Cern in a Global World

Frontier Detectors for Frontier Physics

La Biodola

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CERN

2009-2012: deciding years

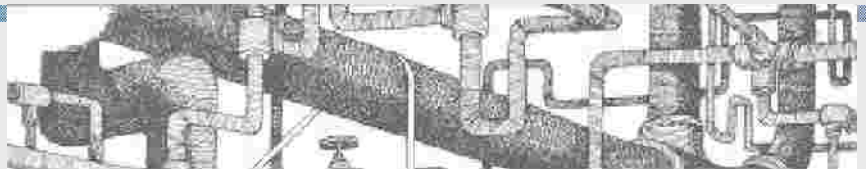
Experimental data will take the floor to drive the field to the next steps:

- LHC results
- θ_{13} (T2K, DChooz, etc..)
- masses (Cuore, Gerda, Nemo…)
- Dark Matter searches
- …….

Preparing the next steps

- **More globalization**
- More (coordinated) R&D on accelerators and detectors
- More synergies between Particle and Astroparticle Physics
- More space for diversity

The LHC



"Ok, let's try an emergency start."

LHC repairs and restart

- Enhanced quench protection system (QPS):

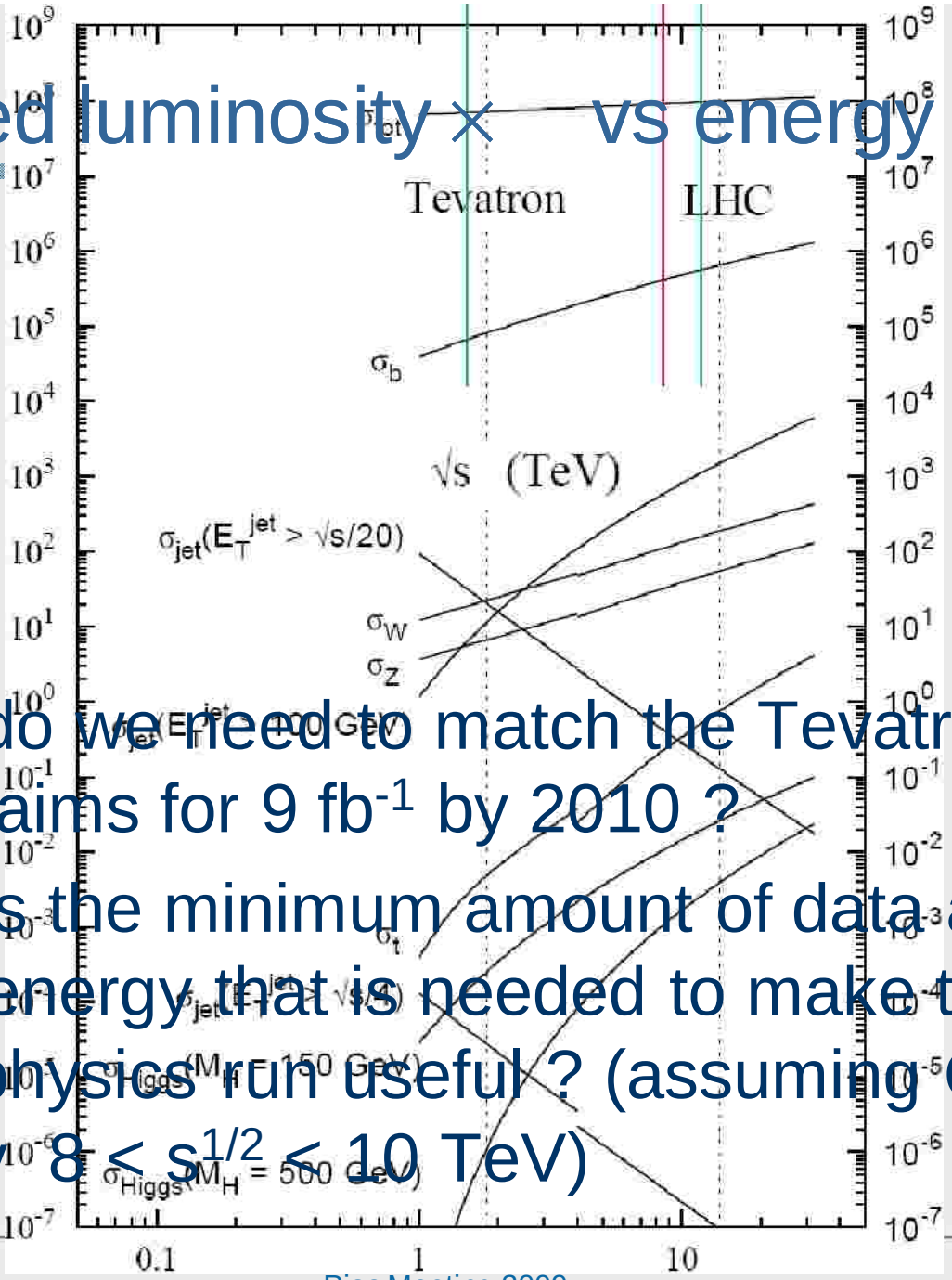
  More precise system to monitor (and protect) anomalously high resistance in a joint (splice) near the magnets.
  - A QPS threshold of 0.3mV is needed
  - The QPS will be upgraded everywhere to cover all busbar splices

- Improve pressure relief devices:
  - The four warm sectors will be equipped with extra pressure relief valves (PRVs) on all dipole cryostats
  - The four cold sectors will get extra PRVs on all short straight section cryostats. This can be done with the sectors cold and is adequate for 5 TeV operation

- The whole machine will be cold by mid August, ready for first injected beam in late September

- The machine will run at 5 TeV until autumn 2010

Integrated luminosity × vs energy



- What do we need to match the Tevatron, which aims for 9 fb^{-1} by 2010 ?
- What is the minimum amount of data at given energy that is needed to make the 2009 physics run useful ? (assuming CM energy $8 < s^{1/2} < 10$ TeV)

LHC Physics in 2009/2010

First beams: very early physics - rediscover SM physics

Detector synchronization, in-situ alignment and calibration

10 pb^{-1}: Standard Model processes

measure jet and lepton rates, observe W, Z bosons

first look at possible extraordinary signatures…

30 pb^{-1}

Measure Standard Model Processes (at 10TeV need ~ 30pb^{-1}):

~ 10^4 $Z \rightarrow e+e-$ (golden Z's for detector studies (1%))

~ 10^5 $W \rightarrow e\nu$

~ 10^3 ttbar (measure σ to 10%)

Background for new physics

Need to understand very well

Initial Higgs searches and searches for physics beyond the SM

> 200 pb^{-1} Entering Higgs discovery era and explore large part of SUSY and new resonances at ~ few TeV

LHC Upgrades

Phase 1 (~ 2014, in construction):

Linac4

New triplets

First detector upgrades

Goal: $10^{34} < L < 2\ 10^{34}\ cm^{-2}s^{-1}$

Phase 2 (~ 2020 (?))

Luminosity upgrade (x 10) or Energy upgrade? (will depend on Physics!)

New injector chain (SPL, PS2, SPS2?)

Massive Detector upgrades

A GLOBAL PROJECT anyway

Not only LHC…..

- A workshop on “New Opportunities in the Physics Landscape at CERN” took place at Cern on May 10-13, as a **starting point** to assess new ideas for unique experiments, which can be performed at Cern, outside the LHC programme.

  http://indico.cern.ch/conferenceDisplay.py?confId=51128

  Large interest in the community, large attendance (> 500), more than 100 abstract received, very lively community.

Not only LHC, (cont…)

- A neutrino workshop, co-organized with the SPC Study Group, will be held on October 1-3, 2009, to **focus the discussion** on the **European Strategy** on **physics**
- A stronger connection among the CLIC and ILC **accelerator** and **detector** R&D is being realized.
- A technical review of the LHC new injection chain (LINAC4,SPL,PS2) is underway

Making CERN more global

- Council group for CERN enlargement (**scientific** and **geographic**) has been setup and is in full activity.
- Cern is intensifying bilateral meeting with the other regions (labs, agencies)
- More proactive role of Cern in improving networking among the European Labs
- More synergies with the Astroparticle community (Joint Theory Institute, Detector R&D, etc…)

In summary

- By year 2012, **experimental results** will be dictating the agenda of the field.
- Early discoveries will greatly accelerate the case for the construction of the next facilities (Linear Collider, -factory, SLHC…)
- No time to idle: a lot of work has to be done in the meantime

In summary

We will need

- Flexibility
- Preparedness
- Visionary global policies

Very exciting years are ahead of us