FCC Week 2017

Report of Contributions

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

Physics benchmarks and detector specifications

Wednesday, May 31, 2017 1:30 PM (20 minutes)

Primary author: SELVAGGI, Michele (CERN)

Presenter: SELVAGGI, Michele (CERN)

Session Classification: FCC-hh experiments and detectors

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

Radiation environment

Wednesday, May 31, 2017 1:50 PM (20 minutes)

We present radiation calculations for the updated reference geometry of a general purpose FCC-hh detector. The magnet system of this detector consists of a 4T central solenoid and two 4T forward solenoids. Subdetectors are implemented with proper envelopes that leave installation clearances and space for services.

Primary author: BESANA, Maria Ilaria (CERN)

Co-authors: FERRARI, Alfredo (CERN); CERUTTI, Francesco (CERN); VLACHOUDIS, Vasilis (CERN); RIEGLER, Werner (CERN)

Presenter: BESANA, Maria Ilaria (CERN)

Session Classification: FCC-hh experiments and detectors

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

FCC-hh Detector Magnets System baseline and variants

Wednesday, May 31, 2017 2:10 PM (20 minutes)

"As part of the Future Circular Collider conceptual design study for hadron-hadron physics (FCC-hh), conceptual designs of detector magnets are being developed that provide sufficiently large bending power to study the particle products resulting from the 100 TeV collisions.

This talk focuses on several topics. Firstly, an overview is given of the various previously considered baseline designs to illustrate the design choices that led to the current baseline design. Secondly, the current baseline design, which features a larger superconducting central solenoid and two smaller superconducting forward solenoids, is discussed in terms of magnetic field properties, cold mass, cryostats and support structure, cooling, quench protection, etcetera. Thirdly, potential alternative detector magnet designs are discussed such as a dipole alternative for the forward solenoids and an ultra-thin superconducting central solenoid, where particle products traverse through the detector magnet before interacting with the calorimeters.

As the magnetic field and space requirements of the trackers, calorimeters, and muon chambers drive the design of the detector magnets, and the overall performance of the detector is in part dependent on the detector magnet performance, the conceptual detector magnet design of is an important component of the FCC-hh detector study.

Primary author: MENTINK, Matthias (CERN)

Presenter: MENTINK, Matthias (CERN)

Session Classification: FCC-hh experiments and detectors

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

Muon systems

Wednesday, May 31, 2017 4:10 PM (20 minutes)

Muon systems of the FCC detectors will have to cover areas of 1000's of square meters and posses accurate time and coordinate resolutions all at a reasonable cost. Among attractive options is use of newly available SiPMs to readout wavelength shifting fibers imbedded in long extruded scintillator strips. We present results of the test beam studies of such detectors where time resolution of 0.3ns and coordinate resolution along the strip of 5 cm have been obtained. We will further discuss how perfromance of such strips scales with the length of the strip and main features of the FCC detector muon system based on this innovative technology.

Primary author: DENISOV, Dmitri (Fermi National Accelerator Lab. (US))

Co-authors: UJIC, Predrag (Vinca Institute, Belgrade); LUKIC, Strahinja (University of Belgrade (RS)); EVDOKIMOV, Valery (IHEP Protvino (RU)); RIEGLER, Werner (CERN)

Presenter: RIEGLER, Werner (CERN)

Session Classification: FCC-hh experiments and detectors

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

Trigger & Data Acquisition at FCC-hh

Wednesday, May 31, 2017 4:30 PM (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. We start by reviewing the state of the art in the field - namely the Phase-2 upgrades planned for ATLAS and CMS. We explore the particular nature of the trigger challenge for FCC-hh, and propose some options for further investigation.

Primary author: BROOKE, Jim (University of Bristol (GB))

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

Presenter: BROOKE, Jim (University of Bristol (GB))

Session Classification: FCC-hh experiments and detectors

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

Tracker design overview

Wednesday, May 31, 2017 3:30 PM (20 minutes)

Primary author: DRASAL, Zbynek (CERN)

Presenter: DRASAL, Zbynek (CERN)

Session Classification: FCC-hh experiments and detectors

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

Tracker performance studies

Wednesday, May 31, 2017 3:50 PM (20 minutes)

Primary author: PEREZ CODINA, Estel (CERN)

Presenter: PEREZ CODINA, Estel (CERN)

Session Classification: FCC-hh experiments and detectors

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

Electromagnetic calorimeter using LAr technology for FCC

Thursday, June 1, 2017 8:30 AM (20 minutes)

Requirements and feasibility of the electromagnetic calorimeter (ECAL) in the FCC-hh experiment will be discussed. The ECAL subdetector will have to be able to deal with unprecedented luminosities and very high pile-up. Moreover, very good 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.
A brief overview and status of the calorimeter reconstruction software, which is a part of the offline FCC software package (FCCSW), will be given.
A proposal of a high granularity ECAL using liquid Argon (LAr) / lead (Pb) technology will be presented. First results of the performance studies with the new design will be shown. Similar technologies (LAr / Pb, resp. LAr / Cu) are foreseen for the hadronic endcap, resp. forward calorimeter.
Finally, future plans including studies of different technologies (Si / W) will be mentioned.

Primary author: FALTOVA, Jana (CERN)

Co-authors: ZABOROWSKA, Anna (Warsaw University of Technology (PL)); NEUBUSER, Coralie (CERN); ALEKSA, Martin (CERN)

Presenter: FALTOVA, Jana (CERN)

Session Classification: FCC-hh experiments and detectors

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

Digital Electromagnetic Calorimetry at the FCC-hh

Thursday, June 1, 2017 9:10 AM (20 minutes)

The number of particles in an electromagnetic shower is proportional to the incident particle energy. A Digital Electromagnetic Calorimeter (DECAL) is a highly granular device that counts the number of particles in a shower rather than the total energy deposited. An improved energy resolution is possible compared to an analogue calorimeter as this should be less sensitive to Landau fluctuations on single particle energy deposits. Ultra high granularity can be achieved using radiation hard CMOS sensors. Pixels can then be grouped together in cells for which the hit count is then output every beam crossing. Even in today's technology, sufficient granularity and radiation hardness can be demonstrated to meet the requirements of future experiments. However, a key argument for this approach is that by working with mainstream CMOS imaging sensor suppliers and keeping relatively simple in-pixel logic, it should be possible over a decade timescale to take advantage of the huge size of this market to give an extremely cost-effective solution for a Particle Flow based ECAL suitable for the FCC. At the same time, by making the pixel cells reconfigurable, it is possible to implement outer tracker short strip ("strixel") layers using identical technology allowing a seamless transition from outer tracking to pre-shower to ECAL.

We will present the optimisation of a DECAL for the FCC-hh as an alternative technology to the baseline LArPb ECAL within FCCSW. Particular focus will be on single particle resolutions, the impact of pile-up and its reduction, and reconstruction algorithms to extract the detailed shower development information available from such a highly segmented detector. We will also present an overview of a radiation hard CMOS device designed for such a purpose. Finally, if time permits, we will present results on the impact of a DECAL on the physics at the FCC-hh.

Primary author: PRICE, Tony (University of Birmingham (GB))

Co-authors: WINTER, Alasdair (University of Birmingham (GB)); NIKOLOPOULOS, Konstantinos (University of Birmingham (GB)); GONELLA, Laura (University of Birmingham (UK)); WATSON, Nigel (University of Birmingham (GB)); NEWMAN, Paul Richard (University of Birmingham (GB)); ALLPORT, Philip Patrick (University of Birmingham (UK))

Presenter: PRICE, Tony (University of Birmingham (GB))

Session Classification: FCC-hh experiments and detectors

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

Hadron calorimetry at the FCC-hh experiment

Thursday, June 1, 2017 8:50 AM (20 minutes)

The new energy regime of the Future Circular Collider (FCC) in hadron mode with centre of mass energies up to 100\,TeV opens the opportunity for the discovery of physics beyond the standard model. At 100 TeV a large fraction of the W,Z, H bosons and top quarks are produced with a significant boost. It implies an efficient reconstruction of very high energetic objects decaying hadronically and producing high p_T jets in the detector. The reconstruction of those boosted objects is challenging and sets the calorimeter performance requirements in terms of energy resolution, containment of highly energetic hadron showers, and high transversal granularity. \\
We will present the current baseline technologies for the calorimeter system for the barrel region of the FCC-hh baseline detector: a Liquid Argon (LAr) electromagnetic and a Scintillator-Steel (Tile) hadron calorimeter. The talk will focus on the performance studies for hadrons, in terms of single particle and jet reconstruction. We will present the achieved energy resolutions and dependences on the sampling fraction and granularity. Additionally, design considerations will be discussed and we will introduce future plans that includes the application of particle flow algorithms.

Primary author: NEUBUSER, Coralie (CERN)

Co-authors: ZABOROWSKA, Anna (Warsaw University of Technology (PL)); HELSENS, Clement (CERN); FALTOVA, Jana (CERN); ALEKSA, Martin (CERN)

Presenter: NEUBUSER, Coralie (CERN)

Session Classification: FCC-hh experiments and detectors

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

Top FCNC

Thursday, June 1, 2017 11:35 AM (10 minutes)

Primary author: CAKIR, Orhan (Ankara University (TR))

Presenter: CAKIR, Orhan (Ankara University (TR))

Session Classification: FCC-hh experiments and detectors

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

Stop Searches

Session Classification: FCC-hh experiments and detectors

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

Conference opening

Monday, May 29, 2017 8:30 AM (15 minutes)

Primary author: Prof. WIESTLER, Otmar D. (German Helmholtz Gemeinschaft)

Presenter: Prof. WIESTLER, Otmar D. (German Helmholtz Gemeinschaft)

Session Classification: Plenaries

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

Physics at FCC

Monday, May 29, 2017 9:00 AM (1 hour)

Primary author: MCCULLOUGH, Matthew Philip (CERN)

Presenter: MCCULLOUGH, Matthew Philip (CERN)

Session Classification: Plenaries

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

Study status & further plans

Monday, May 29, 2017 10:00 AM (30 minutes)

Primary author: BENEDIKT, Michael (CERN)

Presenter: BENEDIKT, Michael (CERN)

Session Classification: Plenaries

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

FCC-hh conceptual machine design - CDR plan and status

Monday, May 29, 2017 11:00 AM (30 minutes)

Primary author: SCHULTE, Daniel (CERN)

Presenter: SCHULTE, Daniel (CERN)

Session Classification: Plenaries

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

FCC-ee conceptual machine design - CDR plan and status

Monday, May 29, 2017 11:30 AM (30 minutes)

Primary author: OIDE, Katsunobu (High Energy Accelerator Research Organization (JP))

Presenter: OIDE, Katsunobu (High Energy Accelerator Research Organization (JP))

Session Classification: Plenaries

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

HE-LHC and FCC-eh - CDR plan and status

Monday, May 29, 2017 12:00 PM (30 minutes)

Primary author: ZIMMERMANN, Frank (CERN)

Presenter: ZIMMERMANN, Frank (CERN)

Session Classification: Plenaries

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

FCC-eh - CDR plan and status

Session Classification: Plenaries

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

Special technologies R&D - CDR plan and status

Monday, May 29, 2017 2:30 PM (30 minutes)

Primary author: JIMENEZ, Jose Miguel (CERN)

Presenter: JIMENEZ, Jose Miguel (CERN)

Session Classification: Plenaries

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

Civil engineering, infrastructure & operation - CDR plan and status

Monday, May 29, 2017 2:00 PM (30 minutes)

Primary author: MERTENS, Volker (CERN)

Presenter: MERTENS, Volker (CERN)

Session Classification: Plenaries

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

16 T magnet R&D - CDR plan and status

Monday, May 29, 2017 3:00 PM (15 minutes)

Primary author: TOMMASINI, Davide (CERN)

Presenter: TOMMASINI, Davide (CERN)

Session Classification: Plenaries

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

SRF R&D - CDR plan and status

Monday, May 29, 2017 3:15 PM (15 minutes)

Primary author: BRUNNER, Olivier (CERN)

Presenter: BRUNNER, Olivier (CERN)

Session Classification: Plenaries

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

FCC-hh experiments & detectors - CDR plan and status

Monday, May 29, 2017 4:00 PM (35 minutes)

Primary author: RIEGLER, Werner (CERN)

Presenter: RIEGLER, Werner (CERN)

Session Classification: Plenaries

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

FCC-ee physics & experiments - CDR plan and status

Monday, May 29, 2017 4:35 PM (35 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: Plenaries

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

FCC-eh - CDR plan and status

Monday, May 29, 2017 5:10 PM (20 minutes)

Primary author: KLEIN, Max (University of Liverpool (GB))

Presenter: KLEIN, Max (University of Liverpool (GB))

Session Classification: Plenaries

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

Parameters and layout

Tuesday, May 30, 2017 8:30 AM (15 minutes)

Primary author: SCHULTE, Daniel (CERN)

Presenter: SCHULTE, Daniel (CERN)

Session Classification: FCC-hh machine design

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

Arc design and lattice integration

Tuesday, May 30, 2017 8:45 AM (25 minutes)

The FCC-hh (Future Hadron-Hadron Circular Collider) is one of the three options considered for the next generation accelerator in high-energy physics as recommended by the European Strategy Group. The layout of FCC-hh has been optimized to a more compact design following recommendations from civil engineering aspects. The updates on the first order and second order optics of the ring will be shown for collisions at the required centre-of-mass energy of 100 TeV. Special emphasis is put on the dispersion suppressors and general beam cleaning sections as well as first considerations of injection and extraction sections.

Primary author: Dr CHANCE, Antoine (CEA Irfu)

Co-authors: LANGNER, Andy Sven (CERN); DALENA, Barbara (CEA/IRFU,Centre d'etude de Saclay Gif-sur-Yvette (FR)); HOLZER, Bernhard (CERN); SCHULTE, Daniel (CERN); Dr BOUTIN, David Jean Henri (CEA)

Presenter: Dr CHANCE, Antoine (CEA Irfu)

Session Classification: FCC-hh machine design

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

Experimental insertions

Tuesday, May 30, 2017 9:10 AM (25 minutes)

Primary author: SERYI, Andrei (University of Oxford (GB))

Presenter: SERYI, Andrei (University of Oxford (GB))

Session Classification: FCC-hh machine design

Contribution ID: **38** Type: **not specified**

Injections and extraction insertions and dump lines

Tuesday, May 30, 2017 9:35 AM (25 minutes)

Safely extracting and absorbing the 50 TeV proton beams of the FCC-hh collider will be a major challenge. In the new baseline concept one straight section of 2.8 km length is dedicated to the beam dumping system. The beam dumping system will fast-extract the beam and transport it to an external absorber. The high stored beam energy of about 8.5 GJ per beam means that machine protection considerations will severely constrain the functional design and specifications of the straight section and the beam dump line geometry.
The overall system concept is presented and evaluated regarding overall system length, energy deposition on absorbers, hardware requirements, radiation issues and layout flexibility. It is proposed to use of a highly segmented extraction kicker system allowing a single kicker switch to fail, this will significantly reduce the probability of an asynchronous beam dump. In order to sufficiently separate swept single bunches on the extraction absorbers in case of an asynchronous beam dump a fast field rise of the extraction kicker is required. Superconducting septa are foreseen to limit the overall system length and power consumption. Detailed studies to ease the challenging dilution kicker system were performed and will be presented.

Primary author: BURKART, Florian (CERN)

Co-authors: SANZ ULL, Alejandro (Eindhoven Technical University (NL)); LECHNER, Anton (CERN); GODDARD, Brennan (CERN); BORBURGH, Jan (CERN); ATANASOV, Miroslav Georgiev (CERN); BARTMANN, Wolfgang (CERN)

Presenter: BURKART, Florian (CERN)

Session Classification: FCC-hh machine design

Contribution ID: **39** Type: **not specified**

Betatron collimation system insertions

Tuesday, May 30, 2017 10:30 AM (22 minutes)

Primary author: LANGNER, Andy Sven (CERN)

Presenter: LANGNER, Andy Sven (CERN)

Session Classification: FCC-hh machine design

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

Energy collimation system insertions

Tuesday, May 30, 2017 10:52 AM (22 minutes)

Primary author: Dr FAUS-GOLFE, Angeles (Univ. of Valencia and CSIC (ES))

Presenter: Dr FAUS-GOLFE, Angeles (Univ. of Valencia and CSIC (ES))

Session Classification: FCC-hh machine design

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

Longitudinal dynamics and RF requirements

Tuesday, May 30, 2017 11:14 AM (22 minutes)

Primary author: SHAPOSHNIKOVA, Elena (CERN)

Presenter: SHAPOSHNIKOVA, Elena (CERN)

Session Classification: FCC-hh machine design

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

Ion considerations

Tuesday, May 30, 2017 11:36 AM (22 minutes)

The hadron collider studied in the future circular collider (FCC) project could operate with protons and lead nuclei in similar modes to the LHC. Considering the current baseline assumptions for the proton-proton program, this paper updates and extends previous studies investigating the potential performance in lead-lead and proton-lead collisions. Beam parameter and luminosity evolution, as well as estimates for the integrated luminosity are given. The secondary beams produced by bound-free pair production in heavy-ion collisions would carry several kW of power and it is therefore crucial to include countermeasures in the initial accelerator design. Preliminary studies of this key aspect of heavy-ion operation are presented.

Primary author: SCHAUMANN, Michaela (CERN)

Co-authors: LOGOTHETIS AGALIOTIS, Efstathios (National Technical Univ. of Athens (GR)); JOWETT, John (CERN)

Presenter: SCHAUMANN, Michaela (CERN)

Session Classification: FCC-hh machine design

Contribution ID: **43** Type: **not specified**

Dynamic aperture and alignment

Tuesday, May 30, 2017 1:30 PM (25 minutes)

In the hadron machine option, proposed in the context of the Future Circular Colliders (FCC) study, the first evaluation of dipole field quality, based on the Nb3Sn technology has shown a Dynamic Aperture at injection above the LHC target value. In this paper the effect of field imperfections on the dynamic aperture, using the updated lattice design, is presented. Tolerances on the main multipole components are evaluated including feed-down effect.

Primary author: DALENA, Barbara (CEA/IRFU,Centre d'etude de Saclay Gif-sur-Yvette (FR))

Co-authors: CHANCE, Antoine (CEA Irfu); HOLZER, Bernhard (CERN); SCHULTE, Daniel (CERN); BOUTIN, David Jean Henri (CEA)

Presenter: DALENA, Barbara (CEA/IRFU,Centre d'etude de Saclay Gif-sur-Yvette (FR))

Session Classification: FCC-hh machine design

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

Impedances and electron cloud

Tuesday, May 30, 2017 1:55 PM (20 minutes)

This presentation summarizes the recent activities on beam instabilities, impedances and electron clouds within the EuroCirCol Workpackage 2.4.

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

Co-authors: RIEMANN, Bernard (TU Dortmund University); SCHULTE, Daniel (CERN); ASTAPOVYCH, Daria (TU Darmstadt); KRKOTIC, Patrick (TU Darmstadt); ARSENYEV, Sergey (CERN); NIEDERMAYER, Uwe (TU-Darmstadt); KORNILOV, Vladimir (GSI Helmholtzzentrum Darmstadt, Germany)

Presenter: BOINE-FRANKENHEIM, Oliver (TU Darmstadt)

Session Classification: FCC-hh machine design

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

Beam-beam effects

Tuesday, May 30, 2017 2:15 PM (20 minutes)

Primary author: PIELONI, Tatiana (EPF Lausanne)

Presenter: PIELONI, Tatiana (EPF Lausanne)

Session Classification: FCC-hh machine design

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

Instrumentation overview and challenges

Tuesday, May 30, 2017 2:35 PM (20 minutes)

Primary author: PONCE, Laurette (CERN)

Presenter: PONCE, Laurette (CERN)

Session Classification: FCC-hh machine design

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

LHC as 3.3 TeV HEB

Tuesday, May 30, 2017 3:30 PM (25 minutes)

The transfer and injection of the high brightness 3.3 TeV proton beams from the High Energy Booster (HEB) to the FCC presents several interesting challenges. In the new baseline concept one straight section of 1.4 km length is dedicated to house one injection system and a side-experiment. Due to the limited amount of space, a special injection and collision optics were designed and optimized to provide a minimal beta* to the experiment, respecting the requirements of the injection system. The high stored beam energy during beam transfer will influence the machine protection considerations concerning the functional design of the transfer and injection, for instance in the amount of bunches transferred, the kicker rise and fall times and the protection of the experimental detector located downstream of the injection point.

Primary author: BARTMANN, Wolfgang (CERN)

Co-authors: CHMIELINSKA, Agnieszka (AGH University of Science and Technology (PL)); LECHNER, Anton (CERN); GODDARD, Brennan (CERN); WOOG, David (CERN); BURKART, Florian (CERN); HOFER, Michael (Vienna University of Technology (AT)); BARNES, Mike (CERN); MARTIN, Roman (CERN); KRAMER, Thomas (CERN)

Presenter: BARTMANN, Wolfgang (CERN)

Session Classification: FCC-hh machine design

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

scSPS as 1.3 TeV HEB

Tuesday, May 30, 2017 3:55 PM (20 minutes)

A new SPS with significantly higher extraction energy than the present 450 GeV is of interest for several CERN projects presently under study. Firstly, for the Future Circular Collider for hadrons (FCC-hh) the tunnels of SPS, LHC and the 100 km collider will be available to house a High Energy Booster (HEB). Replacing the SPS by a superconducting single aperture, low complexity accelerator (scSPS), accelerating the beams up to 1.3 TeV, would have several advantages compared to the other HEB designs. Secondly, for an eventual High-Energy-LHC (HE-LHC) in the LHC tunnel, a higher injection energy could be mandatory for field quality, aperture and impedance reasons. And finally, for future Fixed Target programmes, the possibility of slow extracted beams at energies above 1 TeV could open new physics and detector test beam possibilities. This talk presents the conceptual design considerations for a superconducting single aperture accelerator (designated scSPS) in the SPS tunnel which can be used to accelerate protons to an extraction energy of 1.3 TeV for FCC and for interleaved fixed target beam operation in CERN's North Area. The
cell design, magnet parameters, overall layout, design of the different insertion and performance estimates for specific applications will be presented and discussed in detail.

Primary author: BURKART, Florian (CERN)

Co-authors: MILANESE, Attilio (CERN); GODDARD, Brennan (CERN); BENEDIKT, Michael (CERN); BARTMANN, Wolfgang (CERN)

Presenter: BURKART, Florian (CERN)

Session Classification: FCC-hh machine design

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

3.3 TeV beam injection into combined experimental and injection FCC machine insertions

Tuesday, May 30, 2017 4:15 PM (20 minutes)

The layout of the FCC-hh has recently been modified due to civil engineering requirements. Whereas in the previous baseline layout the low luminosity experiments were situated in dedicated straight sections, the new version combines injection and experiment in the same insertion keeping the straight section length constant. We present first optics designs for these insertions together with the challenges arising from combining these two systems. Energy deposition studies with this new layout allow to set first goals in term of both instantaneous and integrated luminosity for the low luminosity experiments in the FCC-hh.

Primary author: HOFER, Michael (Vienna University of Technology (AT))

Co-authors: SCHULTE, Daniel (CERN); BURKART, Florian (CERN); CERUTTI, Francesco (CERN); BESANA, Maria Ilaria (CERN); TOMAS GARCIA, Rogelio (CERN); MARTIN, Roman (CERN)

Presenter: HOFER, Michael (Vienna University of Technology (AT))

Session Classification: FCC-hh machine design

Contribution ID: **50** Type: **not specified**

Impact of injection energy on collider design

Tuesday, May 30, 2017 4:35 PM (20 minutes)

Primary author: Dr CHANCE, Antoine (CEA Irfu)

Presenter: Dr CHANCE, Antoine (CEA Irfu)

Session Classification: FCC-hh machine design

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

FCC software

Wednesday, May 31, 2017 10:30 AM (20 minutes)

Primary author: LINGEMANN, Joschka (CERN)

Presenter: LINGEMANN, Joschka (CERN)

Session Classification: FCC-hh experiments and detectors

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

ACTS tracking software

Wednesday, May 31, 2017 10:50 AM (20 minutes)

We present a first assessment of track reconstruction for the FCC-hh detector. Starting from common DD4hep detector input the simulation and reconstruction geometry is built. Events generated with PYTHIA are merged to create a pile-up scenario and the output is fed into the full (Geant4) or fast track simulation (FATRAS). The simulated output is digitized using a geometrical digitization approach. A truth based tracking algorithm bypasses conventional pattern recognition applications and in a final track fit the track resolutions of the current FCC-hh detector are established.

Primary author: HRDINKA, Julia (Vienna University of Technology (AT))

Co-authors: SALZBURGER, Andreas (CERN); ZABOROWSKA, Anna (Warsaw University of Technology (PL)); HEGNER, Benedikt (CERN); LINGEMANN, Joschka (CERN); VOLKL, Valentin (University of Innsbruck (AT)); DRASAL, Zbynek (CERN)

Presenter: HRDINKA, Julia (Vienna University of Technology (AT))

Session Classification: FCC-hh experiments and detectors

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

ACTS tracking performance

Wednesday, May 31, 2017 11:10 AM (20 minutes)

Primary author: VOLKL, Valentin (University of Innsbruck (AT))

Presenter: VOLKL, Valentin (University of Innsbruck (AT))

Session Classification: FCC-hh experiments and detectors

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

RF system design for the CEPC main ring

Tuesday, May 30, 2017 8:30 AM (20 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. 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 in the end of 2017 as an important step to move the project forward. In this talk, CEPC SRF system design and the progress of key technology R&D will be shown, including SRF staging scenarios in terms of RF power, key parameter choices and system configuration at different operation energies of both Main Ring and Booster, bunch train beam loading and phase shift compensation, coupled bunch instabilities and HOM coupler design, as well as high Q cavity, variable input coupler, tuner and cryomodule concepts.

Primary author: ZHAI, Jiyuan (IHEP)

Co-authors: LIU, Baiqi (IHEP (CN)); PAGANI, Carlo (University of Milano and INFN); GONG, Dianjun (IHEP (CN)); KAKO, Eiji (KEK (JP)); MENG, Fanbo (IHEP (CN)); ZHENG, Hongjuan (IHEP (CN)); GAO, Jie (Institute of High Energy Physics, China); SHA, Peng (IHEP (CN)); MA, Qiang (IHEP (CN)); RIMMER, Robert Alan; HAN, Ruixiong (IHEP (CN)); JIN, Song; ZHANG, Xinying (IHEP (CN)); CHI, Yunlong (IHEP (CN)); MI, Zhenghui (IHEP (CN))

Presenter: ZHAI, Jiyuan (IHEP)

Session Classification: RF

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

Update on the US decadal roadmap on SRF technology for HEP accelerators

Tuesday, May 30, 2017 8:50 AM (20 minutes)

Recently, the U.S. HEP community has developed a 10-year research roadmap for the accelerator RF technology. In this contribution, I present a portion of the roadmap dealing with developing superconducting RF technology for future Intensity Frontier and Energy Frontier HEP accelerators.

Primary author: BELOMESTNYKH, Sergey (Fermilab)

Presenter: BELOMESTNYKH, Sergey (Fermilab)

Session Classification: RF

Contribution ID: **56** Type: **not specified**

Cavity design approaches and HOM damping for FCC-ee

Tuesday, May 30, 2017 9:10 AM (20 minutes)

In the design study of the FCC-ee an RF cavity system is required to provide the necessary accelerating voltage for the four operating modes of the FCC-ee, i.e. Z, W, H and tt-bar. Based on the preliminary studies, a single design that can serve all four setups is not feasible. The H and tt-bar systems are two demanding cases that are characterized by high accelerating voltage of up to 10 GV. This paper will focus on the cavity design for the Higgs modes of operation. Higher order mode (HOM) couplers are included to assess the damping efficiency and the optimum placement on the cavity endgroup.

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

Co-authors: GERIGK, Frank (CERN); CALAGA, Rama (CERN); VAN RIENEN, Ursula Helga

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

Session Classification: RF

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

Innovative cavity fabrication techniques

Primary author: PALMIERI, Enzo (INFN)

Presenter: PALMIERI, Enzo (INFN)

Session Classification: RF

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

Crab cavities for FCC

Tuesday, May 30, 2017 9:30 AM (20 minutes)

Primary author: CALAGA, Rama (CERN)

Presenter: CALAGA, Rama (CERN)

Session Classification: RF

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

Potential performance of N doping and Nb3Sn

Tuesday, May 30, 2017 10:30 AM (18 minutes)

Plans for FCC call for 11 GV of RF voltage for ee-tt, corresponding to ~2600 SRF cells. In this contribution, we examine recent developments in state-of-the-art SRF technology that can reduce the cost burden of this significant infrastructure. Topics of discussion include new nitrogen infusion processing for bulk niobium, progress in Nb3Sn coatings, and preparation techniques that promote flux expulsion. For each, we estimate the impact on the cost of the SRF infrastructure as well as the technical challenges with their implementation.

Primary author: POSEN, Samuel Elliott (Department of Physics - University of Toronto)

Co-authors: CRAWFORD, A. C. (Fermilab (US)); ROMANENKO, Alexander (Fermilab); GRASSELLINO, Anna; MARTINELLO, Martina (Fermilab - IIT); CHECCHIN, Mattia (FNAL - IIT); ADERHOLD, S. (Fermilab (US)); CHANDRASEKARAN, S. (Fermilab (US))

Presenter: POSEN, Samuel Elliott (Department of Physics - University of Toronto)

Session Classification: RF

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

ECR: from samples to cavities

Tuesday, May 30, 2017 10:48 AM (18 minutes)

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

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

Session Classification: RF

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

Alternative materials and coating techniques for cavities

Tuesday, May 30, 2017 11:06 AM (18 minutes)

The high critical temperature (~18K for Nb3Sn) and very low Bardeen-Cooper-Schrieffer (BCS) surface resistance of A15 intermetallics makes them a promising category of materials alternative to niobium to be used in Superconducting Radio Frequency (SRF) cavities. Despite these benefits, the excessive brittleness of this group of materials means that they cannot be used as the bulk material in cavity manufacturing. They could thus be encouraging candidates for superconductor coated copper cavity technology. This thin film based approach could offer desired characteristics together with significant cost reduction compared to the standard niobium cavities, by replacing expensive superconducting substrates with copper ones and improving cryogenic efficiency by increasing the operational temperature of the cavity to 4.2K.

In this study, magnetron sputtering was used to synthesise Nb3Sn thin films onto a copper substrate, designed to closely mimic a cavity coating. Investigations into the deposition and annealing response of films manufactured using different coating pressures and sputtering gases have been performed using a broad range of techniques. These include X-ray Diffraction (XRD), Scanning Electron Microscopy (SEM) analysis, Energy Dispersive X-ray Spectroscopy (EDS), Focused Ion Beam (FIB) cross-sectional milling and Superconducting QUantum Interference Device (SQUID) magnetometer testing. A maximum critical temperature of 16.5K has been obtained up to now by refining the process parameters. The challenges inherent to the use of copper as a substrate and proposals to tackle them down will be exposed.

Primary author: ILYINA, Katsiaryna (CERN)

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

Presenter: ILYINA, Katsiaryna (CERN)

Session Classification: RF

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

Copper electropolishing studies for the FCC-ee SC-RF cavities

Tuesday, May 30, 2017 11:24 AM (18 minutes)

Previous experiments have demonstrated a better performance obtained for thin film Nb/Cu RF cavities on electropolished copper substrates compared to chemically polished ones. In the context of the Future Circular Collider (FCC) study, CERN is designing a new copper electropolishing facility capable of processing elliptical cavities from 1.3 GHz to 400 MHz (single cell); this facility is to be commissioned in early 2018. The aim is to provide state of the art surface finishing on copper bulk radio frequency structures, namely on the 400 MHz single cell FCC type cavities and thus contributing in achieving the ultimate performance on the Nb/Cu technology. In this contribution, it'll be shown the planning, cost evaluation, design status as well as ongoing modelling and simulation work to define the optimum working tools (cathode geometry) and parameters (potential, current and polishing bath flow). The modelling and simulation work is being presently benchmarked with 1.3 GHz cavities.

Primary author: MARQUES ANTUNES FERREIRA, Leonel (CERN)

Co-author: PEREZ RODRIGUEZ, Alejandra (Centro de Investigaciones Energéti cas Medioambientales y Tecno)

Presenter: MARQUES ANTUNES FERREIRA, Leonel (CERN)

Session Classification: RF

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

Surface characterization of Nb/Cu 6 GHz seamless cavities

Tuesday, May 30, 2017 11:42 AM (13 minutes)

Primary author: VALIZADEH, Reza (STFC)

Presenter: VALIZADEH, Reza (STFC)

Session Classification: RF

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

RF scenarios and parameters layout for FCC

Tuesday, May 30, 2017 1:30 PM (20 minutes)

Primary author: SCHWERG, Nikolai (CERN)

Presenter: SCHWERG, Nikolai (CERN)

Session Classification: RF

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

Cavity design and beam-cavity interaction

Tuesday, May 30, 2017 1:50 PM (20 minutes)

Primary author: BUTTERWORTH, Andy (CERN)

Presenter: BUTTERWORTH, Andy (CERN)

Session Classification: RF

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

Beam Dynamics studies for FCC-ee

Tuesday, May 30, 2017 2:10 PM (20 minutes)

Primary author: KARPOV, Ivan (CERN)

Presenter: KARPOV, Ivan (CERN)

Session Classification: RF

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

RF feedback design and performance

Tuesday, May 30, 2017 2:30 PM (20 minutes)

Primary author: HOFLE, Wolfgang (CERN)

Presenter: HOFLE, Wolfgang (CERN)

Session Classification: RF

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

Nb/Cu perspectives for FCC

Tuesday, May 30, 2017 3:30 PM (20 minutes)

Primary author: AULL, Sarah (CERN)

Presenter: AULL, Sarah (CERN)

Session Classification: RF

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

Innovative cryomodule designs

Tuesday, May 30, 2017 3:50 PM (20 minutes)

Primary author: RIMMER, Robert Alan

Presenter: RIMMER, Robert Alan

Session Classification: RF

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

FPC challenges and perspectives for FCC

Tuesday, May 30, 2017 4:10 PM (20 minutes)

Primary author: MONTESINOS, Eric (CERN)

Presenter: MONTESINOS, Eric (CERN)

Session Classification: RF

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

High efficiency klystron technology

Tuesday, May 30, 2017 4:30 PM (20 minutes)

Primary author: SYRATCHEV, Igor (CERN)

Presenter: SYRATCHEV, Igor (CERN)

Session Classification: RF

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

Summary FCC-hh machine design

Friday, June 2, 2017 8:30 AM (30 minutes)

Primary author: Dr CHANCE, Antoine (CEA Irfu)

Presenter: Dr CHANCE, Antoine (CEA Irfu)

Session Classification: Summaries

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

Summary FCC-ee machine design

Friday, June 2, 2017 9:00 AM (30 minutes)

Primary authors: ZIMMERMANN, Frank (CERN); WENNINGER, Jorg (CERN)

Presenters: ZIMMERMANN, Frank (CERN); WENNINGER, Jorg (CERN)

Session Classification: Summaries

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

Summary infrastructure & operation

Friday, June 2, 2017 9:30 AM (15 minutes)

Primary author: OSBORNE, John Andrew (CERN)

Presenter: OSBORNE, John Andrew (CERN)

Session Classification: Summaries

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

Summary magnets

Friday, June 2, 2017 10:00 AM (15 minutes)

Primary author: BOTTURA, Luca (CERN)

Presenter: BOTTURA, Luca (CERN)

Session Classification: Summaries

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

Summary HE LHC

Friday, June 2, 2017 11:00 AM (15 minutes)

Primary author: SERYI, Andrei (University of Oxford (GB))

Presenter: SERYI, Andrei (University of Oxford (GB))

Session Classification: Summaries

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

Summary FCC-hh experiments

Friday, June 2, 2017 11:30 AM (30 minutes)

Primary author: ALEKSA, Martin (CERN)

Presenter: ALEKSA, Martin (CERN)

Session Classification: Summaries

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

Summary FCC-ee experiments

Friday, June 2, 2017 12:00 PM (30 minutes)

Primary author: BLONDEL, Alain (Universite de Geneve (CH))

Presenter: BLONDEL, Alain (Universite de Geneve (CH))

Session Classification: Summaries

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

Closing remarks

Friday, June 2, 2017 12:30 PM (30 minutes)

Presenter: BENEDIKT, Michael (CERN)

Session Classification: Summaries

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

Beam transfer technology challenges, including dump and dilution system design

Wednesday, May 31, 2017 1:30 PM (18 minutes)

Primary author: BARTMANN, Wolfgang (CERN)

Presenter: BARTMANN, Wolfgang (CERN)

Session Classification: Special technologies

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

Collimators and dumps for FCC-hh

Wednesday, May 31, 2017 1:48 PM (18 minutes)

Primary author: Dr GILARDONI, Simone (CERN)

Presenter: Dr GILARDONI, Simone (CERN)

Session Classification: Special technologies

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

Design studies for the FCC-hh beam dump

Wednesday, May 31, 2017 2:06 PM (18 minutes)

The FCC proton beams pose a severe challenge for the robustness of the beam dump and protection devices. Depending on the local beta-function, already a single 50 TeV bunch can induce damage in typical absorber materials presently used at the LHC (e.g. Graphite or carbon composites). In order to safely absorb the FCC beams in a LHC-like dump, the beams need to be sufficiently diluted across the dump upstream face. This study assesses the dilution kicker requirements and derives energy densities, temperatures and stresses in the dump core and windows for regular sweeps and dilution failures. In particular, the effect of overlapping shower tails from neighbouring bunches and neighbouring branches in the sweep pattern is quantified. Based on the obtained results, the implications for the overall dilution system design are discussed.

Primary author: LECHNER, Anton (CERN)

Co-authors: PERILLO MARCONE, Antonio (CERN); GODDARD, Brennan (CERN); BURKART, Florian (CERN); CALVIANI, Marco (CERN); KRAMER, Thomas (CERN); POLZIN, Tobias (CERN); BARTMANN, Wolfgang (CERN)

Presenter: LECHNER, Anton (CERN)

Session Classification: Special technologies

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

Hydrodynamic tunneling studies for a water beam dump

Wednesday, May 31, 2017 2:24 PM (18 minutes)

Primary author: TAHIR, Naeem Ahmad (GSI - Helmholtzzentrum fur Schwerionenforschung GmbH (DE))

Presenter: TAHIR, Naeem Ahmad (GSI - Helmholtzzentrum fur Schwerionenforschung GmbH (DE))

Session Classification: Special technologies

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

Progress with the cryogenic vacuum system of FCC-hh

Wednesday, May 31, 2017 3:30 PM (20 minutes)

Primary author: PEREZ, Francis (ALBA Synchrotron - CELLS)

Presenter: PEREZ, Francis (ALBA Synchrotron - CELLS)

Session Classification: Special technologies

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

Proposal and simulation of the FCC-ee vacuum system

Wednesday, May 31, 2017 3:50 PM (20 minutes)

Primary author: KERSEVAN, Roberto (CERN)

Presenter: KERSEVAN, Roberto (CERN)

Session Classification: Special technologies

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

Summary of the requirements the FCC-hh and FCC e+e- beam instrumentation

Wednesday, May 31, 2017 4:10 PM (20 minutes)

Primary author: SCHMICKLER, Hermann (CERN)

Presenter: SCHMICKLER, Hermann (CERN)

Session Classification: Special technologies

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

Status overview of the radiation hardness assurance studies for FCC

Wednesday, May 31, 2017 4:30 PM (20 minutes)

Primary author: GARCIA ALIA, Ruben (CERN)

Presenter: GARCIA ALIA, Ruben (CERN)

Session Classification: Special technologies

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

Test of FCC-hh beam screens at the ANKA beamline

Thursday, June 1, 2017 8:30 AM (18 minutes)

The cryogenic beam vacuum system work package (WP 4) is developing a technical design concept for the FCC-hh beam screen based on the requirements and constraints that emerge from the arc design and magnets work packages (WP 2 and WP5). Within this framework, a measurement setup was designed with the goal of determining the photodesorpotion yield, synchrotron radiation heat loads and photo electron generation inside the FCC-hh beam screen prototype. Measurements on several beam screen setups, both at cryogenic and room temperature, will be carried out in the ANKA light source, which has a synchrotron radiation spectrum similar to FCC-hh. We present here a status report of the installation of the rst setup at ANKA, together with the results obtained after the conditioning of the installed equipment.

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

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

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

Session Classification: Special technologies

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

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

Thursday, June 1, 2017 8:48 AM (18 minutes)

Primary author: BELLAFONT, Ignasi (Consortium for the Exploitation of the Synchrotron Light Labor)

Presenter: BELLAFONT, Ignasi (Consortium for the Exploitation of the Synchrotron Light Labor)

Session Classification: Special technologies

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

Thermo-mechanical simulation of the FCC-hh beam screen during magnet quench

Thursday, June 1, 2017 9:06 AM (18 minutes)

Primary author: FERNANDEZ TOPHAM, Javier (Centro de Investigaciones Energéti cas Medioambientales y Tecno)

Presenter: FERNANDEZ TOPHAM, Javier (Centro de Investigaciones Energéti cas Medioambientales y Tecno)

Session Classification: Special technologies

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

Cold plasma spray application in the FCC

Thursday, June 1, 2017 9:24 AM (18 minutes)

Presenter: GARION, Cedric (CERN)

Session Classification: Special technologies

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

Vacuum characterisation of 3D printed metals

Thursday, June 1, 2017 9:42 AM (18 minutes)

Primary author: GARGIULO, Julien (CERN)

Presenter: GARGIULO, Julien (CERN)

Session Classification: Special technologies

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

Shape memory alloys for remote connection of beam pipes in radioactive areas

Thursday, June 1, 2017 10:30 AM (20 minutes)

The ultrahigh-vacuum (UHV) coupling performance of shape memory alloy (SMA) rings was investigated by finite element (FE) simulations and experimental measurements. In particular, the tightening performance of SMA rings, in terms of contact pressure and clamping/unclamping mechanisms, was studied for different values of the initial clearance between ring and vacuum pipe by means of strain gauge (SG) and digital image correlation (DIC) tests. The results have revealed that the contact pressure is not significantly affected by the assembly clearance due to the plateau in the stress-strain response of the material and the thermal dismounting and subsequent re-clamping is obtained by exploiting the two-way shape memory recovery capabilities of the alloy. A design method was proposed that involves the numerical results and a vacuum sealing model. The leak rate measurements, carried out to assess the sealing performance of the couplings, revealed that the constraints for UHV applications could be easily satisfied (leak rate < 10-10 mbar l s-1), which opens the possibility of remotely clamping/unclamping the tight couplers by well-defined changes in their temperature. SMA connectors could be used in high-energy particle accelerators, especially in radioactive areas, where thermally induced mounting and dismounting operations can be activated remotely.

Primary author: NICCOLI, Fabrizio (Universita della Calabria (IT))

Co-authors: MALETTA, Carmine (Universita della Calabria (IT)); GARION, Cedric (CERN); CHIGGIATO, Paolo (CERN)

Presenter: NICCOLI, Fabrizio (Universita della Calabria (IT))

Session Classification: Special technologies

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

High field normal conducting massless septa for FCC beam transfer

Thursday, June 1, 2017 10:50 AM (20 minutes)

For the FCC, challenging requirements are set for the extraction septum magnets. A scaled up LHC-like beam dump system architecture is not attractive in terms of low maximum field, lattice space requirements and power consumption. To address these challenges whilst respecting the requirements for the reliability and availability of the system, a high field massless septum with a target field of 2 T offers several advantages. This paper presents a study of the so-called “Pacman” massless septum design. The field quality, maximum obtainable field, the leak field limits and the effective shielding of the circulating beams are described. The achieved performance is compared to that of an alternative, simpler ironless design with lower field.

Primary author: SANZ ULL, Alejandro (Eindhoven Technical University (NL))

Co-authors: BORBURGH, Jan (CERN); ATANASOV, Miroslav Georgiev (CERN)

Presenter: SANZ ULL, Alejandro (Eindhoven Technical University (NL))

Session Classification: Special technologies

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

FLUKA Montecarlo modelling of the FCC arc cell: radiation environment and energy deposition due to beam-gas interactions

Thursday, June 1, 2017 11:10 AM (20 minutes)

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

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

Session Classification: Special technologies

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

Reflectivity and Photo Yield measurements of technical surfaces.

Thursday, June 1, 2017 11:30 AM (20 minutes)

"In the Highest Energy Proton Circular Collider ever designed, FCC-hh, a large production of Synchrotron Radiation is expected, which causes significant problems. Thus, it is very important to have an experimental characterization of optical properties of technical surfaces, in particular reflectivity and photo yield. Such material properties are essential ingredients to calculate single- and multi-bunch instabilities, vacuum behaviour, e-cloud instabilities, etc. One of the great experimental challenges for measuring such properties is not only to study them on realistic candidates to be used as accelerator walls, but to study them in conditions as close as possible to the one that will actually occur in the machine. There, SR Wight Light, with increasing (during particle acceleration), critical energy from a few eV to more than 4 keV will impinge on the accelerator walls at grazing angles smaller than 0.1 degree. A systematic experimental campaign has been recently launched, identifying the versatility offered by the At-Wavelength Metrology Station (Optics Beamline and Reflectometer) at BESSY-II in Berlin, as an ideal tool to get realistic experimental values to be used in most relevant simulations. Preliminary data on specular and non-specular reflectivity and photo yield in the UV and XUV range (from 35 eV to 1800 eV) and at grazing angles below 0.5 deg, are indeed very encouraging and will be presented and discussed here.

Primary author: LA FRANCESCA, Eliana (LNF INFN (IT))

Co-authors: SOKOLOV, Andrey (HZB (DE)); SIEWERT, Frank (HZB (DE)); SCHÄFERS, Franz (HZB (DE)); GWALT, Grzegorz (HZB (DE)); ANGELUCCI, Marco (LNF INFN (IT)); CIMINO, Roberto (Istituto Nazionale Fisica Nucleare Frascati (IT))

Presenter: LA FRANCESCA, Eliana (LNF INFN (IT))

Session Classification: Special technologies

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

Design status for a high field superconducting septum magnet

Thursday, June 1, 2017 1:30 PM (18 minutes)

“GSI proceeds design studies with respect to future requests of FAIR and further projects.
Beyond the 2 T limit of an iron dominated magnet, a superconducting high field septum magnet is one of the key component of new planned circulare accelerators.
For a higher magnetic field, an 8 T level conceptual 2D design was presented in 2016.
Now analytical calculations were made to acquire the design principle of a iron-yoked cosine-theta septum magnet at high fields far beyond 2 T.
We present the status of the engineering study for a 4 T level superconducting septum magnet including the mechanical design of the magnet.
Suggestions will be given to extend the electromagnetic design for other applications.

Primary author: SUGITA, Kei (GSI)

Co-author: FISCHER, Egbert

Presenter: SUGITA, Kei (GSI)

Session Classification: Special technologies

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

First experimental results with a superconducting shield (SuShi) septum prototype

Thursday, June 1, 2017 1:48 PM (18 minutes)

The parameters of the FCC-hh ring impose serious requirements on the beam extraction septa, which are very difficult to realize with the technology of the LHC. A device using a superconducting shield to create a field-free region within a strong (3-4 Tesla) magnet was proposed one year ago as a possible solution. The construction of 3 prototypes using different superconducting materials and technologies has been launched since. Optimized design of a realistic device and experimental results with the first prototype(s) will be presented.

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

Co-authors: SANZ ULL, Alejandro (Eindhoven Technical University (NL)); BORBURGH, Jan (CERN); ATANASOV, Miroslav Georgiev (CERN)

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

Session Classification: Special technologies

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

Design of 6 T superconducting dipole for SPS upgrade

Thursday, June 1, 2017 2:06 PM (18 minutes)

One of the options being considered for the FCC-hh high energy injector is a superconducting machine replacing the SPS, so to increase the energy from the current 450 GeV to 1.3 TeV. This synchrotron would operate in a cycled mode also to feed experimental areas, much like the SPS nowadays. Due to this specific cycled operation, innovative design and development approaches will be required to cope with the AC losses in the superconducting cables and reaching the highest possible critical wire and cable critical current. Some of the other design parameters of the model are the following: aperture - 80 mm diameter; the field ramp rate of 0.2 - 0.5 T/s; the wire – NbTi @1.9 K; the total thermal losses less of 2 W/m at 4.2 K equivalent while ramping. The design is started. Possibilities of a single layer cosine (theta) dipole with the yoke at intermediate temperature are analyzing.

Primary author: Prof. KOVALENKO, Alexander (Joint Inst. for Nuclear Research (RU))

Presenter: Prof. KOVALENKO, Alexander (Joint Inst. for Nuclear Research (RU))

Session Classification: Special technologies

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

FCC-ee Warm magnets design

Thursday, June 1, 2017 2:24 PM (18 minutes)

Primary author: MILANESE, Attilio (CERN)

Presenter: MILANESE, Attilio (CERN)

Session Classification: Special technologies

Contribution ID: **101** Type: **not specified**

Towards a conceptual design for FCC cryogenics

Thursday, June 1, 2017 1:30 PM (30 minutes)

Following the update of the European strategy in particle physics, CERN has undertaken an international study of possible future circular colliders beyond the LHC. The study considers several options for very high-energy hadron-hadron, electron-positron and hadron-electron colliders.
From the cryogenics point of view, the most challenging option is the hadron-hadron collider (FCC-hh) for which the conceptual design of the cryogenic system is progressing. The FCC-hh cryogenic system will have to produce up to 120 kW at 1.8 K for the superconducting magnet cooling, 6 MW between 40 and 60 K for the beam-screen and thermal-shield cooling as well as 850 g/s between 40 and 300 K for the HTS current-lead cooling. The corresponding total entropic load represents about 1 MW equivalent at 4.5 K and this cryogenic system will be by far the largest ever designed. In addition, the total mass to be cooled down is about 250'000 t and an innovative cool-down process must be proposed.
The cryogenic system of the electron-positron collider (FCC-ee) will have to produce up to 184 kW at 4.5 K for the cooling of superconducting RF cavities.
This paper will present the proposed cryogenic layout and architecture, the cooling principles of the main components, the corresponding cooling schemes, as well as the cryogenic plant arrangement and proposed process cycles. The corresponding required development plan for such challenging cryogenic system will be highlighted.

Primary author: TAVIAN, Laurent Jean (CERN)

Presenter: TAVIAN, Laurent Jean (CERN)

Session Classification: Infrastructure & operation

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

Cryogenic refrigeration with neon-helium mixtures for the FCC-hh

Thursday, June 1, 2017 2:00 PM (20 minutes)

The Nelium concept is a novel approach for highly efficient refrigeration in the temperature range from 25 to 65K, making it a promising candidate for the cooling of the FCC-hh beam screens. The concept uses a cycle with turbo compressors, which have higher efficiencies compared to classical screw compressors. To achieve acceptable capital cost, a mixture of neon and helium is used which reduces the number of compression stages. This presentation shows the general concept, the preliminary design of the components and the influence of the neon content.

Primary author: KLOEPPEL, Steffen (TU Dresden)

Co-authors: HABERSTROH, Christoph; HOLDENER, Fridolin (shirokuma GmbH); QUACK, Hans (TU Dresden)

Presenter: KLOEPPEL, Steffen (TU Dresden)

Session Classification: Infrastructure & operation

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

Technical specifications for industry studies on the FCC cryogenic system

Thursday, June 1, 2017 2:20 PM (20 minutes)

Different scenarios of circular colliders are examined and a 100 TeV hadron collider in a 100 km long tunnel is the baseline of the overall infrastructure for the FCC study. Building such a machine requires the development of large unit-capacity cryogenic infrastructures (50 to 100 kW equivalent at 4.5 K) to cool down superconducting accelerator components. The cooling requirements are challenging with a very large refrigeration capacity 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. An international collaboration team has evaluated these cooling capacity requirements, defined the reference cryogenic architecture and pre-designed the main cryogenic subsystems for such a machine. It is now time to assess industrial solutions for FCC cryoplants and to identify together the innovative technologies which have to be developed and assessed in the coming years to offer greater efficiency and more reliable operation for the FCC. The presentation will recall the state-of-the art for Helium plants and detail the technical specifications for industry studies on the FCC cryogenic system.

Primary author: MILLET, Francois

Presenter: MILLET, Francois

Session Classification: Infrastructure & operation

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

Cryogenic distribution for FCC-hh

Thursday, June 1, 2017 2:40 PM (20 minutes)

The Future Circular Collider (FCC), with of about 86 km circumference, will be the largest particle accelerator ever constructed. Such a scale entails numerous problems, many of which have never been faced before. One of them is a considerable growth in the length of cryogenic distribution lines. In case of the FCC the maximum length for the distribution line is considered as 8.4 km, what is almost 3 times higher than for presently the longest, LHC distribution lines. During the gas flow through such a long process lines flow pressure drops is an issue. In order to reduce losses caused by pressure drops the process lines sizes or helium pressure must be increased. In case of thermal shield supply and return headers the pressure increase has no influence on the thermal shield cooling process, thus for FCC it is considered to increase the helium pressure from 20 bar, what is currently used in state-of–art transfer lines, to 50 bar. Due to pressure increase mechanical supports and vacuum barriers of the process headers need to be more massive, what will result in higher heat fluxes to the headers.
The talk presents three design options for the straight section of the FCC cryogenic distribution system. The designs will be compared in view of the heat fluxes to the process header for 20 bar and 50 bar helium pressure in the thermal shield cooling circuit as well as in view the system reliability. Recommendation of the final cryogenic distribution system design will be done.

Primary author: DUDA, Paweł (Wroclaw University of Technology)

Co-authors: POLINSKI, Jaroslaw (Wroclaw University of Technology); CHOROWSKI, Maciej (Wroclaw University of Technology)

Presenter: DUDA, Paweł (Wroclaw University of Technology)

Session Classification: Infrastructure & operation

Contribution ID: **105** Type: **not specified**

Civil engineering optimisation and design development

Thursday, June 1, 2017 8:30 AM (20 minutes)

Primary author: STANYARD, Joanna Louise (CERN)

Presenter: STANYARD, Joanna Louise (CERN)

Session Classification: Infrastructure & operation

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

Supply and distribution of electrical energy

Thursday, June 1, 2017 8:50 AM (25 minutes)

Primary author: BOZZINI, Davide (CERN)

Presenter: BOZZINI, Davide (CERN)

Session Classification: Infrastructure & operation

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

A ventilation system for the FCC

Thursday, June 1, 2017 9:15 AM (20 minutes)

Primary author: PEON, Guillermo (CERN)

Presenter: PEON, Guillermo (CERN)

Session Classification: Infrastructure & operation

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

Cryomagnet logistics and transport

Thursday, June 1, 2017 9:35 AM (25 minutes)

Logistics is of great importance for the construction, assembly and operation of FCC. During set-up of LHC, logistics already proved to be a key factor. In respect of the size of FCC, logistics is increasing its significance. New concepts, methods and analytics for logistics, supply chain and transport concepts will have a direct impact on the estimation of the feasibility and costs of the FCC.
It is therefore of high importance to already think about logistics concepts during the planning period for all phases of the project (design/ development, planning, transport, construction, assembly, implementing, operations and maintenance, lifecycle evaluation/ possible rededication). This will include concepts for (over ground) transports, storage, assembly strategies, testing and handling of magnets, vehicle concepts for the underground transportation of magnets, concept for the underground transportation of people and material, a technical feasibility study for tracking solutions and the design and evaluation of a global cryo-magnet transport concept. The possibility to transfer already existing concepts from other domains, like strategies for the sourcing and assembly of complex (mechanical) systems (e.g. semi-knock-down in the automotive industry), is already taken into consideration.
The presentation will give an overview of the current status of ideas, concepts and possible feedback from logistics to other areas like the magnet design or tunnel layout.

Primary author: NETTSTRÄTER, Andreas (Fraunhofer-Institut für Materialfluss und Logistik)

Co-author: PRASSE, Christian (Fraunhofer-Institut für Materialfluss und Logistik)

Presenter: NETTSTRÄTER, Andreas (Fraunhofer-Institut für Materialfluss und Logistik)

Session Classification: Infrastructure & operation

Contribution ID: **109** Type: **not specified**

FCC-hh operation schedule and turn-around cycle

Thursday, June 1, 2017 3:30 PM (20 minutes)

This contribution presents the first version of the FCC-hh operation schedule and updates estimates on collider turn around cycle. The operational schedule shows planned time for physics operations and maintenance during collider life cycle. The schedule meets requirements for time reserved for physics production. However, this considerably limits the time reserved for maintenance and this restraint needs to be taken into account in collider system design. The turn-around cycle time of a collider is defined as the time spent between the end of stable beams and the start of the next stable beams. This time is a crucial ingredient for the computation of the optimal time spent in luminosity production and for the estimates of the collider operational performance. The first estimation of the turn-around time was presented at the FCC week 2016. This contribution updates the estimate based on advances in the FCC-hh study and LHC operation data from 2016.

Primary author: NIEMI, Arto (Tampere University of Technology)

Co-authors: APOLLONIO, Andrea (CERN); NISBET, David (CERN); BURKART, Florian (CERN); FUCHSBERGER, Kajetan (CERN); PONCE, Laurette (CERN); PRIOLI, Marco (CERN); ALEMANY FERNANDEZ, Reyes (CERN); MERTENS, Volker (CERN); BARTMANN, Wolfgang (CERN)

Presenter: NIEMI, Arto (Tampere University of Technology)

Session Classification: Infrastructure & operation

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

FCC availability and integrated luminosity

Thursday, June 1, 2017 3:50 PM (25 minutes)

The achievable level of availability will be one of the main performance indicators for the next generation of particle accelerators. Studies are ongoing for the FCC to model future operation of the collider based on LHC experience. The software ELMAS is used for modelling system fault trees and simulate the achievable integrated luminosity production as a function of different operational modes and system failure rates. This contribution presents the first estimates of FCC availability and integrated luminosity, comparing two injector options (LHC and superconducting SPS). Recommendations are given on how to define availability 'budgets' for accelerator systems, based on the defined integrated luminosity goals.

Primary author: APOLLONIO, Andrea (CERN)

Co-authors: NIEMI, Arto (CERN); GUTLEBER, Johannes (CERN); PONCE, Laurette (CERN); SOLLANDER, Peter (CERN)

Presenter: APOLLONIO, Andrea (CERN)

Session Classification: Infrastructure & operation

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

FCC safety strategy for the CDR

Thursday, June 1, 2017 4:15 PM (25 minutes)

Primary author: OTTO, Thomas (CERN)

Presenter: OTTO, Thomas (CERN)

Session Classification: Infrastructure & operation

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

Radioprotection matters

Thursday, June 1, 2017 4:40 PM (20 minutes)

Primary author: WIDORSKI, Markus (CERN)

Presenter: WIDORSKI, Markus (CERN)

Session Classification: Infrastructure & operation

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

FCC-ee (History, motivation, overview of present status of design study and issues, run plan)

Tuesday, May 30, 2017 8:30 AM (20 minutes)

Primary author: JANOT, Patrick (CERN)

Presenter: JANOT, Patrick (CERN)

Session Classification: FCC-ee physics & experiments

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

Electroweak physics at the Z and W – experimental capabilities

Tuesday, May 30, 2017 8:50 AM (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

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

Status and prospects for precision electroweak calculations

Tuesday, May 30, 2017 9:10 AM (20 minutes)

The high precision program of future e^+ e^- colliders, such as CEPC, FCC-ee and ILC, will be very challenging for the needed accuracy in theoretical predictions. The present status and future prospects on the Z pole observables and the thresholds for WW, ZH and $t\bar{t}$ production are reviewed.

Primary author: PICCININI, Fulvio (Universita e INFN, Pavia (IT))

Presenter: PICCININI, Fulvio (Universita e INFN, Pavia (IT))

Session Classification: FCC-ee physics & experiments

Contribution ID: **116** Type: **not specified**

QCD and gamma-gamma

Tuesday, May 30, 2017 11:30 AM (20 minutes)

Presentation of the physics case for QCD and gamma-gamma measurements at FCC-ee.

Primary author: D'ENTERRIA, David (CERN)

Presenter: D'ENTERRIA, David (CERN)

Session Classification: FCC-ee physics & experiments

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

Higgs physics at FCC-ee

Tuesday, May 30, 2017 10:30 AM (20 minutes)

After the Higgs boson discovery, the precision measurements and searches for new phenomena in the Higgs sector are among the most important goals in particle physics. Experiments at the Future Circular Colliders (FCC) are ideal to study these questions. Electron-positron collisions up to an energy of 350 GeV provide the ultimate precision with studies of Higgs boson couplings, mass, total width and CP parameters, as well as searches for exotic and invisible decays. The feasibility of observation of the s-channel production is reviewed. We conclude by giving an outline of the contributions to the FCC CDR.

Primary author: KLUTE, Markus (Massachusetts Inst. of Technology (US))

Presenter: KLUTE, Markus (Massachusetts Inst. of Technology (US))

Session Classification: FCC-ee physics & experiments

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

Top physics at FCC-ee

Tuesday, May 30, 2017 10:50 AM (20 minutes)

In the framework of the FCC project, the FCC-ee collider program contains a specific run at the center of mass energy around 350 GeV with an integrated luminosity corresponding to the production of about 1 Million top quark pairs. The ultimate goal is to obtain the most precise measurement of the top mass with a threshold scan from 340 to 350 GeV. However, the top physics program at the FCC-ee is extremely rich and comprises, among other measurements, the study of the achievable precision at or below the per-cent level on top couplings to Z and gamma with a specific scan just above the top-pair threshold ($\sqrt{s}$ ~ 365-370 GeV), the indirect measurement of the top-Yukawa coupling, top width, processes with FCNC and rare top decays. It can be shown that the precision obtained at this machine is able to probe new physics scales up to several TeV and to fully characterize a large variety of Composite Higgs models. This result in a perfect complementarity with direct measurements obtained in the top sector and elsewhere with the FCC-hh 100 TeV machine later on.

Primary author: AZZI, Patrizia (INFN Padova (IT))

Presenter: AZZI, Patrizia (INFN Padova (IT))

Session Classification: FCC-ee physics & experiments

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

Flavour physics (c, b, LFV)

Tuesday, May 30, 2017 11:10 AM (20 minutes)

Primary author: MONTEIL, Stephane (Univ. Blaise Pascal Clermont-Fe. II (FR))

Presenter: MONTEIL, Stephane (Univ. Blaise Pascal Clermont-Fe. II (FR))

Session Classification: FCC-ee physics & experiments

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

Beam polarization (longitudinal vs transverse) and energy calibration requirements

Tuesday, May 30, 2017 9:30 AM (20 minutes)

Primary author: BLONDEL, Alain (Universite de Geneve (CH))

Presenter: BLONDEL, Alain (Universite de Geneve (CH))

Session Classification: FCC-ee physics & experiments

Contribution ID: **121** Type: **not specified**

Search for New Physics at the FCC-ee

Tuesday, May 30, 2017 1:30 PM (20 minutes)

We discuss the sensitivity of the FCCee collider to physics beyond the satndard model. Taking a few new-physics scenarios as benchmark examples, we show the complementarity between the FCCee and the program at hadron colliders and the implications for the design of the FCCee detector.

Primary author: PIERINI, Maurizio (CERN)

Co-author: ROGAN, Christopher (Harvard University (US))

Presenter: PIERINI, Maurizio (CERN)

Session Classification: FCC-ee physics & experiments

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

FCC-ee requirements and specific designs

Tuesday, May 30, 2017 1:50 PM (20 minutes)

To match the high statistical precision of the FCC-ee event samples, general purpose detectors that can measure and identify with high precision all the fundamental fermions and bosons of the standard model, and thereby access all known physics processes, are called for.
The talk will first briefy summarize the main requirements for a FCC-ee detector: (i) precise momentum measurement of charged particles; (ii) precise energy measurement of neutral particles and of jets; (iii) precise lifetime measurement of final state particles for tagging of final states containing c- or b-quarks or tau-leptons; (iv) very precise definition of the fiducial region. Then, an outline a specific detector concept being developed for the FCC-ee will be presented. Technologies being investigated include:
(i) a low-mass pixel vertex detector for tagging of particles with finite lifetimes;
(ii) a cluster-timing low-mass drift chamber for robust pattern recognition and specific ionization measurement; (iii) high precision dual-readout calorimetry for both em and hadronic particles. A 2 T axial magnetic field will be provided by a solenoid positioned either around or inside the calorimetry.

Primary author: DAM, Mogens (University of Copenhagen (DK))

Presenter: DAM, Mogens (University of Copenhagen (DK))

Session Classification: FCC-ee physics & experiments

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

Detector design II (CLIC adaption)

Tuesday, May 30, 2017 2:10 PM (20 minutes)

Primary author: LEOGRANDE, Emilia (CERN)

Presenter: LEOGRANDE, Emilia (CERN)

Session Classification: FCC-ee physics & experiments

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

Experimental environment and luminosity measurement (experimental side of MDI)

Tuesday, May 30, 2017 2:30 PM (20 minutes)

A preliminary study on machine induced backgrounds has been performed for the proposed FCC-ee interaction region (IR) and proto-detector. The effect of synchrotron radiation and of luminosity-induced backgrounds like γγ to hadrons and pair production have been studied. The impact of background particles on the detector occupancy has been studied in full simulation. The challenges on luminosity measurement are being assesed. The focus is on the luminosity monitoring via Bhabha scattering. A first proposed LumiCal design will be presented.

Primary author: VOUTSINAS, Georgios Gerasimos (CERN)

Presenter: VOUTSINAS, Georgios Gerasimos (CERN)

Session Classification: FCC-ee physics & experiments

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

Complementarity between FCC-ee and FCC-hh Searches for BSM Physics

Tuesday, May 30, 2017 3:30 PM (20 minutes)

Primary author: ELLIS, Jonathan R. (University of London (GB))

Presenter: ELLIS, Jonathan R. (University of London (GB))

Session Classification: FCC-ee physics & experiments

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

Higgs physics synergies

Tuesday, May 30, 2017 3:50 PM (20 minutes)

Primary author: GROJEAN, Christophe (DESY (Hamburg) and Humboldt University (Berlin))

Presenter: GROJEAN, Christophe (DESY (Hamburg) and Humboldt University (Berlin))

Session Classification: FCC-ee physics & experiments

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

QCD synergies

Tuesday, May 30, 2017 4:10 PM (20 minutes)

Primary author: D'ENTERRIA, David (CERN)

Presenter: D'ENTERRIA, David (CERN)

Session Classification: FCC-ee physics & experiments

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

An example of synergy in BSM physics: right-handed neutrinos

Tuesday, May 30, 2017 4:30 PM (20 minutes)

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 overview of the searches 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)

Co-authors: CAZZATO, Eros (University of Basel); ANTUSCH, Stefan (University of Basel)

Presenter: FISCHER, Oliver (Unibas)

Session Classification: FCC-ee physics & experiments

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

Hard QCD, PDFs and EW

Thursday, June 1, 2017 3:30 PM (20 minutes)

Primary author: BRITZGER, Daniel (Deutsches Elektronen-Synchrotron (DE))

Presenter: BRITZGER, Daniel (Deutsches Elektronen-Synchrotron (DE))

Session Classification: FCC-eh

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

SM and BSM Higgs

Thursday, June 1, 2017 3:50 PM (20 minutes)

Primary author: KLEIN, Uta (University of Liverpool (GB))

Presenter: KLEIN, Uta (University of Liverpool (GB))

Session Classification: FCC-eh

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

Top Physics

Thursday, June 1, 2017 4:10 PM (15 minutes)

Primary author: CAKIR, Orhan (Ankara University (TR))

Presenter: CAKIR, Orhan (Ankara University (TR))

Session Classification: FCC-eh

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

New Physics

Thursday, June 1, 2017 4:25 PM (15 minutes)

Primary author: Dr WANG, Kechen (DESY / IHEP)

Presenter: Dr WANG, Kechen (DESY / IHEP)

Session Classification: FCC-eh

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

High Density and eA Physics

Thursday, June 1, 2017 4:40 PM (20 minutes)

Primary author: Dr TEIXEIRA DE ALMEIDA MILHANO, Guilherme (LIP-Lisbon & CERN TH)

Presenter: Dr TEIXEIRA DE ALMEIDA MILHANO, Guilherme (LIP-Lisbon & CERN TH)

Session Classification: FCC-eh

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

High density QCD and eA physics

Session Classification: FCC-eh

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

FCC-eh Configuration and Performance

Thursday, June 1, 2017 1:30 PM (20 minutes)

Primary author: BRUNING, Oliver (CERN)

Presenter: BRUNING, Oliver (CERN)

Session Classification: FCC-eh

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

Detector Design

Thursday, June 1, 2017 1:50 PM (15 minutes)

Primary author: KOSTKA, Peter (University of Liverpool (GB))

Presenter: KOSTKA, Peter (University of Liverpool (GB))

Session Classification: FCC-eh

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

IR design

Thursday, June 1, 2017 2:05 PM (20 minutes)

The Interaction Region (IR) Machine Detector Interface (MDI) for an electron-hadron collider such as the LHeC/FCC-eh combines challenging aspects of both hadron and e+e- colliders. High-field superconducting magnets are needed to provide strong focusing and deflection fields for handling a stiff high-rigidity hadron beam. But we must also protect the electrons from seeing any such large magnetic fields that can lead to excessive synchrotron radiation (synrad) to strike cryogenic components or to cause detector background. In addition to their focusing function, the hadron IR quadrupoles must provide a septum-like function for passing the electron beam and possibly a non-colliding hadron beam (e.g. 3-beam mode). Generating some synrad near the IP is unavoidable due to the LHeC using a beam separation dipole, in contrast to the eRHIC layout that employs a crossing angle scheme. While protection collimators and masks will be used to protect LHeC IR magnets from synrad, HERA-II experience shows that extreme care must be taken in order to ensure acceptable experimental background conditions. We should avoid both direct synrad backscatter albedo from protection devices and beam scattering off of desorbed gasses from hitting sensitive detector components. In this presentation we review LHeC MDI challenges in the context of HERA-II experience and the ongoing eRHIC IR design effort and present some newly developed IR magnet design options to address anticipated LHeC/FCC-eh MDI issues.

Primary authors: PARKER, Brett (Brookhaven National Laboratory); BRUNING, Oliver (CERN)

Presenter: BRUNING, Oliver (CERN)

Session Classification: FCC-eh

Contribution ID: **138** Type: **not specified**

Civil Engineering for FCC-eh IR

Thursday, June 1, 2017 2:25 PM (10 minutes)

Primary author: STANYARD, Joanna Louise (CERN)

Presenter: STANYARD, Joanna Louise (CERN)

Session Classification: FCC-eh

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

PERLE ERL Facility Design

Thursday, June 1, 2017 2:35 PM (20 minutes)

Primary author: KLEIN, Max (University of Liverpool (GB))

Presenter: KLEIN, Max (University of Liverpool (GB))

Session Classification: FCC-eh

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

Development of the ERL demonstrator PERLE

Session Classification: FCC-eh

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

Global activities on future colliders and ICFA view

Monday, May 29, 2017 6:00 PM (30 minutes)

Primary author: LYKKEN, Joseph David (Fermi National Accelerator Lab. (US))

Presenter: LYKKEN, Joseph David (Fermi National Accelerator Lab. (US))

Session Classification: Plenaries

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

Procedure for the next European particle physics strategy update

Monday, May 29, 2017 6:30 PM (30 minutes)

Primary author: DE JONG, Sijbrand (Radboud University Nijmegen (NL))

Presenters: GIANOTTI, Fabiola (CERN); DE JONG, Sijbrand (Radboud University Nijmegen (NL))

Session Classification: Plenaries

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

CERN accelerator technology roadmap

Monday, May 29, 2017 7:00 PM (30 minutes)

Primary author: BORDRY, Frederick (CERN)

Presenter: BORDRY, Frederick (CERN)

Session Classification: Plenaries

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

XFEL status and activities at DESY

Thursday, June 1, 2017 6:00 PM (30 minutes)

Primary author: WEISE, Hans (DESY)

Presenter: WEISE, Hans (DESY)

Session Classification: Germany specific contributions

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

Status of the FAIR project

Thursday, June 1, 2017 6:30 PM (30 minutes)

Primary author: Prof. BLAUROCK, Jörg (GSI)

Presenter: Prof. BLAUROCK, Jörg (GSI)

Session Classification: Germany specific contributions

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

IPP Stellarator and Tokamak Research and Technology

Thursday, June 1, 2017 7:00 PM (30 minutes)

Primary author: THOMAS, Klinger (MPI for Plasma Physics)

Presenter: THOMAS, Klinger (MPI for Plasma Physics)

Session Classification: Germany specific contributions

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

Highlights of the FCC-hh physics report and recent progress

Wednesday, May 31, 2017 8:30 AM (30 minutes)

Primary author: MANGANO, Michelangelo (CERN)

Presenter: MANGANO, Michelangelo (CERN)

Session Classification: FCC-hh physics

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

Questions from the Review Committee and discussion

Wednesday, May 31, 2017 9:00 AM (1 hour)

Session Classification: FCC-hh physics

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

SppC study progress

Wednesday, May 31, 2017 8:30 AM (25 minutes)

Primary author: TANG, Jingyu (Institute of High Energy Physics, CAS)

Presenter: TANG, Jingyu (Institute of High Energy Physics, CAS)

Session Classification: FCC-hh machine design

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

SppC collimation study

Wednesday, May 31, 2017 8:55 AM (20 minutes)

In LHC, the limiting locations in terms of losses on cold magnets are the dispersion suppressors downstream of the transverse collimation insertion. These losses are due to the protons experiencing single diffractive interactions in the primary collimators. How to solve this problem is very important for future proton-proton collider, such as FCC and SPPC. An effective method which arranges both the transverse and momentum collimation in the same cleaning insertion has been studied at SPPC. The momentum collimation system will clean those particles those protons related to the single diffractive effect. This has been confirmed by multi-particle simulations. In addition, superconducting quadrupoles with special designs such as enlarged aperture and good shielding are being considered to enhance the phase advance in the transverse collimation section, so that tertiary collimators can be arranged to clean off the tertiary halo which emerges from the secondary collimators and improve the collimation efficiency. Multi-particle simulation results with the Merlin code confirm the effectiveness of the method with the additional collimation stage. The particle losses in the warm drifts and the beginning of the momentum collimation insertion are reduced significantly.

Primary author: YANG, Jianquan (Institute of High Energy Physics (CN))

Co-authors: TANG, Jingyu (Institute of High Energy Physics, CAS); ZOU, Ye (Chinese Academy of Sciences (CN))

Presenter: YANG, Jianquan (Institute of High Energy Physics (CN))

Session Classification: FCC-hh machine design

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

Use of electron lenses in FCC-hh

Wednesday, May 31, 2017 9:15 AM (20 minutes)

High intensity and high brightness beams in FCC pose significant challenges due to coherent instabilities and beam collimation. Usual ways to control the instabilities, such as nonlinear octupole magnets, beam feedback dampers, employment of chromatic effects as well as standard types of the "hard-material" collimators become less effective at the ultimate FCC-hh beam paramters. We briefly present two applications electron lenses which utilize space-charge forces of low-energy, magnetically stabilized electron beams: 1) a novel method to provide sufficient Landau damping in the particle beams ; and 2) hollow electron beam collimation. The proposed methods are free of operational limitations, cost effective and show great promise for the FCC-hh.

Primary author: SHILTSEV, Vladimir (Fermilab)

Co-authors: VALISHEV, Alexander (Fermi National Accelerator Lab. (US)); BUROV, Alexey (Fermi National Accelerator Lab. (US)); ALEXAHIN, Yuri (Fermilab)

Presenter: SHILTSEV, Vladimir (Fermilab)

Session Classification: FCC-hh machine design

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

Implications of 5 ns bunch spacing for the injector chain

Wednesday, May 31, 2017 9:35 AM (20 minutes)

Primary author: SHAPOSHNIKOVA, Elena (CERN)

Presenter: SHAPOSHNIKOVA, Elena (CERN)

Session Classification: FCC-hh machine design

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

Correction schemes for the interaction region of FCC-hh

Wednesday, May 31, 2017 10:30 AM (10 minutes)

The interaction region is an important and challenging part of the design of any accelerator. An important aspect of this design is the compensation of the errors in the interaction region, necessary not only to control de orbit deviation but also to ensure the long term stability of the beam. Several errors are expected to be found in the lattice; this study contemplates only errors in the interaction region, particularly alignment and field errors in the quadrupoles of the inner triplet and the separation/recombination dipoles. In order to correct the effects of these errors a correction scheme is used based on a series of correctors arranged along the interaction region and a series of BPMs to monitor the orbit. After the correction procedure we are able to estimate the tolerance on misalignment and field errors in order to provide a good correction measured in terms of deviation of the orbit, strength of the correctors and effects on long term stability via the dynamic aperture.

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

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

Session Classification: FCC-hh machine design

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

Exploring the triplet parameter space to optimise the final focus of the FCC

Wednesday, May 31, 2017 10:40 AM (10 minutes)

One of the main challenges when designing final focus systems of particle accelerators is maximising the beam stay clear in the strong quadrupole magnets of the inner triplet. Moreover it is desirable to keep the quadrupoles in the inner triplet as short as possible for space and costs reasons but also to reduce chromaticity and simplify corrections schemes. An algorithm that explores the triplet parameter space to optimise both these aspects was written. It uses thin lenses as a first approximation and MADX for more precise calculations. In cooperation with radiation studies, this algorithm was then applied to design an alternative triplet for the final focus of the Future Circular Collider.

Primary author: VAN RIESEN-HAUPT, Leon

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

Presenter: VAN RIESEN-HAUPT, Leon

Session Classification: FCC-hh machine design

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

Cross-talk simulations between FCC-hh experimental interaction regions

Wednesday, May 31, 2017 10:50 AM (10 minutes)

Debris from 50 TeV proton-proton collisions at the main interaction point in the FCC-hh may contribute to the background in the subsequent detector. This cross-talk is of possible concern for the FCC-hh due to the high luminosity and energy of the collider. Monte Carlo simulations with FLUKA have been performed using a full length model of the tunnel between the adjacent points A and B, in order to account for the muons which are transported through the rock.

Primary author: RAFIQUE, Haroon (University of Manchester/Cockcroft Institute)

Co-authors: ABELLEIRA, Jose; BESANA, Maria Ilaria (CERN); APPLEBY, Robert Barrie (University of Manchester (GB))

Presenter: RAFIQUE, Haroon (University of Manchester/Cockcroft Institute)

Session Classification: FCC-hh machine design

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

Simulation of the FCC-hh double crystal-based collimation system

Wednesday, May 31, 2017 11:00 AM (10 minutes)

"The FCC-hh collimation system must be designed to prevent quench of superconducting magnets. However, preliminary simulations [1] demonstrate the estimated cleaning inefficiency to be 2 orders less than required. In order to considerably reduce it, we propose a preliminary setup of a double crystal-based collimation system [2].
The main advantage of the double crystal-based collimation, containing two bent crystals instead of one, is additional halo cleaning by deflection of dechanneled/volume reflected particles by the second crystal. On the one hand this allows one to intercept almost 100% of halo particles by only one passage of the collimation zone, considerably reducing inelastic losses in crystal as well as leakage in absorbers. On the other hand the second crystal does not prevent particle interception by the first one, being placed closer to an absorber in the transverse space.
We simulate the collimation system suggested using CRYSTAL software [3] as well as compare its efficiency with single crystal-based collimation. We optimize the crystal parameters to maximize the collimation efficiency.
We acknowledge the CINECA award under the ISCRA initiative for the availability of high performance computing resources and support.

1. J. Molson et al. Proc. of IPAC'16, Busan, Korea (2016) p. 1381-1383.
2. A. Lobko, V. Tikhomirov, A. Sytov. Abstr. of the FCC Week 2016, contribution ID: 125.
3. A. I. Sytov, V. V. Tikhomirov, Nucl. Instr. and Meth. in Phys. Res. B 355 (2015) 383–386."

Primary author: SYTOV, Alexei (Universita di Ferrara & INFN (IT))

Co-authors: LOBKO, Alexander (Byelorussian State University (BY)); TIKHOMIROV, Viktor (Byelorussian State University (BY))

Presenter: SYTOV, Alexei (Universita di Ferrara & INFN (IT))

Session Classification: FCC-hh machine design

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

Dispersion suppressor protection

Wednesday, May 31, 2017 11:10 AM (10 minutes)

The superconducting magnets in the Dispersion suppressors at the end of the straight sections are the main location for beam losses in cold magnets in the LHC. For the FCC this poses a problem due to the much higher beam energies. The losses in these regions mainly come from off-momentum particles due to proton-proton collisions in the experimental areas, and single-diffractive effects from interaction with primary collimators in the cleaning insertions. To protect those magnets and to ensure safe operation of the machine, a new protection system is necessary.
The requirements for the beam optics have been assessed and suitable space has been integrated in the current lattice to allow the placement of the protection system.
A collimation system has been designed and optimized with respect to energy deposition in the magnets due to particle showers from the collimators.
Tracking simulations, using the MERLIN tracking code, have been done to ensure that the new system is effective in catching the off-momentum losses. Shower simulations have been done using the FLUKA code to assess the energy deposition in the downstream magnets and compare it to quench limits.

Primary author: Mr KRAINER, Alexander (CERN)

Co-authors: LANGNER, Andy Sven (CERN); LECHNER, Anton (CERN); SCHULTE, Daniel (CERN); CERUTTI, Francesco (CERN); RAFIQUE, Haroon (University of Manchester/Cockcroft Institute); Dr MOLSON, James (Universite de Paris-Sud 11 (FR)); FIASCARIS, Maria (CERN); BESANA, Maria Ilaria (CERN); BRUCE, Roderik (CERN)

Presenter: Mr KRAINER, Alexander (CERN)

Session Classification: FCC-hh machine design

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

Alignment and beam-based correction

Wednesday, May 31, 2017 11:20 AM (10 minutes)

The FCC-hh (Future Hadron-Hadron Circular Collider) is one of the three 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. Studies are ongoing about the evaluation of the various magnets mechanical errors and field errors tolerances in the arc sections of FCC-hh, as well as an estimation of the associated correctors strengths.

In this study an exploration of the possible tolerances is presented, the eventual impact on the correctors technological choice and on the beam screen design are discussed. A comparison with the LHC correction scheme is performed. Also the integration of the insertion regions (interaction region, collimation, etc) into the global correction scheme has been started and is discussed.

Primary author: BOUTIN, David Jean Henri (CEA)

Co-authors: Dr CHANCE, Antoine (CEA Irfu); DALENA, Barbara (CEA/IRFU,Centre d'etude de Saclay Gif-sur-Yvette (FR)); HOLZER, Bernhard (CERN); SCHULTE, Daniel (CERN)

Presenter: BOUTIN, David Jean Henri (CEA)

Session Classification: FCC-hh machine design

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

Importance of the surface resistivity for the impedance model

Wednesday, May 31, 2017 11:30 AM (10 minutes)

Transverse mode coupling instability (TMCI) can limit the maximum achievable bunch intensity in the FCC-hh. Impedance due to the resistive walls of the beamscreen makes a significant contribution to the TMCI, especially at the injection energy. The proposed laser treatment of the beamscreen surface for e-cloud mitigation might increase the impedance to a level unacceptable from the beam stability point of view.

We applied two models to estimate the impedance of a rough surface such as the one produced by the laser. Both models indicate that the TMCI intensity threshold due to the beamscreen alone can decrease by several times, placing serious limitations to the total area that can be treated without sacrificing beam stability. However, actual measurements of the impedance of the treated beamscreen are necessary to draw definite conclusions. We thus argue that such measurements are of critical importance for the FCC-hh.

Primary author: ARSENYEV, Sergey (CERN)

Co-author: SCHULTE, Daniel (CERN)

Presenter: ARSENYEV, Sergey (CERN)

Session Classification: FCC-hh machine design

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

Landau damping of intra-bunch oscillations

Wednesday, May 31, 2017 11:40 AM (10 minutes)

Octupole magnets are foreseen in the FCC-hh lattice as a passive mitigation of the transverse collective instabilities. The incoherent betatron tune spread due to octupoles provides Landau damping of the unstable bunch modes. The previous studies for FCC, and estimations for LHC, have considered only the rigid bunch modes. The higher-order modes cause intra-bunch oscillations, which are differently affected by a tune spread . We study the Landau damping of the higher-order bunch modes due to octupoles using the modified dispersion relation and the particle tracking simulations. For a comparison, Landau damping due RF Quadrupoles is considered.

Primary author: KORNILOV, Vladimir (GSI - Helmholtzzentrum fur Schwerionenforschung GmbH (DE))

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

Presenter: KORNILOV, Vladimir (GSI - Helmholtzzentrum fur Schwerionenforschung GmbH (DE))

Session Classification: FCC-hh machine design

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

FCC-hh electron cloud

Wednesday, May 31, 2017 11:50 AM (10 minutes)

Primary author: METHER, Lotta (Ecole Polytechnique Federale de Lausanne (CH))

Presenter: METHER, Lotta (Ecole Polytechnique Federale de Lausanne (CH))

Session Classification: FCC-hh machine design

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

Learning accelerator science and technology : the Joint Universities Accelerator School (JUAS)

Tuesday, May 30, 2017 6:00 PM (20 minutes)

Primary author: LEBRUN, Philippe (European Scientific Institute (FR))

Presenter: LEBRUN, Philippe (European Scientific Institute (FR))

Session Classification: Opportunities for Students

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

EASItrain

Tuesday, May 30, 2017 5:30 PM (30 minutes)

European Advanced Superconductivity Innovation and Training project (EASItrain)

Primary author: GUTLEBER, Johannes (CERN)

Presenter: GUTLEBER, Johannes (CERN)

Session Classification: Opportunities for Students

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

Opening address

Monday, May 29, 2017 8:45 AM (5 minutes)

Primary author: HEUER, Rolf (Deutsches Elektronen-Synchrotron (DE))

Presenter: HEUER, Rolf (Deutsches Elektronen-Synchrotron (DE))

Session Classification: Plenaries

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

Opening address

Monday, May 29, 2017 8:50 AM (5 minutes)

Primary author: GIANOTTI, Fabiola (CERN)

Presenter: GIANOTTI, Fabiola (CERN)

Session Classification: Plenaries

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

Status of optics

Wednesday, May 31, 2017 8:30 AM (25 minutes)

Primary author: OIDE, Katsunobu (High Energy Accelerator Research Organization (JP))

Presenter: OIDE, Katsunobu (High Energy Accelerator Research Organization (JP))

Session Classification: FCC-ee

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

Overview of optics tuning results and tolerances

Wednesday, May 31, 2017 8:55 AM (25 minutes)

"The FCC-ee project foresees to build a 100 km e+/e- circular collider for precision studies and rare decay observations in the range of 90 to 350 GeV center of mass energy with luminosities in the order of 10^35 cm^-2s^-1. In
order to reach such performances, an extrem focusing of the beam is required in the interaction regions with a low vertical beta function of 2mm at the IP.
Moreover, the FCC-ee physics program requires also very low emittance never achieved in a collider with 1nm for eps_x and 2pm for eps_y, bringing down the coupling ratio to 2/1000. In order to reach such performances, coupling and vertical dispersion sources should be under control.
This paper describes the low tolerance of the machine to magnet alignment errors and the optics correction methods that were implemented in order to bring the vertical dispersion to reasonable values. The betatron coupling being 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."

Primary author: AUMON, Sandra (CERN)

Co-author: HOLZER, Bernhard (CERN)

Presenter: AUMON, Sandra (CERN)

Session Classification: FCC-ee

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

Beam instrumentation for FCC-ee

Primary author: SCHMICKLER, Hermann (CERN)

Presenter: SCHMICKLER, Hermann (CERN)

Session Classification: FCC-ee

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

Emittance measurement using X-ray interferomter and proposal for test in Australian Synchrotron

Wednesday, May 31, 2017 9:20 AM (20 minutes)

For a demonstration of the performance of the X-ray interferometer, we propose a test at the long-range Imaging and Medical Beamline (IMBL) at the Australian Synchrotron. The Australian Synchrotron is a SR facility in the Australia, and it has a remarkable long range beamline for medical imaging. We can construct a Young's type double slit interferometer in this beam line which will be similar to the design proposed for the FCC-ee SR monitor. A visible light SR interferometer on the neighbouring Optical Diagnostic Beamline (ODB) will be used as the gold standard for cross checking the performance of the novel x-ray interferometer. These measurements will be tested in the vertical plane due to the exceptionally small vertical beam size that can be achieved in the Australian Synchrotron storage ring.

Primary author: MITSUHASHI, Toshiyuki (KEK)

Co-authors: ZIMMERMANN, Frank (CERN); OIDE, Katsunobu (High Energy Accelerator Research Organization (JP)); BOLAND, Mark (Australian Synchrotron)

Presenter: MITSUHASHI, Toshiyuki (KEK)

Session Classification: FCC-ee

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

MDI status and overview

Wednesday, May 31, 2017 10:30 AM (25 minutes)

The wide range of beam energies of the FCC-ee accelerator presents unique challenges to the interaction region. The lowest beam energy is 45.6 GeV (Z running) and the highest beam energy is 175 GeV ($t\bar{t}$ running). The lowest beam energy machine will have 1.45 A of beam current while the highest beam energy machine will have 6.6 mA. We present an update of the IR design with emphasis on the acceptance for the high-precision luminosity detector and on synchrotron radiation background studies.

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

Co-authors: KOLANO, Anna Maria (CERN); BURKHARDT, Helmut (CERN)

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

Session Classification: FCC-ee

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

MDI: synchrotron radiation protection

Wednesday, May 31, 2017 10:55 AM (20 minutes)

Primary author: SULLIVAN, Michael Kenneth (SLAC National Accelerator Laboratory (US))

Presenter: SULLIVAN, Michael Kenneth (SLAC National Accelerator Laboratory (US))

Session Classification: FCC-ee

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

MDI: trapped modes and other power losses

Wednesday, May 31, 2017 11:15 AM (20 minutes)

We discuss the problem of the Higher Order Modes heating in the Interaction Region of FFC ee. High current beams excite high frequency modes in IR due to very complicated geometry. We analyze the effect of geometrical transitions in IR on the excitation of HOMs. We suggest using a special water-cooled HOM absorber to capture the HOM power.

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

Co-author: BELLI, Eleonora (Sapienza Universita e INFN, Roma I (IT))

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

Session Classification: FCC-ee

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

Solenoid copensation scheme & final quadrupole

Wednesday, May 31, 2017 11:35 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

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

Overview of energy calibration

Wednesday, May 31, 2017 1:30 PM (20 minutes)

Presenter: BLONDEL, Alain (Universite de Geneve (CH))

Session Classification: FCC-ee

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

Transverse polarization

Wednesday, May 31, 2017 1:50 PM (20 minutes)

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

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

Session Classification: FCC-ee

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

Resonant depolarization process and systematic errors

Wednesday, May 31, 2017 2:10 PM (20 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

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

Polarimeter design

Wednesday, May 31, 2017 2:30 PM (20 minutes)

Primary author: WENNINGER, Jorg (CERN)

Presenter: WENNINGER, Jorg (CERN)

Session Classification: FCC-ee

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

Beam-beam overview

Wednesday, May 31, 2017 3:30 PM (25 minutes)

Primary author: SHATILOV, Dmitry (Budker Institute of Nuclear Physics (RU))

Presenter: SHATILOV, Dmitry (Budker Institute of Nuclear Physics (RU))

Session Classification: FCC-ee

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

Impedance model and collective effects for FCC-ee

Wednesday, May 31, 2017 3:55 PM (20 minutes)

FCC-ee is an e+e- circular collider designed to accelerate and collide counter-propagating beams of electrons and positrons. One of the fundamental aspects to be addressed in the design phase is the intensity limitation due to collective effects and the impedance budget. The machine design must be such that the global machine impedance as well as individual equipment do not pose any limits for nominal operation to reach the required machine perfomance.
Although this collider will operate at room temperature, as in the case of other lepton colliders, the heat load in specific machine locations could still represent one of the major issues for the operation with nominal parameters. In particular, we will analyze the electron cloud induced heat load in both the arc components and interaction region magnets.
Besides, preliminary studies on transverse and longitudinal instabilities due to resistive wall and other vacuum chamber components will be also presented, which will help to provide specifications on the coating compatible with the nominal operation and a possible way to reduce the beam coupling impedance.

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

Co-authors: SPATARO, Bruno (Istituto Nazionale Fisica Nucleare (IT)); CASTORINA, Giovanni (INFN-LNF (IT)); RUMOLO, Giovanni (CERN); MIGLIORATI, Mauro (Sapienza Universita e INFN, Roma I (IT)); ZOBOV, Mikhail (INFN LNF); PERSICHELLI, Serena (LBNL (US))

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

Session Classification: FCC-ee

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

Transient beam loading

Wednesday, May 31, 2017 4:15 PM (20 minutes)

In a storage ring, interaction between the fundamental impedance of the accelerating cavities and the beam determines such important longitudinal properties as bunch length, synchronous phase, synchrotron frequency, and others. This interaction is especially important in machines with large circumference and high stored beam current. In this work, steady-state beam loading effects will be estimated for the FCC-ee parameters. Several techniques for managing these effects will also be discussed. These techniques will be illustrated with the simulation examples as well as the measurements from the existing machines.

Primary author: TEYTELMAN, Dmitry (Dimtel, Inc.)

Presenter: TEYTELMAN, Dmitry (Dimtel, Inc.)

Session Classification: FCC-ee

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

Top-up injection scheme

Wednesday, May 31, 2017 4:35 PM (20 minutes)

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

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

Session Classification: FCC-ee

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

Beam-beam simulations update

Thursday, June 1, 2017 8:30 AM (20 minutes)

Primary author: OHMI, kazuhito (KEK)

Presenter: OHMI, kazuhito (KEK)

Session Classification: FCC-ee

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

Beam losses from beamstrahlung and radiative bhabha

Thursday, June 1, 2017 8:50 AM (20 minutes)

Primary author: EL KHECHEN, Dima (CERN)

Presenter: EL KHECHEN, Dima (CERN)

Session Classification: FCC-ee

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

Accelerating and injecting polarized beams

Thursday, June 1, 2017 9:10 AM (20 minutes)

Primary author: KOOP, Ivan (Budker Institute of Nuclear Physics (RU))

Presenter: KOOP, Ivan (Budker Institute of Nuclear Physics (RU))

Session Classification: FCC-ee

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

CEPC Overall Design related to Accelerator Physics

Thursday, June 1, 2017 9:30 AM (20 minutes)

The baseline of CEPC is a double ring configuration with the circumference of 100km. The booster has the same circumference as main collider ring in the same tunnel with injection energy of 10GeV. The exit energy of the LINAC for electron and positron is 10GeV. The Overall design of CEPC related to accelerator physics will be described in detail.

Primary author: YU, Chenghui (Institute of High Energy Physics (CN))

Co-authors: YU, Chenghui (IHEP (CN)); ZHANG, Chuang (IHEP (CN)); Dr WANG, DOU (IHEP); ZHENG, Hongjuan (IHEP); GENG, Huiping (IHEP (CN)); GAO, Jie (IHEP (CN)); ZHAI, Jiyuan (IHEP); GE, Rui (IHEP (CN)); BAI, Sha (IHEP (CN)); BIAN, Tianjian (IHEP (CN)); CUI, Xiaohao (IHEP (CN)); ZHU, Yingshun (Institute of High Energy Physics,Chinese Academy of Sciences); WANG, Yiwei; ZHANG, Yuan (IHEP (CN))

Presenter: YU, Chenghui (Institute of High Energy Physics (CN))

Session Classification: FCC-ee

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

Overview of injector complex

Thursday, June 1, 2017 10:30 AM (20 minutes)

Primary author: SEEMAN, John (SLAC)

Presenter: SEEMAN, John (SLAC)

Session Classification: FCC-ee

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

Linac and damping ring

Thursday, June 1, 2017 10:50 AM (20 minutes)

Primary author: OGUR, Salim (CERN)

Presenter: OGUR, Salim (CERN)

Session Classification: FCC-ee

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

e+ system

Thursday, June 1, 2017 11:10 AM (15 minutes)

Primary author: CHAIKOVSKA, Iryna (Universite de Paris-Sud 11 (FR))

Presenter: CHAIKOVSKA, Iryna (Universite de Paris-Sud 11 (FR))

Session Classification: FCC-ee

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

Prebooster ring

Thursday, June 1, 2017 11:25 AM (15 minutes)

The FCC-e+e- injector complex needs to produce and to transport a high-intensity e+/e- beam at a fast repetition rate of about 0.1 Hz for topping up the collider at its collision energy. A basic parameter set exists for all the collider energies, assuming a 10 GeV linac operating with a large number of bunches being accumulated in the existing SPS, which serves as pre-accelerator and damping ring before the bunches are transferred to the high-energy booster. The purpose of this study is to provide the conceptual design of an alternative accelerator ring, replacing the SPS in the present scheme. This ring will have injection energy of around 5 GeV and extraction energy of around 20 GeV. Apart from establishing the basic parameters of the ring, the study work will include the optics design and layout, single particle linear and non-linear dynamics optimization, including magnetic and alignment error tolerances. The study will also contain some basic estimation of collective effects and address the issue of synchrotron radiation handling.

Primary author: ETISKEN, Ozgur

Co-authors: CIFTCI, Abbas Kenan (Ankara University (TR)); PAPAPHILIPPOU, Yannis (CERN)

Presenter: ETISKEN, Ozgur

Session Classification: FCC-ee

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

Booster ring

Thursday, June 1, 2017 11:40 AM (15 minutes)

The beam lifetime at FCC-ee will be limited to less than one hour, because of radiative Bhaba scattering and beamstrahlung. In order to keep the luminosity on the high level of 10^35 cm^-2s^-1 continuous top-up injection is required. Therefore, besides the collider, that will operate at constant energy, a fast cycling booster synchrotron will be installed in the same tunnel.
The injection energy to the booster synchrotron will be around 6-20\,GeV. Such small energies together with the large bending radius not only create an ultra-small beam emittances, but also requires very low magnetic fields close to the limit of technical feasibility.
While the main challenge for the injector chain is the production of the high currents up to 1.45 A for operation at the Z threshold at 45.6 GeV the booster must provide stable beam dynamics for a large range of beam energies in a range from 6 GeV to 175 GeV.
This paper will focus on the challenges and requirements for the top-up booster design arising from low magnetic fields and collective instabilities and present the status of the lattice design.

Primary author: HARER, Bastian (CERN)

Co-authors: HOLZER, Bernhard (CERN); OIDE, Katsunobu (High Energy Accelerator Research Organization (JP)); TYDECKS, Tobias (CERN); PAPAPHILIPPOU, Yannis (CERN)

Presenter: HARER, Bastian (CERN)

Session Classification: FCC-ee

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

Baseline parameters

Thursday, June 1, 2017 3:30 PM (15 minutes)

Primary author: ZIMMERMANN, Frank (CERN)

Presenter: ZIMMERMANN, Frank (CERN)

Session Classification: HE-LHC design

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

Optics development for HE-LHC

Thursday, June 1, 2017 3:45 PM (20 minutes)

The High Energy LHC (HE-LHC) proton-proton collider is one of the options being explored in the framework of the Future Circular Collider (FCC) study. The design of the HE-LHC is based on the existing 27-km LHC tunnel with the goal of reaching a centre-of-mass beam energy of about 25 TeV at a peak luminosity of a least 2.5×10^35 (1/cm^2/s). The HE-LHC requires novel dipole magnets, based on Nb3Sn superconductor, with a field of 16 T, about a factor of two higher than for the present LHC dipoles made from Nb-Ti. Such 16 T magnets are also under development for a proposed 100-km 100 TeV collider ("FCC-hh"). A major concern for HE-LHC is the dynamic aperture at injection energy, in view of possibly degraded field quality for the new superconductor, the potentially large energy swing between injection and top energy, and the (slightly) reduced aperture of the magnet cold bore. Another consideration is the required maximum field in quadrupoles, sextupoles and other magnets, for which it may be cost-effective, wherever possible, to stay with Nb-Ti technology. The goal of this study is to design a possible HE-LHC injection lattice that fits the present LHC geometry, provides sufficient dynamic aperture in presence of large non-linear field errors in the dipoles, and minimizes the required field in quadrupoles and sextupoles. The initial design and the results of dynamic aperture calculations with dipole systematic field errors are presented.

Primary author: NOSOCHKOV, Yuri

Co-authors: TODESCO, Ezio (CERN); ZIMMERMANN, Frank (CERN); GIOVANNOZZI, Massimo (CERN); RISSELADA, Thys

Presenter: NOSOCHKOV, Yuri

Session Classification: HE-LHC design

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

HE-LHC Triplet

Thursday, June 1, 2017 4:05 PM (20 minutes)

Primary author: VAN RIESEN-HAUPT, Leon

Presenter: VAN RIESEN-HAUPT, Leon

Session Classification: HE-LHC design

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

Nonlinear analysis and dynamic aperture

Thursday, June 1, 2017 4:25 PM (15 minutes)

The talk presents the preliminary results on nonlinear analysis using PTC code, and dynamic aperture calculations using SAD code. Several optics based on different design schemes for HE-LHC will be addressed.

Primary author: ZHOU, Demin (Japan Atomic Energy Agency JAEA (JP))

Presenter: ZHOU, Demin (Japan Atomic Energy Agency JAEA (JP))

Session Classification: HE-LHC design

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

HE-LHC synchrotron radiation photon flux

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

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

Session Classification: HE-LHC design

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

HE-LHC photon flux & electron cloud

Thursday, June 1, 2017 4:40 PM (20 minutes)

Primary author: METHER, Lotta (Ecole Polytechnique Federale de Lausanne (CH))

Presenter: METHER, Lotta (Ecole Polytechnique Federale de Lausanne (CH))

Session Classification: HE-LHC design

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

The CERN FCC Conductor Development Program

Tuesday, May 30, 2017 8:30 AM (10 minutes)

Primary author: BALLARINO, Amalia (CERN)

Presenter: BALLARINO, Amalia (CERN)

Session Classification: Conductor

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

FCC Conductor Development at Bruker EAS

Tuesday, May 30, 2017 8:40 AM (20 minutes)

Primary author: SCHLENGA, Klaus (Bruker EST)

Presenter: SCHLENGA, Klaus (Bruker EST)

Session Classification: Conductor

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

FCC Conductor Development in Japan

Tuesday, May 30, 2017 9:00 AM (20 minutes)

A high Jc Nb3Sn conductor development program has been launched jointly by CERN, KEK, Tohoku and Tokai Universities. The scope of the program is to develop, produce in representative lengths and characterize Nb3Sn wire 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 non-copper critical current density at 4.2 K and 16 T (Jc(4.2 K, 16 T)) of at least 1500 A/mm2;
A wire diameter of not more than 1 mm;
A fraction of stabilizer to superconductor in the wire of at least 1;
An equivalent diameter of the superconducting Nb3Sn filaments of less than 50 m;
A low electrical resistivity of the copper stabilizer of the wire, i.e. a Residual Resistivity Ratio (RRR) of the copper after wire reaction of above 150.
First R&D conductor has been ordered to a Japanese company and the second order will be placed in April 2017. The performaces of those conductor will be reported in the presentation.

Primary author: OGITSU, Toru

Co-authors: SUGANO, Michinaka; NAKAMOTO, Tatsushi

Presenter: OGITSU, Toru

Session Classification: Conductor

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

FCC Conductor Development at KAT-Korea

Tuesday, May 30, 2017 9:20 AM (20 minutes)

Primary author: Dr KIM, Jiman (Kiswire Advanced Technology(KAT))

Co-author: Mr YOON, soobok (KAT)

Presenter: Dr KIM, Jiman (Kiswire Advanced Technology(KAT))

Session Classification: Conductor

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

FCC Conductor Development in Russia

Tuesday, May 30, 2017 9:40 AM (20 minutes)

Primary author: PANTSYRNY, Victor (Bochvqr Institute)

Presenter: PANTSYRNY, Victor (Bochvqr Institute)

Session Classification: Conductor

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

PIT and RRP for HL-LHC: state of the art performance

Tuesday, May 30, 2017 10:30 AM (30 minutes)

Primary author: BORDINI, Bernardo (CERN)

Presenter: BORDINI, Bernardo (CERN)

Session Classification: Conductor

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

Maximum potential for PIT and RRP

Tuesday, May 30, 2017 11:20 AM (20 minutes)

Primary author: LEE, Peter (Florida State University)

Presenter: LEE, Peter (Florida State University)

Session Classification: Conductor

Contribution ID: **204** Type: **not specified**

Development of APC (ZrO2) Nb3Sn multifilamentary and ternary conductor for FCC applications

Tuesday, May 30, 2017 11:40 AM (20 minutes)

In this work we pursue the development of high-Jc multifilamentary (Nb,Ti)3Sn wire containing ZrO2 APCs. Previously, 61-filament powder-in-tube (PIT) APC Nb3Sn binary conductors were demonstrated. These conductors showed very high pinning strength and high layer Jcs at 12 and 15 T (a layer Jc double the best RRP wires). However, the wires had low A15 layer conversion fractions, because the designs were not optimized. Additionally, they were binary, and thus not optimized for the highest fields. Here, new 61 subelement binary designs were made to achieve higher Sn/Nb ratios, leading to conductors with larger A15 conversion factors; these results are discussed. Next, we performed some initial work in order to develop a ternary wire. In this experiment, an externally oxidized tube-type wire was manufactured, starting from a precursor of Cu-Sn-Ti rod in a Nb-1%Zr tube. Samples were heat-treated in a vacuum sealed quartz tube with CuO present. Heat treatment schedules included 20℃/h up to 650℃ for 300h, and 20℃/h up to 700℃ for 100h. Grain refinement (about 35nm) was observed due to the internal oxidation process, and Ti was observed within A15 layer, demonstrating a simple ternary APC route. Subsequently, a modified restack was manufactured with internal oxide and Ti sources. Heat treatment times and schedules were optimized for oxygen diffusion and phase formation. Refined grain sizes and Ti inclusion are also detailed for this ternary option. The SEM, magnetic, and transport results are presented for these conductors.

Primary author: SUMPTION, Mike (The Ohio State University)

Presenter: SUMPTION, Mike (The Ohio State University)

Session Classification: Conductor

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

R&D on Nb3Sn at Fermilab

Tuesday, May 30, 2017 1:30 PM (20 minutes)

Fermilab is collaborating with industry and other labs and universities on superconducting (SC) wire and cable R&D, with the goal of improving key properties and providing conductor specifications and data for design and construction of SC accelerator magnets for a future very high energy pp collider. SC wire R&D focused first on optimizing the geometrical and chemical layout of Restacked-Rod Process conductor by Bruker OST. Then, efforts were intensified on research to improve Nb3Sn inherent flux pinning by producing artificial pinning centers in the Nb3Sn phase, which refines grain size to 30 nm. In parallel, FNAL is collaborating with a number of companies to develop Nb3Sn wires with increased specific heat to improve conductor stability and reduce sensitivity to external perturbations. Rutherford cable development includes heat treatment studies to boost performance of existing cables, and innovative design ideas for larger cables, which are preferred for 16 T magnets with appropriate operational margin. This presentation will give an overview of the various SC R&D activities at Fermilab and their associated results.

Presenter: ZLOBIN, Alexander (Fermilab)

Session Classification: Conductor

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

High Field potentials of MgB2 and Iron based super conductors

Tuesday, May 30, 2017 1:50 PM (30 minutes)

Primary author: PUTTI, Marina (University of Genova)

Presenter: PUTTI, Marina (University of Genova)

Session Classification: Conductor

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

REBCO and Bi-2212

Tuesday, May 30, 2017 2:20 PM (30 minutes)

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

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

Session Classification: Conductor

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

Effect of transverse pressure on Nb3Sn cables

Tuesday, May 30, 2017 3:30 PM (20 minutes)

Presenter: BORDINI, Bernardo (CERN)

Session Classification: Conductor

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

Effect of transverse pressure on Nb3Sn wires

Tuesday, May 30, 2017 3:50 PM (20 minutes)

Primary author: SENATORE, Carmine

Presenter: SENATORE, Carmine

Session Classification: Conductor

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

Effect of stress in Nb3Sn magnets

Tuesday, May 30, 2017 4:10 PM (20 minutes)

Primary author: BARZI, emanuela (Fermilab)

Presenter: BARZI, emanuela (Fermilab)

Session Classification: Conductor

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

Baseline parameters

Wednesday, May 31, 2017 8:30 AM (10 minutes)

Primary author: TOMMASINI, Davide (CERN)

Presenter: TOMMASINI, Davide (CERN)

Session Classification: 16 Tesla magnet

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

Electromagnetic design of the block coil option

Wednesday, May 31, 2017 8:40 AM (20 minutes)

In the framework of the EuroCirCol project the high field accelerator magnet design work package 5 focuses on double-aperture dipole magnets made of Nb3Sn conductors and providing a field of 16 T in a 50-mm aperture. Three options are considered: block-coils, common-coils and cosine-¬theta, the workload being shared between several European institutes. All options are explored and compared based on the same assumptions, in particular in what regards the conductor performance, operating temperature and margin. We will describe in this presentation the status of the block-coil design. A 2D electromechanical analysis in a double aperture configuration is presented as well as a 3D investigation in a single aperture configuration.

Primary author: LORIN, Clement (CEA/IRFU,Centre d'etude de Saclay Gif-sur-Yvette (FR))

Co-authors: DURANTE, Maria (CEA/IRFU,Centre d'etude de Saclay Gif-sur-Yvette (FR)); SEGRETI, Michel (CEA/Saclay)

Presenter: LORIN, Clement (CEA/IRFU,Centre d'etude de Saclay Gif-sur-Yvette (FR))

Session Classification: 16 Tesla magnet

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

Electromagnetic design of the common-coils option

Wednesday, May 31, 2017 9:00 AM (20 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: 16 Tesla magnet

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

Electromagnetic design of the cosθ option

Wednesday, May 31, 2017 9:20 AM (20 minutes)

In the framework of H2020, the EuroCirCol program has the outcome of producing a conceptual design of the FCC within 2019. One of the main targets is designing a superconducting magnetic dipole able to reach 16 T, in order to bend the beams within energy and size constraints. This magnetic field can be achieved using Nb3Sn conductors at their highest performances.
Here we present the 2D magnetic conceptual design and the quench protection of the costheta dipole configuration. The work shows that it is possible to design a magnet able to produce 16 T with accelerator field quality, working at 86% of the load-line at a temperature of 1.9 K, using a reasonable amount of conductor. Moreover, it is possible to keep the temperature below 350 K with realistic assumptions on the quench protection system.

Primary author: MARINOZZI, Vittorio (University of Milan / INFN)

Co-authors: RICCI, Alessandro (INFN Genova); CAIFFI, Barbara (INFN Genova); FABBRICATORE, Pasquale (INFN e Universita Genova (IT)); FARINON, Stefania (INFN e Universita Genova (IT)); BELLOMO, giovanni; SORBI, massimo (Milan University & INFN-LASA)

Presenter: MARINOZZI, Vittorio (University of Milan / INFN)

Session Classification: 16 Tesla magnet

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

Electromagnetic design of the FCC main quadrupoles

Wednesday, May 31, 2017 9:40 AM (20 minutes)

Primary author: LORIN, Clement (CEA/IRFU,Centre d'etude de Saclay Gif-sur-Yvette (FR))

Presenter: LORIN, Clement (CEA/IRFU,Centre d'etude de Saclay Gif-sur-Yvette (FR))

Session Classification: 16 Tesla magnet

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

Mechanical design of the block coil option

Wednesday, May 31, 2017 10:30 AM (20 minutes)

Primary author: LORIN, Clement (CEA/IRFU,Centre d'etude de Saclay Gif-sur-Yvette (FR))

Presenter: LORIN, Clement (CEA/IRFU,Centre d'etude de Saclay Gif-sur-Yvette (FR))

Session Classification: 16 Tesla magnet

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

Mechanical design of the common-coils option

Wednesday, May 31, 2017 10:50 AM (20 minutes)

Presenter: MUNILLA LOPEZ, Javier (CIEMAT)

Session Classification: 16 Tesla magnet

Contribution ID: **218** Type: **not specified**

Mechanical design of the cosθ option

Wednesday, May 31, 2017 11:10 AM (20 minutes)

In the framework of H2020, the EuroCirCol project has the outcome of producing a conceptual design of the Future Circular Collider within 2019. One of the main targets is designing a superconducting magnetic dipole able to reach 16 T, in order to bend the beams within energy and size constraints. This magnetic field can be achieved using Nb3Sn conductors at their highest performances.
The present contribution deals with 2D mechanical studies aimed at designing a suitable support structure for the cosθ dipole option. Both the single aperture and the double aperture configurations are taken into consideration. Promising solutions have been found, based on the rather new bladders and keys system. These solutions are able to guarantee acceptable pre-stress to the 16 T magnet, even considering the huge Lorentz forces. Such solutions fulfill also the goal of keeping the stress on the superconducting cables below 150 MPa at room temperature and below 200 MPa at 4 K. Potentially dangerous detachment of the coil from the inner pole are also avoided. Also the stress induced in the supporting materials (i.e. austenitic steel for the collar, electrical steel for the yoke and titanium for the inner pole) are kept below each corresponding yield limits.

Primary author: CAIFFI, Barbara (INFN Genova)

Co-authors: RICCI, Alessandro (INFN Genova); FABBRICATORE, Pasquale (INFN e Universita Genova (IT)); FARINON, Stefania (INFN e Universita Genova (IT)); MARINOZZI, Vittorio (University of Milan / INFN); BELLOMO, giovanni; SORBI, massimo (Milan University & INFN-LASA)

Presenter: CAIFFI, Barbara (INFN Genova)

Session Classification: 16 Tesla magnet

Contribution ID: **219** Type: **not specified**

Protection of the 16 T EuroCircol dipoles

Wednesday, May 31, 2017 11:30 AM (20 minutes)

As a part of the Future Circular Collider (FCC) project, the European Circular Energy-Frontier Collider Study (EuroCirCol) is aiming to design a 16 T Nb3Sn accelerator dipole magnet that could be used in a 100 km 100 TeV hadron collider. In addition to provide the required magnetic field, the design aims for a compact and cost-effective magnet. To select the most suitable cross-section type, three options are being explored and compared: Cosθ, Block, Common-Coil. The pursuit for compactness leads to higher energy density magnets, which are more challenging to protect against the effects of quench. The requirements from magnet protection have been considered throughout the magnet design phase. In this paper we present a quench protection system design for all the three magnets, and compare the magnets from the point of view of performance and technical realization of the quench protection system. The magnet protection design is based on a hybrid system including the Coupling Loss Induced Quench system (CLIQ) and quench heaters. The configurations of CLIQ and heaters are designed to complement each other in an optimal way, including the redundancy.

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

Co-authors: STENVALL, Antti Aleksis; VERWEIJ, Arjan (CERN); AUCHMANN, Bernhard (CERN); Dr RAVAIOLI, Emmanuele (LBNL); PRIOLI, Marco (CERN)

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

Session Classification: 16 Tesla magnet

Contribution ID: **220** Type: **not specified**

Design of ERMC-RMM

Wednesday, May 31, 2017 1:50 PM (20 minutes)

The Racetrack Model Magnet (RMM) and the Enhanced Racetrack Model Coil (ERMC), are racetrack test magnets being developed at CERN. Their main goal is to demonstrate, in view of future high field accelerator magnets, that a nominal field of 16 T can be reached in a 50 mm bore, with margins and limited training. Also, this program gives the opportunity of studying field quality, and the opportunity of exploring coil manufacturing concepts as well as loading strategies. In the coil ends, the peak field has to be reduced in order to keep a safe margin. Also, the high longitudinal Lorentz forces must be managed to limit the motion of the coils, which would degrade performances. This presentation shows magnetic and mechanical studies, and proposes solutions to achieve a peak field in the ends lower than in the straight section, while containing the electromagnetic forces.

Primary author: ROCHEPAULT, Etienne (CERN)

Co-authors: SCHOERLING, Daniel (CERN); TOMMASINI, Davide (CERN); PEREZ, Juan Carlos (CERN); ORTWEIN, Rafal (CERN); IZQUIERDO BERMUDEZ, Susana (CERN)

Presenter: ROCHEPAULT, Etienne (CERN)

Session Classification: 16 Tesla magnet

Contribution ID: **221** Type: **not specified**

Status of ERMC-RMM

Wednesday, May 31, 2017 1:30 PM (20 minutes)

Primary author: IZQUIERDO BERMUDEZ, Susana (CERN)

Presenter: IZQUIERDO BERMUDEZ, Susana (CERN)

Session Classification: 16 Tesla magnet

Contribution ID: **222** Type: **not specified**

Status of the wound conductor task

Wednesday, May 31, 2017 2:10 PM (20 minutes)

Primary author: LACKNER, Friedrich (CERN)

Presenter: LACKNER, Friedrich (CERN)

Session Classification: 16 Tesla magnet

Contribution ID: **223** Type: **not specified**

A canted cosθ option for the FCC

Wednesday, May 31, 2017 2:30 PM (20 minutes)

The CCT (Canted Cosine Theta) Technology has been studied for its suitability for an FCC main dipole in terms of magnetic and mechanical performance, electro-thermal protectability, as well as efficiency. In this paper we present lessons learnt from our search for efficient CCT solutions by means of 2-D magnetic and mechanical simulations, discuss the 3-D periodic mechanical model, as well as 3-D electromagnetic analysis of the end regions. Temperature and voltage distributions during a quench under simplifying assumptions are discussed. Eventually, we present quench propagation in CCT-type high-field magnets, and how it may impact quench detection when compared to classic cosine-theta coils. Several new insights into efficient CCT design could be gleaned from these types of analyses and are summarized.
CCT being a much more recent technology in the field of high-field accelerator magnets, a program is under way at LBNL and PSI to catch up with other design options in terms of practical experience and development. In this presentation we will also line out the immediate plans for a 10-T model magnet at PSI, as well as steps towards manufacturing and instrumentation.

Primary author: AUCHMANN, Bernhard (CERN)

Co-authors: ROLANDO, Gabriella (CERN); GAO, Jiani (PSI); BROUWER, Lucas (Lawrence Berkeley National Laboratory); CASPI, Shlomo (Lawrence Berkeley National Lab. (US)); SANFILIPPO, stephane (Paul Scherrer Institut)

Presenter: AUCHMANN, Bernhard (CERN)

Session Classification: 16 Tesla magnet

Contribution ID: **224** Type: **not specified**

Overview of the US magnet development programme

Thursday, June 1, 2017 10:30 AM (20 minutes)

Primary author: PRESTEMON, Soren (LBNL)

Presenter: PRESTEMON, Soren (LBNL)

Session Classification: 16 Tesla magnet

Contribution ID: **225** Type: **not specified**

Design and status of the 14-15 T demonstrator

Thursday, June 1, 2017 10:50 AM (20 minutes)

Fermilab is developing a 15 T Nb3Sn dipole demonstrator for a future very high energy pp collider as a part of the U.S. MDP Plan. The magnet design is based on optimized 60-mm aperture 4-layer shell-type coils and cold iron yoke 600 mm in diameter. The coils are graded between the inner and outer layers to maximize the performance and reduce the cost. Two mechanical structures – one, based on aluminum clamps and a thick stainless steel shell, and another one, based on a thick aluminum shell and a key&bladder assembly method – are being considered for this magnet. Magnet engineering design is complete, coil fabrication and structure procurement are in progress. Magnet design parameters, the work status and plans will be presented and discussed.

Primary author: ZLOBIN, Alexander (Fermilab)

Presenter: ZLOBIN, Alexander (Fermilab)

Session Classification: 16 Tesla magnet

Contribution ID: **226** Type: **not specified**

Design and status of canted cosθ

Thursday, June 1, 2017 11:10 AM (20 minutes)

Primary author: CASPI, Shlomo (Lawrence Berkeley National Lab. (US))

Presenter: CASPI, Shlomo (Lawrence Berkeley National Lab. (US))

Session Classification: 16 Tesla magnet

Contribution ID: **227** Type: **not specified**

Common coil design update

Thursday, June 1, 2017 11:30 AM (20 minutes)

The common coil geometry offers a 2-in-1 conductor friendly block coil dipole design based on simple racetrack (mostly flat) coils with large bend radii. Significate progress has been world-wide since FCC2016 in various designs of 50 mm aperture high field 2-in-1 dipoles based on the common coil geometry. These include designs of (a) 16 T dipoles based entirely on Low Temperature Superconductors (LTS) and (b) 20 T dipoles based on High Temperature Superconductors (HTS) in addition to LTS. In particular, the coils have become simpler, stored energies and inductances smaller, field quality has improved and the mechanical structure has been more developed. Brookhaven National Laboratory (BNL) is working and collaborating with other institutions in the United States and worldwide to make this design more suitable for future high energy colliders.

The work on common coil design at BNL is primarily being performed under the US DOE SBIR/STTR programs with the Particle Beam Lasers, Inc. (PBL). BNL/PBL team is also getting ready to test a pair of HTS coils in the background field of 10 T the Nb3Sn common coil dipole, making it an early test of an HTS/LTS hybrid common coil magnet.

In addition to providing the status of the common coil design, the experience of operating the BNL Nb3Sn common coil dipole after a decade and the experience of an HTS/LTS hybrid coil test will also be presented.

*Work supported by Brookhaven Science Associates, LLC under contract Number DE-SC0012704, with the U.S. Department of Energy and SBIR/STTR contract DOE Grant Number DE-SC0011348 and DE-SC0015896.

Primary author: GUPTA, Ramesh (BNL)

Presenter: GUPTA, Ramesh (BNL)

Session Classification: 16 Tesla magnet

Contribution ID: **228** Type: **not specified**

Magnet status towards the CDR

Thursday, June 1, 2017 3:30 PM (20 minutes)

Primary author: SCHOERLING, Daniel (CERN)

Presenter: SCHOERLING, Daniel (CERN)

Session Classification: 16 Tesla magnet

Contribution ID: **229** Type: **not specified**

Cost model status towards the CDR

Thursday, June 1, 2017 3:50 PM (20 minutes)

Primary author: SCHOERLING, Daniel (CERN)

Presenter: SCHOERLING, Daniel (CERN)

Session Classification: 16 Tesla magnet

Contribution ID: **230** Type: **not specified**

Conductor status towards the CDR

Thursday, June 1, 2017 4:10 PM (20 minutes)

Primary author: BALLARINO, Amalia (CERN)

Presenter: BALLARINO, Amalia (CERN)

Session Classification: 16 Tesla magnet

Contribution ID: **231** Type: **not specified**

EFT global fit of Higgs couplings at ee colliders

Tuesday, May 30, 2017 5:30 PM (20 minutes)

Primary author: GU, Jiayin (DESY)

Presenter: GU, Jiayin (DESY)

Session Classification: FCC-ee physics & experiments

Contribution ID: **232** Type: **not specified**

Implications of a leptoquark explanation of the anomalous magnetic moment of the muon for the FCC-ee

Tuesday, May 30, 2017 5:50 PM (20 minutes)

Primary author: MUELLER, Dario (PSI)

Presenter: MUELLER, Dario (PSI)

Session Classification: FCC-ee physics & experiments

Contribution ID: **233** Type: **not specified**

Present status on numerical calculation of complete 2-loop EWPOs and 3-loop prospects

Tuesday, May 30, 2017 6:10 PM (20 minutes)

Primary author: GLUZA, Janusz (U. Silesia)

Presenter: GLUZA, Janusz (U. Silesia)

Session Classification: FCC-ee physics & experiments

Contribution ID: **234** Type: **not specified**

Precision Observables at FCC-ee: Status and Future

Tuesday, May 30, 2017 6:30 PM (20 minutes)

Primary author: HEINEMEYER, Sven (CSIC (Madrid, ES))

Presenter: HEINEMEYER, Sven (CSIC (Madrid, ES))

Session Classification: FCC-ee physics & experiments

Contribution ID: **235** Type: **not specified**

Fast Simulation with PAPAS

Wednesday, May 31, 2017 11:30 AM (20 minutes)

Primary author: ROBSON, Alice (Universite de Geneve (CH))

Presenter: ROBSON, Alice (Universite de Geneve (CH))

Session Classification: FCC-hh experiments and detectors

Contribution ID: **236** Type: **not specified**

FCC-hh Detector Magnet and Detector Integration

Wednesday, May 31, 2017 2:30 PM (20 minutes)

The design of the FCC-hh Experiment and its magnet system is being conducted and in the meantime, a baseline design has been defined. Part of the study is the feasibility of the integration of the detector in its cavern and to develop the requirements on cavern and shaft dimensions. For system integration, the various subsystems in the detector are not independent and the modularity needs to be carefully analyzed. An preliminary proposal for the routing of the various subdetector services and cabling will be presented. This is of paramount importance for developing the maintenance scenarios respecting the limitations in displacement each subdetector element has. Two options for the maintenance scenario will be presented, the first one where access to the inner trackers is provided without breaking the beam pipe, while in the second their replacement has to be envisioned. The cavern dimensions are derived from the maximum envelope taken by the detector during its installation. As for the crane requirements and shaft dimensions, they are mostly determined by the heaviest and largest objects that have to be moved around in the cavern.

Primary author: PAIS DA SILVA, Helder Filipe (CERN)

Co-authors: DUDAREV, Alexey (CERN); TEN KATE, Herman (CERN); MENTINK, Matthias (CERN)

Presenter: PAIS DA SILVA, Helder Filipe (CERN)

Session Classification: FCC-hh experiments and detectors

Contribution ID: **237** Type: **not specified**

Developments for tracking and timing detectors

Thursday, June 1, 2017 1:30 PM (30 minutes)

Current R&D in Hadron Collider tracking and timing detectors with potential to develop further into the FCC era is reviewed. Silicon strip and pixel detectors have made tracking at LHC rate and radiation conditions at all possible. The increase rate/radiation conditions at the HL-LHC by a factor of 10 compared to today's standard require intense R&D in sensors, readout ASICs, mechanics and cooling. In addition, picosecond timing seems to become possible using thin sensors with dedicated features. The interesting aspects of this new R&D will be included in the presentation.

Primary author: WERMES, Norbert (University of Bonn (DE))

Presenter: WERMES, Norbert (University of Bonn (DE))

Session Classification: FCC-hh experiments and detectors

Contribution ID: **238** Type: **not specified**

Radiation hard scintillators

Thursday, June 1, 2017 2:30 PM (30 minutes)

Future circular and linear colliders as well as the Large Hadron Collider in the High-Luminosity era have been imposing unprecedented challenges on the radiation hardness of particle detectors that will be used for specific purposes e.g. forward calorimeters, beam and luminosity monitors. We performed research on the radiation-hard active media for such detectors, particularly calorimeters, by exploring intrinsically radiation-hard materials and their mixtures.The initial samples that we probed were thin plates of Polyethylene Naphthalate (PEN) and Polyethylene Terephthalate (PET) and thin sheets of HEM. The previous studies indicate towards promising performance under high radiation conditions. We will report on the necessary process of mixing the PEN and PEN for optimized scintillation and signal timing properties preserving the high radiation resistance. Recently we developed a new plastic scintillator material. The scintillation yield of SiX sample was compared to a BGO crystal using a setup with 90Sr source and a Hamamatsu R7525-HA photomutiplier tube (PMT). The SiX was measured to yield roughly 50% better light production compared to the BGO crystal.sample SiX was irradiated at the CERN PS radiation facility with 24 GeV/c protons. The samples received a fluence of 1.2 x 1015 p/cm2 which corresponds to 4 x 105 Gy radiation doses. The comparison of the transmission spectra of SiX sample before and after the irradiation exhibits a loss of roughly 7% light transmission after 4 x 105 Gy proton irradiation.

Primary author: ONEL, Yasar (The University of Iowa (US))

Presenter: ONEL, Yasar (The University of Iowa (US))

Session Classification: FCC-hh experiments and detectors

Contribution ID: **239** Type: **not specified**

A high granularity hadronic calorimeter for multi TeV jets

Thursday, June 1, 2017 9:30 AM (20 minutes)

We discuss performance requirements for future hadronic calorimeters in the context of reconstruction of multi-TeV objects (jets, particles) at a 100 TeV collider. For this study, we use a Geant4 simulation of the detector response of the SiFCC detector which is designed to study hadronic jets up to 33 TeV in transverse momentum. We show response and energy resolutions for single particles and hadronic jets in the energy range from 2 GeV to 33 TeV. In addition, we show how changes in lateral cell segmentation can affect jet-shape and jet-substructure variables used for reconstruction of highly boosted jets.

Primary author: CHEKANOV, Sergei (Argonne National Laboratory (US))

Co-authors: HENRIQUES CORREIA, Ana Maria (CERN); KOTWAL, Ashutosh (Duke University (US)); SOLANS SANCHEZ, Carlos (CERN); HELSENS, Clement (CERN); PROUDFOOT, James (Argonne National Laboratory (US)); STRUBE, Jan Fridolf; MCCORMICK, Jeremy (SLAC (US)); REPOND, Jose Olivier (Argonne National Laboratory (US)); GRAY, Lindsey (Fermi National Accelerator Lab. (US)); BEYDLER, Marybeth Morris (Argonne National Laboratory (US)); TRAN, Nhan Viet (Fermi National Accelerator Lab. (US))

Presenter: CHEKANOV, Sergei (Argonne National Laboratory (US))

Session Classification: FCC-hh experiments and detectors

Contribution ID: **240** Type: **not specified**

Introduction

Thursday, June 1, 2017 10:30 AM (10 minutes)

Primary authors: MOORTGAT, Filip (CERN); GRAY, Heather (LBNL)

Presenters: MOORTGAT, Filip (CERN); GRAY, Heather (LBNL)

Session Classification: FCC-hh experiments and detectors

Contribution ID: **241** Type: **not specified**

Dark Matter searches

Thursday, June 1, 2017 10:40 AM (20 minutes)

Primary author: HARRIS, Philip Coleman (CERN)

Presenter: HARRIS, Philip Coleman (CERN)

Session Classification: FCC-hh experiments and detectors

Contribution ID: **242** Type: **not specified**

Di-Higgs studies

Thursday, June 1, 2017 11:00 AM (15 minutes)

Primary author: DI MICCO, Biagio (Universita' degli Studi di Roma Tre e Istituto Nazionale di Fisica Nucleare (INFN))

Presenter: DI MICCO, Biagio (Universita' degli Studi di Roma Tre e Istituto Nazionale di Fisica Nucleare (INFN))

Session Classification: FCC-hh experiments and detectors

Contribution ID: **243** Type: **not specified**

Higgs properties

Thursday, June 1, 2017 11:15 AM (20 minutes)

Primary author: SELVAGGI, Michele (CERN)

Presenter: SELVAGGI, Michele (CERN)

Session Classification: FCC-hh experiments and detectors

Contribution ID: **244** Type: **not specified**

Adaption of the LHC cold mass cooling system to the requirements of the Future Circular Collider (FCC)

Tuesday, May 30, 2017 5:00 PM (2 minutes)

The cooling of the superconducting magnet cold masses with superfluid helium (HeII) is a well-established concept successfully in operation since years in the LHC. Consequently, its application for the cooling of FCC magnets is an obvious option. The 12-kW heat loads distributed over 10-km long sectors not only require an adaption of the magnet bayonet heat exchangers, but also present new challenges to the cryogenic plants, the distribution system and the controls strategy.

The poster recalls the basic LHC cooling concept with superfluid helium and define the main parameters for the adaption to the FCC requirements. Pressure drop and hydrostatic head is developed in the distribution and pumping systems; their impact on the magnet temperature profile and the corresponding cooling efficiency is presented and compared for different distribution and pumping schemes.

Primary author: KOTNIG, Claudio (Graz University of Technology (AT))

Co-authors: BRENN, Gunter (Graz University of Technology (AT)); TAVIAN, Laurent Jean (CERN)

Presenter: KOTNIG, Claudio (Graz University of Technology (AT))

Session Classification: Poster session

Contribution ID: **245** Type: **not specified**

Pneumatic free valve actuators

Tuesday, May 30, 2017 5:02 PM (2 minutes)

Large cryogenic systems as projected for FCC need a large number of cryogenic and warm valves. Most of these valves are control or metering valves guided by a PLC generated signal. Furthermore also, actuated shut-off valves are needed. Today such valves are driven by pneumatic actuators with electro-pneumatic control. The supply pneumatic system and electric signal cabling increases with the number of valves, is energy intensive, needs space and continuous servicing. Not at least operation and capital costs for such an electro-pneumatic system are quite high.
One can observe new developments in in the refrigeration, natural gas and energy industries which use pneumatic free electric driven control and shut-off valves.
Based on the positive experiences in these industries, innovative cryogenic and warm valves, actuated by an electrical stepper motor were developed. Together with the control module the full functionality including fail open or fail closed positions as well as many further control advantages are available. Using this type of valves allows a highly simplified installation. These advantages open a potential to reduce operation and capital costs remarkably.
Presently, available are valves driven by an electrical stepper motor up to size DN40 depending on the requested shut-off pressure. For bigger valves and higher shut-off pressure, actuators with their own electro-hydraulic drive control system are available.
Examples of such valves will be shown and described. Future development perspectives as well as problems for application in accelerator cryogenic systems like radiation proof request will be discussed.

Primary author: HOLDENER, Fridolin (shirokuma GmbH)

Co-author: HEGGLIN, Andres (sirokuma GmbH (CH))

Presenter: HOLDENER, Fridolin (shirokuma GmbH)

Session Classification: Poster session

Contribution ID: **246** Type: **not specified**

A scalable and open system for complex system behaviour assessment

Tuesday, May 30, 2017 5:04 PM (20 minutes)

Particle accelerators exhibit complex behaviour emerging from the interaction of diverse machine systems, services, beam and environmental conditions. Since 2015 we explore the fitness of probabilistic reliability engineering to particle accelerators. The investigation relies on the LHC as use-case. Results indicate that the approach, already well established in manufacturing, automotive, pharmaceutical, process and other industries fits well the needs of particle accelerator facilities. Consequently, an R&D project has been launched to develop an open method to model and simulate the behaviour large systems efficiently.
It does not rely on graphical user interfaces, permits specifying large sets of equipment characteristics in time and space saving manner, adequately addresses building models in a collaborative fashion, is data store agnostic and is incrementally extensible to different modelling techniques and simulation engines. Considering the processing requirements, the implementation by Ramentor will also permit deployment in a distributed computing cluster, leading simulation times cut by a factor 10 to 100. The approach and tool will help building reliability, availability and energy efficiency into the designs of a future circular collider. Ramentor will offer the suite to industrial clients for the assessment and improvement of energy efficiency and availability in very diverse domains such as data centres, cargo handling and natural gas distribution.

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

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

Presenter: PENTTINEN, Jussi-Pekka (Ramentor Oy)

Session Classification: Poster session

Contribution ID: **247** Type: **not specified**

Impact of large beam-induced heat loads on the transient operation of the beam screens and cryogenic plants of the Future Circular Collider (FCC)

Tuesday, May 30, 2017 5:24 PM (2 minutes)

The Future Circular Collider (FCC) under study at CERN will produce 50-TeV high-energy proton beams. The high-energy particle beams are bent by 16-T superconducting dipole magnets operating at 1.9 K and distributed over a circumference of 80 km. The circulating beams induce 5 MW of dynamic heat loads by several processes such as synchrotron radiation, resistive dissipation of beam image currents and electron clouds. This beam-induced heat loads will be intercepted by beam screens operating between 40 and 60 K and induce challenging transients during beam injection, energy ramp-up and beam ejection on the distributed beam-screen cooling loops, the sector cryogenic plants and the dedicated circulators.

Based on the current baseline parameters, numerical simulations of the fluid flow in the cryogenic distribution system during a beam operational cycle were performed. The effects of the thermal inertia of the headers on the helium flow temperature at the cryogenic plant inlet as well as the temperature gradient experienced by the beam screens has been assessed. Additionally, it enabled a thorough exergetic analysis of different cryogenic plant configurations and laid the building-block for establishing design specifications of cold or warm circulators.

Primary author: CORREIA RODRIGUES, Hugo Ricardo (CERN)

Co-author: TAVIAN, Laurent Jean (CERN)

Presenter: CORREIA RODRIGUES, Hugo Ricardo (CERN)

Session Classification: Poster session

Contribution ID: **248** Type: **not specified**

Bose–Einstein condensation in strong interaction processes

Tuesday, May 30, 2017 5:26 PM (2 minutes)

A multiparticle Bose–Einstein symmetrization can enhance the emission of pions and as consequence can lead to the pion condensation in strong interactions at high energies. Onset of the Bose–Einstein condensation is driven by the critical space density of charged secondary bosons which are mostly pions. The energy dependence of space pion density at freeze-out and its critical value, calculated from estimations for volume of emission region and for total multiplicity, is investigated for both the proton-proton and the nucleus-nucleus collisions. The space-time extent of emission region is derived with help of the Bose–Einstein correlations of pion pairs produced in various collisions within the framework of the Gaussian model for particle source. It is shown that the space density of charged particles is smaller than its critical value and Bose–Einstein condensation cannot be expected for secondary pions in proton-proton collisions at energies up to about 100 TeV or even higher. A marked enhancement is observed for charged pion density in heavy ion collisions with respect to the proton-proton ones at similar collision energies. Relation between the charged particle density and its critical value allow the possibility of Bose–Einstein condensation for secondary pions in nucleus-nucleus collisions in multi-TeV energy domain. Therefore the experimental manifestations can be expected for qualitatively new effects in multiparticle production processes in energy domain of the Future Circular Collider project.

Primary author: OKOROKOV, Vitaly (National Research Nuclear University MEPhI (RU))

Presenter: OKOROKOV, Vitaly (National Research Nuclear University MEPhI (RU))

Session Classification: Poster session

Contribution ID: **249** Type: **not specified**

Scalar particles of the Higgs Triplet Models at the FCC with low energy constraints

Tuesday, May 30, 2017 5:28 PM (2 minutes)

Discovery of the Higgs particle at the LHC confirmed the mechanism of mass generation predicted by the Standard Model. However, the Standard Model leaves some problems unsolved and many attemps to construct more sophisticated theory are undertaken. This poster will concentrate on non-standard models with triplet extention of the scalar sector of the electroweak theory like Higgs Triplet Model. Additional triplets in the scalar sector involve singly and doubly charged scalar particles, depending on the hypercharge of the implemented triplet. Those types of particles contribute to (g-2) and Lepton Flavour Violatin (LFV) processes. Taking into account low energy constraints it is possible to limit the parameters space and analyse signals which could be observed at the FCC collider.

Primary author: KORDIACZYŃSKA, Magdalena

Co-authors: GLUZA, Janusz (U. Silesia); CHAKRABORTTY, Joydeep (IIT Kanpur); TRIPURARI, Srivastava (IIT Kanpur (IN))

Presenter: KORDIACZYŃSKA, Magdalena

Session Classification: Poster session

Contribution ID: **250** Type: **not specified**

Probing the light quark Yukawa couplings through rare exclusive Higgs boson decays

Tuesday, May 30, 2017 5:30 PM (2 minutes)

Following the discovery of a Higgs boson with a mass of about 125 GeV, subsequent measurements have confirmed its central role in the spontaneous breaking of electroweak symmetry. Currently, a wide-reaching programme of measurements is being proposed both for the HL-LHC
and future electron-positron colliders to clarify the properties of the observed Higgs boson. Nevertheless, its role in the generation of fermion mass, in particular for the first and second generation, is still unclear. In the Standard Model (SM) this is implemented in an ad hoc manner through Yukawa interactions, and many beyond-the-SM theories offer rich phenomenology and exciting prospects for the discovery of New Physics in this sector.
The measurement of the rare exclusive decays H->Vγ, where V denotes a vector meson, is a unique probe of the Higgs boson coupling to light quarks, and provides sensitivity to a multitude of BSM scenarios. These measurements constitute a programme which is unique to hadron collider facilities due to the required large sample of Higgs bosons: a 100 TeV FCC-hh would be an ideal facility to measure these otherwise inaccessible quantities.
The sensitivity of a FCC-hh to probe these exclusive Higgs boson decays is assessed for the first time, and the potential to test the Standard Model and constrain new physics models is discussed.

Primary author: NIKOLOPOULOS, Konstantinos (University of Birmingham (GB))

Co-authors: CHISHOLM, Andrew Stephen; LONG, Elizabeth (University of Birmingham); ZALYAEVA, Evilina (University of Birmingham); OWEN, Rhys Edward (University of Birmingham (GB))

Presenter: NIKOLOPOULOS, Konstantinos (University of Birmingham (GB))

Session Classification: Poster session

Contribution ID: **251** Type: **not specified**

Design Studies of 16 T Nb3Sn Dipole Magnets at Fermilab

Tuesday, May 30, 2017 5:32 PM (2 minutes)

Cost-effective superconducting dipole magnets with operating fields up to 16 T are being considered for the LHC energy upgrade (HE-LHC) or a Future Circular Collider (FCC). Design studies of 16 T Nb3Sn dipole magnets based on 2-, 3- and 4-layer 50 mm aperture cos-theta coils with and without stress management elements are being conducted at Fermilab. The goal of these studies is to explore the limit of the Nb3Sn accelerator magnet technology, optimize magnet design and performance parameters, and reduce magnet cost. The work status and the results of these studies will be reported and discussed.

Primary author: ZLOBIN, Alexander (Fermilab)

Presenter: ZLOBIN, Alexander (Fermilab)

Session Classification: Poster session

Contribution ID: **252** Type: **not specified**

Internal tin strands designed in RF for application in high field dipoles

Tuesday, May 30, 2017 5:34 PM (2 minutes)

In spite of the maturity of Nb3Sn internal tin wires designing and production routes there are still significant R&D needed for attaining of the challenging set of requirements specific for high field dipole magnets. The development of layouts and processing of Nb3Sn internal tin strands with non copper critical current density exceeding 2450 A/mm2 altogether with reasonably low hysteresis losses are carried out in the Bochvar Institute (RF).
Experimental study on the limitations of the different approaches to the diffusion barrier design has been carried out. Two types of strands containing one common barrier and numerous barriers surrounding each of the subelements have been produced. The model wires 1.0 to 0.36 mm in diameter have been subjected to reaction heat treatment and the microstructure of Nb3Sn layers was investigated. The superconducting characteristics of the strands designed and produced were investigated.
The influence of the design features of developed superconductors and the heat treatment regimes on the current-carrying capacity and relative residual resistance ratio (RRR) has been studied. The relationship between temperature and duration of reaction and the characteristics of the superconducting Nb3Sn layer in the manufactured superconductors are discussed.
As the result of the carried out research the optimal regimes of the reaction for each layout of the obtained superconductors have been developed.

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

Co-authors: SILAEV, Alexandr (VNIINM); TSAPLEVA, Anastasya (VNIINM); ZUBOK, Evgeniy (VNIINM); MAREEV, Konstantin (VNIINM); KRYLOVA, Marya (VNIINM); POLIKARPOVA, Marya (VNIINM); ALEKSEEV, Maxim (VNIINM); POTAPENKO, Michail (VNIINM); LUKYANOV, Pavel (VNIINM); ALIEV, Ruslan (VNIINM); PANTSYRNY, Victor (Bochvqr Institute)

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

Session Classification: Poster session

Contribution ID: **253** Type: **not specified**

Analysis of stresses in a 16-T superconducting dipole during a quench

Tuesday, May 30, 2017 5:36 PM (2 minutes)

The copper current density plays important role in the quench protection of superconducting magnets. In non-graded magnets the worst case hot spot is typically at the location of the highest magnetic field and with active quench protection the temperature of the rest of the magnet is kept relatively isothermal. Graded superconducting magnets pose new challenges to the quench protection because the maximum copper current density is cable dependent. The worst case hot spot is not anymore typically at the location exposed to the highest magnetic field. At the same time significant temperature gradients may occur at the interface between different cables. This means that the quench protection becomes also a mechanical issue. In this paper we study the quench protection of a 16-T EuroCirCol FCC dipole design from mechanical point of view. We use finite element analysis to study the worst case stresses in the magnet assembly during its entire use cycle: pre-loading, cool down, energising and quench event. In addition, we study stresses caused by different quench events to find limiting conditions for magnet and quench protection system design.

Primary author: ZHAO, Junjie (Lanzhou University (CN) and TUT (FI))

Co-authors: STENVALL, Antti Aleksis; LORIN, Clement (CEA/IRFU,Centre d'etude de Saclay Gif--sur-Yvette (FR)); SALMI, Tiina-Mari (Tampere University of Technology, Finland)

Presenter: ZHAO, Junjie (Lanzhou University (CN) and TUT (FI))

Session Classification: Poster session

Contribution ID: **254** Type: **not specified**

First considerations of the layout and lattice design of SPPC

Tuesday, May 30, 2017 5:38 PM (2 minutes)

For precision measurement of Higgs bason and searching for evidences of new physics beyond the Standard Model, China proposed a strategy of CEPC-SPPC, which plans to build a pp collider (SPPC) after the phase of ee Higgs factory (CEPC). In November 2016, CEPC-SPPC Steering Committee decided to adopt the baseline design of 100 km tunnel. This paper will present the progress of lattice design of SPPC. The lattice design is mainly constrained by tunnel layout, maximum dipole strength, C.O.M energy, beam optics and so on. The following problems have been considered carefully in our study. Firstly, constrained by the tunnel length of 100 km and maximum dipole strength of 16 T, lattice design with large dipole filling factor may reduce the difficulty in obtaining C.O.M energy of 100 TeV; secondary, the maximum strength of quadrupole and the value of beam optics in arcs should be acceptable; thirdly, considering the compatibility problem between CEPC and SPPC tunnel, the lattice design should have the ability of adjusting the layout slightly in the future. This Paper presents our first considerations of the layout and beam optics of SPPC based on the new baseline of 100 km tunnel - 16 T dipoles - 100 TeV C.O.M energy, including the designs of arc structure, dispersion suppressor, and high - luminosity insertion. Dynamics aperture have been estimated by using SixTrack based on the first version of lattice of SPPC, and the preliminary result of dynamics aperture will be presented in this paper too.

Primary author: CHEN, Yukai (IHEP, CAS, China)

Co-authors: SU, Feng (IHEP,CAS); YANG, Jianquan (Institute of High Energy Physics (CN)); TANG, Jingyu (Institute of High Energy Physics, CAS); ZHANG, Linhao (IHEP (CN)); ZOU, YE (Institute of High Energy Physics, CAS)

Presenter: CHEN, Yukai (IHEP, CAS, China)

Session Classification: Poster session

Contribution ID: **255** Type: **not specified**

Synchrotron radiation backgrounds for the FCC-hh Experiments

Tuesday, May 30, 2017 5:40 PM (2 minutes)

We present in this paper a detailed analysis of the synchrotron radiation emitted by the 50 TeV protons of the FCC-hh in the last bending and quadrupole magnets upstream the interaction region. We discuss the characteristics of this radiation in terms of power, flux, photon spectrum and fans in different running conditions such as, for example, with and without crossing angle.
We mainly focus our study on the fraction of photons that may hit the detector, with a full tracking into GEANT4 that simulates their interaction within the central beam pipe.

Funding: This work was supported by the HORIZON 2020 project EuroCirCol, grant agreement 654305.

Primary author: COLLAMATI, Francesco (INFN)

Co-authors: BURKHARDT, Helmut (CERN); BOSCOLO, Manuela (INFN e Laboratori Nazionali di Frascati (IT))

Presenter: COLLAMATI, Francesco (INFN)

Session Classification: Poster session

Contribution ID: **256** Type: **not specified**

Modeling approaches for the beam impedance contribution of pumping holes

Tuesday, May 30, 2017 5:42 PM (2 minutes)

The current FCC-hh beam screen proposal includes pumping holes of considerable area hidden behind a shield. Although each hole's contribution to the ring impedance is negligible, the effect of a large number of pumping holes in a very large ring (constructive interference) has to be considered.

On one hand, due to evanescent coupling and the shield, space-discretisizing eigenmode and wake-field computations produce significant numerical noise considering those effects. On the other hand, the hole dimensions are too large in comparison to the chamber dimensions to be treated using substitute elementary dipoles.

After reviewing numerical limits of Floquet-periodic FEM eigenmode computation, we approach the problem by adapting existing Field Matching techniques to a simplified FCC-hh beam screen geometry. Due to the possibility of discretising the fields only in the hole areas, computation time and accuracy may be sufficient to yield qualitative results.

Primary author: RIEMANN, Bernard (TU Dortmund University)

Presenter: RIEMANN, Bernard (TU Dortmund University)

Session Classification: Poster session

Contribution ID: **257** Type: **not specified**

Novel technique of solid-state amplifiers design

Tuesday, May 30, 2017 5:44 PM (2 minutes)

A novel technique to build high efficiency, modular, scalable, high availability solid-state amplifiers has been developed. The system allows for easy adjustment of single SSPA RF power to the power profile of the accelerator. High availability due to the use of unique technology of RF switches together with “”hot swap”” feature allows almost infinite constant running of the machine.
The total cost of ownership of using RF amplifiers during the lifetime of the FCC project is being discussed. The comparison of TCO for the developed technique and competitive solutions will be presented.

Primary author: Dr SHARKOV, Georgy (SC NIITFA)

Co-authors: BOTYACHKOVA, Alexandra (SC NIITFA); KRASNOV, Andrei (SC NIITFA); POLIKHOV, Stepan (SC NIITFA); BONDARENKO, Taras (SC NIITFA); FRANTOV, Victor (SC NIITFA)

Presenter: Dr SHARKOV, Georgy (SC NIITFA)

Session Classification: Poster session

Contribution ID: **258** Type: **not specified**

Pressure profile in the experimental areas of FCC hh and ee, calculation by an analytical code

Tuesday, May 30, 2017 5:46 PM (2 minutes)

Ultra high vacuum in the beam pipe is a basic requirement for the Future Circular Colliders (FCC). The dimension of the FCC and the high energy of the particles will make this requirement challenging. Simulations that predict the vacuum quality due to material and beam induced effects will allow to evaluate different designs and to choose an optimal solution.

The mathematical model behind the simulations will be shown. Four coupled differential equations describe the mass conservation of the residual gas particles in the beam pipe. The sinks include all kind of distributed and local pumping. The sources are caused by synchrotron radiatin, electron clouds, thermal outgassing and ion-induced desorption.

The equation system is solved by an analytical method. This requires a transformation to first order equations for which a general valid solution exists. Adding a particular solution and the inclusion of appropriate boundary conditions define the solution function. The big advantage here is that an analytical simulation delivers fast results over large systems.

The model has been implemented in a Python environment. It has been cross checked with programs like VASCO and MolFlow. Additionally, data obtained from the Large Hadron Collider's (LHC) gauges were compared to the simulation output. This validates the program and gives trust to produce accurate vacuum forecasts for the FCC.
Finally, simulations will be shown for the hadron-hadron collider FCC-hh. Possible designs will be evaluated for the long straight sections including interaction points.

Primary author: AICHINGER, Ida (Johannes Kepler University (AT))

Co-authors: CHIGGIATO, Paolo (CERN); KERSEVAN, Roberto (CERN)

Presenter: AICHINGER, Ida (Johannes Kepler University (AT))

Session Classification: Poster session

Contribution ID: **259** Type: **not specified**

High-Temperature Superconductor Coating for the FCC Beam Screen

Tuesday, May 30, 2017 5:48 PM (2 minutes)

The baseline design of the FCC-hh beam screen is based on a 1 mm thick octagonal shaped stainless steel tube coated with a 300μm layer of copper. In the foreseen operating temperature of 40K to 60K the intended coating provides an impedance already close to the acceptable limit for a stable beam. In order to reduce the coupling impedance, we investigate High-Temperature Superconductor (HTS) thin films in the form of stripes. It promises a lower impedance by screening the beam induced radio frequency currents. The effect of different coatings will be estimated as well as the impact of the applied 16T dipole field on the material properties. The characteristics of HTS under temperature, frequencies and magnetic fields are discussed. Numerical results for the beam screen impedance obtained by the two-dimensional finite element solver BeamImpedance2D [1] are presented.

[1] U. Niedermayer, O. Boine-Frankenheim, and H. De Gersem, Phys. Rev. Special Topics – Accelerators and Beams 18, 032001, (2015)

Primary author: KRKOTIC, Patrick (TU Darmstadt)

Co-authors: ASTAPOVYCH, Daria (TU Darmstadt); BOINE-FRANKENHEIM, Oliver (TU Darmstadt); NIEDERMAYER, Uwe (TU-Darmstadt)

Presenter: KRKOTIC, Patrick (TU Darmstadt)

Session Classification: Poster session

Contribution ID: **260** Type: **not specified**

Solid-State Marx Generators for use in the Injection Kickers of the Future Circular Collider

Tuesday, May 30, 2017 5:50 PM (2 minutes)

A 100 TeV centre-of-mass energy frontier proton collider, in a new tunnel of 80−100 km circumference, is a central part of CERN's Future Circular Colliders (FCC) design study. The FCC will require extremely reliable kicker systems to ensure safe injection of beam. Most existing kicker systems at CERN rely on technologies which include thyratron switches and pulse-forming networks/lines (PFN/PFL). However thyratrons are susceptible to untriggered (erratic) turn-on which negatively impacts system reliability. In addition long-term commercial availability of thyratrons is a real concern. Hence alternative fast-switch technologies, based on high power semiconductor devices, are being investigated for replacing thyratrons in kicker applications: one of these technologies is the Marx generator. A semiconductor based Marx generator topology would also potentially resolve another problem, as it would eliminate the need for difficult-to-source PFL cable for the highest voltage (~80 kV) kicker systems. This paper discusses initial ideas for the application of solid-state Marx generators as thyratron replacements, with specific focus on the FCC injection system. In addition, preliminary test results on fast switching, high voltage, Silicon Carbide MOSFETS are presented and discussed.

Primary author: CHMIELINSKA, Agnieszka (AGH University of Science and Technology (PL))

Co-authors: KANDRATSYEU, Aleh; HOLMA, Janne (CERN); DUCIMETIERE, Laurent Sylvain (CERN); DOS SANTOS REDONDO, Luis Manuel (ISEL Instituto Superior de Engenharia (PT)); BARNES, Mike (CERN); FOWLER, Tony (CERN)

Presenter: CHMIELINSKA, Agnieszka (AGH University of Science and Technology (PL))

Session Classification: Poster session

Contribution ID: **261** Type: **not specified**

Advancements in low secondary electron yield carbon coatings for electron cloud mitigation

We report on the progress of carbon coating for multipacting mitigation on SRF-Guns. The findings comprise valuable information for e.g. high-energy charged particle accelerators where the beam-induced electron multiplication leads to electron cloud build up on the beam path. Reports have shown secondary electron yields (SEY or δ) of carbon coatings of less than 1 which is sufficient for most of the applications. Here we show carbon coatings displaying different morphologies leading to SEYs of $0.6 < \delta \leq 1$. One of the vital requirements in accelerator systems is the elimination of possible contamination by delamination of the coating. To investigate the adhesion scratch tests have been carried out and a method to significantly improve the adhesion of carbon coatings on metal surfaces by a titanium interlayer is shown.

Primary author: VOGEL, Michael (University Siegen)

Co-authors: FRETTLOEH, Danica (Siegen University); JIANG, Xin (Siegen University)

Presenter: VOGEL, Michael (University Siegen)

Session Classification: Poster session

Contribution ID: **262** Type: **not specified**

Axial channeling of high-energy protons in bent crystals as a tool for beam steering or splitting in high-energy hadron accelerators

Tuesday, May 30, 2017 5:54 PM (2 minutes)

As a charged particle beam is aligned with one of the main axes of a slightly bent crystal, most of the particles follows the crystal curvature due to multiple scattering with bent crystal atomic strings, the so called stochastic deflection. Indeed, in the case of positively charged particles, a portion of the beam may escape from the axial confinement to planar channeling. We investigated such mechanism at the external line H8 of CERN SPS with 400 GeV/c protons [1]. Two bent crystals were selected for the purpose, the first to meet the condition for stochastic deflection, the second, with a smaller bending radius, not to meet it.

We individuated a necessary condition for the exploitation of axial confinement for particle beam manipulation in high-energy accelerators. In the first mode exploited for the first bent crystal tested, total relaxation from axial to planar channeling is prevented and a bent crystal may be used as an efficient deflector for the whole beam. This first mode can be exploited to improve the beam collimation in the LHC, but also in future FCC-hh through an efficient deflection of the beam halo.

In the second regime used for the second crystal, escape of particles to the skew planar channels is favored and a short (few mm) Si crystal can be exploited to efficiently split the beam into two separated beams with adjustable intensity. This regime can be used in hadron accelerators, such as FCC-hh, for realization of both beam extraction and layout of the extracted beam to several beam lines by means of one passive and space-saving device.

References

[1] L. Bandiera et al., Eur. Phys. J. C 76 (2016) 80 (1-6).

Primary author: BANDIERA, Laura (Universita di Ferrara & INFN (IT))

Co-authors: BERRA, Alessandro (Universita & INFN, Milano-Bicocca (IT)); SYTOV, Alexei (Universita di Ferrara & INFN (IT)); MAZZOLARI, Andrea (Universita di Ferrara & INFN (IT)); LIETTI, Daniela (Universita & INFN, Milano-Bicocca (IT)); DE SALVADOR, Davide (Universita e INFN (IT)); BAGLI, Enrico (INFN); VALLAZZA, Erik (Universita e INFN (IT)); KIRILLIN, Igor; PREST, Michela (Universita & INFN, Milano-Bicocca (IT)); SHUL'GA, Nikolai; GUIDI, Vincenzo (Universita di Ferrara & INFN (IT))

Presenter: BANDIERA, Laura (Universita di Ferrara & INFN (IT))

Session Classification: Poster session

Contribution ID: **263** Type: **not specified**

HTS Coated Conductors for the FCC-hh beam screen

Tuesday, May 30, 2017 5:56 PM (2 minutes)

A collaboration project between Instituto de Ciencia de Materiales de Barcelona-CSIC ("ICMAB"), Institut de Física d'Altes Energies ("IFAE"), ALBA Synchrotron Light source ("ALBA) and CERN has been established in order to obtain physical results to evaluate the use of Coated Conductors (CC) tapes as elements for the beam screen for FCC-hh based on its expected low surface impedance and high superconducting properties. The project aims to generate knowledge on the RF surface impedance of high temperature superconducting-CC (HTS-CC) irradiated by synchrotron light at high fields, and at intermediate temperatures (40-60 K). Also, studies and prototypes will be performed in order to find an adequate way of incorporating the CC in the beam-screen design. First initial investigations will be presented.

Primary author: PEREZ, Francis (ALBA Synchrotron - CELLS)

Co-authors: NOSYCH, Andriy (CELLS (ES)); KOROLKOV, Ilya (Universitat Autònoma de Barcelona (ES)); O'CALLAGHAN, Joan M. (UPC Barcelona (ES)); PEDREGOSA GUTIERREZ, Jofre (Université de Provence); PONT, Montse (CELLS-ALBA); PONT, Montse (ALBA CELLS (ES)); CALATRONI, Sergio (CERN); OBRADORS, Xavier (ICMAB-CSIC (ES)); PUIG, teresa (CSIC)

Presenter: PEREZ, Francis (ALBA Synchrotron - CELLS)

Session Classification: Poster session

Contribution ID: **264** Type: **not specified**

Radiation Monitoring Technologies and Irradiation Test Facilities for FCC

Tuesday, May 30, 2017 5:58 PM (2 minutes)

The Future Circular Collider (FCC) is being designed to reach h-h collisions at an unprecedented energy level of 100 TeV, about 8 times higher than in today's Large Hadron Collider (LHC). Because of the increased energy and luminosity during FCC operation, radiation levels will likely exceed several tens of MGy (with >10e17 particles/cm2) inside the FCC experiments, and tens of KGy (with >10e15 particles/cm2) in certain sectors of the FCC tunnel itself. These estimations correspond to factors of 1000 and 100 with respect to the expected conditions at LHC and HL-LHC, respectively. To withstand such a harsh radiation environment special materials and technologies are required, implying strict component selection and development of custom qualification protocols taking into account possible dependencies of the radiation response to different technologies.

A survey of state-of-the-art solid-state devices for radiation measurement showed that current existing technologies are not capable of integrating such radiation levels, as well as of providing viable solutions to build an on-line radiation monitor fulfilling the FCC requirements. For these reasons, a completely novel dosimetry structure is under development as potential solution for Ultra High Dose and 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, W, L) and physical (material) properties of the nanolayers. The devices are fabricated at EPFL Centre of Micronanotechnology, and specific high-fluence irradiation tests (with gamma, protons, neutrons) are being carried out in CERN facilities and outside CERN. Limitations of the existing solid-state dosimeters, as well as a proposal for a new dosimetric technology based on metal thin films are presented.

In a wider scope, the development and characterization of novel devices as described above, as well as experiment and detector components for FCC, need adequate radiation test facilities. The requirements of the FCC community (machine and experiments) in terms of radiation test facilities and the observable shortcomings of the ones currently available at CERN are also presented.

Primary author: GORINE, Georgi (Ecole Polytechnique Federale de Lausanne (CH))

Co-authors: RAVOTTI, Federico (CERN); PEZZULLO, Giuseppe (CERN); SALLESE, Jean-Michel (EPFL (CH)); CAPEANS GARRIDO, Mar (CERN); MOLL, Michael (CERN)

Presenter: GORINE, Georgi (Ecole Polytechnique Federale de Lausanne (CH))

Session Classification: Poster session

Contribution ID: **265** Type: **not specified**

Remote manipulations and application of unconventional repair technologies in the FCC tunnel

Tuesday, May 30, 2017 6:00 PM (2 minutes)

Following the FCC study and its recent developments, it is evident that due to the nature, size, scale and complexity of the environment, the deployment of conventional repair methods and technologies will be insufficient in the FCC. Human intervention will be limited or even counterproductive because of the safety issues, time constraints and related costs. At the same time, it appears that the FCC infrastructure will be so large and complex that the potential for failures or malfunctions will increase exponentially. Therefore, the FCC may face an unprecedented amount of technical glitches and problems to resolve.
The prospective solution for the FCC is remote manipulations and unconventional repair technologies. However, this will largely depend on the general maintenance and repair strategy chosen for the FCC: preventive or predictive maintenance, or run-to-failure?
Advanced robotic and remote manipulation systems, along with novel in-situ repair technologies, offer tangible repair results. Hence one of the solutions for the FCC is a remotely controlled robotic platform performing in-situ additive manufacturing repairs. This could be performed at micro and macro levels, i.e. both in the accelerator structure and the actual civil engineering installations. Concrete examples of applications of this technology are provided in the paper and presentation. Since there are numerous challenges to overcome, the new concepts have to be developed to address environmental, safety, technological and operational issues. This paper and the presentation includes analysis of these challenges.
Finally, the aforementioned concepts could be used not only during operation but also in the construction, installation and testing phase of the FCC.

Primary author: Prof. TORIMS, Toms (Riga Technical University (LV))

Co-authors: RATKUS, Andris (Riga Technical University); IVANOVS, Ivanovs (Riga Technical University); RIBICKIS, Leonids (Riga Technical University)

Presenter: Prof. TORIMS, Toms (Riga Technical University (LV))

Session Classification: Poster session

Contribution ID: **266** Type: **not specified**

Experimental investigation of adsorption and desorption processes of cryosorbed gases on proposed FCC accelerator walls

Tuesday, May 30, 2017 6:02 PM (2 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,most simulation programs need realistic inputs measured in experimental conditions as close as possible to the ones that will occur in the machine. Most of the accelerators walls will see the beam while being at low temperatures and their relevant properties will not only depend on the technical materials but also on the presence of cryosorbed residual gas condensed on cold surfaces. Gas layers may affect vacuum stability and secondary electrons yield even in case of tiny wall temperature fluctuations. Studying SEY,it's possible to obtain direct information about its value,which is of great relevance in e-cloud related simulations,and on the presence of any gas overlayer. In fact,SEY depends both on the bulk and the surface composition,giving direct information about surface contamination and on different adsorbed gases and molecules.Here we present a study on the SEY of a Cu surface exposed at low temperature to different gases.Adsorption and desorption occurring in different temperature ranges change the SEY that can be directly correlated with the number of layers adsorbed. The measure of SEY it's used here,for the first time,as a novel technique to extract relevant information on the actual adsorption/desorption process. Such SEY studies are compared with Quadrupole mass spectrometry showing the potentialities of the new approach here proposed.

Primary author: ANGELUCCI, Marco (LNF-INFN (IT))

Co-authors: CIMINO, Roberto (Istituto Nazionale Fisica Nucleare Frascati (IT)); LARCIPRETE, Rosanna (CNR-ISC, LNF-INFN (IT))

Presenter: ANGELUCCI, Marco (LNF-INFN (IT))

Session Classification: Poster session

Contribution ID: **267** Type: **not specified**

Kicker pulse generator anomaly detection for reliability improvements through advanced machine learning

Tuesday, May 30, 2017 6:04 PM (2 minutes)

Reliability, availability and maintainability are parameters that determine if a large-scale accelerator system can be operated in a sustainable and cost effective manner. Beam transfer equipment such as kicker systems are critical components with potential significant impact on global performance of the entire machine complex. Identifying the root cause of a malfunction can be a challenging and tedious task due to the always increasing complexity of such systems. Manual extraction and analysis of this information seems excluded for a future collider with more systems and an even higher complexity.
The use of Artificial Intelligence (AI) models can assist in this task leveraging existing frameworks and libraries for machine learning. A collaboration between CERN and the University of Leuven (KU Leuven) was founded to conduct such a research for an existing data set. A subset of historical data from the LHC logging database is used and logged data of the LHC injection kicker magnet pulse generators has been chosen as a first case study. The goal is to apply supervised and unsupervised learning techniques from open-source libraries such as the Scikit-learn Python library to extract useful features to create a model that detects anomalies without human interaction, both on historical data as live data from the equipment. The status and outlook of this research are presented.

Primary author: VAN TRAPPEN, Pieter (CERN)

Co-authors: WERY, Niels (KU Leuven); MEERT, Wannes (KU Leuven)

Presenter: VAN TRAPPEN, Pieter (CERN)

Session Classification: Poster session

Contribution ID: **268** Type: **not specified**

Resonant Production of Scalar Leptons by RPV Couplings at the FCC

Tuesday, May 30, 2017 6:06 PM (2 minutes)

Resonant production of l˜ and ν˜ at the FCC has been considered. For example, scalar neutrino may be investigated trough subprocess (dd)→ ν˜→ l+ l'- These processes have great potential for determination of RPV couplings.

Primary author: KARTAL, Sehban (University of Istanbul Department of Physics)

Co-authors: YILMAZ, Ayberk (Istanbul University); PAGLIARONE, Carmine (A); OZDEMIR, Kadri (Piri Reis University (TR)); SAHIN, Mehmet Ozgur (Usak University); Dr BOLUKBASI, Olcay (asoc.prof); SULTANSOY, Saleh (TOBB ETU (TR))

Presenter: KARTAL, Sehban (University of Istanbul Department of Physics)

Session Classification: Poster session

Contribution ID: **269** Type: **not specified**

Magnet development for FCC detectors

As part of the Future Circular Collider conceptual design study for hadron-hadron physics (FCC-hh), conceptual designs of detector magnets are being developed that provide sufficiently large bending power to study the particle products resulting from the 100 TeV collisions.
This talk focuses on several topics. Firstly, an overview is given of the various previously considered baseline designs to illustrate the design choices that led to the current baseline design. Secondly, the current baseline design, which features a larger superconducting central solenoid and two smaller superconducting forward solenoids, is discussed in terms of magnetic field properties, cold mass, cryostats and support structure, cooling, quench protection, etcetera. Thirdly, potential alternative detector magnet designs are discussed such as a dipole alternative for the forward solenoids and an ultra-thin superconducting central solenoid, where particle products traverse through the detector magnet before interacting with the calorimeters.
As the magnetic field and space requirements of the trackers, calorimeters, and muon chambers drive the design of the detector magnets, and the overall performance of the detector is in part dependent on the detector magnet performance, the conceptual detector magnet design of is an important component of the FCC-hh detector study.

Primary author: MENTINK, Matthias (CERN)

Co-authors: DUDAREV, Alexey (CERN); GADDI, Andrea (CERN); CURE, Benoit (CERN); BIELERT, Erwin Roland (Univ. Illinois at Urbana-Champaign (US)); PAIS DA SILVA, Helder Filipe (CERN); TEN KATE, Herman (CERN); GERWIG, Hubert (CERN); KLYUKHIN, Slava (M.V. Lomonosov Moscow State University (RU)); WAGNER, Udo (CERN)

Presenter: MENTINK, Matthias (CERN)

Session Classification: Special technologies

Contribution ID: **270** Type: **not specified**

Simulations of High efficiency Klystron

Tuesday, May 30, 2017 6:08 PM (2 minutes)

In the application on the contemporary large particle colliders, increasing the efficiency of Klystron indicates substantial decrease of the operating cost, especially in a long run. There are lots of methods and concepts to increase the Klystron effeciency, which consistently engage to collect the peripheral electrons in the bunching process to achieve a very deep modulation at the entrance of the output cavity. To make a more compact high effeciency Klystron operating in L band, with MW output power, a new method called CSM(core stablization method) employs a set of high order harmonic cavities to focus the beam longitudinally. As a demonstration, single beam Klystron based on CSM method is designed by 1-D code and verified by 3-D simulations. This L-band Klystron can produce 1.4MW microwave power with the conversion effeciency of 80%, while the total length of interaction region is less than 2 meters.

Primary author: CAI, Jinchi

Co-authors: MARELLI, Chira (ESS); SYRATCHEV, Igor (CERN); HILL, Victoria (Lancaster University)

Presenter: CAI, Jinchi

Session Classification: Poster session

Contribution ID: **271** Type: **not specified**

Luminosity and beam backgrounds for the FCC-ee Interaction Region design

A preliminary study on machine induced backgrounds has been performed for the proposed FCC-ee interaction region (IR) and proto-detector. Synchrotron radiation has the strongest impact on the present design of the IR and both radiation from dipoles and quadrupoles have been taken into account. The effect of luminosity backgrounds like Bhabha and pair production have also been studied. The impact of background particles on the detector occupancy has also been studied in full simulation.

Primary author: VOUTSINAS, Georgios Gerasimos (CERN)

Co-authors: KOLANO, Anna Maria (CERN); PEREZ, Emmanuel Francois (CERN); BURKHARDT, Helmut (CERN); BOSCOLO, Manuela (INFN e Laboratori Nazionali di Frascati (IT)); SULLIVAN, Michael Kenneth (SLAC National Accelerator Laboratory (US)); BACCHETTA, Nicola (Universita e INFN, Padova (IT))

Presenter: VOUTSINAS, Georgios Gerasimos (CERN)

Session Classification: Poster session

Contribution ID: **272** Type: **not specified**

Collective Effects in the Interaction Region of FCC-ee

Tuesday, May 30, 2017 6:12 PM (2 minutes)

FCC-ee is an e+e- circular collider designed to accelerate and collide electron and positron beams. One of the most critical aspects to be addressed in the design phase is the intensity limitation due to collective effects which can produce instabilities, limit the accelerator operation and reduce its performance. The studies presented in this contribution are focused on the electromagnetic interactions of the beam with the surrounding environment in the accelerator Interaction Region. In particular, we will analyse the wake fields induced by the beam, the resulting power loss, the heat load due to possible high order modes that could remain trapped and the electron cloud induced heat load in the two final focusing magnets and field-free region.

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

Co-authors: RUMOLO, Giovanni (CERN); MIGLIORATI, Mauro (Sapienza Universita e INFN, Roma I (IT))

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

Session Classification: Poster session

Contribution ID: **273** Type: **not specified**

Disappearing Track

Thursday, June 1, 2017 11:45 AM (10 minutes)

Primary author: SAWADA, Ryu (University of Tokyo (JP))

Presenter: SAWADA, Ryu (University of Tokyo (JP))

Session Classification: FCC-hh experiments and detectors

Contribution ID: **274** Type: **not specified**

Production of High Mass Charged Higgs Boson at FCC-hh

Tuesday, May 30, 2017 6:14 PM (2 minutes)

Possible extensions of the Higgs sector can be searched for a wide range of parameter space in the high energy proton-proton collisions. The searches of the heavy Higgs bosons have special challenges at present high energy colliders. One of the future international projects currently under consideration is the Future Circular Collider (FCC) which has the potential to search for a wide parameter range of new physics. The FCC-hh collider is to provide proton-proton collisions at nearly an order of magnitude higher energy than the LHC. We have studied the production and decay of charged Higgs boson at FCC-hh with a center of mass energy of 100 TeV, which extends the parameter space of Higgs sector with a high luminosity of 500 fb^(-1).
The decay modes of the charged Higgs boson can be well similar to the background reactions from top and bottom quarks and other sources. The charged Higgs boson signal can be distinguished from the background for m_H up to 2 TeV.

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

Co-authors: SENOL, Abdulkadir (Abant Izzet Baysal University); Dr YILMAZ, Ali; DENIZLI, Haluk (Ankara University Institute of Accelerator Technologies (TR)); CAKIR, Orhan (Ankara University (TR))

Presenter: TURK CAKIR, Ilkay (Istanbul Aydin University)

Session Classification: Poster session

Contribution ID: **275** Type: **not specified**

Probing Anomalous HVV Couplings at the FCC-ep

Tuesday, May 30, 2017 6:16 PM (2 minutes)

In this work, we have investigated Higgs-gauge boson couplings via e-p->e-qh process at the Future Circular eh Collider (FCC-eh). The limits on the anomalous hVV couplings in this process are obtained by using MadGraph5 multi-purpose event generator at the parameters of the FCC-eh.

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

Co-authors: SENOL, Abdulkadir (Abant Izzet Baysal University); ALTINLI, Murat; CAKIR, Orhan (Ankara University (TR)); KARTAL, Sehban (University of Istanbul Department of Physics); BOLUKBASI, olcay (asoc.prof)

Presenter: TURK CAKIR, Ilkay (Istanbul Aydin University)

Session Classification: Poster session

Contribution ID: **276** Type: **not specified**

Test of HTS Demonstrator Dipoles in the 11 T Background Field of the SULTAN Facility

Tuesday, May 30, 2017 6:18 PM (2 minutes)

The development of High Temperature Superconductor (HTS) dipoles is fundamental for future high magnetic field accelerators. In this context, CERN is currently producing a series of HTS demonstrator dipoles, named FeaTHeR (Five Tesla HTS Research) dipoles. The FeaTHeR-M0 coils are subscale planar racetrack dipoles designed to test fabrication techniques in magnets wound with ReBCO-Roebel cable, and gain experience in quench detection and protection. A set of these demonstrator dipoles will be tested at variable temperature in the 11 T background field of the SULTAN facility. Two upgrades are required in SULTAN for the test of the FeaTHeR dipoles. First, the sample dipoles have to be installed inside a cryostat where the temperature can be regulated between 4.5 and 50 K. The cryostat will be equipped with high current feedthroughs, which can provide more than 10 kA at 50 K to the sample while minimizing the heat leak to the Nb-Ti transformer of SULTAN. The second required upgrade is a counter flow heat exchanger, which will ensure that the warm helium leaving the sample returns to the cryoplant as cold gas at less than 20 K. The construction and commissioning of the new sample cryostat and heat exchanger will be presented along with results of the tests of the first HTS demonstrator dipoles in the SULTAN facility.

Primary author: SARASOLA, Xabier (EPFL)

Co-authors: DE RIJK, Gijs (CERN); KIRBY, Glyn (CERN); VAN NUGTEREN, Jeroen (CERN); BRUZZONE, Pierluigi (EPFL-SPC)

Presenter: SARASOLA, Xabier (EPFL)

Session Classification: Poster session

Contribution ID: **277** Type: **not specified**

Compact common-coil design for a future collider

Tuesday, May 30, 2017 6:20 PM (2 minutes)

"High field accelerator dipoles are the enabling technology for future colliders surpassing the energy reach of LHC.
The effectiveness of adopting a common-coil layout, featuring flat racetrack coils shared between the two magnetic apertures, is investigated here. The common coil layout offers potential advantages such as use of flat cables and larger bending radius at the coil ends. However, the vertical arrangement of the two apertures is less efficient than the traditional case with the two apertures placed side by side, from both the magnetic and mechanical standpoint.
In this study we attempt to address these challenges and provide an attractive and compact common coil design in the field and aperture range of interest. Key performance parameters such as maximum field as a function of superconductor volume and overall magnet size, field quality, mechanical support, and quench protection in the accelerator, will be discussed.

Primary author: RAVAIOLI, Emmanuele (LBNL)

Co-author: SABBI, GianLuca (LBNL)

Presenter: RAVAIOLI, Emmanuele (LBNL)

Session Classification: Poster session

Contribution ID: **278** Type: **not specified**

A Code for Optimising Triplet Layout

Tuesday, May 30, 2017 6:22 PM (2 minutes)

One of the main challenges when designing final focus systems of particle accelerators is maximising the beam stay clear in the strong quadrupole magnets of the inner triplet. Moreover it is desirable to keep the quadrupoles in the inner triplet as short as possible for space and costs reasons but also to reduce chromaticity and simplify corrections schemes. An algorithm that explores the triplet parameter space to optimise both these aspects was written. It uses thin lenses as a first approximation for a broad parameter scan and MADX for more precise calculations. The thin lens algorithm is significantly faster than a full scan using MADX and relatively precise at indicating the approximate area where the optimum solution lies.

Primary author: VAN RIESEN-HAUPT, Leon

Presenter: VAN RIESEN-HAUPT, Leon

Session Classification: Poster session

Contribution ID: **279** Type: **not specified**

Strategies to reduce the voltage to ground in the FCC main dipole circuits

Tuesday, May 30, 2017 6:24 PM (2 minutes)

Within the FCC project, the EuroCirCol Work Package 5 is dedicated to the study of the high-field, high-current superconducting dipole magnets. The target performance of these magnets, together with the unprecedented size of the accelerator, poses a number of challenges as, among others, machine integration and protection.
As for the LHC, dipole magnets have to be powered in long strings, resulting in large stored energy in the circuits. In case of a quench or equipment failure, a safe extraction of the circuit energy in a short amount of time is very challenging due to the development of high voltages to ground.
The voltage to ground in the coils of a magnet is composed by two contributions: the voltage drop over the string from the grounding point to the magnet input and its internal voltage distribution. The higher the unbalance between resistive and inductive voltage during the current discharge, the higher the resulting voltage to ground.
In this paper, we discuss dedicated strategies to reduce the voltage to ground both at the circuit level and at the level of the powering layout of single magnets. Numerical simulations support the results, considering electrical transients at the circuit level together with magneto-thermal transients occurring at the magnet level during a quench. In this context, we also present the effect of the Coupling-Loss Induced Quench (CLIQ) system, a magnet protection technology recently developed at CERN, on the voltage to ground distribution.

Primary author: PRIOLI, Marco (CERN)

Co-authors: STENVALL, Antti Aleksis; VERWEIJ, Arjan (CERN); AUCHMANN, Bernhard (CERN); BORTOT, Lorenzo (CERN); MACIEJEWSKI, Michal (Technical University of Lodz(PL)); SALMI, Tiina-Mari (Tampere University of Technology, Finland)

Presenter: PRIOLI, Marco (CERN)

Session Classification: Poster session

Contribution ID: **280** Type: **not specified**

Update on the FCC-hh interaction region design

Tuesday, May 30, 2017 6:26 PM (2 minutes)

Primary author: MARTIN, Roman (CERN)

Presenter: MARTIN, Roman (CERN)

Session Classification: Poster session

Contribution ID: **281** Type: **not specified**

Application of the wire offset measurements technique in the FCC alignment

Tuesday, May 30, 2017 6:28 PM (2 minutes)

Primary author: IBARROLA SUBIZA, Nerea (CERN)

Presenter: IBARROLA SUBIZA, Nerea (CERN)

Session Classification: Poster session

Contribution ID: **282** Type: **not specified**

Electrical transmission line studies

Tuesday, May 30, 2017 6:30 PM (2 minutes)

Presenter: MYLONA, Maria (CERN)

Session Classification: Poster session

Contribution ID: **283** Type: **not specified**

Eliminating field distortions caused by the HTS beam screen coating

Tuesday, May 30, 2017 6:32 PM (2 minutes)

In order to decrease the beam impedance the beam screen of the FCC ring is planned to receive a high-temperature superconductor coating. However the persistent currents induced in the coating would distort the ring's magnetic field. Rather than trying to suppress this effect we examine the possibility to use a tailored thickness profile of the coating such that these currents produce a field with the same symmetry as the external field, giving an offset to the external field rather than distorting it, which can be compensated by proper current settings.

Primary author: Mr BRUNNER, Kristof (Hungarian Academy of Sciences (HU))

Co-author: BARNA, Daniel (Hungarian Academy of Sciences (HU))

Presenter: Mr BRUNNER, Kristof (Hungarian Academy of Sciences (HU))

Session Classification: Poster session

Contribution ID: **284** Type: **not specified**

Summary SRF

Friday, June 2, 2017 10:15 AM (15 minutes)

Primary author: JENSEN, Erk (CERN)

Presenter: JENSEN, Erk (CERN)

Session Classification: Summaries

Contribution ID: **285** Type: **not specified**

Summary FCC-eh

Friday, June 2, 2017 11:15 AM (15 minutes)

Primary author: BRUNING, Oliver (CERN)

Presenter: BRUNING, Oliver (CERN)

Session Classification: Summaries

Contribution ID: **286** Type: **not specified**

HIJING++ Monte Carlo Generator for the Future Heavy-ion Collisions

Tuesday, May 30, 2017 6:34 PM (2 minutes)

The development os a new-generation particle Monte Carlo generator for simulating high-energy heavy-ion collisions, HIJING++ is under development. The completely rewritten version of the FORTRAN-based HIJING2.1 relies on the latest version of PYTHIA8 and contains all the nuclear effects has been included in the HIJING2.1. The code is written in C++ and due to its modualarity, supports parallel computing architectures. Applying these techniques, relevant speedup of the simulation can be achieved. We also included an improved version of the shadowing parametrization and working on the jet quenching module. Here we summarize the mayor changes of the new program code beside the comparison between experimental data.

Primary authors: Dr BARNAFOLDI, Gergely Gabor (Wigner RCP Hungarian Academy of Sciences (HU)); LEVAI, Peter (Hungarian Academy of Sciences (HU))

Co-authors: ZHANG, Ben-Wei (Central China Normal University); BIRO, Gabor (Hungarian Academy of Sciences (HU)); MA, Guoyang (I); PAPP, Gábor (Eötvös University); GYULASSY, Miklos (Columbia University); HARANGOZO, Szilveszter Miklos (Hungarian Academy of Sciences (HU)); WANG, Xin--Nian (Lawrence Berkeley National Lab. (US))

Presenters: Dr BARNAFOLDI, Gergely Gabor (Wigner RCP Hungarian Academy of Sciences (HU)); LEVAI, Peter (Hungarian Academy of Sciences (HU))

Session Classification: Poster session

Contribution ID: **287** Type: **not specified**

New design concepts for suppressing erratic triggering of solid state switch stacks

Tuesday, May 30, 2017 6:36 PM (2 minutes)

The proposed FCC Beam Dump architecture consists of a large number of kicker magnets to assure a fast and safe beam deflection. The High Voltage (HV) pulse generators will produce fast controlled capacitor discharges through HV power switches into lumped inductance magnets. As for the LHC Beam Dump System (LBDS), an erratic triggering (i.e. self-trigger) of one or more of the 300 generator switches cannot be avoided and will deflect the circulating beam and could significantly damage the machine. The standard mitigation is a retrigger mechanism that ensures the triggering of the remaining generators, but the kicker rise time is then unsynchronised with the beam abort gap(s) and hence several bunches will be steered on the machine extraction and downstream equipment.
Two alternative generator topologies for tackling the problem of erratic triggers at the source are studied: the use of additional shorting crowbar or series blocking switches. Both topologies can limit the current in the kicker magnet with the aim to reduce or eradicate the impact on the beam. This can result in a higher system reliability but the impact on availability needs to be acceptable. The results of electrical simulation models are presented in addition to topology advantages and disadvantages. A low-voltage test-bench has been built and the results of the associated tests are discussed.

Primary author: VAN TRAPPEN, Pieter (CERN)

Co-authors: GODDARD, Brennan (CERN); CARLIER, Etienne (CERN); KRAMER, Thomas (CERN)

Presenter: VAN TRAPPEN, Pieter (CERN)

Session Classification: Poster session

Contribution ID: **288** Type: **not specified**

3D modelling of underground structures and integration

Tuesday, May 30, 2017 6:38 PM (2 minutes)

Primary author: VALCHKOVA-GEORGIEVA, Fani (Bulgarian Academy of Sciences (BG))

Co-author: MUTTONI, Yvon (CERN)

Presenters: VALCHKOVA-GEORGIEVA, Fani (Bulgarian Academy of Sciences (BG)); MUTTONI, Yvon (CERN)

Session Classification: Poster session

Contribution ID: **289** Type: **not specified**

Design guidelines for handling and maintenance in radiation areas

Primary author: KERSHAW, Keith (CERN)

Presenter: KERSHAW, Keith (CERN)

Session Classification: Poster session

Contribution ID: **290** Type: **not specified**

First results of large size SRF cavity fabrication by electrohydraulic forming

Tuesday, May 30, 2017 6:52 PM (2 minutes)

In the framework of Future Circular Collider study, copper coated with niobium cavities must be fabricated to operate at a frequency of 400MHz. The two half-cells, to make one cavity, are traditionally manufactured by spinning through multiple forming steps, comprising intermediates heat treatments to achieve the required shape. Finally, the two half-cells are welded at the equator by electron-beam welding.

Shape conformity and processing time are key factors for the optimization of cavity fabrication. An alternative to conventional shaping method is electrohydraulic forming (EHF). By EHF, half-cells are obtained through ultra-high speed deformation of blank sheets, using shockwaves induced in water by a pulsed electrical discharge. With reference to traditional methods, this process brings about interesting results in terms of final shape precision, repeatability, higher formability and reduced spring back. This shaping technology has been tested at CERN for smaller half-cells (704MHz) and promising results were achieved in terms of shape accuracy and damaged layer in the material after forming.

In this work, large half-cells of Cu are produced by EHF for the first time. This new method and the conventional one (spinning) are compared regarding shape accuracy, mechanical properties and material characterization.

Primary author: ABAJO CLEMENTE, Carolina (CERN)

Co-authors: CHERIF, Ahmed (CERN); PEREZ FONTENLA, Ana Teresa (CERN); NOTTEBAERT, Aurelien (Bmax); CANTERGIANI, Elisa (Bmax); LEAUX, Floriane (CERN); BERTINELLI, Francesco (CERN); RAVELAU, Frederic (Bmax); MOTSCHMANN, Fritz (CERN); AVRILLAUD, Gilles (Bmax); FAVRE, Gilles (CERN); FUZEAU, Julien (Bmax); MEYER, Mickael Sebastien (CERN); KARPPINEN, Mikko (CERN); TRUBACOVA, Pavlina (CERN); ATIEH, Said (CERN)

Presenter: ABAJO CLEMENTE, Carolina (CERN)

Session Classification: Poster session

Contribution ID: **291** Type: **not specified**

Fire safety

Tuesday, May 30, 2017 6:44 PM (2 minutes)

Primary author: LA MENDOLA, Saverio (CERN)

Presenter: LA MENDOLA, Saverio (CERN)

Session Classification: Poster session

Contribution ID: **292** Type: **not specified**

Fire Performance-based Safety design

Tuesday, May 30, 2017 6:46 PM (2 minutes)

Primary author: HENRIQUES, Andre (CERN)

Presenter: HENRIQUES, Andre (CERN)

Session Classification: Poster session

Contribution ID: **293** Type: **not specified**

Investigation of the mechanical properties of epoxy impregnated Nb3Sn cables

Tuesday, May 30, 2017 6:48 PM (2 minutes)

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 and 77 K. A dedicated test bench was designed to measure the vertical and lateral deformations of the sample. This work presents the production process of the Nb3Sn 10 stacks and the features of the experimental setup. The stress-strain relationships and the Poisson's ratios are analysed focusing on the effect of loading speed rate and temperature.

Primary author: FICHERA, Claudio (CERN)

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

Presenter: FICHERA, Claudio (CERN)

Session Classification: Poster session

Contribution ID: **294** Type: **not specified**

Energy Deposition Studies for the New Compact FCC-hh Final-Focus System

Tuesday, May 30, 2017 6:50 PM (2 minutes)

An optimized design of a final-focus system for the main EIR of FCC-hh is presented here. The new design is more compact and enables unequal in both planes, whose choice is justified here. This is followed by energy deposition studies, where the total dose in the magnets as a consequence of the collision debris is evaluated.

Primary author: ABELLEIRA, Jose L. (JAI-Oxford)

Co-authors: VAN RIESEN-HAUPT, Leon; BESANA, Maria Ilaria (CERN)

Presenter: ABELLEIRA, Jose L. (JAI-Oxford)

Session Classification: Poster session

Contribution ID: **295** Type: **not specified**

A fully symmetric final focus system for FCC-hh

Tuesday, May 30, 2017 6:52 PM (2 minutes)

We present the concept for a new optics for the main Experimental Interaction Region (EIR) of the FCC-hh. This optics is fully symmetric for either side of the IP and for either plane. The luminosity evolution and a schematic of the first quadrupole is shown.

Primary author: ABELLEIRA, Jose L. (JAI-Oxford)

Presenter: ABELLEIRA, Jose L. (JAI-Oxford)

Session Classification: Poster session

Contribution ID: **296** Type: **not specified**

The CERN Accelerator School

Tuesday, May 30, 2017 6:20 PM (15 minutes)

Primary author: SCHMICKLER, Hermann (CERN)

Presenter: SCHMICKLER, Hermann (CERN)

Session Classification: Opportunities for Students

Contribution ID: **297** Type: **not specified**

Magnetic core and semiconductor switch characterisation for an Inductive Adder kicker generator

Wednesday, May 31, 2017 2:42 PM (18 minutes)

For the FCC-hh injection kicker magnet system a highly reliable generator is needed. One promising technology to reach the challenging voltage, current, rise time and flat top stability values for this application is an inductive adder (IA) based on high-power semiconductor switches. A prototype IA will be built at CERN to validate the theoretical performance and identify technology limits. Many components influence the performance of the inductive adder, making it a complex device. The two components that have a significant influence are the magnetic cores, which are part of the output transformer, and the semiconducting switches, which allow the current to be both turned on and off. Hence detailed characterisation of samples, including both of these components, are necessary before selecting components for the final prototype. The presentation gives an overview of the IA technology, describes the testing of the magnetic cores and semiconductor switches and presents the results and preliminary decisions for component selection. An outlook is given for the upcoming activities in the next years.

Primary author: WOOG, David (CERN)

Co-authors: HOLMA, Janne (CERN); BARNES, Mike (CERN); KRAMER, Thomas (CERN)

Presenter: WOOG, David (CERN)

Session Classification: Special technologies

Contribution ID: **298** Type: **not specified**

Registration

Contribution ID: **299** Type: **not specified**

Summary technologies

Friday, June 2, 2017 9:45 AM (15 minutes)

Primary author: JIMENEZ, Jose Miguel (CERN)

Presenter: JIMENEZ, Jose Miguel (CERN)

Session Classification: Summaries

Contribution ID: **300** Type: **not specified**

Neutron irradiation

Tuesday, May 30, 2017 6:54 PM (20 minutes)

For the design of FCC-hh superconducting magnets an increase of the high field critical currents in commercial Nb3Sn wires by about 50 % is required. Feasibility of reaching this target has already been demonstrated by fast neutron irradiation induced defects. In this study, the underlying mechanisms are investigated through combined microstructural and magnetic analysis for realization in an industrial process.

A research reactor was used to irradiate Nb3Sn wires and TEM samples. Micro- and nanostructural examinations of grain geometry, grain boundary morphology, compositional gradients, local texture and defect structure were performed by transmission electron microscopic methods such as HRTEM, EDX, EELS and selected area diffraction before and after irradiation. The results thereof are correlated with superconducting measurements such as transport, magnetometry and scanning Hall probe experiments to determine the global critical current as well as the local critical current density within the subelements.

This study contributes to a better understanding of the influence of irradiation damage and the resulting microstructure on local superconducting properties and ultimately on the macroscopic performance of the superconductor.

Primary author: PFEIFFER, Stephan (TU Vienna)

Co-authors: BALLARINO, Amalia (CERN); Dr BERNARDI, Johannes (Technische Universität Wien (TU Wien)); EISTERER, Michael; STÖGER-POLLACH, Michael (TU Vienna); BAUMGARTNER, Thomas (TU Wien, Atominstitut)

Presenter: PFEIFFER, Stephan (TU Vienna)

Session Classification: Poster session

Contribution ID: **301** Type: **not specified**

Beam instability study for FCC-hh

Tuesday, May 30, 2017 7:14 PM (2 minutes)

Previous studies already showed that the FCC-hh beam intensities are limited by the resistive wall and the collimator impedances. In addition, electron clouds also contribute to the total impedance and could be the cause of instabilities. Numerical model of beam instabilities taking into account the impedance model is being developed. This should also be extended and include electron clouds. The numerical and analytical results of the impedance and growth rates for coupled-bunch instabilities will be shown.

Primary author: ASTAPOVYCH, Daria (TU Darmstadt)

Co-authors: BOINE-FRANKENHEIM, Oliver (TU Darmstadt); KRKOTIC, Patrick (TU Darmstadt); NIEDERMAYER, Uwe (TU-Darmstadt)

Presenter: ASTAPOVYCH, Daria (TU Darmstadt)

Session Classification: Poster session

Contribution ID: **302** Type: **not specified**

Magnet families for the FCC-hh

Wednesday, May 31, 2017 3:30 PM (20 minutes)

Primary author: Dr CHANCE, Antoine (CEA Irfu)

Presenter: Dr CHANCE, Antoine (CEA Irfu)

Session Classification: 16 Tesla magnet

Contribution ID: **303** Type: **not specified**

Performance of the LHC magnets and margin

Wednesday, May 31, 2017 3:50 PM (30 minutes)

Primary author: TODESCO, Ezio (CERN)

Presenter: TODESCO, Ezio (CERN)

Session Classification: 16 Tesla magnet

Contribution ID: **304** Type: **not specified**

HL-LHC focusing quadrupoles as precursors to HE-LHC/FCC magnet development

Wednesday, May 31, 2017 4:20 PM (20 minutes)

The world-wide HEP community has identified the exploitation of physics opportunities at the High Luminosity-LHC (HL-LHC) as one of the highest near-term priorities. Thanks to multi-year R&D programs, Laboratories and Universities in America and Europe have developed technical solutions to increase the LHC luminosity by bringing the Nb3Sn technology for magnets to production readiness. In the next ~5 years, the experience gained building ~30 “”accelerator quality”” focusing quadrupoles for HL-LHC will represent a treasure chest of knowledge and capabilities on which plans for future high energy hadron machine can be based.

The proposed presentation will cover the plans and achievements of magnets for the HL-LHC Project, and will describe some of the issues on which further development and coordinated work is necessary to converge on magnets meeting the requirement of proposed future hadron colliders, such as a possible High Energy-LHC (HE-LHC).

Primary author: APOLLINARI, Giorgio (Fermi National Accelerator Lab. (US))

Presenter: APOLLINARI, Giorgio (Fermi National Accelerator Lab. (US))

Session Classification: 16 Tesla magnet

Contribution ID: **305** Type: **not specified**

Status of high field magnet technology for CEPC-SPPC

Wednesday, May 31, 2017 4:40 PM (20 minutes)

IHEP (Beijing, China) is pursuing R&D of high field accelerator magnet technology for recently proposed CEPC-SPPC project, which will need thousands of all-HTS 12T (SPPC) to 24T (SPPC Upgrade) accelerator magnets in the next 20~40 years. A long-term R&D plan has been made aiming to realize the magnets in time. The conceptual design study of the all-HTS (Fe-based superconductor) & Nb3Sn+HTS 12T magnets and the development status of the Nb3Sn & Nb3Sn+HTS model magnets will be presented and discussed.

Primary author: XU, Qingjin (IHEP)

Presenter: XU, Qingjin (IHEP)

Session Classification: 16 Tesla magnet

Contribution ID: **306** Type: **not specified**

Introductory Remarks

Wednesday, May 31, 2017 1:30 PM (10 minutes)

Primary author: BORDRY, Frederick (CERN)

Presenter: BORDRY, Frederick (CERN)

Session Classification: Economic impact of CERN colliders

Contribution ID: **307** Type: **not specified**

Perspectives on CERN procurement: beyond LHC

Wednesday, May 31, 2017 1:40 PM (20 minutes)

Primary authors: UNNERVIK, Anders (CERN); ROSSI, Lucio (CERN)

Presenters: UNNERVIK, Anders (CERN); ROSSI, Lucio (CERN)

Session Classification: Economic impact of CERN colliders

Contribution ID: **308** Type: **not specified**

Measuring the CERN effect on company performance with empirical models

Wednesday, May 31, 2017 2:00 PM (20 minutes)

Primary author: FLORIO, Massimo (Università degli Studi e INFN Milano (IT))

Presenter: FLORIO, Massimo (Università degli Studi e INFN Milano (IT))

Session Classification: Economic impact of CERN colliders

Contribution ID: **309** Type: **not specified**

A new survey of CERN suppliers: a Bayesian Network Analysis

Wednesday, May 31, 2017 2:20 PM (20 minutes)

Primary author: SIRTORI, Emanuela

Presenter: SIRTORI, Emanuela

Session Classification: Economic impact of CERN colliders

Contribution ID: **310** Type: **not specified**

Are CERN suppliers different? A quasi-experiment

Wednesday, May 31, 2017 2:40 PM (20 minutes)

Primary author: BASTIANIN, Andrea (Università degli Studi e INFN Milano (IT))

Presenter: BASTIANIN, Andrea (Università degli Studi e INFN Milano (IT))

Session Classification: Economic impact of CERN colliders

Contribution ID: **311** Type: **not specified**

Comments

Wednesday, May 31, 2017 3:00 PM (15 minutes)

Primary authors: KROLL, Henning (Fraunhofer ISI); KRUPA, Jörn (Helmholtz Association); KROSCHEWSKI, Katja (DESY)

Presenters: KROLL, Henning (Fraunhofer ISI); KRUPA, Jörn (Helmholtz Association); KROSCHEWSKI, Katja (DESY)

Session Classification: Economic impact of CERN colliders

Contribution ID: **312** Type: **not specified**

Discussion

Wednesday, May 31, 2017 3:15 PM (15 minutes)

Session Classification: Economic impact of CERN colliders

Contribution ID: **313** Type: **not specified**

USA procurement of RRP conductor for HL-LHC: state of the art performance

Tuesday, May 30, 2017 11:00 AM (20 minutes)

Primary author: COOLEY, Lance (Fermilab)

Presenter: COOLEY, Lance (Fermilab)

Session Classification: Conductor

Contribution ID: **314** Type: **not specified**

Future developments for high speed links

Thursday, June 1, 2017 2:00 PM (30 minutes)

Primary author: TROSKA, Jan (CERN)

Presenter: TROSKA, Jan (CERN)

Session Classification: FCC-hh experiments and detectors

Contribution ID: **315** Type: **not specified**

Development of Distributed Tin processed Nb3Sn wire for FCC

Tuesday, May 30, 2017 7:16 PM (2 minutes)

Kobe Steel Ltd. have been doing research of Nb3Sn wire since 1980s', and Japan Superconductor Technology, Inc. (JASTEC), one of her affilieted company manufacturing superconducting wire and magunet, has high production capacity of Bronz(Cu-Sn alloy) routed Nb3Sn wire. JASTEC was one of the main supplier of Nb3Sn strand for ITER (International Thermal Experimental Reactor) project, and supplied amount of more than 100tons of bronze routed Nb3Sn wire in total for ITER project from 2008 to 2016. Jc requirement for Nb3Sn in FCC project is much higher than ITER project. In the case of bronze routed Nb3Sn wire, Jc could be increased by the enhancement of tin concentration in Cu-Sn alloy. But higher tin concentration (more than 16% tin) makes it difficult for drawing process. So, as one of alternative method to increase tin concentration, KSL is developing Distributed Tin wire (DT wire). With this method we can improve Jc at 16 Tesla twice than the conventional our bronze routed Nb3Sn. In addition, DT compared with other high tin concentration methods such as Internal Tin, it can be manufactured stably, so it is suitable for mass production. In this presentation, we will introduce our research for increasing Jc using DT wire.

Primary author: KAWASHIMA, Shinya (Kobelco)

Presenter: KAWASHIMA, Shinya (Kobelco)

Session Classification: Poster session

Contribution ID: **316** Type: **not specified**

Beam abort system for the FCC-ee

Tuesday, May 30, 2017 7:18 PM (2 minutes)

The conceptual design of an abort system for the future electron positron circular collider is presented. A dedicated abort system has been studied based on MAD-X simulations. The proposed abort system consists of abort kickers, septum magnets and a dilution kicker system. The abort system must safely remove the beam from the accelerator ring and transport it to a dedicated beam dump. The dilution kickers must spread the beam evenly on the surface of the beam dump and on the vacuum chamber window, in order to prevent damages due to high energy electron and positron beams. Simulation studies are carried out in order to determine an operational configuration of the abort system and the required apertures of the abort beam lines.

Primary author: APYAN, Armen

Presenter: APYAN, Armen

Session Classification: Poster session

Contribution ID: **317** Type: **not specified**

Functional requirements, design and performance of the transverse damping system

Tuesday, May 30, 2017 7:20 PM (2 minutes)

Primary author: KOMPPULA, Jani Paavo Olavi (CERN)

Presenter: KOMPPULA, Jani Paavo Olavi (CERN)

Session Classification: Poster session

Contribution ID: **318** Type: **not specified**

Studies on beam related machine protection of the FCC-hh

Tuesday, May 30, 2017 7:22 PM (2 minutes)

Primary author: NIE, Yuancun (CERN)

Co-authors: Dr JONKER, Michael (CERN); SCHMIDT, Rudiger (CERN)

Presenter: NIE, Yuancun (CERN)

Session Classification: Poster session