



ATLAS

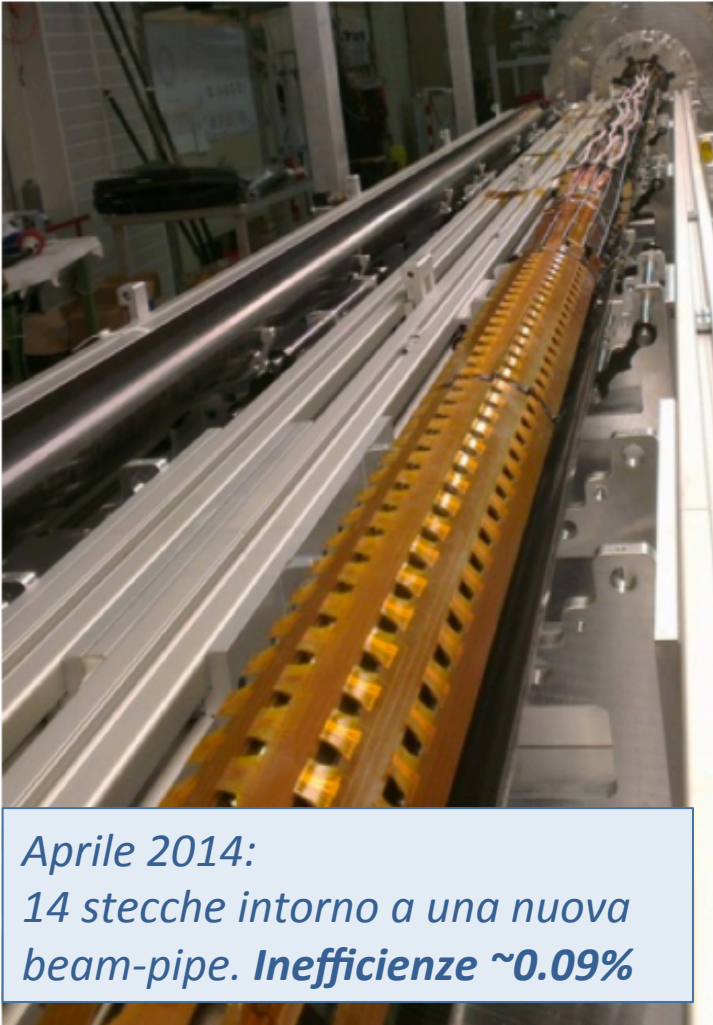
ATLAS in Genova

C. Gemme

CdS, 6 Luglio 2015

ATLAS in 2015

IBL detector completed



*Aprile 2014:
14 stecche intorno a una nuova
beam-pipe. Inefficienze ~0.09%*

- ✓ Per ATLAS due anni di lavoro intenso con nuovi rivelatori (IBL! per esempio), importanti cambiamenti nel trigger e analisi dati.

Insertion speed: 5-10 cm/min

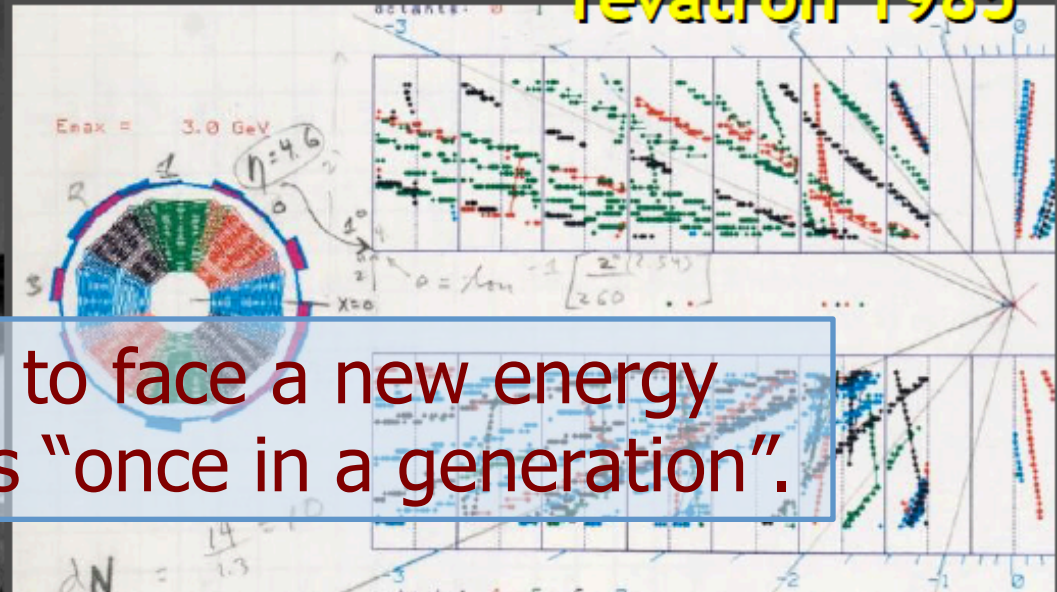


*Maggio 2014:
IBL sceso nel pozzo e
installato in ATLAS*

SPS 1976

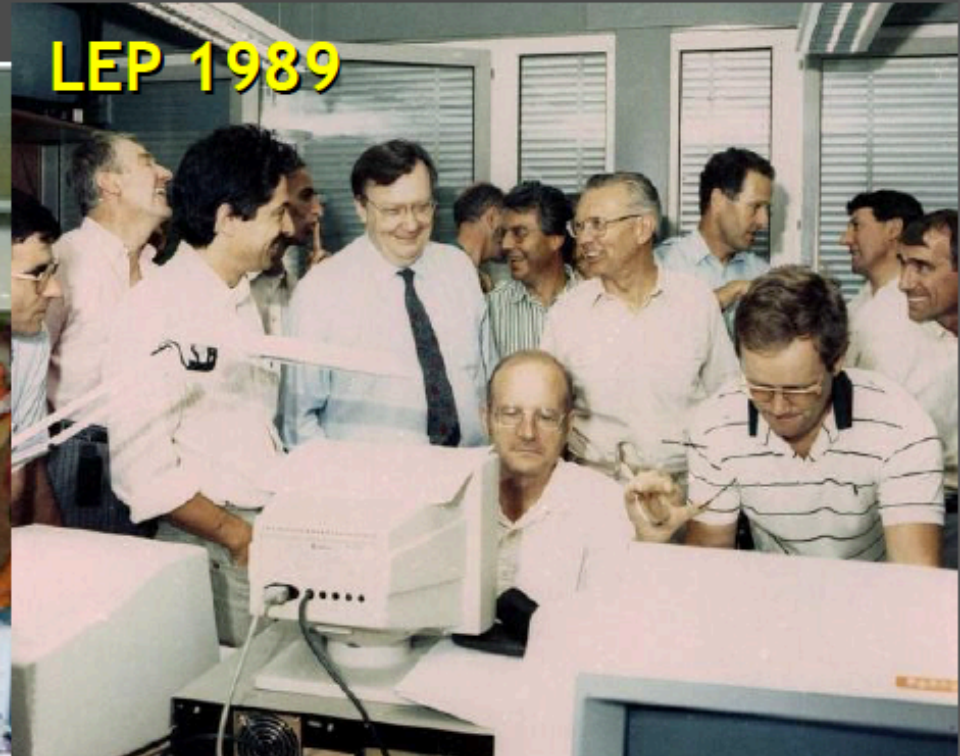


Tevatron 1985



The chance to face a new energy frontier comes "once in a generation".

LEP 1989

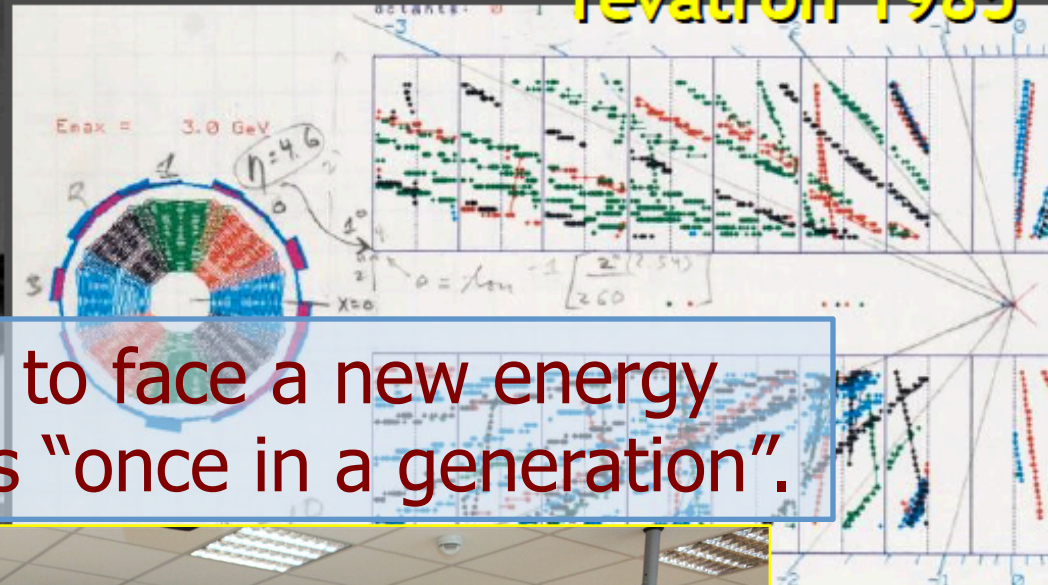


HERA 1991



Tevatron 1985

SPS 1976



The chance to face a new energy frontier comes "once in a generation".

ATLAS 2008

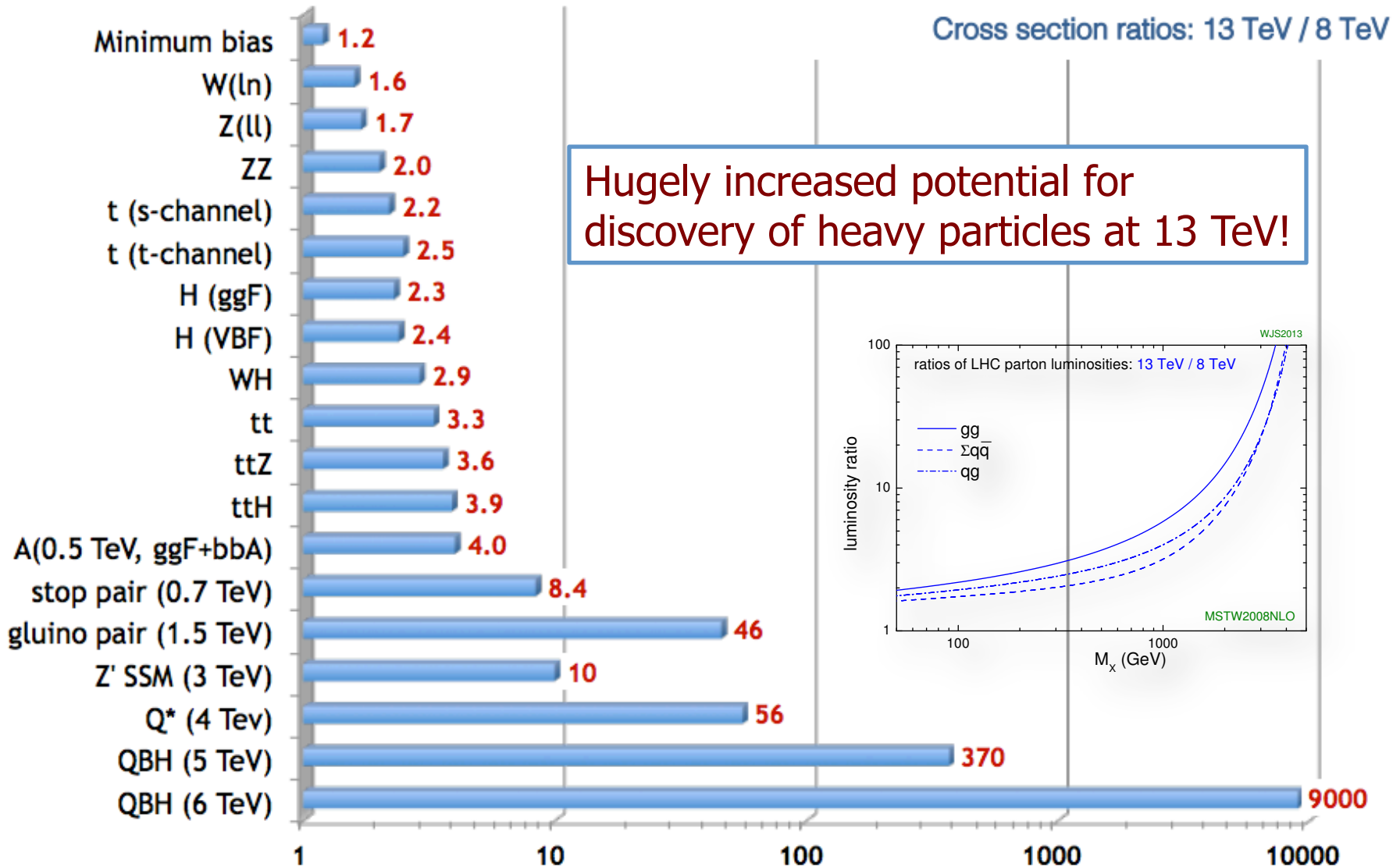


But we are about to do it again for the second time in six years!!

HERA 1991

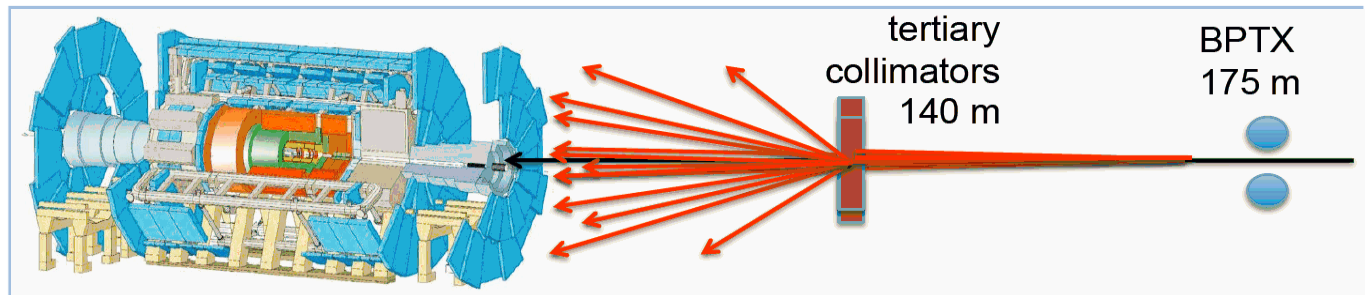
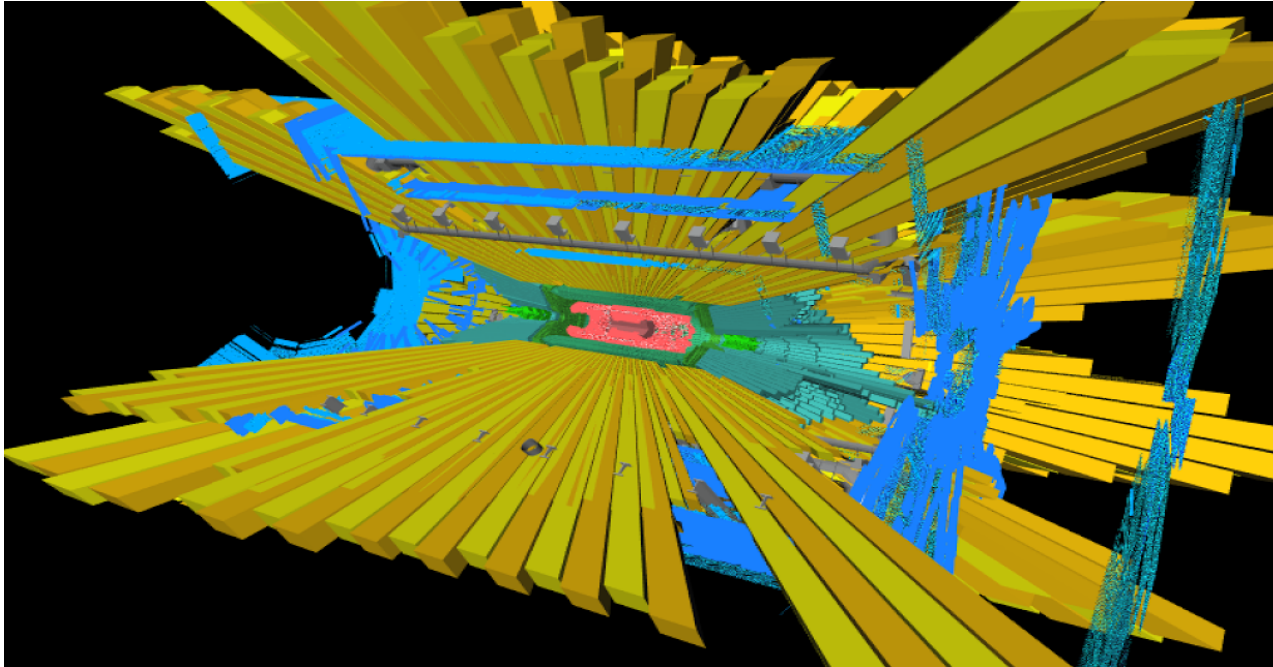


A unique discovery potential at 13 TeV!



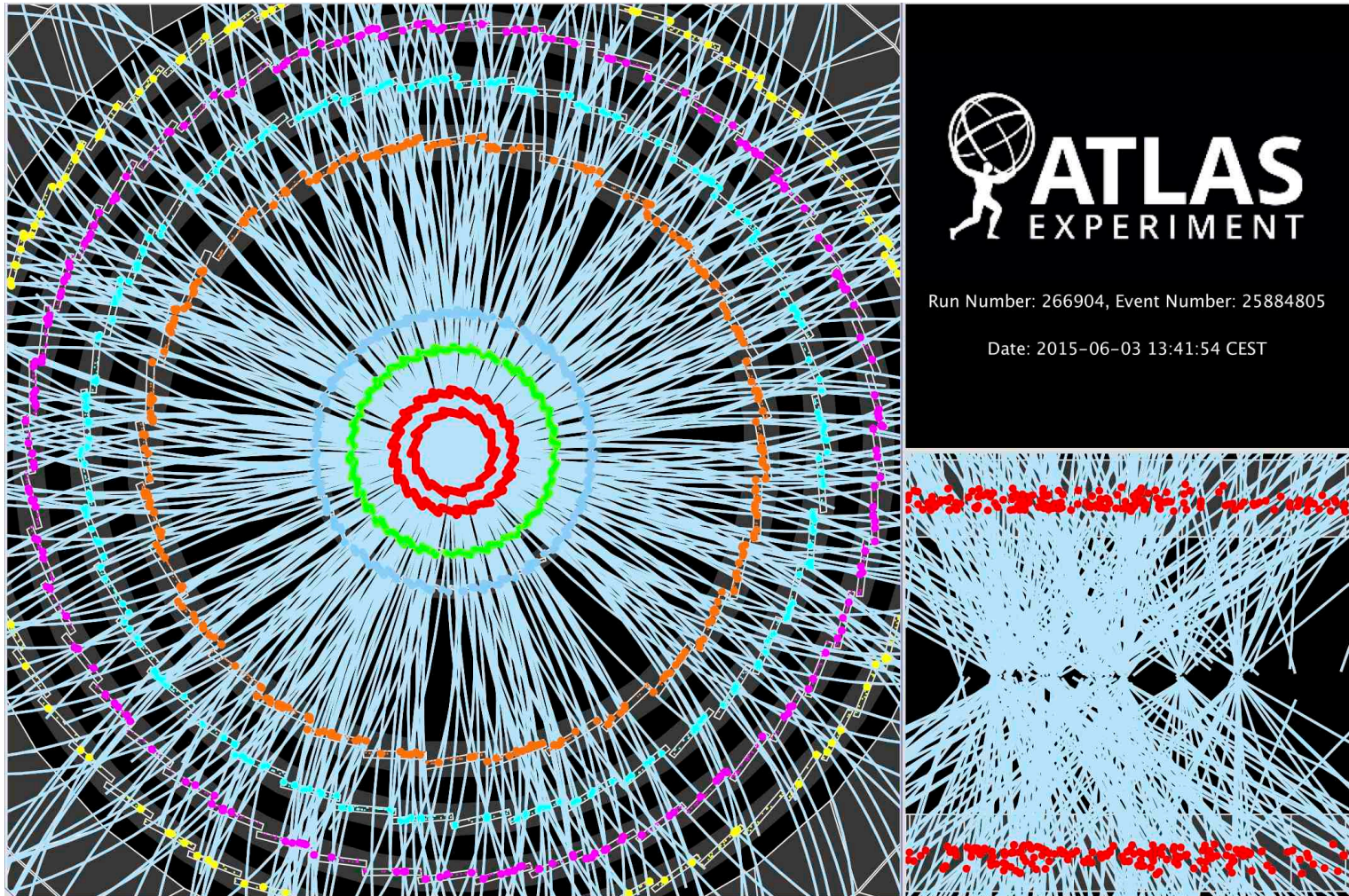
ATLAS in 2015

- ✓ Dopo due anni di shutdown, LHC e' ripartito il 5 Aprile con i primi beam splash

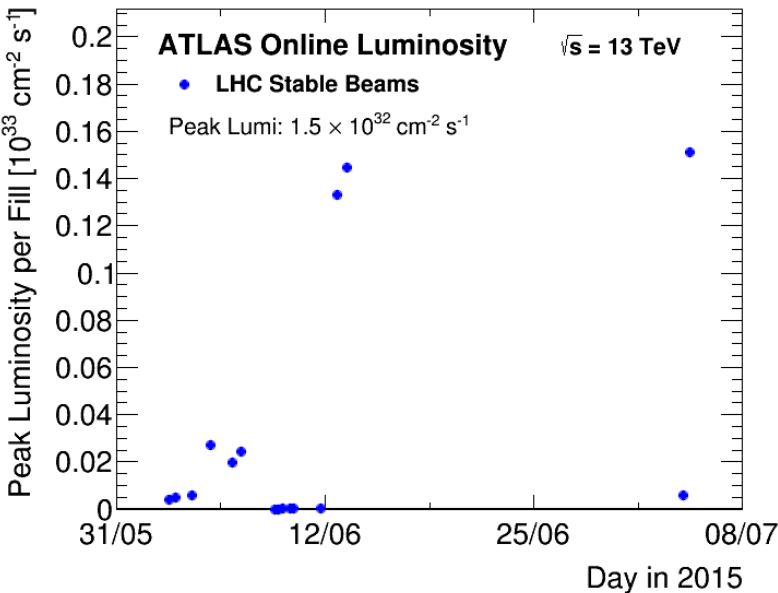
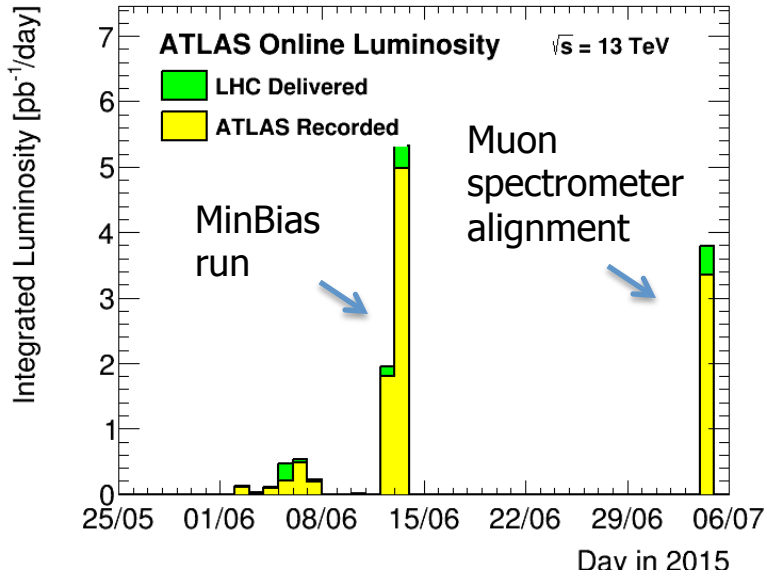


ATLAS in 2015

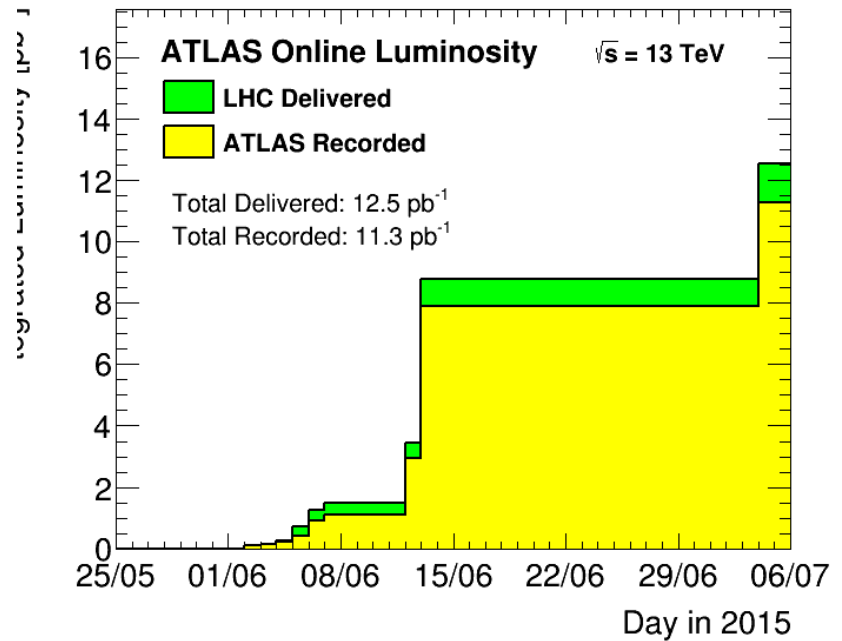
- ✓ Dopo due anni di shutdown, LHC e' ripartito il 5 Aprile con i primi beam splash e ai primi di giugno con le collisioni a 13 TeV.



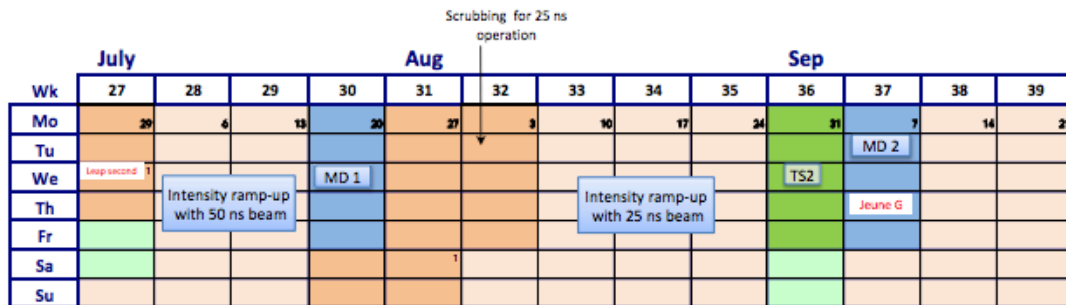
ATLAS in 2015



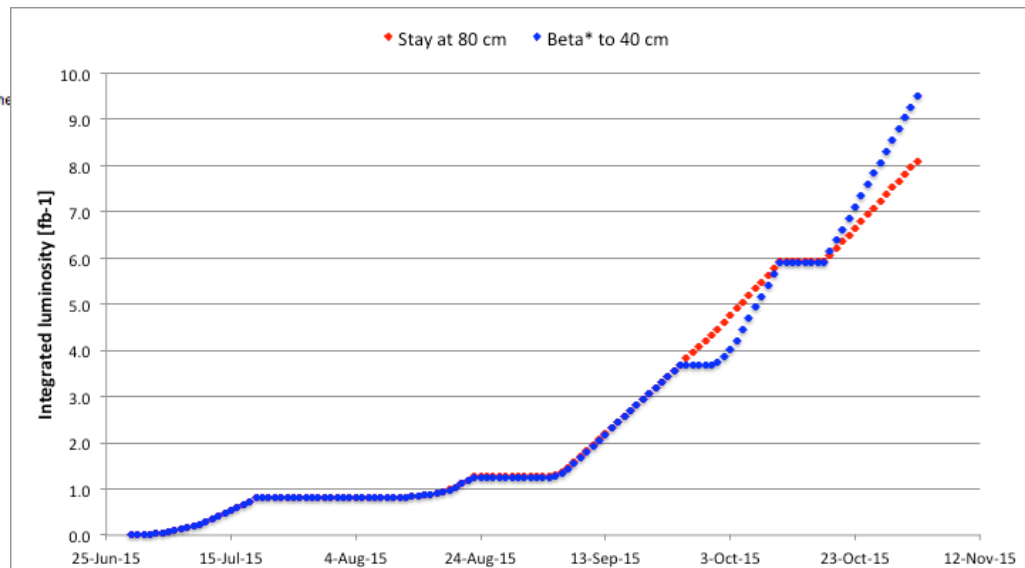
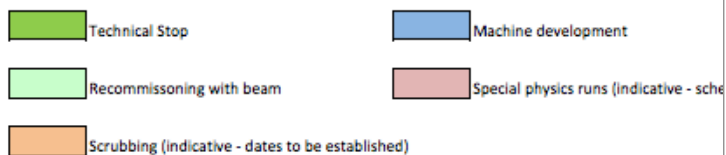
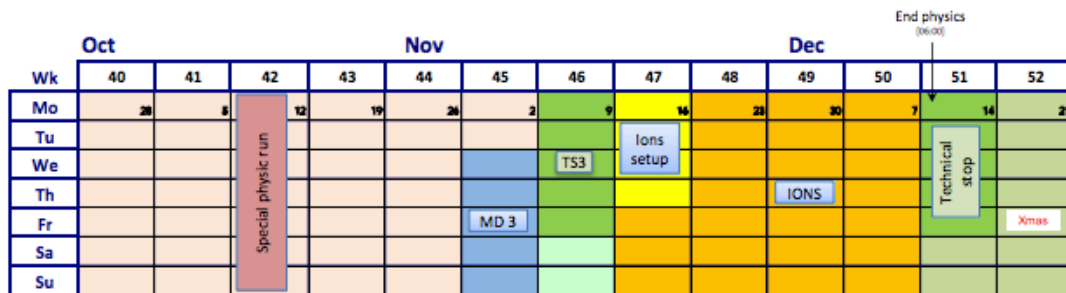
✓ LHC e ATLAS in commissioning



LHC in 2015



✓ July 2, 2015



Composizione del Gruppo ATLAS

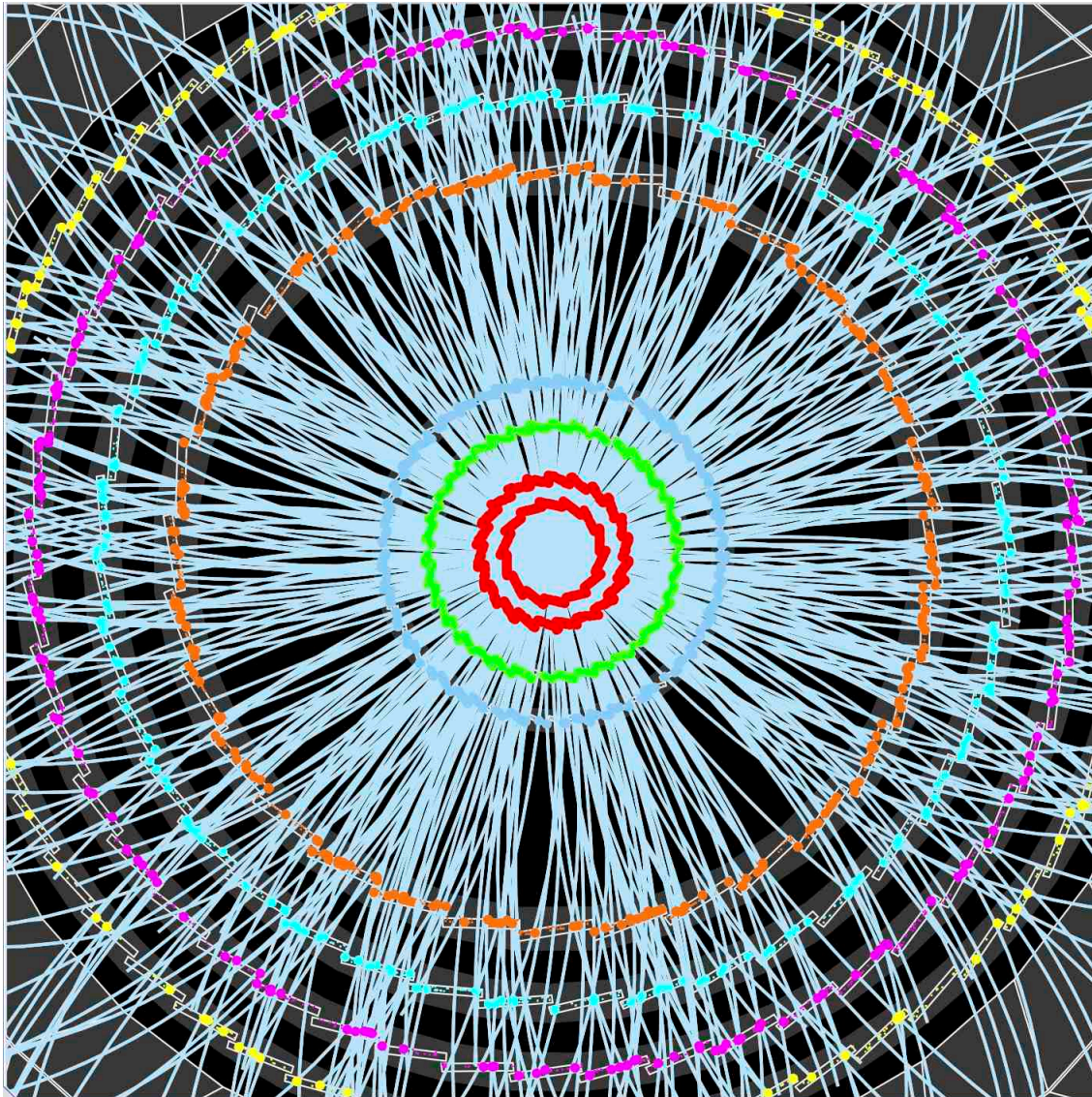


Composizione del Gruppo

- ✓ Composizione del gruppo stabile (era 15 FTE nel 2014).
- ✓ Oltre agli strutturati:
 - 1 borsista INFN neolaureato (C. Varni)
 - 2 laureandi (T. Bontae, A. Lapertosa)
- ✓ e tre tecnici INFN (G. Gariano, A. Rovani, E. Ruscino)

	<i>Contratto</i>	<i>Qualifica</i>	<i>ATLAS</i>	<i>R&D Fase2</i>	<i>Gr5-HVCMOS</i>	<i>Aida</i>	<i>Totale ATLAS</i>
Barberis Dario	Associato	Ricercatore	100				100
Darbo Giovanni	Dipendente	Dirigente di Ricerca	10	60	30		100
Favareto Andrea	Associato	Borsista	70	30			100
Gagliardi Guido	Associato	Ricercatore	100				100
Gaudiello Andrea	Associato	Dottorando	40	30	30		100
Gemme Claudia	Dipendente	Ricercatore	60	30	10		100
Guido Elisa	Associato	Borsista	90	10			100
Morettini Paolo	Dipendente	Primo Ricercatore	20	60	20		100
Osculati Bianca Maria	Associato	Prof. Associato	100				100
Parodi Fabrizio	Associato	Ricercatore	100				100
Passaggio Stefano	Dipendente	Primo Ricercatore	100				100
Rossi Leonardo	Dipendente	Dirigente di Ricerca	70	20	10		100
Sannino Mario	Associato	Prof. Associato	40	40	20		100
Schiavi Carlo	Associato	Ricercatore	100				100
Corosu Mirko	Dipendente	Tecnologo	30				30
Rossi Cecilia	Dipendente	Tecnologo	0	15			15
Total FTE			10.3	2.95	1.2	0	14.45

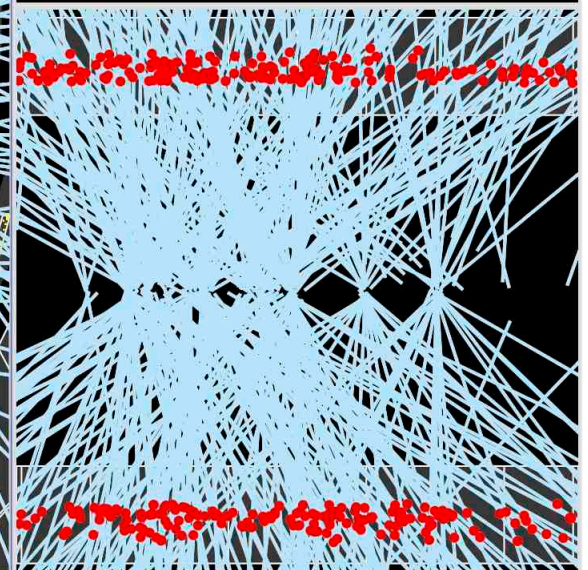
Attivita' di ricerca



ATLAS
EXPERIMENT

Run Number: 266904, Event Number: 25884805

Date: 2015-06-03 13:41:54 CEST



Attivita' del gruppo ATLAS@GEnova

- ✓ Commissioning del rivelatore a Pixel (IBL)

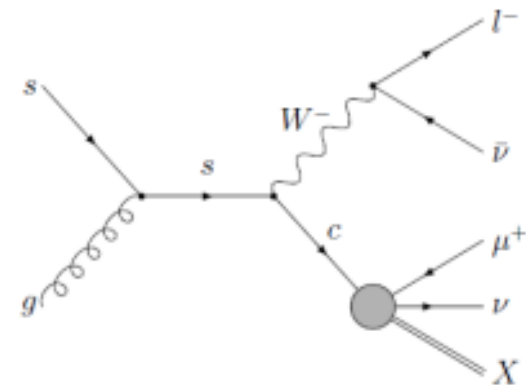
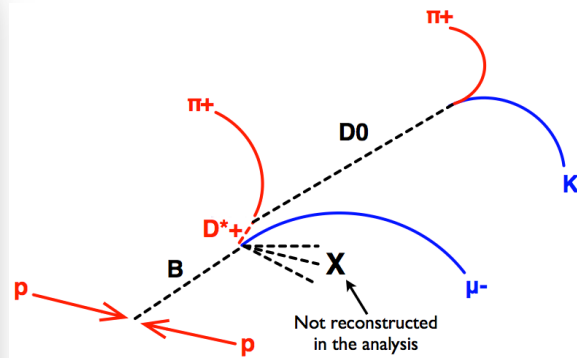
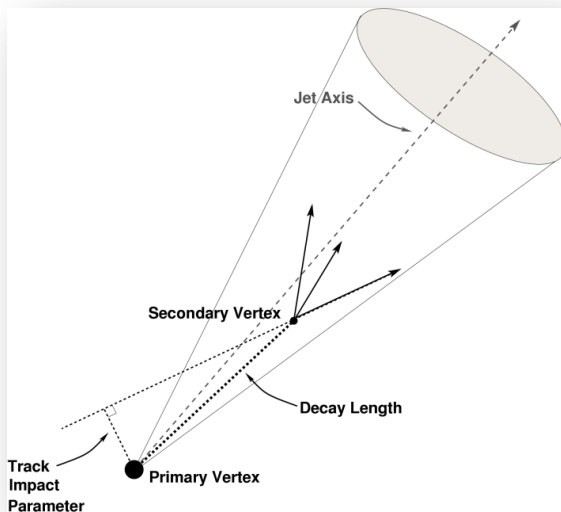
- ✓ Calibrazioni:
 - B-tagging con D^* e W_c
 - Ionizzazione nei Pixel

- ✓ Analisi di fisica:
 - Higgs VBF \rightarrow bb
 - Ricerca di particelle massive metastabili

- ✓ Upgrade del tracciatore di Fase 2 (installazione in 2023-24) \rightarrow P. Morettini
 - R&D su sensori 3D e HV-CMOS
 - Definizione del layout del tracciatore

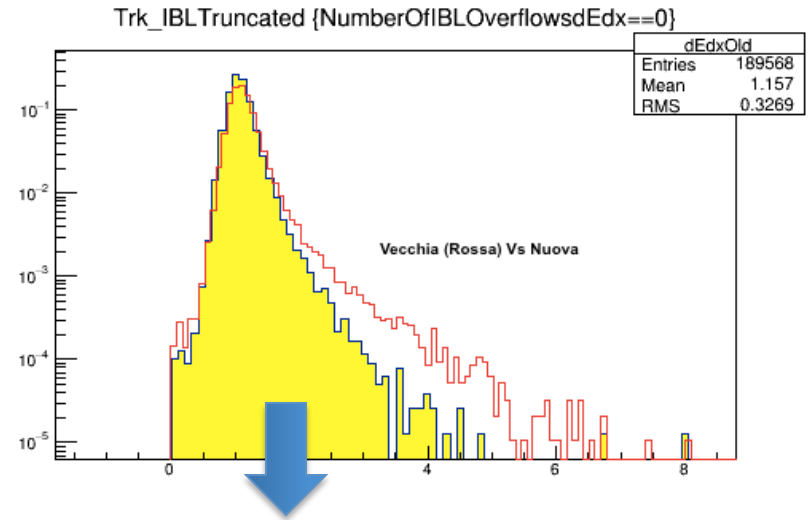
b (and c)-tagging

- ✓ The b-tagging is the capability to identify **jets coming from b-quark** fragmentation. It is based on the relatively long lifetime of b-hadrons ($\tau \sim 1.5$ ps, $\beta\gamma c\tau \sim 4.5$ mm for $p_T \sim 50$ GeV).
- ✓ Several b-tagging algorithms, exploiting: tracks impact parameters, reconstruction of the secondary vertex, topological structure of b and c-hadron decays inside the jet.
 - ✓ Genova is responsible for the calibration using D^* - used in Run1 and at the start of Run2
 - ✓ Developing a new method for c-tagging using a sample of c-jets produced in association with W.

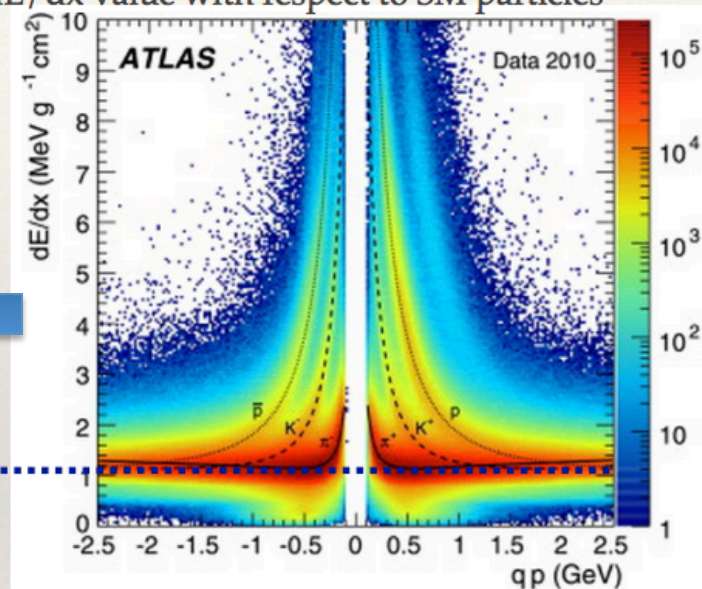
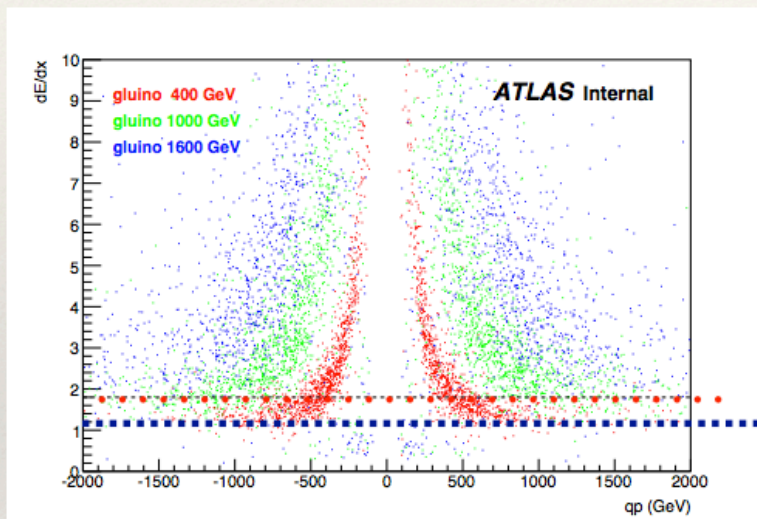


Ionizzazione nel rivelatore a Pixel

- ✓ Il rivelatore a Pixel permette una misura precisa della carica rilasciata nel sensore
 - Aggiunto alla definizione di track dE/dx il nuovo layer IBL.
- ✓ La dE/dx permette di identificare particelle a bassa $\beta\gamma$ e/o carica frazionaria.



- Searched anomalous particles have a well-separated dE/dx value with respect to SM particles

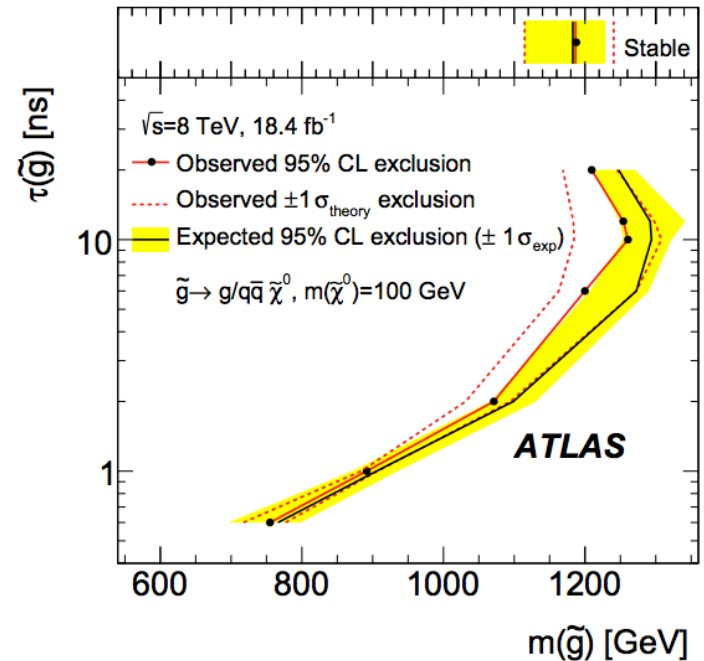
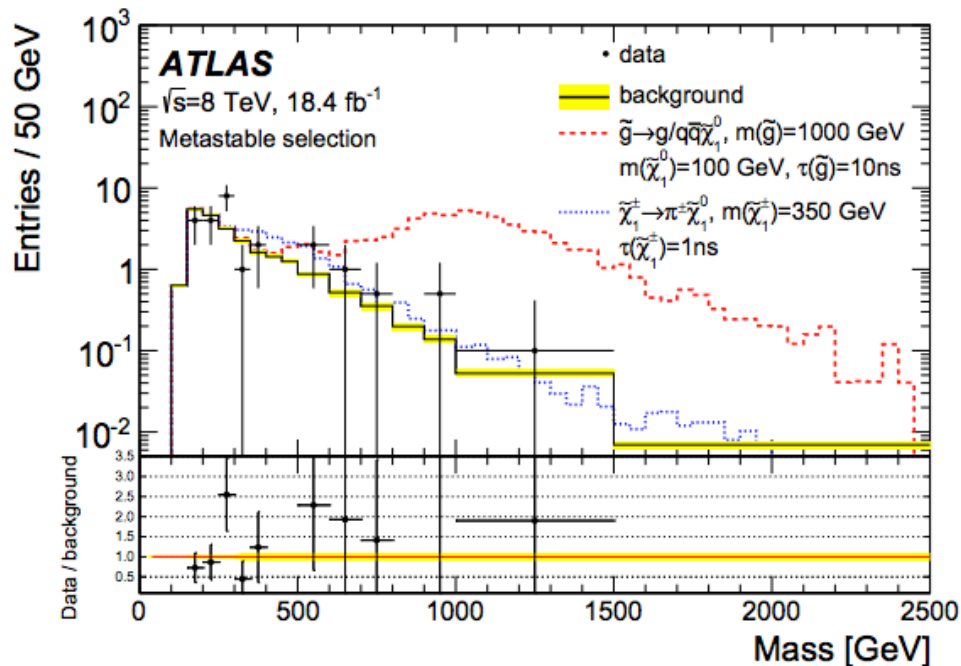


... cut in the analysis (1.8)

--- MIP release (1.2) [$\sigma(\text{MIP}) \sim 0.15$]

Massive charged particles searches

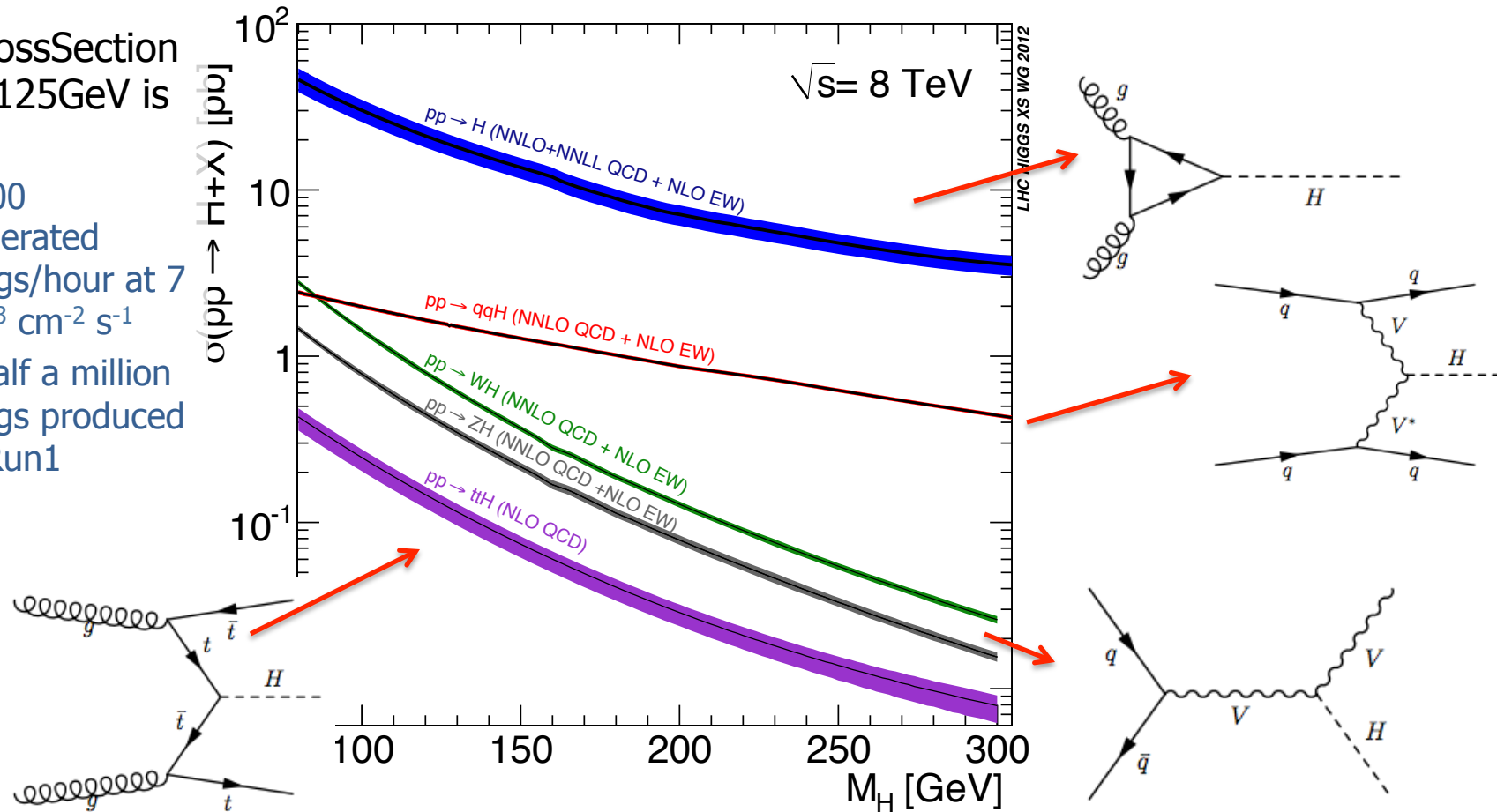
- ✓ La ionizzazione anomala e' usata per identificare particelle cariche massive (per esempio R-adroni), in particolare quelle che decadono prima di raggiungere calorimetri e spettrometro a mu.
- Limiti posti intorno a 800-1200 GeV a seconda dei modelli considerati e vite medie $O(10\text{ns})$.



Studi di Higgs

Total CrossSection
Higgs@125GeV is
~22 pb:

~500
generated
Higgs/hour at 7
 $10^{33} \text{ cm}^{-2} \text{ s}^{-1}$
~Half a million
Higgs produced
in Run1

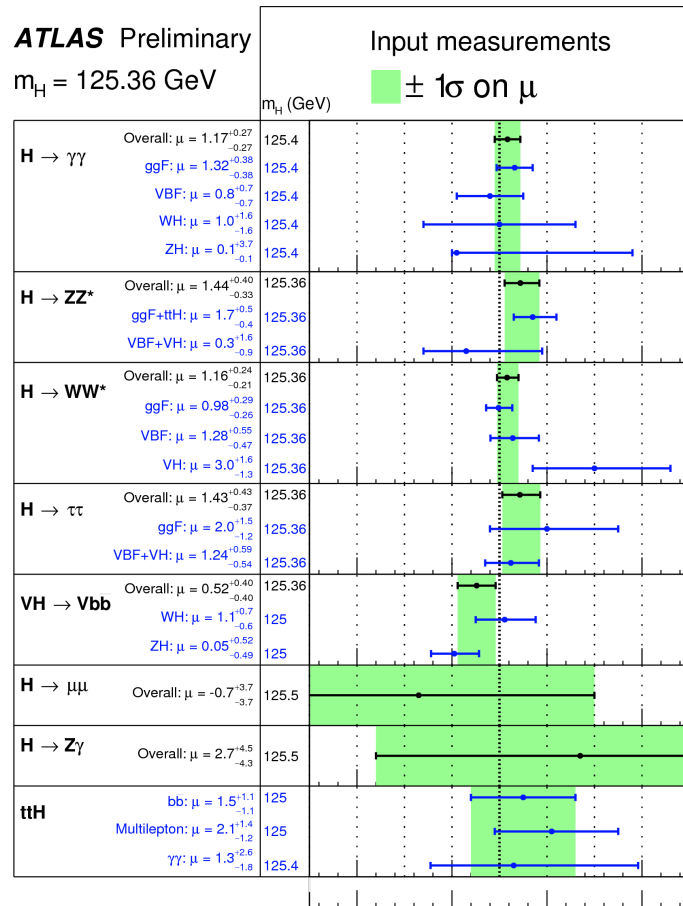


Dominant Processes:

- Gluon fusion, Vector Boson Fusion (VBF), W/Z associated production, Top associated production (ttH)

Studi di Higgs

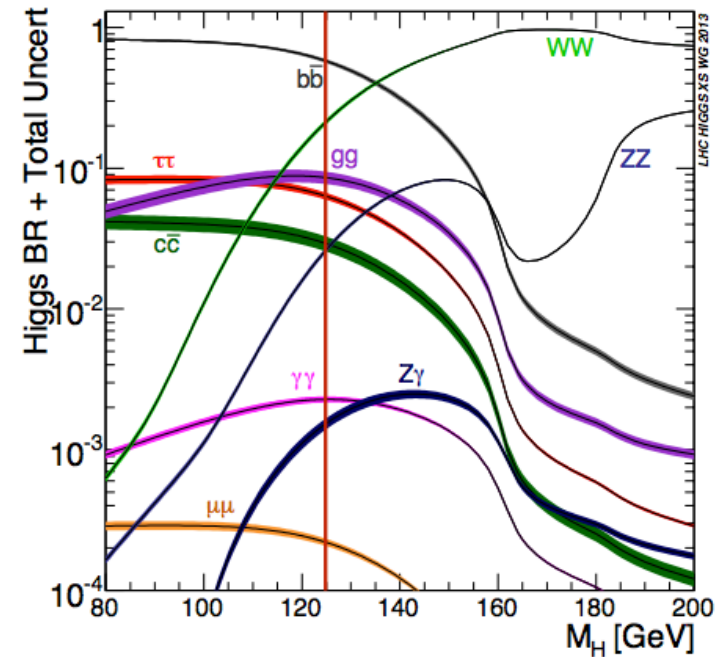
- ✓ Il canale di decadimento principale e' $H \rightarrow bb$, seguito da $H \rightarrow WW$.



$\sqrt{s} = 7$ TeV, 4.5-4.7 fb^{-1}

$\sqrt{s} = 8$ TeV, 20.3 fb^{-1}

Signal strength (μ)

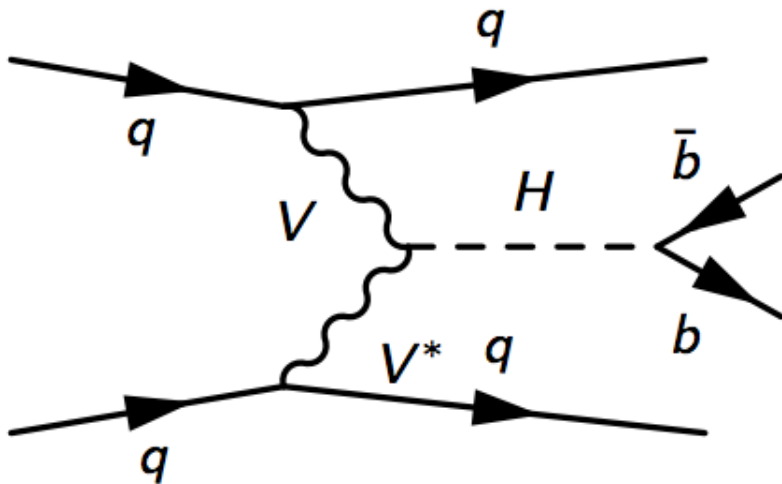


- ✓ A LHC vengono studiati molte combinazioni di produzioni e decadimenti.

- Signal strength = $\sigma_H / \sigma_H^{\text{SM}}$

Studi di Higgs@Genova

- ✓ A Genova cerchiamo Higgs prodotto tramite VBF e decadente in bb.
- ✓ Si sfrutta la topologia di due jet in avanti e la massa invariante di due jet bb. In corso analisi sui dati di Run1.



ATLAS

$$\mu_H = \frac{\sigma_H}{\sigma_H^{SM}} = \mu \pm 1.8(stat)$$

CMS

$$\mu_H = \frac{\sigma_H}{\sigma_H^{SM}} = 0.7 \pm 1.4(stat)$$

Responsabilita'

LEVEL	ITEM
<i>L2</i>	Dario Barberis - ATLAS DB Coordinator
<i>L3</i>	Claudia Gemme - ITK Design Group
<i>L3</i>	Claudia Gemme - Pixel Management (publications)
<i>L2</i>	Claudia Gemme - ITK Layout Task Force
<i>L3</i>	Guido Gagliardi - Contact person Fractional Charge in Exotic
<i>L1</i>	Paolo Morettini - ITK PIXEL PL
<i>L3</i>	Paolo Morettini - Pixel Management (DAQ software)
<i>L2</i>	Carlo Schiavi - b-tagging on-line coord.
<i>L3</i>	Stefano Passaggio - Contact person mSMP in SUSY
<i>L2</i>	Leonardo Rossi - ITK IB Chair
<i>L3</i>	Fabrizio Parodi - Resp. continuous calibration infrastructure
<i>L3</i>	Fabrizio Parodi - Coordinator of the charm calibration with D*