

ICE SECTION

Elias Métral

In very close
collaboration with LIS
and LCU

- ◆ ICE and Dieter Möhl who passed away on May 24th, 2012
- ◆ 2 new staff (LD) soon
- ◆ New instabilities in the LHC
- ◆ Impedance, instabilities, e-cloud, beam-beam, space charge
- ◆ Others

DIETER MÖHL PASSED AWAY ON MAY 24th, 2012



COLLECTIVE EFFECTS IN THE LHC AND ITS INJECTOR COMPLEX

Elias Métral (Invited talk, THYB03, 25 + 5 min, 26 slides)

Dedicated to Dieter Möhl (my PHD thesis director) who passed away last night. Many thanks for all!

- ◆ Introduction and main challenges
- ◆ Best results so far and main limitations from collective effects
 - LHC INJECTORS: LINAC2 (4), PSB, PS, SPS TUXA02 (R. Garoby)
 - LHC MOXBP01 (S. Myers), THPPP020
- ◆ Some (nice) pictures
- ◆ Conclusion and outlook
- ◆ APPENDIX: Some (more) pictures and results

Elias Métral, IPAC2012, New Orleans, Louisiana, USA, 21-25/05/2012

1/26

DIETER MÖHL – PROMINENT SCIENTIST AND WONDERFUL TEACHER



Every time I saw him I was truly enraptured by his very special aura - the aura of goodness intelligence and love irradiated from the very core of his soul..

from Alexey Burov (FNAL)

Just learned recently that Dieter was one of the pioneers who demonstrated by the **Initial Cooling Experiment (ICE)** that stochastic cooling was a viable proposition!

2 NEW STAFF (LD) SOON

- ◆ **Benoit Salvant** => 01/10/2012



Seem quite happy
for the moment...

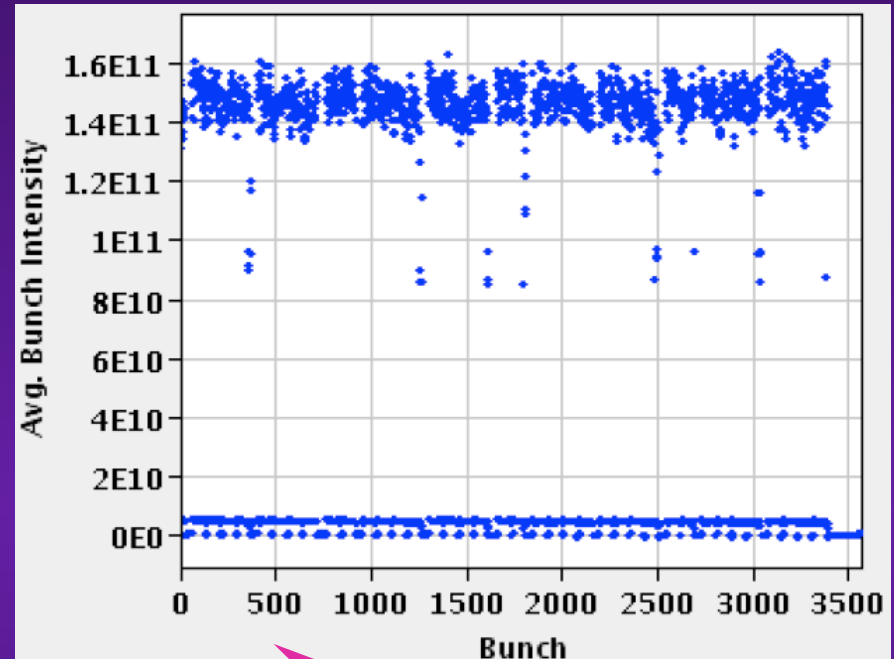
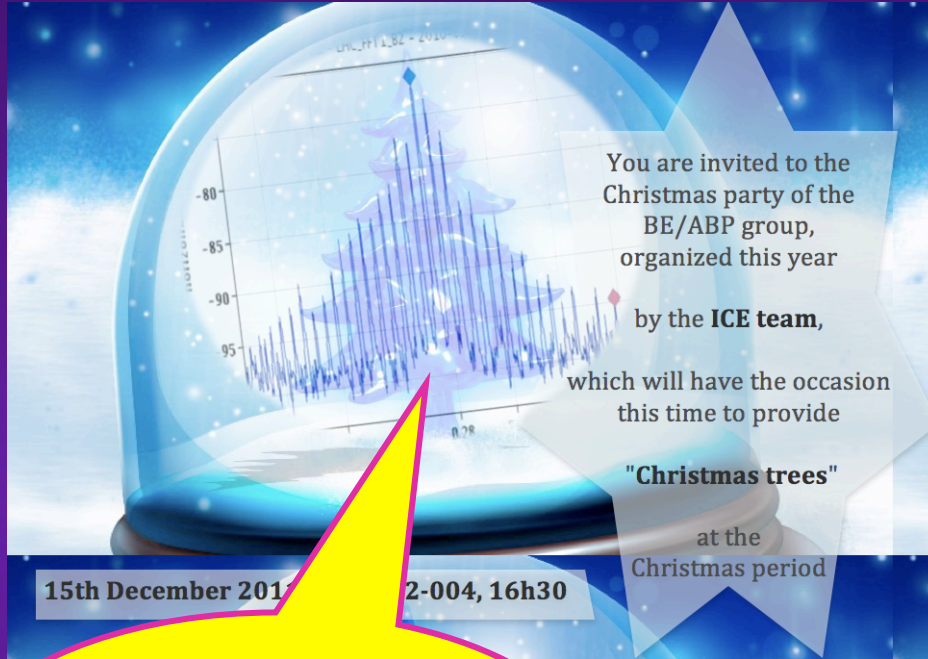
- ◆ **Kevin Li** => 01/02/2013



NEW INSTABILITIES IN THE LHC (1/6)

◆ From “Christmas trees”...

... to “snowflakes”



Understood and solution is Landau octupoles with small chromaticities (to reduce the required loct)

=> What else do we need for a good Christmas?

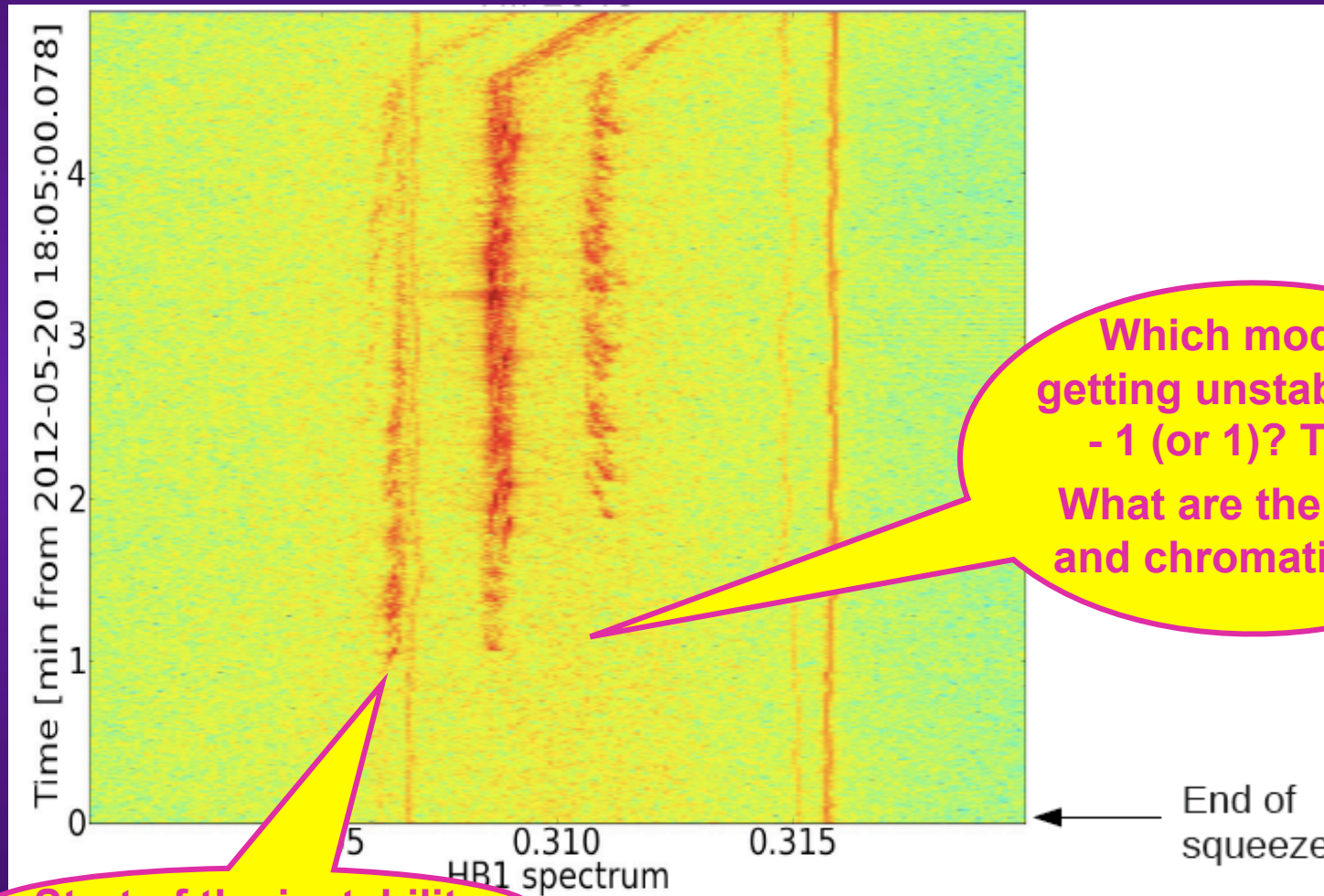
Understood and solution is to avoid some bunches with very small tune spread



+ maybe a nICE present: the Higgs...

NEW INSTABILITIES IN THE LHC (2/6)

- ◆ ... and another instability during / at the end of the squeeze



NEW INSTABILITIES IN THE LHC (3/6)

- => ICE team (and close collaborators) had to go to Avoriaz to follow the lines... and try to understand what happens



Start of the instability

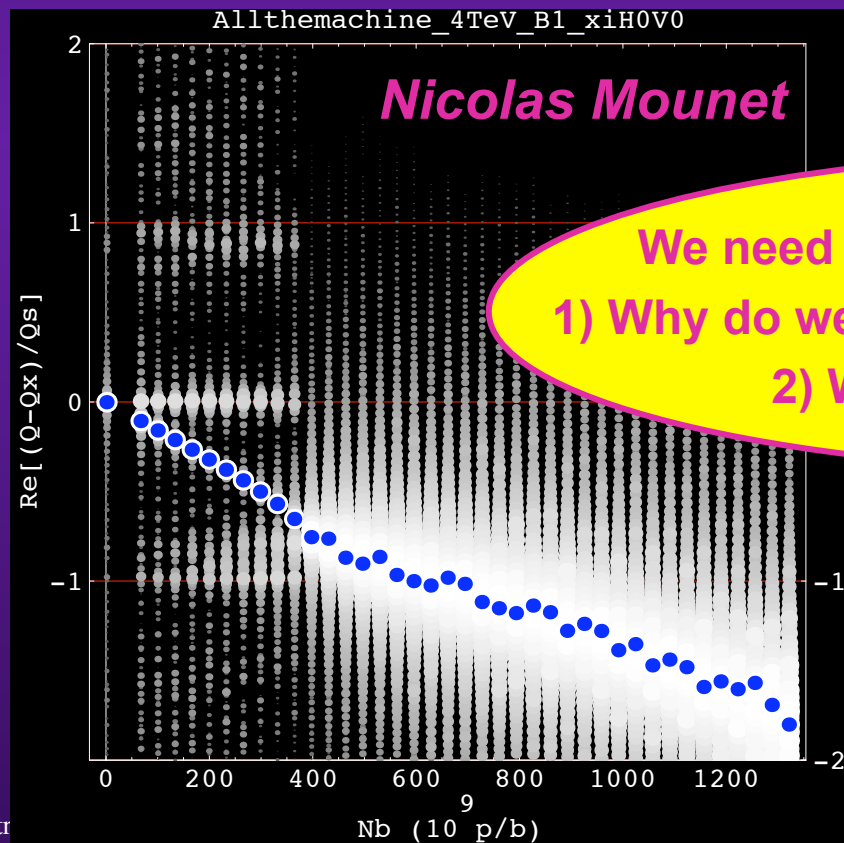
Mode 1?

Mode 0?

Mode - 1?

NEW INSTABILITIES IN THE LHC (4/6)

- Was it due to the negative chromas observed recently?
- Are we already at the TMCI limit? => In case of a transverse imaginary impedance larger by a factor ~ 2 (or HOMs), we could be close to the limit with the current bunch intensity ($\sim 1.5 \cdot 10^{11}$ p/b)...
=> More news (hopefully) soon with the coming MDs...



We need to answer to (at least) 2 questions:
1) Why do we need such a high octupoles' current?
2) Why is the ADT gain so high?

NEW INSTABILITIES IN THE LHC (5/6)



It is not yet fully understood
but we are pretty confident that
we will be able to find solutions...

NEW INSTABILITIES IN THE LHC (6/6)

... because Alexey Burov (FNAL) is with us. Many thanks for all!

I think I understood everything => No pb, I developed a simple model for the effect of SC, e-cloud, ADT etc. Just to be checked in detail with Nicolas Mounet...

IMPEDANCE

Many thanks for all
Vittorio Vaccaro (Naples)!

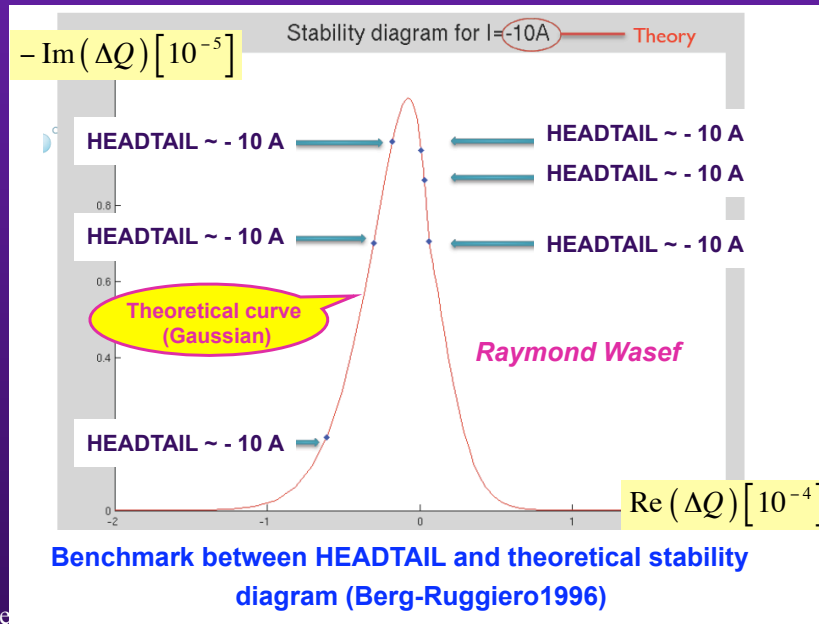
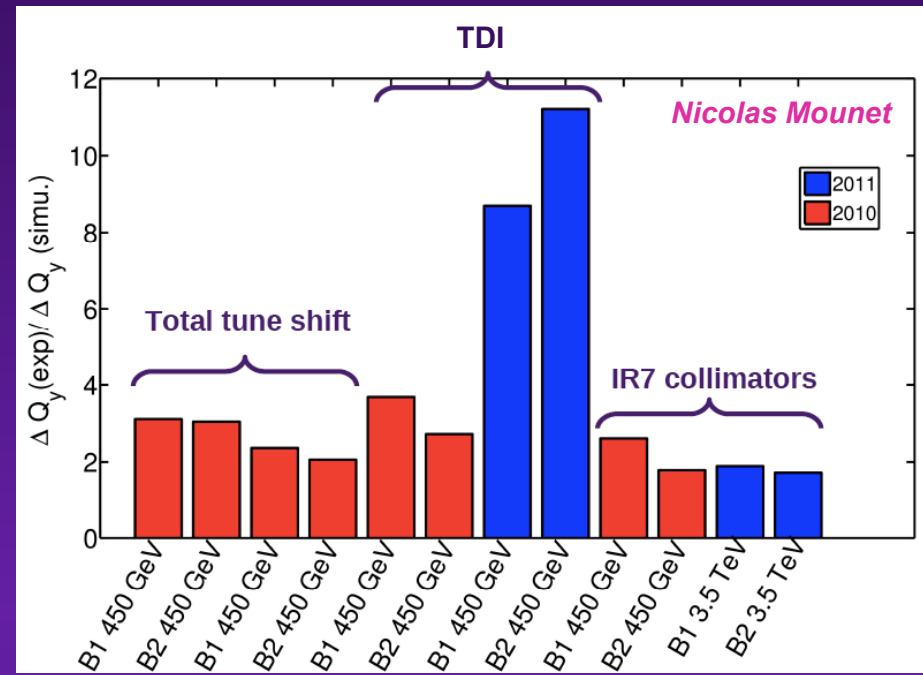
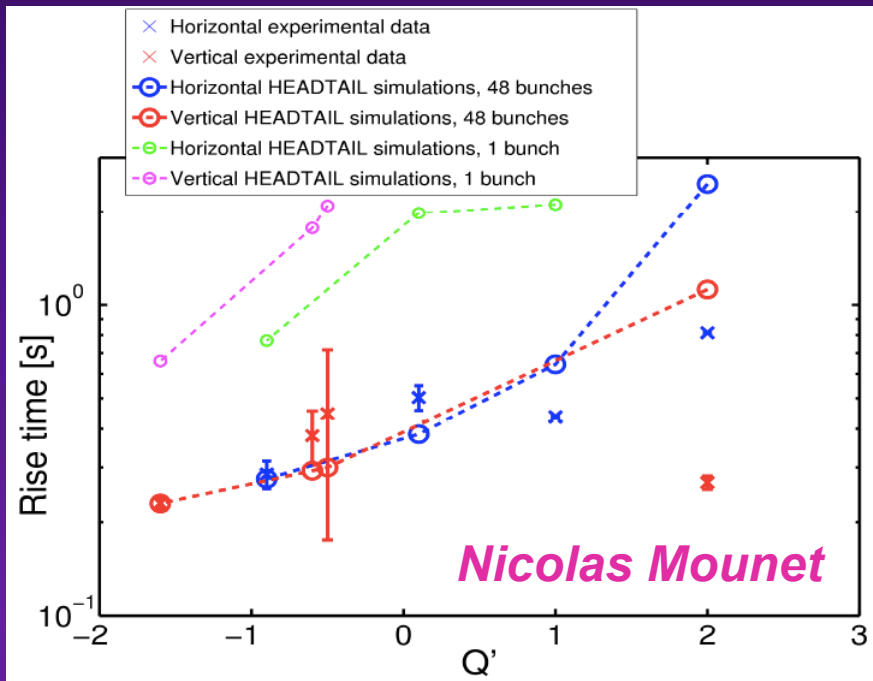


Jean-Luc Nougaret



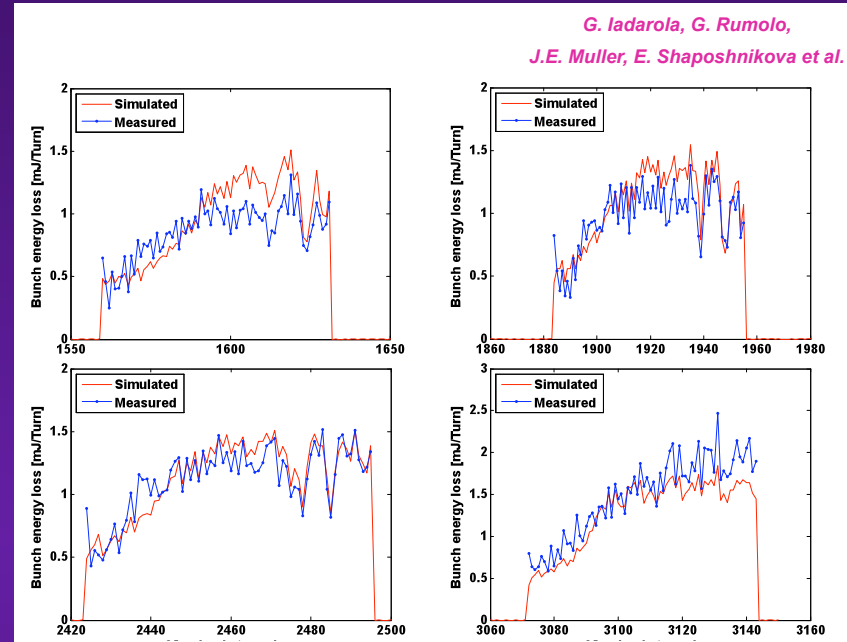
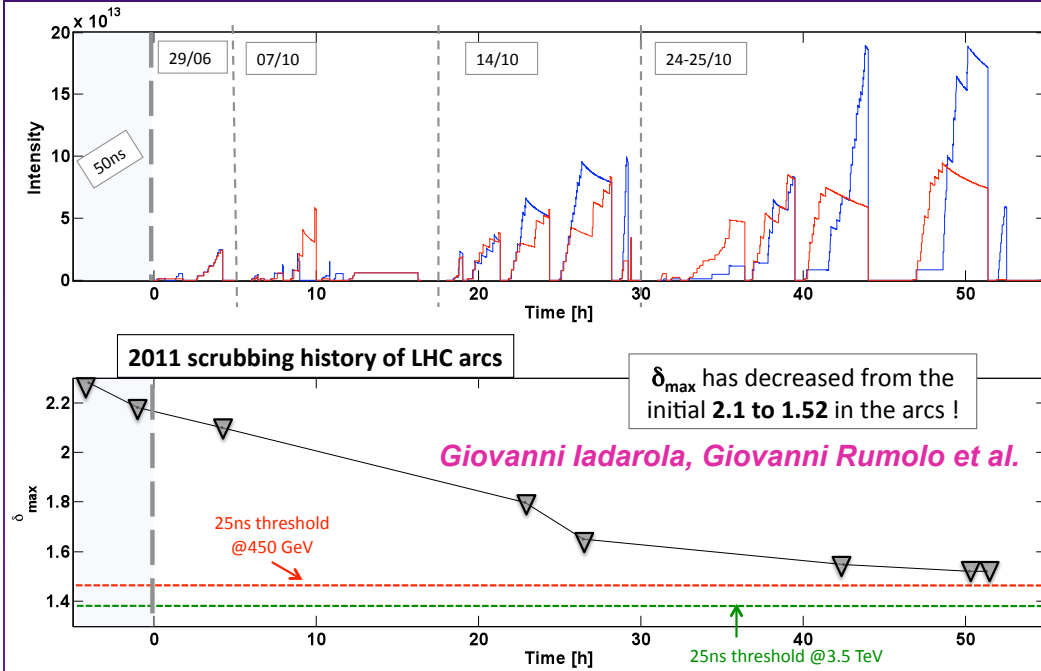
*and also Olav Berrig, Hugo Day
(LRFF Task Force in 2012)*

INSTABILITIES

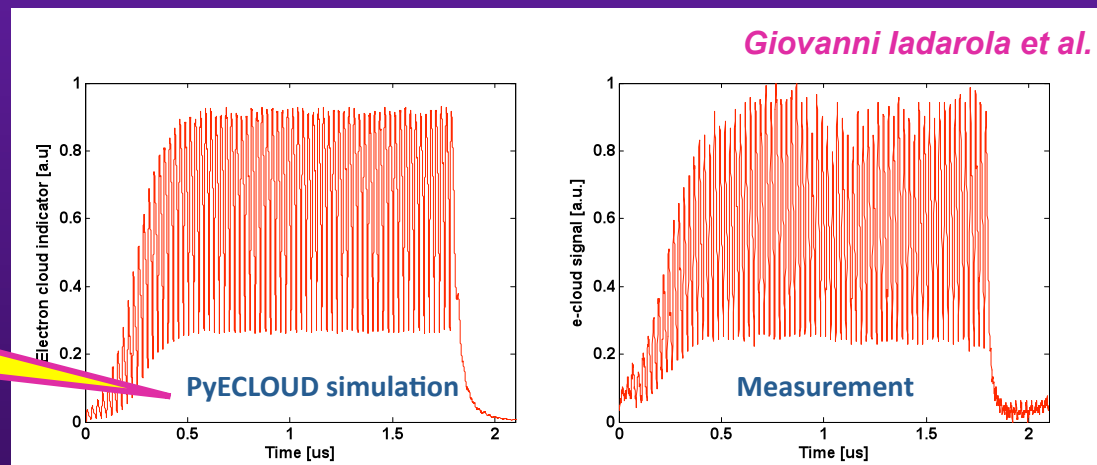


**=> HEADTAIL
Development WG**

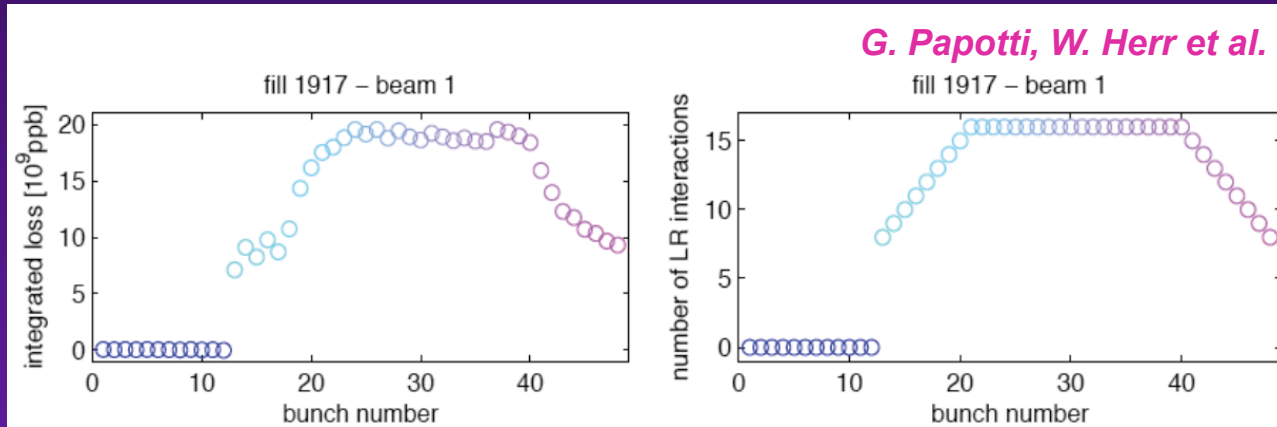
ECLLOUD



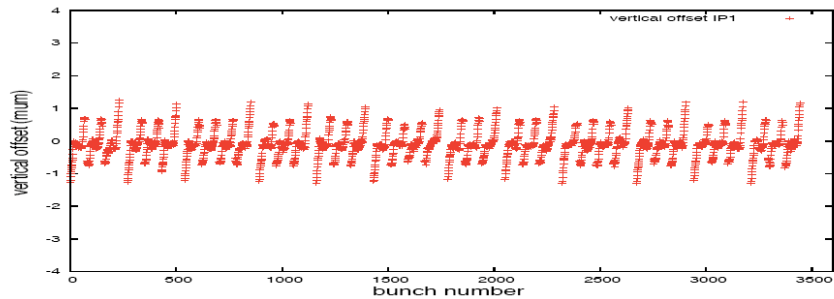
New ECLLOUD code
from G. Iadarola



BEAM-BEAM

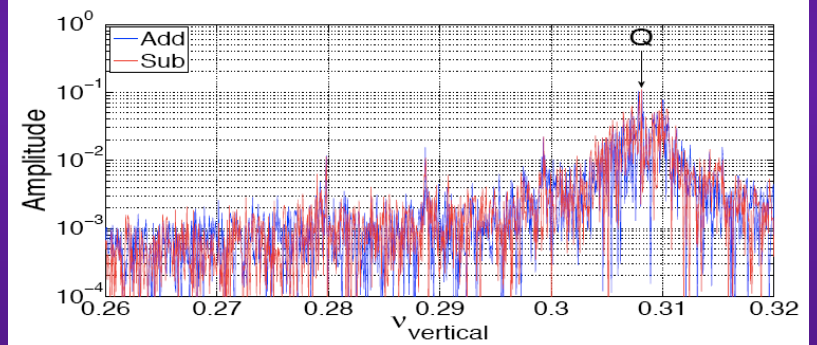
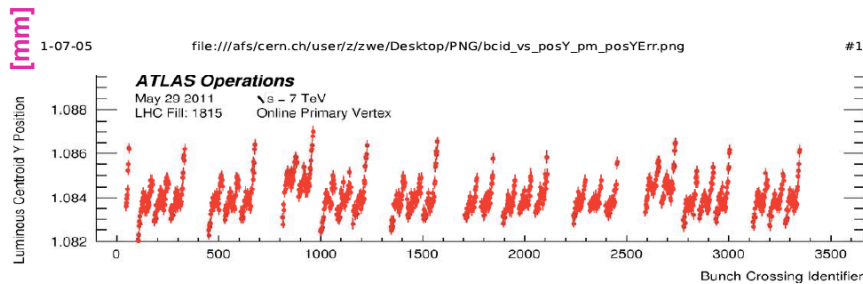


PACMAN Orbit effects: calculation

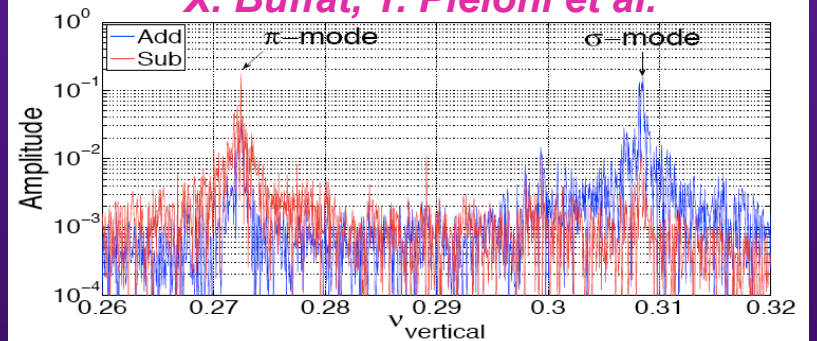


W. Herr, R. Bartoldus et al.

PACMAN Orbit effects: observation



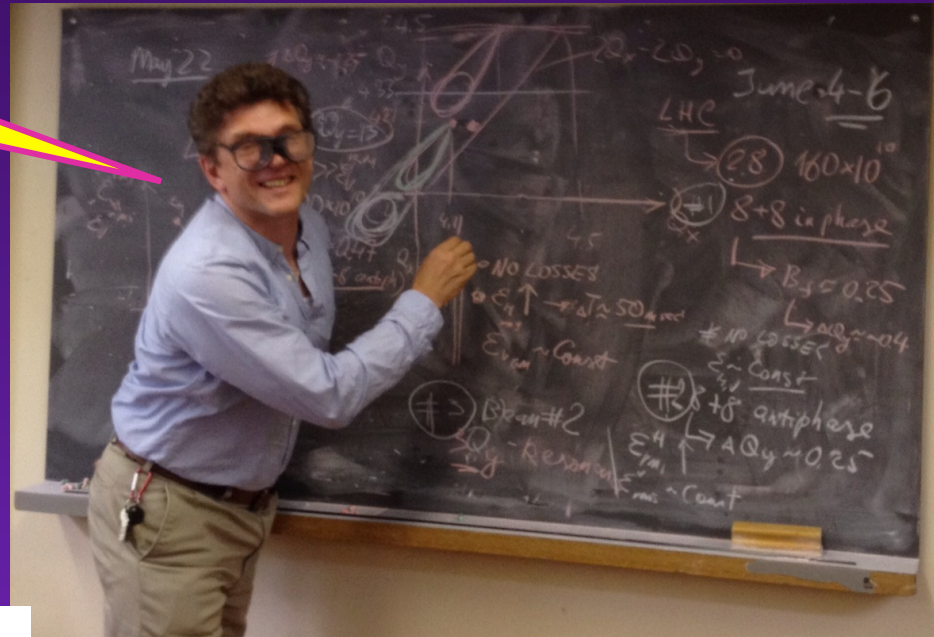
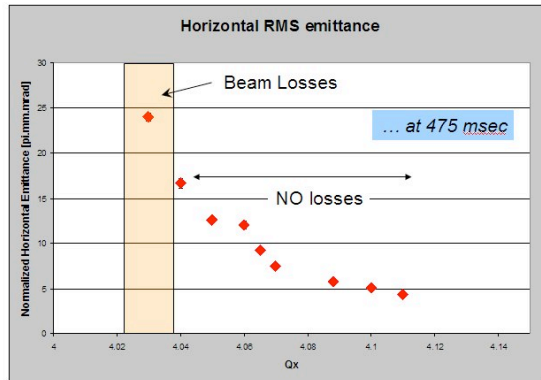
X. Buffat, T. Pieloni et al.



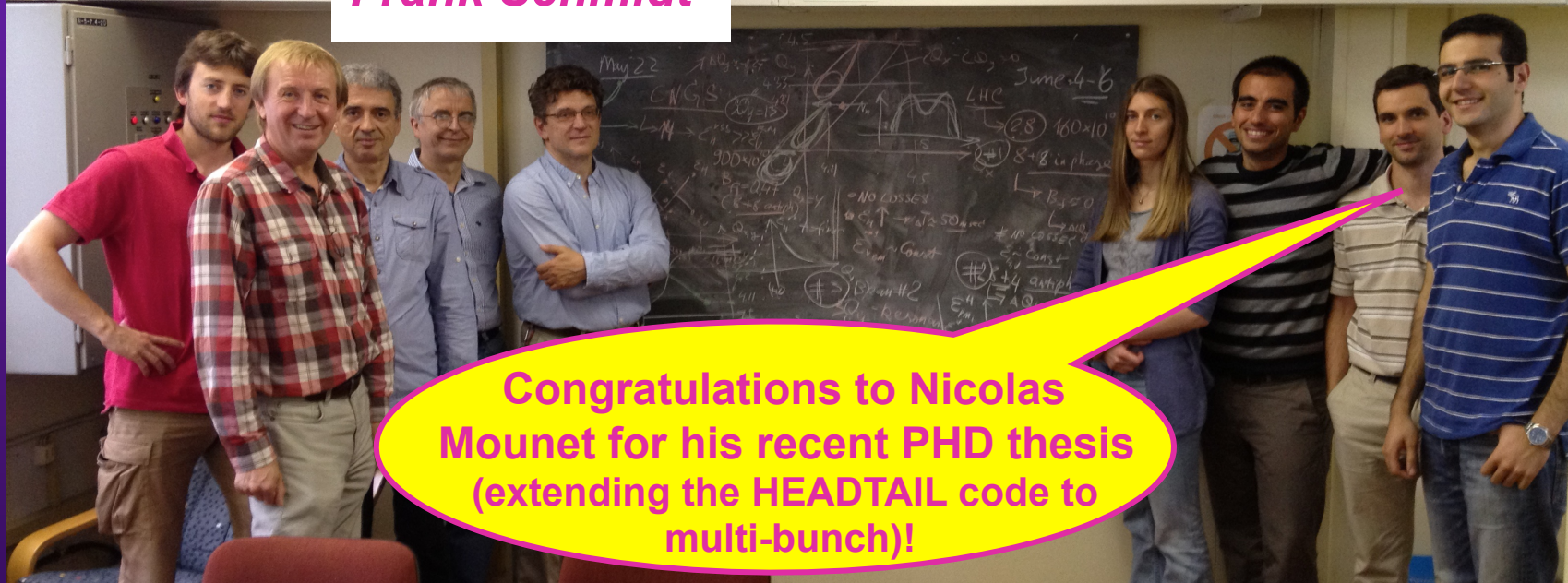
Many thanks for all
Alexander Molodozhentsev
(KEK)!

SPACE CHARGE

$Q_y = 4.21 \dots Q_x$ variation



Frank Schmidt



Congratulations to Nicolas
Mounet for his recent PHD thesis
(extending the HEADTAIL code to
multi-bunch)!

OTHERS

- ◆ **Beta-beams => Report next August** *Elena Wildner*
- ◆ **HL-LHC WP2**
 - **Task 2.4: LHC collective effects studies (without beam-beam)**
 - **Task 2.5: Beam-beam effects** *Tatiana Pieloni*

=> Starting, after all the (collaboration) set-up phase
- ◆ **LIU** *Giovanni Rumolo*
- ◆ **MDs and MD coordination** *Werner Herr...*
- ◆ **Teaching activities** *Werner Herr...*
- ◆ **Good luck to our PHD students**
 - **Who will enter soon into the writing phase** *Hugo Day, Carlo Zannini*
 - **Who started recently** *Serena Persichelli*
 - **And the others** *Nicolo Biancacci, Xavier Buffat, Giovanni Iadarola*



Many thanks for all
Mauro Migliorati (Roma)!