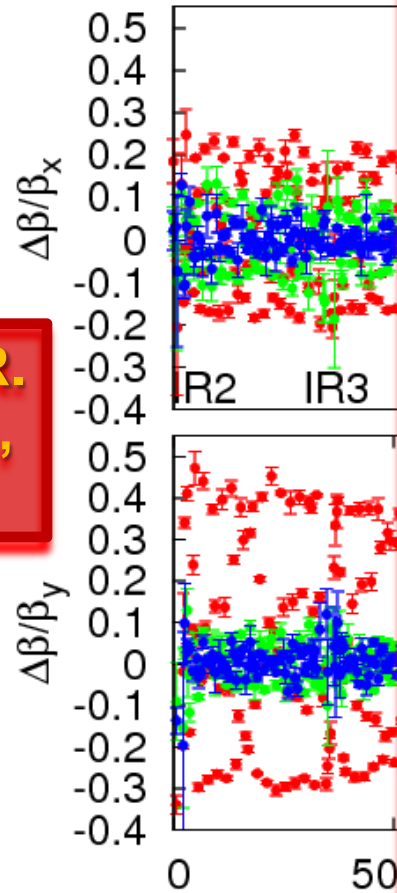
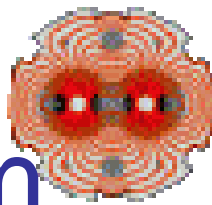


# HIGHLIGHTS OF LAST MONTHS OF LCU ACTIVITIES

ANOTHER VERY EXCITING PERIOD

FROM COMMISSIONING TO  
PHYSICS, **MDs** AND...THE UPGRADE!

# Optics correction at $\beta^*=1.5\text{m}$

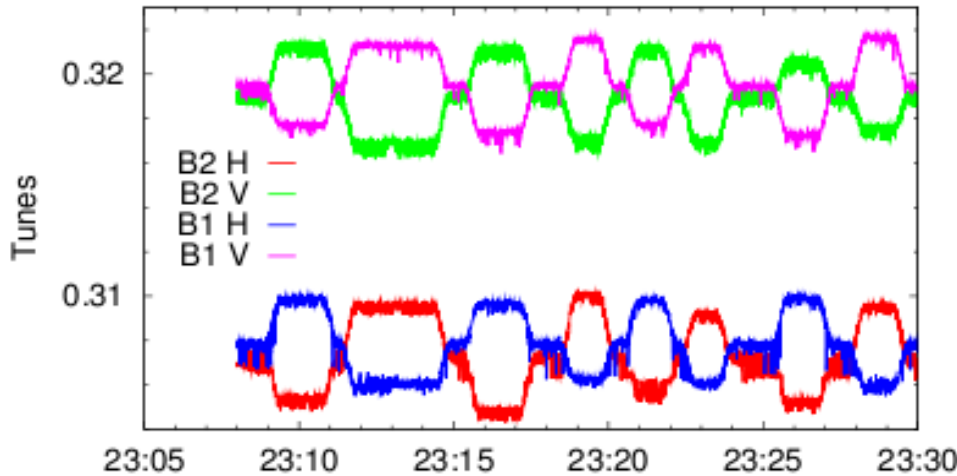
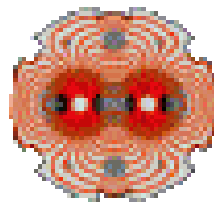


**This excellent result is like the “cerise sur le gâteau”!**  
**Careful specifications, design and production follow up, allocation strategy, and installation have been essential to achieve these results!**  
**Thanks to Stephane, Bernard, Yannis, Simone, Alessandra, Dominique, Patrick, SU team, and many more (also in the rest of CERN)**

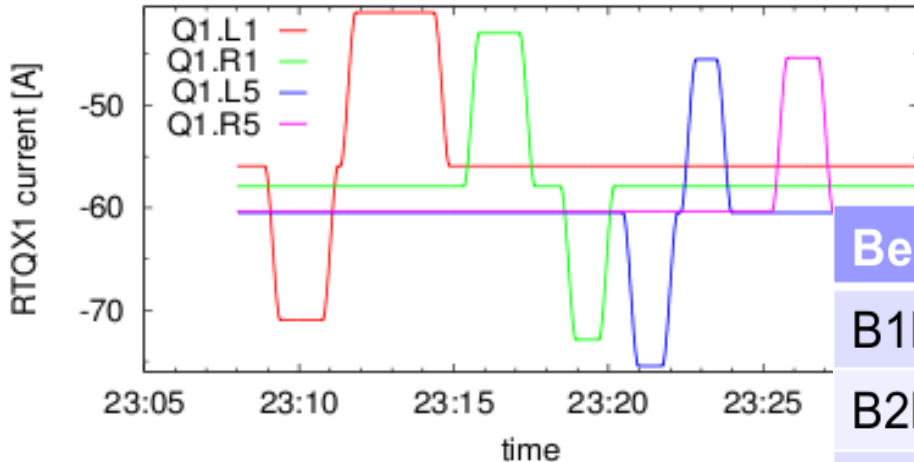
**M. Aiba, R. Calaga, R. Miyamoto, R. Tomás, G. Vanbavinckhove**

Local and global corrections required to achieve 10%

# K-modulation for $\beta^*$ measurement



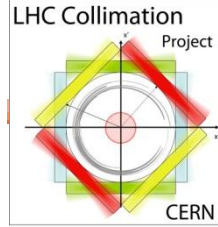
**Short measurement gives 2-9% resolution. Automatic procedure is in preparation**



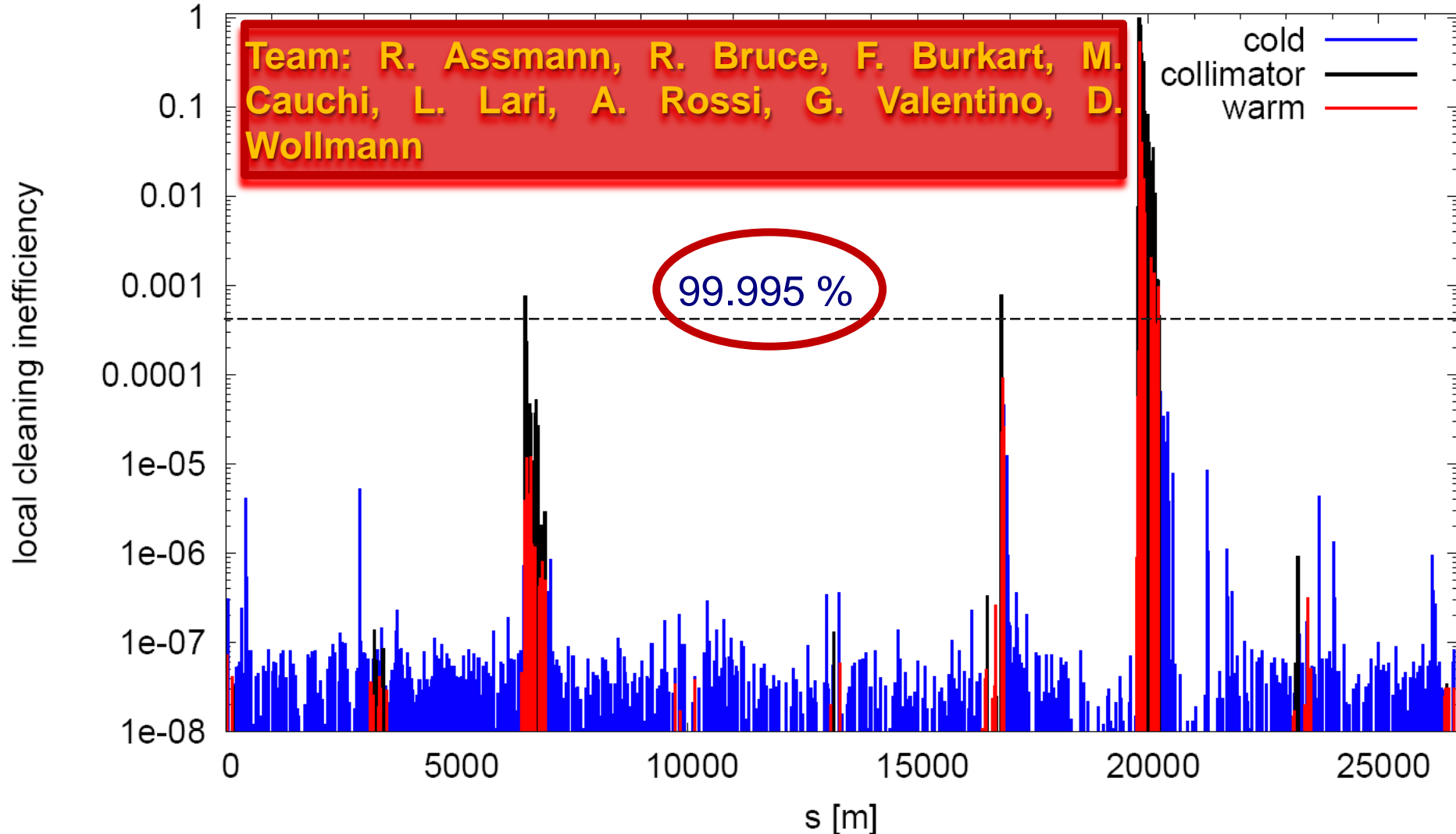
Beam/plane	IR5	IR1
B1H	1.50	1.53
B2H	1.48	1.57
B1V	1.52	1.50
B2V	1.52	1.57

# Observed Losses

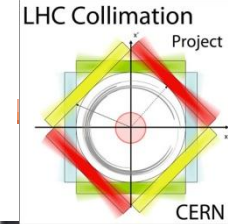
(Normalized to Primary Collimator)



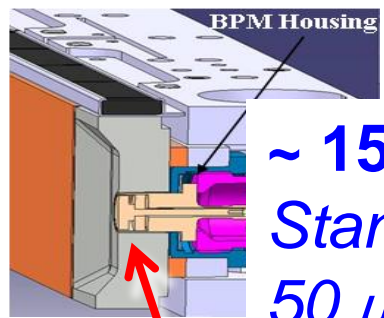
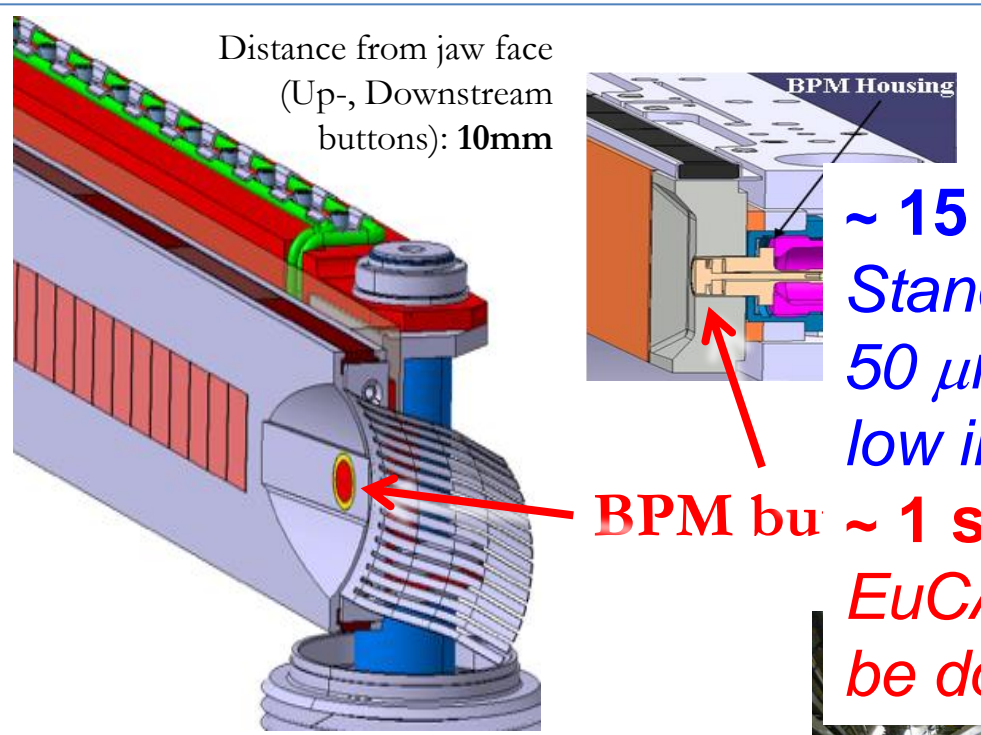
betatron losses B1 3500GeV hor norm F (2011.05.08, 01:00:47)



# 1<sup>st</sup> Phase-II Collimator with Integrated BPM



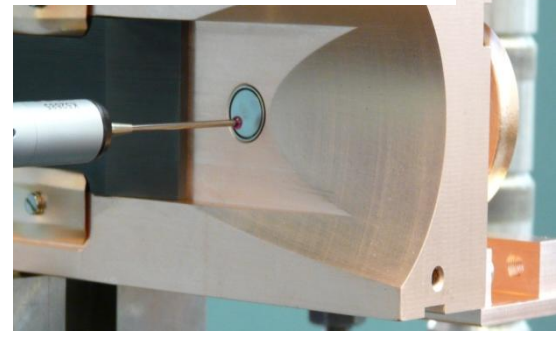
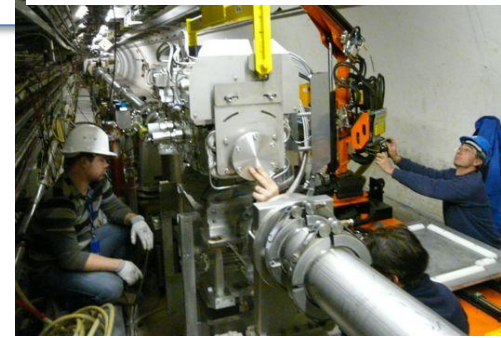
Distance from jaw face  
(Up-, Downstream  
buttons): **10mm**



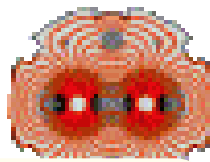
**~ 15 min per point**  
*Standard method: step size  
50  $\mu\text{m}$  in SPS, requires special  
low intensity beam in LHC*

**~ 1 s per point**  
*EuCARD solution for LHC, can  
be done every LHC fill*

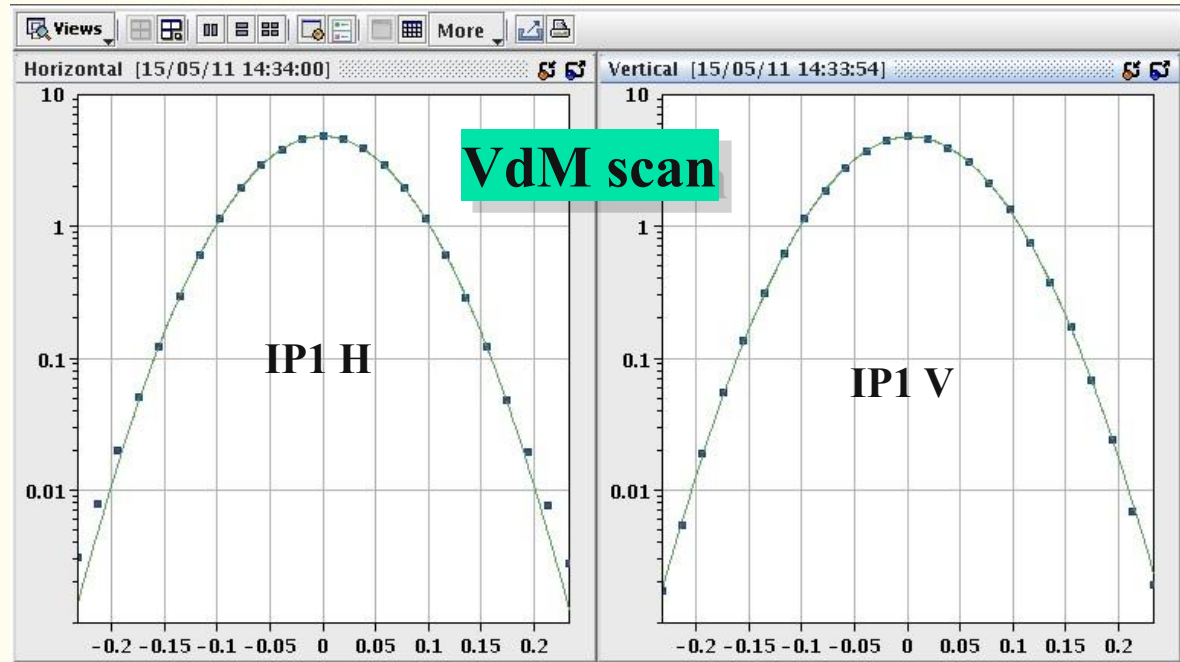
- First prototype produced at CERN
- Installed into SPS in 2010



# LHC precision front



- absolute luminosity normalization
- low, well understood backgrounds
- precision optics for ATLAS-ALFA and TOTEM



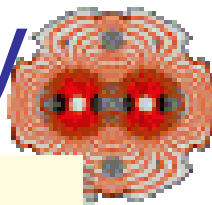
precise measurement of the luminous region + beam intensity --> absolute luminosity and cross section calibration

currently ~ 5 % level, already better than Tevatron

H. Burkhardt and  
S. White

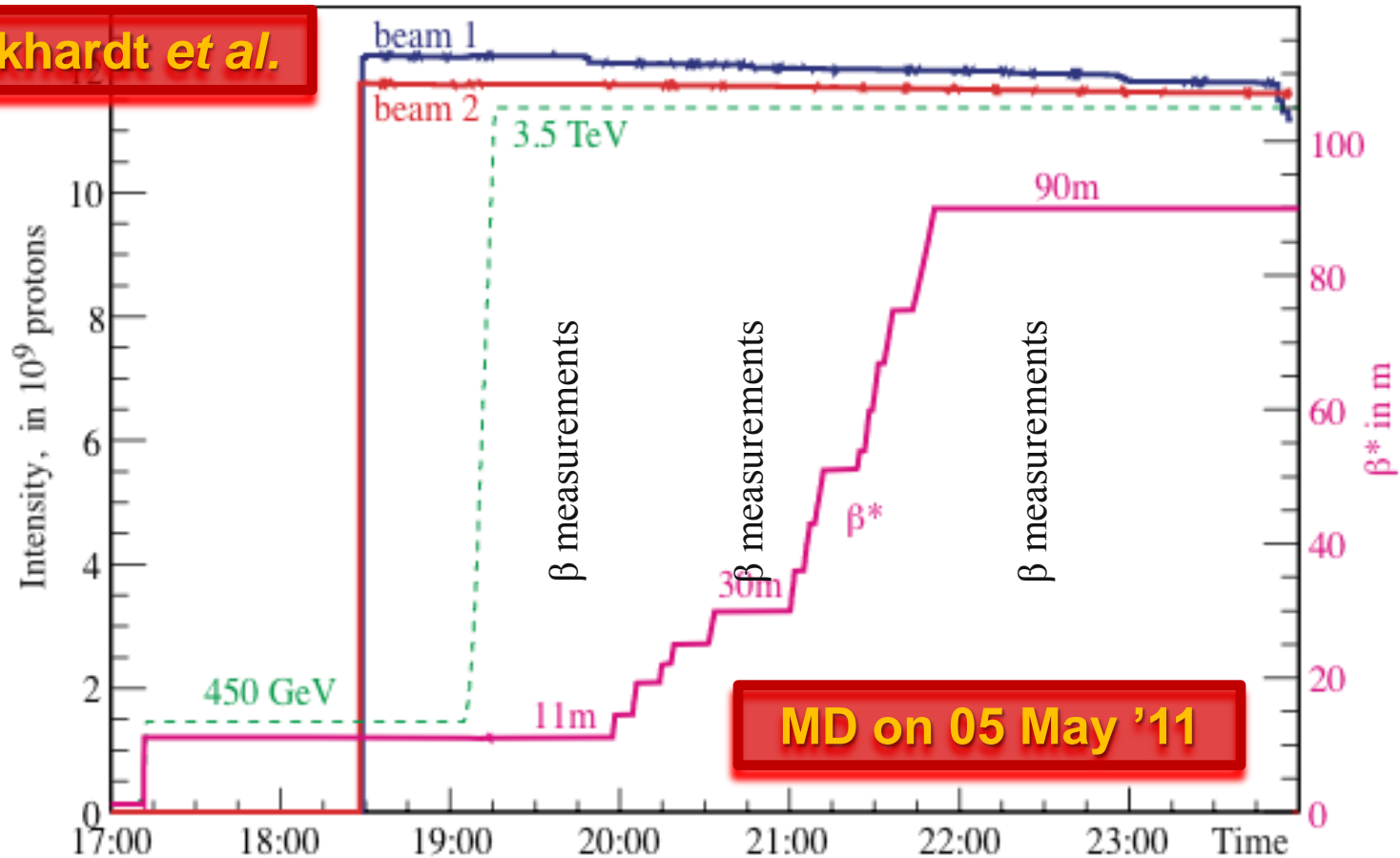
In close collaboration between LHC machine and experiments  
Ref. and further information : Lumi Days, Jan 2011

# Un-squeeze simultaneously



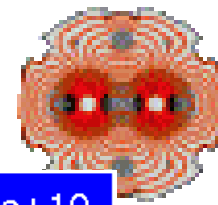
At top energy 3.5 TeV; 1st attempt to un-squeeze in steps with major external tune compensation of  $+\Delta Q_x = 0.45$ ,  $+\Delta Q_y = 0.11$  provided by the main arc quadrupoles QD, QF.

**H. Burkhardt *et al.***



Reaching 90 m without losses : excellent start of the challenging program of high- $\beta$  optics for TOTEM / ATLAS-ALPHA

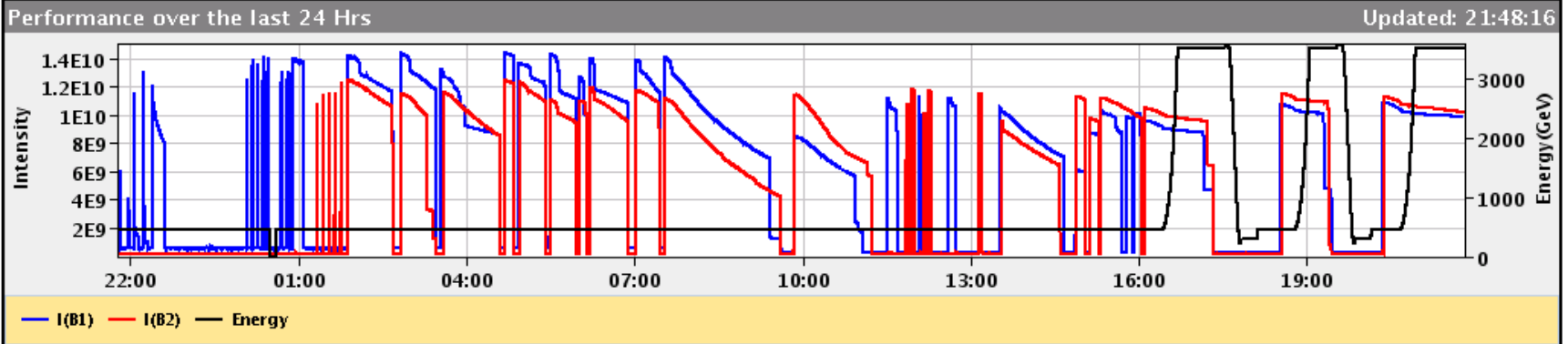
# Heavy Ion Run: first 24 h



05-Nov-2010 21:48:18 Fill #: 1473 Energy: 3500 Z GeV I(B1): 9.86e+09 I(B2): 1.02e+10

	ATLAS	ALICE	CMS	LHCb
Experiment Status	STANDBY	STANDBY	STANDBY	STANDBY
Instantaneous Lumi (ub.s) <sup>-1</sup>	0.000	0.000	0.000	0.000
BRAN Luminosity (ub.s) <sup>-1</sup>	0.000	0.000	0.000	0.000
Inst Lumi/CollRate Parameter	1.00e+00		0.00e+00	
BKGD 1	0.002	0.244	0.000	0.122
BKGD 2	0.000	0.000	0.000	0.407
BKGD 3	0.000	1.628	0.098	0.044

LHCb VELO Position **OUT** Gap: 58.0 mm **SQUEEZE** TOTEM: **STANDBY**



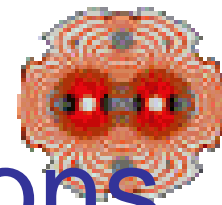
Beam 1 Inj.,  
Circ.  
& Capture

Beam 2  
Inj., Circ.  
& Capture

Optics Checks  
BI Checks  
Collimation Checks

First Ramp  
Collimation Checks  
Squeeze

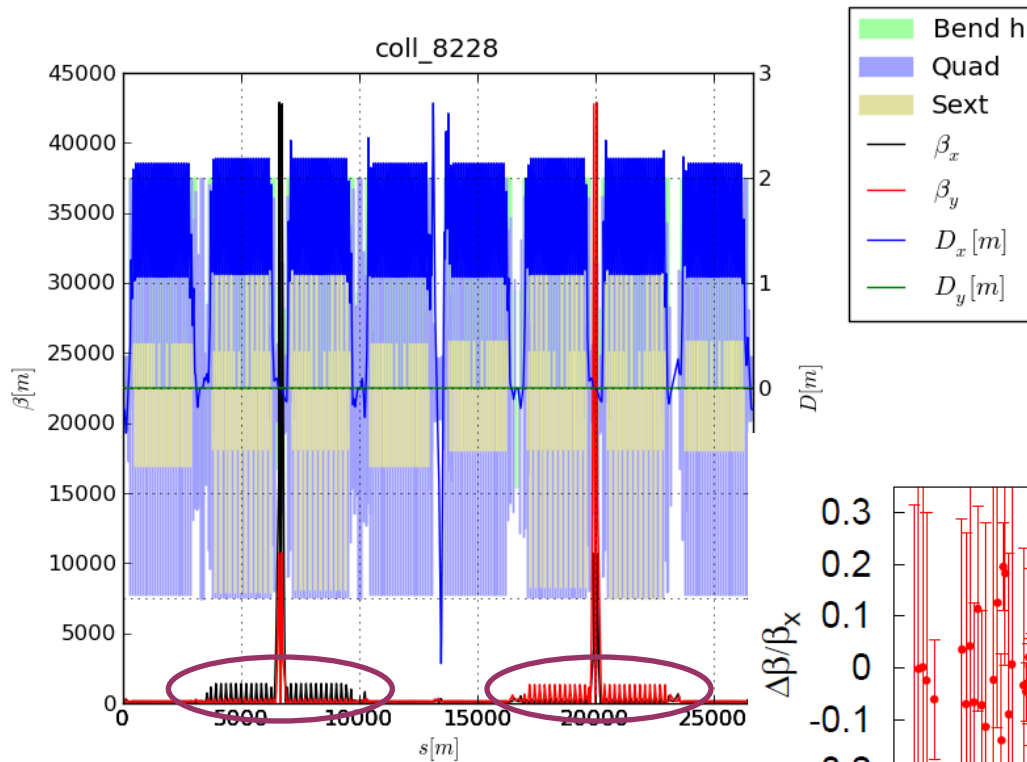
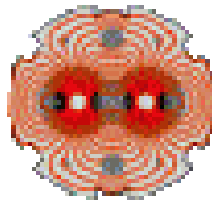




# Beam physics with heavy ions

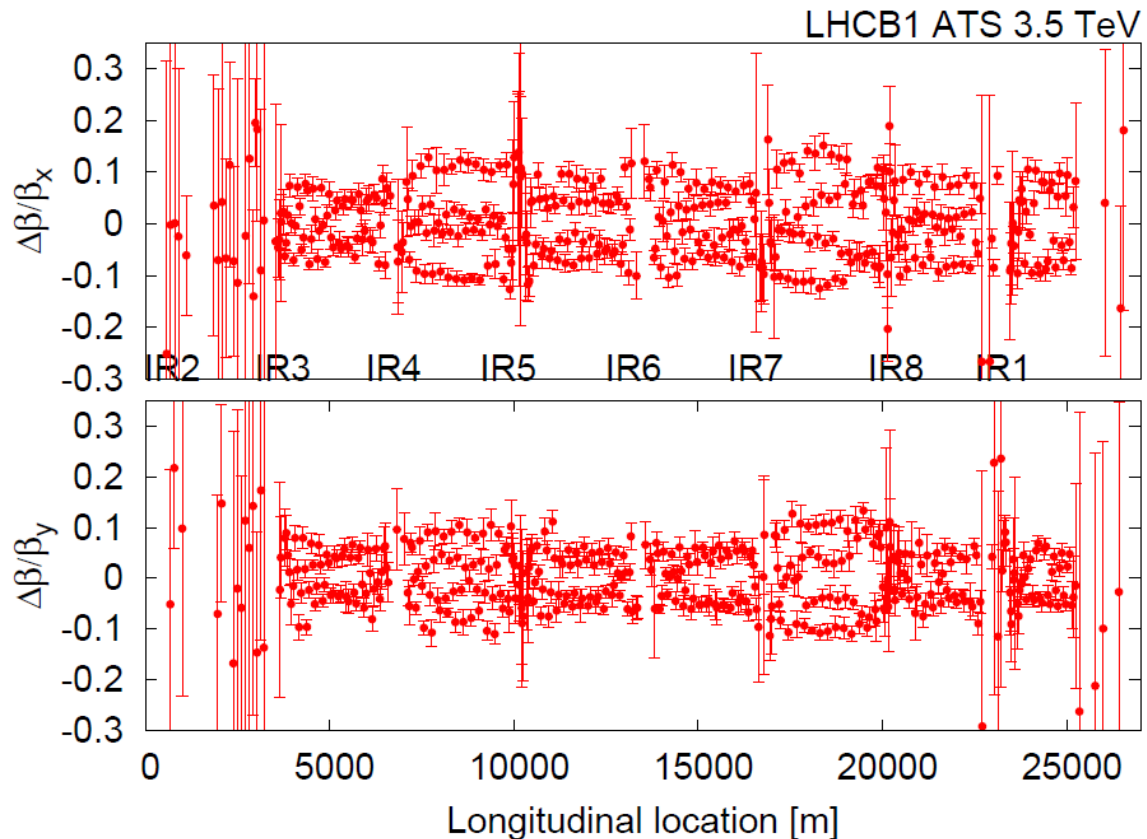
- Emittance evolution at injection
  - Strong IBS, RF manipulations, simulation
- Luminosity evolution model
  - Detailed modelling and simulation (also p-p)
- Collimation (very different from p)
- Secondary beams from IP (BFPP etc.)
  - Predicted loss patterns measured in physics
- Preparation for first **p-Pb collisions** (2012)
  - Studies of beam dynamics and operation
  - Feasibility test in Nov 2011

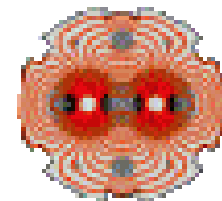
# LHC upgrade optics: ATS scheme



**From MAD-X simulations to...MDs!**

**LHC collision optics**  
 $\beta_{x/y}^* = 7.5 \text{ cm}/30 \text{ cm}$  at IP1 and  
 $\beta_{x/y}^* = 30 \text{ cm}/7.5 \text{ cm}$  at IP5



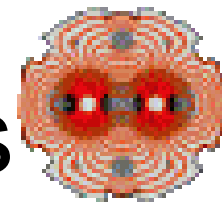


# Other activities

- FiDeL
- UFO
- E-cloud (strong collaboration with ICE and LIS sections)
- MAD-X
- Analysis of 11 T dipoles scenario
- HE-LHC studies
- Crab cavities
- LHeC

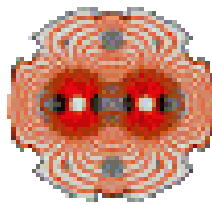
**Marek, Frank, Laurent,  
Bernhard, Rama, Giulia,  
Octavio, Kevin,  
Humberto, Elias, Tatiana,  
Giovanni, Zao, Rogelio**

# AccNet 2<sup>nd</sup>-year achievements



- **AccNet-RFTech** supported WS on **Advanced LLRF Control**, April 2010
- **AccNet-RFTech session** on **xTCA at MIXDES2010** conference, June '10
- **AccNet-EuroLumi** workshop on **Higher-Energy LHC**, HE-LHC, Oct. 2010
- (invited) **talk** at **German KET Strategy Workshop**
- **AccNet-EuroLumi workshop on Crystal Collimation**, Oct. 2010
- **AccNet-RFTech 2<sup>nd</sup> Annual Workshop**, December 2010
- **AccNet workshop on LHC crab cavities**, LHC-CC10, December 2010
- **AccNet web site moved from LAL to CERN server**
- launch of **new network on novel accelerators AccNet-EuroNNAc**
- several **EuCARD Newsletter articles**
- **AccNet-EuroLumi** bilateral **CERN-GSI workshop on e-cloud**, March'11
- 1st **AccNet-EuroNNAc workshop**, May 2011
- **AccNet-EuroLumi** workshop on **Optics ...**, "OMCM", June 2011
- expansion of **collaborations with CINECA/Mexico, ESA, ITER,...**

**WP4 co-ordinators: Ralph, Frank et al.**



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**CONGRATULATION TO ALL  
OF YOU, YET AGAIN, FOR THE  
GREAT ACHIEVEMENTS!**