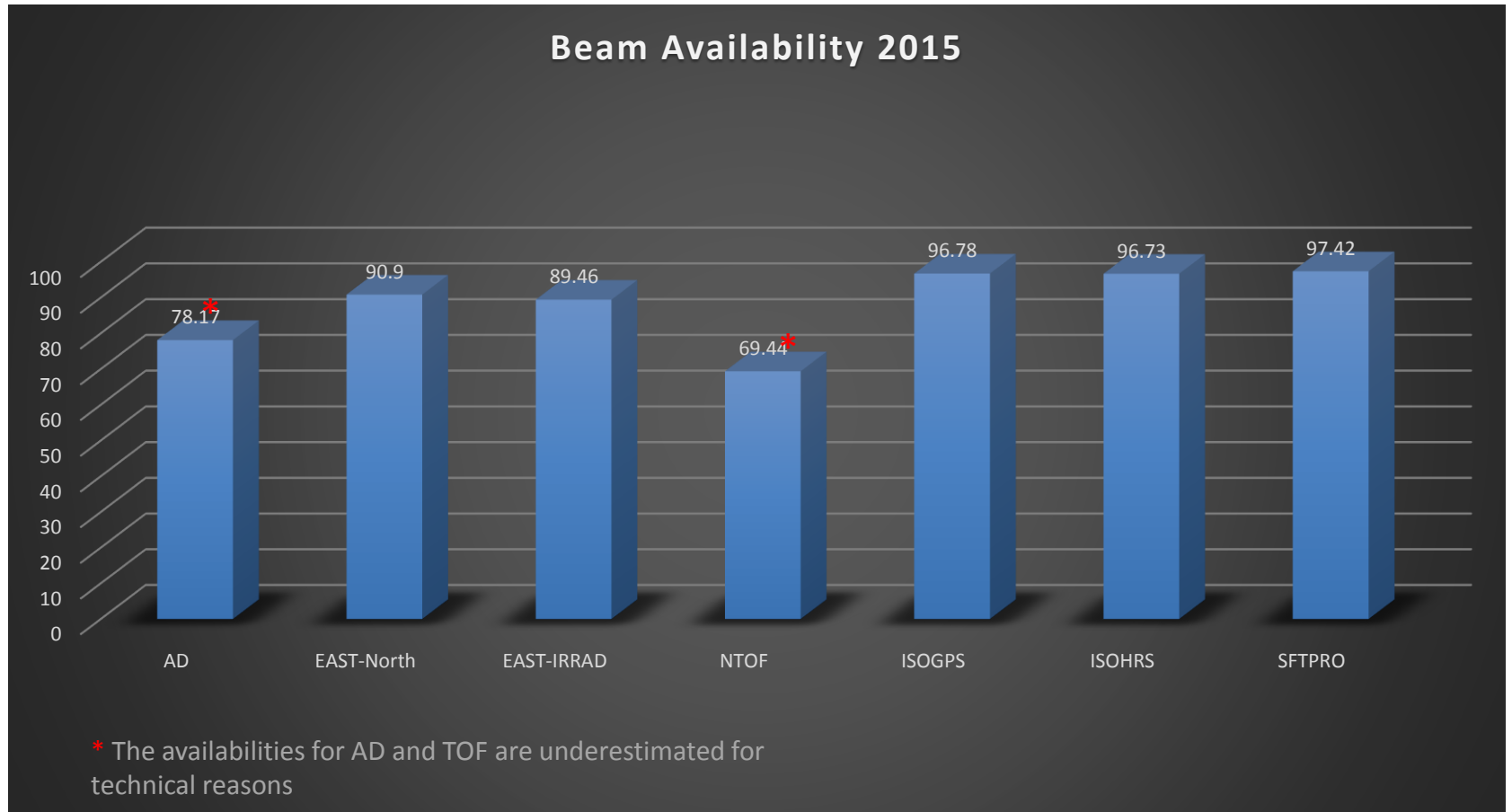


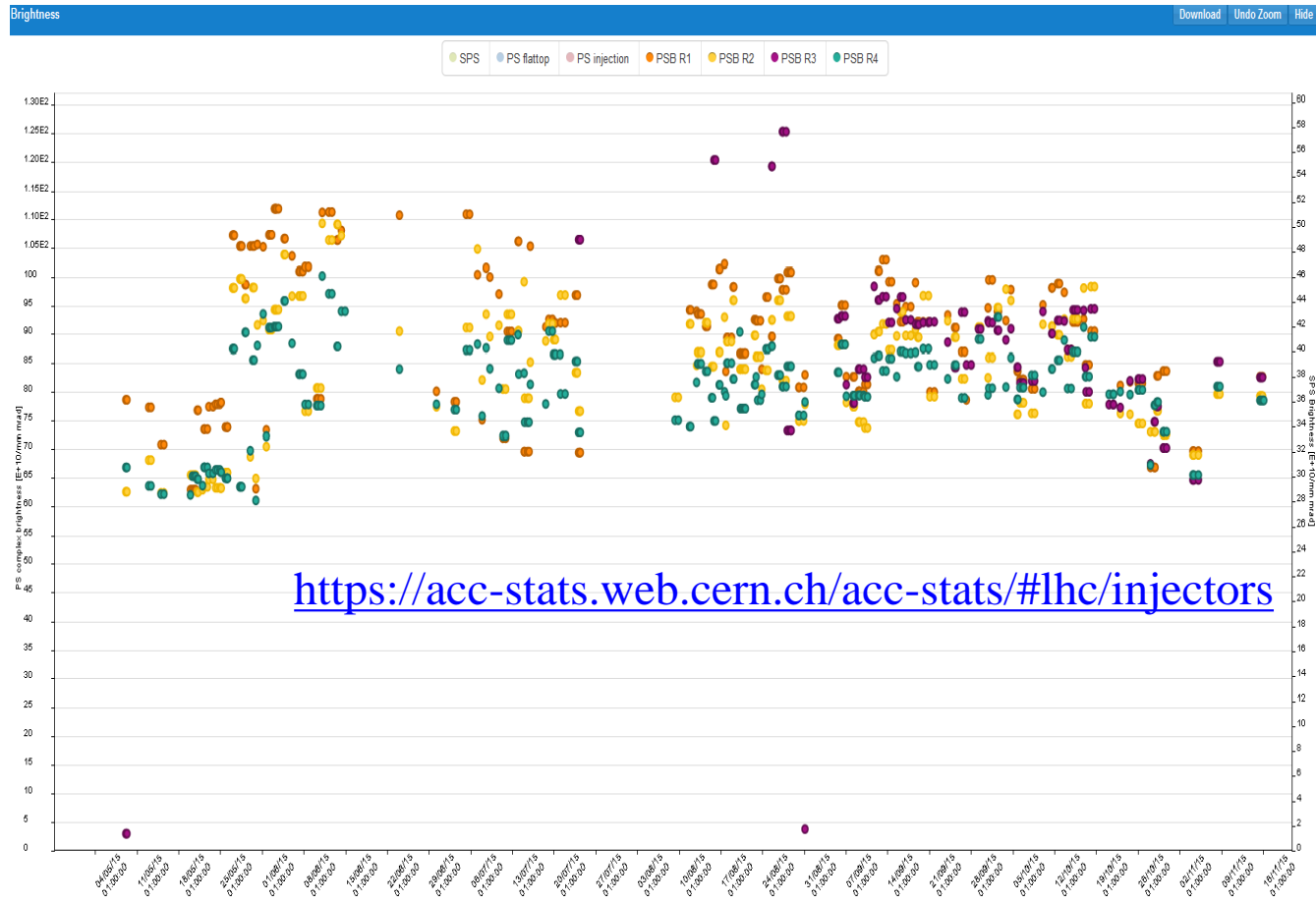
A few highlights from 2015



PSB: Beam Availabilities in 2015

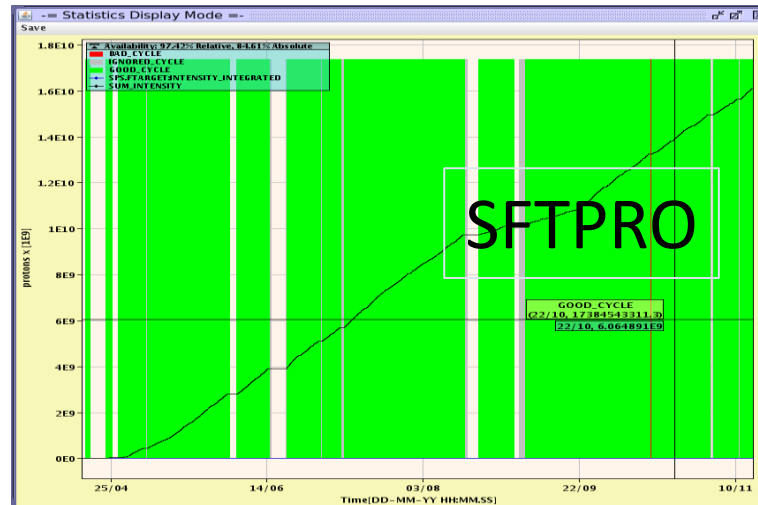
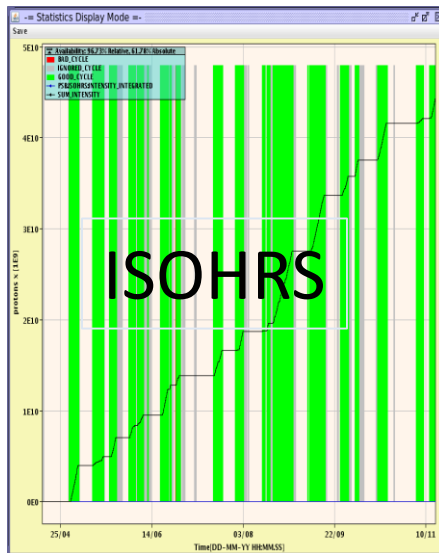
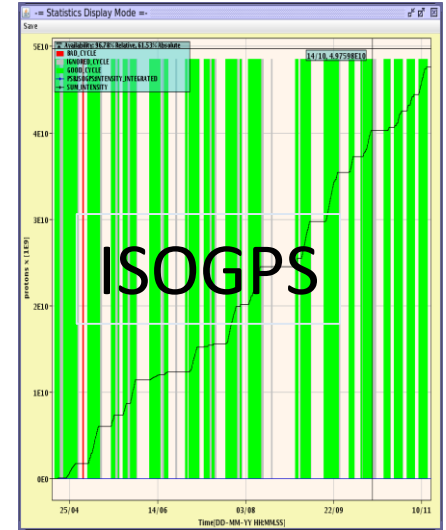
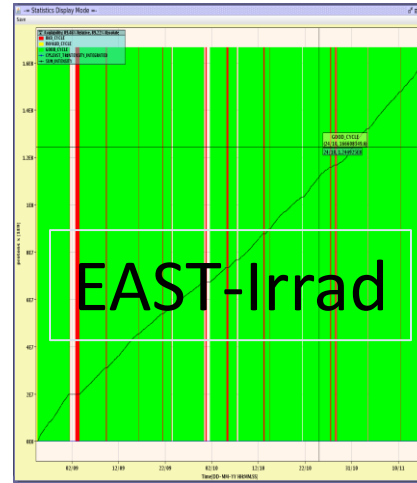
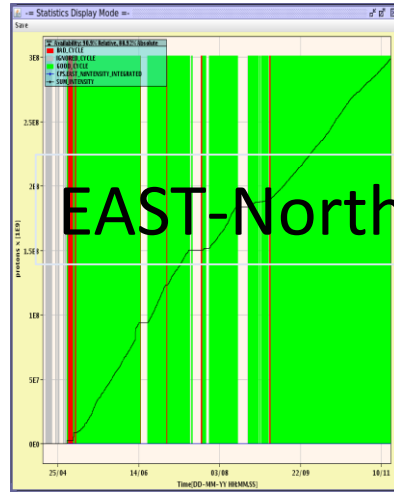
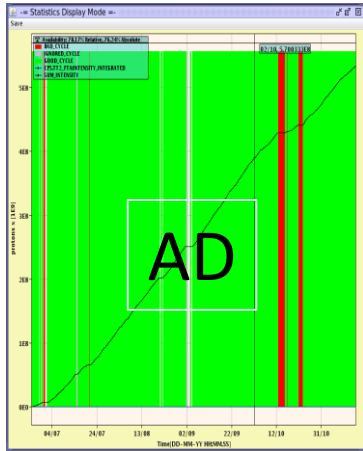


PSB: Operational Beam Status(4)



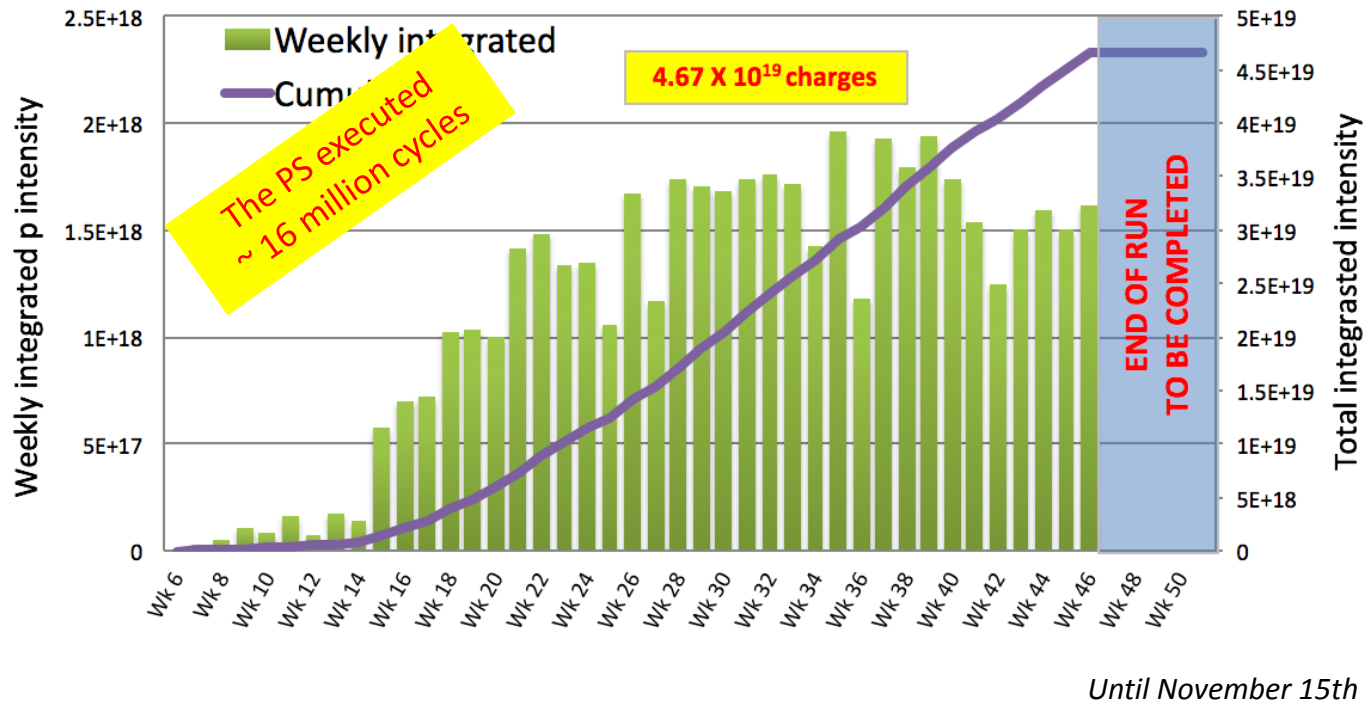
LHC Beams' Brightness performance statistic of PSB 4 rings

Intensity & availabilities of beam



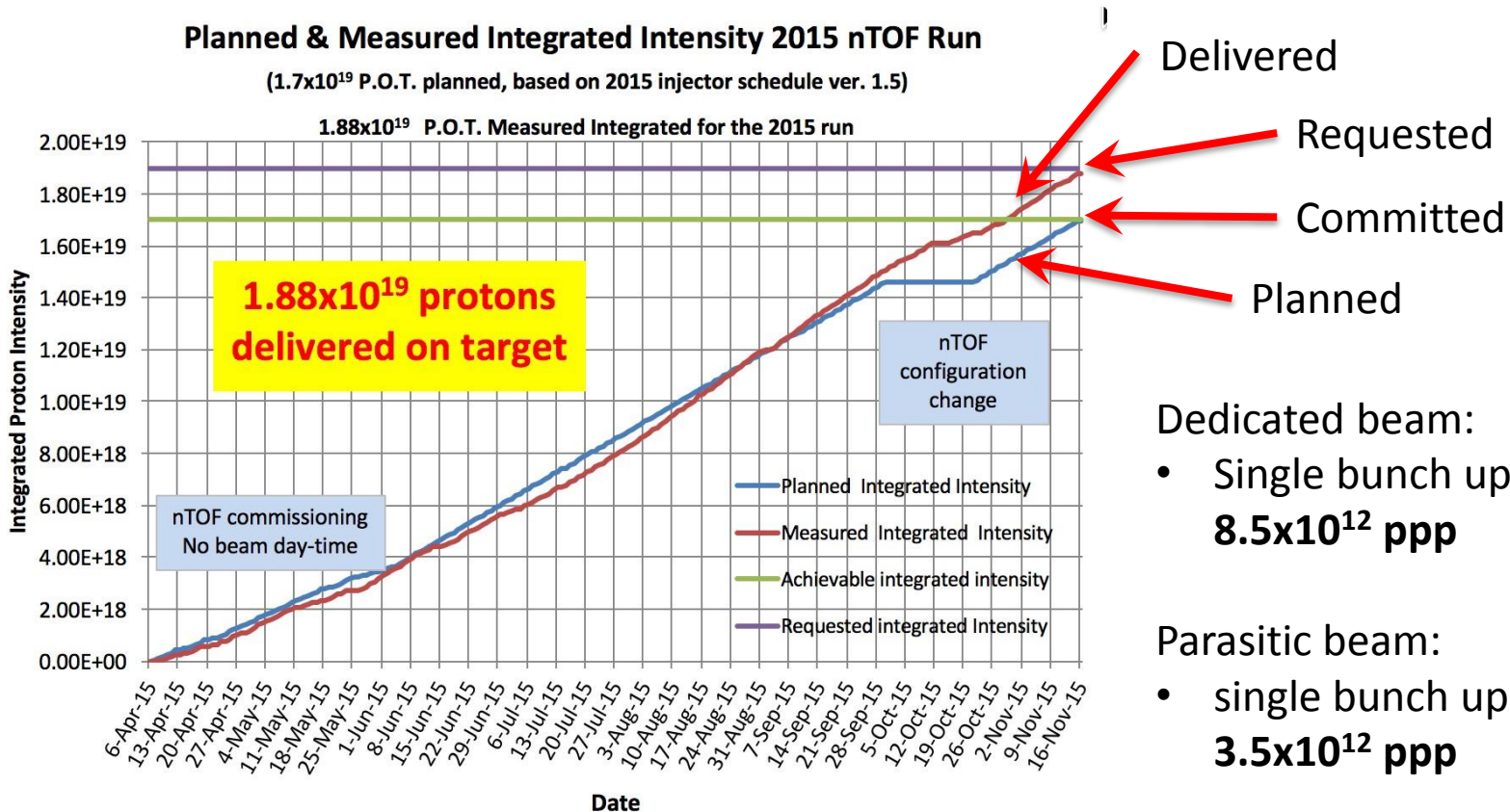
2015 : Intensity Accelerated in PS

- Total 4.67×10^{19} charges, of which :
 - 1.9×10^{19} for SPS fixed target beam (CT/MTE) setting up and physics → 41%
 - 1.9×10^{19} for nTOF → 41%
 - 1.7×10^{18} for LHC beams in PS, SPS and LHC (setting up, studies and physics) → 4%



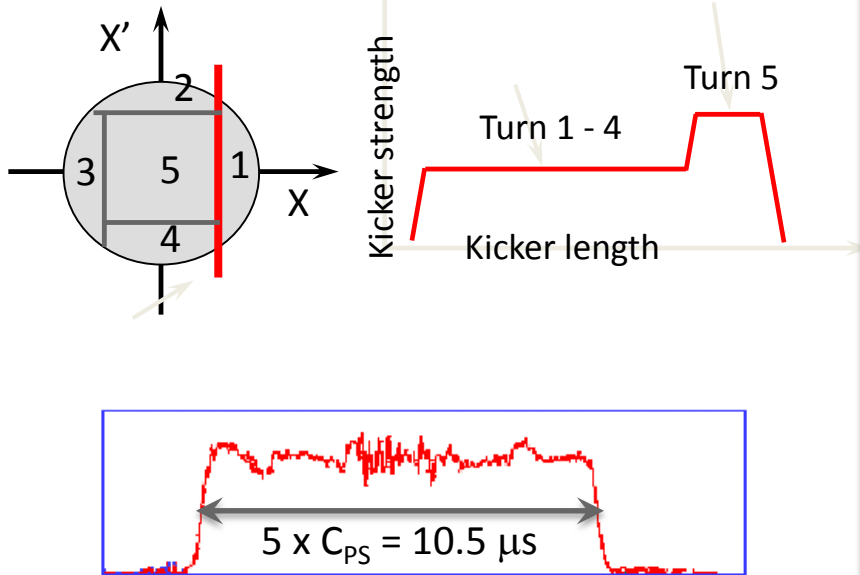
nTOF: Goal & Achievement

- What was 'promised' and what we achieved...

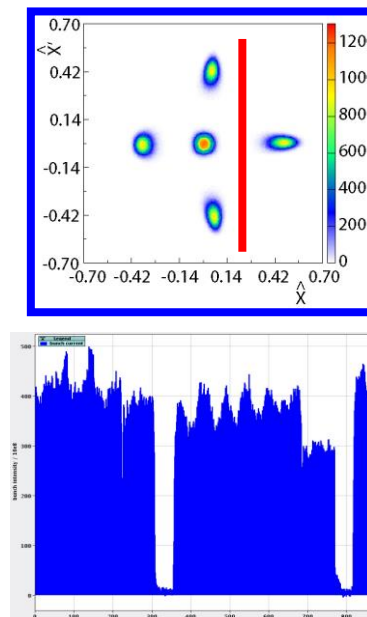


Continuous Transfer versus Multi Turn Extraction

PS CT Extraction Scheme



PS Multi Turn Extraction Scheme



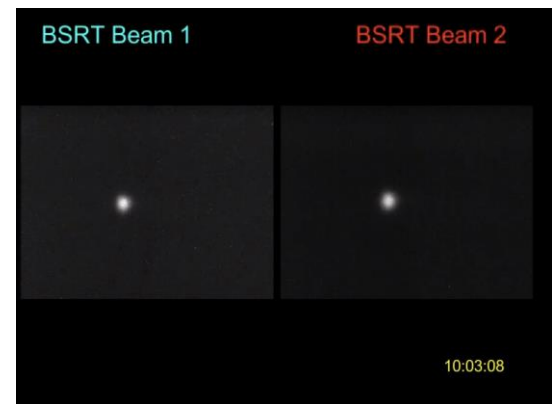
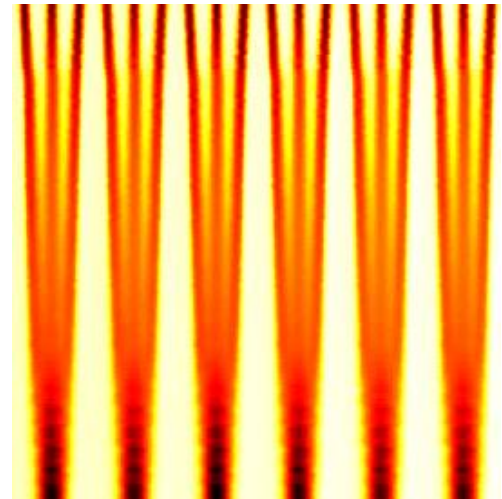
- Phase space topology with stable islands
- Depleted space for septum blade
- Theoretically loss free
- In practice $\sim 2 - 3\%$ losses

Rather high loss rate in PS $\sim 6\%$

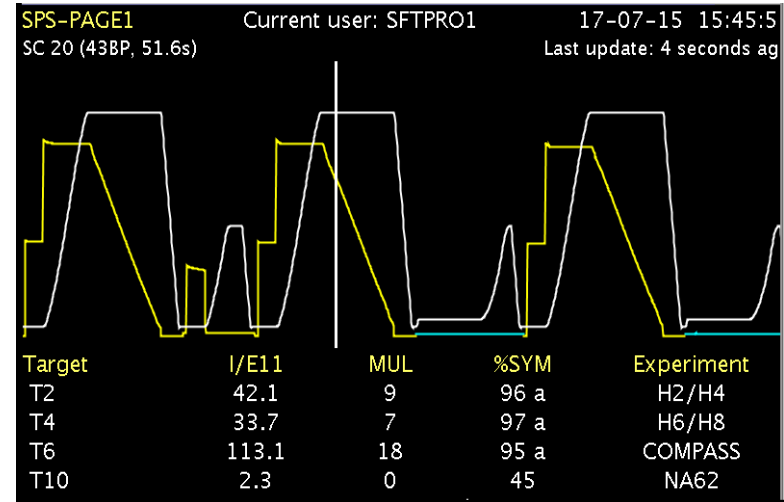
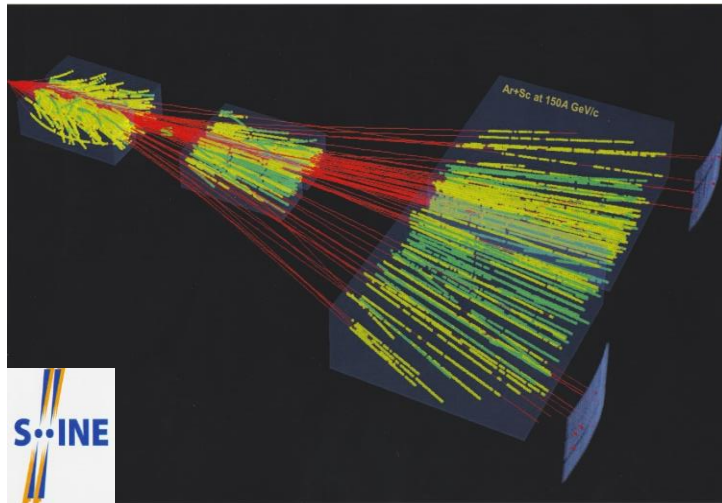
MTE was operationally used for North Area fixed target physics between 21/09 and 15/12

LHC beams

- PS creates the time structure of the LHC beams
- Brighter and brighter beams are required
- In many different flavours:
 - 50ns, 25ns, INDIV, PROBE, BCMS, 8b4e



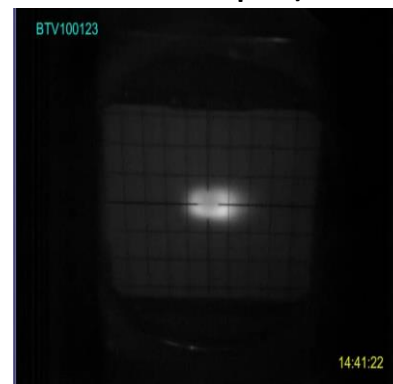
2. Physics in numbers... North Area



- Ar-ions for north area at six different energies

Particle type	% Efficiency
Argon	88
Proton	84
Lead	90

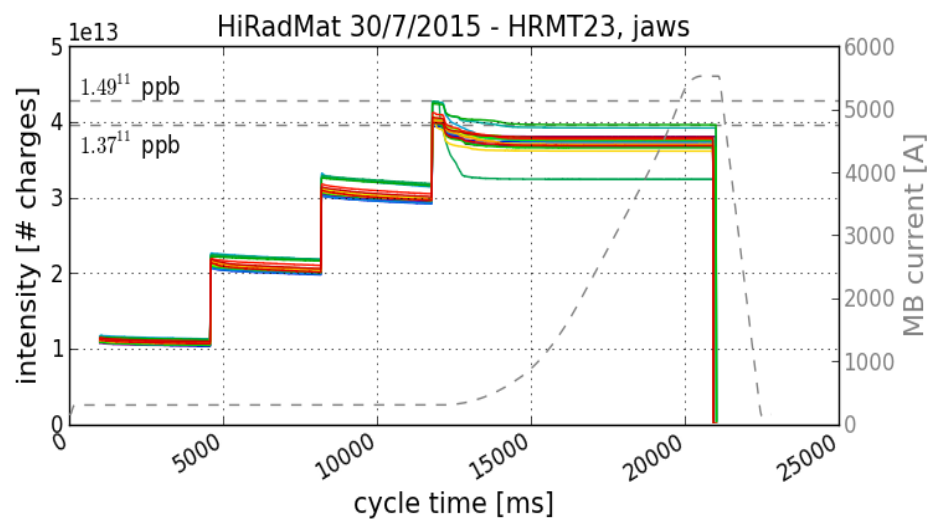
- Proton flux for North Area 3 times higher than in 2012.
- Spill control by auto-trimming the tune (no servo spill).



- MTE beam for North Area

2. Physics in numbers...HiRadMat

- A record intensity of $1.37 \cdot 10^{11}$ p/b in 288 bunches to HiRadMat



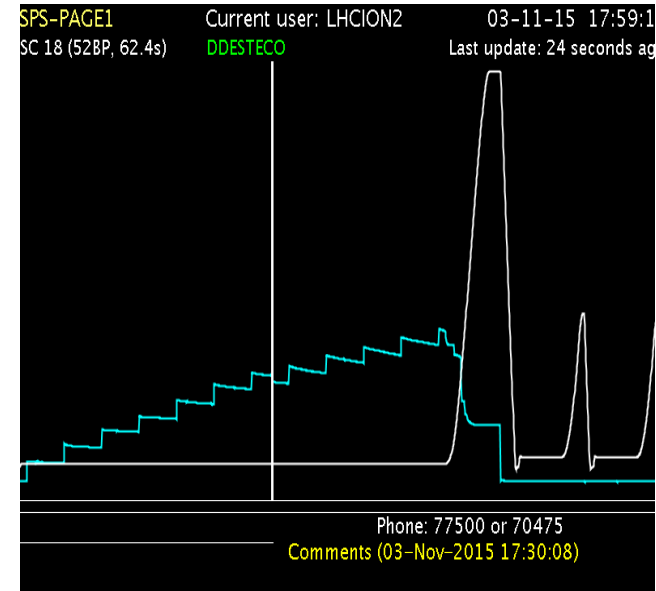
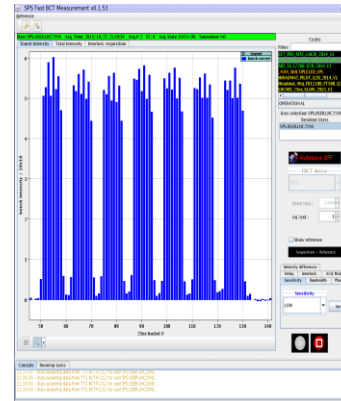
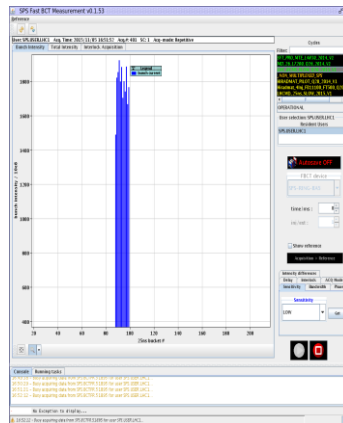
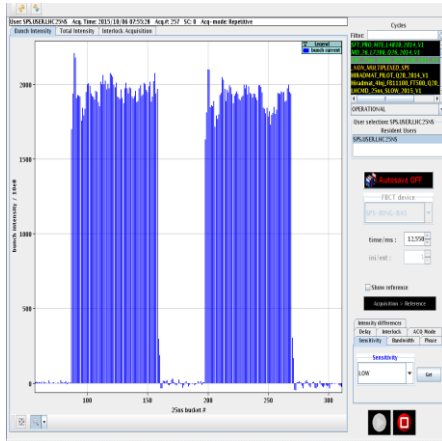
Different targets after experiment

Courtesy of K.Cornelis

3. LHC filling in numbers

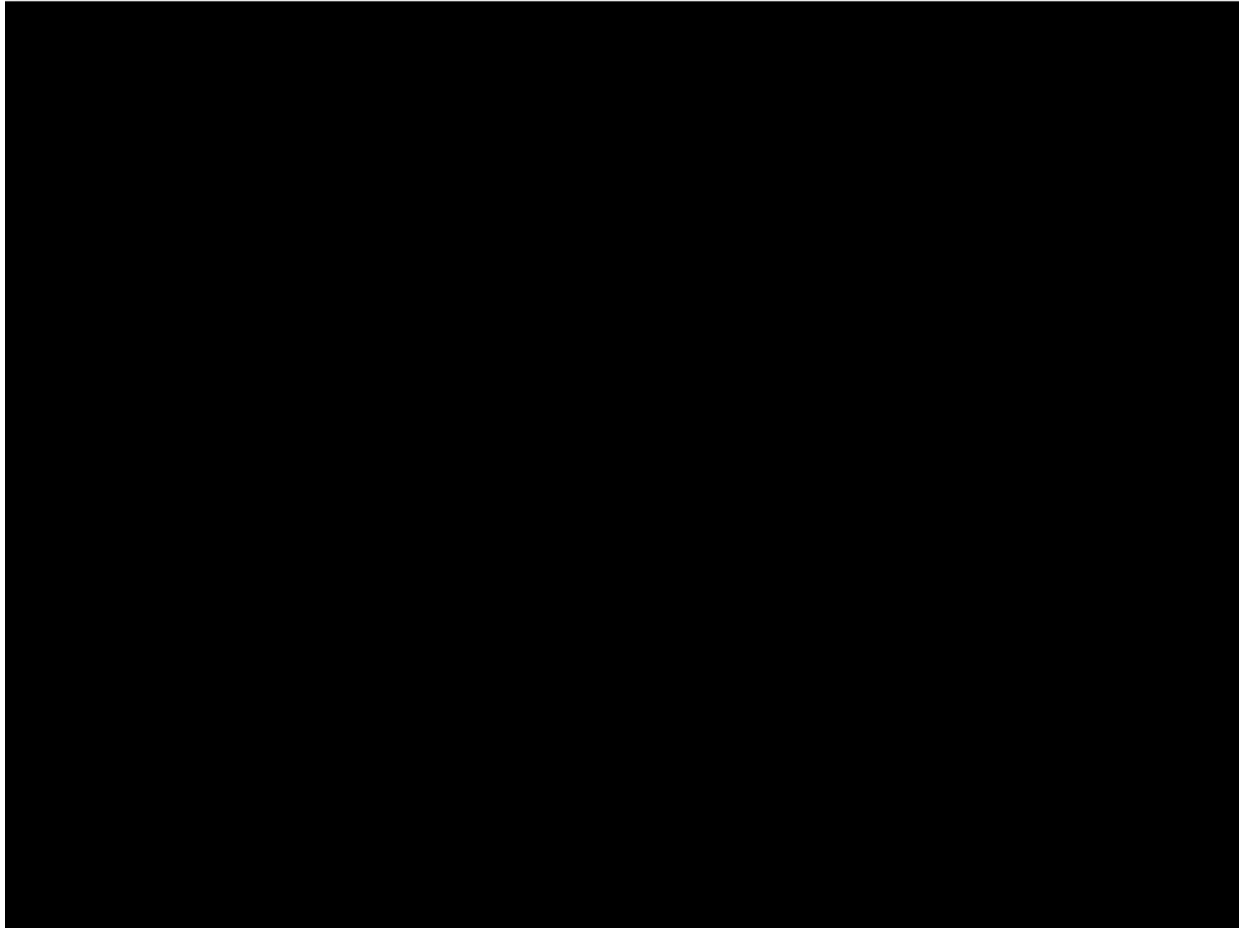
An endless list of bunch patterns to help the LHC with e-cloud problems.

LHC 50 NS, LHC 25 NS, BCMS, 8b4e.....
-> 144, 72, 12 bunches...



Ready for Ions filling...

- **And You ? What do you think about the SPS crazy Gang ?**





**THE FOOL
SPEAKS, THE
WISE MAN
LISTENS.**

African Proverb

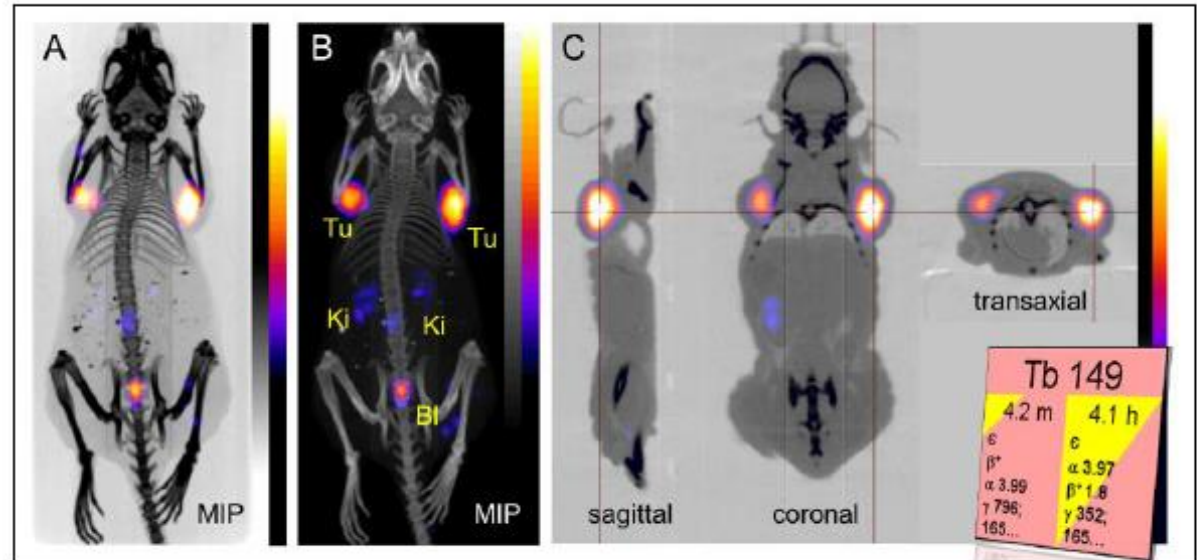
- ✓ ISOLDE Mouse hunter:





Silver medal achievements

- ✓ An outstanding example from the applied/medical world is the first ever PET scan taken at PSI with ^{149}Tb from the ISOLDE 528 experiment which is the alpha-emitting isotope usually used for alpha-therapy. This potentially allows us to perform PET scans during the course of alpha therapy in the future so that one could directly observe the effect of the isotope (hopefully) killing the tumour



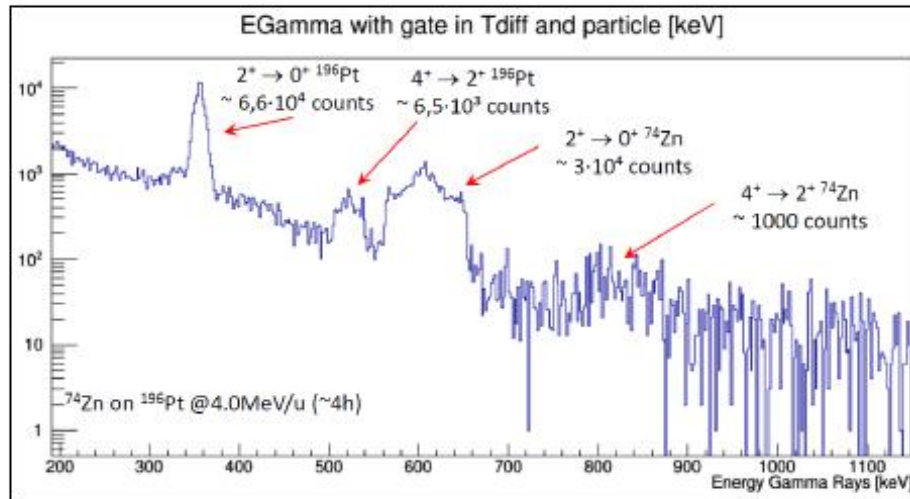
First PET scan using ^{149}Tb

Submitted to
the European Journal of Nuclear
Medicine and Molecular Imaging

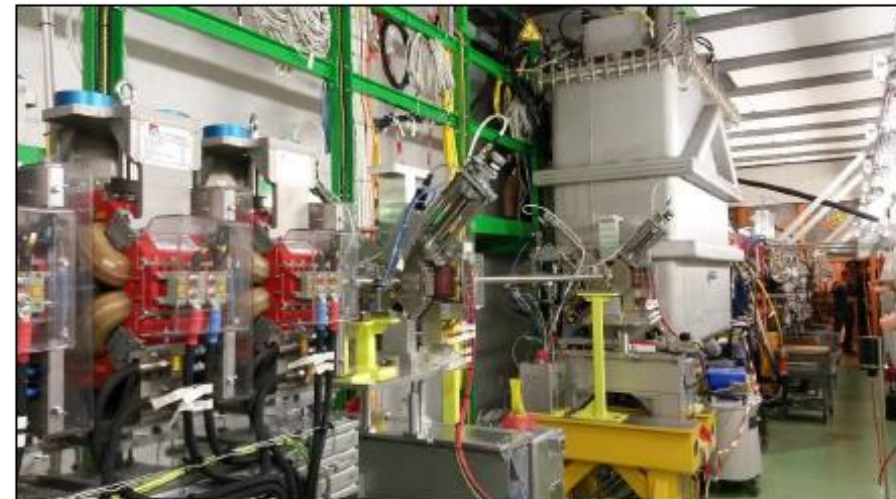
Gold medal achievement



- ✓ In spite of issues such as the burst of the He cryostat rupture disc on the cryo module and unexpected heating of the RF couplers the first radioactive beam, $^{74}\text{Zn}^{25+}$ at an energy of $\sim 4\text{MeV/u}$ was successfully send to the Miniball experiment on October 22nd
- ✓ As scheduled the HIE ISOLDE accelerated beams were provided since to the happy users these last weeks of the 2015 run



First Miniball gamma-ray energy spectrum after 4hrs data



The HIE Linac with its Cryo Module containing five SC cavities and one SC solenoid

Summary

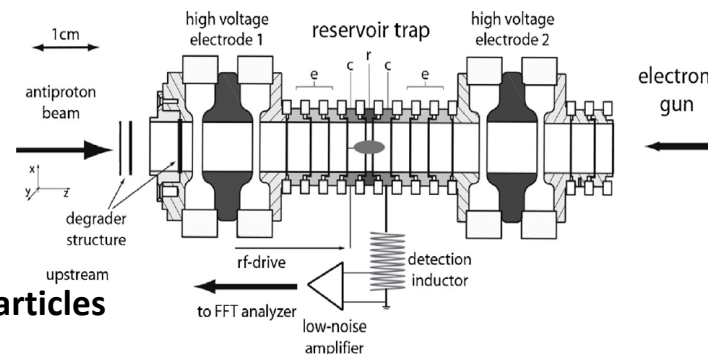
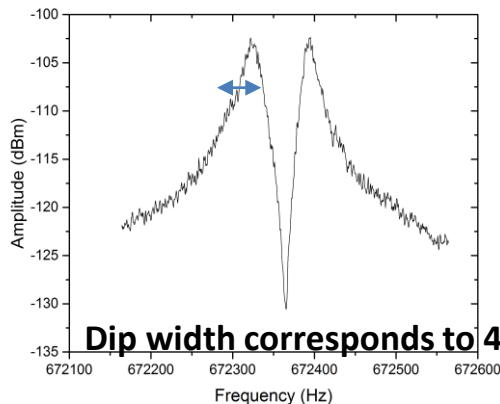
- CTF3
 - hot like a sauna
 - innovative
 - sparkling!
 - colourful
 - a hot spot
 - has hidden treasures
- Don't start the treasure hunt before 2017!
- We are still running until 16 December and for another year!
- THANKS again for all your support!

AD Highlights 2015 – physics run



- ~3200 physics hours realised with 90% beam availability for the 5 present AD users
- Good progress with new apparatus & towards physics goals for ALPHA, ATRAP & AEGIS
- ASACUSA:s 3 sub-groups progress: Improvement of Antihydrogen production rate. Better precision of electron to antiproton mass measurements using antiprotonic Helium. Multi-ejection on $h=6$ for measurements of antiproton annihilation cross section in carbon.
- **Physics is still going on at BASE!** :
 - 42 Antiprotons in storage (since 4/11); these will be used well into 2016...
 - Detected via image current signal in the Penning trap electrodes:

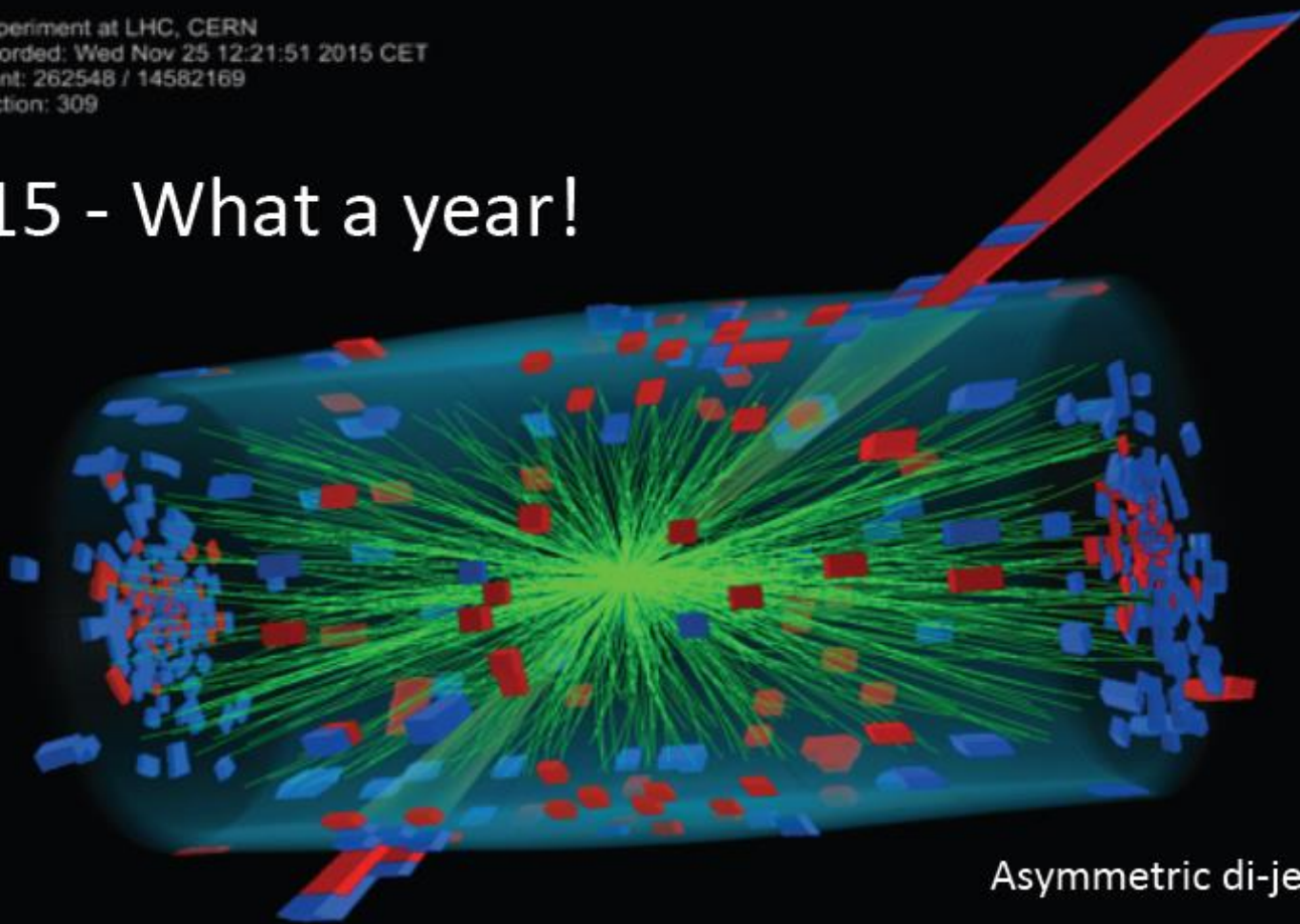
Reservoir trap FFT signal





CMS Experiment at LHC, CERN
Data recorded: Wed Nov 25 12:21:51 2015 CET
Run/Event: 262548 / 14582169
Lumi section: 309

2015 - What a year!

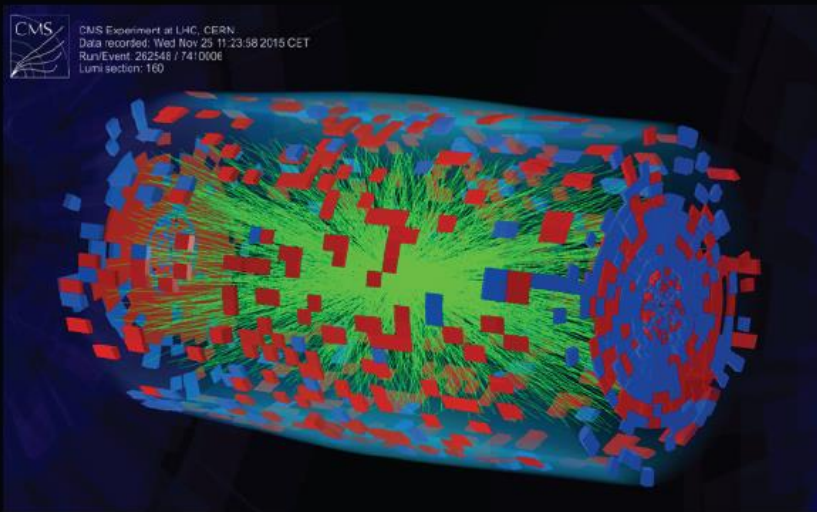


Asymmetric di-jet event PbPb

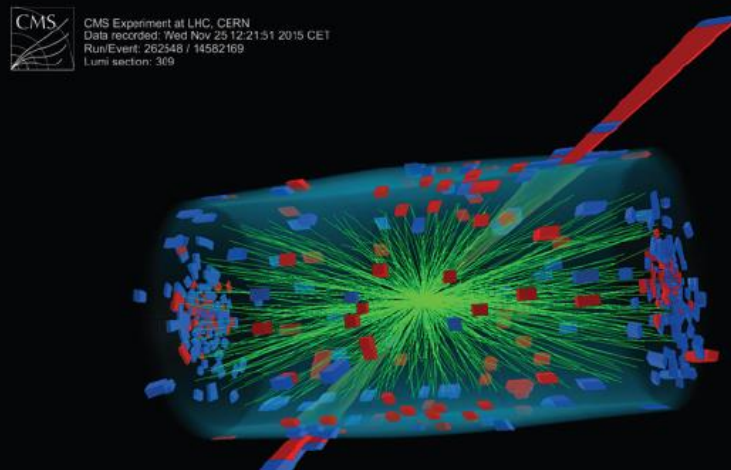


Event displays from PbPb collisions

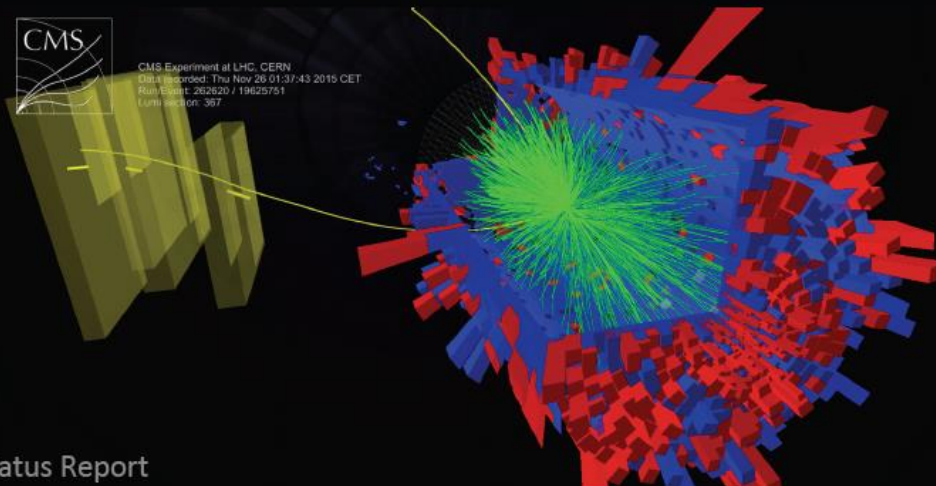
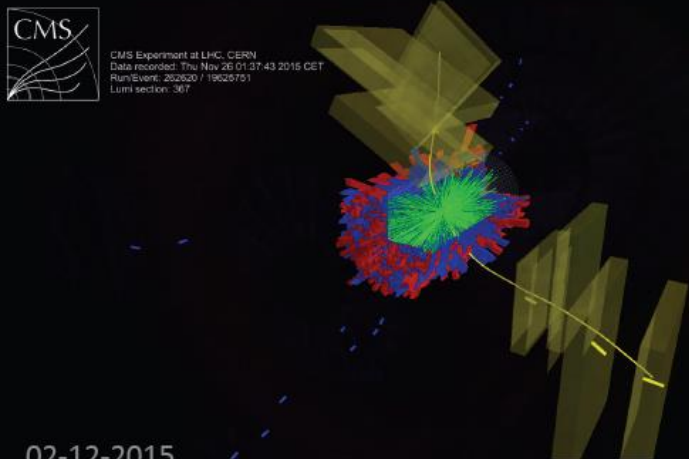
Head-on collision



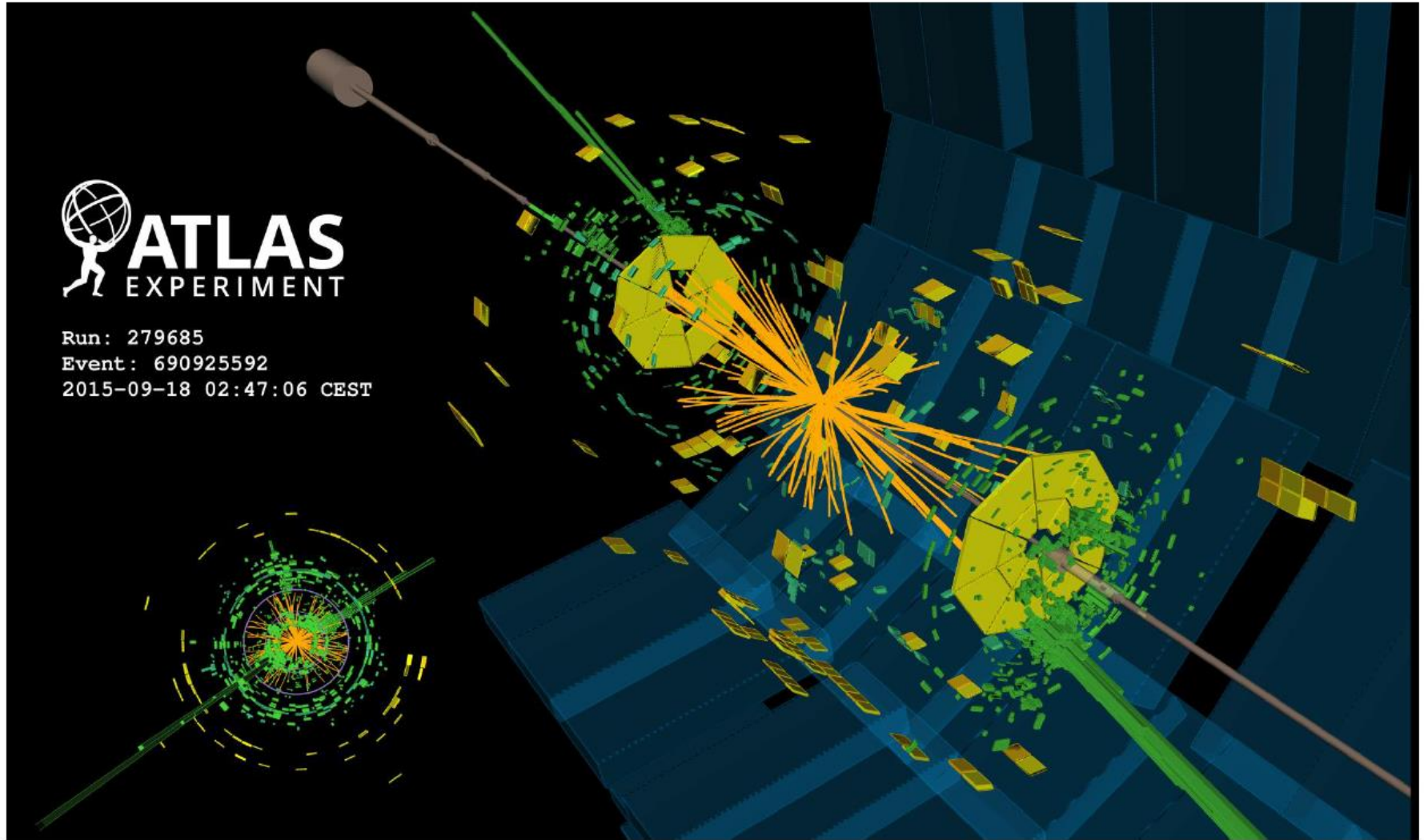
The first dijet event



The first Upsilon Candidate



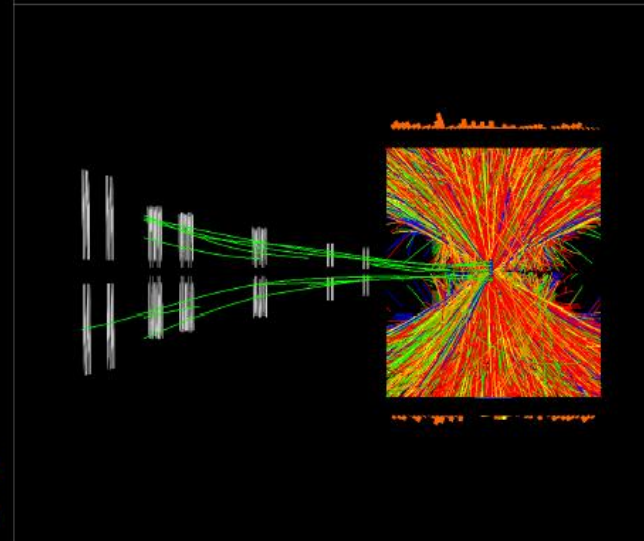
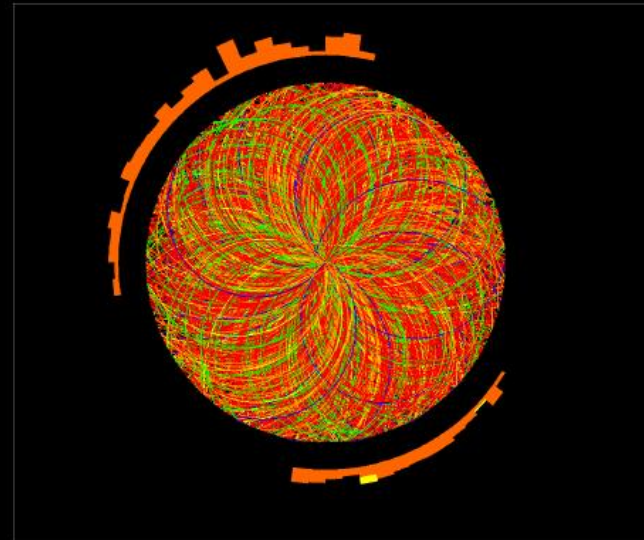
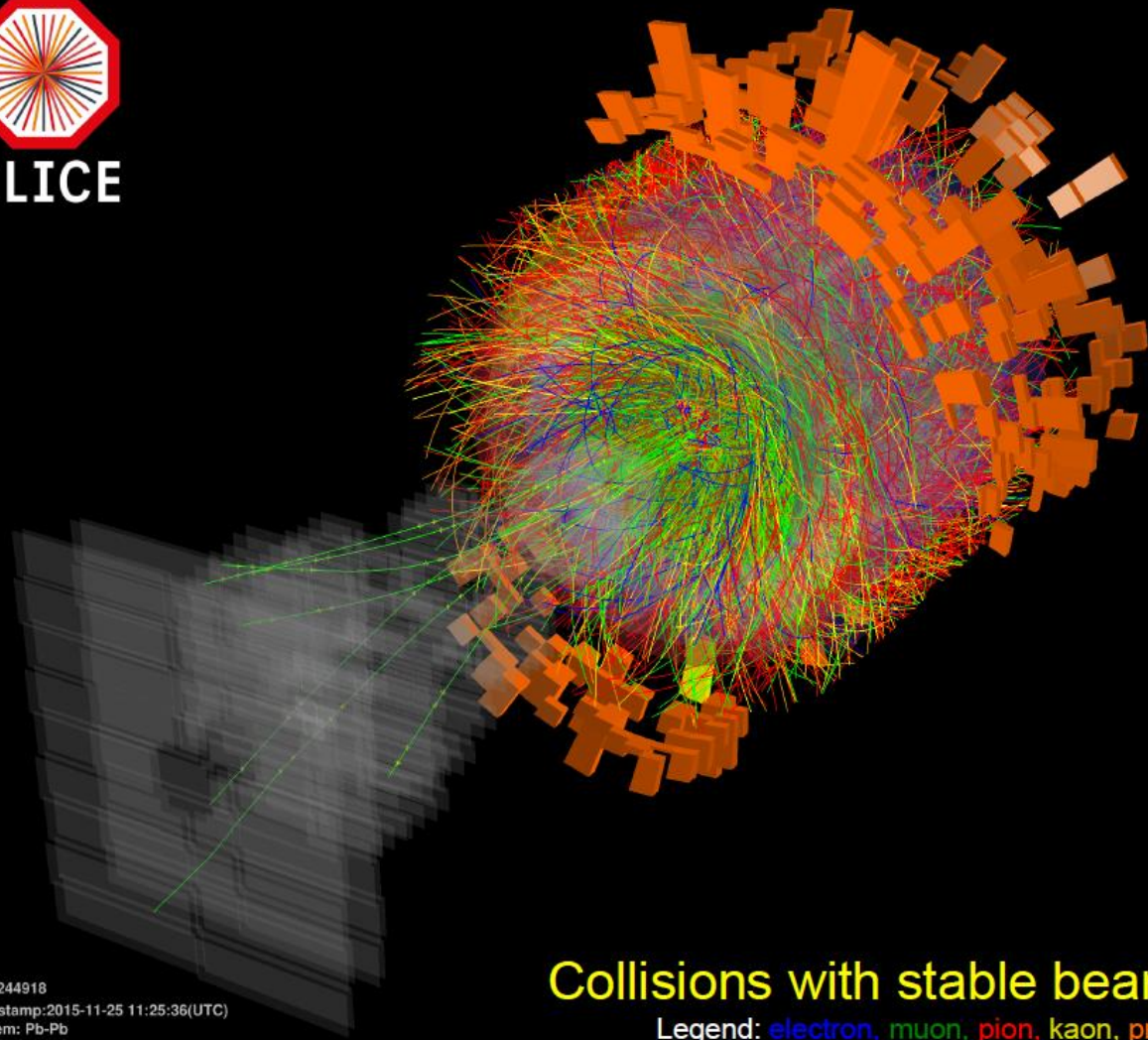
Unprecedented Centre of Mass Energy



A high-mass dijet event collected by ATLAS in September, 2015. The two central high- p_T jets have an invariant mass of 8.8 TeV, the highest- p_T jet has a p_T of 810 GeV, and the sub-leading jet has a p_T of 750 GeV. The missing transverse energy for this event is 60 GeV.



ALICE



Run: 244918
Timestamp: 2015-11-25 11:25:36(UTC)
System: Pb-Pb
Energy: 5.02 TeV

Collisions with stable beams

Legend: electron, muon, pion, kaon, proton

...FINALLY, THE HIGHEST ENERGY
Pb-Pb at $\sqrt{s_{NN}} = 5.02$ TeV