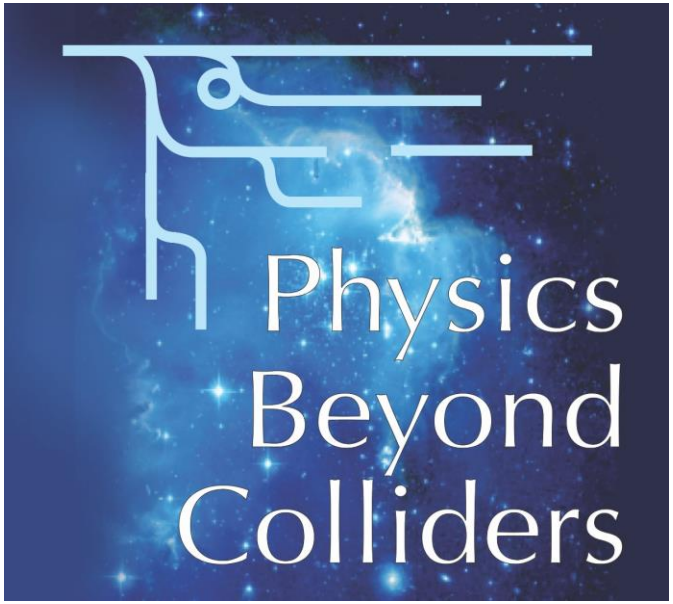


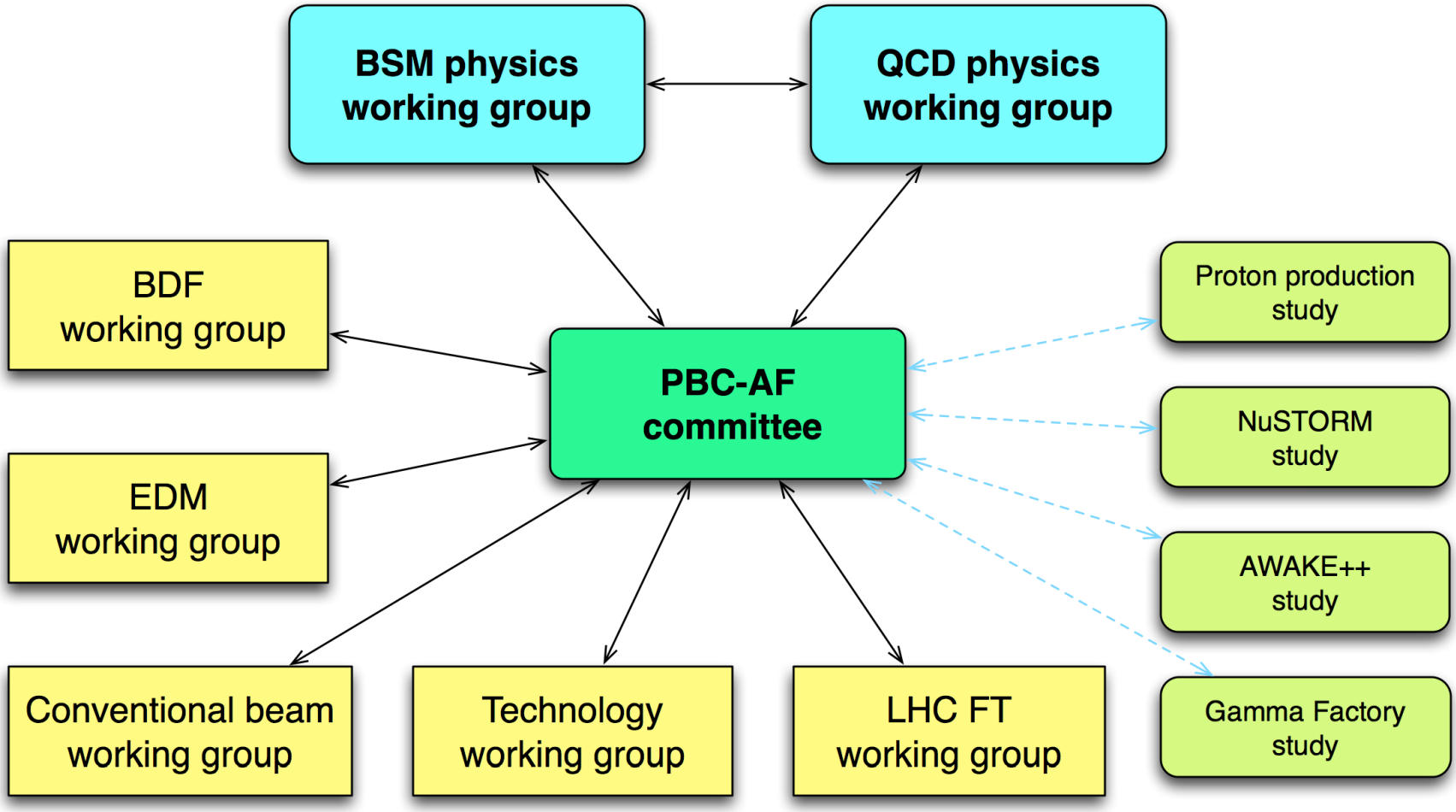
Status and News

- Overview of the PBC-acc activities
- Details of the BDF planning
- Future PBC meetings

Mike Lamont for PBC coordination (Joerg Jaeckel, Claude Vallée) and the BDF team

7th June 2017

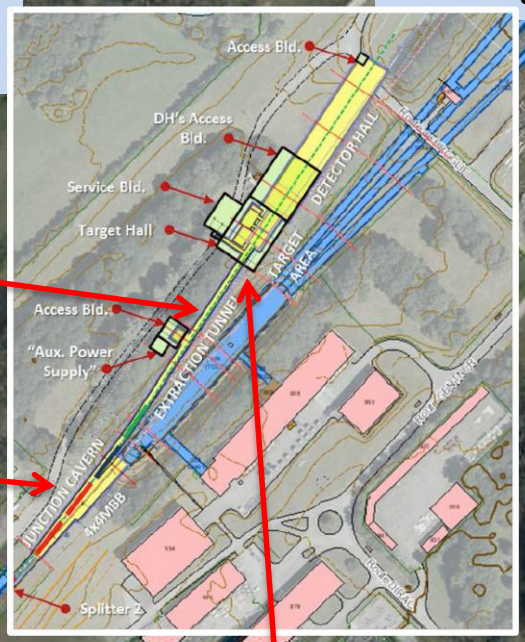
Organization



See //cern.ch/pbc for details

Civil engineering
Geotechnical and hydrogeology of site

Existing users



New beam line
Dilution

Construction of junction cavern
Switching into new beam-line

Radiation protection of personnel and environment

Safe exploitation

Target and target complex

Beam delivery by SPS
Slow extraction with acceptable losses

BDF deliverables

- Beam requirements specification for all potential users
- Evaluation of SPS performance reach per requested beam type
- Design and feasibility evaluation for engineering subsystems (extraction, beam-lines, splitting, dilution, target and target complex, interface to experiment(s))
- Preliminary integration and infrastructure study
- Preliminary civil engineering design
- RP simulation, impact and optimization studies
- Safety impact studies
- Preliminary project safety folder
- Projection execution analysis and planning
- Cost analysis
- Comprehensive Design Report plus CDR input for SHiP

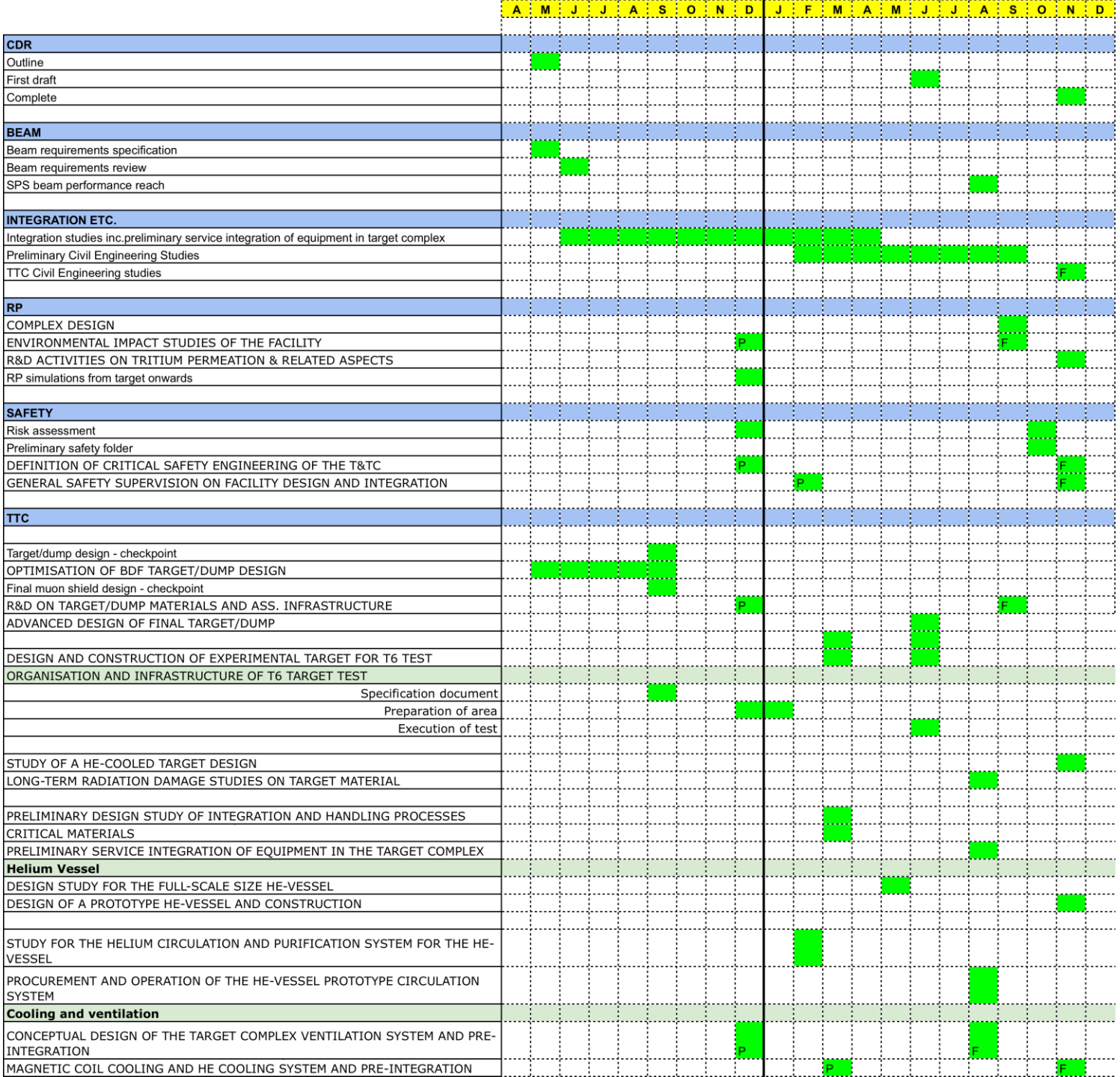
BDF work packages

- Target and target complex (Marco Calviani)
  - BDF target & target complex WG
- Extraction and beam transfer (Brennan Goddard)
  - SPS Losses and Activation WG (SLAWG)
  - SPS Crystal-Assisted Slow Extraction WG (SPS-CASE WG)
  - TT20 for BDF WG: splitters and TL design
- Radiation protection (Heinz Vincke)
- Safety engineering (Fernando Pedrosa)
- Integration and infrastructure (Lau Gatignon, Markus Brugger)
  - Junction cavern, beam-line, target complex, detector hall

- Civil engineering (J. Osborne)
  - Preliminary studies - 2017

BDF activities - May 2017

- **Extraction and beam transfer**
  - Loss mitigation studies
  - Two polarity splitter magnet design and prototyping
  - TT20 optics studies
- **Target and target complex**
  - Beam dilution sweep on target optimization
  - Target material studies and characterization
  - Target cooling simulations
  - Target complex handling and integration studies (OTL design study)
  - Target shielding studies
  - T6 target test preparation
- **Safety engineering** Impact studies on existing installations and environment
  - Support on the definition of Safety based design, installation, and maintenance procedures
  - PBC hazard register
  - Preliminary qualitative flooding risk assessment for the BDF target building
  - Definition of the strategy to perform the hydrogeological study
  - Preliminary list of hazards for the BDF
  - Preliminary list of qualitative risk assessments
- **Radiation protection**
  - Update of the new, quite complex FLUKA geometry followed by update of estimates of prompt dose rates…
  - Optimization of the design of the target bunker
  - The production of radionuclides in air, helium & water compartments/circuits of the BDF; beam extraction and transfer tunnels; TDC2/TCC2.
- **Integration**
  - Studies to start on integration for target complex, beam lines, junction cavern and eventually the experimental hall.


A M J J A S O N D J F M A M J J A S O N D
CDR
Outline
First draft
Complete
BEAM
Beam requirements specification
Beam requirements review
SPS beam performance reach
INTEGRATION ETC.
Integration studies inc.preliminary service integration of equipment in target complex
Preliminary Civil Engineering Studies
TTC Civil Engineering studies
F
RP
COMPLEX DESIGN
ENVIRONMENTAL IMPACT STUDIES OF THE FACILITY
P
F
R&D ACTIVITIES ON TRITIUM PERMEATION & RELATED ASPECTS
RP simulations from target onwards
SAFETY
Risk assessment
Preliminary safety folder
DEFINITION OF CRITICAL SAFETY ENGINEERING OF THE T&TC
P
F
GENERAL SAFETY SUPERVISION ON FACILITY DESIGN AND INTEGRATION
P
F
TTC
Target/dump design - checkpoint
OPTIMISATION OF BDF TARGET/DUMP DESIGN
Final muon shield design - checkpoint
R&D ON TARGET/DUMP MATERIALS AND ASS. INFRASTRUCTURE
P
F
ADVANCED DESIGN OF FINAL TARGET/DUMP
DESIGN AND CONSTRUCTION OF EXPERIMENTAL TARGET FOR T6 TEST
ORGANISATION AND INFRASTRUCTURE OF T6 TARGET TEST
Specification document
Preparation of area
Execution of test
STUDY OF A HE-COOLED TARGET DESIGN
LONG-TERM RADIATION DAMAGE STUDIES ON TARGET MATERIAL
PRELIMINARY DESIGN STUDY OF INTEGRATION AND HANDLING PROCESSES
CRITICAL MATERIALS
PRELIMINARY SERVICE INTEGRATION OF EQUIPMENT IN THE TARGET COMPLEX
Helium Vessel
DESIGN STUDY FOR THE FULL-SCALE SIZE HE-VESSEL
DESIGN OF A PROTOTYPE HE-VESSEL AND CONSTRUCTION
STUDY FOR THE HELIUM CIRCULATION AND PURIFICATION SYSTEM FOR THE HE-VESSEL
PROCUREMENT AND OPERATION OF THE HE-VESSEL PROTOTYPE CIRCULATION SYSTEM
Cooling and ventilation
CONCEPTUAL DESIGN OF THE TARGET COMPLEX VENTILATION SYSTEM AND PRE-INTEGRATION
P
F
MAGNETIC COIL COOLING AND HE COOLING SYSTEM AND PRE-INTEGRATION
P
F

Resources

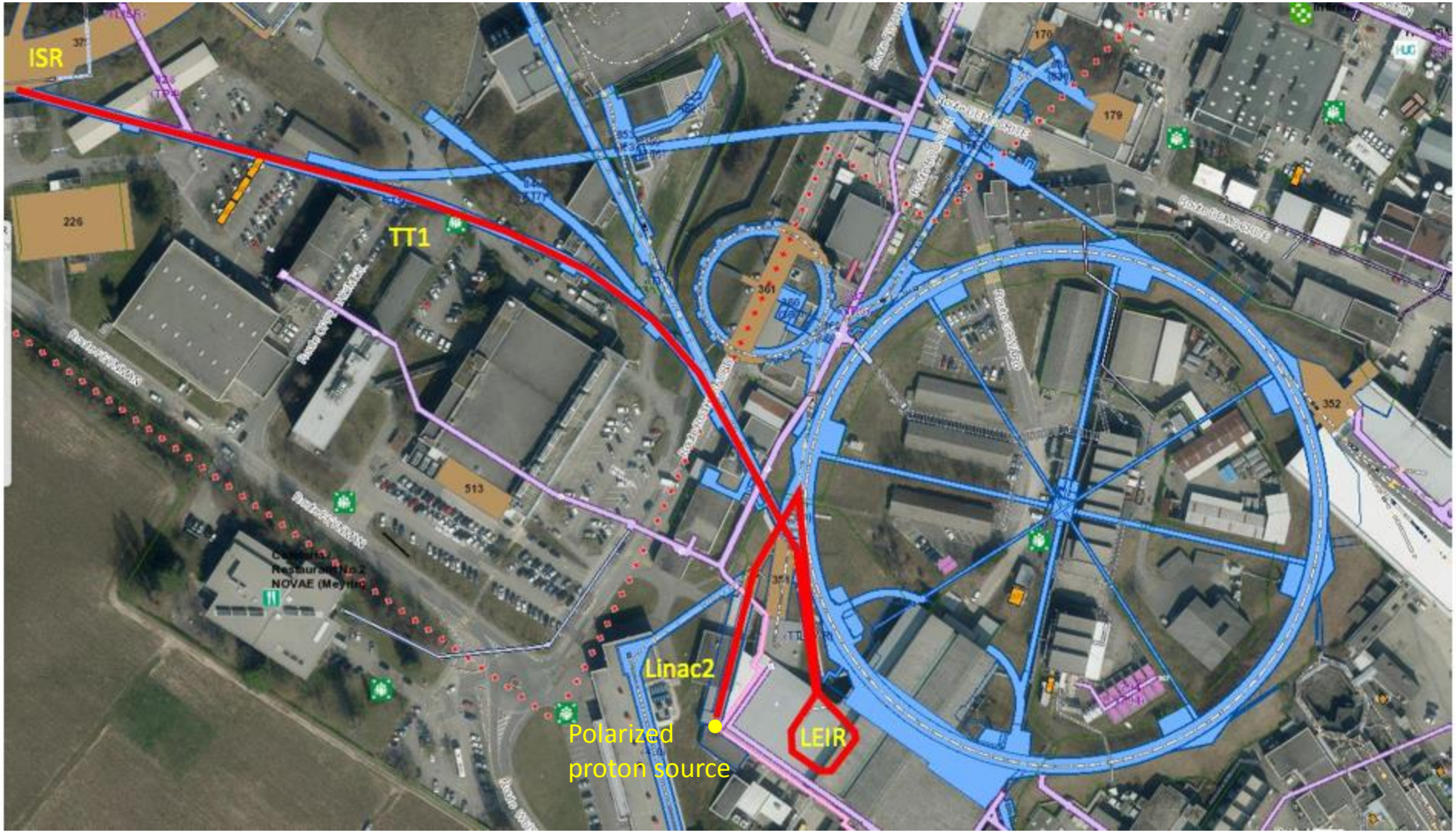
BDF fellows

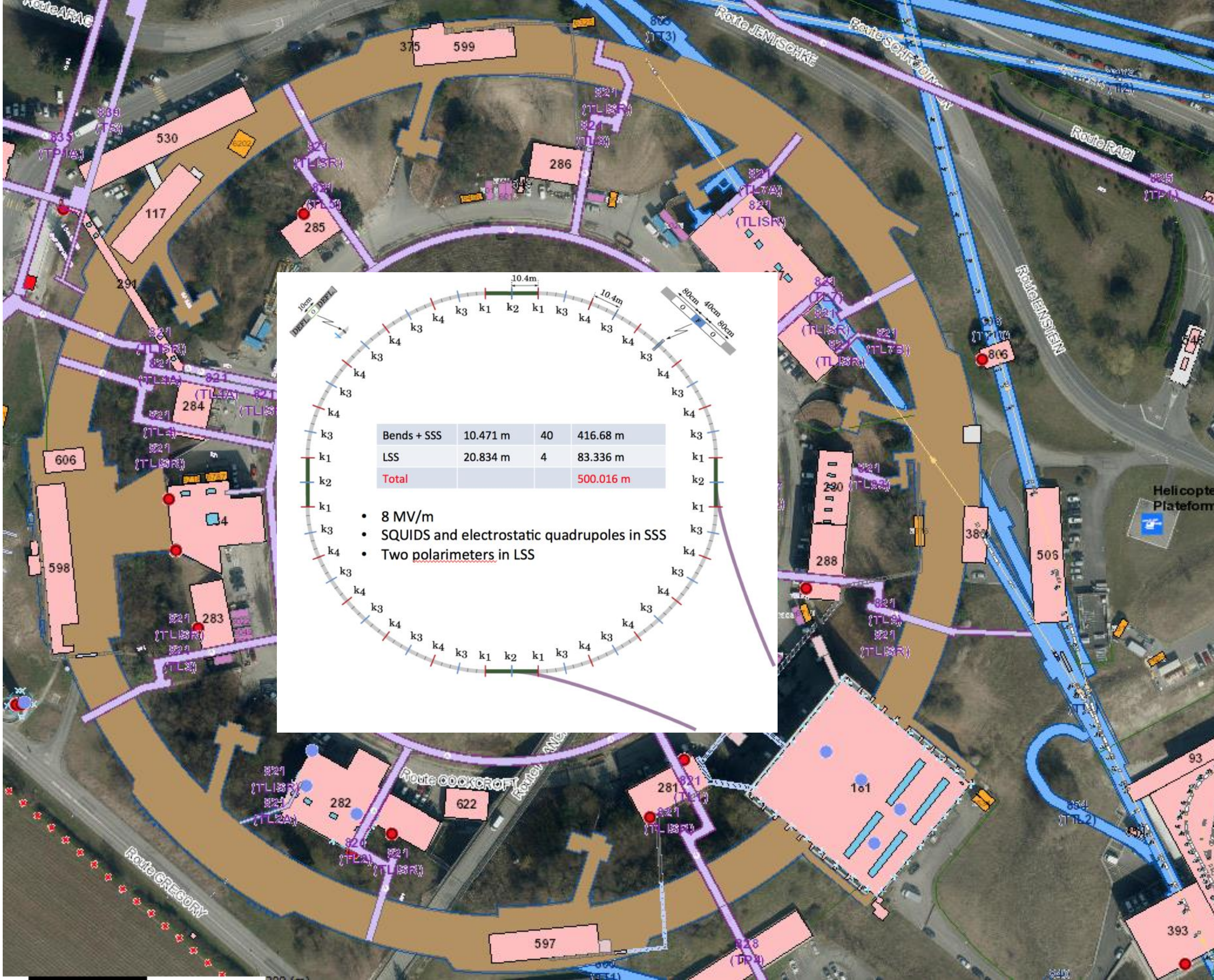
Section	Subject	Status
EN/STI	Target design	In place
EN/MME	Target complex	In place
EN/CV	Target complex	In place
HSE/SEE	Safety	In place
HSE/RP	Radiation protection studies	In place
TE/MSC	Splitter magnet design	In place
TE/ABT	Extraction and beamline studies	AFC May 17
EN/EA	Target and EA integration	AFC May 17
EN/ACE	Beam line and junction cavern integration	AFC May 17
SMB/SE	Civil engineering studies	2018

Assigned material budget is also being utilized

- CPEDM collaboration established between JEDI, srEDM and CERN
  - Kick-off meeting 1-2 March 2017
- Huge amount work already gone into proton (pure E) and deuteron (mixed B,E) storage rings
- Targeting a feasibility study for possible implementation at CERN
- Work packages and coordinators established
  - CERN concentrating on possible siting, beam delivery and getting up to speed on systematics
  - PBC fellow selected at May AFC

Beam delivery – one possibility





Bends + SSS	10.471 m	40	416.68 m
LSS	20.834 m	4	83.336 m
Total			500.016 m

- 8 MV/m
- SQUIDS and electrostatic quadrupoles in SSS
- Two polarimeters in LSS

Conventional beams

- Available and required EN-EA resources:

	Proposal	What to study	Beam(s)	PBC Priority	EA Responsible	Required Man-Power	
ECN3	KLEVER	Neutral beam, high intensities K_L and protons	K12 (BDF?)	1	L.Gatignon	M.van Dijk + new fellow	priority
	NA62 Dump	Estimate conditions with TAX and later dump	K12	1	L.Gatignon	M.Rosenthal	ok
	ECN3 // exp. NA60 (DIRAC)	Find suitable location, e.g. in ECN3	H10++ ?	1 / 2	L. Gatignon	M.Rosenthal	limited
EHN2	M2 study (COMPASS)	RF separated muon beam	M2	2	J.Bernhard	New fellow	no
	μ-e, NA64-μ	Low-energy pbar beam, standard muon beam	M2	1	J.Bernhard	New fellow	priority
	CEDAR	Improve / consolidate CEDARs	H2, H4, M2	3	Serge Mathot	CEDAR fellow	no
EHN1	NA61	Higher intensities, better low-E hadrons	H2	1	N.Charitonidis	New fellow + Staff	on hold
	NA64 hadrons	Beam quality studies and optimization	H4	2 / 1	N.Charitonidis	New fellow + Staff	on hold
BDF	BDF	Experimental area aspects	BDF	1	L.Gatignon	New fellows (ACE + EA)	ok

- Status today: supervision of fellow work can be assured, but tasks can not be carried by staff alone (some in a limited way)

Lau Gatignon, Markus Brugger

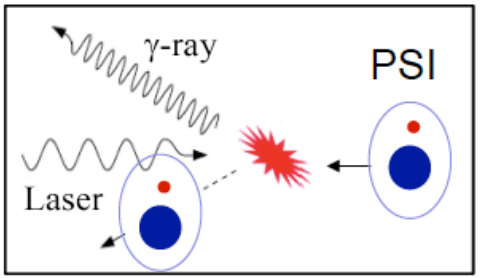
Injector complex performance after LIU

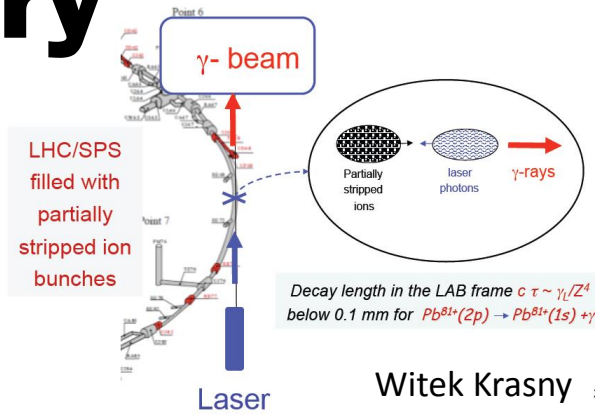
- Proton delivery through the CERN accelerator complex will be developed in view of the potential provided by LIU; included in the analysis:
  - LHC and HL-LHC
  - Existing non-LHC physics users and their future perspectives
  - Potential new physics users, in particular SHiP
  - Considerations on the optimization of the delivery rates
  - Limitations, areas of improvement, challenges
- Beam losses in all accelerators - machine activation
- Other intensity limitations and mitigation
  - PS
    - RF power, instabilities, extraction beam loss
    - MTE, barrier bucket, higher extraction energy…
  - SPS
    - RF power, instabilities, e-cloud, beam dump, extraction losses
    - RF capture, 800 MHz, gamma jump quads, extraction monitoring and control, collimators

1 fellow for fixed target beams intensity limitations (Giovanni, Hannes)
1 Ph.D. for PS barrier bucket studies (Heiko)

Giovanni Rumolo, Hannes Bartosik

Gamma factory



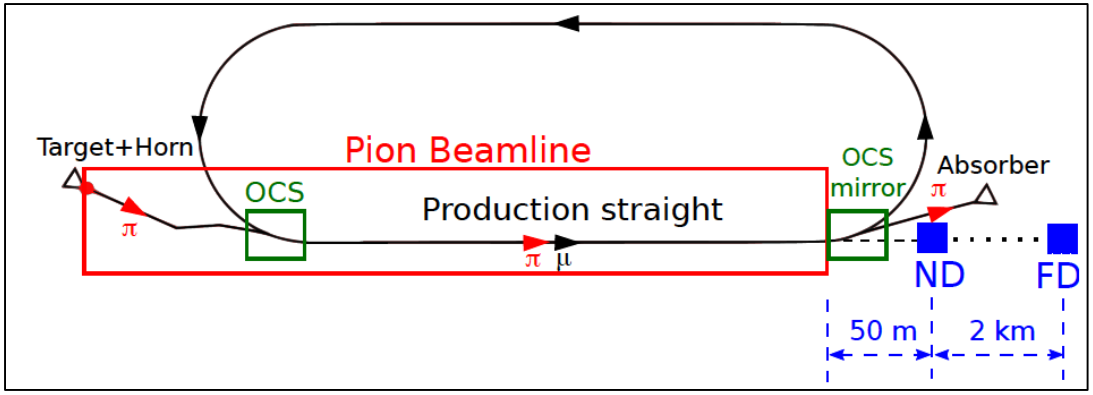


Witek Krasny

- Well-motivated initiative
  - team at CERN and elsewhere already formed
- Scientific associate at CERN for ~1 year to concentrate on this effort
- MD program established
- Simulation software development and tests
- GF workshop incoming
- Conceptual studies of applied GF research tools

- MD requested for 2017 to run Xe39+ beam in the SPS *(MD request - SPS MD 2026 - done by Django Manglunki and Reyes Alemany Fernandez)*
- MD request for 2018 to run Pb54+ beams in the SPS *(pending)*
- MD request for 2018 Pb80+ beams in the LHC *(pending)*
- MD request for the parasitic ep collisions with the Pb80+ beam *(generate interest of the LHC experiments for these collisions already this year to increase a chance of storing the Pb80+ beam in the LHC ring in 2018)*
- optimization of the stripper for Pb80+ ions *(work in this direction to be started)*

nuSTORM

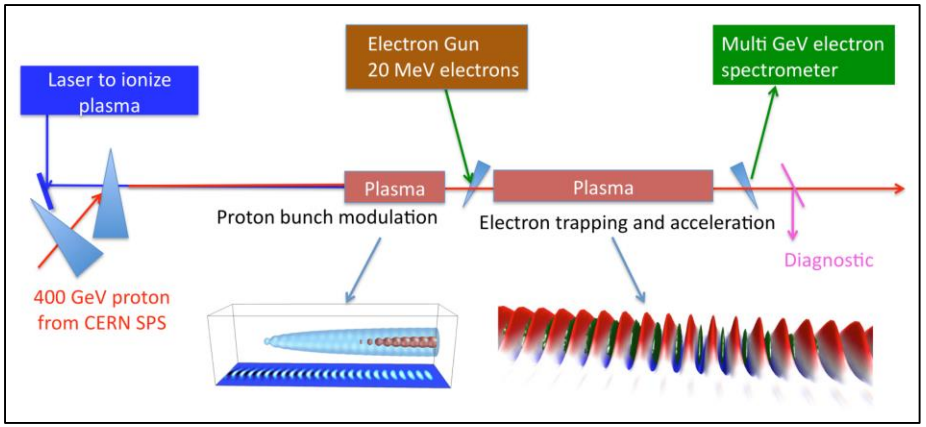


Opportunity:
- Exploit exquisite neutrino-beam properties to:
  - Execute high-impact neutrino-nucleus scattering programme
    - Neutrino oscillations (long and short baseline)
    - Nuclear physics
    - Sterile-neutrino search, non-standard interactions …
- Develop as option for CERN—Physics Beyond Colliders w/s

- Meeting in UK in Feb. Keen on exploring options to site at CERN.
- Production/capture/ring design already well-developed (along with possible siting at FNAL).
- Targeting a preliminary proposal for siting and exploitation at CERN
  - Possible material outlay to support some (very) preliminary civil engineering/RP studies

AWAKE@PBC

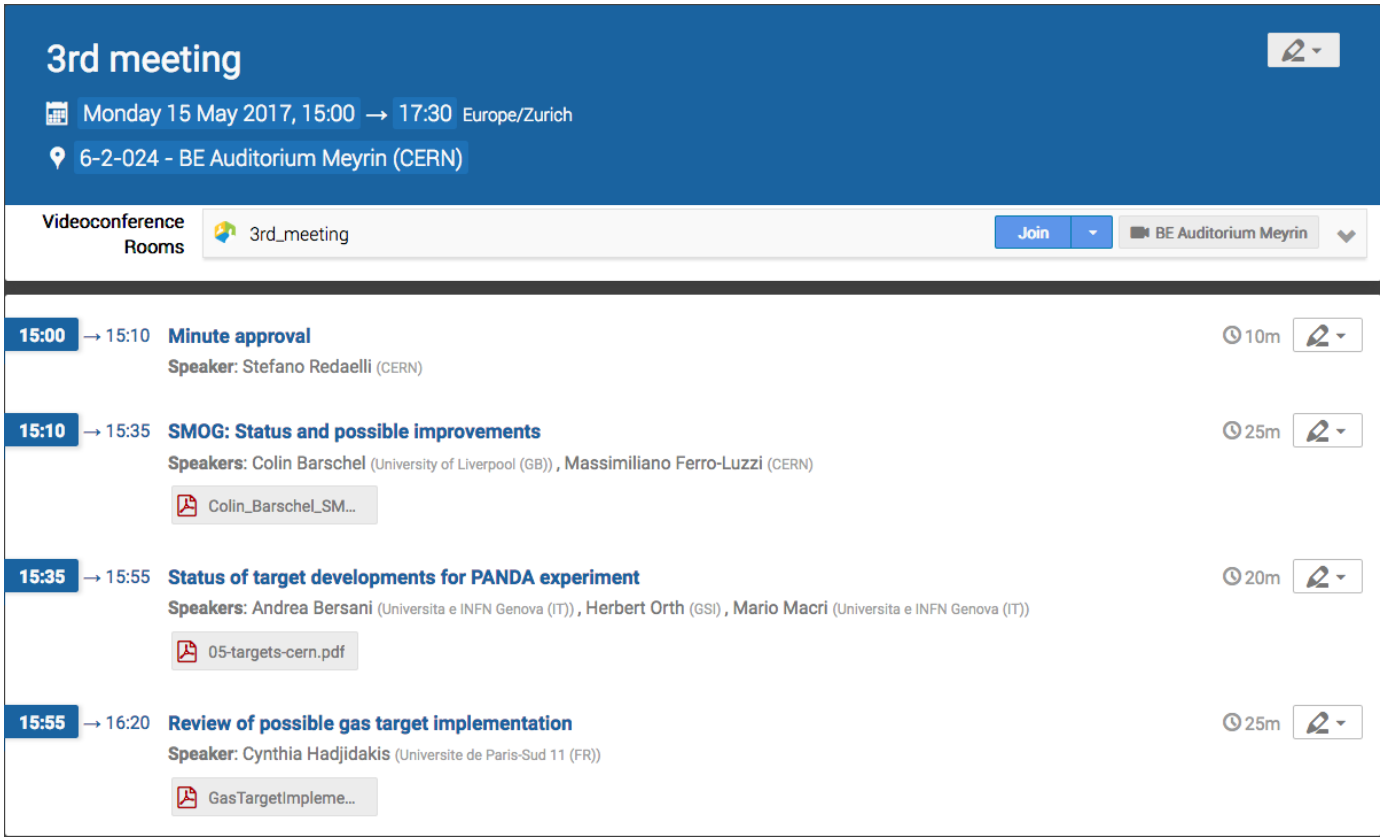
- Exploratory study of possible applications of the AWAKE concept
  - Leads: E. Gschwendtner, M. Wing
- Possibilities:
  - Use of electron beam for test-beam campaigns
  - Fixed-target experiments using electron beams
  - Searches for dark photons (NA64-like)
  - High energy electron-proton collider
- Key studies
  - Particle physics: development of physics cases and experimental design
  - Accelerator systems and realistic range of parameters
  - Infrastructure and siting
  - Possible synergies with AWAKE Run 2 integration studies



Request for fellow – not successful

LHC Fixed Target

Considerable lively interest in the various options (internal gas-jet; target-crystal; crystal-target-crystal). LHCb, ALICE, UA9 in the mix.



Stefano Redaelli, Massi Ferro-Luzzi

Technology

Mini-IAXO concept: An intermediate stage with prototyping activities + relevant physics reach.

- Strongly pursued at the moment. High motivation in the collaboration
- Work in progress. Conceptual design quite advanced, incl. rough cost & physics reach
- First sketch : 10 m 60 cm diameter bore.

PBC fellow to work on IAXO magnet development -- AFC Nov 17

Discussions with LSW/ALPS also in progress

Accelerator domain - deliverables

COMPLEX	Fully developed proton performance plan – post LIU era
BDF	• Complete technical feasibility studies • Preliminary Comprehensive Design Report
EDM	Fully developed proposal including preliminary costing
CONV. BEAMS	Establish requirements, initiate feasibility studies
LHC FT	Preliminary conceptual design report(s)
GAMMA	Exploratory study, initiate initial tests
nuSTORM	• Exploratory study of implementation at CERN • Review potential scientific impact
AWAKE+	Exploratory study for potential application of AWAKE concept
Technology	• Explore possible technological contributions by CERN to externally hosted facilities • Facilitate potential use of CERN infrastructure • Study physics case and technical requirements as input to ESU

All groups up and running – resources limited in some areas

MTP

- The Physics Beyond Colliders study heading, shown explicitly in the MTP for the first time, reports the budget allocated to PBC studies until 2019 to prepare the necessary input to the ESPP
  - e.g. to complete technical feasibility studies for a possible beam-dump facility at the North Area, and to perform initial civil engineering studies for a possible proton EDM ring at CERN

Physics Beyond Colliders Annual Workshop

21-22 November 2017
CERN
Europe/Zurich timezone

Search...