p+Pb 2016 summary

L.Bonechi

Initial ideas

- **We had not required initially to run at 5 TeV, but only at 8 TeV**
  - We had an official agreement with LHCC to run only at 8 TeV

- After that LHC plan was fixed (5 TeV mostly for ALICE and 8 TeV mostly for ATLAS/CMS) **together with ATLAS** we made the request to have the possibility to take some common data at 5 TeV. Not an official document, but a request via email to the LPC coordinators and some words at LPC meeting by ATLAS people

- Main purposes for running at 5 TeV
  - **commissioning of our detector**
  - **commissioning of LHCf-ATLAS common data taking**
  - **common run with ATLAS (too limited in 2013)**
  - 5 TeV and 8 TeV taken with the same setup and config

Balance test and installation (2-3 November 2016)

- **Balance test: OK**
  - Perfect support by the transport team as usual
    - **Caterina Bertone, Jean-Loius Grenard etc.**
- **Some conflicts with installation of ZDC**
  - We were not informed of the ZDC installation until few weeks before
  - Installation of ZDC and LHCf to be done at the same time to minimize the effort of machine people
  - Planned with **Marzia Bernardini** (coordinator of all the activities in the LHC tunnel)
    - to avoid interference between the two groups
    - to allow cabling LHCf after ZDC was already cabled
- **Successfull installation**

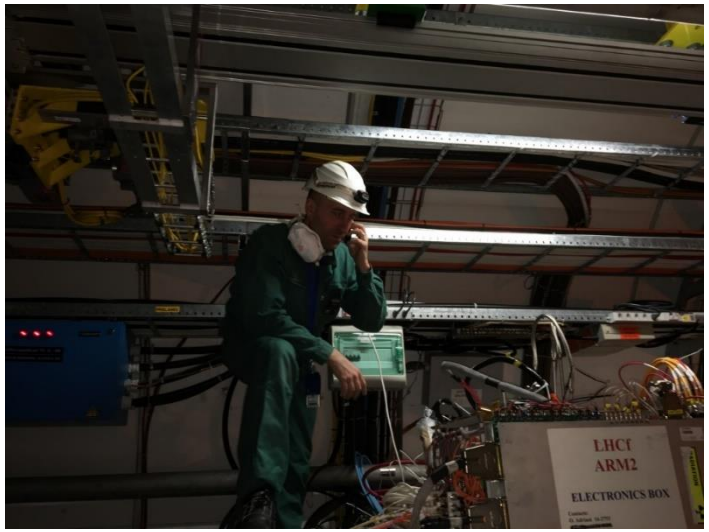

LHCf

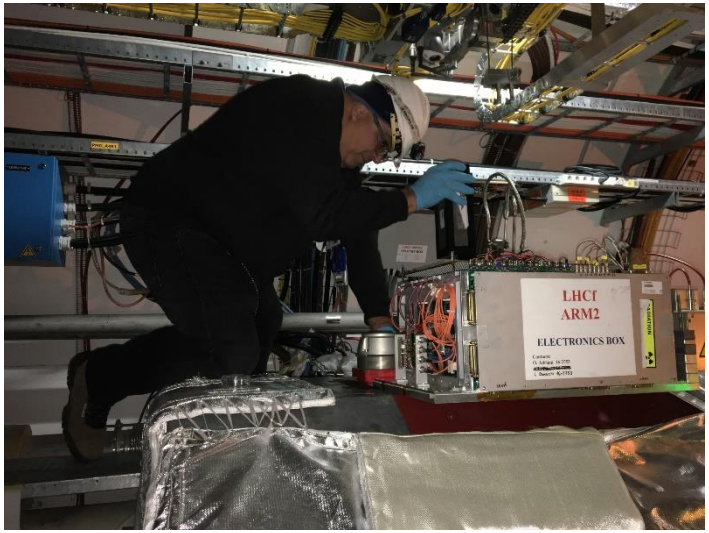

LHCf
ARM2
ELECTRONICS BOX

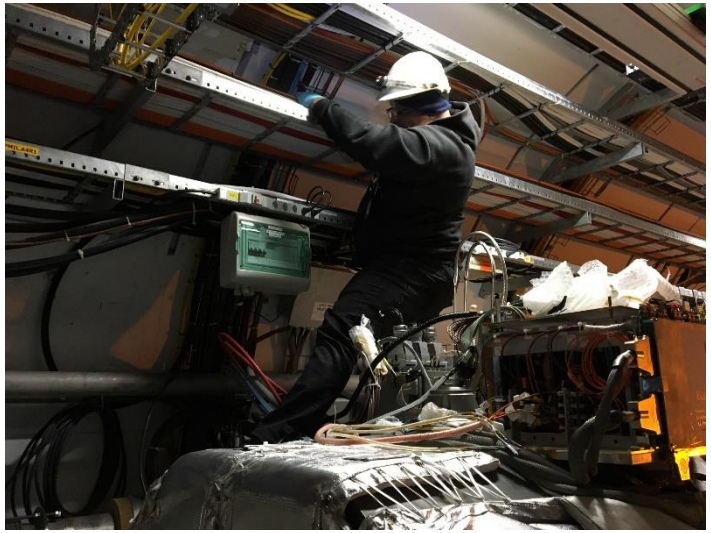
Cabling & Commissioning
(3-4 November)

- Cabling
  - No problems found initially
- Commissioning
  - Different problems found:
    - **One optical fiber from TAN to USA15 probably broken → CONSIDER FOR NEXT OPERATION !**
    - **High noise level for analog electronic circuits at TAN → CONSIDER FOR NEXT OPERATION !**
    - **Problems with a VME board in USA15 → CONSIDER FOR NEXT OPERATION !**
  - Important help from Marzia Bernardini to get access urgently to the tunnel
  - Interventions in the tunnel on 4 November
  - All problems were solved!
- Note for the run at 5 TeV
  - Very important for a test of the system after these operations
- Some hardware problems found in this phase: **think about it for future!**

Some photos of installation





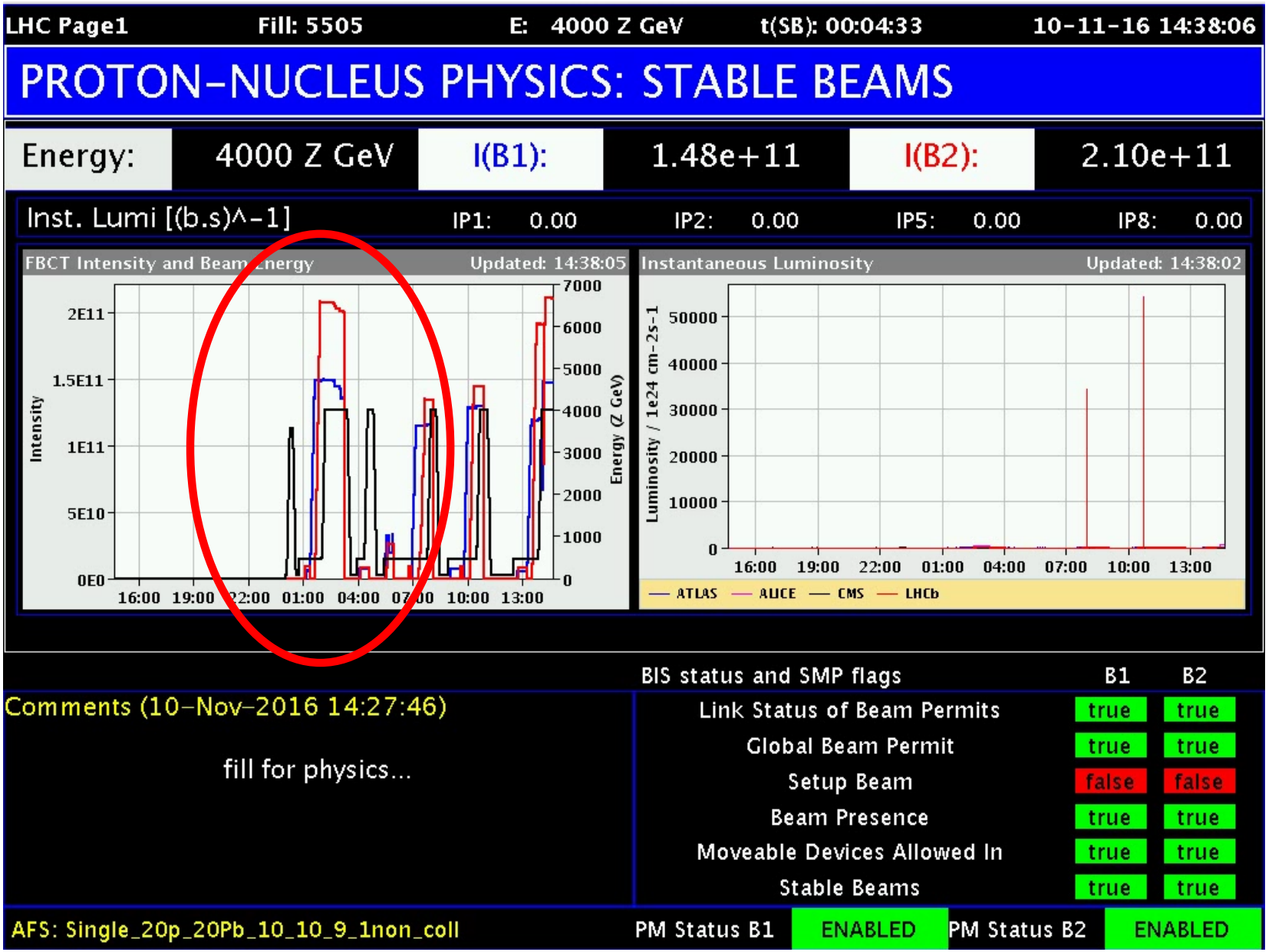



SWISS
STAR ALLIANCE
GENEVA COINTRIN
LX 1691
13:45
13:55
CANCELLED


Cidre
ANJOU

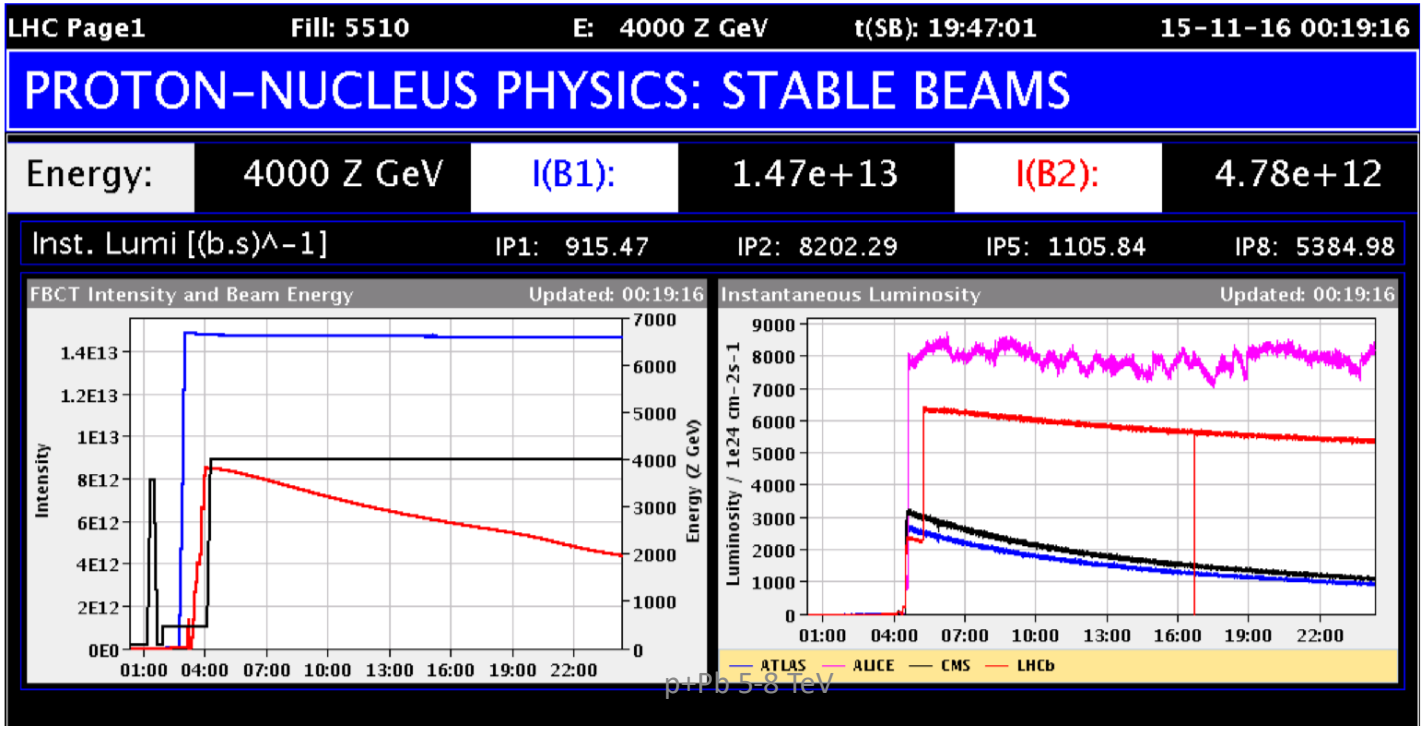
LHC run and data taking

- **First fill at very low luminosity**
  - 10 November (discussion with CCC to be allowed to go in!)
  - 20 bunches colliding at all IPs
  - Calibration and checks (no physics for LHCf)
  - Setup of silicon latency not completed
  - Fill was dumped after 2h
- **Second fill only for ALICE**
  - Fill with higher lumi and longest duration ever (37h)!
- **Third fill at still higher luminosity**
  - Started on Sat 12 November
  - 81 bunches colliding at IP1
  - Setup of silicon latency quickly completed
  - **DATA TAKING**!!! 10h, then separation of beams
    - 6M events beam center + 3.5M events +8mm up


LHC Page1
Fill: 5505
E: 4000 Z GeV
t(SB): 00:04:33
10-11-16 14:38:06
PROTON-NUCLEUS PHYSICS: STABLE BEAMS
Energy:
4000 Z GeV
I(B1):
1.48e+11
I(B2):
2.10e+11
Inst. Lumi [(b.s)^-1]
IP1: 0.00
IP2: 0.00
IP5: 0.00
IP8: 0.00
FBCT Intensity and Beam Energy
Updated: 14:38:05
Intensity
Energy (Z GeV)
2E11
1.5E11
1E11
5E10
0E0
7000
6000
5000
4000
3000
2000
1000
0
16:00 19:00 22:00 01:00 04:00 07:00 10:00 13:00
Instantaneous Luminosity
Updated: 14:38:02
Luminosity / 1e24 cm-2s-1
50000
40000
30000
20000
10000
0
16:00 19:00 22:00 01:00 04:00 07:00 10:00 13:00
ATLAS
ALICE
CMS
LHCb
Comments (10-Nov-2016 14:27:46)
fill for physics...
BIS status and SMP flags
B1
B2
Link Status of Beam Permits
true
true
Global Beam Permit
true
true
Setup Beam
false
false
Beam Presence
true
true
Moveable Devices Allowed In
true
true
Stable Beams
true
true
AFS: Single_20p_20Pb_10_10_9_1non_coll
PM Status B1
ENABLED
PM Status B2
ENABLED

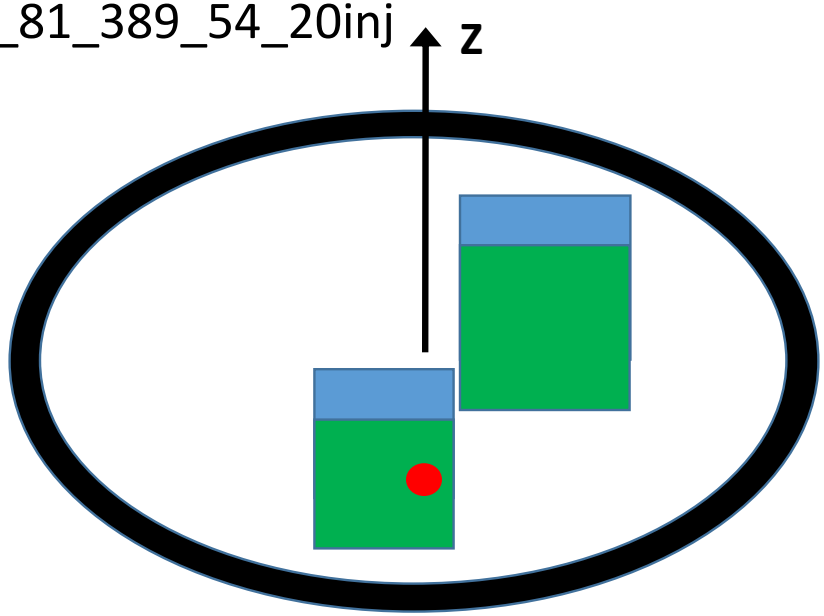
LHC run and data taking

- **Fourth fill**
  - Started on 14 November at 4:00
  - 81 bunches colliding at IP1
  - **DATA TAKING**!!! 20h, then separation of beams
    - 7M events beam center + 3M events +8mm up + 4M events +16mm up



Summary of the 5 TeV run

- Fills 5007 and 5010
  - scheme 100_200ns_702p_548Pb_81_389_54_20inj
  - Very favourble conditions
    - → Low luminosity ($L \approx n \times 10^{27}$)
    - → Low pile-up ($\mu \approx 0.01$)
    - → $\beta^* = 11$ m
    - → Tot crossing angle = 280 μrad
- Collected data sets
  - Three different positions
    - Z=0, +8mm, +16mm
  - 26M common events (LHCf-ATLAS)
    - 15.8M at Z=0 (beam center)
    - 6.3M at Z=+8mm (beam center near lower edge)
    - 3.7M at Z=+16mm (beam center outside the acceptance → first time, max p_t)



Summary of the 8 TeV run

- Fills 5519
  - scheme Single_20p_20Pb_**10**_10_9_1non_coll
  - Good conditions
    - → Low luminosity ($L \approx 10^{27}$)
    - → Quite low pile-up ($\mu \approx 0.03$)
    - → $\beta^* = 0.6$ m
    - → Tot crossing angle = 280 μrad
- Fills 5538
  - scheme 100_200ns_684p_540Pb_**432**_427_89_20inj
  - Almost perfect conditions
    - → Higher luminosity ($L \approx 8 \times 10^{27}$)
    - → Low pile-up ($\mu < 0.01$)
    - → No uniform intensity of bunches
- Collected data sets
  - Two different positions
    - Z=0, +8mm
  - 20.5M common events (LHCf-ATLAS)
    - 15M at Z=0 (beam center)
    - 5.5M at Z=+8mm (beam center near lower edge)

Data taking of LHCf for p+Pb at 5 TeV and 8 TeV successfully completed !!!!!!!!!!!!!!!!!!!!!!!!

Many festivals organized in different parts of the World!

For example:

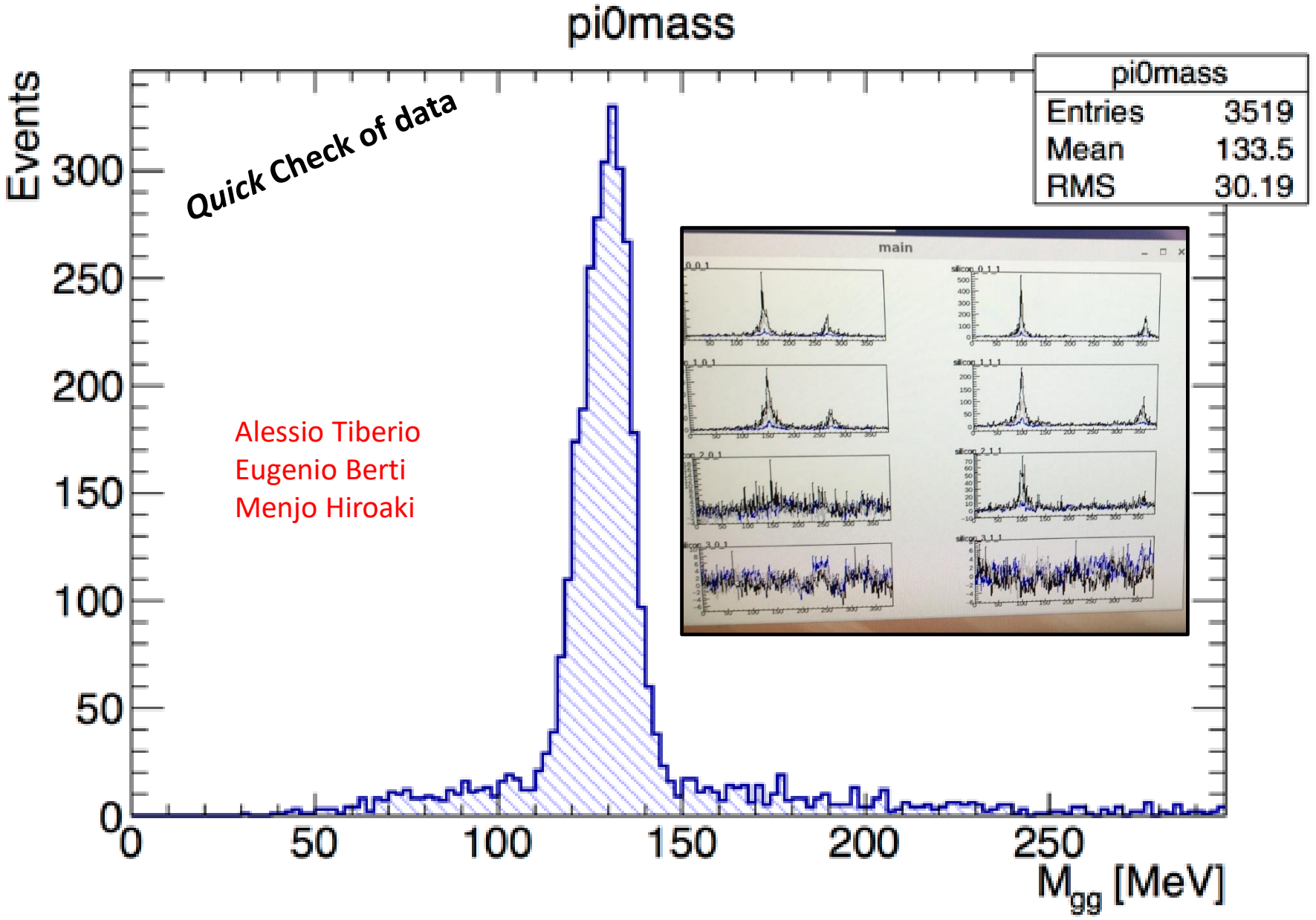

LHCf
Firenze…

Summary slides presented at an LPC meeting at the end of the run

LHCf 5 TeV and 8 TeV p+Pb

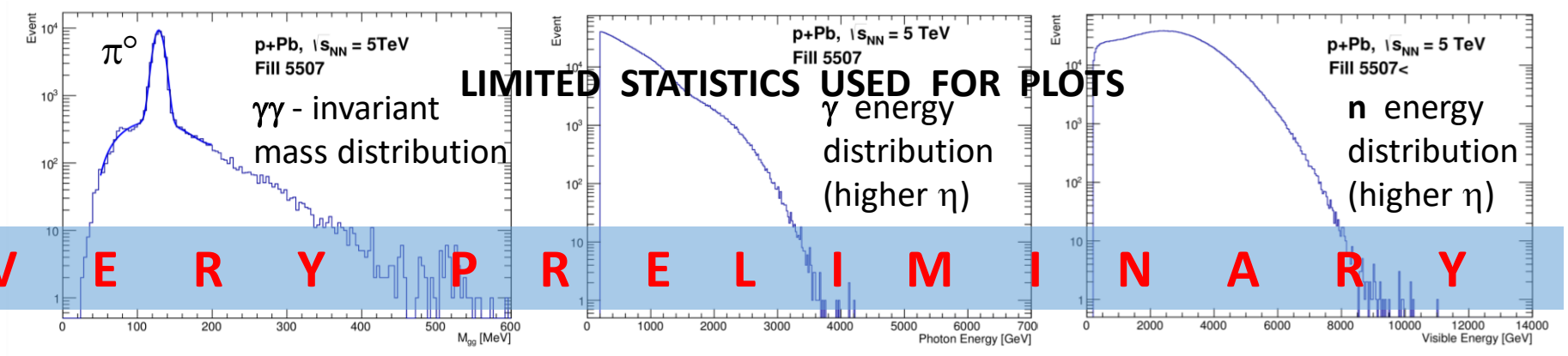
- **Installation** at beginning of November worked very well
- No problems found on the LHCf side during the **run**
  - Few problems found after the installation were solved before the beginning of data taking (replacement of one 200 m long fibre with a spare one from TAN to USA15, reduction of a high noise level due to a grounding problem, recovery of a malfunctioning VME board).
- **Trigger sharing with ATLAS** worked very well
  - LHCf trigger was not pre-scaled. Common acquisition at maximum rate allowed by ATLAS. Preliminary identification of common triggers: OK
- **5 TeV**
  - Favourable beam config: low luminosity and low pile-up
  - 3 different position of the Arm2 detector (beam center, Z=+8mm, Z=+16mm)
- **8 TeV**
  - Some problems with the beams
  - Finally: non uniformity of the bunch intensities (factor 2÷3)
  - Dedicated fill for <12h
  - 2 different position of the Arm2 detector (beam center and short time at Z=+8mm)

The LHCf Collaboration would like to thank the LPC coordinators, Jamie and Christoph, John and all the people involved on the machine side for the final success of the run!!!

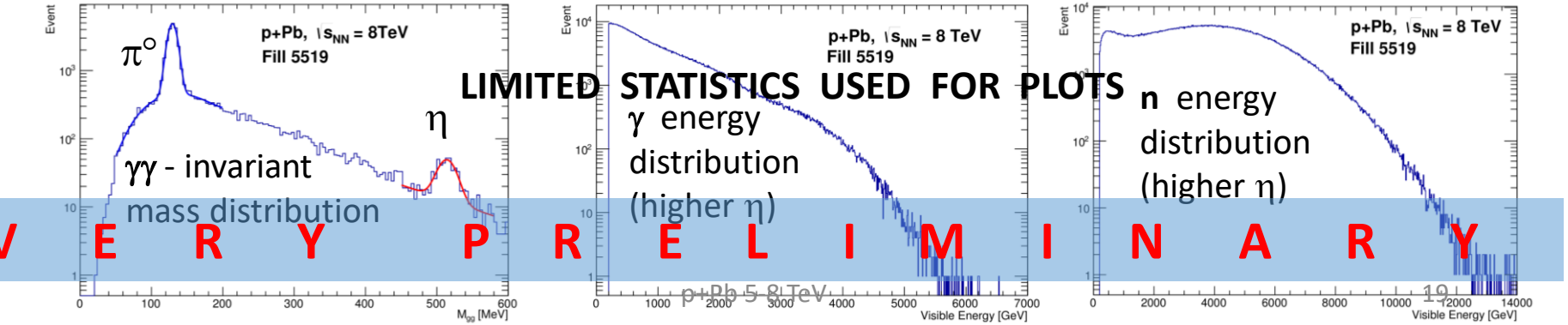

pi0mass
pi0mass
Entries 3519
Mean 133.5
RMS 30.19
Events
Quick Check of data
Alessio Tiberio
Eugenio Berti
Menjo Hiroaki
main
0
50
100
150
200
250
300
M_{gg} [MeV]

LHCf – preliminary overview of the run

- **5 TeV**
  - Fills 5007 and 5010 (100_200ns_702p_548Pb_81_389_54_20inj)
    - 26M common events (LHCf-ATLAS)



- **8 TeV**
  - Fill 5519 (Single_20p_20Pb_10_10_9_1non_coll) → 5.5M events (LHCf-ATLAS)
  - Fill 5538 (100_200ns_684p_540Pb_432_427_89_20inj) → 15M events (LHCf-ATLAS)



Uninstalling of Arm2 at the end of the run

- Prompt uninstallation requested by ZDC...
  - I had proposed to delay the uninstallation of Arm2 till January or February to cool down the activated materials...
- We (I and Raffaello) left the detector in an undergroud bunker
  - The same where the TAN Cu bars are stored
- We were required to go back in January to remove Arm2 from there

February 2017

- Raffaello and Sebastiano at CERN
  - Removal of Arm2 from the underground bunker
  - Arm2 declared «radioactive»
    - Measurements: https://edms.cern.ch/equipment/CR-002780
    - 06 Feb 2017 : **0.6 μSv/h** in contact (< 0.1 μSv/h at 40 cm)
    - 08 Mar 2017: same (why same after 1 month???)
  - Storage of the detector in the ATLAS buffer zone
    - thanks to Giancarlo Spigo of ATLAS for finding this temporary space
  - The occupied space must be free before the end of the EYETS

Then...

Transportation of Arm2 to Prevessin

- Michael Jeckel (now responsible at SPS exp. area) was very kind to find quickly a space for the storage of Arm2

This room is near the first entrance of the exp. area that we find on the Jura side

Points to be discussed

- Plans for the analysis / publications
  - When
  - Who
  - Priorities
  - LHCf/ATLAS
  - Prelim plots for conferences?
- Hardware operations:
  - Silicon DAQ
  - Preamp LEMO cables (damaged during uninstall)
  - Others?

Backup slides