

## **Kickoff close-out**

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It's been an intense couple of days!

Huge thanks to all the speakers and contributors for a quite remarkable survey of what's out there and some of the possibilities.



**WHAT  
NEXT?**

# PBC - Scientific goal

- The main goal of the Study Group is to explore the opportunities offered by the CERN accelerator complex to address some of today's outstanding questions in particle physics through **experiments complementary to high-energy colliders and other initiatives in the world.**
- These experiments would typically:
  - ...exploit the unique opportunities offered by CERN's accelerator complex and scientific infrastructure...

**Provide input for the future of CERN's scientific diversity programme, which today consists of several facilities and experiments at the Booster, PS and SPS, over the period until ~2040.**

# Kickoff - general points

- Four sessions
  - **Theorists' motivations, ideas and wishes**
  - **Accelerator and infrastructure opportunities**
  - **Potential future of existing programs**
  - **New experiment ideas**
- **Avoided a top-down approach**
- **With the aim of getting ideas on the table**
- **No commitment at this stage! Goal is to provide input to European Strategy Update (ESU)**

# Motivation

Why CERN should have initiated the PBC study was beautiful motivated in a series of theory talks.

Whatever the LHC will bring us, we are in a “no lose” situation: New physics at the LHC - study it! No new physics at the LHC - a number of new experiments at high energy, precision, and high intensity frontiers, in cosmology and astrophysics will be needed - a lot to explore!

Mikhail Shaposhnikov

We have to leave all this spectrum of possibilities open and just enjoy this extremely fascinating science.

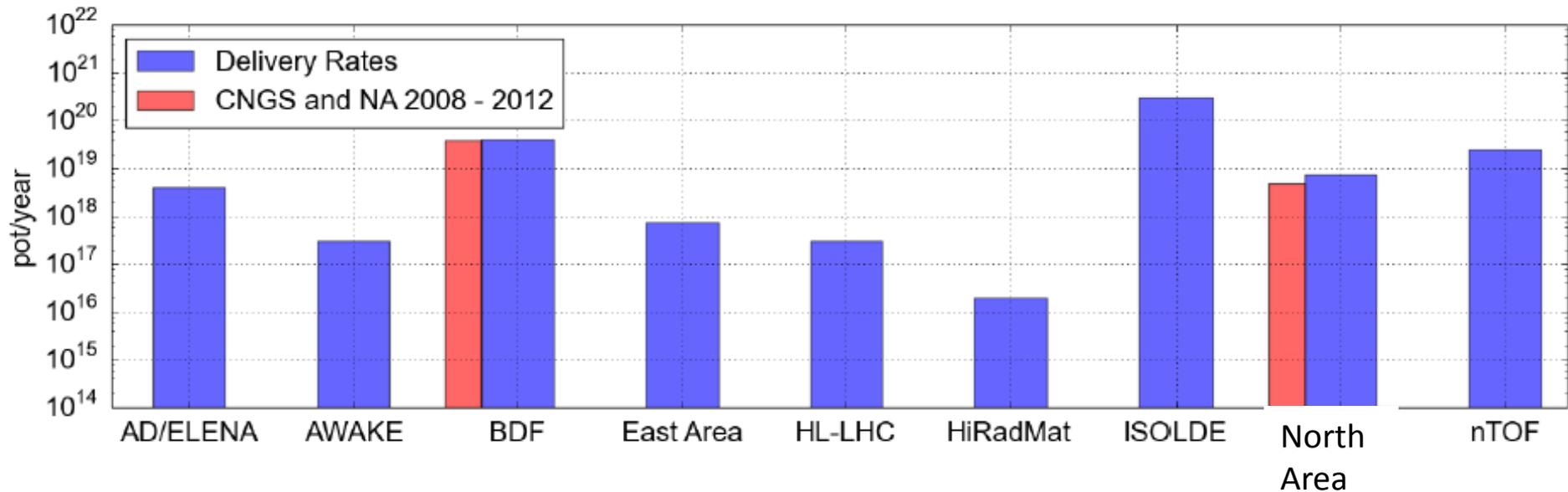
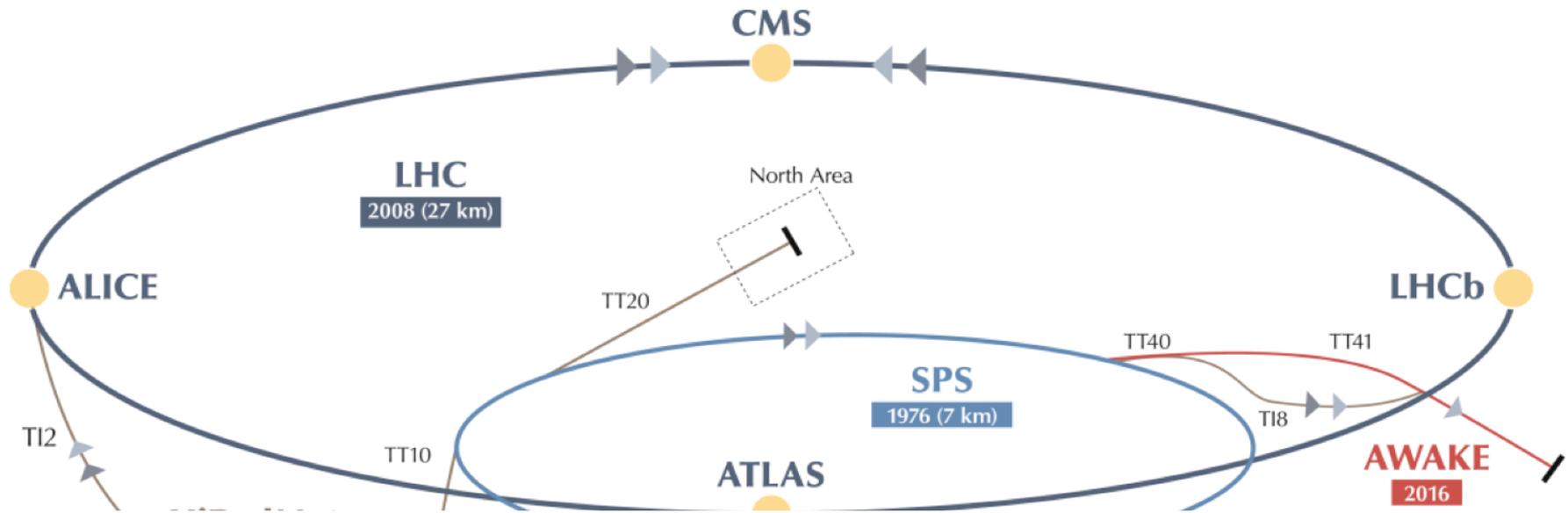
Mikhail Shaposhnikov quoting Carlo Rubbia

# Physics reach

For the proposals on the table we should evaluate:

- What is the strength of the physics motivation?
- Physics reach compared to projects in established worldwide landscape:
  - FNAL/JLAB/BNL/JPARC/PSI/COSI/FAIR/RAL/ESS/TRIUMF/KEK/Frascati/Orsay/DESY et al

- LHC will continue to dominate
- Diverse forward looking program already in place!



# Novel exploitation of existing facilities

- North Area
- East Area
- AD/ELENA
- nTOF
- ISOLDE, HIE-ISOLDE, TSR (?)

Developments/studies are required to enable the proposed physics programs.

ESU will need to find right balance between upgrade/extension of ongoing projects and new projects

# North Area – in particular

6/15 “New ideas”

- Feasibility studies/resources required for proposed conventional beam upgrades
  - RF separated beams for COMPASS;
  - Kaon beam for NA62;
  - DIRAC at SPS;
  - NA60+
  - etc. etc.
- Evaluation of the physics case of the detector projects and investigation of possible combinations and synergy

# North Area

## Studies needed for intensity increases

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- Go to long flat top whilst maintaining instantaneous rates
- Detailed radiation protection studies
- Loss reduction at extraction and along proton transport
- Reduce splitter losses, or go to different splitting approach (crystals, RF switching magnets, etc)
- North Area consolidation (immediately after East Area renovation)
- Upgrades of targets, beam dumps
- Improved machine protection systems
- Move to underground areas for higher intensities
- Significant injector upgrades may be required for some new ideas.
- Some former beam areas (e.g. West Area) would have been useful now

# New ideas

- SPS Beam Dump Facility
  - complete technical feasibility studies of a beam dump facility in the CERN North Area (extraction, target, radiation protection)
- Electric Dipole Moment
  - Polarized protons, 0.7 GeV storage ring
- Electron beam dump
- LHC fixed target via crystal extraction
- LHC fixed target via internal gas jet
- Partially stripped ions – LHC - gamma source
- NuSTORM – explore possible synergies (e.g. target...)

Study reports at a appropriate level depending on the maturity of project proposal with possibly a rough resource/timescale estimate

# Non-accelerator

Searches for axion dark matter, axion-like particles, hidden photons etc.

- CAST >> IAXO
  - OSQAR+
  - LSW
  - aKWISP
  - Darkside
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- These do not need to be realized at CERN
    - Study physics case and technical requirements as input to ESU
    - Explore possible technological contributions by CERN to externally hosted facilities

# Deliverables

- For update of the European Strategy for Particle Physics in ~2019-2020
- Evaluation of the physics case in a world wide context
- Will range from:
  - Results of BDF feasibility studies
  - Exploratory study reports for selected new ideas
  - Required R&D going forward –initiate feasibility studies depending on resources
  - Preliminary evaluations of more long term options
- Ranking left to ESU
- Working groups to be set-up
  - Will inform the community once the structure has been decided

# Constraints

- Maximal exploitation post-LIU/proton budget
- Mutual compatibility/exclusion between the various projects
- Infrastructure support needed for non-accelerator projects
- Bear in mind the original criteria
  - exploit the unique opportunities offered by CERN's accelerator complex and scientific infrastructure,
  - experiments complementary to high-energy colliders and other initiatives in the world

# Conclusions

- Considerable potential for novel exploitation of existing complex
  - Clearly need to evaluate, prioritize, and commit resources where appropriate
- Some compelling new ideas at varying degrees of maturity
  - Evaluate, select, develop, report
  - Continue exploration of new ideas
- Possible collaboration with other labs to be explored

Foresee PBC follow-up meeting next year

# Thanks!!!

- All the speakers and contributors again
- Attendees!
- Sylvia and the support team
- Fabiola for kicking it off and her support

Connie for organizing everything.

Connie rocks.