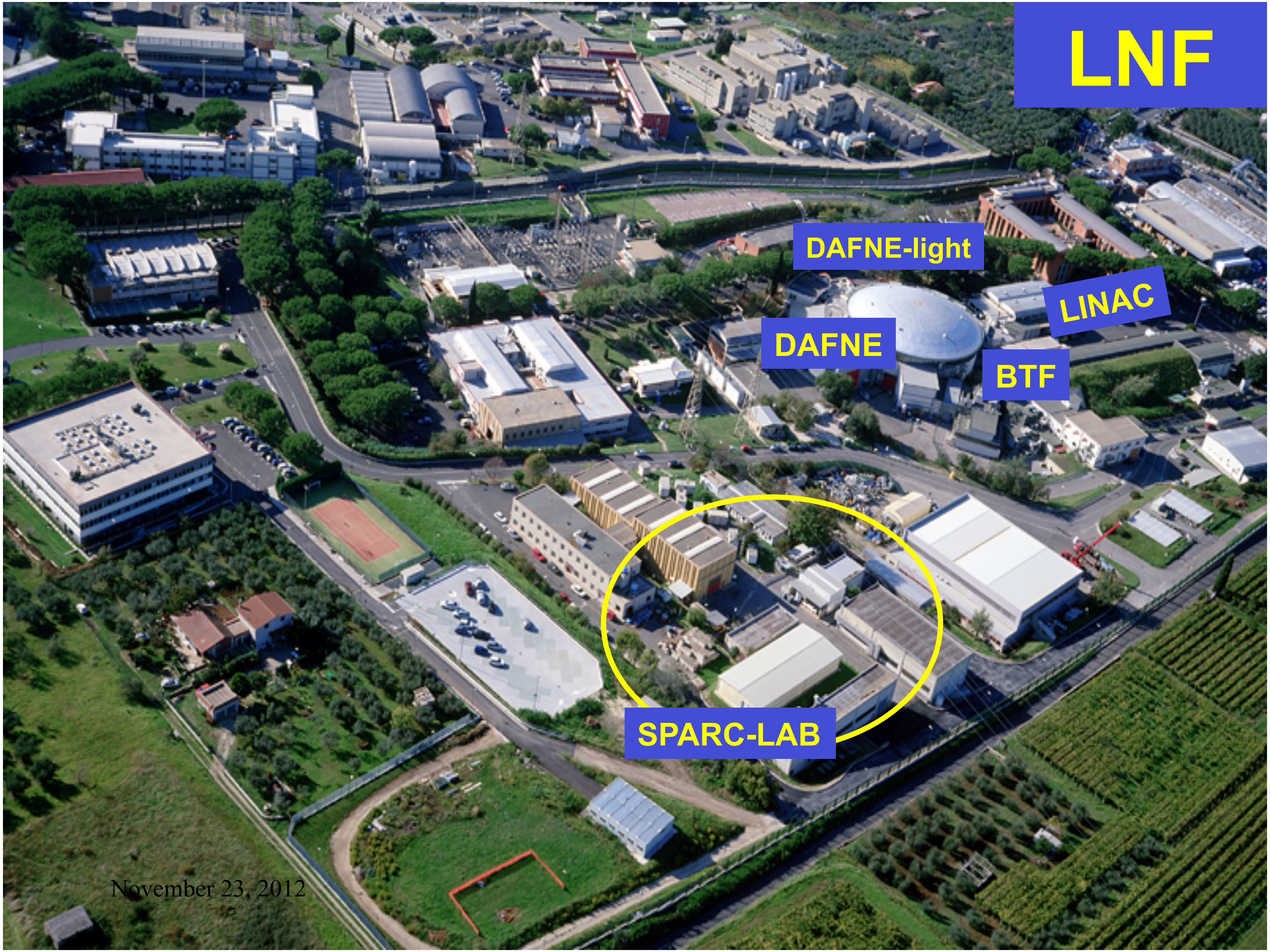
Status of INFN Frascati Natl. Labs

Umberto Dosselli

November 23, 2012

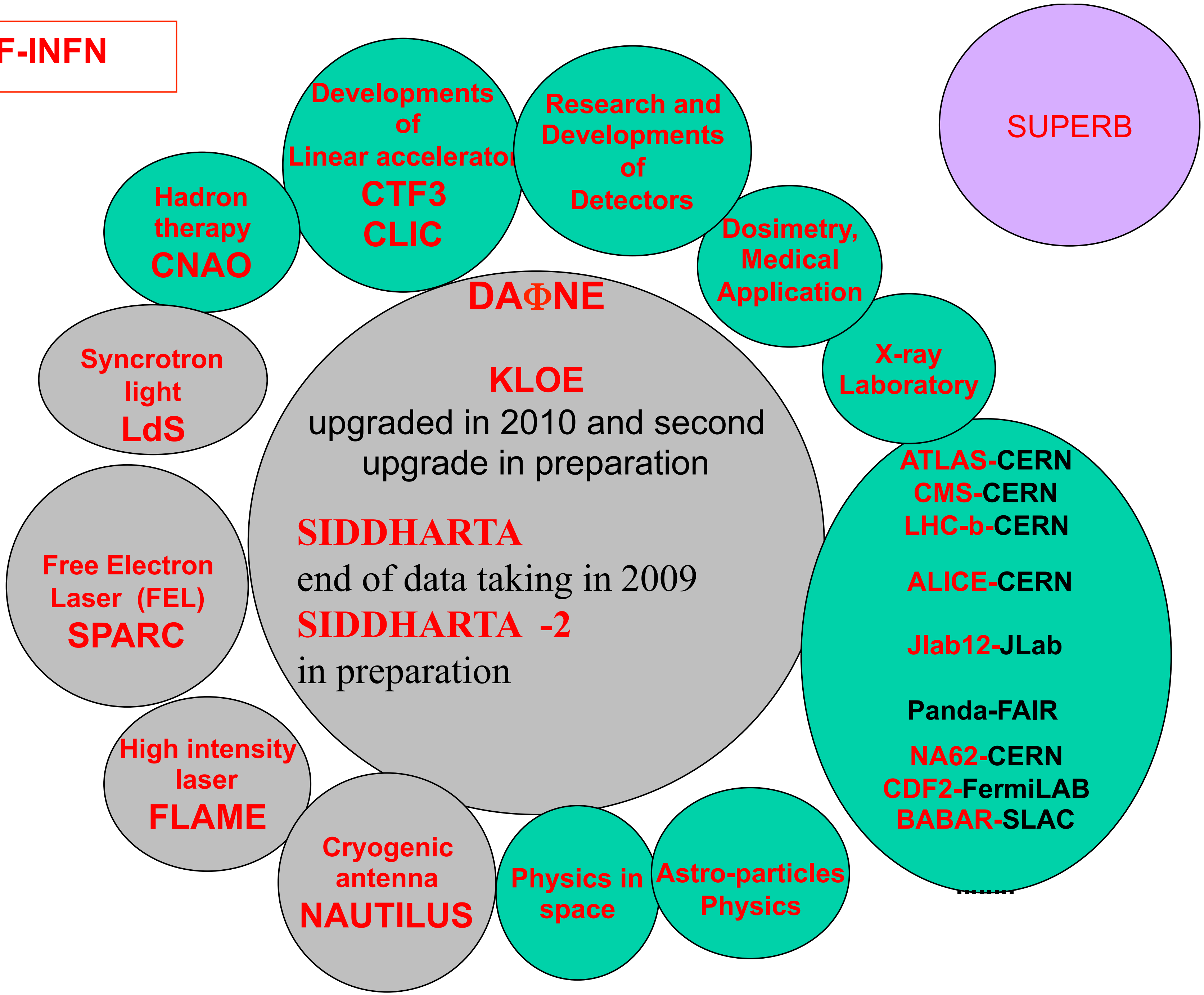
- LNF are strongly focused on Particle Physics based on accelerators
- Long and successful track record of accelerators building and efforts in R&D


LNF
DAFNE-light
LINAC
DAFNE
BTF
SPARC-LAB
November 23, 2012

Frascati National Labs (LNF)

Total Staff of which: 293	Researchers 80		Technologist/ Engineers 38	Technicians 142		Administration/ Services 33
External Users **501**	***Italian*** **257**			***Foreign*** **244**		
Visitors **3426**	**Stages** **184**	**Conference Workshops** **21**		**Participants to Seminars** **765**	**Course for teachers of high school** **172**	

LNF-INFN



Developments of Linear accelerator CTF3 CLIC
Research and Developments of Detectors
SUPERB
Hadron therapy CNAO
DAΦNE
KLOE
upgraded in 2010 and second upgrade in preparation
SIDDHARTA
end of data taking in 2009
SIDDHARTA -2
in preparation
Dosimetry, Medical Application
X-ray Laboratory
Syncrotron light LdS
Free Electron Laser (FEL) SPARC
ATLAS-CERN
CMS-CERN
LHC-b-CERN
ALICE-CERN
Jlab12-JLab
Panda-FAIR
NA62-CERN
CDF2-FermiLAB
BABAR-SLAC
……..
High intensity laser FLAME
Cryogenic antenna NAUTILUS
Physics in space
Astro-particles Physics

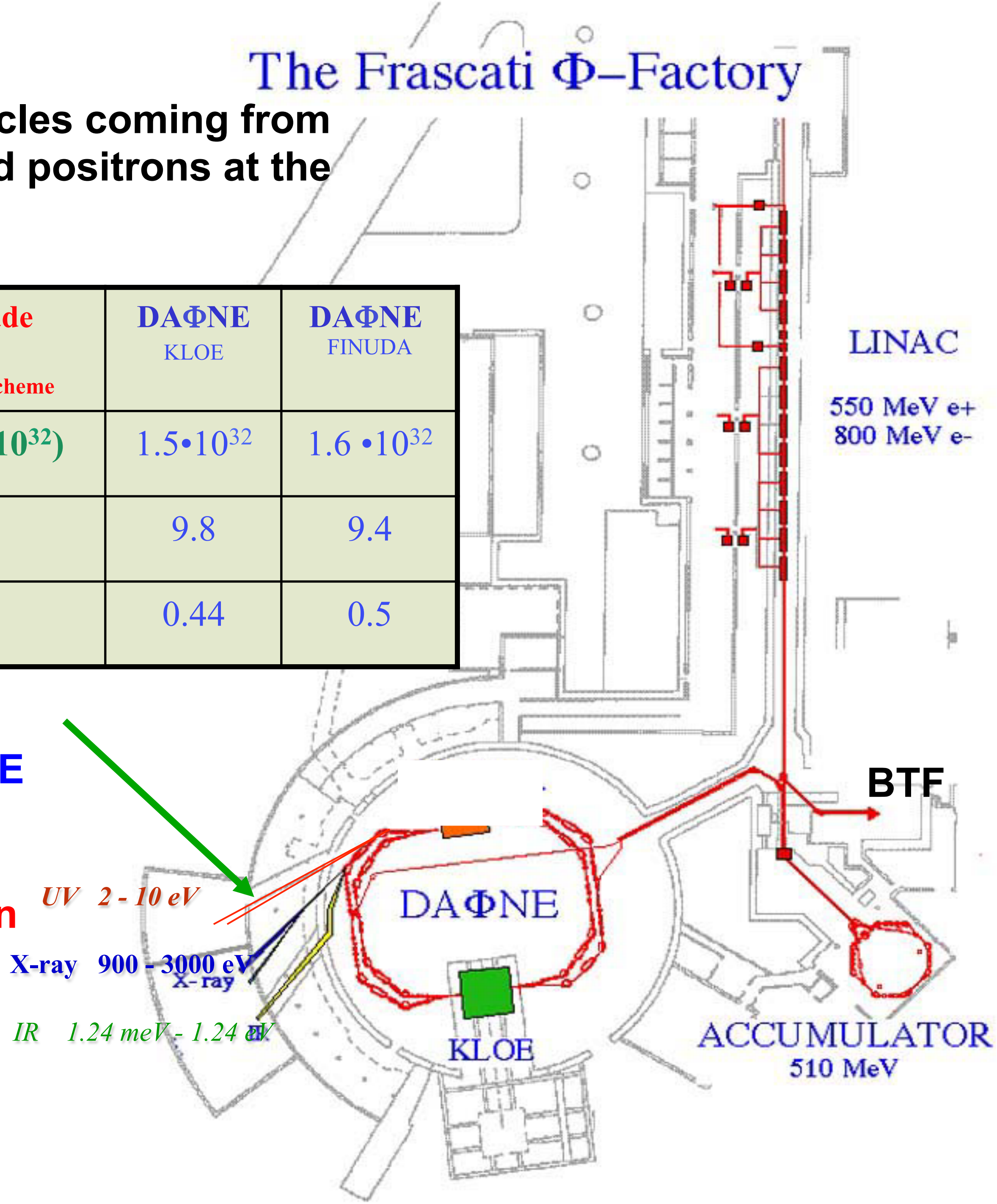
The Frascati Φ–Factory

Abundant production of Φ particles coming from the annihilation of electrons and positrons at the energy of the Φ- resonance.

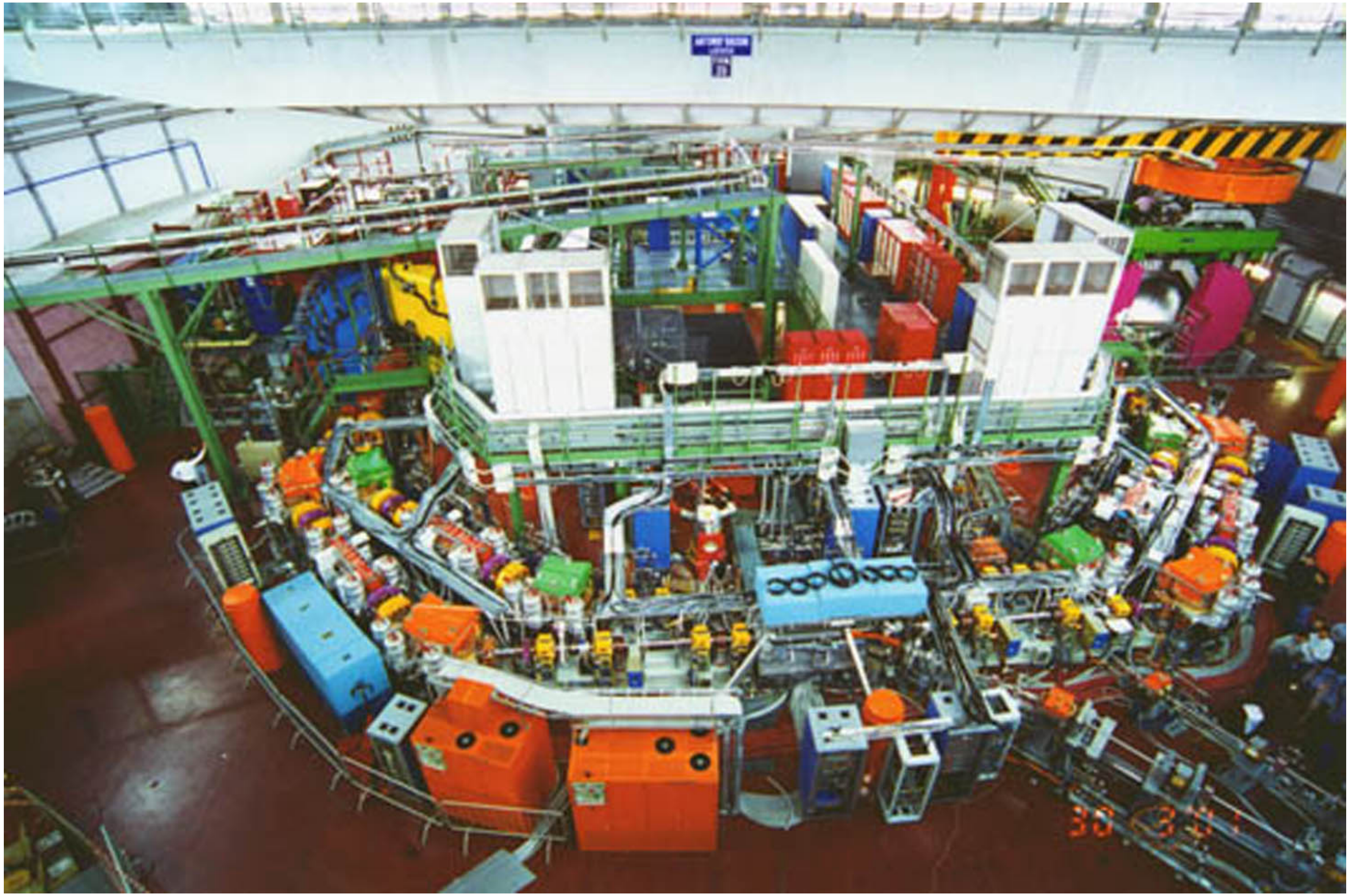
	DAΦNE upgrade SIDDHARTA Crab Waist collision scheme	DAΦNE KLOE	DAΦNE FINUDA
L_{peak} [$cm^{-2}s^{-1}$]	$4.53 \cdot 10^{32}$ ($5.0 \cdot 10^{32}$)	$1.5 \cdot 10^{32}$	$1.6 \cdot 10^{32}$
$L_{\int day}$ [pb^{-1}]	14.98	9.8	9.4
$L_{\int 1\ hour}$ [pb^{-1}]	1.033	0.44	0.5

Syncrotron ligth from DAFNE

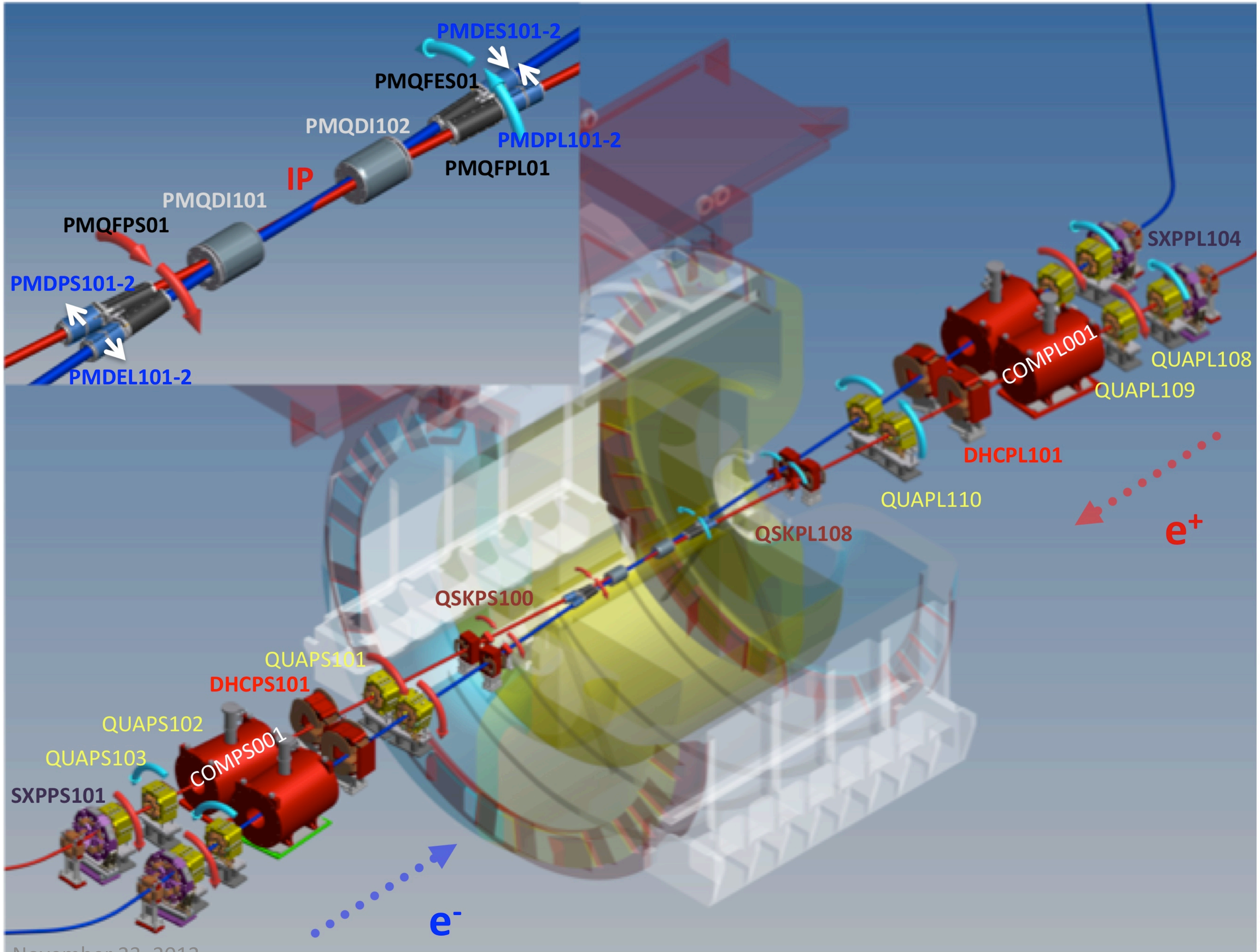
LNF are part of the European Infrastructure for syncrotron light



DAΦNE

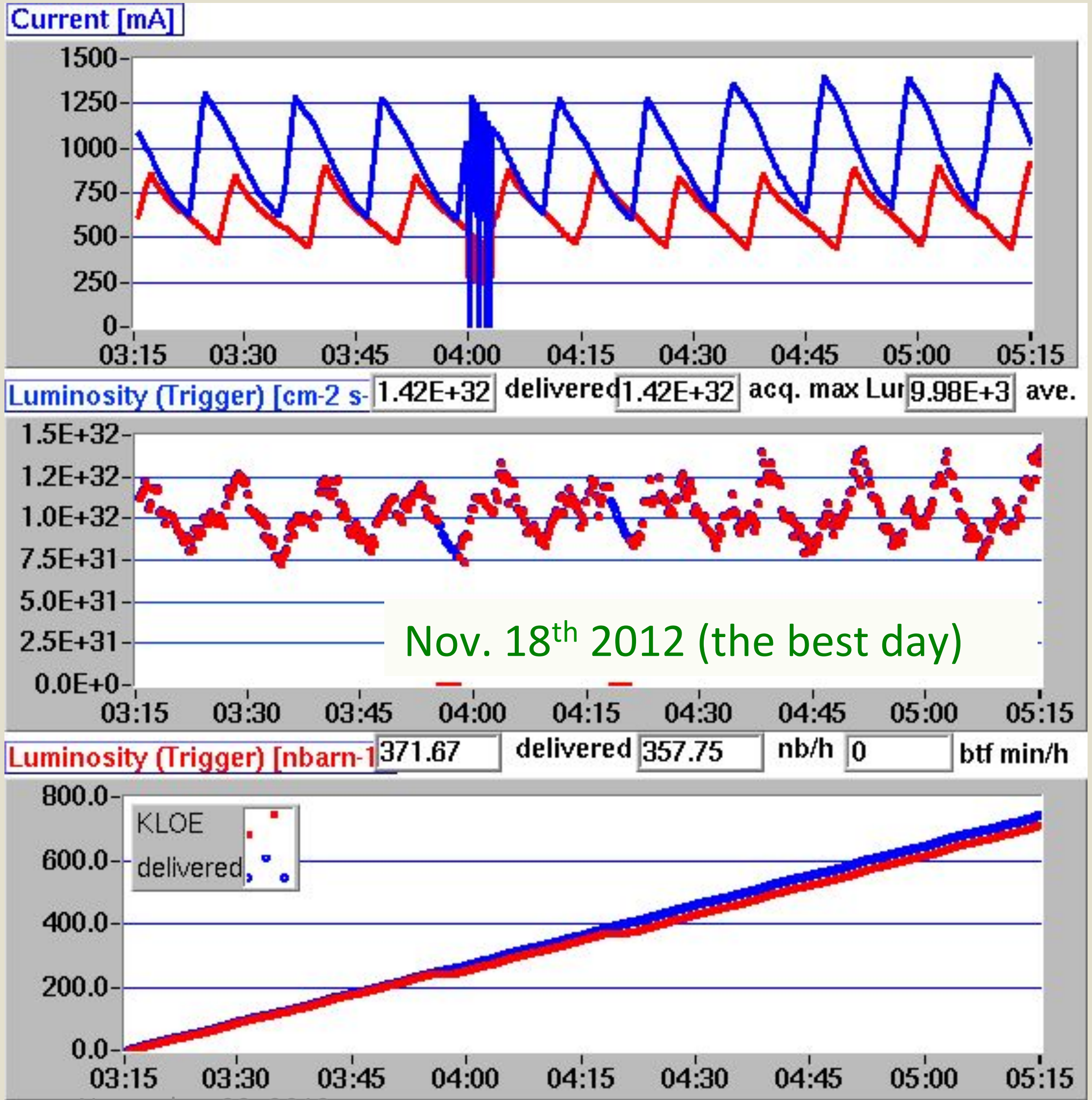


November 23, 2012



November 23, 2012

Hourly integrated luminosity



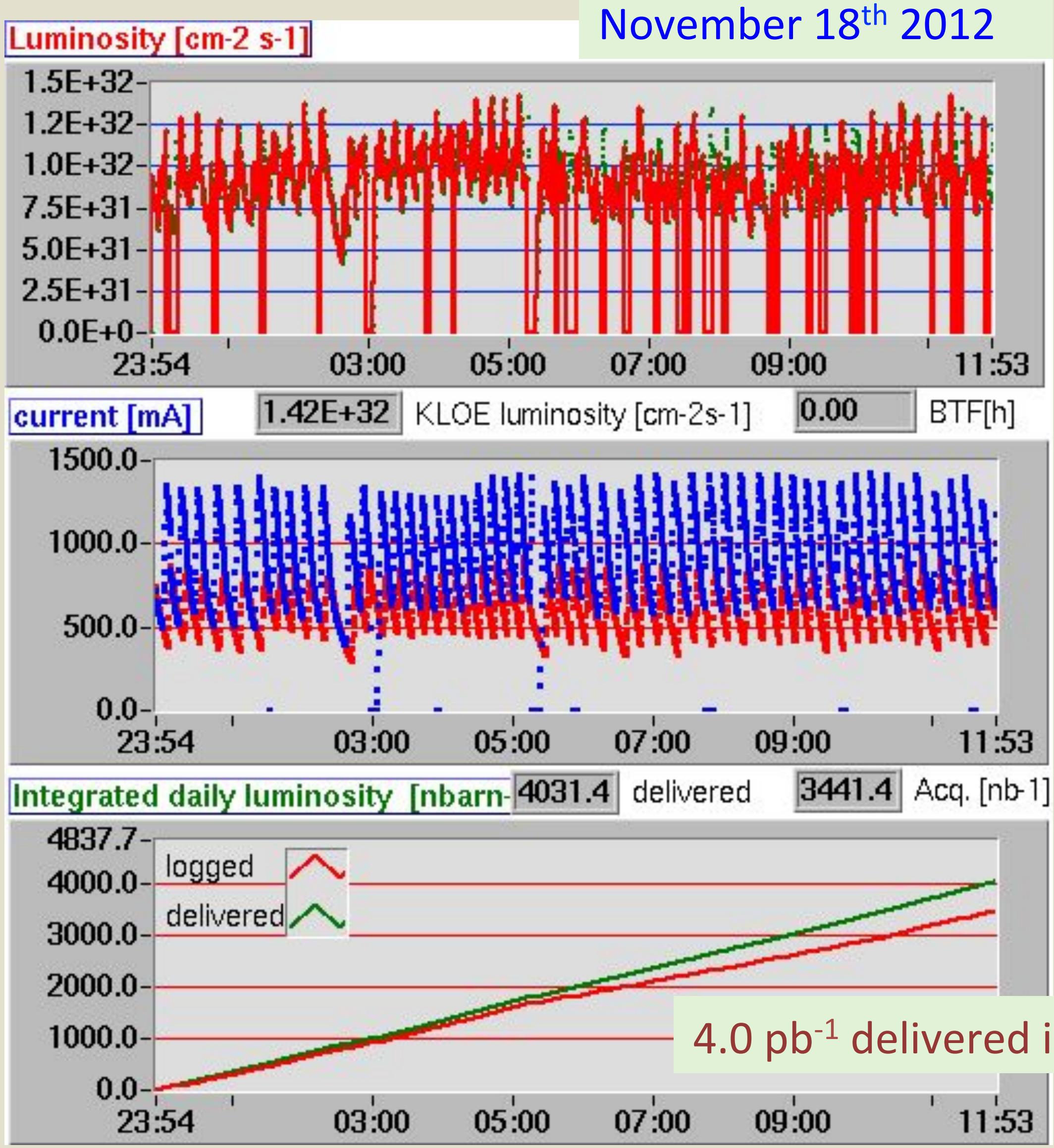
$L_{\int 1\ hour} = 0.372\ pb^{-1}$

$L_{\int day} = 8.9\ pb^{-1}$

- ***KLOE is taking data***
- ***Aquired and delivered L are comparable***
- ***$L_{\int 1\ hour}$ is the highest measured with KLOE-2***

12 hours integrated luminosity

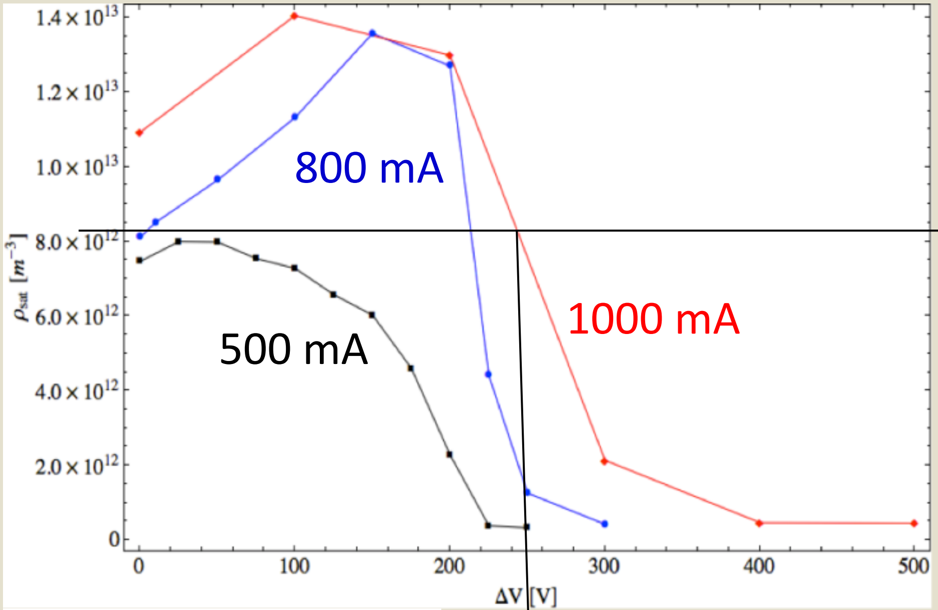
November 18th 2012



4.0 pb^{-1} delivered in 12 hours

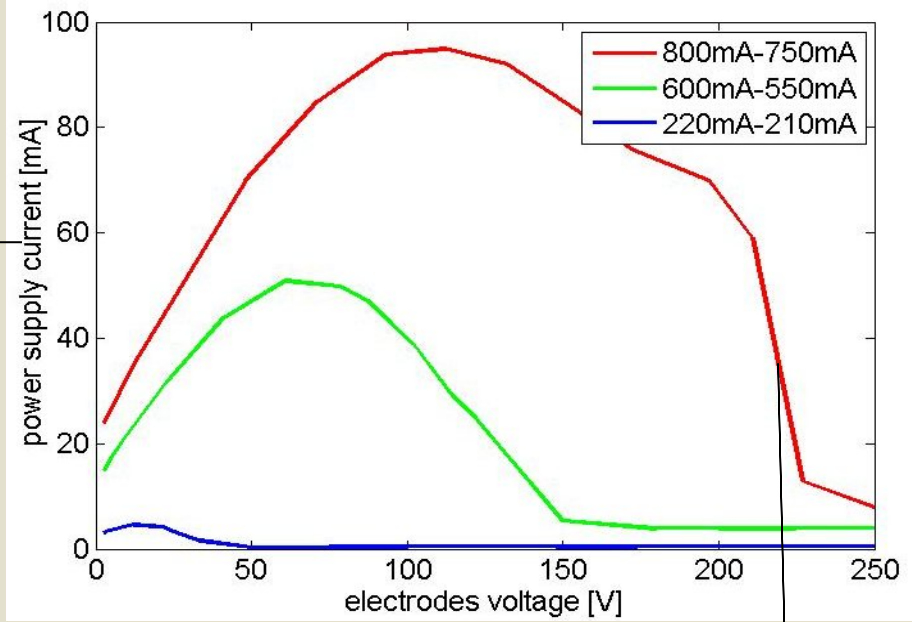
Effectiveness of Electron Cloud Clearing Electrodes

e-cloud density build-up



(Courtesy of T. Demma)

Measured absorbed e-cloud current

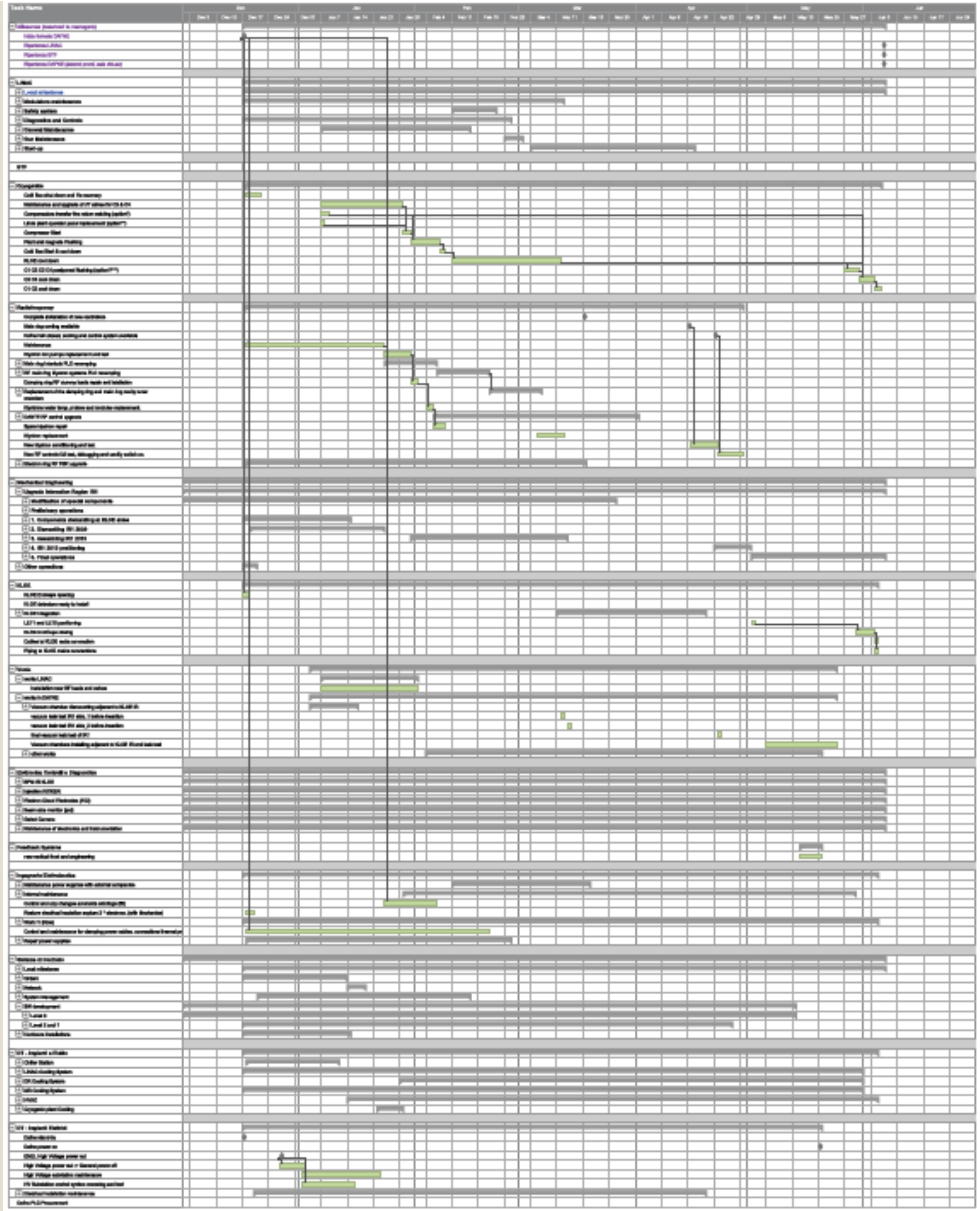


With a maximum voltage of 250 V the electrodes are effective till a positron current of the order of 800-900 mA .
For higher beam currents higher voltages are required

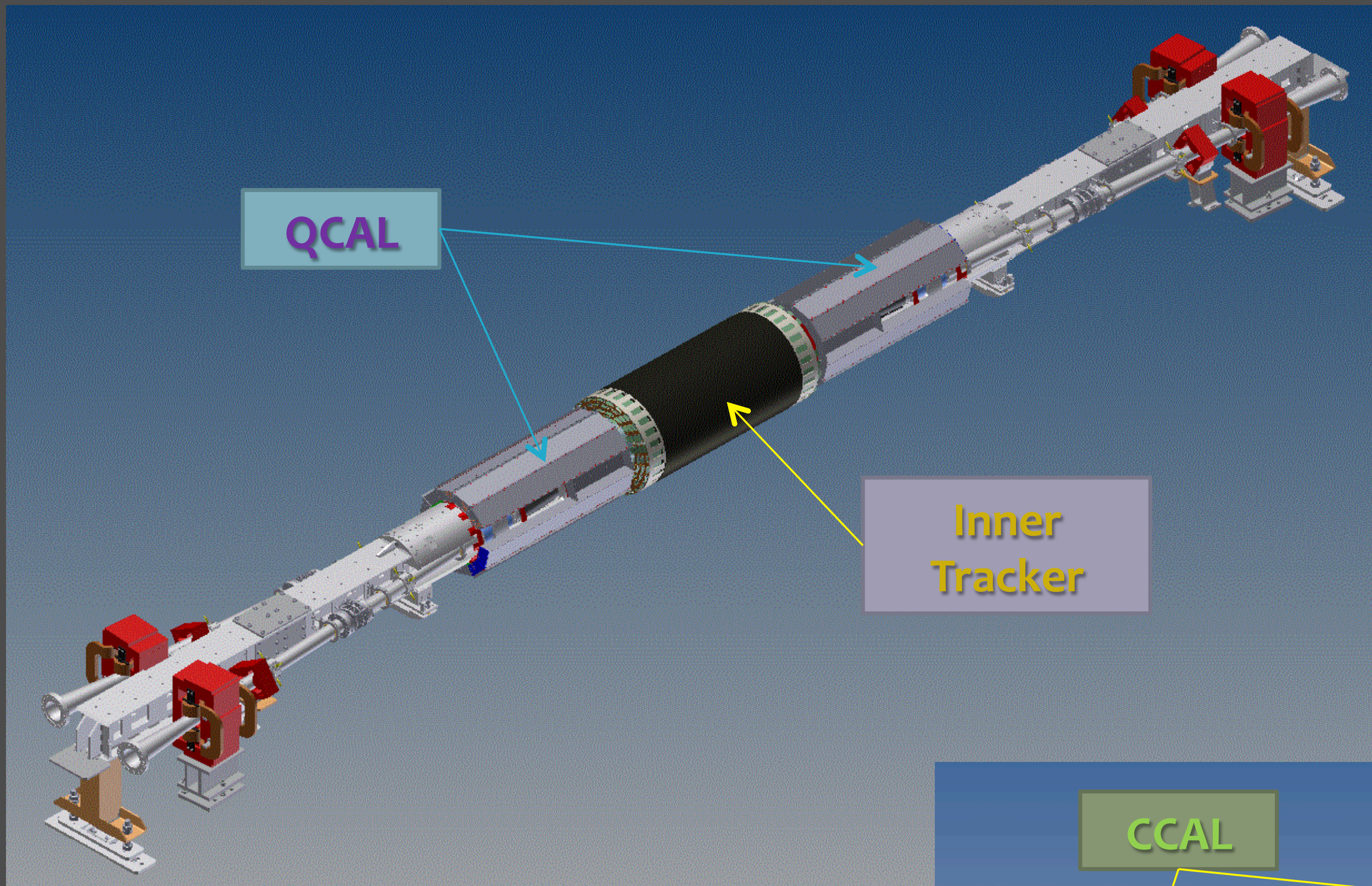
Gantt of the DAΦNE shutdown

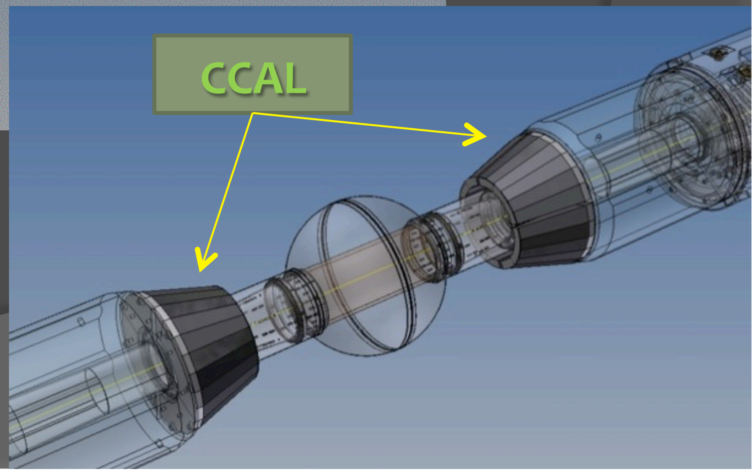
based on SpreadSheet

Using a shared application allows a more efficient coordination among different activities

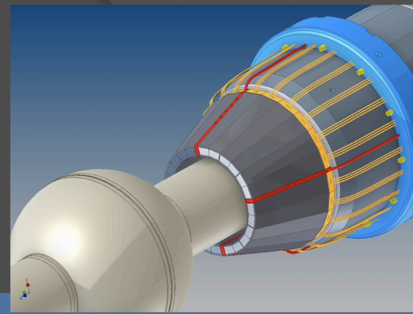


Detector Upgrades Overview

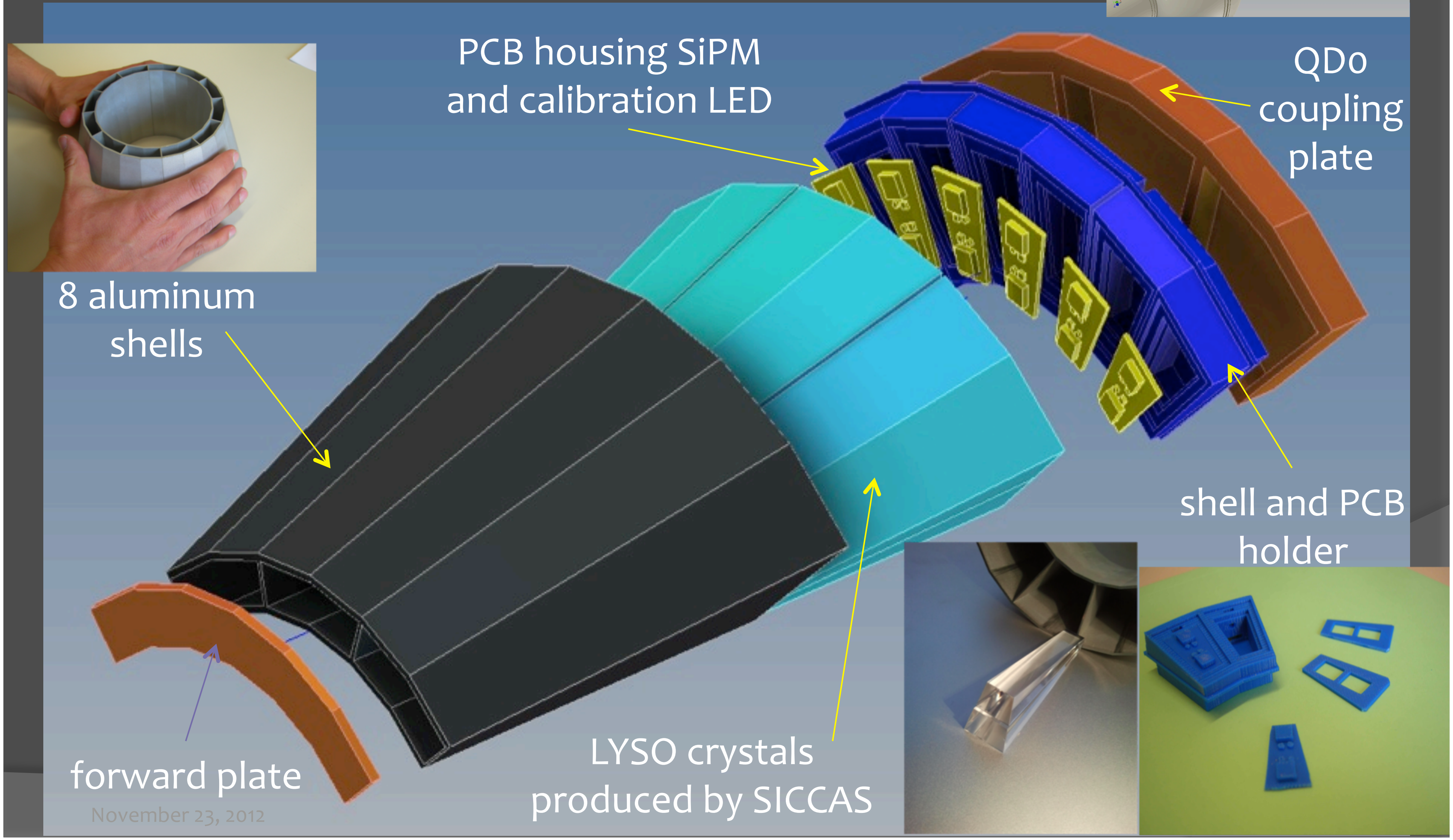




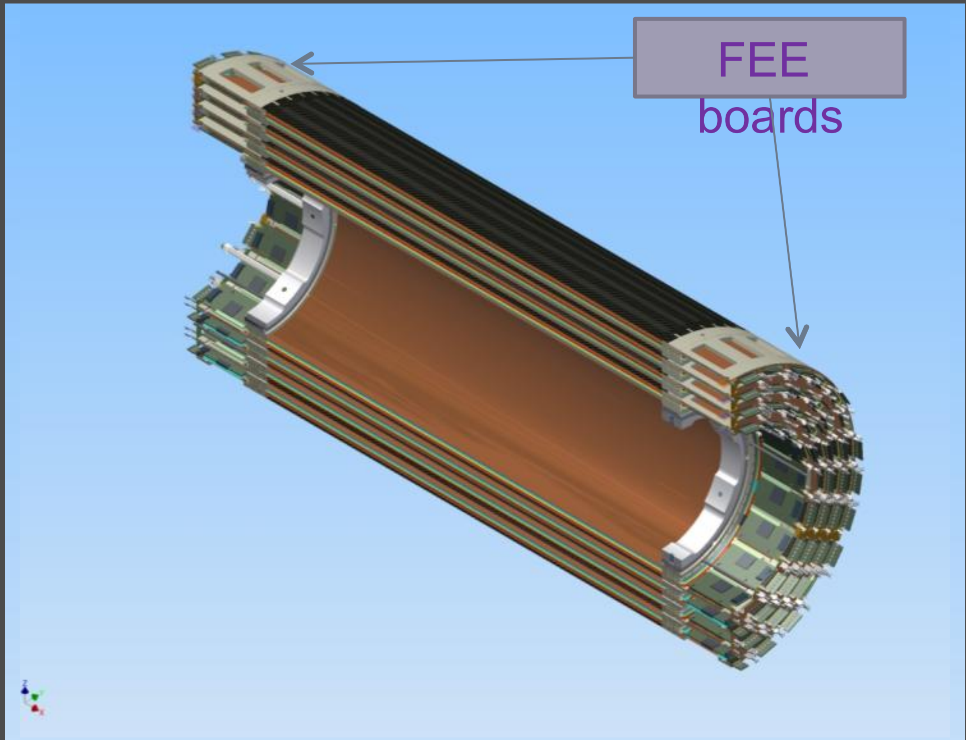
CCALT Layout

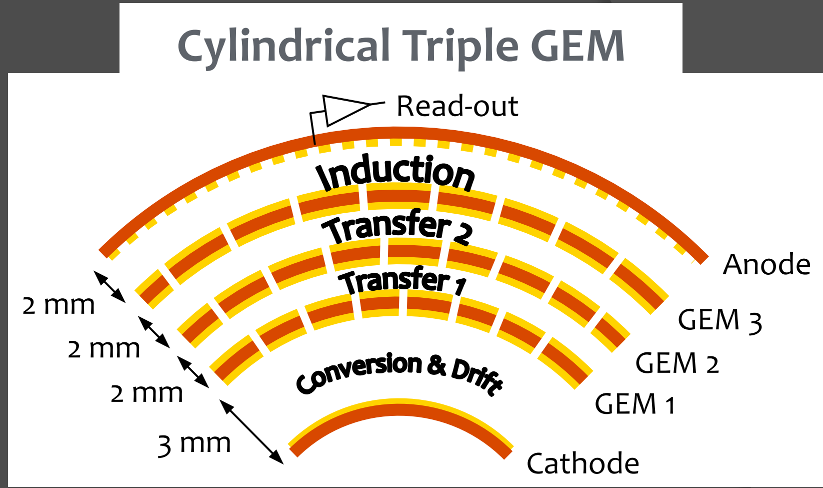


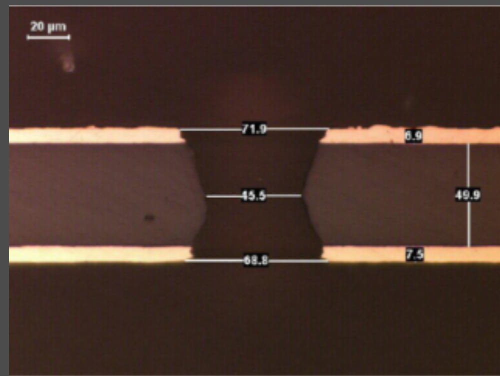
1 calorimeter/side, 4 shells/calo,
3 modules/shell, 4 crystals/module



Cylindrical-GEM Inner Tracker



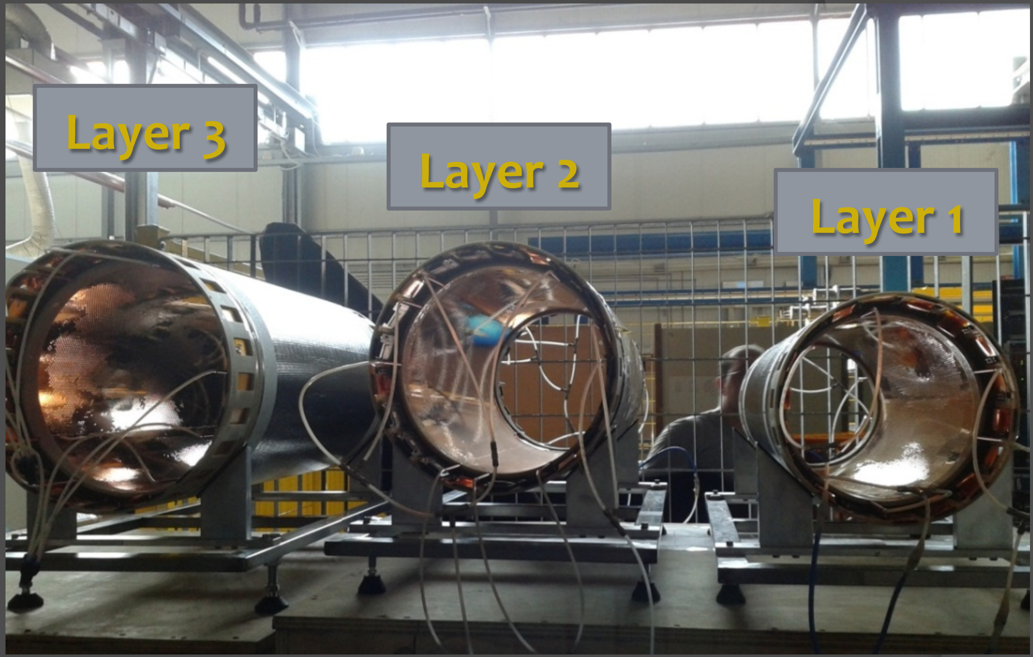




- 4 layers at 13/15.5/18/20.5 cm from IP and 700 mm active length
- $\sigma_{r\phi} \sim 250\ \mu m$ and $\sigma_z \sim 400\ \mu m$
- XV strips-pads readout (20°÷30° stereo angle)
- 2% X_0 total radiation length in the active region

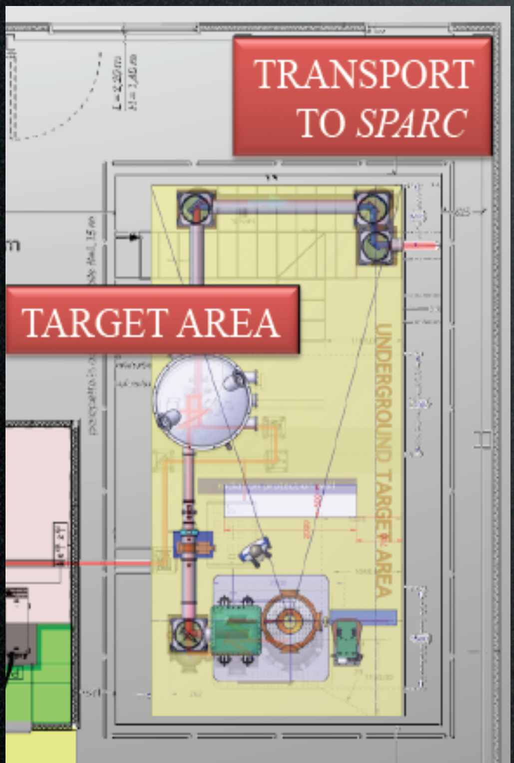
IT Status

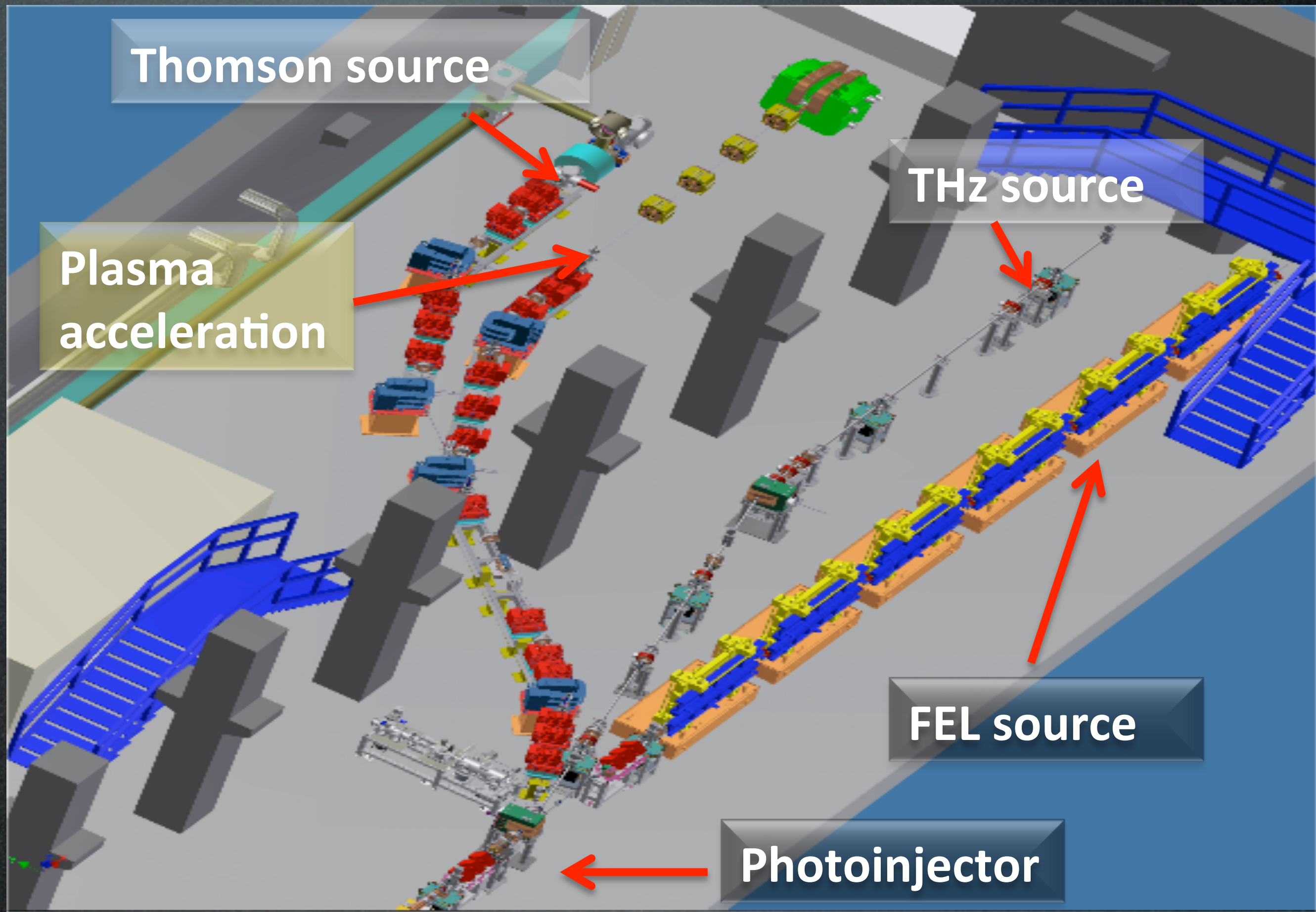
- We have already shown in previous meetings the construction procedure of the Cylindrical-GEM detectors
- At the last SC we reported on the successful creation of the first 2 Layers of the IT



- Since then the third detector Layer has been completed
- Tests with β source and cosmic rays have been accomplished

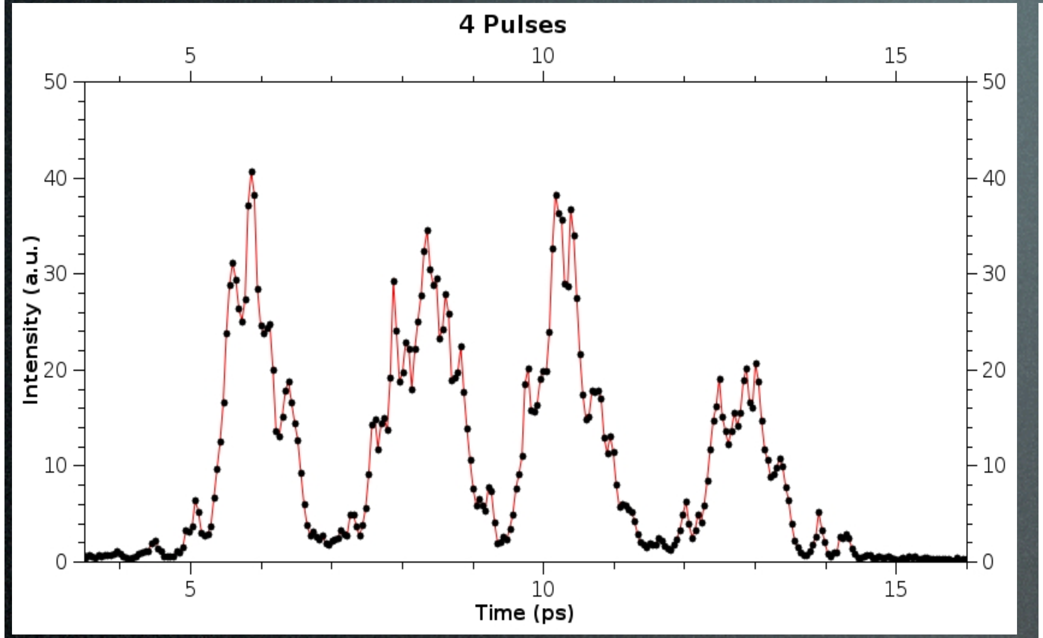
2nd SPARC_LAB PAC Meeting

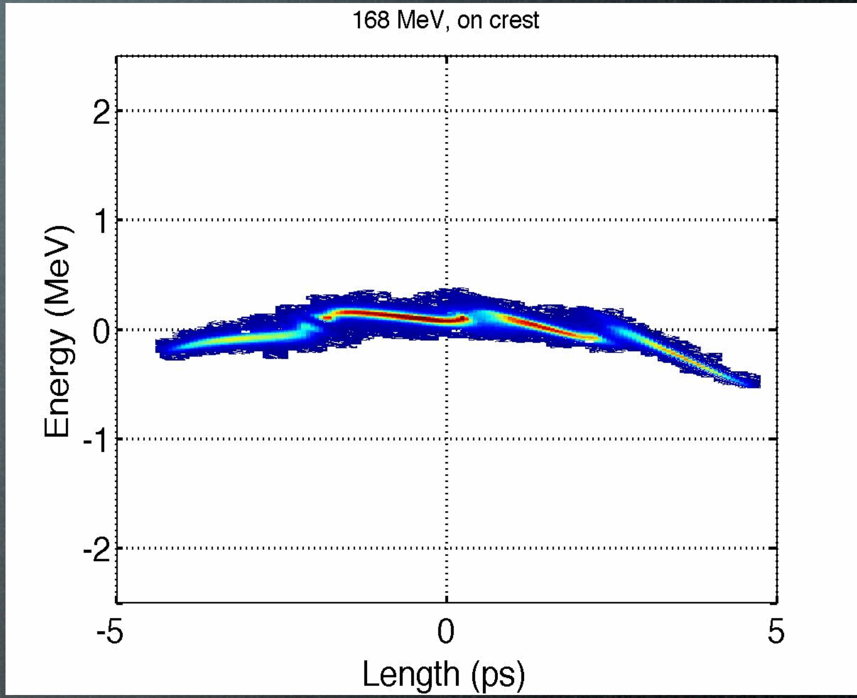


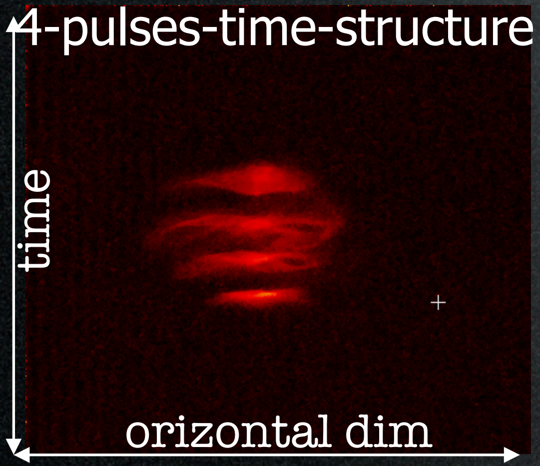


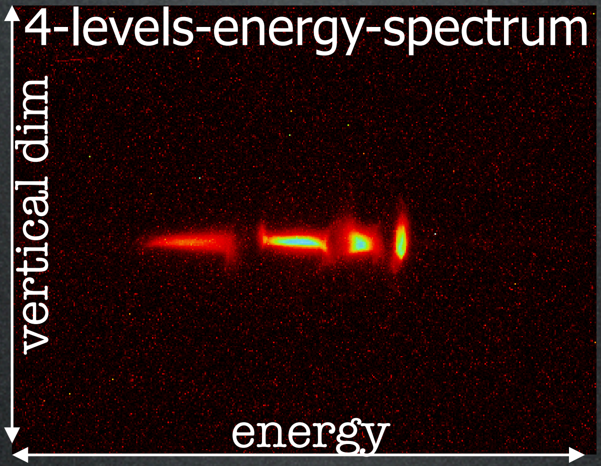
LNF- November 19, 2012

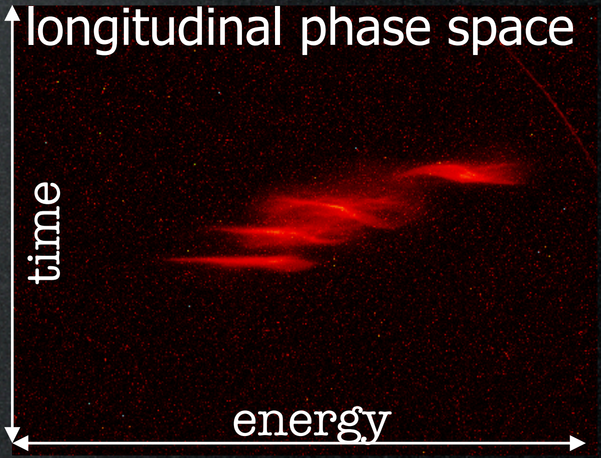
Laser COMB technique



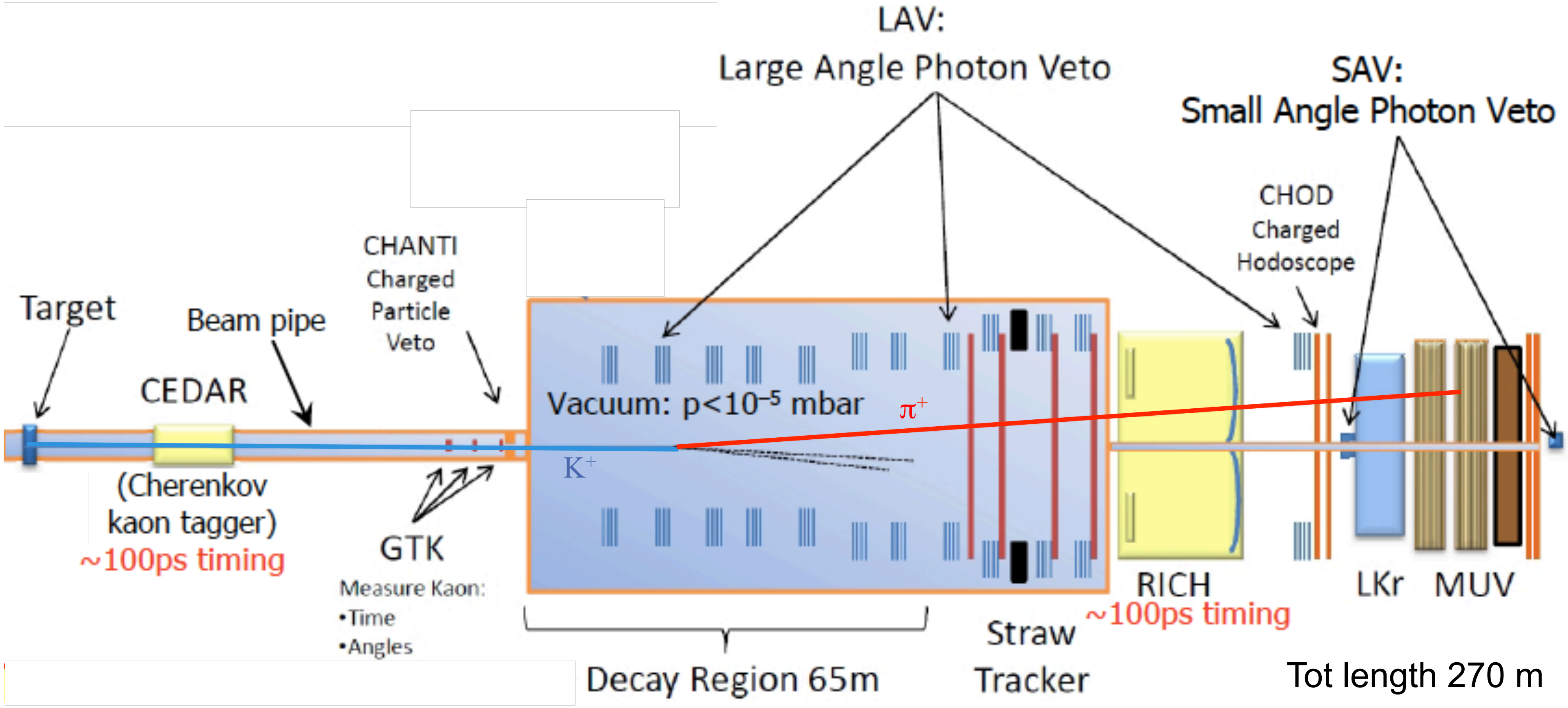








The NA62 detector



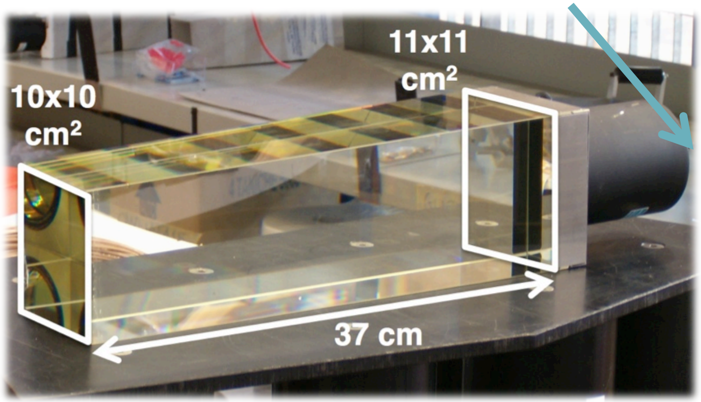
Primary protons:	3×10^{12} protons/pulse from SpS with momentum of 400 GeV
Beam:	750MHz unseparated beam: 525 MHz π^+, 170 MHz p, 45 MHz K^+
Total # kaons:	10% of K^+ decay in FV $\Rightarrow$ 4.5×10^{12} K^+ decays/yr
K^+ momentum:	(75±1) GeV
Measures:	Tag K, K and π momentum and time, π tag, veto all extra particle

The LAV detector (synergy w NA,Rm1,PI)

LAV numbers

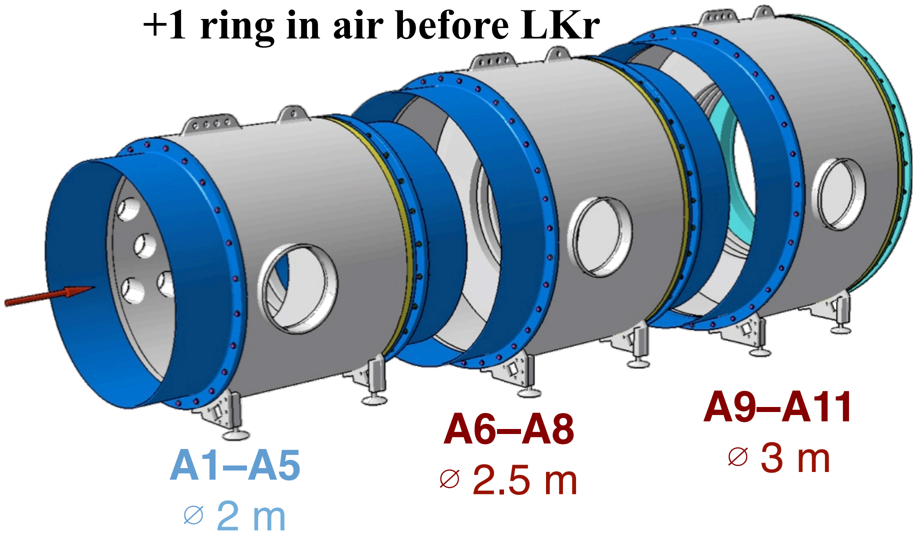
- 12 stations
- 4-5 rings/layer
- 32-64 blocks/layer
- ~ 2500 blocks total
- Operation in vacuum
- All particles from axis cross min 3 blocks ($20X_0$)

R2238 76-mm PMTµ-metal case



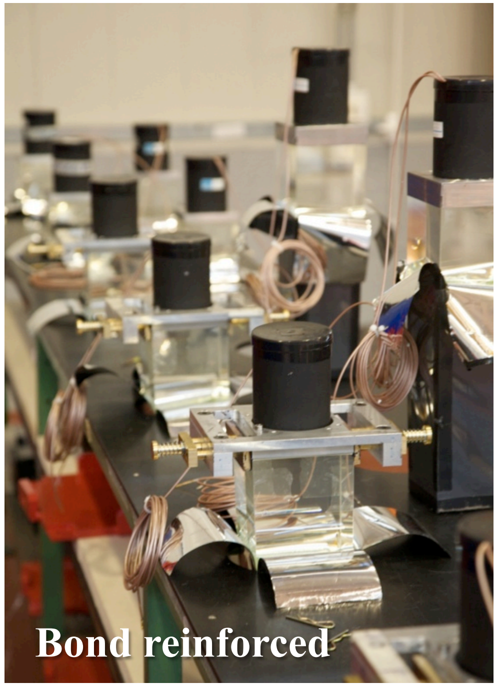
Lead-glass blocks from OPAL EM barrel
Schott SF57 lead glass

11 rings installed in vacuum tank
+1 ring in air before LKr

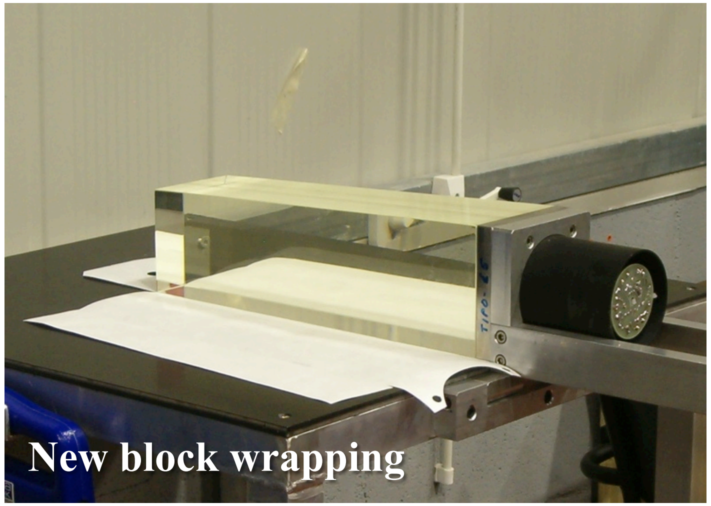


LAV construction @ LNF


Water damage


Bond reinforced

"Banana" assembly

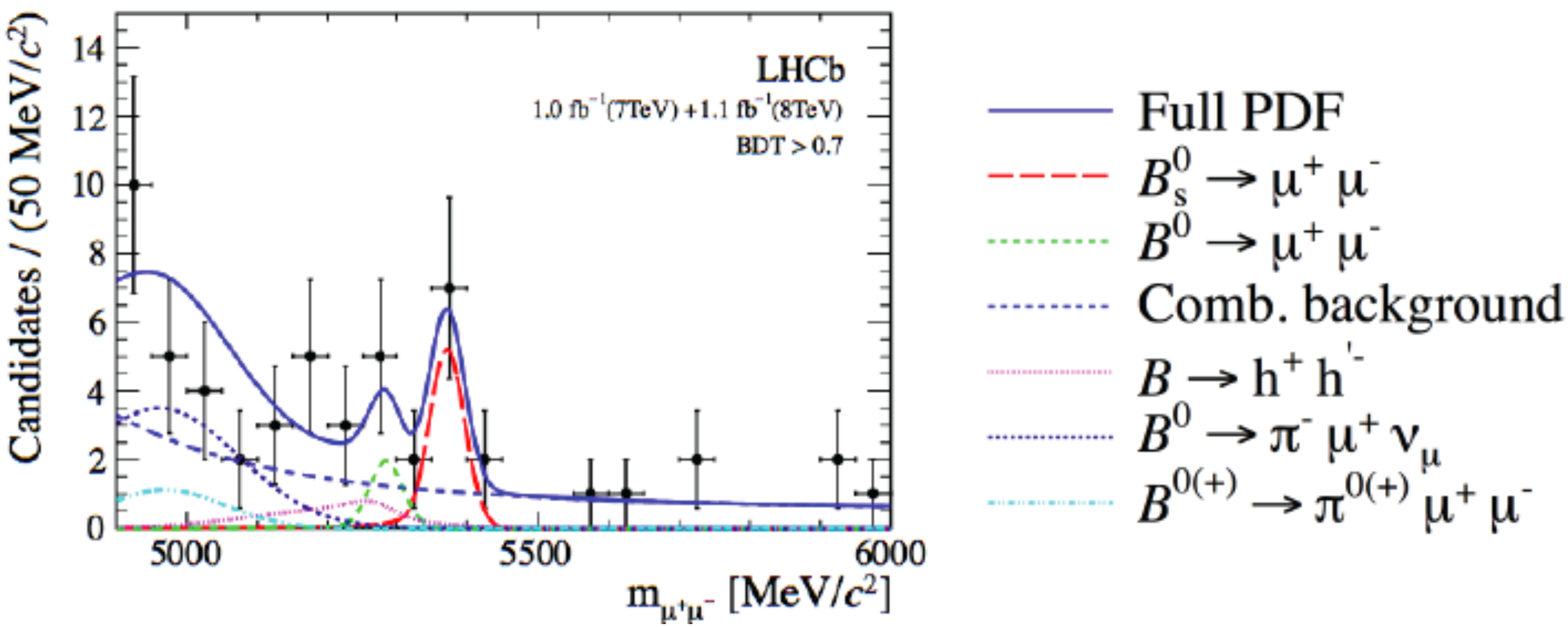

New block wrapping


Banana installation

Completed 9 LAV now at CERN!

Combined dataset, $\mathcal{B}(B^0_s \to \mu^+\mu^-)$

- 7 TeV (1 fb^{-1})+ 8 TeV (1.1 fb^{-1}): $\mathcal{B}(B^0_s \to \mu^+\mu^-) = (3.2^{+1.5}_{-1.2}) \times 10^{-9}$
- SM expectation: $(3.54 \pm 0.30) \times 10^{-9}$
- Bkg-only probability value: 5.3×10^{-4} (3.5 σ excess)



$B^0_s \to \mu^+\mu^-$: contribution from LNF

- Among the 23 analysis authors, 6 are from LNF, contributing to different aspects of the analysis:

- Data streaming and validation
- Muon identification efficiency
- pion/kaon/proton misidentification probabilities → peaking background determination ($B^0_s \to h^+h'^-$ with double misID)
- combinatorial background (bbar → $\mu\mu X$) determination via interpolation of the dimuon mass sidebands
- Branching fraction fit
- Paper writing and submission

- collaborations/responsibilities in various accelerators R&D (i.e. TTF, CTF3, LHC High Lumi, ELI NP et al.)
- responsibilities in construction of Syncro for Carbon Ions for CNAO (Italian hadrotherapy center)

ECLOUD12 sheds light on electron clouds

INTERNATIONAL JOURNAL OF HIGH-ENERGY PHYSICS
CERNCOURIER
VOLUME 52 NUMBER 7 SEPTEMBER 2012

A recent workshop reviewed the latest experiences with the phenomenon of electron clouds at the LHC and other accelerators.

Electron clouds – abundantly generated in accelerator vacuum chambers by residual-gas ionization, photoemission and secondary emission – can affect the operation and performance of hadron and lepton accelerators in a variety of ways. They can induce increases in vacuum pressure, beam instabilities, beam losses, emittance growth, reductions in the beam lifetime or additional heat loads on a (cold) chamber wall. They have recently regained some prominence: since autumn 2010, all of these effects have been observed during beam commissioning of the LHC.

Electron clouds were recognized as a potential problem for the LHC in the mid-1990s (*CERN Courier* July/August 1999 p29) and the first workshop to focus on the phenomenon was held at CERN in 2002 (*CERN Courier* July/August 2002 p15). Ten years later, the fifth electron-cloud workshop has taken place, again in Europe. More than 60 physicists and engineers from around the world gathered at La Biodola, Elba, on 5–8 June to discuss the state of the art and review recent electron-cloud experience.

Valuable test beds

Many electron-cloud signatures have been recorded and a great deal of data accumulated, not only at the LHC but also at the CESR Damping Ring Test Accelerator (CesrTA) at Cornell, DAΦNE at Frascati, the Japan Proton Research Complex (J-PARC) and PETRA III at DESY. These machines all serve as valuable test beds for simulations of electron-cloud build-up, instabilities and heat load, as well as for new diagnostics methods. The latter include measurements of synchronous phase-shift and cryoeffects at the LHC, as well as microwave transmission, coded-aperture images and time-resolved shielded pick-ups at CesrTA. The impressive resemblance between simulation and measurement suggests that the existing electron-cloud models correctly describe the phenomenon. The workshop also analysed the means of mitigating electron-cloud effects that are proposed for future projects, such as the High-Luminosity LHC, SuperKEKB in Japan, SuperB in Italy, Project-X in the US, the upgrade of the ISIS machine in the UK and the International Linear Collider (ILC).

An international advisory committee had assembled an exceptional programme for ECLOUD12. As a novel feature for the series, members of the spacecraft community participated
includir
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Polytecl
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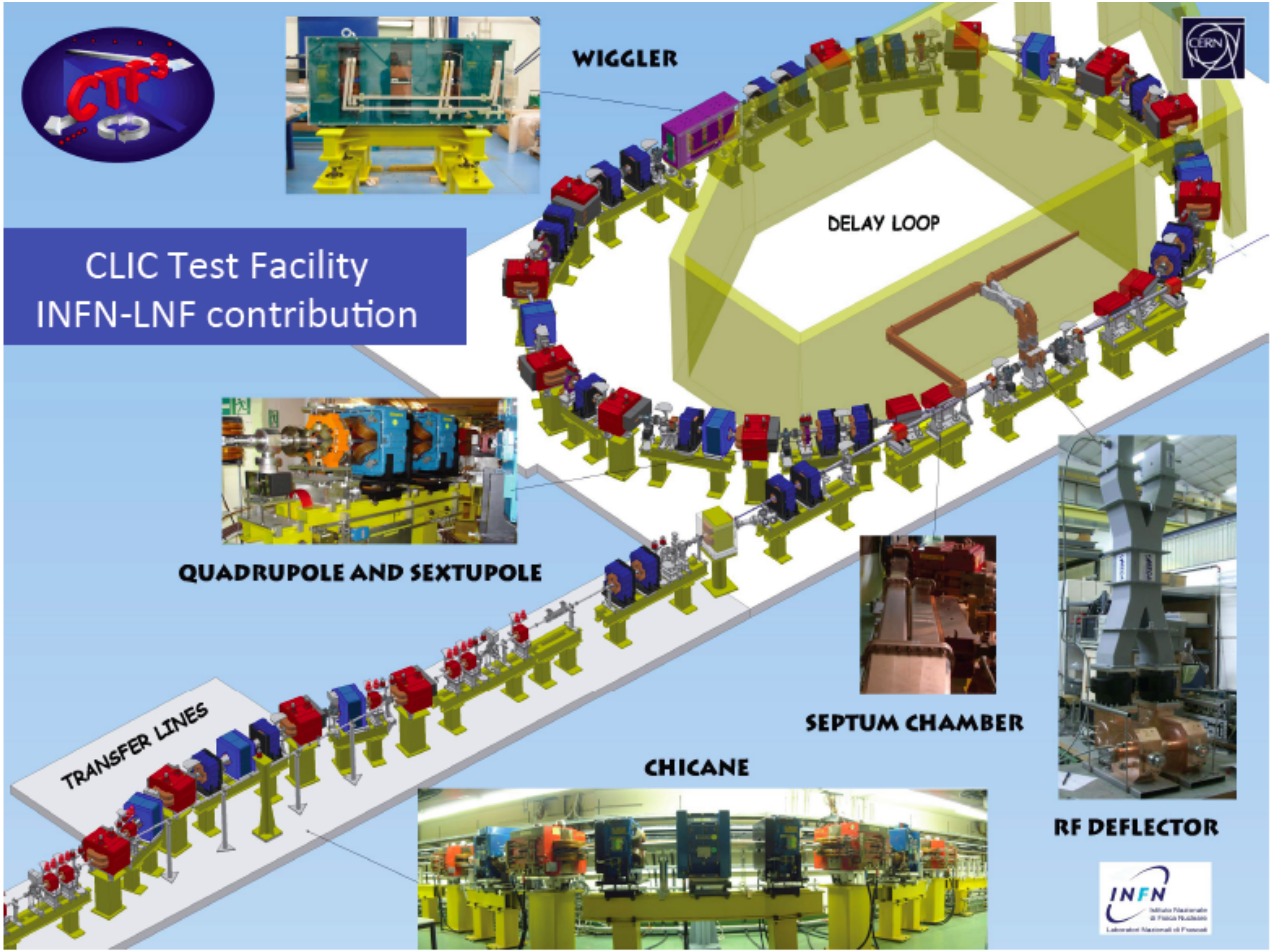
from Cornell, for photon tracking, modelling surface properties and 3D geometries; OSMOSEE from Onera, to compute the secondary-emission yield, including at low primary energies; PyECLOUD from CERN, to perform improved and faster build-up simulations; the latest version of WARP-POSINST from Lawrence Berkeley National Laboratory, which allows for self-consistent simulations that combine build-up, instability and emittance growth, and is used to study beam-cloud behaviour over hundreds of turns through the Super Proton Synchrotron (SPS); and BI-RME/ECLOUD from a ▷

Several powerful new simulation codes were presented for the first time at ECLOUD12.

chairs of ECLOUD12

Roberto Cimino, LNF/INFN
and
Frank Zimmermann, CERN


CLIC Test Facility
INFN-LNF contribution
WIGGLER
DELAY LOOP
QUADRUPOLE AND SEXTUPOLE
SEPTUM CHAMBER
RF DEFLECTOR
CHICANE
TRANSFER LINES
CTF3
CERN
INFN

SuperB update

- work ongoing to define details of lattice and related infrastructures
- detailed financial and resource loaded schedule prepared
- High level ministerial review (especially) on financial status just finished (chair G. Fioni – CEA, F)
- final report shortly + meeting of INFN management with Italian Research Minister in order to plan future steps
- more news soon


Thank you !!