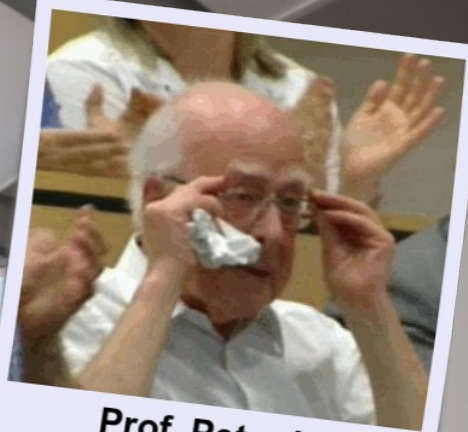


Pavia@ATLAS

The image features a composite background. The top portion is an aerial photograph of a green valley with a blue lake and distant mountains. A red line with circular markers traces a path across the landscape. The bottom portion is a 3D cutaway rendering of the ATLAS detector, showing its complex internal structure of pipes, cables, and components, situated within a tunnel-like environment.

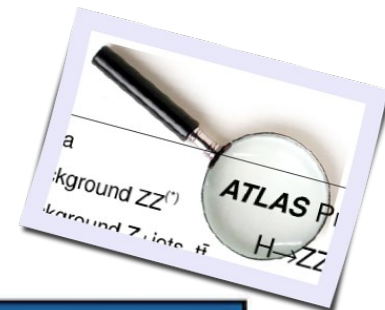
Andrea Negri
Pavia, 23/05/13

Luglio 2012



Prof. Peter Higgs

ATLAS Collaboration



Argentina
Armenia
Australia
Austria
Azerbaijan
Belarus
Brazil
Canada
China
Czech Republic
Denmark
France
Georgia
Germany
Greece
Israel
Italy
Japan
Morocco

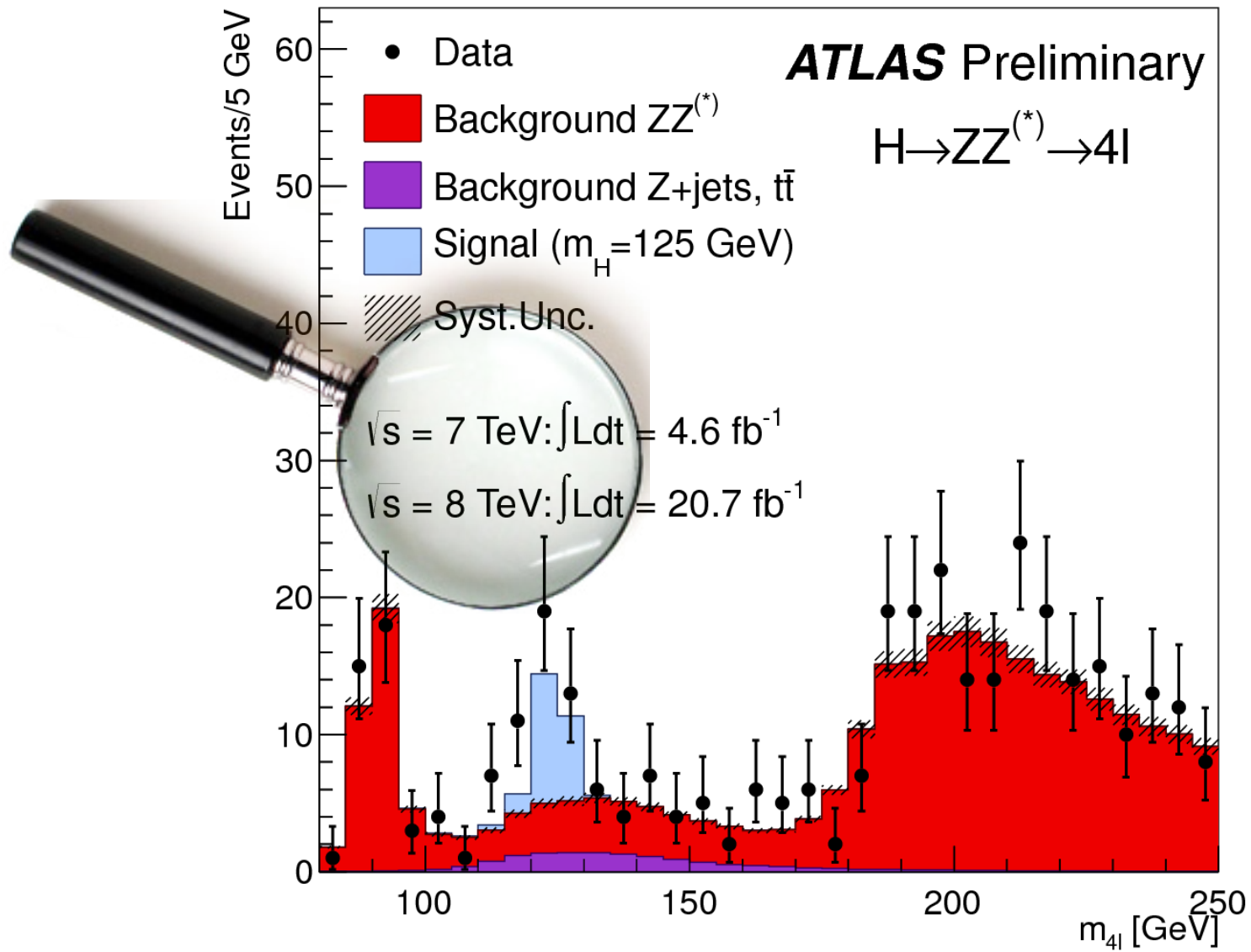
Netherlands
Norway
Poland
Portugal
Romania
Russia
Serbia
Slovakia
Slovenia
Spain
Sweden
Switzerland
Taiwan
Turkey
UK
USA
CERN
JINR

**ATLAS
Collaboration**

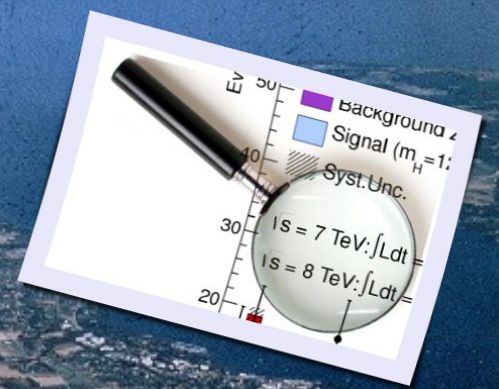
~3000 ricercatori, ~180 istituti

Pavia@ATLAS

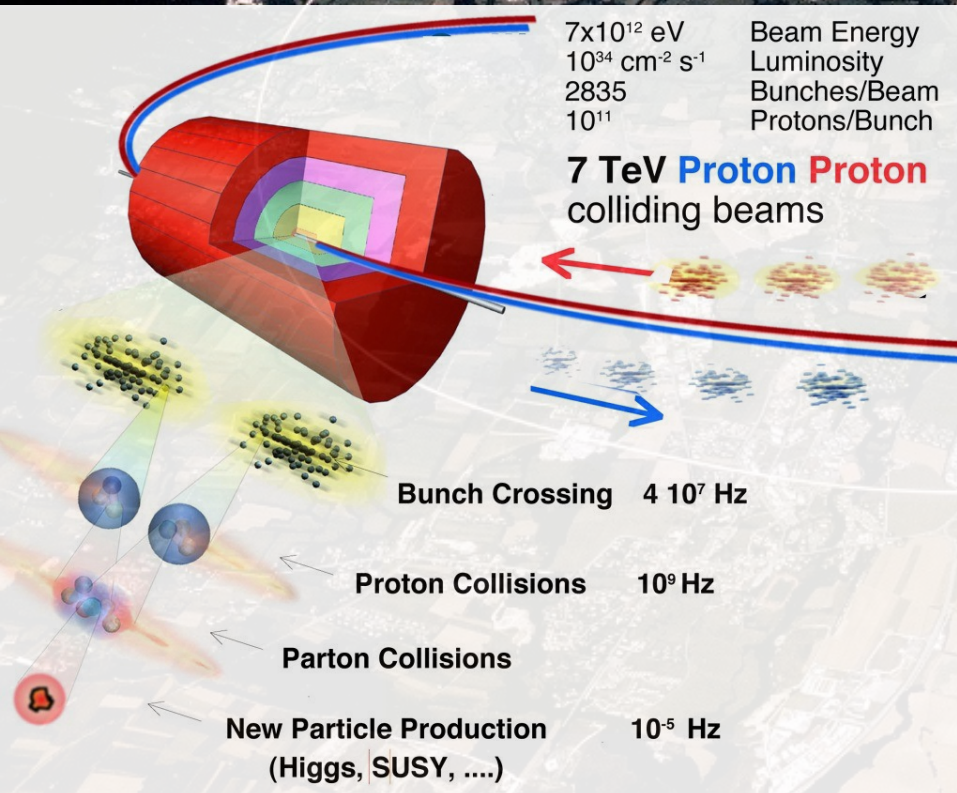
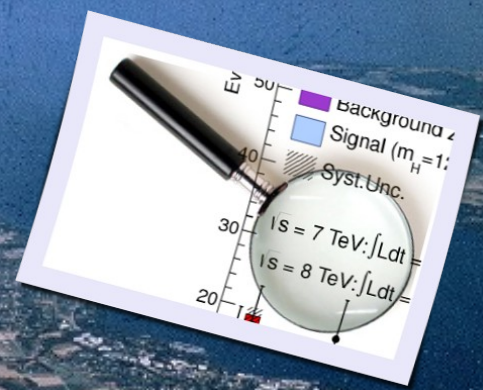




LHC



LHC

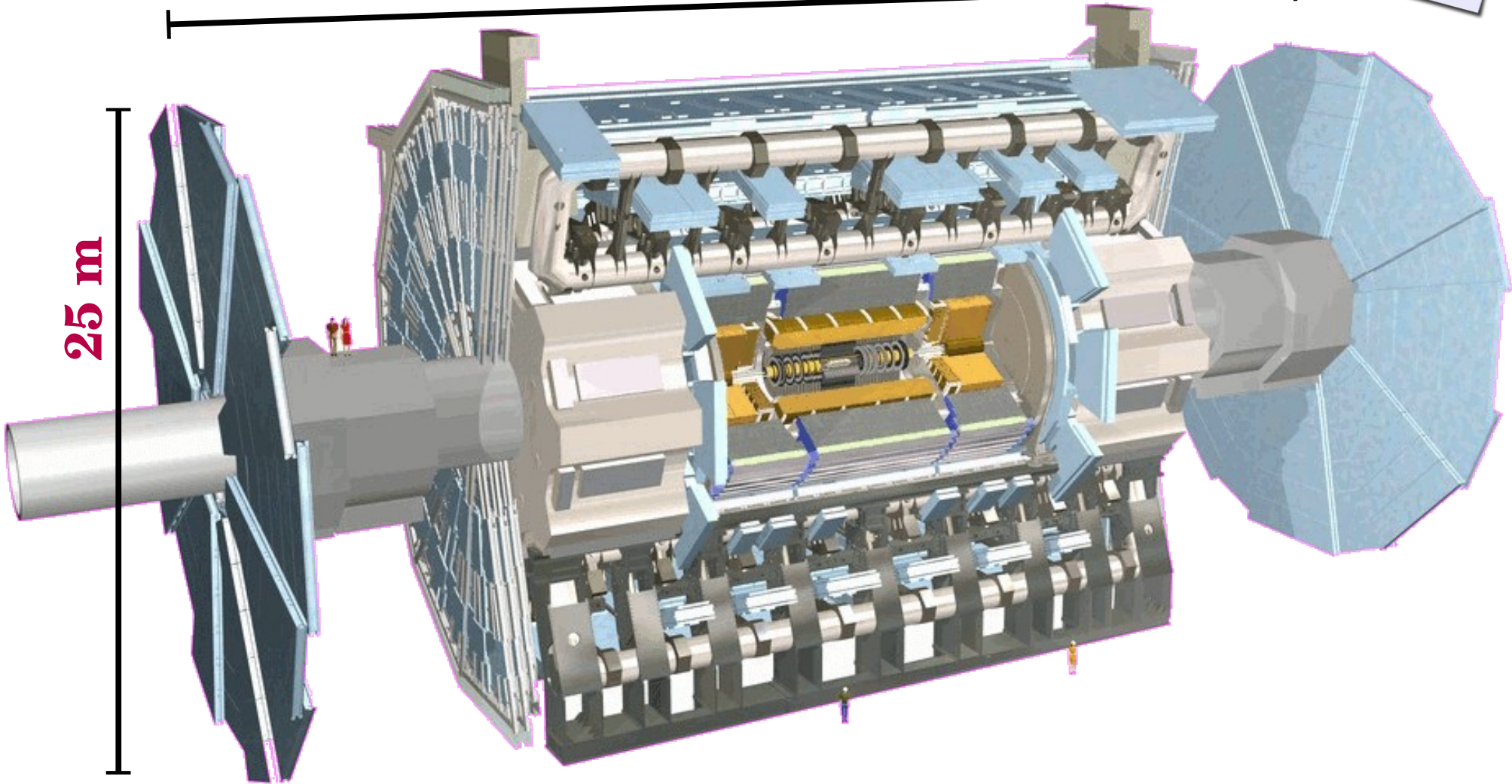


ATLAS

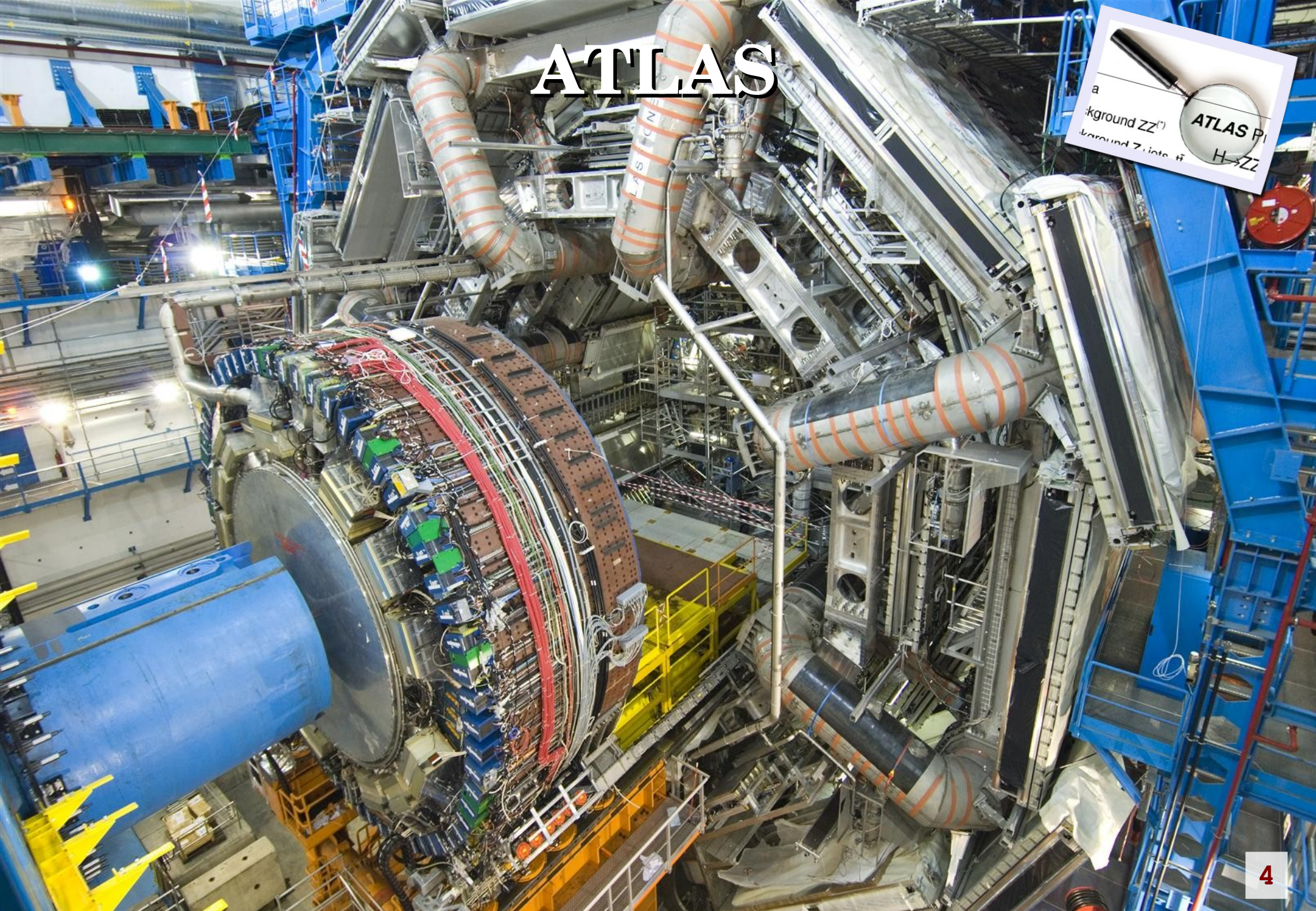
44 m

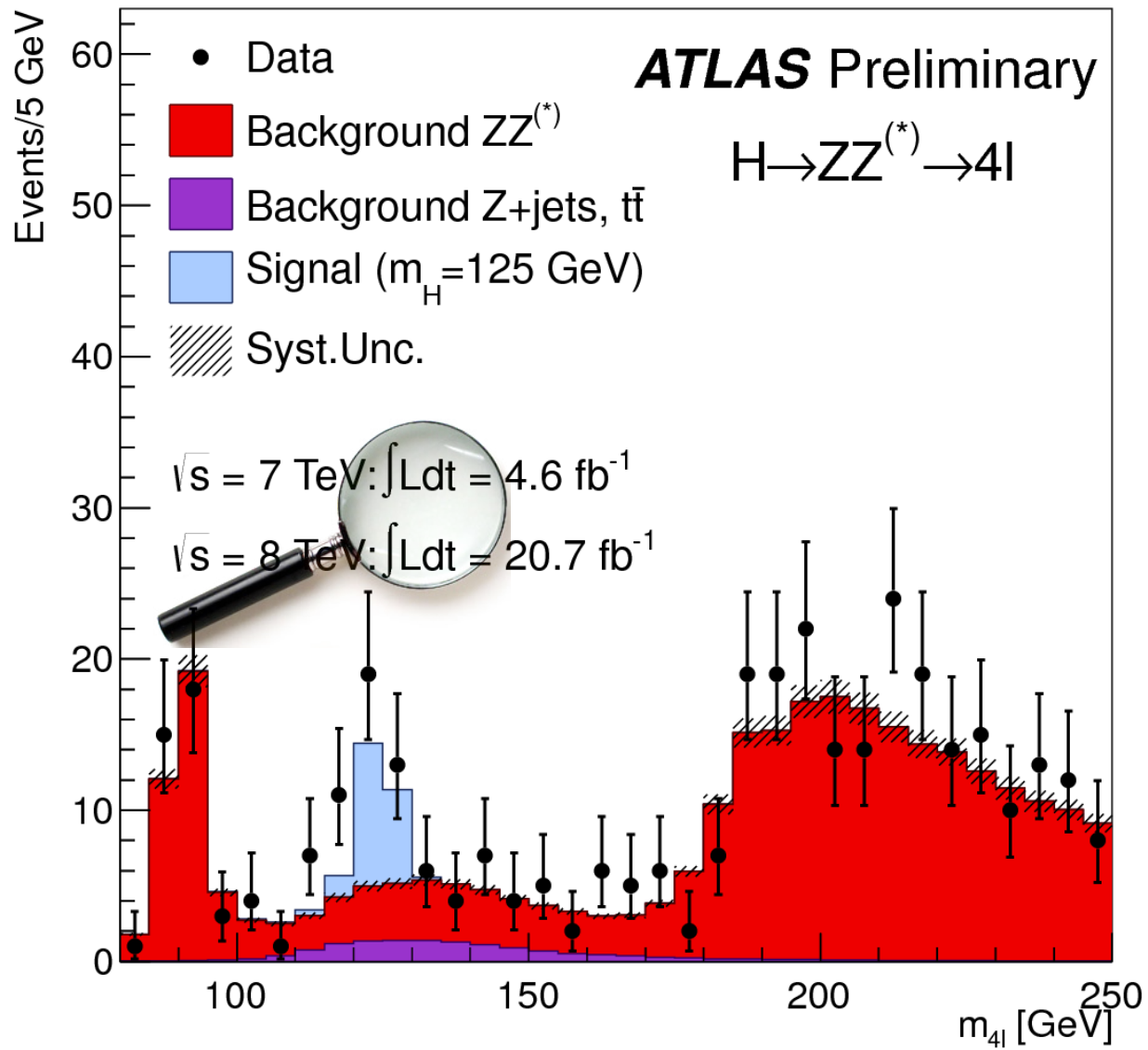


25 m

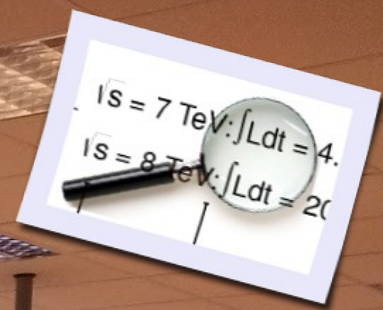


ATLAS



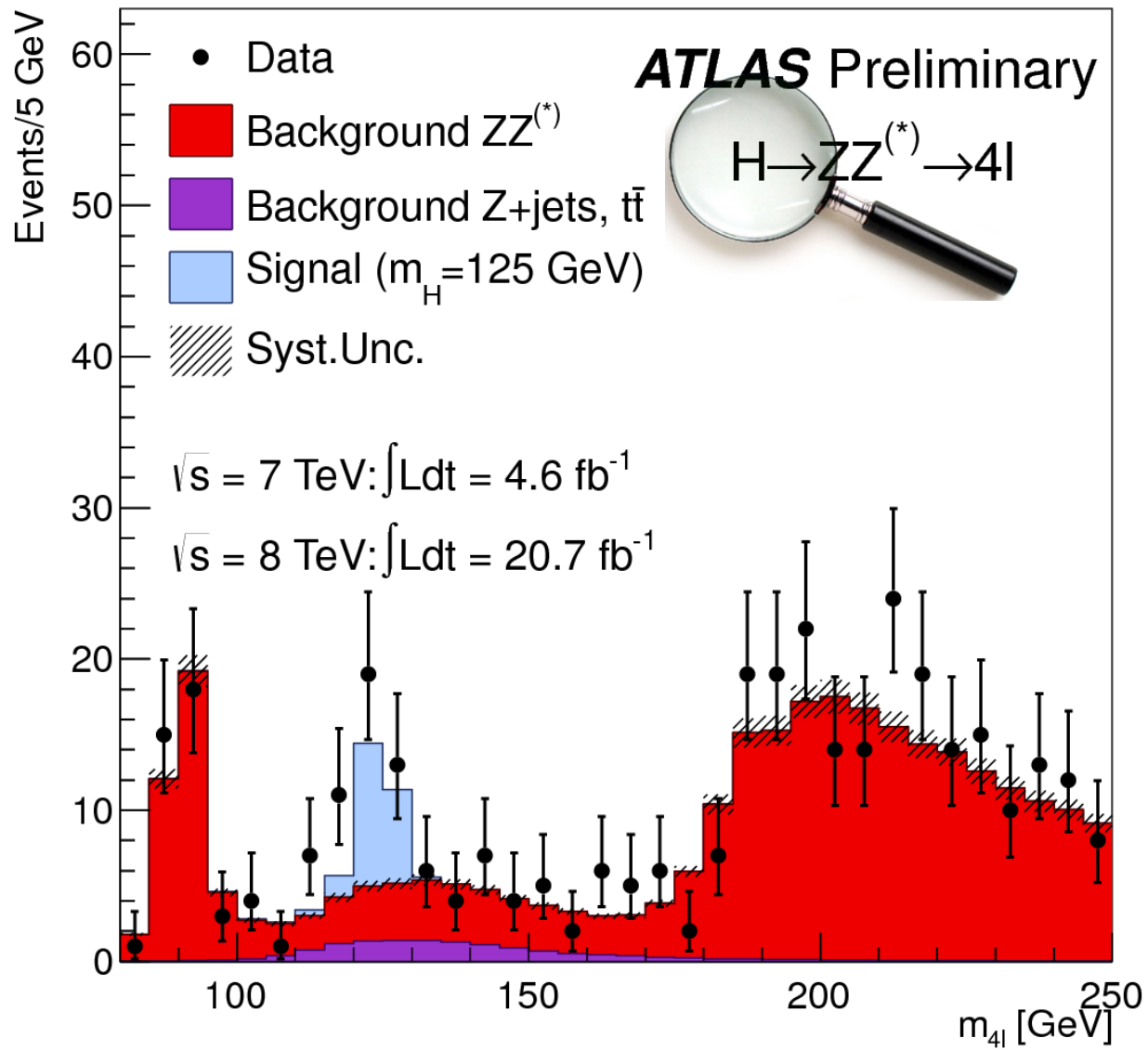


Turni di presa dati



$$s = 7 \text{ TeV} : \int L dt = 4.$$
$$s = 8 \text{ TeV} : \int L dt = 20$$





Modello standard



Materia (fermioni)

Forze (bosoni)

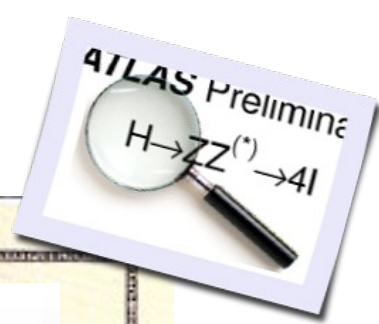
A hand-drawn diagram of the Standard Model particle zoo. It features a grid of brown cardboard pieces with various particle symbols written on them. A vertical dashed blue line separates the fermions (left) from the bosons (right). To the right of the grid is a cloud-shaped piece labeled 'Higgs'. At the bottom right, there is a white sticker with the Lagrangian for the Standard Model and the text 'STANDARD MODEL'.

u	c	t	γ	g	g
d	s	b	Z^0	g	g
ν_e	ν_μ	ν_τ	W^+	g	g
e	μ	τ	W^-	g	

Higgs

$\mathcal{L} = -\frac{1}{4}F^2 + i\bar{\Psi}\not{D}\Psi + \bar{\Psi}\phi\Psi + h.c. + |D\phi|^2 - V(\phi)$
STANDARD MODEL

Bosone di Higgs



Cognome **Bosone**
 Nome **Higgs**
 nato il **$\sim 10^{-30}$ s** dopo il BigBang
 (atto n. P. S.)
 a **Ovunque** (.....)
 Cittadinanza **Nostro universo**
 Residenza **Ovunque**
 Via.....
 Stato civile **Assai poligamo**
 Professione **Spacciatore di massa**

CONNOTATI E CONTRASSEGNI SALIENTI

Statura **Da 100 a 1000 GeV**
 Spin **0**
 Parità **+1**

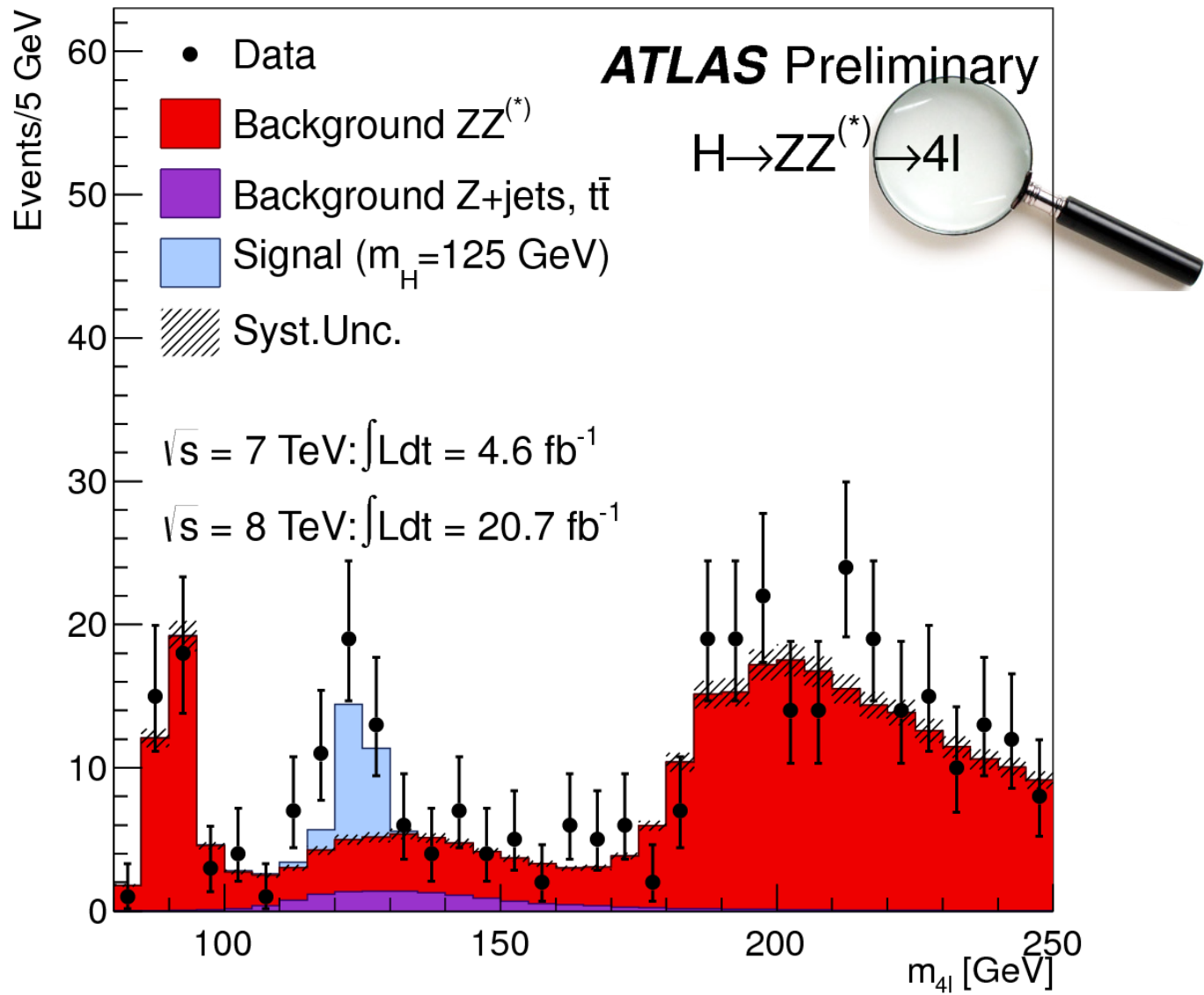
Segni particolari **Sfuggente**

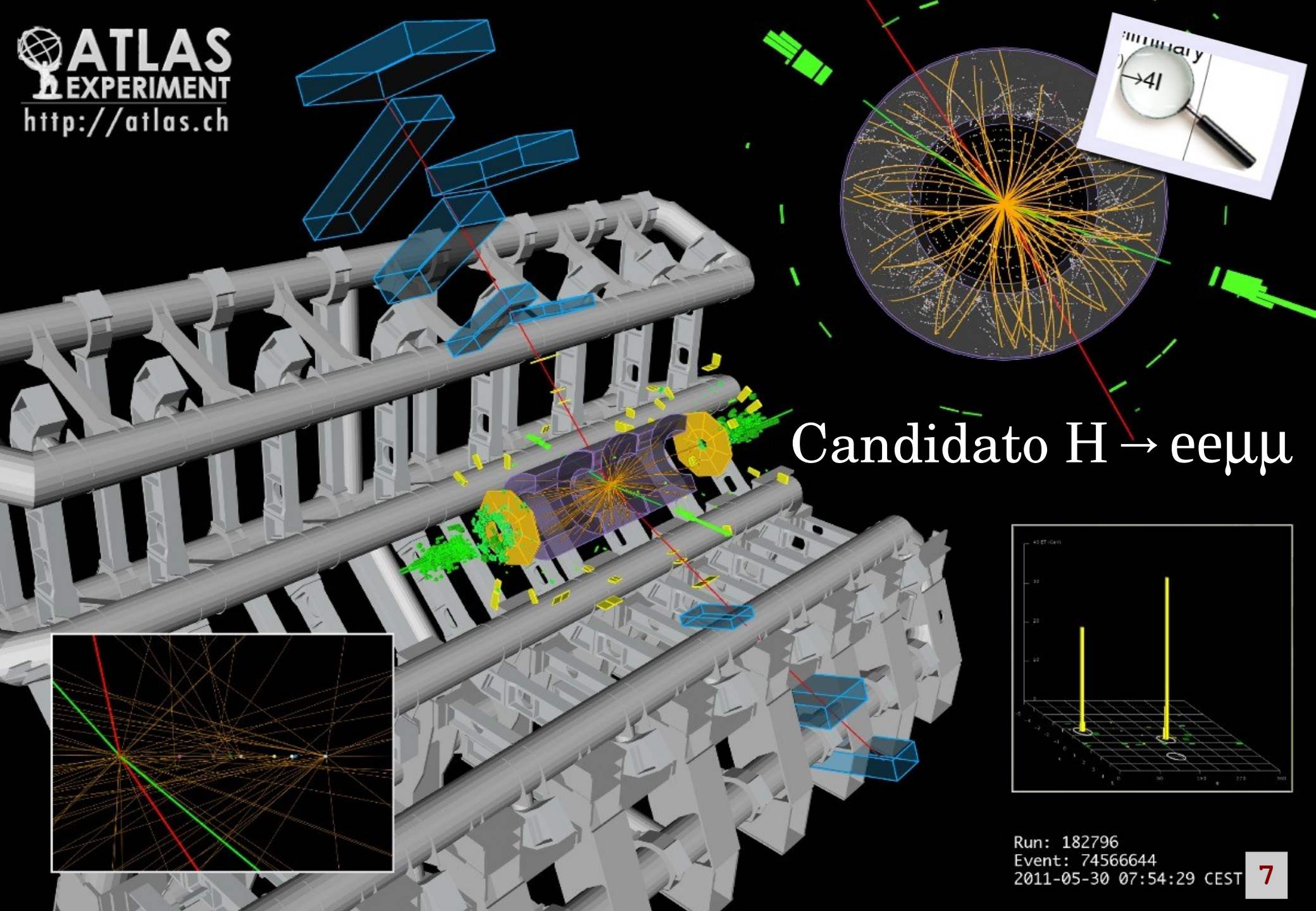
Accoppiamento con le particelle
 proporzionale alla loro massa



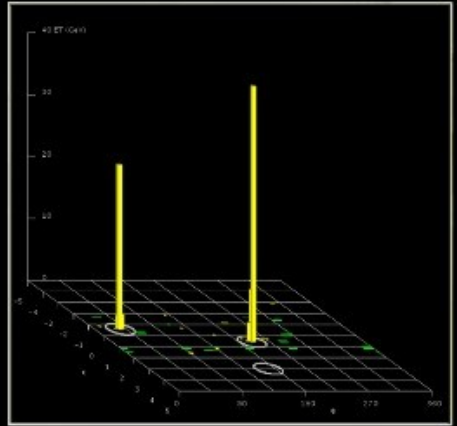
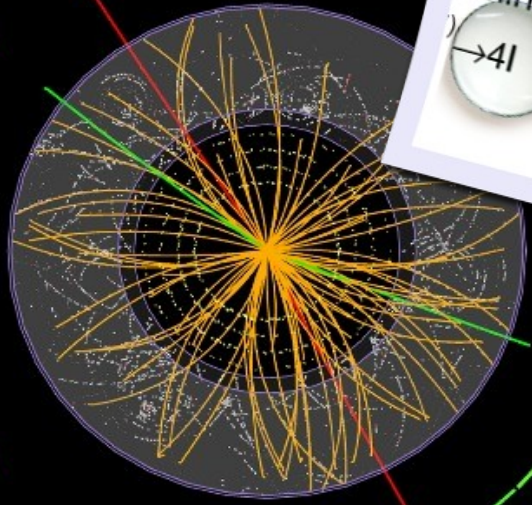
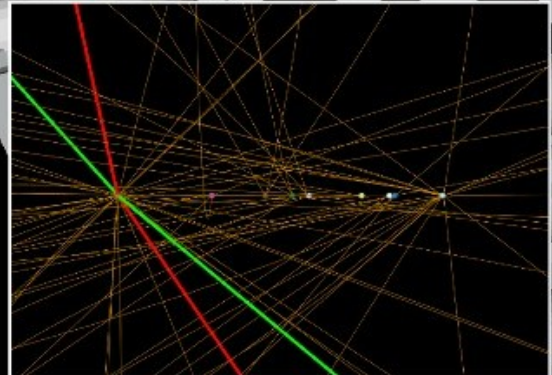
Firma del titolare **Decado in $\gamma\gamma$, WW , ZZ , bb , cc , $\tau\tau$, ecc**

Impronta del dito indice sinistro **Peter Higgs** IL SINDACO





Candidato $H \rightarrow ee\mu\mu$

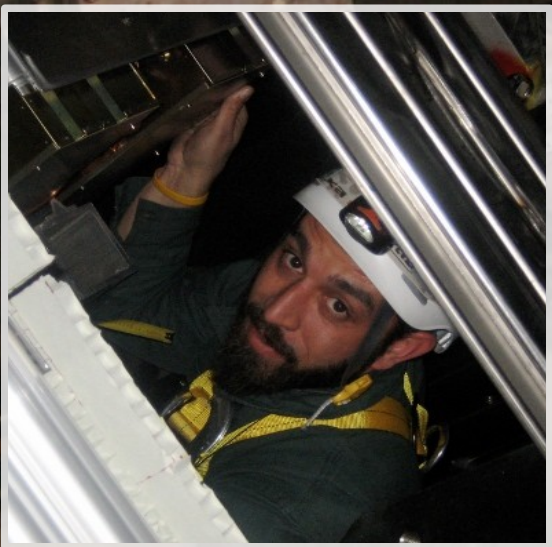


Spettrometro (2002)



Pavia

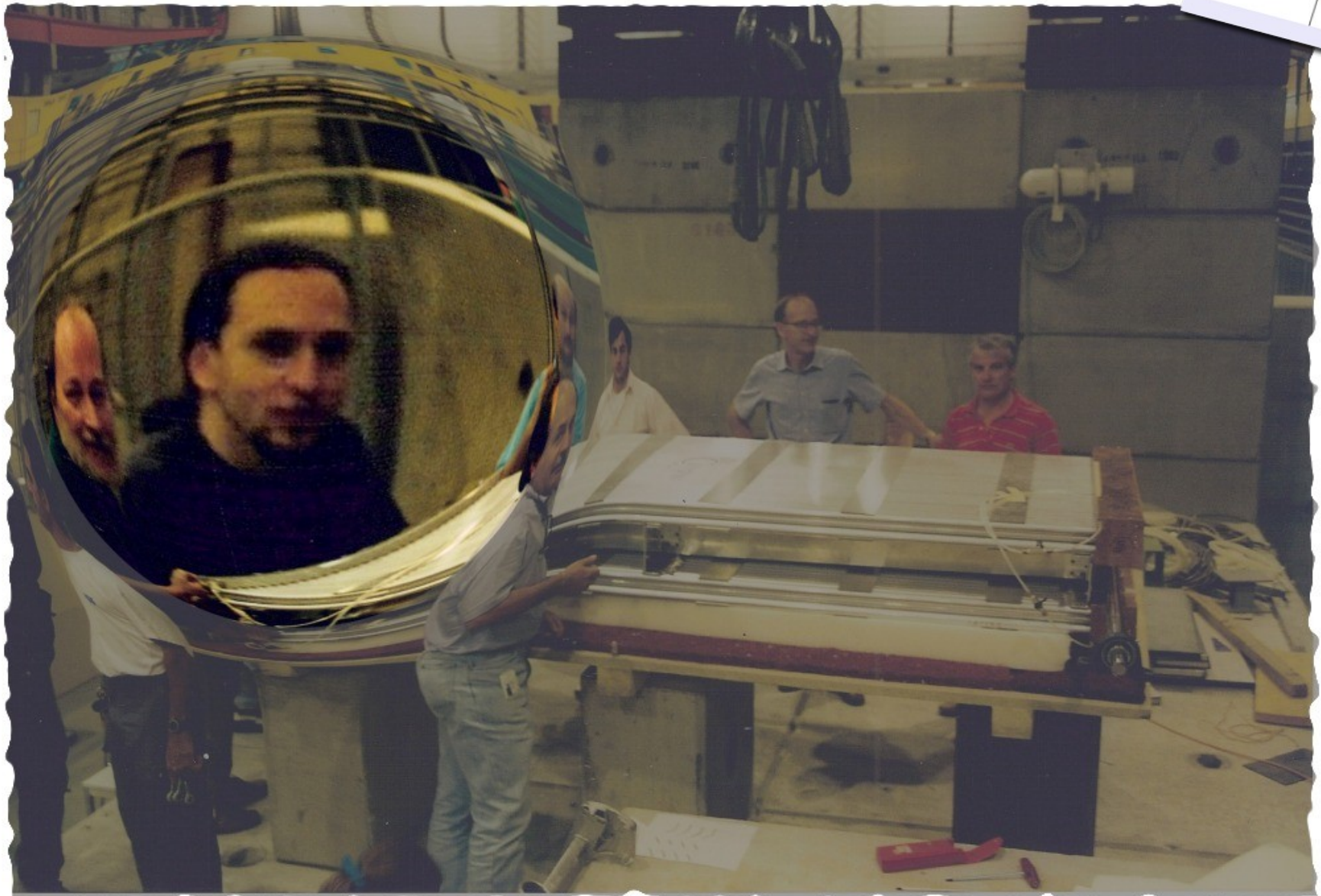
Installazione 2003-2006

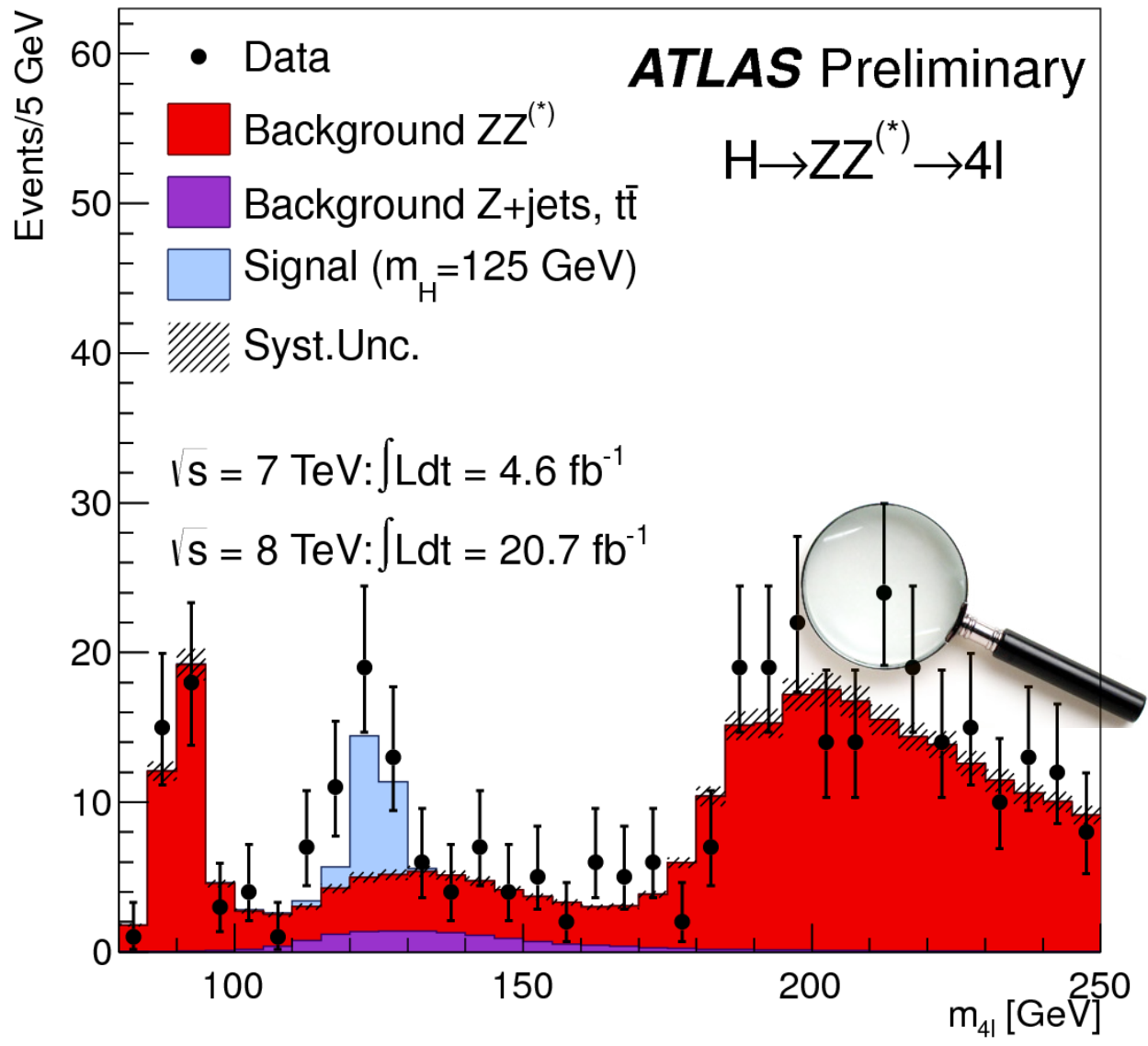


Qualche anno prima ...

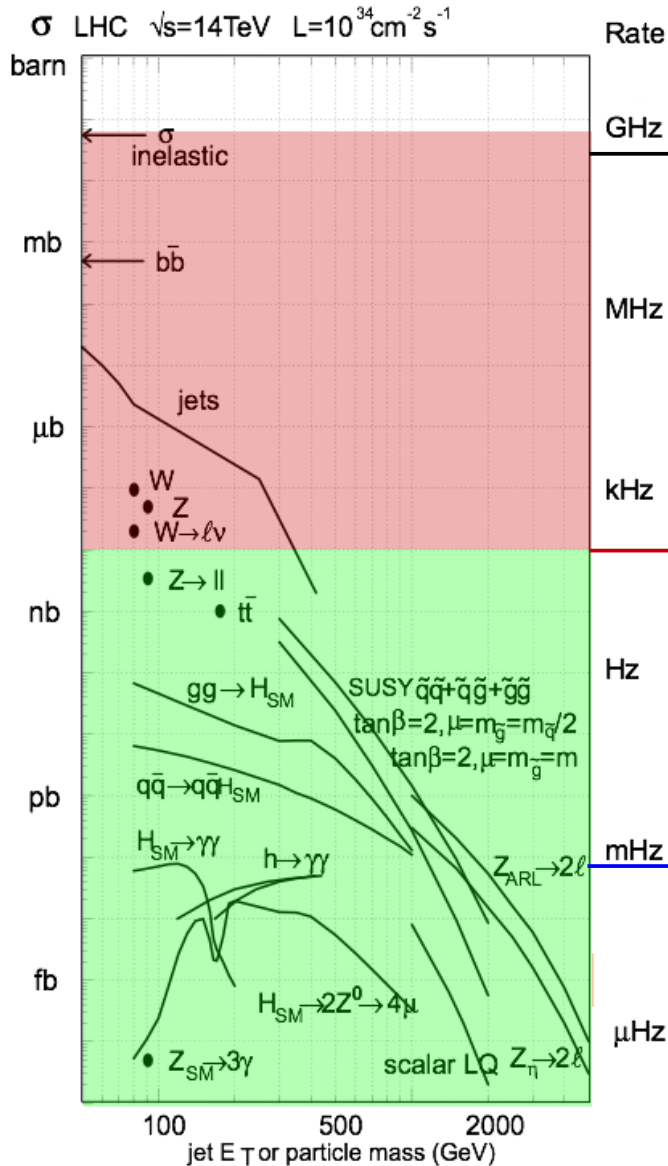


... $O(10^6)$ capelli fa





Eventi rari



Collisioni (60 TB/s)

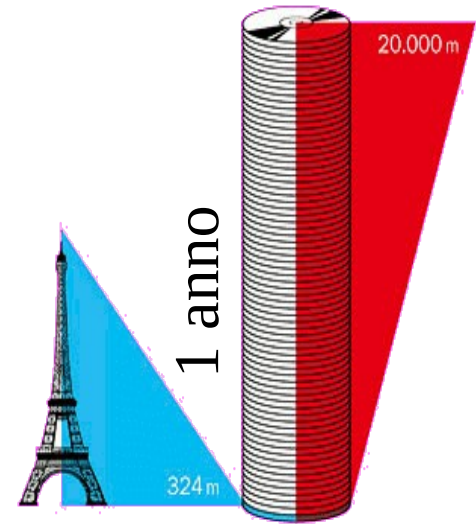
10^8 canali

Scrittura (600 MB/s)

$1/10^5$ collisioni

Higgs

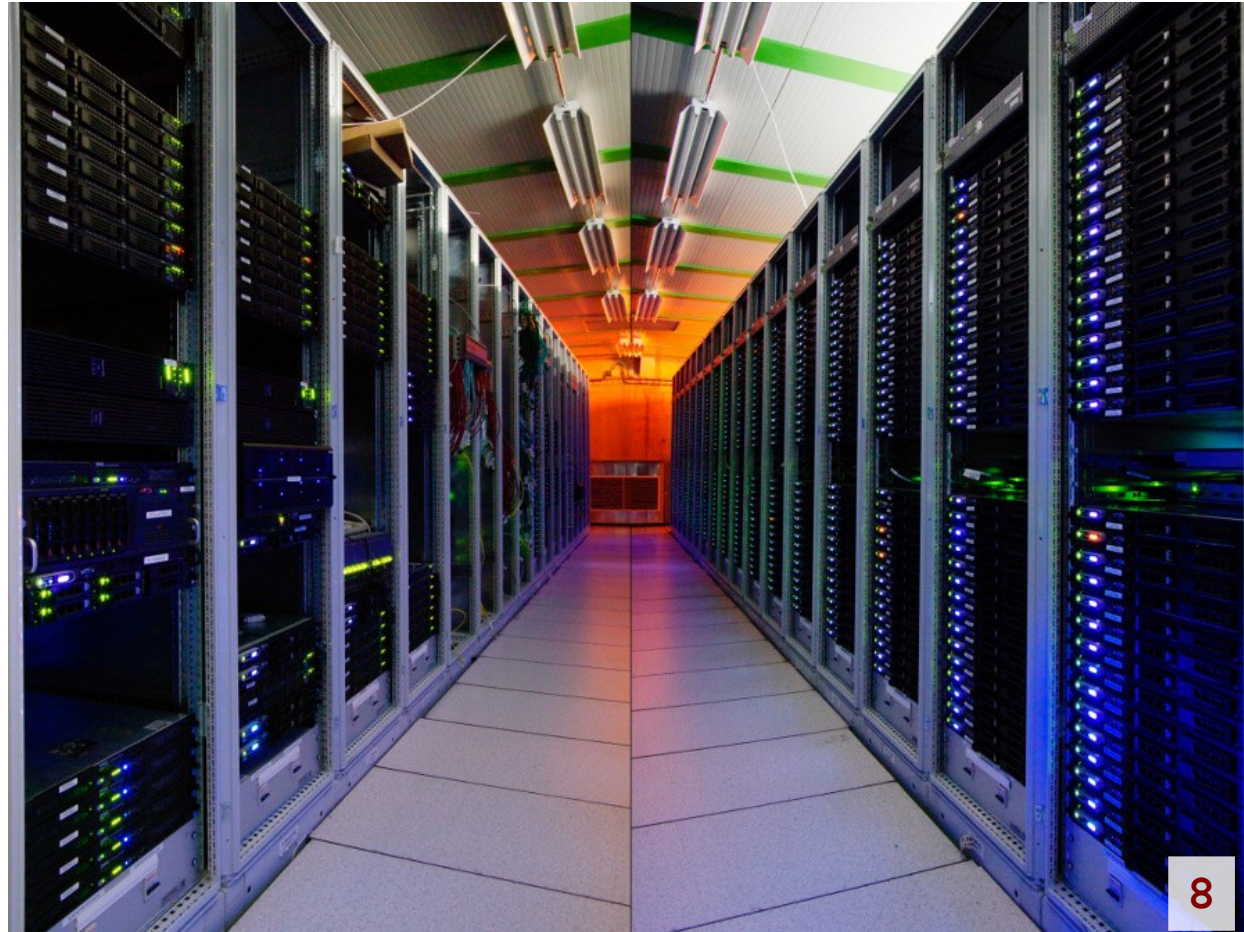
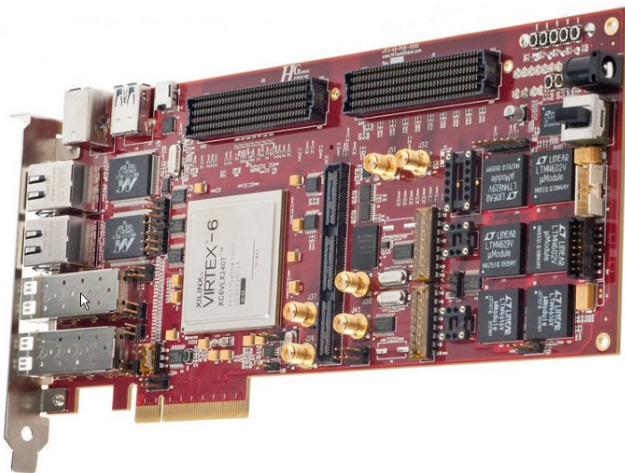
$1/10^{10}$ collisioni

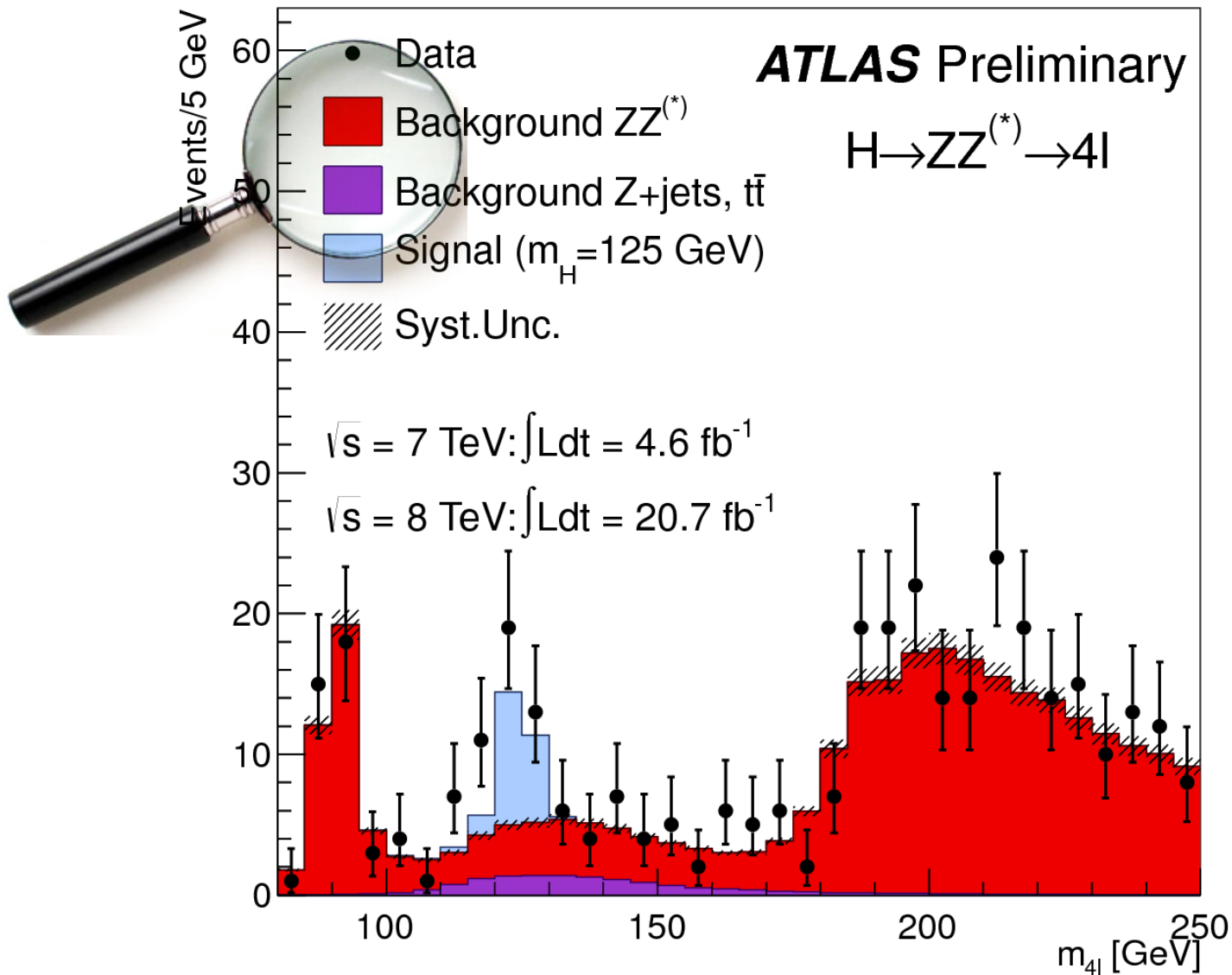


Trigger & DAQ



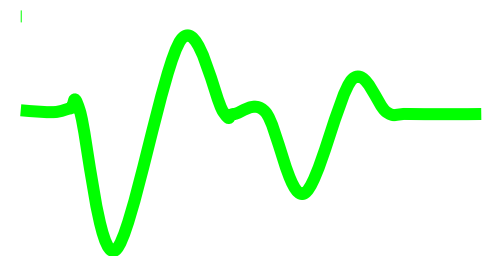
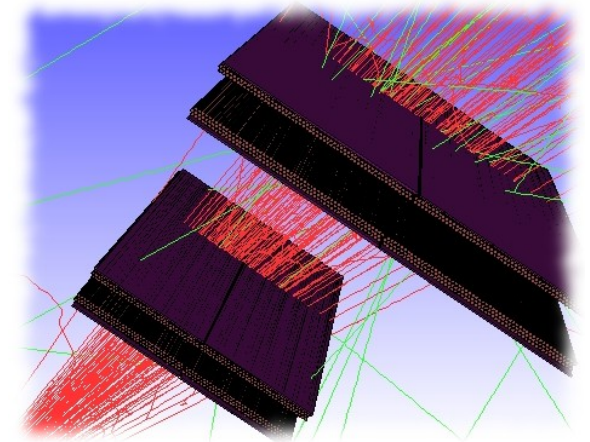
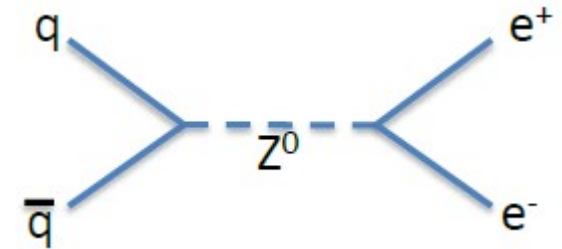
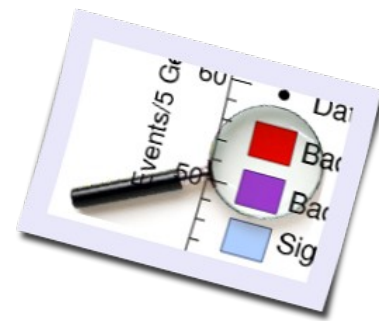
- Seguire/guidare lo sviluppo tecnologico in elettronica, telecomunicazioni, informatica, ...

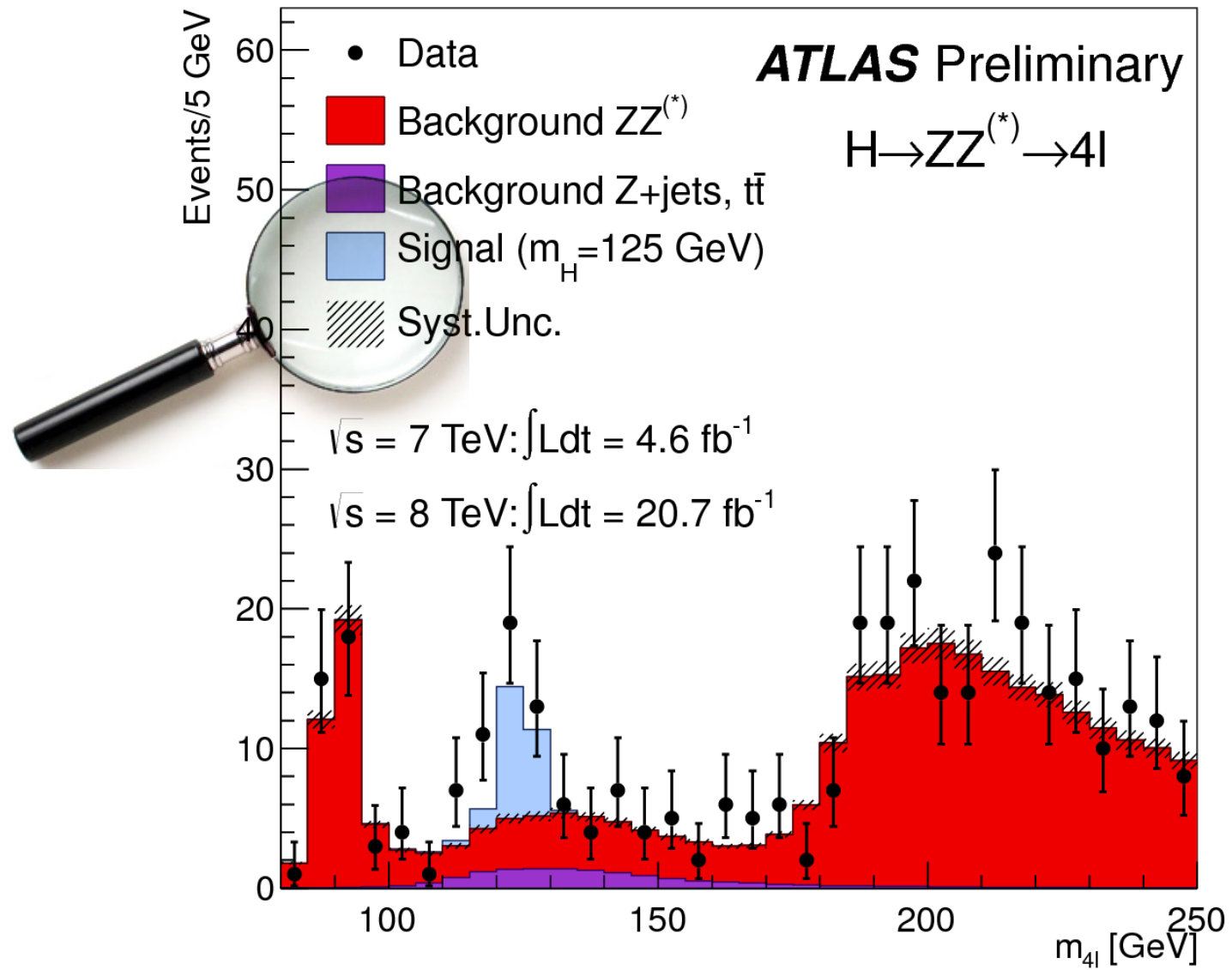




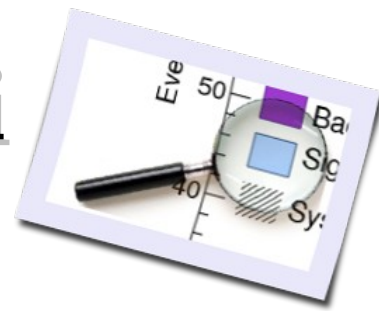
Simulazione

- Simulazione delle interazioni fisiche
 - Quadrivettori delle particelle prodotte
- Simulazione del detector
 - Propagazione delle particelle in ATLAS
- Simulazione risposta dell'elettronica
 - Dati simili a quelli forniti dal rivelatore
0xaa1234aa 0x00002123 0x2378ab67 ...

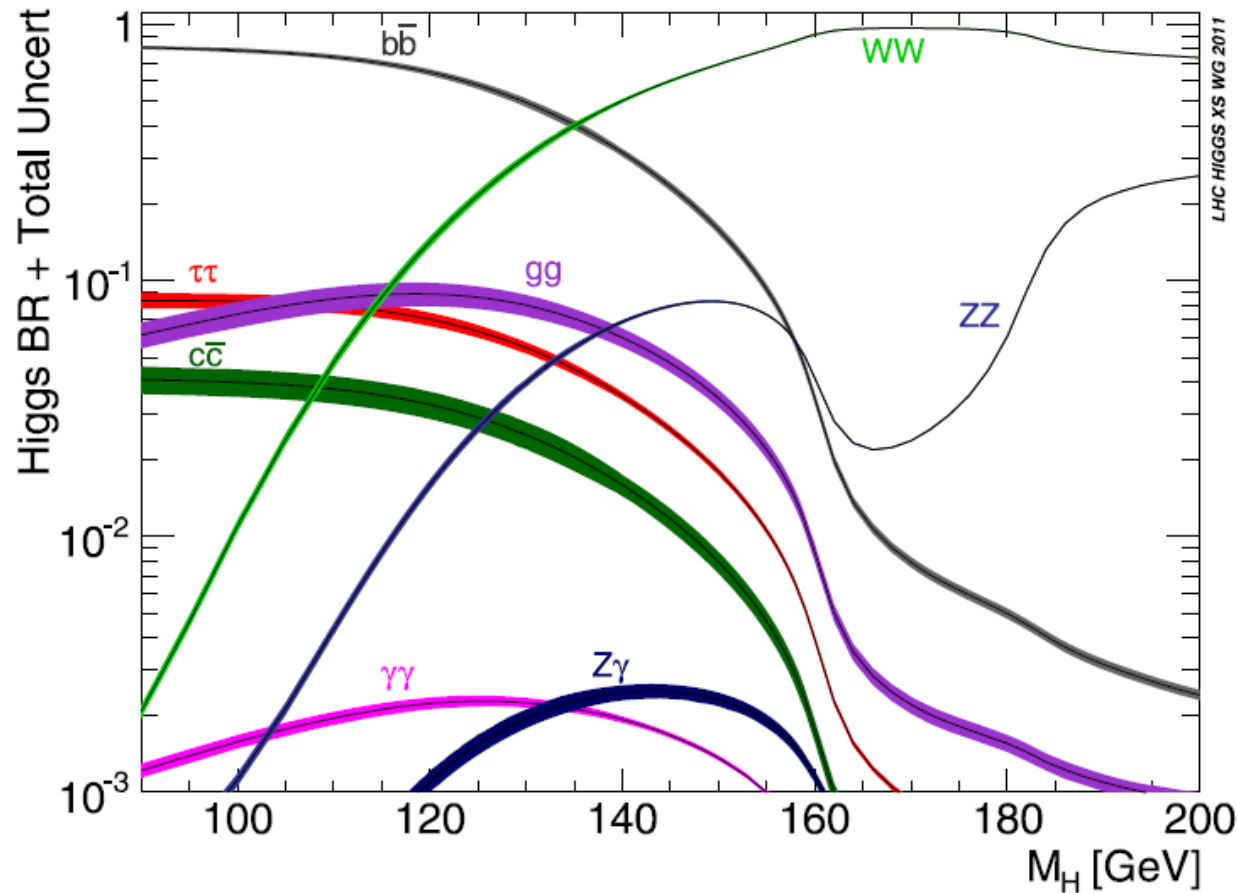


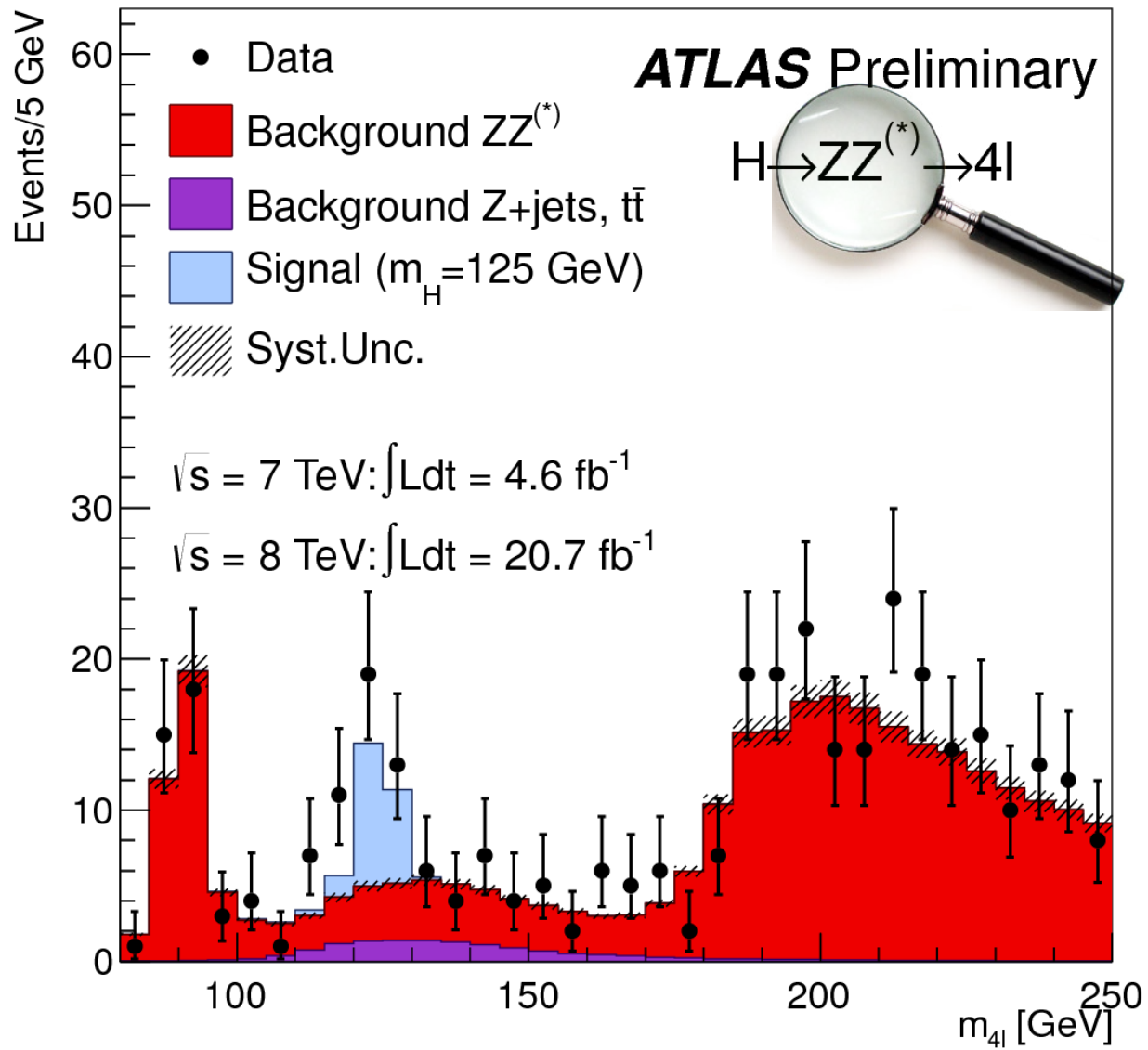


Teorici \Leftrightarrow Sperimentali



- Sezioni d'urto e branching ratio
→ input per la simulazione

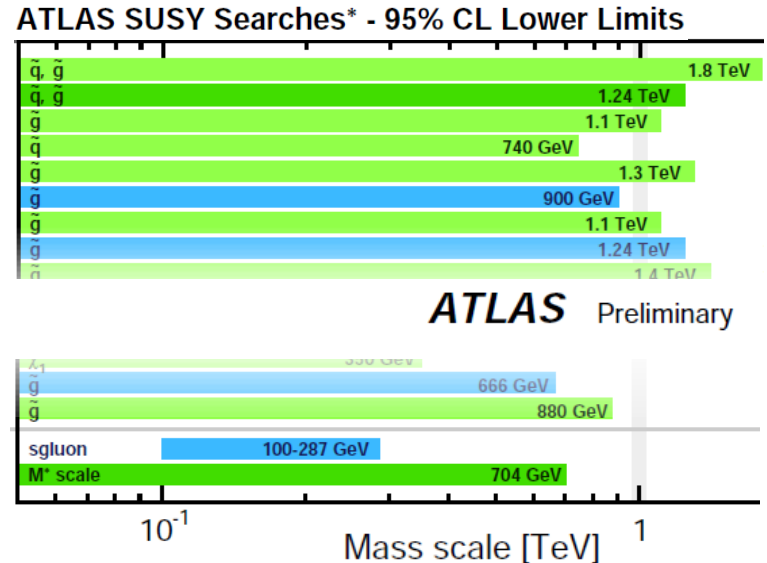
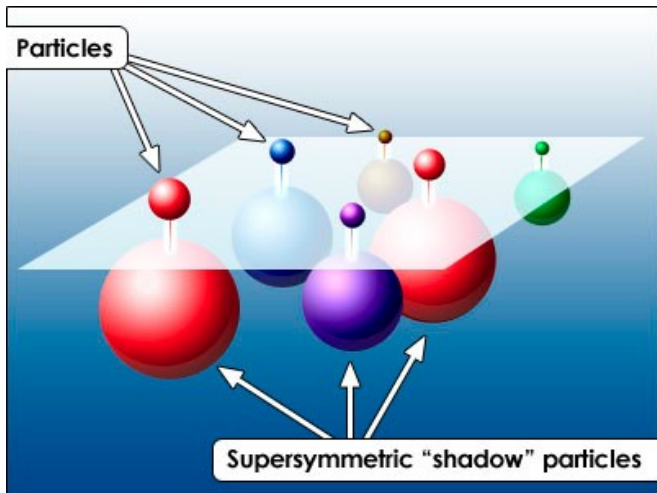
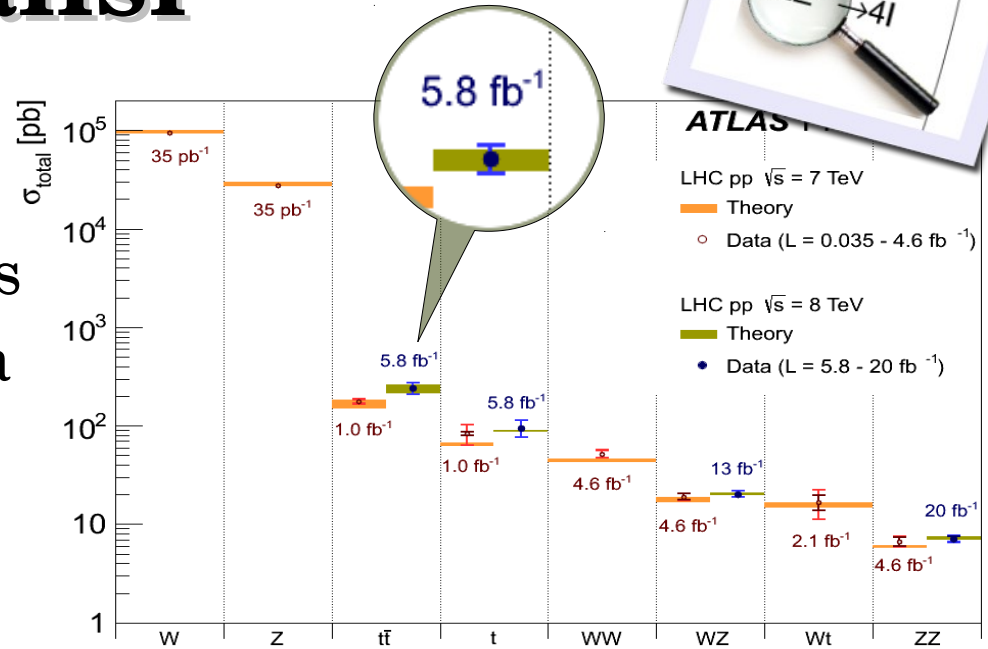




Analisi

- Modello Standard
 - Fondo per l'analisi dell'Higgs
 - Indicazioni di possibile fisica "oltre il Modello Standard"

- Ricerca supersimmetrie
 - fermioni \leftrightarrow bosoni



SHUTDOWN: NO BEAM

Comments (16-Feb-2013 08:25:13)

*** END OF RUN 1 ***

No beam for a while. Access required
time estimate: ~2 years

BIS status and SMP flags

B1 B2

Link Status of Beam Permits

false false

Global Beam Permit

false false

Setup Beam

true true

Beam Presence

false false

Moveable Devices Allowed In

false false

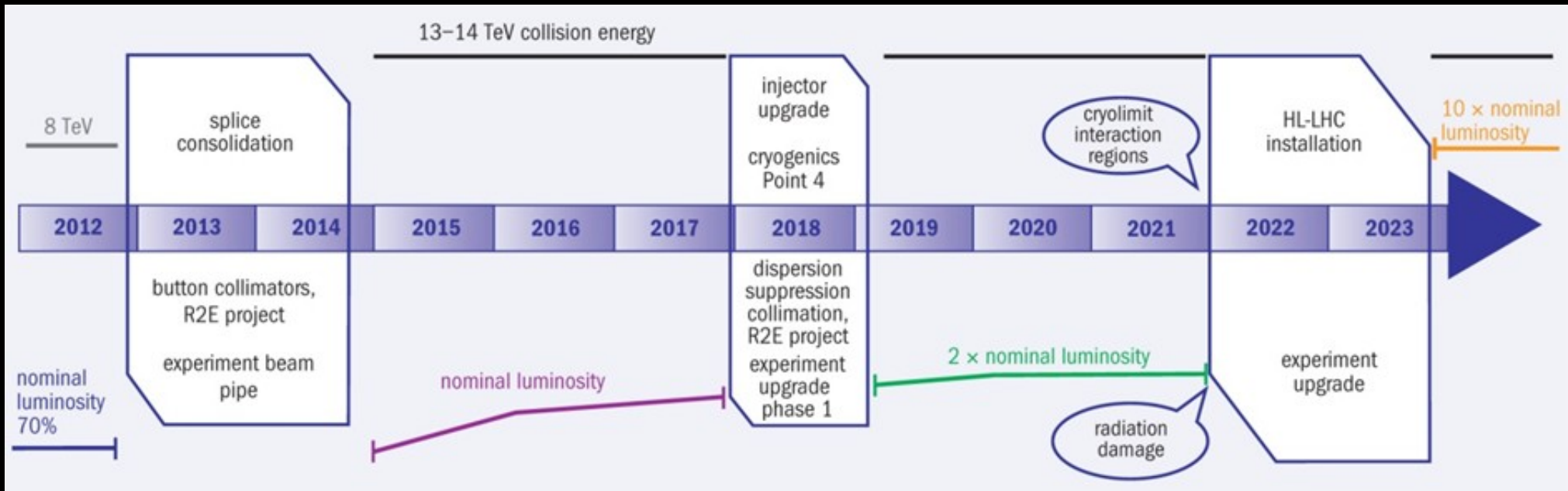
Stable Beams

false false

SHUTDOWN: NO BEAM

Ma è solo l'inizio

→ Proprietà H, SUSY, sotto-strutture dei quark, extra-dimensions, ???, ...

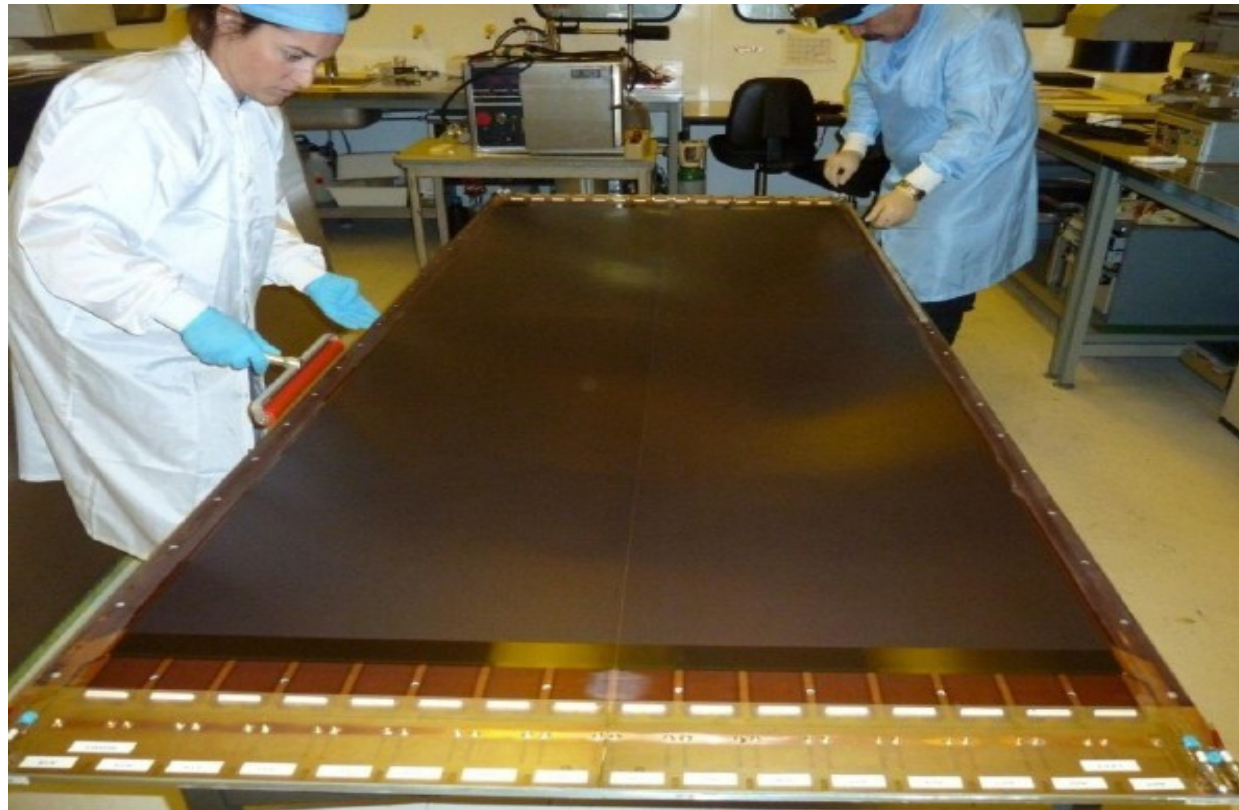
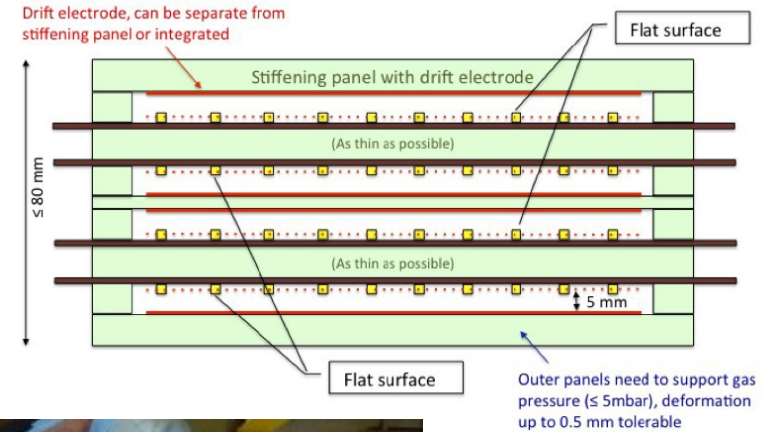


BIS status and SMP flags		B1	B2
<p>Comments (16-Feb-2013 08:25:13) *** END OF RUN 1 ***</p> <p>No beam for a while. Access required time estimate: ~2 years</p>	Link Status of Beam Permits	false	false
	Global Beam Permit	false	false
	Setup Beam	true	true
	Beam Presence	false	false
	Moveable Devices Allowed In	false	false
	Stable Beams	false	false

LHC Upgrade: detectors

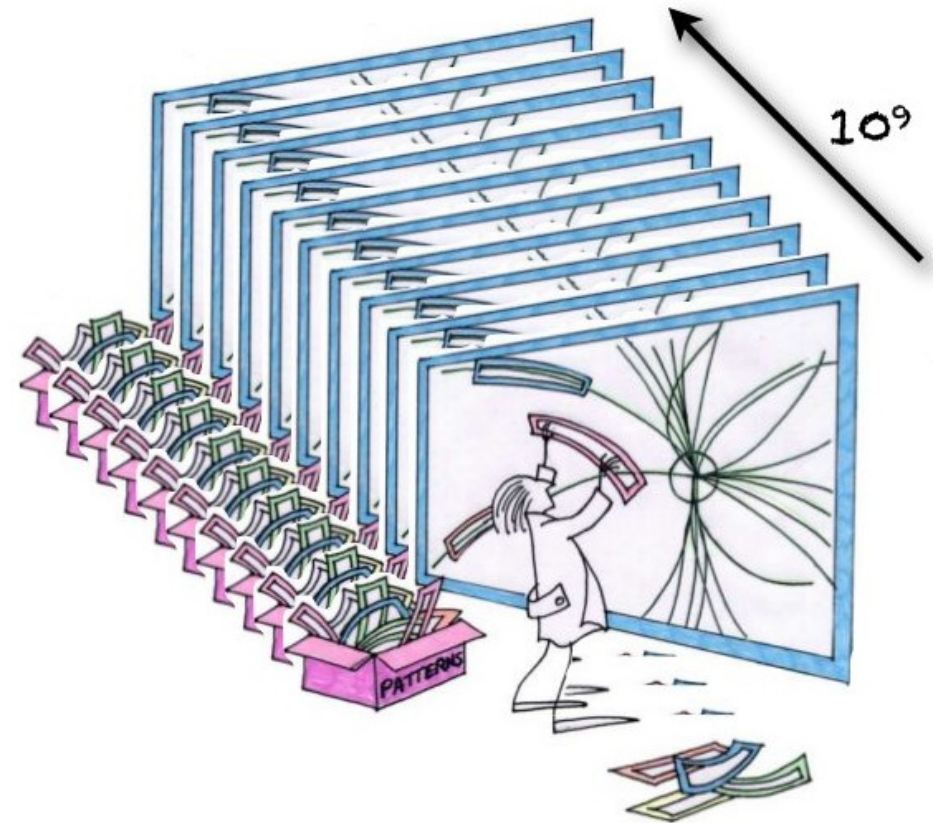
Micro Mega

- Design, caratterizzazione, realizzazione, test, installazione, ...



LHC Upgrade: trigger

- Memorie associative per la ricostruzione online delle tracce nel rivelatore



- Ricadute multidisciplinari
 - Analisi di immagini in tempo reale (diagnostica medica)
 - Super-computers a tecnologia ibrida (CPU & AM & FPGA)
 - Simulazione in-silico del cervello umano



www.atlas.ch

web.infn.it/atlas