIBA, Masamitsu (Paul Scherrer Institut (CH))

Session Classification: FCC-ee accelerator

Track Classification: FCC-ee ACC

Contribution ID: **209** Type: **not specified**

Exergetic analyses of the Cold Mass Cooling and the Beam Screen Cooling systems of the Future Circular Collider (FCC)

Tuesday, April 10, 2018 6:04 PM (1 minute)

The cryogenic distribution and discharge system of the FCC-hh beam-bending sections (arcs) will require 220 MW of electric power in nominal operation. The two biggest consumers are the Cold Mass Cooling (≈ 60 % of the supplied power) and the Beam Screen Cooling including the Thermal Shielding of the Cold Mass and the Cryogenic Distribution Line (≈ 37 % of the supplied power). The cryogenic system will be operated with an exergetic efficiency of around 20 %, resulting in 176 MW of exergy losses. Using an exergy analysis, the exergy losses can be matched to the corresponding origins to detect anergy sources and determine the potentials for improvement.

This poster presents the results of the exergy analyses of the current designs of the Cold Mass Cooling and the Beam Screen Cooling system of the FCC-hh. The different anergy sources are presented and the generated exergy losses are quantified. Possible improvements of the exergetic performance are proposed and will be discussed.

Primary author: KOTNIG, Claudio

Co-author: TAVIAN, Laurent Jean (CERN)

Presenter: KOTNIG, Claudio

Session Classification: Poster session

Track Classification: I&O

Contribution ID: **210** Type: **not specified**

Update on canted cosine theta final focus magnet design

Wednesday, April 11, 2018 4:20 PM (15 minutes)

The requirements for the Final Focus Quadrupoles of FCC-ee are very stringent in terms of field quality and compactness of the design. We are happy to report that we have a design based on the Canted Cosine Theta concept that fullfills all requirements: Very compact design (distance of magnetic centres of the two quadrupoles at the tip 66mm), excellent field quality (less than 0.1units in all multipoles) high field gradients (150T/m possible), no dipole component, adequate space to fit needed correctors as extra rings on top of the quadrupoles. The magnetic design and misalignment study have been finished.

Primary author: KORATZINOS, m (Massachusetts Inst. of Technology (US))

Presenter: KORATZINOS, m (Massachusetts Inst. of Technology (US))

Session Classification: FCC-ee accelerator

Track Classification: FCC-ee ACC

Contribution ID: **211** Type: **not specified**

Resonant depolarization precision, relation between spin tune and beam energy

Thursday, April 12, 2018 11:00 AM (15 minutes)

The goal of beam energy calibration is to define central mass energy at the interaction point (IP). The most accurate method is resonant depolarization technique with relative error of 1 ppm in single beam energy calibration. The whole procedure consists of measurement of spin precession frequency, and calculations of beam energy averaged over circumference, beam energy at IP and central mass energy. The talk is discussing errors introduced on each step of central mass energy determination.

Primary author: Dr BOGOMYAGKOV, Anton (Budker Institute of Nuclear Physics (RU))

Presenter: Dr BOGOMYAGKOV, Anton (Budker Institute of Nuclear Physics (RU))

Session Classification: FCC-ee accelerator

Track Classification: FCC-ee ACC

Contribution ID: **212** Type: **not specified**

Optics Integration

Thursday, April 12, 2018 2:42 PM (18 minutes)

Design of the HE-LHC, which will reach approximately twice the centre of mass energy of the LHC, in an already existing tunnel is challenging for optics design.
To efficiently generate lattices with different parameters, strong effort has been put in developing an automatic lattice generation application. By focusing on two different arc options, namely 18 or 23 cells per arc, merits are explored and presented in this talk. The impact of dipole errors on energy reach and aperture is studied together with proposed solutions.

Primary author: KEINTZEL, Jacqueline (Vienna University of Technology (AT))

Presenter: KEINTZEL, Jacqueline (Vienna University of Technology (AT))

Session Classification: HE LHC

Track Classification: HE-LHC

Contribution ID: **213** Type: **not specified**

MDI status and overview

Wednesday, April 11, 2018 10:30 AM (25 minutes)

The wide range of beam energies of the FCC-ee accelerator presents unique challenges to the interaction region. An update of this design will be discussed with emphasis on the basic choices and its mechanical constraints. A first 3d mechanical design of the IR will be presented addressing some open questions.

Primary author: BOSCOLO, Manuela (INFN e Laboratori Nazionali di Frascati (IT))

Presenter: BOSCOLO, Manuela (INFN e Laboratori Nazionali di Frascati (IT))

Session Classification: FCC-ee accelerator

Track Classification: FCC-ee ACC

Contribution ID: **214** Type: **not specified**

IDEA detector model overview

Tuesday, April 10, 2018 8:45 AM (15 minutes)

The FCC-ee collider is designed to provide extreme precision measurements of electro-weak parameters running at various center of mass energies: Z pole, WW pair, Z plus Higgs boson and top quark pair production. This machine is expected to deliver an unprecedented luminosity, more than three orders of magnitude of that achieved by LEP at comparable energy, with beam features much different from those planned for linear colliders. These operating conditions call for a dedicated detector optimized for this environment. In addition, the large statistics expected with this high luminosity can potentially allow measurements of extreme statistical precision. The detector should therefore be designed to minimize the sources of systematic uncertainties.
We present a detector concept with the required precision for the EWK physics measurements planned, that also addresses all these additional requirements with top of the line, yet well established, technologies and discuss its basic performance features.

Primary author: BEDESCHI, Franco (Universita & INFN Pisa (IT))

Presenter: BEDESCHI, Franco (Universita & INFN Pisa (IT))

Session Classification: FCC-ee physics & experiments

Track Classification: FCC-ee Phy/Exp

Contribution ID: **215** Type: **not specified**

Photon tracing and gas-density profiles in the FCC-hh

Tuesday, April 10, 2018 5:59 PM (1 minute)

The vacuum chamber of the FCC-hh will have to cope with unprecedented levels of synchrotron radiation power, dealing simultaneously with tighter impedance and magnet aperture requirements. Given that the high radiation power and photon flux will release larger amounts of gas into the system, new solutions for designing the beam-screen geometry and estimating the effective pumping speed and equilibrium gas densities become necessary. This contribution presents an update of the coupled Monte Carlo simulations which have been performed for the synchrotron radiation and related desorption profiles, together with exchange of information with the work package dealing with the electron cloud studies.

Primary author: BELLAFONT, Ignasi

Co-authors: KERSEVAN, Roberto (CERN); GARION, Cedric (CERN); METHER, Lotta (EPFL - Ecole Polytechnique Federale Lausanne (CH))

Presenter: BELLAFONT, Ignasi

Session Classification: Poster session

Track Classification: EuroCirCol

Contribution ID: **216** Type: **not specified**

Results on the FCC-hh Beam Screen prototype at the KIT electron storage ring.

Tuesday, April 10, 2018 8:50 AM (20 minutes)

The technical design concept for the FCC-hh cryogenic beam vacuum system was developed based on the constraints that emerge from the arc design requirements. Within this framework, a BEam Screen Testbench Experiment (BESTEX) measurement setup was designed with the goal of determining the photodesorption yield, synchrotron radiation heat loads and photo electron generation inside 3 different prototypes of the FCC-hh Beam Screen (BS). Each of the 3 BS prototypes, 2 meter in length, implements a different design feature, namely: 1) baseline design (BD), with electro-deposited copper and no electron-cloud (EC) mitigation features; 2) BD with set of distributed cold-sprayed anti-EC clearing electrodes; 3) BD with laser-ablated anti-EC surface texturing.
BESTEX was installed in the Karlsruhe Institute of Technology (KIT) 2.5 GeV electron storage ring KARA (KArlsruhe Research Accelerator), which has been chosen due to the similarity of the synchrotron light emission with FCC-hh, in terms of photon beam spectrum. We present here the results obtained during irradiation of the first two FCC-hh beam screen prototypes of the three which are planned to be tested on BESTEX, and the comparison with extensive montecarlo simulations of the expected outgassing behavior under synchrotron radiation.

Primary author: GONZALEZ GOMEZ, Luis Antonio (INFN e Laboratori Nazionali di Frascati (IT))

Co-authors: GIL COSTA, Miguel (Centro de Investigaciones Energéti cas Medioambientales y Tecno); BELLAFONT, Ignasi; BAGLIN, Vincent (CERN); Dr CASALBUONI, Sara (IBPT-KIT); CHIGGIATO, Paolo (CERN); GARION, Cedric (CERN); HUTTEL, Erhard; KERSEVAN, Roberto (CERN); PEREZ, Francis (ALBA Synchrotron - CELLS)

Presenter: GONZALEZ GOMEZ, Luis Antonio (INFN e Laboratori Nazionali di Frascati (IT))

Session Classification: Special Technologies

Track Classification: EuroCirCol

Contribution ID: **217** Type: **not specified**

Top quark physics

Thursday, April 12, 2018 11:15 AM (20 minutes)

The top quark flavor changing neutral current (FCNC) processes are extremely suppressed within the standard model (SM), however they could be enhanced in a new physics model beyond the SM. The top quark FCNC interactions would be a good test of new physics at present and future colliders. For a wide framework of these models, these interactions can be described by the effective Lagrangian. In this work, we study tqγ and tqZ effective FCNC interaction vertices through the process e-p—>e-Wq+X at future hadron electron colliders LHeC and FCC-eh. The cross sections for the signal have been calculated for different values of parameters λu, λc for tqγ vertices and ⍰u, ⍰c for tqZ vertices. Studying relevant SM background we estimate the attainable range of parameters depending on the integrated luminosity and present contour plots of couplings according to different significance levels including detector simulation.

Primary author: CAKIR, Orhan (Ankara University (TR))

Co-authors: DENIZLI, Haluk (Abant Izzet Baysal University); SENOL, Abdulkadir (Abant Izzet Baysal University); TURK CAKIR, Ilkay (Istanbul Aydin University); YILMAZ, Ali (Giresun Universitesi)

Presenter: CAKIR, Orhan (Ankara University (TR))

Session Classification: FCC-eh

Track Classification: FCC-eh

Contribution ID: **218** Type: **not specified**

SPPC longitudinal dynamics design

Tuesday, April 10, 2018 5:59 PM (1 minute)

After the discovery of Higgs boson in LHC of CERN, Chinese scientists immediately proposed a plan to build next generation colliders – CEPC&SPPC. SPPC (Super Proton Proton Collider) is the second phase of this project to explore new physics beyond the standard model. The key design goal for SPPC is to reach 75 TeV in center of mass energy with a circumference of 100 km. As an important part of the SPPC study, longitudinal dynamics has been specially considered, which is based on the requirements for luminosity and its upgrade. A set of self-consistent beam and RF parameters has been given to reach the goal RMS Bunch length 7.55cm at 400MHz. But there are two main constraints: Intra-beam scattering and beam instabilities, which limit the longitudinal emittance. The instability bottlenecks associated with longitudinal dynamics are loss of Landau damping and transverse mode coupling instability (TMCI). To relieve the restrictions of beam instabilities, a higher harmonic RF system (800MHz) has been studied. The results indicate that both transverse and longitudinal impedance threshold have been improved to a certain degree, and the bunch length becomes shorter, which is beneficial to luminosity. Therefore, for SPPC RF system, injection capture using 400MHz, acceleration and physics run using 800MHz will be recommended. And the corresponding injector chain parameters match has been designed, which is identified to be self-consistent. Besides, to overcome the difficulty from beam instabilities, a dual harmonic RF system has been put forward to use, which maybe extremely improve the longitudinal impedance threshold while keeping the goal bunch length 7.55cm.

Primary author: ZHANG, Linhao (IHEP)

Co-author: TANG, Jingyu (Institute of High Energy Physics, CAS)

Presenter: ZHANG, Linhao (IHEP)

Session Classification: Poster session

Track Classification: FCC-hh ACC

Contribution ID: **219** Type: **not specified**

An Optimised Alternative Triplet for the Final Focus of the FCC-hh with a 40m Final Drift

Tuesday, April 10, 2018 5:59 PM (1 minute)

The sizes of the beta functions in the final focus triplet of a synchrotron collider have a great impact on the chromaticity and dynamic aperture of the machine. These beta functions are proportional to the square of the length of the final drift so it is desirable to keep it as short as possible whilst leaving enough room for the experiment. In the latest design of the FCC-hh this drift was reduced from 45 m to 40 m. In the following an alternative final focus for this new design will be presented. The effects this change has on the machine will examined and discussed.

Primary author: VAN RIESEN-HAUPT, Leon

Co-authors: SERYI, Andrei (University of Oxford (GB)); ABELLEIRA, Jose; CRUZ ALANIZ, Emilia (University of Oxford JAI)

Presenter: VAN RIESEN-HAUPT, Leon

Session Classification: Poster session

Track Classification: FCC-hh ACC

Contribution ID: **220** Type: **not specified**

Overview of radiation hardness assurance studies for FCC

Thursday, April 12, 2018 10:48 AM (18 minutes)

Radiation effects on electronics pose a serious threat to the operation of a high-energy hadron accelerator such as the present LHC and future FCC-hh machines. In particular, Single Event Effects (SEEs) are the result of the interaction of a single particle with the sensitive volume of a component that compromise its operation and can even result in its permanent destruction in the case of hard errors. In addition, soft errors such as Single Event Upsets (SEUs) or Single Event Functional Interrupts (SEFIs) can typically be recovered from through a correction scheme or power reset, but depending on their criticality at a sub-system level, can also lead to equipment failure.

This work reviews the existing radiation tests standards for SEEs, mainly focused on the space environment and applications, and their adaptation to the high-energy accelerator mixed-field environment. It explores possible means of optimizing the qualification approaches for the future FCC-hh radiation field and component reliability constraints. Whereas present methods rely on proton and mixed-field testing, this work investigates the possible use of ultra-high energy (UHE, > 1 AGeV) heavy ions for the qualification at component and board level of accelerator equipment constituents. Such beams offer potential advantages with respect to proton and mixed-field testing, notably the reduced beam time, reduced total ionizing dose deposition in the components, as well as reduced activation. In addition, they do not suffer from the drawbacks of traditional heavy ion testing (~10 AMeV) mainly related to the limited penetration and possible inaccessibility to the component's sensitive volume.

Primary author: GARCIA ALIA, Ruben (CERN)

Co-authors: BRUGGER, Markus (CERN); CAPEANS GARRIDO, Mar (CERN); CERUTTI, Francesco (CERN); DANZECA, Salvatore (CERN); INFANTINO, Angelo (CERN - EN/STI-FDA)

Presenter: GARCIA ALIA, Ruben (CERN)

Session Classification: Special Technologies

Track Classification: STP

Contribution ID: **221** Type: **not specified**

Development of experimental and theoretical investigations in NRC "Kurchatov Institute" of fast particle irradiation effects on radiation resistance of new collimator and superconductor materials for magnet oriented on the Future Circular Collider (FCC).

Wednesday, April 11, 2018 11:30 AM (20 minutes)

The effect of irradiation of fast particles on the radiation resistance and behavior of collimators and superconductor materials for magnets is very important and serious task for Future Circular Collider (FCC). The energies of fast protons in FCC will be up to 100 TeV and it is much higher comparing with LHC proton beam, where energy is up to 7 TeV. Other very important point for fast particle beams in FCC is the effects of heavy ions (including Pb ions) with energies up to 2.75 TeV/nucleon on the behavior of collimator materials for FCC. Such scientific theoretical investigations were started in NRC KI.

In this report will be explain the developed methodology and will be show the obtained experimental results in NRC KI for investigations of the physical mechanisms of radiation resistance of collimator materials and superconductor materials for magnet, that can be applied also for FCC.

Experimental studies of new collimator materials include the irradiation of these materials on NRC KI cyclotron by different types of ions (fast protons and heavy ions), measurements and analysis of the following physical and mechanical properties of new collimator materials before and after irradiation by fast particles: electrical resistance, thermal expansion coefficient, specific heat, thermal diffusion coefficient, microstructure analysis using transmission electron microscopy (TEM) and X-ray diffraction on the NRC KI Synchrotron Source.

The theoretical investigations include the calculations of primary radiation damage formation in collimator materials for FCC using FLUKA simulations for different proton energies taking into account elastic and inelastic processes of fast particles and secondary particle formation (neutrons, pions, protons, etc.). Very serious new part of theoretical investigations in NRC KI is the development of theoretical models for shock wave formation in different collimator materials under fast proton (up to 100 TeV) and heavy ion irradiation (up to 2.75 TeV/nucleon), taking into account of nuclear reactions. Some results will be show here.

Primary author: RYAZANOV, Alexander

Presenter: RYAZANOV, Alexander

Session Classification: Special Technologies

Track Classification: STP

Contribution ID: **222** Type: **not specified**

Optics correction and Emittance Performance

Wednesday, April 11, 2018 9:10 AM (15 minutes)

The 100 km FCC-ee e+/e- circular collider requires luminosities in the order of 10^35 cm^-2 s^-1 and very low emittances of 1nm for eps_x and 2pm for eps_y. In order to reach these requirements, extreme focusing of the beam is needed in the interaction regions, leading to a vertical beta function of 2mm at the IP. These challenges make the FCC-ee design particularly susceptible to misalignment and field errors. This talk describes the tolerance of the machine to magnet alignment errors and the effectiveness of optics and orbit correction methods that were implemented in order to bring the vertical dispersion to reasonable values. As betatron coupling is also a very important source of emittance growth, its correction has been integrated to the challenging correction scheme to keep the vertical emittance as low as possible. Thousands of misalignment and error seeds were introduced in madx simulations and a comprehensive correction strategy was implemented. The results are summarised in this talk.

Primary author: CHARLES, Tessa (University of Melbourne (AU))

Co-author: AUMON, Sandra (CERN)

Presenter: CHARLES, Tessa (University of Melbourne (AU))

Session Classification: FCC-ee accelerator

Track Classification: FCC-ee ACC

Contribution ID: **223** Type: **not specified**

FCC Machine Protection Challenges and Architecture

Tuesday, April 10, 2018 5:59 PM (1 minute)

As the energy stored in the FCC superconducting magnet circuits and the energy of the beams will be more than an order of magnitude larger than in the present day accelerators, there are new challenges concerning FCC Machine Protection. An overview of the different magnet circuits and their criticality, taking into account their time constants and effect on the orbit, are presented. The results of energy deposition calculations for the given beam energy and beam intensities are given. The possible strategy for FCC machine protection will be presented together with specific challenges: acceptable delay between failure detection and the beam dump action, the challenges of UFO detection and superconducting magnet quench levels and the importance of the presence and absence of a beam halo.

Primary authors: UYTHOVEN, Jan (CERN); NIE, Yuancun (CERN)

Co-authors: DENZ, Reiner (CERN); RAGINEL, Vivien; SIEMKO, Andrzej (CERN); VERWEIJ, Arjan (CERN); WOLLMANN, Daniel (CERN); ZERLAUTH, Markus (CERN)

Presenter: NIE, Yuancun (CERN)

Session Classification: Poster session

Track Classification: STP

Contribution ID: **224** Type: **not specified**

HE-LHC with flat beams

Tuesday, April 10, 2018 2:10 PM (20 minutes)

The HE-LHC final focus triplet must be designed for a potential flat beam operation. Flat beams can partially mitigate the effect of the crossing angle on the luminosity. This solution is interesting if the crossing angle can't be compensated by other means, as for example, by crab-waist rotation. The flat beam parameter choice is explained here, and its luminosity evolution is compared with that of the nominal round optics. The energy deposition in the final triplet is also compared for both cases.

Primary author: ABELLEIRA, Jose

Co-author: VAN RIESEN-HAUPT, Leon

Presenter: ABELLEIRA, Jose

Session Classification: HE LHC

Track Classification: HE-LHC

Contribution ID: **225** Type: **not specified**

Status of truncated cosine-theta septum magnet study

Wednesday, April 11, 2018 9:10 AM (20 minutes)

Challenging requirements are set for the FCC extraction septum magnets.
A scaled up LHC-like beam dump system or a massless architecture are not applicable in terms of maximum field, space reservation and power consumption.
The truncated cosine-theta septa configuration with a target field of 4 T has been proposed to address these requirements maintaining the reliability and availability of the extraction line, The study so far addressed magnetic performance of the magnet cross section such as the magnetic field, the field quality, and estimates for the leak field.
This contribution will additionally present the engineering design concept and provide a first look into the challenges associated with taking the 2D concept to the three-dimensional design.

Primary author: SUGITA, Kei (GSI)

Co-authors: ATANASOV, Miroslav Georgiev (CERN); BORBURGH, Jan (CERN); SANZ ULL, Alejandro (Eindhoven Technical University (NL)); SPILLER, Peter-Jurgen

Presenter: SUGITA, Kei (GSI)

Session Classification: Special Technologies

Track Classification: STP

Contribution ID: **226** Type: **not specified**

Betatron-collimation studies for heavy ions in FCC-hh

Tuesday, April 10, 2018 5:59 PM (1 minute)

One of the biggest challenges in the design of the FCC-hh is the collimation system. From LHC experience it is known that a collimation system optimized for proton cleaning has a significantly reduced efficiency for heavy ions. The study presented in this contribution evaluates the betatron-collimation efficiency for the heavy-ion operation with lead nuclei at a beam energy of 50 Z TeV in the system designed for proton operation. The fragmentation processes of the main beam particles in the primary collimator are simulated with FLUKA and fragments are individually tracked with SixTrack until being lost in the downstream aperture. In this way a first-impact loss-map is obtained, identifying locations where high energy deposition are to be expected. This provides a first-level assessment of feasibility and allows to include countermeasures in the conceptual accelerator design.

Primary author: LOGOTHETIS AGALIOTIS, Efstathios (National Technical Univ. of Athens (GR))

Co-author: SCHAUMANN, Michaela (CERN)

Presenter: LOGOTHETIS AGALIOTIS, Efstathios (National Technical Univ. of Athens (GR))

Session Classification: Poster session

Track Classification: FCC-hh ACC

Contribution ID: **227** Type: **not specified**

Vacuum Properties of Single Metal Zirconium Non-Evaporable Getter Coating

Tuesday, April 10, 2018 5:59 PM (1 minute)

Due to its advantages such as evenly distributed pumping speed, low thermal outgassing and low photon and electron stimulated desorption yields, the non-evaporable getter (NEG) coating has been used in particle accelerators for years. Even though quaternary Ti-Zr-Hf-V coating deposited from an allow wire has been found to have the lowest desorption yields, highest sticking probability and sorption capacity, it is hard to manufacture such a target. Moreover, twisted wire targets occupy more space and are not good for coating narrow chambers. However, single element targets are widely available and can be produced in a form of a wire that is easy to apply for a uniform coating of various shapes of vacuum chambers. Pure Zr coating is tested to find a more efficient and cheaper way of producing the NEG coated chamber parts. In this work, three samples were coated with pure Zr (dense and columnar) and characterised, then results for pumping properties and electron stimulated desorption (ESD) were obtained. Pure Zr coating, although not as good as the quaternary NEG film, could be an economic solution in practise. It has been shown that columnar Zr coating can be activated at 160℃, the temperature close to the Ti-Zr-Hf-V activation temperature and lower than the one for the widely used ternary Ti-Zr-V alloy.

Primary author: SIRVINSKAITE, Ruta (STFC)

Co-authors: MALYSHEV, Oleg (STFC Daresbury Laboratory); VALIZADEH, Reza (STFC Daresbury Laboratory); CROPPER, Michael D.; HANNAH, adrian (science technology facilities council)

Presenter: SIRVINSKAITE, Ruta (STFC)

Session Classification: Poster session

Track Classification: EuroCirCol

Contribution ID: **228** Type: **not specified**

NEG coating: associated problems and solutions

Tuesday, April 10, 2018 5:59 PM (1 minute)

Non-evaporable getter coating of vacuum chamber of particle accelerators was invented approximately 20 year ago by C. Benvenuti at CERN. This technology have already demonstrated its benefits an many machines: ESRF, Elettra, Diamond, Soleil, LHC, MAX-IV, etc. The NEG coatings are very effective vacuum solution, the UHV/XHV conditions could be reached in fully coated vacuum chamber of particle accelerator with much less effort and costs comparing to conventional technology, this only requires a 24-h bakeout to 150 °C and small UHV pumps for hydro carbonates and noble gases. Furthermore, NEG coating can also provide low SEY (□max □ 1) to mitigate the electron cloud and the beam induced multipacting problems. Surface resistance of NEG coating could be varied in wide rage with NEG morphology and chemical composition. Thus, NEG coating provides a complex solution for a few problems.

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Presenter: MALYSHEV, Oleg (STFC Daresbury Laboratory)

Session Classification: Poster session

Track Classification: EuroCirCol

Contribution ID: **229** Type: **not specified**

Dosimetry for ultra-high particle fluence and challenges for irradiation experiments at FCC radiation levels

Thursday, April 12, 2018 11:24 AM (18 minutes)

Current solid-state devices for radiation measurement are not capable of integrating the radiation levels expected in certain sectors of the FCC tunnel (tens of KGy with >1015 particles/cm2) and even more in the experiments of the FCC (tens of MGy, with >1017 particles/cm2). In order to overcome these measurement limitations, we have focused our research on metal nanolayers, as a solution for Ultra High Fluence monitoring. The technology consists of thin film resistive structures deposited on silicon wafers, where sensitivity to displacement damage, measurable in a variation of their electrical properties, can be trimmed by variating geometrical (thickness, width, length) and physical (material) properties of the nanolayers. The prototypes of these Radiation Dependant Resistors have been fabricated at EPFL Centre of Micronanotechnology, and specific high-fluence irradiation tests (with gamma, protons, neutrons) have been carried out in CERN facilities and outside CERN. The fabrication and characterization of the RDRs as well as the results of the irradiation tests performed during 2017 are presented.

Primary author: GORINE, Georgi (EPFL - Ecole Polytechnique Federale Lausanne (CH))

Co-authors: CAPEANS GARRIDO, Mar (CERN); MOLL, Michael (CERN); PEZZULLO, Giuseppe (CERN); RAVOTTI, Federico (CERN); SALLESE, Jean-Michel (EPFL)

Presenter: GORINE, Georgi (EPFL - Ecole Polytechnique Federale Lausanne (CH))

Session Classification: Special Technologies

Track Classification: STP

Contribution ID: **230** Type: **not specified**

Additive manufacturing in-situ repair solutions for the FCC

Thursday, April 12, 2018 1:50 PM (20 minutes)

Additive manufacturing technology and its applications steadily grew from the niche product to the multipurpose manufacturing solution, which today is being applied in many fields of mechanical engineering and machine building technologies. In particular laser cladding proved its high efficiency, precision and economic benefits in repair sectors of aerospace, automotive and ship repair industries. This technology is very flexible and well suited for multi-material micro and macro in-situ repairs. Additive manufacturing equipment, tools and technical solutions are getting more and more compact, precise, productive and versatile.
Therefore, this is of special interest for FCC and eventual in-situ repairs of its structures and elements within the future tunnel itself. Additionally, the in-situ additive manufacturing and laser cladding with moderate R&D effort could be applied in already existing robotised service and surveillance systems of LHC tunnel.

This presentation outlines the current achievements in the additive manufacturing, emphasising in-situ and multi material repair solutions. Future trends and potential application within the FCC framework will be discussed.

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Presenter: TORIMS, Toms (Riga Technical University)

Session Classification: Special Technologies

Track Classification: STP

Contribution ID: **231** Type: **not specified**

Recent development in Laser ablation surface engineering for reduction of secondary electron yield

Tuesday, April 10, 2018 5:59 PM (1 minute)

Developing a surface with low Secondary Electron Yield (SEY) is one of the principal methods of mitigating the beam-induced electron multipacting and electron cloud in high-energy charged particle accelerators. Since the wall material, surface chemistry, topography and electron energy are the parameters that influence the SEY, common mitigation mechanisms are based on engineering the above parameters. Recently ASTeC has demonstrated that nano- and microstructures engineered on Cu, Al and Stainless steel surface reduces SEY to less than 1. Such structures can be readily produced by nano- and sub-nanosecond pulsed laser [1]. SEY can be further reduced to an even lower value by bake-out and/or photon and/or electron bombardment [2]. A systematic analysis of surface composition and chemistry (using XPS), the surface topography (using SEM), and SEY measurements with primary electron energies ranging from 10 to 2000 eV, surface impedance and generated particles size is reported and correlated to the laser treatment conditions.

Primary author: VALIZADEH, Reza (STFC Daresbury Laboratory)

Co-authors: MALYSHEV, Oleg (STFC Daresbury Laboratory); SIAN, Taaj (STFC); TIAGY, Puneet (STFC); PERRIE, Walter (University of Liverpool); WHITEHEAD, David (University of Manchester)

Presenter: VALIZADEH, Reza (STFC Daresbury Laboratory)

Session Classification: Poster session

Track Classification: EuroCirCol

Contribution ID: **232** Type: **not specified**

Mixed refrigerant cycle for cooling below 25 K

Tuesday, April 10, 2018 5:59 PM (1 minute)

The current cryogenic design for the FCC-hh consist of a helium cycle with pre-cooling by the Nelium cycle. Both have their own set of compressors and heat exchangers. The potential of combination of these two distinct cycles with a reduced number of components is investigated. Using efficient turbo compressors requires a mixed refrigerant with a heavier ballast gas to achieve reasonable capital cost for the compressors. On the other hand, the ballast gas has to be removed from the helium if refrigeration at LHe temperatures is requested. This poster covers the choice of a suitable ballast gas and proposes a single cryogenic cycle solution for the FCC-hh and other uses.

Primary author: KLOEPPEL, Steffen (TU Dresden)

Co-authors: HABERSTROH, Christoph (TU Dresden); QUACK, Hans (TU Dresden)

Presenter: KLOEPPEL, Steffen (TU Dresden)

Session Classification: Poster session

Track Classification: I&O

Contribution ID: **234** Type: **not specified**

Non-Contact Human Detection and Vital Parameter Acquisition Based on Physiological Signals of Human Body in Harsh Environments

Tuesday, April 10, 2018 5:59 PM (1 minute)

Likewise LHC, FCC tunnel should be carefully supervised to ensure safety of personnel. Nevertheless, in case of an accident, in order to increase success of the mission and reduce risks for rescue team, it will be crucial for firefighters to collect as much information as possible about the location of victims inside tunnel before entering the unsafe zone. Due to the large size of FCC, rapid intervention and situation analysis will be even more challenging than in case of LHC. The aim of this study is to develop a reconnaissance system based on ultra-wideband (UWB) impulse radar to detect human presence in harsh environments such as smoke-filled room. A short electromagnetic pulse is sent across the room and reflected signal is sampled with small delays (for distance estimation purpose) using swept-threshold coding and integration. Then, signal processing is carried out to detect micro movements of human body due to lung and heart activity. This presentation introduces the principal outline of the said system and the initial results of the measurement experiment in the real smoke filled room.

Primary author: IVANOVS, Arturs (Riga Technical University (LV))

Co-authors: DI CASTRO, Mario (CERN); MASI, Alessandro (CERN); TORIMS, Toms (Riga Technical University); NIKITENKO, Agris

Presenter: IVANOVS, Arturs (Riga Technical University (LV))

Session Classification: Poster session

Track Classification: STP

Contribution ID: **235** Type: **not specified**

R&D on Nb3Sn cable splices

Wednesday, April 11, 2018 2:10 PM (20 minutes)

For space and cost reasons, the Nb3Sn accelerator magnets for FCC should be graded. The joint between the two conductor grades should be conveniently done before the heat treatment (wind-and-react joints) for a compact design, without fragile protrusions from the winding packs. In collaboration between CERN and the Swiss Plasma Center (SPC) an R&D program is carried out to develop reliable, low resistance W&R joints and test them in the SULTAN test facility.
The geometry of the joint is a 100 mm long overlap of cables with the same width. After an initial review of applicable techniques, two methods are retained in the first phase of the R&D: soldered and diffusion bonded joints. Various options and parameters are implemented for the two methods, including preliminary electroplating, inter-leaved copper foil and variable applied pressure.
Screening tests for joint specimens are carried out at 4.2 K in the background field of a 15 T solenoid with operating current up to 1 kA. Four series connected specimens are assembled on a dedicated sample holder.
A more relevant test is carried out in the SULTAN test facility for the most promising joint specimens in the background of 11 T, at the nominal operating current of 18 kA and at variable operating temperature to achieve the nominal distance from the critical surface.
The progress of the R&D and the test results are discussed with an outlook in next phase.

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Presenter: BRUZZONE, Pierluigi (EPFL-SPC)

Session Classification: Magnets

Track Classification: Magnets

Contribution ID: **236** Type: **not specified**

New approaches to high energy physics sensors by CiS

Tuesday, April 10, 2018 5:59 PM (1 minute)

The CiS Forschungsinstitut fuer Mikrosensorik is engaged in developments of radiation detector technologies on several different fields. Current projects are dealing with large area thinned sensors, active edge sensors, 3D sensors, sensor-chip packaging technologies and defect engineering.
For large area sensors, the need for smaller thicknesses can be approached by etching cavities to the sensors' back side while guaranteeing stability on wafer level by thick frames at the edges. An n-in-p pixel run with membranes up to 4x4 cm² and thicknesses of 100 and 150 µm was finished successfully. The technology is currently transferred to 6" wafer size. First results of etching trials with dummy wafers with larger thinned areas will be shown as well.
An active edge sensor run is finished. Three different side wall doping methods (plasma implantation, ion implantation, diffusion) have been tested in combination with two wafer thicknesses as well as with n- and p-substrates. Electrical measurements show the functionality of sensors with inactive edge widths down to 50 µm.
A new innovative approach to 3D processed sensors is being pursued by using plasma etched trenches as isolation between pixels in planar pixel sensor technology. This will allow a modular design and a reduction in cost and time for prototyping for different customers and applications.

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Presenter: ROEDER, Ralf (CiS FIMP)

Session Classification: Poster session

Track Classification: FCC-hh Phy/Exp

Contribution ID: **237** Type: **not specified**

Minimum effective thickness for activation and low total electron yield of TiZrV non-evaporable getter coatings

Tuesday, April 10, 2018 5:59 PM (1 minute)

Minimising the thickness of TiZrV non-evaporable getter (NEG) coatings is mandatory for increasing single-bunch instability thresholds in the proposed FCC-ee high luminosity lepton collider. After thermal activation the NEG surface is depleted of its O content and the total electron yield (TEY) decreases to values close to 1.1. The effect of reducing the thickness of NEG coatings on activation performance, number of possible activation cycles and TEY is investigated. Substrates of OFE copper are coated with TiZrV at thicknesses of 1100 nm, 200 nm, 87 nm and 30 nm by magnetron sputtering using a cathode of intertwisted elemental wires of Ti, Zr and V in a Kr working gas. Coated samples are then heated to temperatures of up to 250 ℃ in ultra-high vacuum and their surface chemistry is monitored with X-ray photoelectron spectroscopy (XPS), then TEY is measured using primary electrons with energies of up to 1800 eV. Samples are vented to atmosphere after activation and reactivated (cycled), up to three times to monitor the change in activation behaviour and TEY decrease upon activation. XPS measurements show a degraded activation with repeated cycling, and the effect is amplified for thinner NEG coatings and for shorter activation times. TEY measurements exhibit a decrease in the electron yield that is less effective for thinner coatings only after repeated activation cycles. These effects are thought to be linked to the delayed diffusion of O away from the surface due to accumulation of higher O concentrations in the film volume, an effect that is faster for thinner films.

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Presenter: SINKOVITS, Theo Finley (CERN)

Session Classification: Poster session

Track Classification: STP

Contribution ID: **238** Type: **not specified**

Effect of transverse stress applied during reaction heat treatment on the stiffness of Nb3Sn Rutherford cable stacks

Tuesday, April 10, 2018 5:59 PM (1 minute)

The stress-strain behaviour of the Nb3Sn conductor blocks of the superconducting coils for the Future Circular Collider (FCC) magnets need to be known in order to predict the stress state distribution in the coils during magnet assembly and operation. The stress-strain behaviour of reacted and impregnated 11 T Rutherford cable stacks has been determined using a dedicated set-up with an extensometer for strain measurements. The set-up was commissioned using reference samples with known mechanical properties. The effect of the sample geometry (cylindrical vs cubic) and sample size on the stiffness has been measured and calculated by finite element simulations.
The investigation of a possible correlation between applied compression during the reaction heat treatment and measured stiffness of the impregnated stack measured in transversal, radial and axial direction have been performed. As expected, the stiffness of the Rutherford cable stack increases with increasing compression during the reaction heat treatment.

Primary author: WOLF, Felix Josef (TU Bergakademie Freiberg (DE))

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Presenter: WOLF, Felix Josef (TU Bergakademie Freiberg (DE))

Session Classification: Poster session

Track Classification: Magnets

Contribution ID: **239** Type: **not specified**

Mechanical stress analysis during quench

Wednesday, April 11, 2018 9:30 AM (15 minutes)

Within the FCC project, the EuroCirCol Work Package 5 is dedicated to the design of 16 T Nb3Sn superconducting dipole magnets. Three main aspects are considered during the design phase, i.e. the optimization of the electromagnetic performance of the dipole magnets, their mechanical structure and quench protection design. Various numerical models have been built for their analysis, employing dedicated commercial and in-house simulation tools, according to the different physics laws involved. As an example, COMSOL is considered to simulate the protection effectiveness of the Coupling-Loss Induced Quench (CLIQ) system during a quench while ANSYS APDL language is employed in the mechanical models.
In this contribution, two of these aspects are considered together to analyze the development of mechanical stress during quench. Magneto-thermal COMSOL and mechanical ANSYS models are coupled via MpCCI, a software that allows for mesh-based interpolation, so that Lorentz forces and temperatures developed during quench can be employed for the mechanical analysis. Different hot-spot locations are considered and their effect on the peak stresses is shown. This analysis may provide useful feedback to the mechanical design, which in a first phase considers nominal operating conditions.

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Presenter: PRIOLI, Marco (CERN)

Session Classification: Magnets

Track Classification: EuroCirCol

Contribution ID: **240** Type: **not specified**

Quench detection System for the FCC era

Thursday, April 12, 2018 3:50 PM (15 minutes)

Quench protection systems are an indispensable asset for the safety and integrity of the components of the FCC superconducting circuits. This contribution focuses on the quench detection (QDS) system. A design study for the QDS proposes main processing units located outside the FCC tunnel and interconnected with high-speed data links to intelligent sensors with reduced complexity and hence increased resistance to higher radiation levels. This will allow for the adoption of a software defined approach for quench detection, while the centralization will improve noise suppression and increase the accuracy by correlating multiple channels. Additionally, the proposed approach facilitates implementation of novel quench detection techniques for the future superconducting magnets.

Primary author: PODZORNY, Tomasz (CERN)

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Presenter: PODZORNY, Tomasz (CERN)

Session Classification: Special Technologies

Track Classification: STP

Contribution ID: **241** Type: **not specified**

A Muon detector based on the μrWell technology

Thursday, April 12, 2018 4:30 PM (30 minutes)

The Muon system of a FCC detector, both for the leptonic as well as for the hadronic collider, will have to cover an area of several thousands of square meters and possess accurate time and coordinate resolutions in order to provide a precise momentum resolution. The muon detector will also need to provide a standalone muon trigger, bunch crossing identification and be able to match muons stubs with tracks measured in the central tracker. Moreover, for FCC-hh the muon detector will have to operate at very high particle rates with a possible pileup up to 1000 events per beam crossing. We will present the requirements and the possible geometry of the muon detector for a FCC detector and discuss an implementation based on an innovative MPGD technology, the μRWell, capable of meeting all these very challenging requirements at an affordable price tag. The main features of the μRWell technology will also be summarised together with the results obtained at test beams and at irradiation facilities.

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Presenter: GIACOMELLI, Paolo (INFN Sezione di Bologna)

Session Classification: Common detector technology

Track Classification: Common detector

Contribution ID: **242** Type: **not specified**

Coating studies on 6 GHz seamless cavities

A key challenge for the next accelerators is the cost reduction. Bulk niobium cavities performances are closer to their theoretical limits and an alternative technology is mandatory. Niobium thin film copper cavities are the most explored solution, but the Q-slope problem, characteristic of these resonators, limits the applications where high accelerating fields are requested.
In this work an original approach is adopted in order to enhance the performances of sputtered cavities, exploring the possibility to sputter 70 micron thick films to mitigate the Q-slope in Niobium sputtered copper cavities. Different strategies have been used for stress reduction: deposition at high temperature (550 ℃), deposition of thick films at the zero stress pressure point, and the development of a multilayer deposition procedure. Rf tests at 4,2 K and 1,8 K on 6 GHz resonant cavities demonstrate the possibility to mitigate the Q-slope in sputtered cavities with thick films.

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Presenter: PIRA, Cristian (LNL-INFN)

Session Classification: SRF

Track Classification: SRF

Contribution ID: **243** Type: **not specified**

FCC as a nucleus-nucleus collider

Tuesday, April 10, 2018 9:35 AM (25 minutes)

The remarkably efficient potential operation of the 100 km FCC as a heavy-ion collider was demonstrated right at the inception of the FCC study. Luminosity projections have risen in recent years in line with the higher intensity beams of lead nuclei now being collided in the LHC. Close contact with the physics working group has been maintained to evaluate the interest of heavy Pb-Pb, asymmetric p-Pb and collisions of lighter nuclei. Beam losses from effects like bound-free pair-production will be prodigious and measures to deal with them must be incorporated in the collider design from the beginning. The present status and needs for further study will be reviewed.

Primary author: JOWETT, John (CERN)

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Presenter: JOWETT, John (CERN)

Session Classification: FCC-hh accelerator

Track Classification: FCC-hh ACC

Contribution ID: **244** Type: **not specified**

IDEA Dual-Readout calorimetry software

Tuesday, April 10, 2018 5:59 PM (1 minute)

Primary author: DUNSER, Marc (CERN)

Presenter: DUNSER, Marc (CERN)

Session Classification: Poster session

Track Classification: FCC-ee Phy/Exp

Contribution ID: **246** Type: **not specified**

HE-LHC Optics overview

Thursday, April 12, 2018 1:48 PM (18 minutes)

Doubling the energy reach of the LHC by upgrading magnets with niobium-tin technology challenges optics design in several aspects. The machine layout and transverse dimensions have to fit in the existing tunnel. The larger energy swing together with features from the new niobium-tin technology deteriorate magnetic field quality, affecting both the linear and non-linear beam dynamics. A large number of design parameters has been explored in order to find optimal solutions. This presentation gives an overview of the optics design standpoint and next steps.

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Presenter: TOMAS GARCIA, Rogelio (CERN)

Session Classification: HE LHC

Track Classification: HE-LHC

Contribution ID: **247** Type: **not specified**

MgB2 and Iron based materials: the FCC activity at SPIN

Tuesday, April 10, 2018 2:08 PM (18 minutes)

The proposed Future Circular Collider at CERN should reach a collision energy of 100 TeV thanks to a four times larger radius and double the magnetic field of the LHC. The latter requirement necessitates the development of superconducting materials/conductors with increased operating field.
Whilst most efforts are focused on Nb3Sn wires, this is an opportunity to assess the potential for high field application of newer superconductors. In the context of a collaboration between CNR-SPIN and CERN, we plan to investigate three different superconducting materials, i.e. Bi-2212, MgB2 and iron-based superconductors (IBS), with the scope of advancing their performance using industrially scalable production methods.
MgB2 conductors can be realised by the powder in tube (PIT) method and have the advantages of low cost and a relatively high critical temperature, Tc. However, the upper critical field, Hc2, and pinning in these conductors is still not optimised. Through the development of a boron precursor synthesis route, we plan to produce MgB2 nanopowders with the inclusion of controlled defects.
Bi-2212 wires realised by the PIT method have shown good performance at high fields. However, these results required heat treatment under pressure that is incompatible with the production of large coils for magnets. We plan to approach the performance today obtained by high pressure heat treatment through mechanical deformation and heat treatment sequences, including optimisation of the temperature profile and oxygenation conditions.
Recently discovered IBS exhibit high Tc and huge Hc2. PIT and coated conductor tapes have been successfully realised, with critical current values exceeding the threshold for practical application (105 A/cm2 at 10 T). We plan to develop prototype IBS conductors that achieve this critical current density at 16 T through reliable, simpler and scalable techniques that would permit industrialisation.
In this talk, the main goals and methods that we are developing will be reviewed.

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Presenter: PUTTI, Marina (University of Genova)

Session Classification: Magnets

Track Classification: EASItrain

Contribution ID: **248** Type: **not specified**

Correction Circuits and Dynamic Aperture

Thursday, April 12, 2018 4:06 PM (18 minutes)

As part of the Future Circular Collider (FCC) study, a high energy upgrade of the LHC (HE-LHC) is studied. Putting this accelerator with twice the center of mass energy in the existing LHC-tunnel relies on the 16 T dipoles developed for the FCC-hh. Using recent field quality tables of these niobium-tin magnets, the dynamic aperture for different injection energies and two lattices is evaluated. Various correction strategies for the magnetic field errors are being investigated and their respective performance in terms of dynamic aperture is presented.

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Presenter: HOFER, Michael (Vienna University of Technology (AT))

Session Classification: HE LHC

Track Classification: HE-LHC

Contribution ID: **249** Type: **not specified**

Beam beam simulations with beamstrahlung for FCC-ee

Wednesday, April 11, 2018 11:35 AM (20 minutes)

Primary author: EL KHECHEN, Dima (CERN)

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Presenter: EL KHECHEN, Dima (CERN)

Session Classification: FCC-ee accelerator

Track Classification: FCC-ee ACC

Contribution ID: **250** Type: **not specified**

FCC-hh transfer line and injection design

Due to the high energy of the injected FCC-hh proton beam (1.3 or 3.3 TeV) a detailed evaluation of the injection design regarding potential failure cases is of major importance. Further attention has to be given to the fact that the injection is – as in LHC - located upstream of the side experiments. Resulting design and hardware specifications for the extraction from the High Energy Booster, the partly superconducting transferline and the injection insertion will be discussed. A layout for the transferlines combined with an injection protection scheme is proposed. Failure scenarios related to the injection process are identified and simulations to validate the efficiency of the protection devices are presented. The feasibility of implementing a massless septum to mitigate the impact of a malfunctioning injection kicker will be discussed.

Primary author: RENNER, Elisabeth (Vienna University of Technology (AT))

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Presenter: RENNER, Elisabeth (Vienna University of Technology (AT))

Session Classification: FCC-hh injector

Track Classification: EuroCirCol

Contribution ID: **251** Type: **not specified**

FCC-hh injection and extraction: insertions and requirements

The design of the FCC-hh extraction systems is driven by the challenge to safely extract the 50 TeV proton beam. The new baseline for the beam dump system design foresees a fast single plane extraction realized by a highly segmented kicker system and a combination of SuShi (Superconducting Shield) and superconducting Cosine-Theta septa. In the dumpline a focusing structure is included to reduce the hardware requirements on the dilution kicker system.
The layout changes and resulting hardware requirements for septa, dilution and extraction kicker magnets will be presented and the implications for failure scenarios and protection devices evaluated. It is proposed to consider multiple abort gaps to enable a faster beam abort and reduce the impact on the machine in case of failures. Technical implications of this proposal will be discussed. Several alternative layout and hardware solutions are summarized and compared to the baseline solution.

Primary author: RENNER, Elisabeth (Vienna University of Technology (AT))

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Presenter: RENNER, Elisabeth (Vienna University of Technology (AT))

Session Classification: FCC-hh injector

Track Classification: FCC-hh INJ

Contribution ID: **252** Type: **not specified**

Top FCNC at FCC-ee

Tuesday, April 10, 2018 5:59 PM (1 minute)

The latest expected sensitivities for the search of flavor changing neutral current processes in top events at the FCC-ee collider run at 365 GeV will be presented in this poster.

Primary author: VAN DER KOLK, Naomi (Universiteit Utrecht)

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Presenter: VAN DER KOLK, Naomi (Universiteit Utrecht)

Session Classification: Poster session

Track Classification: FCC-ee Phy/Exp

Contribution ID: **253** Type: **not specified**

FCC-ee at the Top

Tuesday, April 10, 2018 5:59 PM (1 minute)

FCC-ee special features for the high energy running, description of top precision measurements at threshold and above and implications for new physics.

Primary author: FOPPIANI, Nicolo (Harvard University)

Co-author: AZZI, Patrizia (INFN Padova (IT))

Presenter: FOPPIANI, Nicolo (Harvard University)

Session Classification: Poster session

Track Classification: FCC-ee Phy/Exp

Contribution ID: **254** Type: **not specified**

IDEA Dual-Readout Calorimeter

Tuesday, April 10, 2018 9:00 AM (15 minutes)

Dual-Readout calorimetry is a technique that allows to overcome the non- compensation problem (one of the main limiting factor for the hadronic energy resolution) by the simultaneous measurement of Cherenkov and scintillation light, produced by the shower particles. Thanks to the expected good energy resolution and the excellent particle identification capability, the Dual-Readout fiber calorimeter is the choice for the International Detector for Electron-positron Accelerator (IDEA) detector and one of the most promising options for future leptonic colliders. Test beam results based on a small module read out with Sil- icon Photomultipliers (SiPM) will be shown, together with the required R&D to make this system suitable for a future collider experiment.

Primary author: ANTONELLO, Massimiliano (Università degli Studi e INFN Milano (IT))

Presenter: ANTONELLO, Massimiliano (Università degli Studi e INFN Milano (IT))

Session Classification: FCC-ee physics & experiments

Track Classification: FCC-ee Phy/Exp

Contribution ID: **255** Type: **not specified**

Lattice sextupoles and octupoles

Wednesday, April 11, 2018 4:00 PM (15 minutes)

The Future Circular Collider (FCC) will require 696 double aperture lattice sextupoles, 9336 single aperture sextupole corrector magnets and 480 double aperture octupoles. The tunnel length and the overall integrated field of the main dipoles have to be kept constant so that the FCC can both reach the specified centre of mass collision energy and fit into the Geneva basin. Considering these criteria, any reduction in the length of the other magnets can be traded in exchange for a reduced dipole field, which would result in an overall cost saving for the FCC. However, to be able to reduce the length of these sextupole and octupole magnets, their local strength has to be maximized. Consequently, in this paper we first explore the maximum achievable local strength for these different magnet types for both Nb-Ti and Nb3Sn wire technology taking into account circuit and protection criteria. We then select and present a preferred design based on an overall cost and complexity reduction for the FCC.

Primary author: LOUZGUITI, Alexandre Mehdi (CERN)

Co-author: SCHOERLING, Daniel (CERN)

Presenter: LOUZGUITI, Alexandre Mehdi (CERN)

Session Classification: Magnets

Track Classification: Magnets

Contribution ID: **256** Type: **not specified**

Critical Current Degradation Measurements for RRP Nb3Sn Strands Under Applied Transversal Loads

Tuesday, April 10, 2018 5:59 PM (1 minute)

Superconducting niobium-tin (Nb3Sn) wires have become a key technology for the development of next generation accelerator magnets. These conductors can be described by their high critical current density but also by their remarkable strain-dependent behavior. In presence of mechanical loads, the superconducting lattice is distorted resulting usually in a reversible decrease of the critical current. In addition, the performance of the wire is irreversibly degraded when the applied loads exceed a critical threshold. These two aspects are equally critical in view of the next generation of accelerator magnets based on Nb3Sn conductors, and they need to be accounted for in the proposed solutions for the design studies of the Future Circular Collider (FCC).
At University of Geneva, a measurement probe with a geometry similar to a Walters spring is used to investigate the critical current of impregnated Nb3Sn strands under transversal applied forces. This configuration is chosen to simulate the working conditions of a wire in an accelerator magnet. An extensive campaign of measurements has been undertaken to explore the electro-mechanical behavior of the Restacked-Rod-Process (RRP) wire that is being developed for the potential FCC magnets. To approach the conditions experienced in the Rutherford cables of accelerator magnets, the effects of 15 % rolling deformation and of glass fiber sleeving are investigated. The measurements method and the experimental results are presented in detail, yielding essential information for the magnet design.

Primary author: FERRADAS TROITINO, Jose (Universite de Geneve (CH))

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Presenter: FERRADAS TROITINO, Jose (Universite de Geneve (CH))

Session Classification: Poster session

Track Classification: EuroCirCol

Contribution ID: **257** Type: **not specified**

Beam Impact & Machine Protection challenges

Thursday, April 12, 2018 4:20 PM (20 minutes)

With a machine protection system similar to the Large Hadron Collider (LHC), the Future Circular Collider (FCC) would require up to three turns' to dump the beam synchronously after detection of a failure. The reaction time of the machine protection system can be reduced by several strategies. The time for failure detection can become shorter with faster hardware and beam monitors, e.g. using diamond detectors as fast beam loss monitors. Communication time for the interlock system to the beam dumping system can be reduced by using a straight signal path instead of going through the arc. More than one beam-free abort gap can shorten the time required for synchronization. Different operational and failure scenarios are classified according to beam lifetime, i.e. the speed of the onset and increase of induced beam losses. We put emphasis on so-called ultrafast failures including crab-cavity failures, fast failures such as magnet failures at high beta function positions or with short time constants of field decay, and slow failures. A list is presented, summarizing the critical failure modes and proposing potential mitigation strategies.

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Presenter: NIE, Yuancun (CERN)

Session Classification: Special Technologies

Track Classification: STP

Contribution ID: **258** Type: **not specified**

Study of Reflectivity and Photo Yield on FCC-hh proposed beam screen surfaces.

Tuesday, April 10, 2018 5:59 PM (1 minute)

In the Highest Energy Proton Circular Collider ever designed, FCC-hh, a large production of Synchrotron Radiation (SR) is expected. This SR causes heat load on the accelerator walls, photon stimulated desorption, production of secondary electrons, beam instability, etc. Thus, it is very important to have an experimental characterization of optical properties of technical surfaces, in particular reflectivity and photo yield. Measuring such properties on realistic candidates and in conditions as close as possible to the one that will actually occur in the machine is indeed a great experimental challenge. In FCC-hh, SR Light, with energies going from few eV to more than 4 KeV, will impinge on the accelerator walls at grazing angles smaller than 0.1 degrees. A systematic experimental campaign has been recently launched, using the Optics Beamline and the Reflectometer end station in Berlin, as an ideal tool to get realistic values to be used in simulations. We measured R and PY from clean and Carbon coated Cupper surfaces with different roughness, as well as from LHC Cu beam screen (both on its flat part and on the Saw tooth structure) and from one specific representative of Laser treated Cu surface (LASE). Those measurements will be here presented, confirming the importance of directly measure specular as well as total reflectivity from surfaces with different shape, material and finish to correctly trace SR path and its effect on high energy future colliders.

Primary author: LA FRANCESCA, Eliana (LNF-INFN Frascati (Rome) , Italy)

Co-authors: LIEDL, Andrea (Istituto Nazionale Fisica Nucleare Frascati (IT)); SOKOLOV, Andrey (Helmholtz Zentrum Berlin (DE)); SIEWERT, Frank (Helmholtz Zentrum Berlin (DE)); SCHÄFERS, Franz (Helmholtz Zentrum Berlin (DE)); ANGELUCCI, Marco; SERTSU, Mewael (Helmholtz Zentrum Berlin (DE)); CIMINO, Roberto (LNF-INFN)

Presenter: LA FRANCESCA, Eliana (LNF-INFN Frascati (Rome) , Italy)

Session Classification: Poster session

Track Classification: EuroCirCol

Contribution ID: **259** Type: **not specified**

Study of Vacuum stability and desorption processes at low temperature for various FCC-hh candidate materials.

Tuesday, April 10, 2018 5:59 PM (1 minute)

One of the many important parameters to be studied and fixed in the design of the FCC-hh is the operational temperature (T) at which the foreseen beam screen should operate. Such choice will necessarily be a compromise between the desire to reduce cooling costs (keeping it at as close as possible to room T) and to have a minimal wall resistivity (keeping it at as low as possible Ts). The final chosen T must than cope with other constrains one being vacuum stability even in case of tiny and unavoidable wall T fluctuations.
The required set up to perform such experiment has been commissioned and tested at LNF. Adsorption and desorption processes versus T variation have been studied for calibration purposes for Ar ices deposited on different materials held at T below 20 K.
We performed a preliminary comparison between Ar ice grown on clean Cu, LHC Cu and on a representative sample belonging to the family of laser treated Cu (LASE). If Ar ice is formed on close to flat surfaces its desorption/adsorption dynamics is dominated by Ar-Ar Van-der-Waals bond strength, so that the Ar desorption occurs at the expected T ~ 30 K. When such Ar ice is grown onto such a strongly morphologically modified surface, only thick ices behave as expected. At low/intermediate coverages, the Ar desorption takes place in a much vaster and higher T interval. This evidence may suggest a critical dependence of vacuum stability on surface morphology and gas quantity requiring further investigation.

Primary author: SPALLINO, Luisa (LNF-INFN)

Co-authors: ANGELUCCI, Marco; CIMINO, Roberto (LNF-INFN); LARCIPRETE, Rosanna (CNR-ISC, Rome (IT))

Presenter: SPALLINO, Luisa (LNF-INFN)

Session Classification: Poster session

Track Classification: EuroCirCol

Contribution ID: **260** Type: **not specified**

Desorption, scrubbing and surface modifications during Synchrotron Radiation light irradiation of accelerator walls.

Tuesday, April 10, 2018 5:59 PM (1 minute)

In FCC-hh, one of the most challenging issue will be to limit all possible instabilities that could occur. Expected instabilities are mainly related to the large number of photons and photoelectrons present in the vacuum beam-pipe. Photons and photoelectrons will induce gas desorption and single beam instabilities, whereas at LHC instabilities are dominated by e-cloud formation. It is, therefore, of paramount importance to study the effect of photon irradiation on technical materials, to experimentally address its capability to induce gas desorption and to modify the actual surface chemistry, as electron bombardment does, eventually reducing material Photo yield (PY) and Secondary Electron Yield (SEY).
Up to now, no clear experimental evidence is showing that photon irradiation "scrub", how efficient it is compared to electron scrubbing (the base mitigation processes used at LHC), what are the links between the two phenomena and what detailed surface chemistry changes are related to it and to the gas induced desorption.
At LNF, thanks to the use of SR light emitted from a DAFNE bending magnet, we performed the first test experiments following simultaneously gas desorption, PY, SEY and surface chemistry modification (by using XPS spectroscopy) during focussed WL irradiation of a LHC Cu at room temperature. Preliminary results are here briefly presented, suggesting their importance as input to simulation programs used to validate any proposed design.

Primary author: ANGELUCCI, Marco

Co-authors: SPALLINO, Luisa (LNF-INFN); CIMINO, Roberto (LNF-INFN); LARCIPRETE, Rosanna (CNR-ISC, Rome (IT))

Presenter: ANGELUCCI, Marco

Session Classification: Poster session

Track Classification: EuroCirCol

Contribution ID: **261** Type: **not specified**

Beam Screen surface characterisation for high energy beams: test results at Frascati.

Tuesday, April 10, 2018 9:30 AM (20 minutes)

In FCC-hh one of the most challenging issue will be the control of all possible instabilities that could occur. In order to do so, all vacuum vessel inner surfaces need to be characterised in great details. Among others properties, their Secondary Electron Yield (SEY), Photo Yield (PY), Reflectivity (R) and their capability to adsorb residual gas molecules and maintain them absorbed during temperature fluctuations are of paramount importance to address machine operation issues. All those parameters need to be studied in experimental conditions as close as possible to the ones that will occur. Also, their stability during operation must be addressed thoughtfully.
Most of the accelerators walls will see the beam while being at low temperatures and some of their relevant properties will not only depend on the technical materials in use but also on the presence of cryosorbed ice of residual gases condensed on them. Such gas layers may affect SEY and vacuum stability in case of temperature fluctuations.
At LNF, also thanks to the availability of Synchrotron Radiation light, we can analyse, with a multidisciplinary approach, most of those aspects contemporarily and in experimental conditions close to reality. For low temperature unbacked materials SEY, temperature-, photon- and electron-induced desorption, grazing angle R and PY have been and are under study. Results will suggest important guidelines and input to simulation programs used to validate any proposed design.

Primary author: CIMINO, Roberto (LNF-INFN)

Co-authors: LIEDL, Andrea (Istituto Nazionale Fisica Nucleare Frascati (IT)); LA FRANCESCA, Eliana (LNF-INFN Frascati (Rome) , Italy); SPALLINO, Luisa (LNF-INFN); ANGELUCCI, Marco; LARCIPRETE, Rosanna (CNR-ISC, Rome (IT))

Presenter: CIMINO, Roberto (LNF-INFN)

Session Classification: Special Technologies

Track Classification: EuroCirCol

Contribution ID: **262** Type: **not specified**

CLD detector model overview

Tuesday, April 10, 2018 8:30 AM (15 minutes)

Primary author: VIAZLO, Oleksandr (CERN)

Presenter: VIAZLO, Oleksandr (CERN)

Session Classification: FCC-ee physics & experiments

Track Classification: FCC-ee Phy/Exp

Contribution ID: **263** Type: **not specified**

IDEA Drift Chamber

Tuesday, April 10, 2018 9:15 AM (15 minutes)

Primary author: TASSIELLI, Giovanni F. (INFN Lecce / Università del Salento)

Presenter: TASSIELLI, Giovanni F. (INFN Lecce / Università del Salento)

Session Classification: FCC-ee physics & experiments

Track Classification: FCC-ee Phy/Exp

Contribution ID: **264** Type: **not specified**

A light and compact detector solenoid

Tuesday, April 10, 2018 9:30 AM (15 minutes)

Primary author: TEN KATE, Herman (CERN)

Presenter: TEN KATE, Herman (CERN)

Session Classification: FCC-ee physics & experiments

Track Classification: FCC-ee Phy/Exp

Contribution ID: **265** Type: **not specified**

Mitigation of synchrotron radiation from IR

Tuesday, April 10, 2018 10:30 AM (20 minutes)

FCC-ee is designed to operate at energies from 45.6 up to 182.5 GeV with unprecedented luminosity. This brings some challenges in controlling the emission of synchrotron radiation (SR) photons. A scheme of tungsten shielding has been developed to minimize this effect on the detector backgrounds.

Primary author: KOLANO, Anna Maria (CERN)

Presenter: KOLANO, Anna Maria (CERN)

Session Classification: FCC-ee physics & experiments

Track Classification: FCC-ee Phy/Exp

Contribution ID: **266** Type: **not specified**

Beam-induced backgrounds and impact in the full-Si tracker

Tuesday, April 10, 2018 10:50 AM (20 minutes)

Primary author: VOUTSINAS, Georgios Gerasimos (CERN)

Presenter: VOUTSINAS, Georgios Gerasimos (CERN)

Session Classification: FCC-ee physics & experiments

Track Classification: FCC-ee Phy/Exp

Contribution ID: **267** Type: **not specified**

Beam-background impact in the IDEA drift chamber

Tuesday, April 10, 2018 11:10 AM (20 minutes)

Primary author: ALIPOUR TEHRANI, Niloufar (CERN)

Presenter: ALIPOUR TEHRANI, Niloufar (CERN)

Session Classification: FCC-ee physics & experiments

Track Classification: FCC-ee Phy/Exp

Contribution ID: **268** Type: **not specified**

LumiCal for FCC-ee and beam-background impact

Tuesday, April 10, 2018 11:30 AM (20 minutes)

Primary author: DAM, Mogens (University of Copenhagen (DK))

Presenter: DAM, Mogens (University of Copenhagen (DK))

Session Classification: FCC-ee physics & experiments

Track Classification: FCC-ee Phy/Exp

Contribution ID: **269** Type: **not specified**

Z pole scan strategy and beam-energy spread measurement

Tuesday, April 10, 2018 1:50 PM (20 minutes)

Primary author: JANOT, Patrick (CERN)

Presenter: JANOT, Patrick (CERN)

Session Classification: FCC-ee physics & experiments

Track Classification: FCC-ee Phy/Exp

Contribution ID: **270** Type: **not specified**

Beam energy calibration summary for the FCC-ee at the Z and W

Tuesday, April 10, 2018 1:30 PM (20 minutes)

Primary author: BLONDEL, Alain (Universite de Geneve (CH))

Presenter: BLONDEL, Alain (Universite de Geneve (CH))

Session Classification: FCC-ee physics & experiments

Track Classification: FCC-ee Phy/Exp

Contribution ID: **271** Type: **not specified**

FCC-ee as a W factory

Tuesday, April 10, 2018 2:10 PM (20 minutes)

Primary author: AZZURRI, Paolo (INFN Sezione di Pisa, Universita' e Scuola Normale Superiore, P)

Presenter: AZZURRI, Paolo (INFN Sezione di Pisa, Universita' e Scuola Normale Superiore, P)

Session Classification: FCC-ee physics & experiments

Track Classification: FCC-ee Phy/Exp

Contribution ID: **272** Type: **not specified**

Update of Higgs studies with the CLD detector model

Tuesday, April 10, 2018 3:30 PM (20 minutes)

The FCC-ee experiments will collect an unprecedented amount of data at sqrt s = 240 and 360 GeV. The Higgs bosons are produced in very large numbers, either in association with a Z boson or through W-boson fusion, and are detected in several decay channels. The production yields are combined to measure the Higgs couplings and invisible width with sub-percent precision. The precision obtained with the CLD detector and an integrated luminosity of 5 ab-1 in the major decay modes (H->anything, H->bb, H->tautau), is presented for the first time.

Primary author: BERNET, Colin (IPNL/CNRS (Lyon))

Presenter: BERNET, Colin (IPNL/CNRS (Lyon))

Session Classification: FCC-ee physics & experiments

Track Classification: FCC-ee Phy/Exp

Contribution ID: **273** Type: **not specified**

New results in flavour physics

Tuesday, April 10, 2018 3:50 PM (20 minutes)

Primary author: MONTEIL, Stephane (Université Clermont Auvergne (FR))

Presenter: MONTEIL, Stephane (Université Clermont Auvergne (FR))

Session Classification: FCC-ee physics & experiments

Track Classification: FCC-ee Phy/Exp

Contribution ID: **274** Type: **not specified**

Dynamic aperture at injection for different lattice options

Tuesday, April 10, 2018 1:50 PM (20 minutes)

Primary author: NOSOCHKOV, Yuri (SLAC National Accelerator Laboratory (US))

Presenter: NOSOCHKOV, Yuri (SLAC National Accelerator Laboratory (US))

Session Classification: HE LHC

Track Classification: HE-LHC

Contribution ID: **275** Type: **not specified**

Beam-Beam Effects

Tuesday, April 10, 2018 2:30 PM (20 minutes)

Primary author: PIELONI, Tatiana (EPF Lausanne)

Presenter: PIELONI, Tatiana (EPF Lausanne)

Session Classification: HE LHC

Track Classification: HE-LHC

Contribution ID: **276** Type: **not specified**

Parameters, constraints, options

Thursday, April 12, 2018 1:30 PM (18 minutes)

Primary author: ZIMMERMANN, Frank (CERN)

Presenter: ZIMMERMANN, Frank (CERN)

Session Classification: HE LHC

Track Classification: HE-LHC

Contribution ID: **277** Type: **not specified**

Injection and extraction

Thursday, April 12, 2018 2:24 PM (18 minutes)

Primary author: GODDARD, Brennan (CERN)

Presenter: GODDARD, Brennan (CERN)

Session Classification: HE LHC

Track Classification: HE-LHC

Contribution ID: **278** Type: **not specified**

IR1/5 radiation shielding

Thursday, April 12, 2018 3:30 PM (18 minutes)

Primary author: ABELLEIRA, Jose (JAI Oxford)

Presenter: ABELLEIRA, Jose (JAI Oxford)

Session Classification: HE LHC

Track Classification: HE-LHC

Contribution ID: **279** Type: **not specified**

Collimation

Thursday, April 12, 2018 3:48 PM (18 minutes)

Primary author: CROUCH, Matthew Paul (CERN)

Presenter: CROUCH, Matthew Paul (CERN)

Session Classification: HE LHC

Track Classification: HE-LHC

Contribution ID: **280** Type: **not specified**

HE-LHC electron cloud

Thursday, April 12, 2018 4:42 PM (18 minutes)

Primary author: METHER, Lotta (EPFL - Ecole Polytechnique Federale Lausanne (CH))

Presenter: METHER, Lotta (EPFL - Ecole Polytechnique Federale Lausanne (CH))

Session Classification: HE LHC

Track Classification: HE-LHC

Contribution ID: **281** Type: **not specified**

Simulation and Analysis Chain for the FCC-hh Studies

Thursday, April 12, 2018 1:30 PM (10 minutes)

Primary author: HELSENS, Clement (CERN)

Presenter: HELSENS, Clement (CERN)

Session Classification: Common detector technology

Track Classification: Common detector

Contribution ID: **282** Type: **not specified**

Simulation of the drift chamber for the FCCee-IDEA detector concept within FCCSW

Thursday, April 12, 2018 1:40 PM (20 minutes)

Primary author: ALIPOUR TEHRANI, Niloufar (CERN)

Presenter: ALIPOUR TEHRANI, Niloufar (CERN)

Session Classification: Common detector technology

Track Classification: Common detector

Contribution ID: **283** Type: **not specified**

Timed Track Seeding to mitigate pile-up effects

Thursday, April 12, 2018 2:00 PM (20 minutes)

Primary author: VOLKL, Valentin (University of Innsbruck (AT))

Presenter: VOLKL, Valentin (University of Innsbruck (AT))

Session Classification: Common detector technology

Track Classification: Common detector

Contribution ID: **284** Type: **not specified**

Status of full track reconstruction with ACTS in FCCSW

Thursday, April 12, 2018 2:20 PM (20 minutes)

Primary author: HRDINKA, Julia (Vienna University of Technology (AT))

Presenter: HRDINKA, Julia (Vienna University of Technology (AT))

Session Classification: Common detector technology

Track Classification: Common detector

Contribution ID: **285** Type: **not specified**

Papas: A Fast Simulation of the Particle Flow

Thursday, April 12, 2018 2:40 PM (20 minutes)

Particle flow combines the information from all subdetectors for an optimal reconstruction of all particles in the final state of the collision: charged hadrons, photons, neutral hadrons, electrons, and muons. This technique demonstrated superior performance in past and present experiments, both in ee and pp collisions (ALEPH, CMS), and is now envisioned for future collider experiments. The design of the future detectors is driven by physics performance results, often obtained with a fast, parametrized simulation. Papas (PArametrized PArticle Simulation) is a new fast simulation program featuring a fully-fledged particle-flow algorithm, and is able to capture the influence of the detector properties on reconstruction performance. The principles of papas are presented, as well as the results obtained with two detector models, CMS and CLD (CLIC-based detector design for FCC-ee).

Primary author: BERNET, Colin (IPNL/CNRS (Lyon))

Presenter: BERNET, Colin (IPNL/CNRS (Lyon))

Session Classification: Common detector technology

Track Classification: Common detector

Contribution ID: **286** Type: **not specified**

Present and future of microelectronics

Thursday, April 12, 2018 4:00 PM (30 minutes)

Primary author: CAMPBELL, Michael (CERN)

Presenter: CAMPBELL, Michael (CERN)

Session Classification: Common detector technology

Track Classification: Common detector

Contribution ID: **287** Type: **not specified**

Introduction to FCC-hh physics analysis studies

Wednesday, April 11, 2018 1:30 PM (20 minutes)

Primary author: MOORTGAT, Filip (CERN)

Presenter: MOORTGAT, Filip (CERN)

Session Classification: FCC-hh physics & experiments

Track Classification: FCC-hh Phy/Exp

Contribution ID: **288** Type: **not specified**

Dark Matter: disappearing tracks

Wednesday, April 11, 2018 4:20 PM (15 minutes)

Primary author: SAWADA, Ryu (University of Tokyo (JP))

Presenter: SAWADA, Ryu (University of Tokyo (JP))

Session Classification: FCC-hh physics & experiments

Track Classification: FCC-hh Phy/Exp

Contribution ID: **289** Type: **not specified**

Magnet system

Thursday, April 12, 2018 8:30 AM (20 minutes)

Primary author: BIELERT, Erwin Roland (Univ. Illinois at Urbana Champaign (US))

Presenter: BIELERT, Erwin Roland (Univ. Illinois at Urbana Champaign (US))

Session Classification: FCC-hh physics & experiments

Track Classification: FCC-hh Phy/Exp

Contribution ID: **290** Type: **not specified**

Tracker I

Thursday, April 12, 2018 8:50 AM (20 minutes)

Primary author: DRASAL, Zbynek (CERN)

Presenter: DRASAL, Zbynek (CERN)

Session Classification: FCC-hh physics & experiments

Track Classification: FCC-hh Phy/Exp

Contribution ID: **291** Type: **not specified**

Tracker II

Thursday, April 12, 2018 9:10 AM (15 minutes)

Primary author: PEREZ CODINA, Estel (CERN)

Presenter: PEREZ CODINA, Estel (CERN)

Session Classification: FCC-hh physics & experiments

Track Classification: FCC-hh Phy/Exp

Contribution ID: **292** Type: **not specified**

Track trigger

Thursday, April 12, 2018 9:45 AM (15 minutes)

Primary author: FAWCETT, William James (Universite de Geneve (CH))

Presenter: FAWCETT, William James (Universite de Geneve (CH))

Session Classification: FCC-hh physics & experiments

Track Classification: FCC-hh Phy/Exp

Contribution ID: **293** Type: **not specified**

DECAL

Thursday, April 12, 2018 10:30 AM (20 minutes)

Primary author: PRICE, Tony (University of Birmingham (GB))

Presenter: PRICE, Tony (University of Birmingham (GB))

Session Classification: FCC-hh physics & experiments

Track Classification: FCC-hh Phy/Exp

Contribution ID: **294** Type: **not specified**

HCAL

Thursday, April 12, 2018 10:50 AM (20 minutes)

Primary author: NEUBUSER, Coralie (CERN)

Presenter: NEUBUSER, Coralie (CERN)

Session Classification: FCC-hh physics & experiments

Track Classification: FCC-hh Phy/Exp

Contribution ID: **295** Type: **not specified**

IP Beam Parameter Optimization

Wednesday, April 11, 2018 8:30 AM (20 minutes)

Primary author: SHATILOV, Dmitry (Budker Institute of Nuclear Physics (RU))

Presenter: SHATILOV, Dmitry (Budker Institute of Nuclear Physics (RU))

Session Classification: FCC-ee accelerator

Track Classification: FCC-ee ACC

Contribution ID: **296** Type: **not specified**

Optics Update

Wednesday, April 11, 2018 8:50 AM (20 minutes)

Primary author: OIDE, Katsunobu (High Energy Accelerator Research Organization (JP))

Presenter: OIDE, Katsunobu (High Energy Accelerator Research Organization (JP))

Session Classification: FCC-ee accelerator

Track Classification: FCC-ee ACC

Contribution ID: **297** Type: **not specified**

IR magnets and MDI integration

Wednesday, April 11, 2018 11:15 AM (20 minutes)

Primary author: LEVICHEV, Evgeny (Budker Institute of Nuclear Physics (RU))

Presenter: LEVICHEV, Evgeny (Budker Institute of Nuclear Physics (RU))

Session Classification: FCC-ee accelerator

Track Classification: FCC-ee ACC

Contribution ID: **298** Type: **not specified**

Fast ion instability

Wednesday, April 11, 2018 1:50 PM (15 minutes)

Primary author: METHER, Lotta (EPFL - Ecole Polytechnique Federale Lausanne (CH))

Presenter: METHER, Lotta (EPFL - Ecole Polytechnique Federale Lausanne (CH))

Session Classification: FCC-ee accelerator

Track Classification: FCC-ee ACC

Contribution ID: **299** Type: **not specified**

Update on X-ray interfermetric emittance measurement

Wednesday, April 11, 2018 4:35 PM (15 minutes)

Primary author: MITSUHASHI, Toshiyuki (KEK)

Presenter: MITSUHASHI, Toshiyuki (KEK)

Session Classification: FCC-ee accelerator

Track Classification: FCC-ee ACC

Contribution ID: **300** Type: **not specified**

Polarimeters

Thursday, April 12, 2018 10:45 AM (15 minutes)

Primary authors: MUCHNOI, Nickolai; МУЧНОЙ, Николай

Presenters: MUCHNOI, Nickolai; МУЧНОЙ, Николай

Session Classification: FCC-ee accelerator

Track Classification: FCC-ee ACC

Contribution ID: **301** Type: **not specified**

Relation between beam energies and centre-of-mass energy

Thursday, April 12, 2018 11:15 AM (15 minutes)

Primary author: TYDECKS, Tobias (CERN)

Presenter: TYDECKS, Tobias (CERN)

Session Classification: FCC-ee accelerator

Track Classification: FCC-ee ACC

Contribution ID: **302** Type: **not specified**

Putting it all together; running scheme, requirements and expected precision, remaining tasks

Thursday, April 12, 2018 11:45 AM (15 minutes)

Primary author: BLONDEL, Alain (Universite de Geneve (CH))

Presenter: BLONDEL, Alain (Universite de Geneve (CH))

Session Classification: FCC-ee accelerator

Track Classification: FCC-ee ACC

Contribution ID: **303** Type: **not specified**

Overview on injector complex inc. e+ system

Thursday, April 12, 2018 8:30 AM (25 minutes)

Primary author: PAPAPHILIPPOU, Yannis (CERN)

Presenter: PAPAPHILIPPOU, Yannis (CERN)

Session Classification: FCC-ee injector

Track Classification: FCC-ee INJ

Contribution ID: **304** Type: **not specified**

Linac and damping ring

Thursday, April 12, 2018 8:55 AM (15 minutes)

Primary author: OGUR, Salim (CERN)

Presenter: OGUR, Salim (CERN)

Session Classification: FCC-ee injector

Track Classification: FCC-ee INJ

Contribution ID: **305** Type: **not specified**

Prebooster ring design

Thursday, April 12, 2018 9:25 AM (15 minutes)

Primary author: ETISKEN, Ozgur (Ankara University (TR))

Presenter: ETISKEN, Ozgur (Ankara University (TR))

Session Classification: FCC-ee injector

Track Classification: FCC-ee INJ

Contribution ID: **306** Type: **not specified**

Booster ring design

Thursday, April 12, 2018 9:40 AM (15 minutes)

The FCC-ee booster synchrotron is a 97.75 km long full energy injector performing continuous top-up injection, since the beam lifetime of the collider is very short because of beamstrahlung and radiative Bhabha scattering.
This talk presents the two optics foreseen to obtain similar emittances as in the collider at different operation modes. Particular emphasis is put on the investigation of the beam parameters at injection energy: wigglers are installed to reduce the damping time to 0.1 s and to increase the equilibrium emittance in order to mitigate the effect of intra-beam-scattering.
Dynamic aperture studies included the effects of radiation damping, quantum excitation and 150 mum quadrupole misalignments. More studies with gradient errors and a calculation of TMCI are on the way.

Primary author: HARER, Bastian (CERN)

Co-authors: HOLZER, Bernhard (CERN); TYDECKS, Tobias (CERN); PAPAPHILIPPOU, Yannis (CERN)

Presenter: HARER, Bastian (CERN)

Session Classification: FCC-ee injector

Track Classification: FCC-ee INJ

Contribution ID: **307** Type: **not specified**

FCC-eh summary

Friday, April 13, 2018 11:40 AM (20 minutes)

Primary author: KLEIN, Uta (University of Liverpool (GB))

Presenter: KLEIN, Uta (University of Liverpool (GB))

Session Classification: Summaries

Track Classification: FCC-eh

Contribution ID: **308** Type: **not specified**

FCC-ee experiments & detectors summary

Friday, April 13, 2018 11:00 AM (20 minutes)

Primary author: AZZI, Patrizia (INFN Padova (IT))

Presenter: AZZI, Patrizia (INFN Padova (IT))

Session Classification: Summaries

Track Classification: FCC-ee Phy/Exp

Contribution ID: **309** Type: **not specified**

FCC-hh experiments & detectors summary

Friday, April 13, 2018 11:20 AM (20 minutes)

Primary author: SELVAGGI, Michele (CERN)

Presenter: SELVAGGI, Michele (CERN)

Session Classification: Summaries

Track Classification: FCC-hh Phy/Exp

Contribution ID: **310** Type: **not specified**

Closing remarks

Friday, April 13, 2018 12:00 PM (10 minutes)

Primary author: BENEDIKT, Michael (CERN)

Presenter: BENEDIKT, Michael (CERN)

Session Classification: Summaries

Contribution ID: **311** Type: **not specified**

QCD measurements at FCC

Wednesday, April 11, 2018 8:30 AM (20 minutes)

Primary author: KLEIN, Max (University of Liverpool (GB))

Presenter: KLEIN, Max (University of Liverpool (GB))

Session Classification: FCC physics

Track Classification: Physics

Contribution ID: **312** Type: **not specified**

Search for BSM phenomena 1

Wednesday, April 11, 2018 9:10 AM (25 minutes)

Primary author: TORRE, Riccardo (CERN)

Presenter: TORRE, Riccardo (CERN)

Session Classification: FCC physics

Track Classification: Physics

Contribution ID: **313** Type: **not specified**

Search for BSM phenomena 2

Wednesday, April 11, 2018 9:35 AM (25 minutes)

Primary author: WULZER, Andrea (CERN)

Presenter: WULZER, Andrea (CERN)

Session Classification: FCC physics

Track Classification: Physics

Contribution ID: **314** Type: **not specified**

Higgs measurements at FCC

Wednesday, April 11, 2018 10:30 AM (25 minutes)

Primary author: KLUTE, Markus (Massachusetts Inst. of Technology (US))

Presenter: KLUTE, Markus (Massachusetts Inst. of Technology (US))

Session Classification: FCC physics

Track Classification: Physics

Contribution ID: **315** Type: **not specified**

EW measurements at FCC

Wednesday, April 11, 2018 10:55 AM (25 minutes)

Primary author: TENCHINI, Roberto (INFN Sezione di Pisa, Universita' e Scuola Normale Superiore, P)

Presenter: TENCHINI, Roberto (INFN Sezione di Pisa, Universita' e Scuola Normale Superiore, P)

Session Classification: FCC physics

Track Classification: Physics

Contribution ID: **316** Type: **not specified**

Top physics at FCC

Wednesday, April 11, 2018 11:20 AM (20 minutes)

Primary author: SCHWANENBERGER, Christian (Deutsches Elektronen-Synchrotron (DE))

Presenter: SCHWANENBERGER, Christian (Deutsches Elektronen-Synchrotron (DE))

Session Classification: FCC physics

Track Classification: Physics

Contribution ID: **317** Type: **not specified**

Global fits of EW and Higgs observables

Wednesday, April 11, 2018 11:40 AM (20 minutes)

Primary author: DE BLAS, Jorge (INFN-Padova)

Presenter: DE BLAS, Jorge (INFN-Padova)

Session Classification: FCC physics

Track Classification: Physics

Contribution ID: **318** Type: **not specified**

ESR 1 presentation

Thursday, April 12, 2018 10:30 AM (10 minutes)

Primary author: FONNESU, Dorothea (CERN)

Presenter: FONNESU, Dorothea (CERN)

Session Classification: EASItrain

Track Classification: EASItrain

Contribution ID: **319** Type: **not specified**

ESR 6 presentation

Thursday, April 12, 2018 10:40 AM (10 minutes)

Primary author: SABA, Aisha

Presenter: SABA, Aisha

Session Classification: EASItrain

Track Classification: EASItrain

Contribution ID: **320** Type: **not specified**

ESR 8 presentation

Thursday, April 12, 2018 10:50 AM (10 minutes)

Primary author: TIKHONOV, Dmitry (Helmholtz-Zentrum Berlin für Materialien und Energie)

Presenter: TIKHONOV, Dmitry (Helmholtz-Zentrum Berlin für Materialien und Energie)

Session Classification: EASItrain

Track Classification: EASItrain

Contribution ID: **321** Type: **not specified**

ESR 9 presentation

Thursday, April 12, 2018 11:00 AM (10 minutes)

Primary author: CROTEAU, Jean Francois

Presenter: CROTEAU, Jean Francois

Session Classification: EASItrain

Track Classification: EASItrain

Contribution ID: **322** Type: **not specified**

ESR 10 presentation

Thursday, April 12, 2018 11:10 AM (10 minutes)

Primary author: GARCIA DIAZ, Vanessa

Presenter: GARCIA DIAZ, Vanessa

Session Classification: EASItrain

Track Classification: EASItrain

Contribution ID: **323** Type: **not specified**

ESR 14 presentation

Thursday, April 12, 2018 11:20 AM (10 minutes)

Primary author: LEITH, Stewart Bristow

Presenter: LEITH, Stewart Bristow

Session Classification: EASItrain

Track Classification: EASItrain

Contribution ID: **324** Type: **not specified**

JUAS overview

Thursday, April 12, 2018 1:30 PM (15 minutes)

Primary author: LEBRUN, Philippe (European Scientific Institute (FR))

Presenter: LEBRUN, Philippe (European Scientific Institute (FR))

Session Classification: EASItrain

Track Classification: EASItrain

Contribution ID: **325** Type: **not specified**

ESR 2 presentation

Thursday, April 12, 2018 1:45 PM (15 minutes)

Primary author: GNILSEN, Johannes

Presenter: GNILSEN, Johannes

Session Classification: EASItrain

Track Classification: EASItrain

Contribution ID: **326** Type: **not specified**

ESR 7 presentation

Thursday, April 12, 2018 2:00 PM (15 minutes)

Session Classification: EASItrain

Track Classification: EASItrain

Contribution ID: **327** Type: **not specified**

ESR 12 presentation

Thursday, April 12, 2018 2:15 PM (15 minutes)

Primary author: MOROS, Alice

Presenter: MOROS, Alice

Session Classification: EASItrain

Track Classification: EASItrain

Contribution ID: **328** Type: **not specified**

ESR 13 presentation

Thursday, April 12, 2018 2:30 PM (15 minutes)

Primary author: ORTINO, Mattia (TU Wien (Vienna))

Presenter: ORTINO, Mattia (TU Wien (Vienna))

Session Classification: EASItrain

Track Classification: EASItrain

Contribution ID: **329** Type: **not specified**

ESR 3 presentation

Thursday, April 12, 2018 3:30 PM (15 minutes)

Primary author: VITRANO, Andrea

Presenter: VITRANO, Andrea

Session Classification: EASItrain

Track Classification: EASItrain

Contribution ID: **330** Type: **not specified**

ESR 4 presentation

Thursday, April 12, 2018 3:45 PM (15 minutes)

Primary author: TKACZUK, Jakub

Presenter: TKACZUK, Jakub

Session Classification: EASItrain

Track Classification: EASItrain

Contribution ID: **331** Type: **not specified**

ERS 5 presentation

Thursday, April 12, 2018 4:00 PM (15 minutes)

Primary author: KRETZSCHMAR, Linn (WU Vienna)

Presenter: KRETZSCHMAR, Linn (WU Vienna)

Session Classification: EASItrain

Track Classification: EASItrain

Contribution ID: **332** Type: **not specified**

ESR 11 presentation

Thursday, April 12, 2018 4:15 PM (15 minutes)

Primary author: SAVELYEVA, Sofiya (TU Dresden (DE))

Presenter: SAVELYEVA, Sofiya (TU Dresden (DE))

Session Classification: EASItrain

Track Classification: EASItrain

Contribution ID: **333** Type: **not specified**

ESR 15 presentation

Thursday, April 12, 2018 4:30 PM (15 minutes)

Primary author: PODEUR, Maxime Pierre

Presenter: PODEUR, Maxime Pierre

Session Classification: EASItrain

Track Classification: EASItrain

Contribution ID: **334** Type: **not specified**

Overview on FCC-eh design

Thursday, April 12, 2018 8:30 AM (25 minutes)

Primary author: BRUNING, Oliver (CERN)

Presenter: BRUNING, Oliver (CERN)

Session Classification: FCC-eh

Track Classification: FCC-eh

Contribution ID: **335** Type: **not specified**

Civil engineering

Thursday, April 12, 2018 8:55 AM (20 minutes)

Primary author: OSBORNE, John Andrew (CERN)

Presenter: OSBORNE, John Andrew (CERN)

Session Classification: FCC-eh

Track Classification: FCC-eh

Contribution ID: **336** Type: **not specified**

Interaction region

Thursday, April 12, 2018 9:15 AM (20 minutes)

Primary author: MARTIN, Roman (CERN)

Presenter: MARTIN, Roman (CERN)

Session Classification: FCC-eh

Track Classification: FCC-eh

Contribution ID: **337** Type: **not specified**

PERLE Facility

Thursday, April 12, 2018 9:35 AM (25 minutes)

Primary author: KAABI, Walid (CNRS-IN2P3)

Presenter: KAABI, Walid (CNRS-IN2P3)

Session Classification: FCC-eh

Track Classification: FCC-eh

Contribution ID: **338** Type: **not specified**

FCC-eh as a Higgs facility

Thursday, April 12, 2018 10:30 AM (20 minutes)

Primary author: KLEIN, Uta (University of Liverpool (GB))

Presenter: KLEIN, Uta (University of Liverpool (GB))

Session Classification: FCC-eh

Track Classification: FCC-eh

Contribution ID: **339** Type: **not specified**

BSM Physics in eh

Thursday, April 12, 2018 10:50 AM (25 minutes)

Primary author: D'ONOFRIO, Monica (University of Liverpool (GB))

Presenter: D'ONOFRIO, Monica (University of Liverpool (GB))

Session Classification: FCC-eh

Track Classification: FCC-eh

Contribution ID: **340** Type: **not specified**

A detector for eh

Thursday, April 12, 2018 11:35 AM (25 minutes)

Primary author: KOSTKA, Peter (University of Liverpool (GB))

Presenter: KOSTKA, Peter (University of Liverpool (GB))

Session Classification: FCC-eh

Track Classification: FCC-eh

Contribution ID: **341** Type: **not specified**

FCC-hh beam vacuum concept (I): BS design, tests and feasibility

Tuesday, April 10, 2018 8:30 AM (20 minutes)

Primary author: PEREZ, Francis (ALBA Synchrotron - CELLS)

Presenter: PEREZ, Francis (ALBA Synchrotron - CELLS)

Session Classification: Special Technologies

Track Classification: EuroCirCol

Contribution ID: **342** Type: **not specified**

FCC-ee beam vacuum concept: the bean pipe of FCC-ee

Tuesday, April 10, 2018 9:10 AM (20 minutes)

Primary author: KERSEVAN, Roberto (CERN)

Presenter: KERSEVAN, Roberto (CERN)

Session Classification: Special Technologies

Track Classification: EuroCirCol

Contribution ID: **343** Type: **not specified**

HTS YBaCuO Coated Conductors for the FCC-hh beam screens

Tuesday, April 10, 2018 10:30 AM (15 minutes)

Primary author: GUTIERREZ, Joffre (ICMAB)

Presenter: GUTIERREZ, Joffre (ICMAB)

Session Classification: Special Technologies

Track Classification: EuroCirCol

Contribution ID: **344** Type: **not specified**

Shape memory alloys for remote connection of beam pipes in radioactive areas

Tuesday, April 10, 2018 11:20 AM (20 minutes)

Primary author: GARION, Cedric (CERN)

Presenter: GARION, Cedric (CERN)

Session Classification: Special Technologies

Track Classification: EuroCirCol

Contribution ID: **345** Type: **not specified**

Strategies for efficient He trapping

Tuesday, April 10, 2018 11:40 AM (20 minutes)

Presenter: AGOSTINO , Raffaele G. (University of Calabria)

Session Classification: Special Technologies

Track Classification: EuroCirCol

Contribution ID: **346** Type: **not specified**

High field normal conducting massless septa for FCC beam transfer

Wednesday, April 11, 2018 8:50 AM (20 minutes)

Primary author: SANZ ULL, Alejandro (Eindhoven Technical University (NL))

Presenter: SANZ ULL, Alejandro (Eindhoven Technical University (NL))

Session Classification: Special Technologies

Track Classification: STP

Contribution ID: **347** Type: **not specified**

Marx prototype pulse generator design and initial results

Wednesday, April 11, 2018 9:30 AM (20 minutes)

Fast-switching, high voltage, pulse generator topologies, such as the semiconductor based Marx generator, are being actively pursued for possible replacement of thyratrons and PFLs in existing kicker systems. Such topologies are required for the FCC injection kicker system. In this talk the design of a prototype solid state Marx generator, using new SiC MOSFET devices, is presented. The layout of the laboratory prototype Marx generator is presented together with initial measurements of output pulses. Future challenges and perspectives will also be discussed.

Primary authors: DOS SANTOS REDONDO, Luis Manuel (ISEL Instituto Superior de Engenharia (PT)); BARNES, Mike (CERN)

Co-author: KANDRATSYEU, Aleh (Energy Pulse Systems (PT))

Presenter: BARNES, Mike (CERN)

Session Classification: Special Technologies

Track Classification: STP

Contribution ID: **348** Type: **not specified**

FCC kicker magnet design, impedance and heating aspects

Wednesday, April 11, 2018 10:30 AM (20 minutes)

A fast, highly reliable, injection kicker system is required for FCC injection: the system must not limit accelerator performance. Important considerations in the design of such a system are machine protection constraints, collider filling factor and hence rise and fall times of the kicker magnet field. Fast rise time kicker magnets are generally ferrite loaded transmission line type magnets with a rectangular shaped aperture. The beam coupling impedance of the kicker magnets is important: if the ferrite temperature exceeds the Curie point this impacts the ability to inject beam and hence the availability of the machine. This FCC kicker magnet design is presented together with impedance and heating aspects.

Primary author: BARNES, Mike (CERN)

Presenter: BARNES, Mike (CERN)

Session Classification: Special Technologies

Track Classification: STP

Contribution ID: **349** Type: **not specified**

Laser triggering of thyristor swiches

Wednesday, April 11, 2018 10:50 AM (20 minutes)

Primary author: MAGNIN, Nicolas (CERN)

Presenter: MAGNIN, Nicolas (CERN)

Session Classification: Special Technologies

Track Classification: STP

Contribution ID: **350** Type: **not specified**

Inductive adder prototype pulse generator for FCC-hh kickers

Wednesday, April 11, 2018 11:10 AM (20 minutes)

In order to achieve a highly reliable and modular kicker system for the FCC injection, a semiconductor-based inductive adder (IA) pulse generator is being developed. To achieve the required high voltage and current, the IA consists of series-connected 1:1 pulse transformers (layers). The appropriate number of secondary windings are connected in series to generate the required voltage at the output. Each primary winding has many parallel primary branches to provide the high total current: each primary is referenced to ground. The modular design of many layers and parallel branches facilitates a fault tolerant design, which is important to reach the required high reliability. A fast rise time of 75 ns for the output current pulse (0.5 to 99.5 %), is a demanding performance specification. A prototype FCC IA has been designed and is presently under construction at CERN to investigae the technological limits. A first 10-layer prototype is currently being assembled: a 22-layer prototype will subsequently be built to provide the full 2.5 kA and 15.7 kV output pulses. This presentation gives an overview of the design parameters and the status of the prototype construction, together with the expected performance.

Primary author: WOOG, David (CERN)

Co-authors: HOLMA, Janne (CELLS (ES)); BARNES, Mike (CERN); KRAMER, Thomas (CERN)

Presenter: WOOG, David (CERN)

Session Classification: Special Technologies

Track Classification: STP

Contribution ID: **351** Type: **not specified**

FCC-hh beam dump extraction and dilution kicker systems

Thursday, April 12, 2018 8:50 AM (20 minutes)

To safely and reliably extract the high energy FCC-hh beam is a challenge for the extraction and dilution kicker system and has a major impact on the design. A high segmentation is proposed for both the extraction and the dilution kicker magnets to reduce the impact of one erratic module and to enable operation with less than nominal kick strength. The main challenge for the extraction kicker systems is the required fast risetime of 1us. In addition, the dilution system needs to operate at 50kHz to provide the required dilution pattern on the beam dump. Implications, technological challenges and first proposals for the hardware solutions will be presented in this talk.

Primary authors: RENNER, Elisabeth (Vienna University of Technology (AT)); BARNES, Mike (CERN)

Presenter: RENNER, Elisabeth (Vienna University of Technology (AT))

Session Classification: Special Technologies

Track Classification: STP

Contribution ID: **352** Type: **not specified**

Dilution requirements for the FCC-hh dump

Thursday, April 12, 2018 9:10 AM (20 minutes)

Primary author: LECHNER, Anton (CERN)

Presenter: LECHNER, Anton (CERN)

Session Classification: Special Technologies

Track Classification: STP

Contribution ID: **353** Type: **not specified**

Collision debris and triplet protection for FCC-hh, FCC-ee and HE-LHC

Primary author: CERUTTI, Francesco (CERN)

Presenter: CERUTTI, Francesco (CERN)

Session Classification: Special Technologies

Track Classification: STP

Contribution ID: **354** Type: **not specified**

Overview of the dose response in CMOS technology

Thursday, April 12, 2018 11:06 AM (18 minutes)

Particle detectors for high-energy physics applications can contain billions of MOS transistors, each of them prone to possible radiation-induced failures. The Future Circular Collider represents an unprecedented challenge to the radiation hardness of CMOS technology, with an estimated total ionizing dose (TID) from 10 to 500 times higher than the already very high TID expected to be reached by the HL-LHC. CMOS technologies currently used for design of particle detectors cannot withstand such extreme radiation levels and first investigations of the radiation response of near-future technologies are not showing substantial improvements. Furthermore, the unprecedented particle flux levels expected for FCC-hh (two orders of magnitude higher than for HL-HLC) may lead to additional failure mechanisms. Therefore, if innovative solutions are not developed and introduced, radiation-induced degradation of MOS transistor performance may represent a limit to the physics exploitation of the FCC.

Primary author: BORGHELLO, Giulio (Universita degli Studi di Udine (IT))

Presenter: BORGHELLO, Giulio (Universita degli Studi di Udine (IT))

Session Classification: Special Technologies

Track Classification: STP

Contribution ID: **355** Type: **not specified**

R&D on new concepts for beam instrumentation

Thursday, April 12, 2018 11:42 AM (18 minutes)

Primary author: RONCAROLO, Federico (CERN)

Presenter: RONCAROLO, Federico (CERN)

Session Classification: Special Technologies

Track Classification: STP

Contribution ID: **356** Type: **not specified**

Cold plasma spray additive manufacturing

Thursday, April 12, 2018 1:30 PM (20 minutes)

Primary author: GARION, Cedric (CERN)

Presenter: GARION, Cedric (CERN)

Session Classification: Special Technologies

Track Classification: STP

Contribution ID: **357** Type: **not specified**

Development of technologies for new cryoplant concepts

Thursday, April 12, 2018 2:30 PM (20 minutes)

The preliminary conceptual design of FCC-hh refrigerators was proposed in the framework of an international collaboration and confirmed through the industrial engineering studies undergoing with the cryogenic world-leader industries. Proposed cryoplants (10 cooling units of 100kW equivalent at 4.5K) are based on advanced refrigeration process cycles with very large capacity precooling stages (up to 1 MW at 40 K) to fulfil the non-conventional FCC-hh heat loads distribution with important 16T-magnets cooling at 1.9 K (50% of total heat loads) and very large synchrotron radiation to the beam screens around 50 K (remaining 50%). Potential technical innovations have been identified to improve the existing technologies for compressors and turbo-expanders in order to lower below 200 MW the corresponding overall electrical consumption. The presentation will present identified new technologies to be assessed in the coming years and implemented in future cryoplants to fulfil the FCC challenging cryogenic requirements and to increase the overall efficiency of the cryogenic system by more than 10%.

Primary author: MILLET, Francois

Co-authors: HABERSTROH, Christoph (TU Dresden); QUACK, Hans (TU Dresden); TAVIAN, Laurent Jean (CERN); KLOEPPEL, Steffen (TU Dresden)

Presenter: MILLET, Francois

Session Classification: Special Technologies

Track Classification: STP

Contribution ID: **358** Type: **not specified**

Circuit layout and protection

Thursday, April 12, 2018 3:30 PM (20 minutes)

For the FCC-hh study, 100 TeV is the target center of mass energy. This ambitious target can be reached by means of a 16 T dipole field and a 100 km long accelerator circumference. The target performances of dipole magnets, together with the unprecedented size of the accelerator, poses a number of challenges as, among others, machine integration and protection.
In particular, long strings of dipoles need to be formed in order to simplify their powering. This results in large energies stored in the circuits that, in case of quench or equipment failure, have to be extracted safely. One of the main risks is hereby due to the development of high voltages to ground that might irreversibly damage the electrical insulation of circuit components.
In this contribution, we present an optimized layout for the dipole circuits limiting the voltage to ground to acceptable values and addressing other conflicting requirements as, for example, the reduction of overall circuit complexity, ramp-up time, stored energy and discharge time constant.
We also show that the designed circuits are compatible with the operation of the Coupling-Loss Induced Quench (CLIQ) system, a magnet protection technology recently developed at CERN.

Primary author: PRIOLI, Marco (CERN)

Co-authors: VERWEIJ, Arjan (CERN); AUCHMANN, Bernhard (CERN); BORTOT, Lorenzo (CERN); MENTINK, Matthias (CERN); MACIEJEWSKI, Michal (Technical University of Lodz(PL)); SALMI, Tiina-Mari (Tampere University of Technology, Finland)

Presenter: PRIOLI, Marco (CERN)

Session Classification: Special Technologies

Track Classification: STP

Contribution ID: **359** Type: **not specified**

FCC Powering concepts

Thursday, April 12, 2018 4:40 PM (20 minutes)

For the success of the FCC, one of the key aspects is the energy efficiency. In particular, the magnet powering could represent an enormous power consumption from the AC network, therefore achieving an optimised and efficient design for all power converters is a primary concern.

In this presentation, the main concepts and requirements for the power converters for the dipole magnets of the FCC will be presented.

Firstly, the influence of the ramp-up shape on the power requirements of the converters will be analysed in detail, emphasizing that the duration of the ramp-up plays an important role in the power requirements.

Second, a brief description about the converter topology and the importance of the integration of energy storage will be given.

Third, the energy storage technology required for this application will be addressed, giving details of the type of technology that seems to be the most suitable for this application nowadays. A brief description about the practical implementation will be also given.

Finally, the presentation will finish with the main conclusions of this conceptual design of the magnet powering.

Primary author: BLANQUEZ DELGADO, Francisco Rafael (CERN)

Co-authors: BURNET, Jean-Paul (CERN); KAHLE, Karsten (CERN); HOHN, Thomas (Graz University of Technology (AT))

Presenter: BLANQUEZ DELGADO, Francisco Rafael (CERN)

Session Classification: Special Technologies

Track Classification: STP

Contribution ID: **360** Type: **not specified**

1000 recipes to accommodate dimuons at FCC-ee

Tuesday, April 10, 2018 6:07 PM (1 minute)

Primary author: JANOT, Patrick (CERN)

Presenter: JANOT, Patrick (CERN)

Session Classification: Poster session

Track Classification: FCC-ee Phy/Exp

Contribution ID: **361** Type: **not specified**

Precision calculations for FCC

Tuesday, April 10, 2018 6:08 PM (1 minute)

Primary author: JADACH, Staszek (Polish Academy of Sciences (PL))

Presenter: JADACH, Staszek (Polish Academy of Sciences (PL))

Session Classification: Poster session

Track Classification: FCC-ee Phy/Exp

Contribution ID: **362** Type: **not specified**

Energy calibration at FCC-ee

Tuesday, April 10, 2018 6:09 PM (1 minute)

Primary author: BLONDEL, Alain (Universite de Geneve (CH))

Presenter: BLONDEL, Alain (Universite de Geneve (CH))

Session Classification: Poster session

Track Classification: FCC-ee Phy/Exp

Contribution ID: **363** Type: **not specified**

Transporting synchrotron radiation from the last bend to the interaction region at FCC-ee with GEANT

Tuesday, April 10, 2018 6:10 PM (1 minute)

Primary author: LUCKHOF, Marian (Hamburg University (DE))

Presenter: LUCKHOF, Marian (Hamburg University (DE))

Session Classification: Poster session

Track Classification: FCC-ee Phy/Exp

Contribution ID: **364** Type: **not specified**

Conceptual design for supply of low-voltage power underground

Tuesday, April 10, 2018 6:11 PM (1 minute)

Primary author: MYLONA, Maria (CERN)

Co-author: BOZZINI, Davide (CERN)

Presenter: MYLONA, Maria (CERN)

Session Classification: Poster session

Track Classification: I&O

Contribution ID: **365** Type: **not specified**

Comparative study for a superconducting and a normal conducting power transmission line

Tuesday, April 10, 2018 6:12 PM (1 minute)

Primary author: MYLONA, Maria (CERN)

Co-authors: Dr BALLARINO, Amalia (CERN); BOZZINI, Davide (CERN)

Presenter: MYLONA, Maria (CERN)

Session Classification: Poster session

Track Classification: I&O

Contribution ID: **366** Type: **not specified**

Machine integration for FCC-hh, FCC-ee and HE-LHC

Tuesday, April 10, 2018 6:13 PM (1 minute)

Primary author: VALCHKOVA-GEORGIEVA, Fani (CERN)

Presenter: VALCHKOVA-GEORGIEVA, Fani (CERN)

Session Classification: Poster session

Track Classification: I&O

Contribution ID: **367** Type: **not specified**

FCC-hh cryo-unit transport and handling concept in the FCC tunnel

Tuesday, April 10, 2018 6:14 PM (1 minute)

Primary author: KUHLMANN, Gerd (Fraunhofer IML)

Co-author: WOHLFART, A. M. (FIML Dortmund)

Presenter: KUHLMANN, Gerd (Fraunhofer IML)

Session Classification: Poster session

Track Classification: I&O

Contribution ID: **368** Type: **not specified**

HE-LHC cryo-unit transport and handling concept in the LHC tunnel

Tuesday, April 10, 2018 6:15 PM (1 minute)

Primary author: RUEHL, Ingo (CERN)

Co-authors: Mr GRENARD, Jean-Louis (CERN); CZECH, Michal (CERN)

Presenter: RUEHL, Ingo (CERN)

Session Classification: Poster session

Track Classification: I&O

Contribution ID: **369** Type: **not specified**

FCC-hh beam vacuum concept: test results at BINP

Tuesday, April 10, 2018 6:16 PM (1 minute)

Primary author: KRASNOV, Alexandre (Budker Institute of Nuclear Physics (BINP))

Presenter: KRASNOV, Alexandre (Budker Institute of Nuclear Physics (BINP))

Session Classification: Poster session

Track Classification: STP

Contribution ID: **370** Type: **not specified**

Beamstrahlung effect on FCC-ee center of mass energy and spread

Tuesday, April 10, 2018 6:17 PM (1 minute)

Primary author: SHATILOV, Dmitry (Budker Institute of Nuclear Physics (RU))

Presenter: SHATILOV, Dmitry (Budker Institute of Nuclear Physics (RU))

Session Classification: Poster session

Track Classification: FCC-ee ACC

Contribution ID: **372** Type: **not specified**

Running scheme for Z and W scans, limitation from Touschek effect

Tuesday, April 10, 2018 6:19 PM (1 minute)

Primary author: TYDECKS, Tobias (CERN)

Presenter: TYDECKS, Tobias (CERN)

Session Classification: Poster session

Track Classification: FCC-ee ACC

Contribution ID: **373** Type: **not specified**

CEPC CDR Status and the Perspectives towards TDR

Tuesday, April 10, 2018 6:20 PM (1 minute)

Primary author: GAO, Jie (Institute of High Energy Physics, China)

Presenter: GAO, Jie (Institute of High Energy Physics, China)

Session Classification: Poster session

Track Classification: FCC-ee ACC

Contribution ID: **374** Type: **not specified**

Development and characterisation of diagnostical components located in vacuum vessel under thermal fatigue cycles

Tuesday, April 10, 2018 6:21 PM (1 minute)

In this paper we aim to reveal methods that can decrease the time spent on the mechanical elements development increasing the efficiency of the process. The challenge in this scheme is the optimization of a large number and variety of components in the ITER diagnostic system. During our work we compared the engineering requirements with the specific requirements of a fusion power plant.
Our goal is to create a method that survey complex demands, accomplish evaluation and the final integration of the inspected mechanical design.

Primary author: SZALAI, Judit (Budapest University of Technology and Economics (HU))

Presenter: SZALAI, Judit (Budapest University of Technology and Economics (HU))

Session Classification: Poster session

Track Classification: STP

Contribution ID: **375** Type: **not specified**

FCC detector integration

Tuesday, April 10, 2018 6:22 PM (1 minute)

Primary author: VALCHKOVA-GEORGIEVA, Fani (CERN)

Presenter: VALCHKOVA-GEORGIEVA, Fani (CERN)

Session Classification: Poster session

Track Classification: I&O

Contribution ID: **376** Type: **not specified**

Composite Superconducting MgB2 Wires Made by Continuous Process

Tuesday, April 10, 2018 6:23 PM (1 minute)

Primary author: ATAMERT, Serdar (Epoch Wires)

Presenter: ATAMERT, Serdar (Epoch Wires)

Session Classification: Poster session

Track Classification: EASItrain

Contribution ID: **377** Type: **not specified**

HTS coatings for the FCC-hh collider beam screen

Tuesday, April 10, 2018 6:24 PM (1 minute)

The baseline design of the FCC-hh beam screen is based on an octagonal shaped stainless steel tube coated in its interior with copper. The surface impedance of the beam screen has a strong impact on the beam stability. In the foreseen operating temperature range between 40 K and 60 K the intended coating might not guarantee an impedance sufficiently low for a stable beam. This motivates the exploration of high-temperature superconducting coated conductor (HTS-CC) tapes as an alternative coating approach since they promise lower surface impedance than copper under the required operating conditions. HTS-CC are a approx. 1 micron thick epitaxial layer of ReBa2Cu3O7-x (Re = Y, Gd) deposited on top of flexible metallic substrates (typically stainless steel or hastelloy) which are produced in kilometers length. We are investigating the capabilities of HTS-CCs as a beam screen under the extreme conditions of FCC-hh. Characterisation of samples from different manufacturers under RF fields, intermediate temperature and high magnetic fields has started. The surface resistance is evaluated using the classic fluxon model. Also the secondary electron yield of these samples is being measured. Samples will also be irradiated with synchrotron radiation and their superconducting properties re-measured following irradiation. Finally a setup to characterise the strain field distribution in the HTS-CCs after welding to the vacuum chamber in order to detect possible disturbances of the electric current field density and possible mechanical fatigue is under construction.

Primary author: ROMANOV, Artur (ICMAB (ES))

Presenter: ROMANOV, Artur (ICMAB (ES))

Session Classification: Poster session

Track Classification: STP

Contribution ID: **378** Type: **not specified**

Searching right-handed neutrinos at the FCC

Tuesday, April 10, 2018 6:25 PM (1 minute)

"Right-handed or, equivalently, sterile neutrinos are among the most attractive extensions of the SM to generate the light neutrino masses observed in neutrino oscillation experiments.
When the right-handed neutrinos are subject to a ""lepton number""-like symmetry they can have masses around the electroweak scale and potentially large Yukawa couplings, which makes them testable at the planned Future Circular Colliders (FCC).
In this talk I present an up-to-date overview on the different search strategies for right-handed neutrinos at the FCC in its electron-positron, proton-proton, or electron-proton configuration.
I provide a systematic assessment of the different search channels, give the state of the art sensitivities for the most promising signatures and discuss the synergy and complementarity of the different FCC configurations."

Primary author: FISCHER, Oliver (Unibas)

Presenter: FISCHER, Oliver (Unibas)

Session Classification: Poster session

Track Classification: FCC-ee Phy/Exp

Contribution ID: **379** Type: **not specified**

CSR mitigation in the FCC-ee injector bunch compressor

Tuesday, April 10, 2018 6:26 PM (1 minute)

Primary author: CHARLES, Tessa (University of Melbourne (AU))

Presenter: CHARLES, Tessa (University of Melbourne (AU))

Session Classification: Poster session

Contribution ID: **380** Type: **not specified**

The IDEA drift chamber (2, physics performance or software oriented)

Tuesday, April 10, 2018 6:29 PM (1 minute)

Primary author: GRANCAGNOLO, Francesco (Universita & INFN Pisa (IT))

Presenter: GRANCAGNOLO, Francesco (Universita & INFN Pisa (IT))

Session Classification: Poster session

Track Classification: FCC-ee Phy/Exp

Contribution ID: **381** Type: **not specified**

Direct W mass reconstruction at and above WW threshold

Tuesday, April 10, 2018 6:29 PM (1 minute)

Primary author: AZZURRI, Paolo (INFN Sezione di Pisa, Universita' e Scuola Normale Superiore, P)

Presenter: AZZURRI, Paolo (INFN Sezione di Pisa, Universita' e Scuola Normale Superiore, P)

Session Classification: Poster session

Track Classification: FCC-ee Phy/Exp

Contribution ID: **382** Type: **not specified**

What do we learn from FCC-ee precision measurements ?

Tuesday, April 10, 2018 6:29 PM (1 minute)

Primary author: DE BLAS, Jorge (Universita e INFN, Padova (IT))

Presenter: DE BLAS, Jorge (Universita e INFN, Padova (IT))

Session Classification: Poster session

Track Classification: FCC-ee Phy/Exp

Contribution ID: **383** Type: **not specified**

Update of the Righ Handed neutrino search

Tuesday, April 10, 2018 6:29 PM (1 minute)

Primary author: BLONDEL, Alain (Universite de Geneve (CH))

Presenter: BLONDEL, Alain (Universite de Geneve (CH))

Session Classification: Poster session

Track Classification: FCC-ee Phy/Exp

Contribution ID: **384** Type: **not specified**

The Z factory : sensitivity to lepton flavour universality violation

Tuesday, April 10, 2018 6:29 PM (1 minute)

Primary author: MONTEIL, Stephane (Université Clermont Auvergne (FR))

Presenter: MONTEIL, Stephane (Université Clermont Auvergne (FR))

Session Classification: Poster session

Track Classification: FCC-ee Phy/Exp

Contribution ID: **385** Type: **not specified**

Top EW couplings without longitudinal polarization

Tuesday, April 10, 2018 6:29 PM (1 minute)

Primary author: AZZI, Patrizia (INFN Padova (IT))

Presenter: AZZI, Patrizia (INFN Padova (IT))

Session Classification: Poster session

Track Classification: FCC-ee Phy/Exp

Contribution ID: **386** Type: **not specified**

The W factory : anomalous W couplings

Tuesday, April 10, 2018 6:29 PM (1 minute)

Primary author: AZZURRI, Paolo (INFN Sezione di Pisa, Universita' e Scuola Normale Superiore, P)

Presenter: AZZURRI, Paolo (INFN Sezione di Pisa, Universita' e Scuola Normale Superiore, P)

Session Classification: Poster session

Track Classification: FCC-ee Phy/Exp

Contribution ID: **387** Type: **not specified**

Impact of Synchrotron radiation on the detector/shielding studies

Tuesday, April 10, 2018 6:29 PM (1 minute)

Primary author: KOLANO, Anna Maria (CERN)

Presenter: KOLANO, Anna Maria (CERN)

Session Classification: Poster session

Track Classification: FCC-ee Phy/Exp

Contribution ID: **388** Type: **not specified**

CKM and beyond at the Z factory

Tuesday, April 10, 2018 6:29 PM (1 minute)

Primary author: MONTEIL, Stephane (Université Clermont Auvergne (FR))

Presenter: MONTEIL, Stephane (Université Clermont Auvergne (FR))

Session Classification: Poster session

Track Classification: FCC-ee Phy/Exp

Contribution ID: **389** Type: **not specified**

QCD studies at FCC-ee

Tuesday, April 10, 2018 6:29 PM (1 minute)

Primary author: D'ENTERRIA, David (CERN)

Presenter: D'ENTERRIA, David (CERN)

Session Classification: Poster session

Track Classification: FCC-ee Phy/Exp

Contribution ID: **390** Type: **not specified**

The top factory

Tuesday, April 10, 2018 6:28 PM (1 minute)

Primary authors: FOPPIANI, Nicolo (Harvard University); AZZI, Patrizia (INFN Padova (IT))

Presenters: FOPPIANI, Nicolo (Harvard University); AZZI, Patrizia (INFN Padova (IT))

Session Classification: Poster session

Track Classification: FCC-ee Phy/Exp

Contribution ID: **391** Type: **not specified**

Measurement of the Higgs coupling to electrons.

Tuesday, April 10, 2018 6:27 PM (1 minute)

Primary author: D'ENTERRIA, David (CERN)

Presenter: D'ENTERRIA, David (CERN)

Session Classification: Poster session

Track Classification: FCC-ee Phy/Exp

Contribution ID: **392** Type: **not specified**

Proposal on a novel energy extraction system for superconducting magnet chains

Thursday, April 12, 2018 4:05 PM (15 minutes)

An alternative energy extraction system of the FCC superconducting circuits capable of energy recuperation is proposed. This system is suggested to comprise a converter module, which by controlling the extraction voltage across the magnet chain will determine the energy extracted and transferred to a temporary storage unit, before being re-used e.g. for the following energy ramp. The advantages introduced are the considerable reduction of the extraction time compared to a resistor-based system and the reduced operational losses leading to smaller environmental impact. However, the additional power converter as well as an intermediate energy storage unit increase the system's complexity. Nonetheless, the reliability of the system must remain high despite the added complexity to assure a safe extraction of energy at all times.

Primary author: KARAVENTZAS, Vasilios (CERN)

Co-authors: SIEMKO, Andrzej (CERN); RODRIGUEZ MATEOS, Felix (CERN)

Presenter: KARAVENTZAS, Vasilios (CERN)

Session Classification: Special Technologies

Track Classification: STP

Contribution ID: **393** Type: **not specified**

Introduction

Tuesday, April 10, 2018 8:00 PM (15 minutes)

Presenter: BENTVELSEN, Stan (Nikhef National institute for subatomic physics (NL))

Session Classification: Public event in Dutch

Contribution ID: **394** Type: **not specified**

Jo van den Brand

Tuesday, April 10, 2018 8:15 PM (40 minutes)

Presenter: VAN DEN BRAND, Jo

Session Classification: Public event in Dutch

Contribution ID: **395** Type: **not specified**

Ivo van Vulpen

Tuesday, April 10, 2018 8:55 PM (40 minutes)

Presenter: VAN VULPEN, Ivo (Nikhef National institute for subatomic physics (NL))

Session Classification: Public event in Dutch

Contribution ID: **396** Type: **not specified**

NNV

Tuesday, April 10, 2018 9:35 PM (10 minutes)

Presenter: VAN EIJK, Bob (Nikhef National institute for subatomic physics (NL))

Session Classification: Public event in Dutch