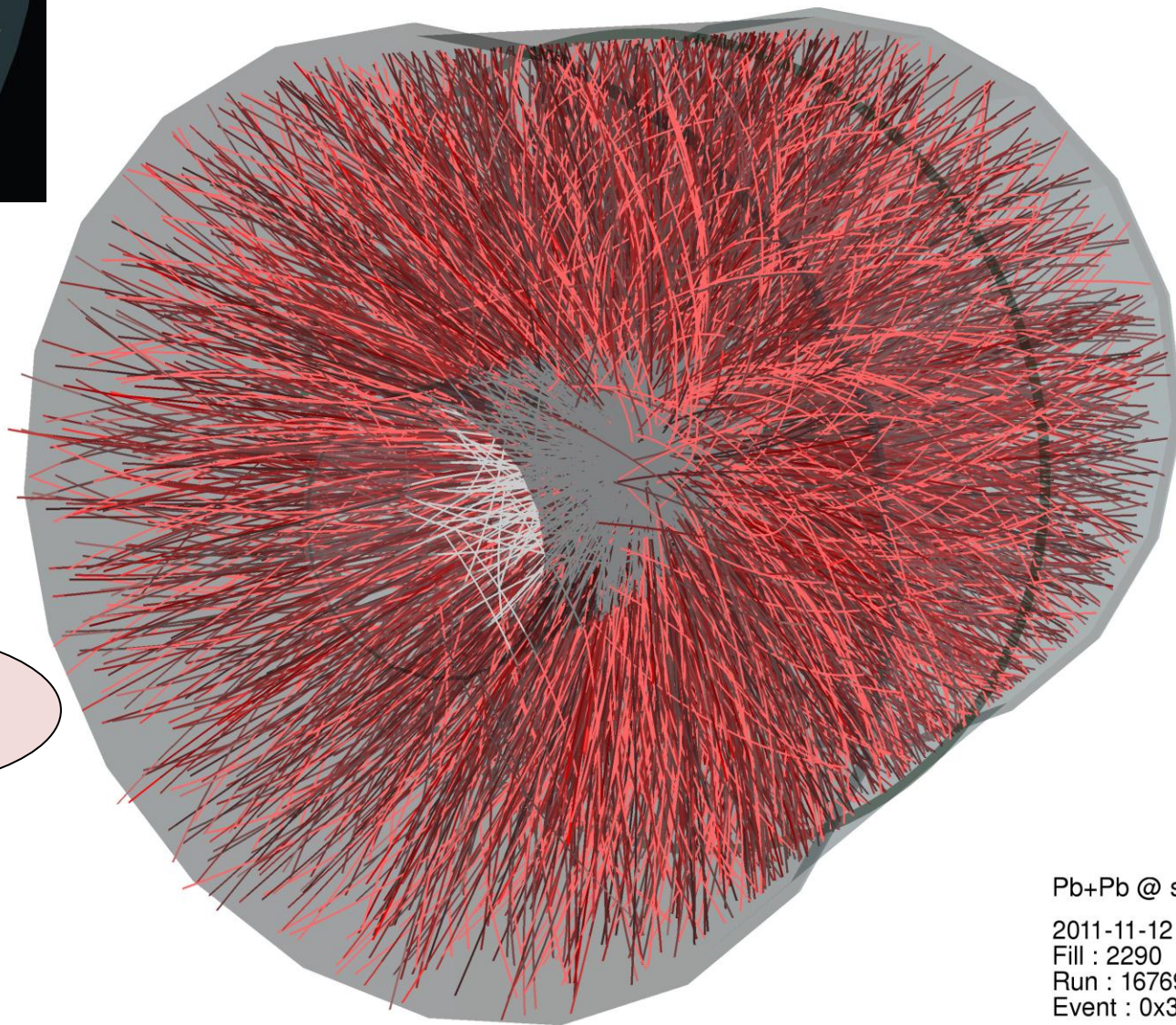
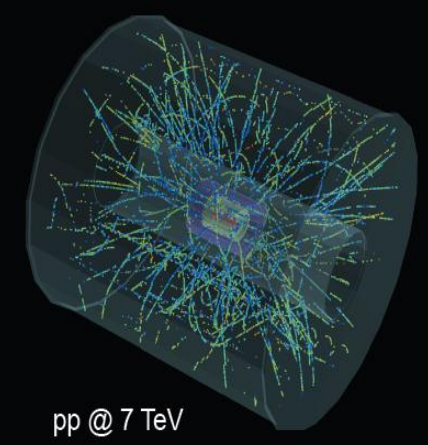


# ALICE 2011



First PbPb  
event of 2011

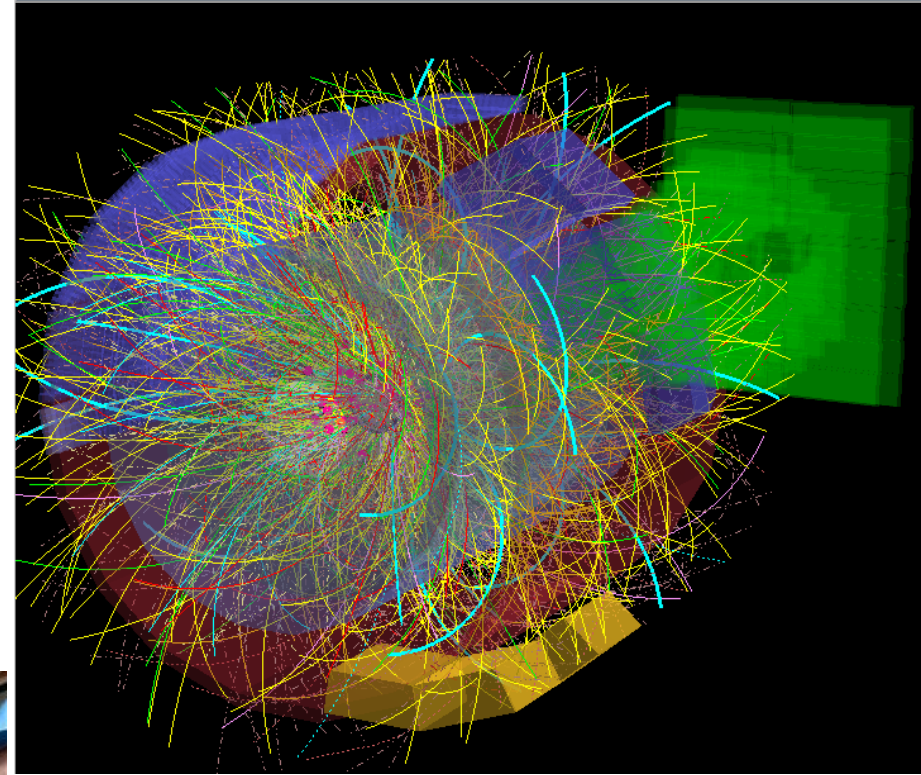


ALICE

EVIAN December 13, 2011 P. Giubellino

# ALICE

## The 2011 LHC Experience



**One more  
memorable year**

# Acknowledgements

ALICE (thanks) congratulates the Accelerator Team for an incredible performance during 2010, surpassing all possible expectations.

Commissioning a machine while having all eyes of the particle physics community following every step did certainly not make the task easier.

The Heavy Ion performance and speed of commissioning, starting from the source, LEIR, etc. up to LHC was mindblowing.

We hope very much that the accelerator team feels like being part of the physics exploitation of the machine.

We do sincerely thank the LHC operations team for supporting the sometimes difficult ALICE running requirements. This made it possible for us to take full advantage of the proton period for physics exploitation and reference running for the Heavy Ion physics.


**Congratulations, thank you & looking forward for exciting years ahead !**

# So: ALICE requests in 2011



Collisions at 1.38 TeV, vdM scan, lumi levelling, fill with B = 0T, fill with B = 0.2T, polarity reversal, X-angle adjustment, opening of collimators, low pile-up, background reduction (while giving the other more and more and more), collisions main-satellites, test with pA, squeeze to  $\beta^* = 1\text{m}$ , last but not least high luminosity PbPb, with zero time to switch from protons since the Pb time is so so short...


But it seems our requests are not challenging enough, will try to improve next year

# Goals of the ALICE 2011 run

- A short (35 hours) pp run at 2.76 TeV aimed at  $> 50$  M events of reference at the same c.m. Energy as the Pb runs, collected 74 M minimum bias events and 10 M of rare triggers (Muon, EMCAL:  $18 \text{ nb}^{-1}$ ) 

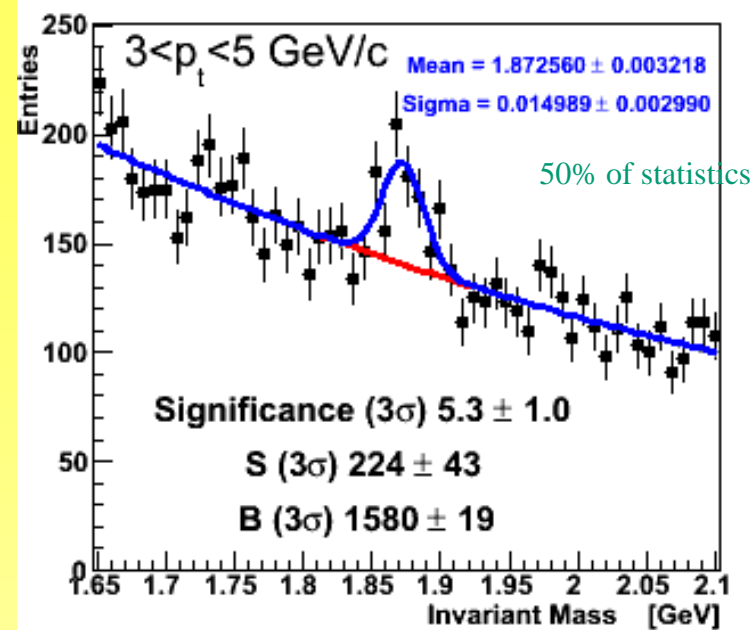
- pp at 7 TeV: continue to collect integrated luminosity for comparison with the  $\sim 40 \mu\text{b}^{-1}$  originally foreseen in the 2010- 2011 Pb runs (more will be needed for the comparison of the *future* High-Luminosity HI runs)

- Complete original goal of  $\sim 10^9$  events min bias (about half was taken in 2010) at 10 kHz 
- Collect at least  $\sim 2 \text{ pb}^{-1}$  for rare triggers (hard processes scale as  $N_{\text{coll}} \sim A^2$ ) 
  - 10% dead time (100 Hz trig rate)
    - $\sim 20 \text{ nb}^{-1}/\text{day}$  (*daily stat*  $\sim$  *total 2010*)
    - $2 \text{ pb}^{-1}$  in 100 days
    - Triggers: dimuon, high- $p_T$  single muon, EMCAL, PHOS, diffractive + small percentage of MB

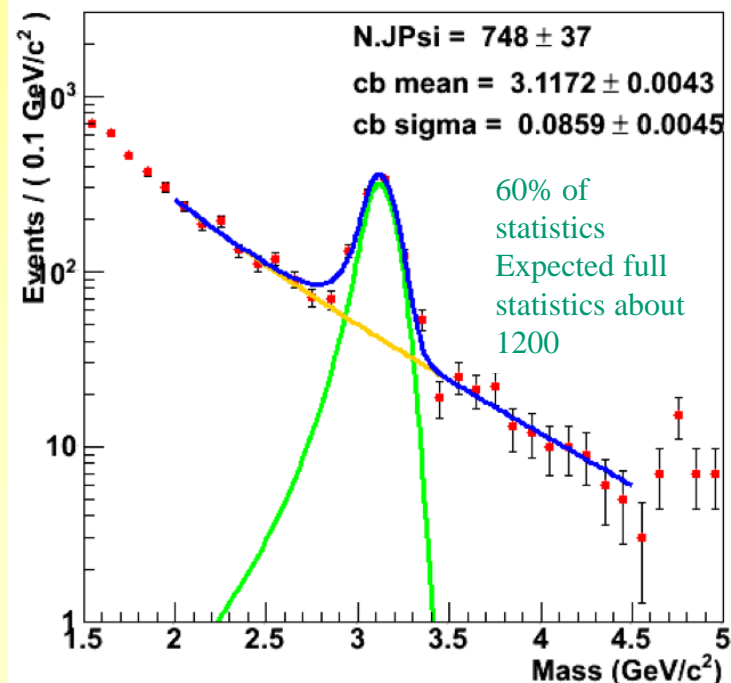
- Second PbPb run in the fall, with increased luminosity (3 to 5 times 2010) 

# The 2.76 TeV pp Run

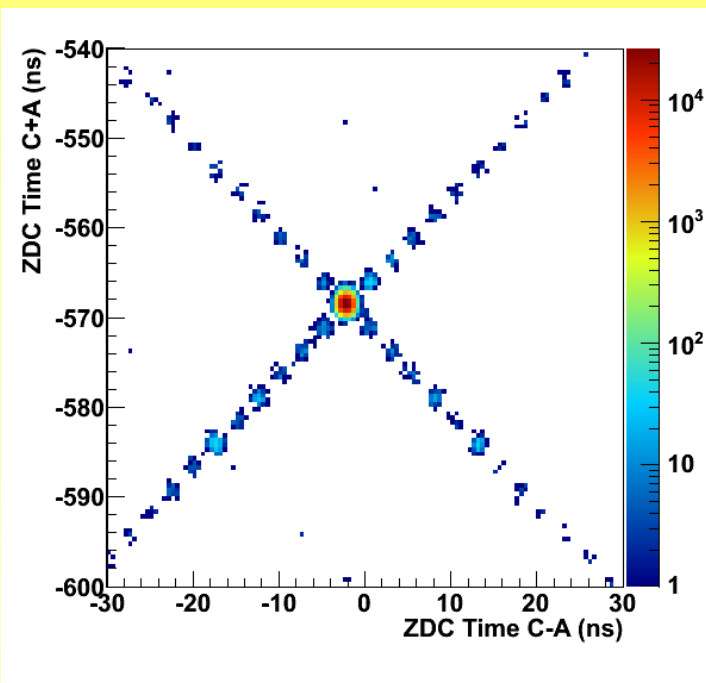
- Aim: 35 hours of data taking to achieve
  - > 50 Million MB events after physics selections
  - A van der Meer scan
- **ACCOMPLISHED**  
(in record time, essentially all during the weekend of March 26-27 congratulation to the LHC team!)
- High running efficiency, collected 74 M minimum bias events and 10 M of rare triggers (Muon, EMCAL:  $18 \text{ nb}^{-1}$ ), enough for J/psi and charm
- Used for final PbPb results



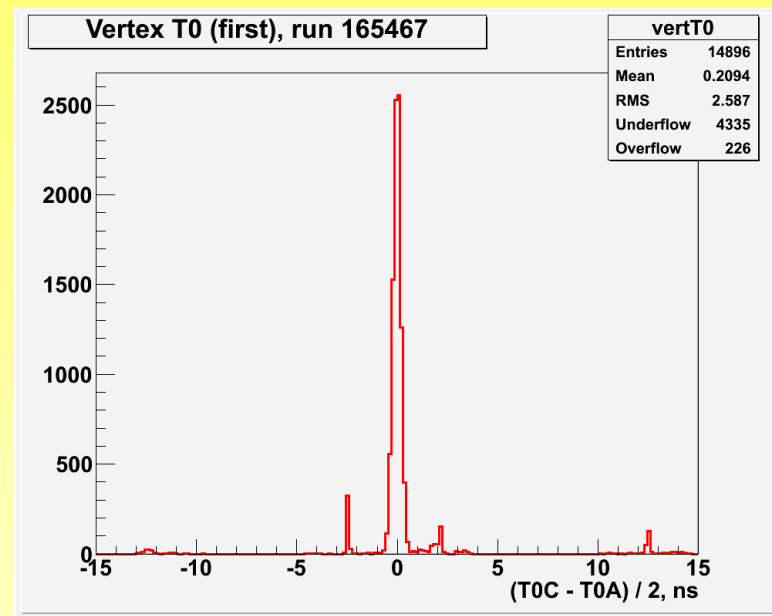
## J/ψ and D<sup>0</sup> signals



# Hard to fit the ALICE low-lumi needs with the rest

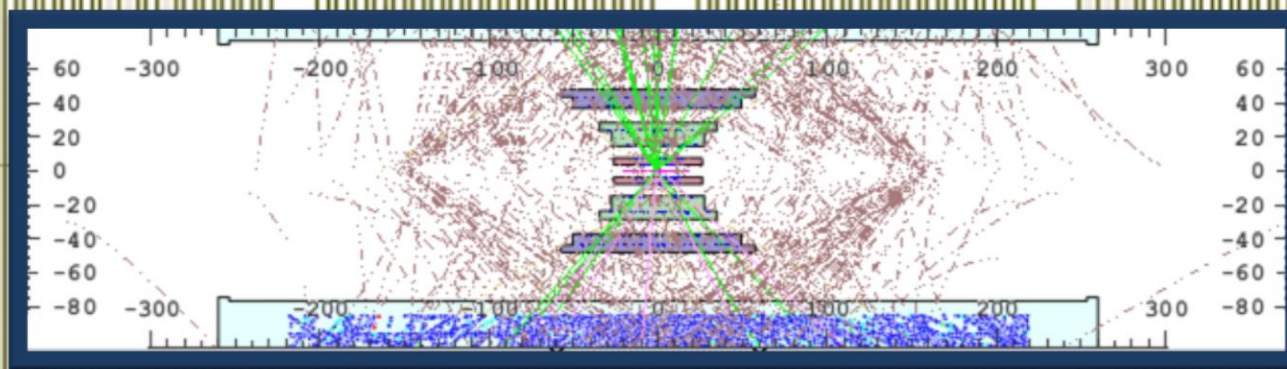


But, as usual,  
a smart idea  
comes in:  
satellites!  
Manage to do a  
clean job for  
all



**Nov 2011 conclusion: Many thanks and congratulations to:**

- Massi for the idea and support
- Steve and the injector teams for the “trick” and its implementation
- the LHC as a whole for the superb performance
- our ATLAS, CMS and LHCb colleagues for the constructive attitude

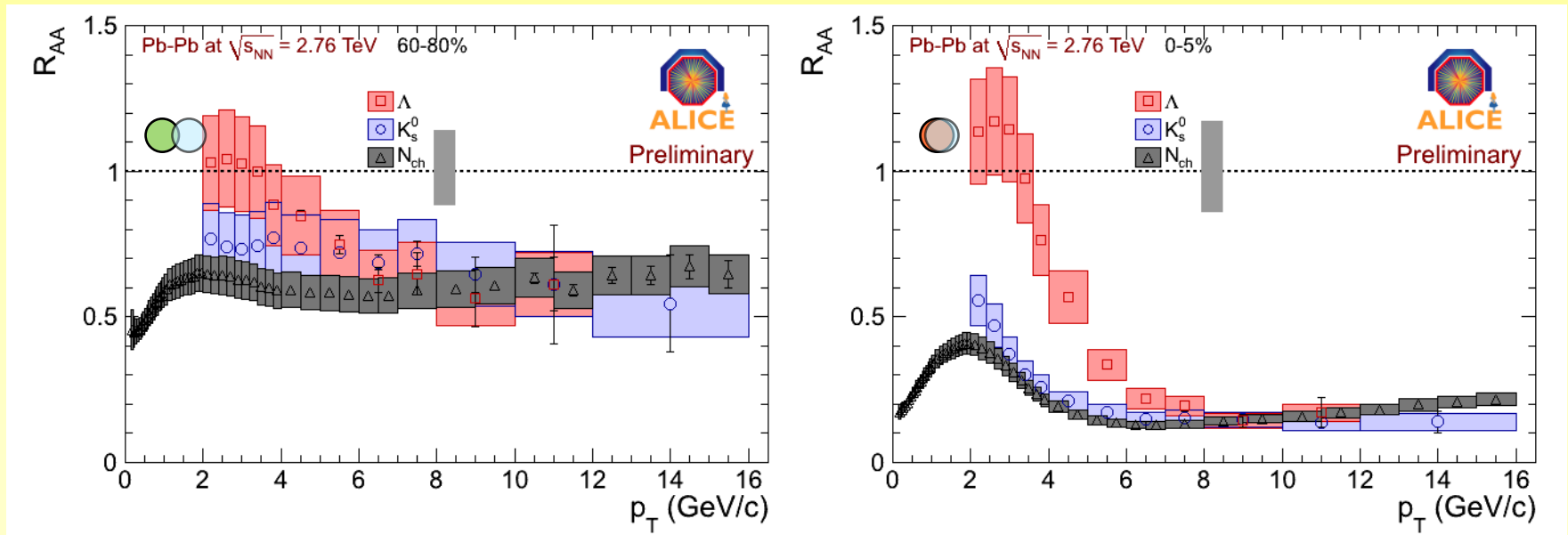


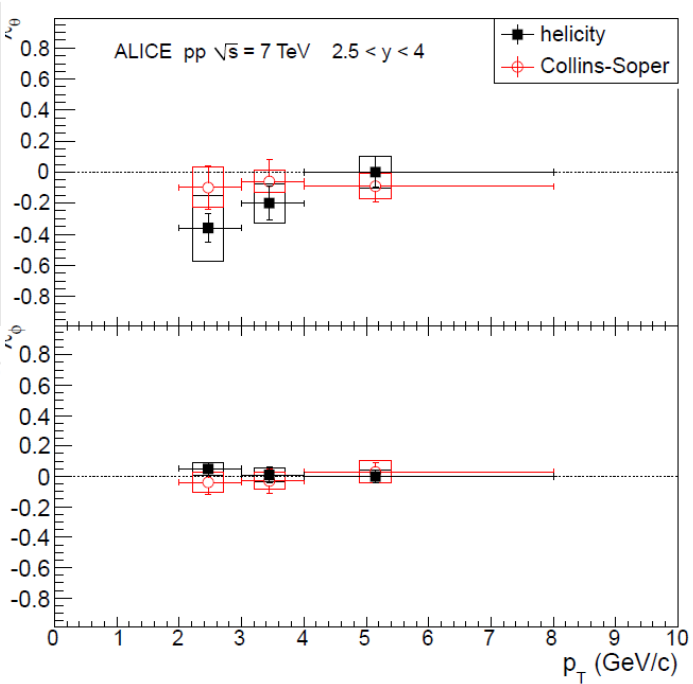
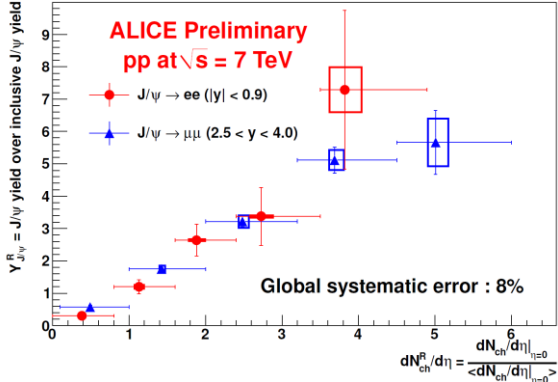
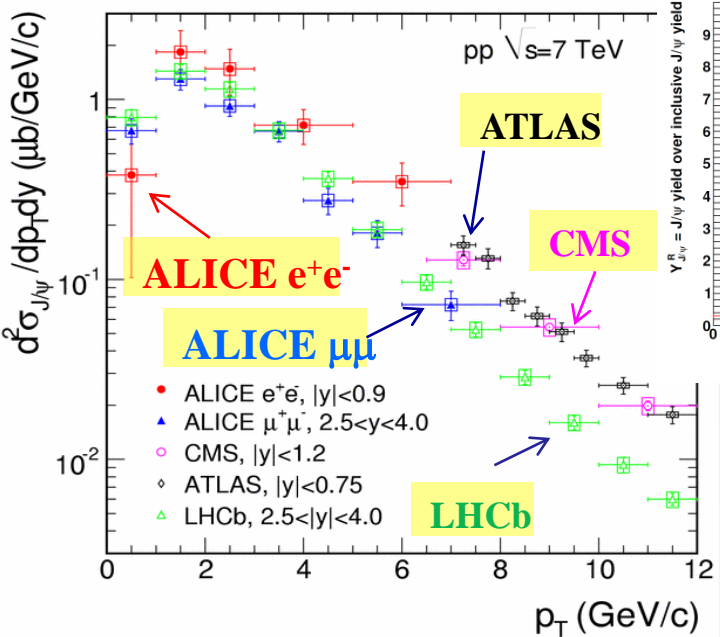
We love the mushrooms  
growing beneath the trees



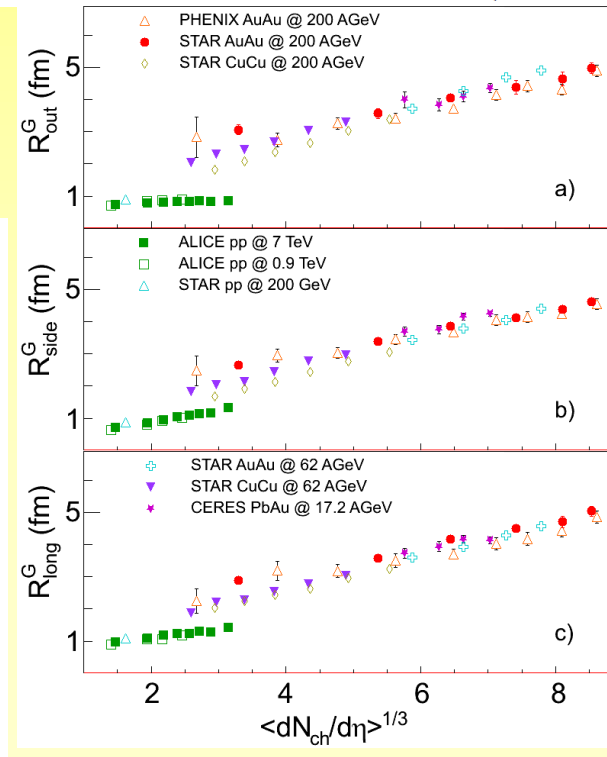
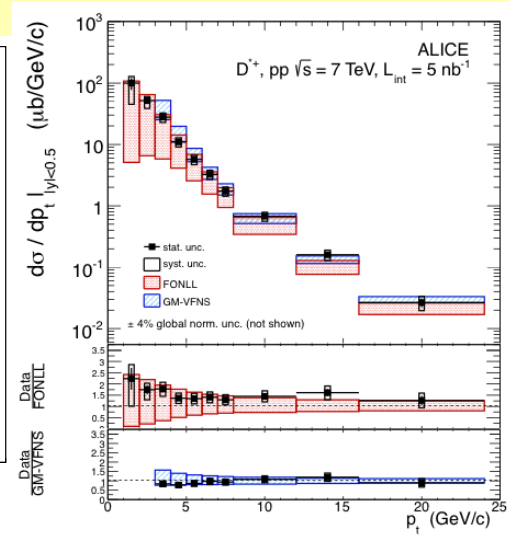
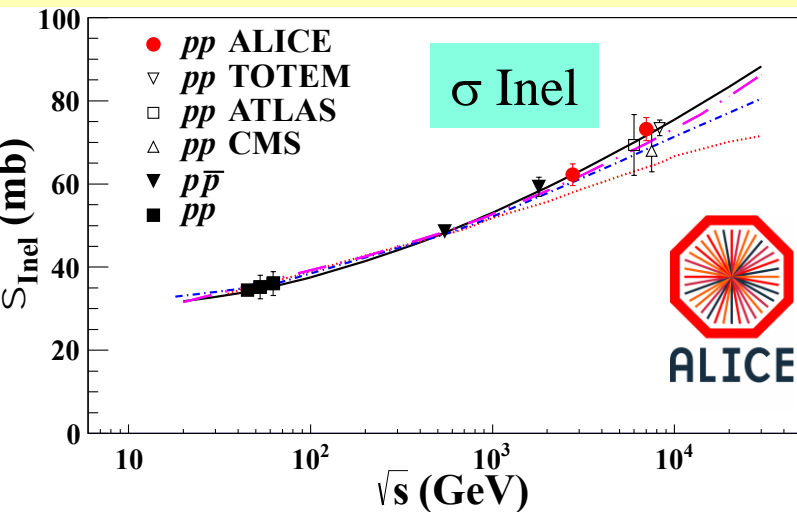
# A lot of essential data!

- pp data are vital for the study of Heavy-Ion Collisions, since what is observed there is understood in terms of how it compares to the extrapolated pp behavior

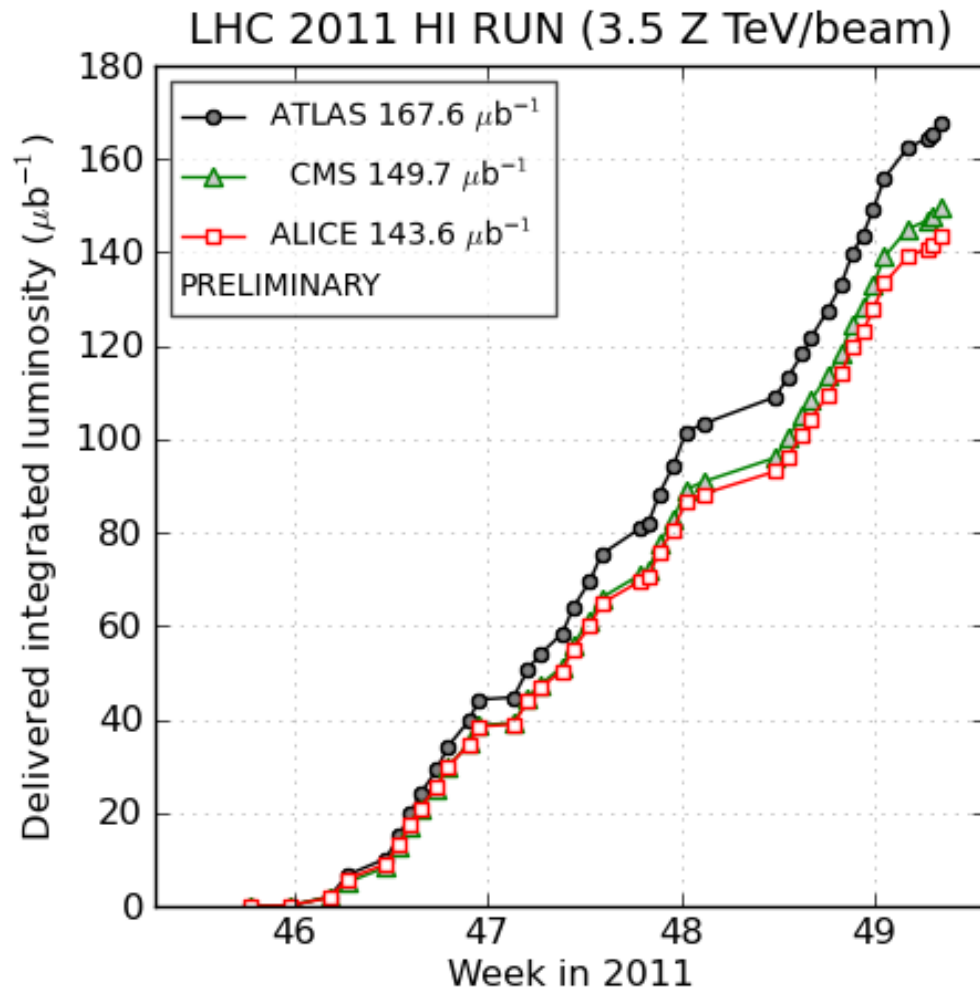




**But there are also nice pp results!**

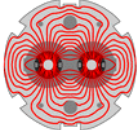


# An AMAZING HI run



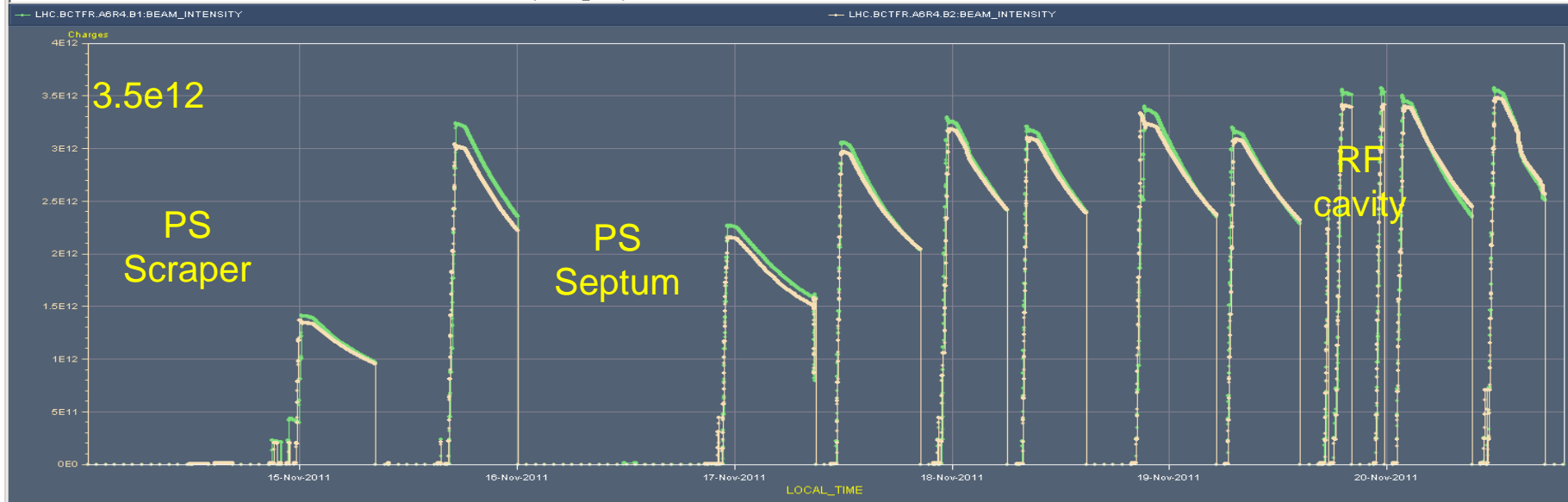
(generated 2011-12-09 08:08 including fill 2351)

- **5 times** the promised peak luminosity!
- Peak Luminosity  $\sim 5 \cdot 10^{26}$  or **twice** the design value at this energy.  
In 2010 was  $\sim 2 \cdot 10^{25}$
- Integrated luminosity 15 times 2010

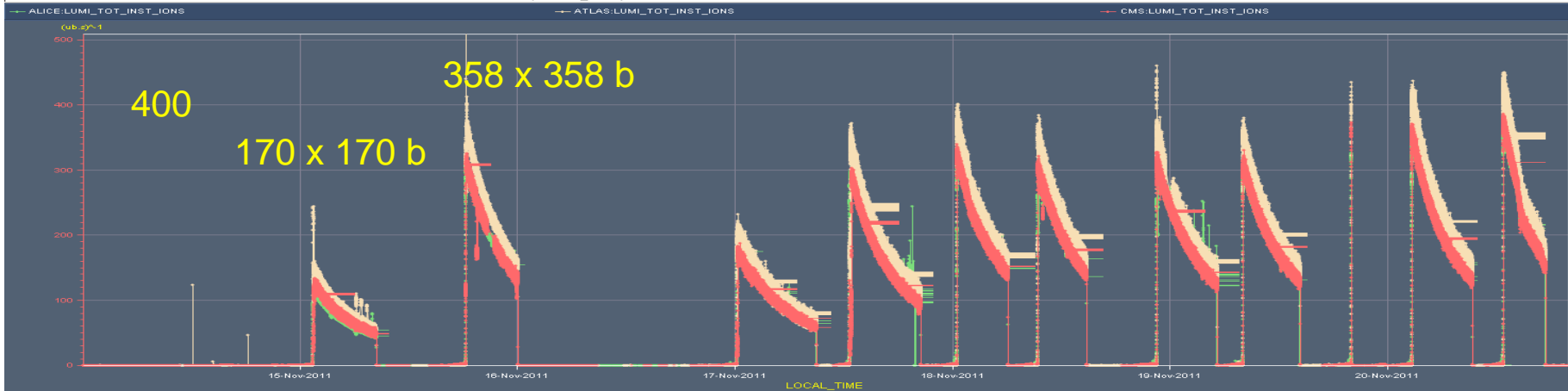


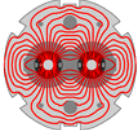
# Beam Current and Lumi Plots

Timeseries Chart between 2011-11-14 00:00:00.000 and 2011-11-20 20:06:46.137 (LOCAL\_TIME)



Timeseries Chart between 2011-11-14 00:00:00.000 and 2011-11-20 20:06:46.137 (LOCAL\_TIME)

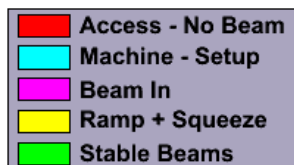




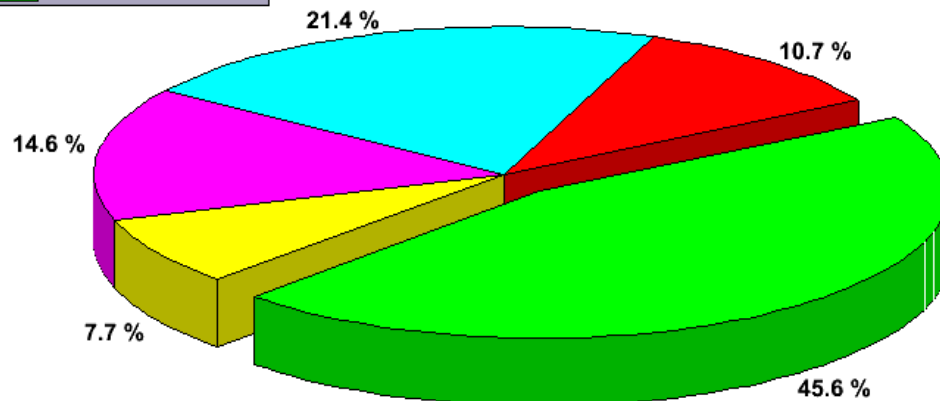
# Stable Beams ~ 50 %

**Very high LHC availability**  
**Thanks!!**

## LHC Efficiency: Last 10 fills



Statistics for fills 2338 to 2347  
Total Duration: 3 days, 21 h [02.12.11 to 06.12.11]  
Time in Stable Beams: 1 days, 18 h



# New mode of operation for ALICE

- From MB to selective triggers
  - Centrality classes (central and semi-central), Muons, EMCAL, PHOS and special triggers for Ultra Peripheral Collisions (UPC)
- Maximize use of the bandwidth => record HLT-reconstructed clusters for the TPC
- Commissioned and tested during the pp running => fully operational for the HI run
- Used T0 counters to trigger on vertex position  $< \pm 10$  cm

# Final Statistics

Trigger	Events ~
MinBias	8.7 M
Central	29.2 M
Semi-Central	34.1 M
EMCAL Jet	10.5 M
EMCAL Gamma	7.7 M
Barrel UPC	7.9 M
PHOS $\pi^0$	0.9 M
MUON Single	29.9 M
MUON UPC	3.4 M
MUON dimuon	21.6 M

**One order of magnitude or more the 2010 statistics, depending on class**

**In 2010: just MB**

**One special run for Electromagnetic Dissociation and one for the luminosity measurement (VdM scan)**

**Several runs recording both HLT compressed and uncompressed data to control systematics**

The LHC (and everything else) accelerates ..



..after concentrated preparations..



.. and tense anticipation..

**2010**





2011



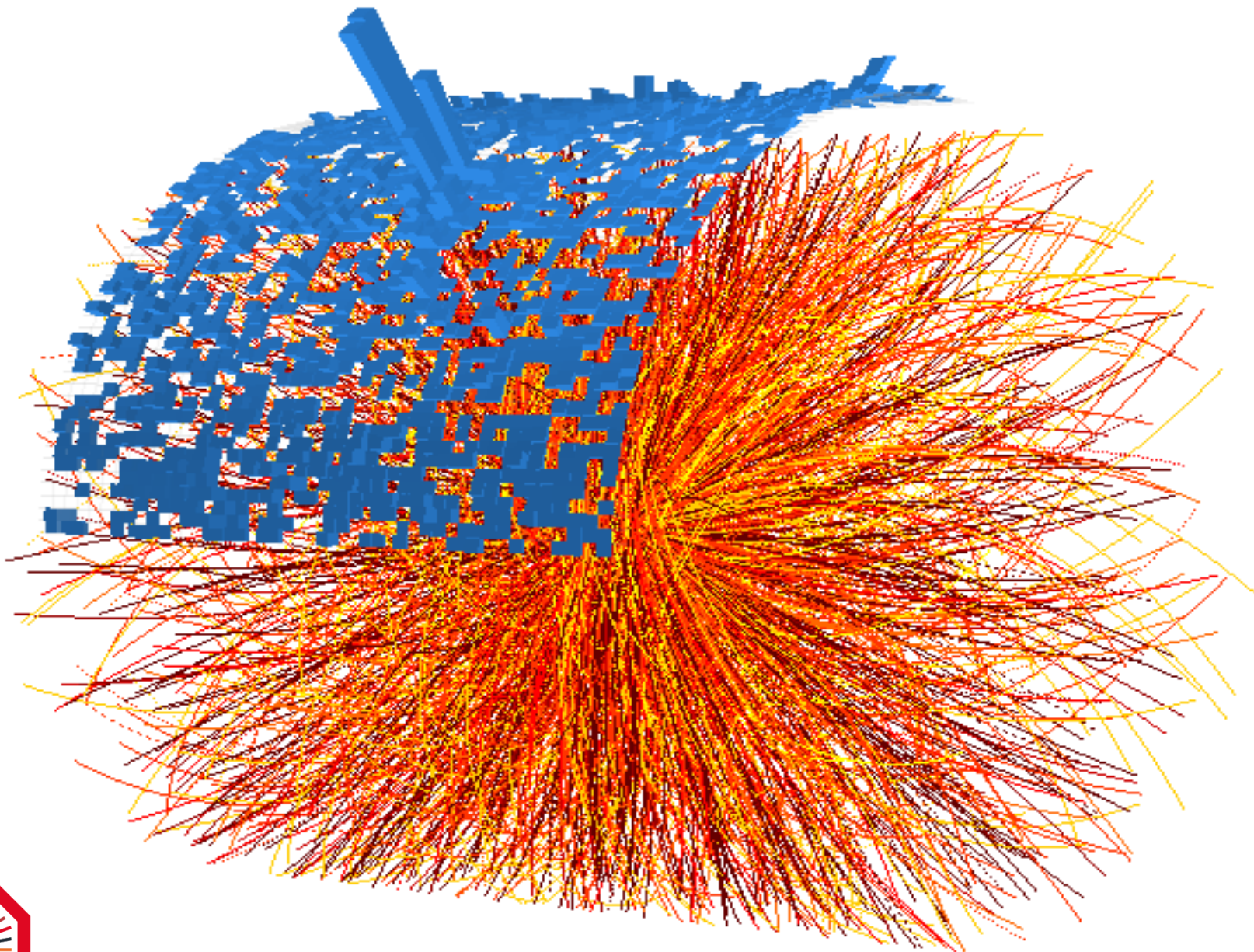
**2010 Run Coordinator**



**2011 Run Coordinator**



**2012 Run Coordinator**



**ALICE**

**Thank you!**



spares

# And Background...

The high intensity beam in the LHC resulted (as expected) in an increased vacuum pressure and therefore beam gas interactions which produces background events in the detector.

ALICE is most sensitive to this background (LHCb 100x, ATLAS and CMS 1000x ALICE luminosity).

At vacuum pressures of  $10^{-8}$  mbar in the straight sections around ALICE the particle rate from background was comparable to the collision rate of 150kHz.

- Vacuum pressures close to  $10^{-7}$  mbar were observed at the first high intensity beam fills preventing ALICE from data taking for a significant fraction of the time.
- **The situation then improved (beam scrubbing etc.) such that we were ‘just’ O.K. to take data for the rest of the run.**
- A number of measures will be taken during the winter shutdown which should improve the situation (shielding, repair of “fingers”, move of collimators, ...)

