



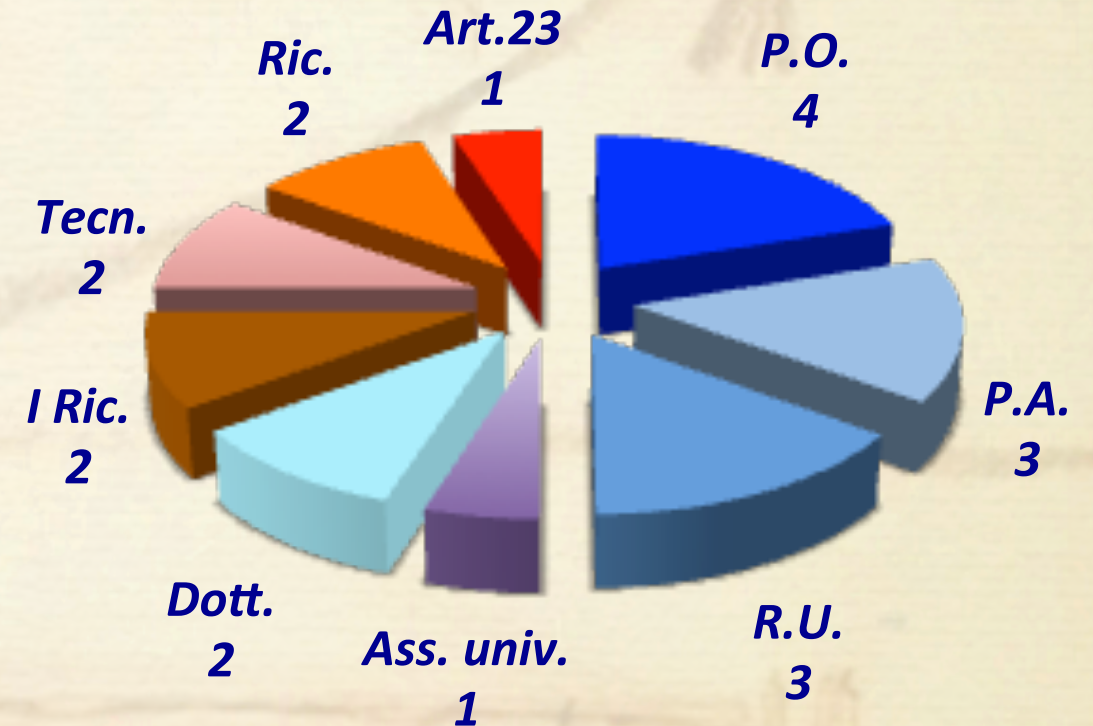
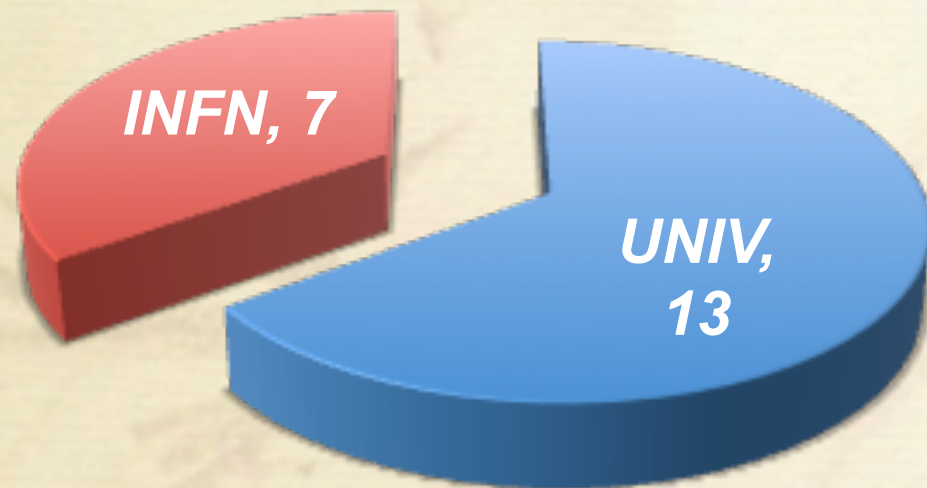
ATLAS STATUS

MEETING ANNUALE DEL GRUPPO I DI NAPOLI

21 DICEMBRE 2011

D. DELLA VOLPE

ATLAS NAPOLI



- Aloisio Alberto
- ***Alvigi Mariagrazia***
- Canale Vincenzo
- Carlino Gianpaolo
- Cevenini Francesco
- Chiefari Giovanni
- Conventi Francesco
- de Asmundis Riccardo
- Della Pietra Massimo
- della Volpe Domenico
- Doria Alessandra

- Iengo Paolo
- Izzo Vincenzo
- Merola Leonardo
- Patricelli Sergio
- Sekhniaidze Givi
- Di Donato Camilla
- Giordano Raffaele
- Musto Elisa
- Russo Guido
- Sanchez Arturo

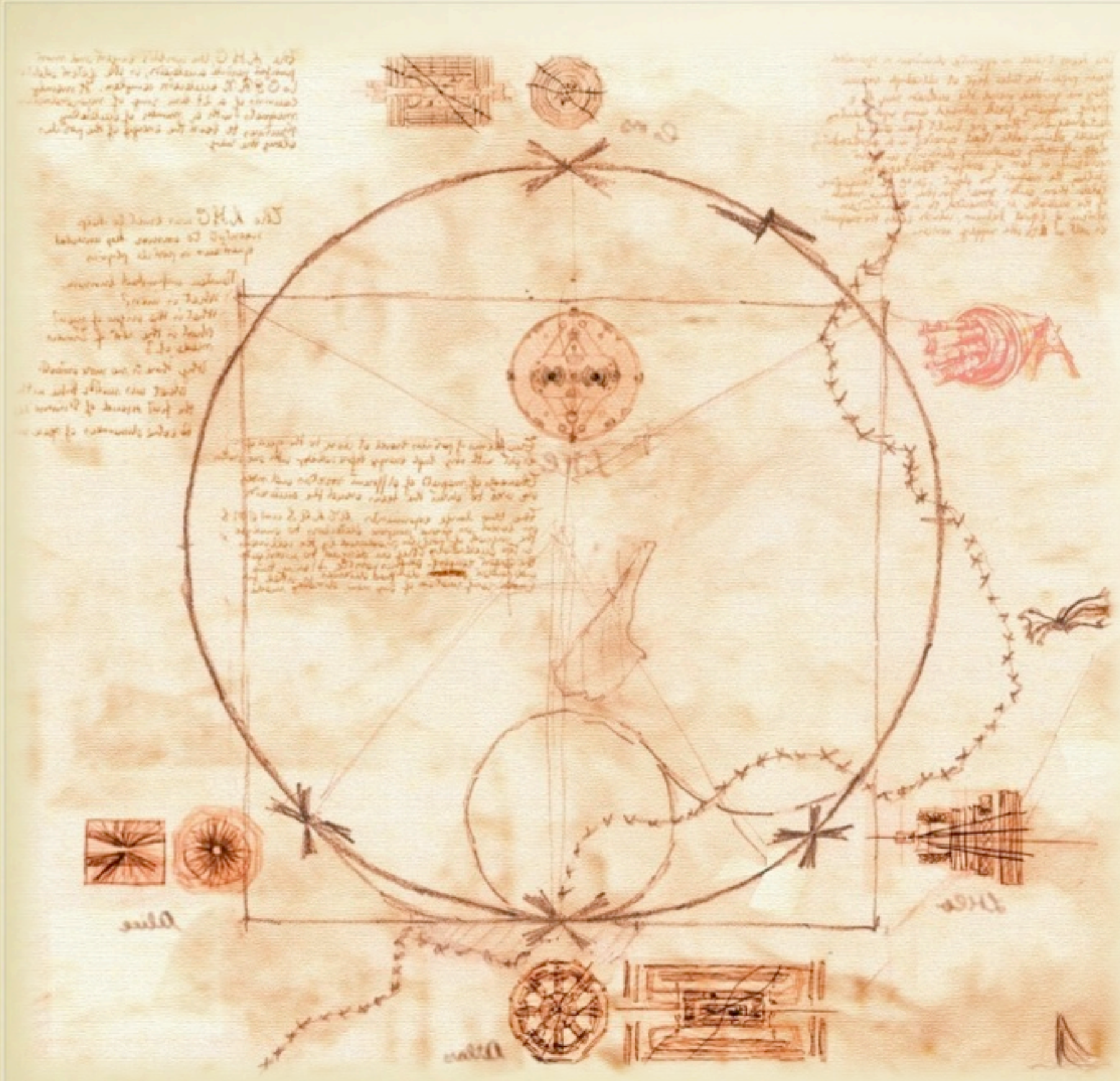
Laureandi

- ***Triennali:***

***Noemi Calace,
Claudio Savarese***

- ***Magistrali:***

***Mirko Casolino,
Sabrina Perrella***

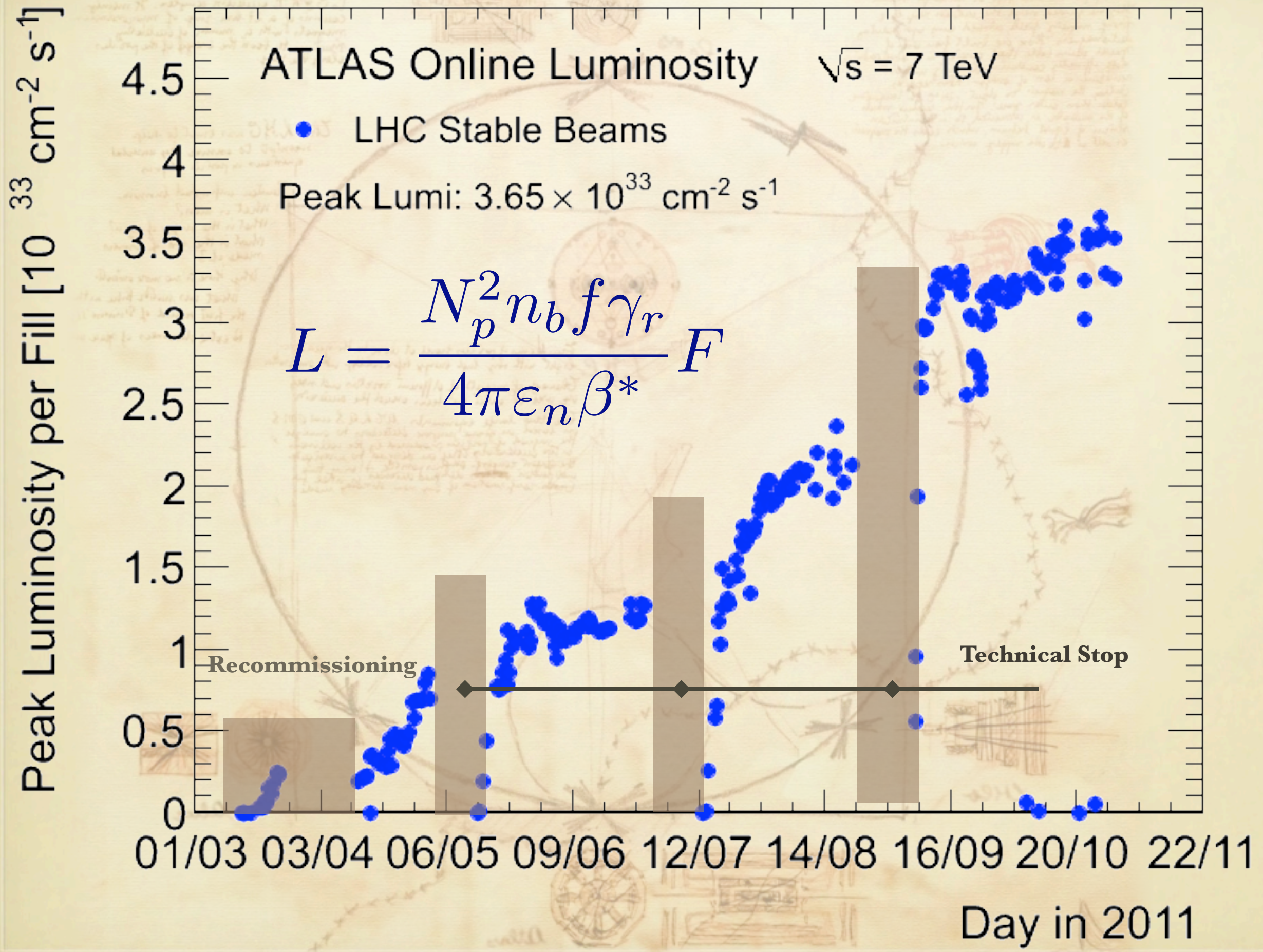


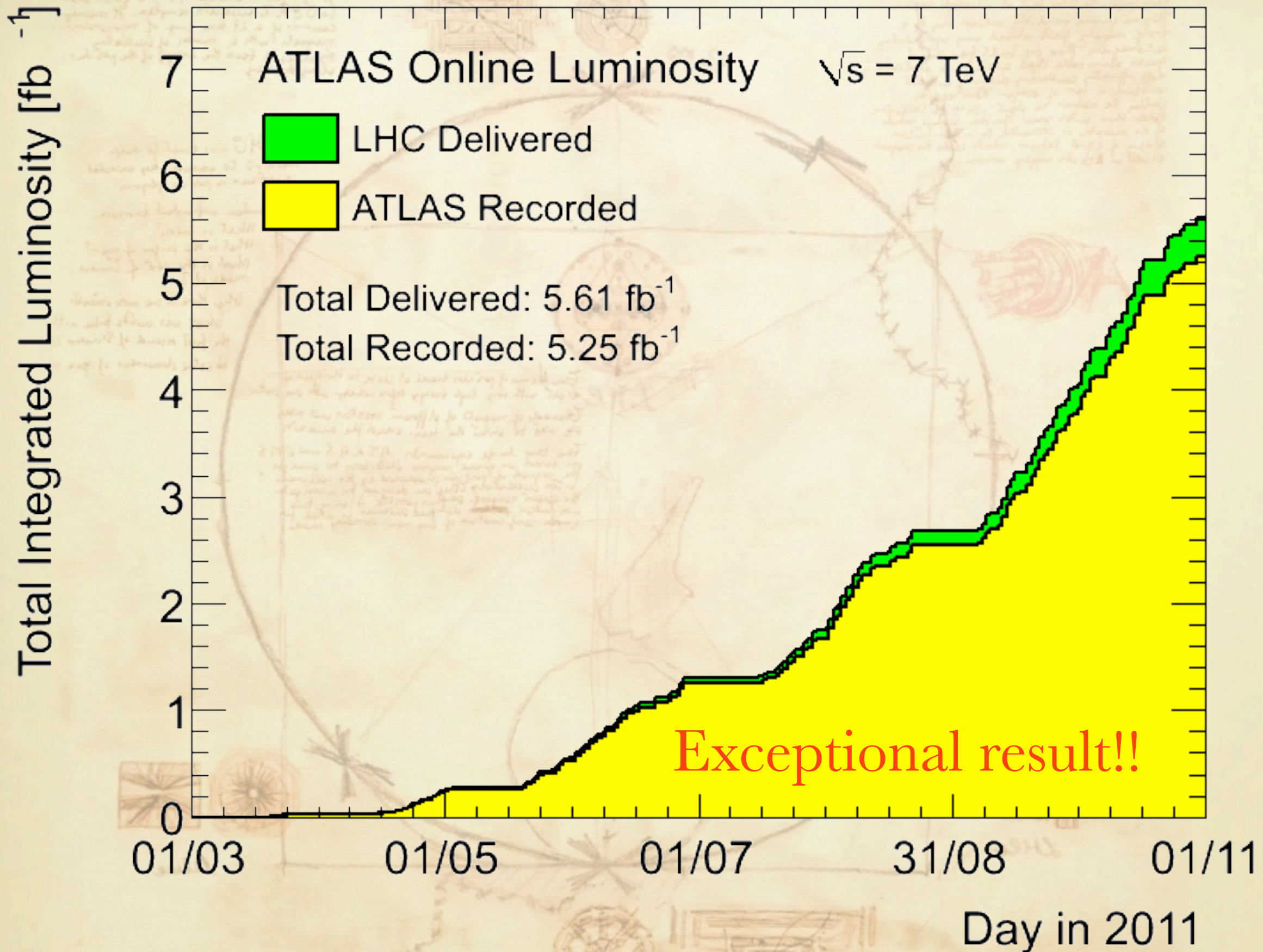
LHC Performance in 2011

ATLAS Online Luminosity $\sqrt{s} = 7$ TeV

● LHC Stable Beams
Peak Lumi: $3.65 \times 10^{33} \text{ cm}^{-2} \text{ s}^{-1}$

$$L = \frac{N_p^2 n_b f \gamma_r}{4\pi \epsilon_n \beta^*} F$$





THE ATLAS DETECTOR

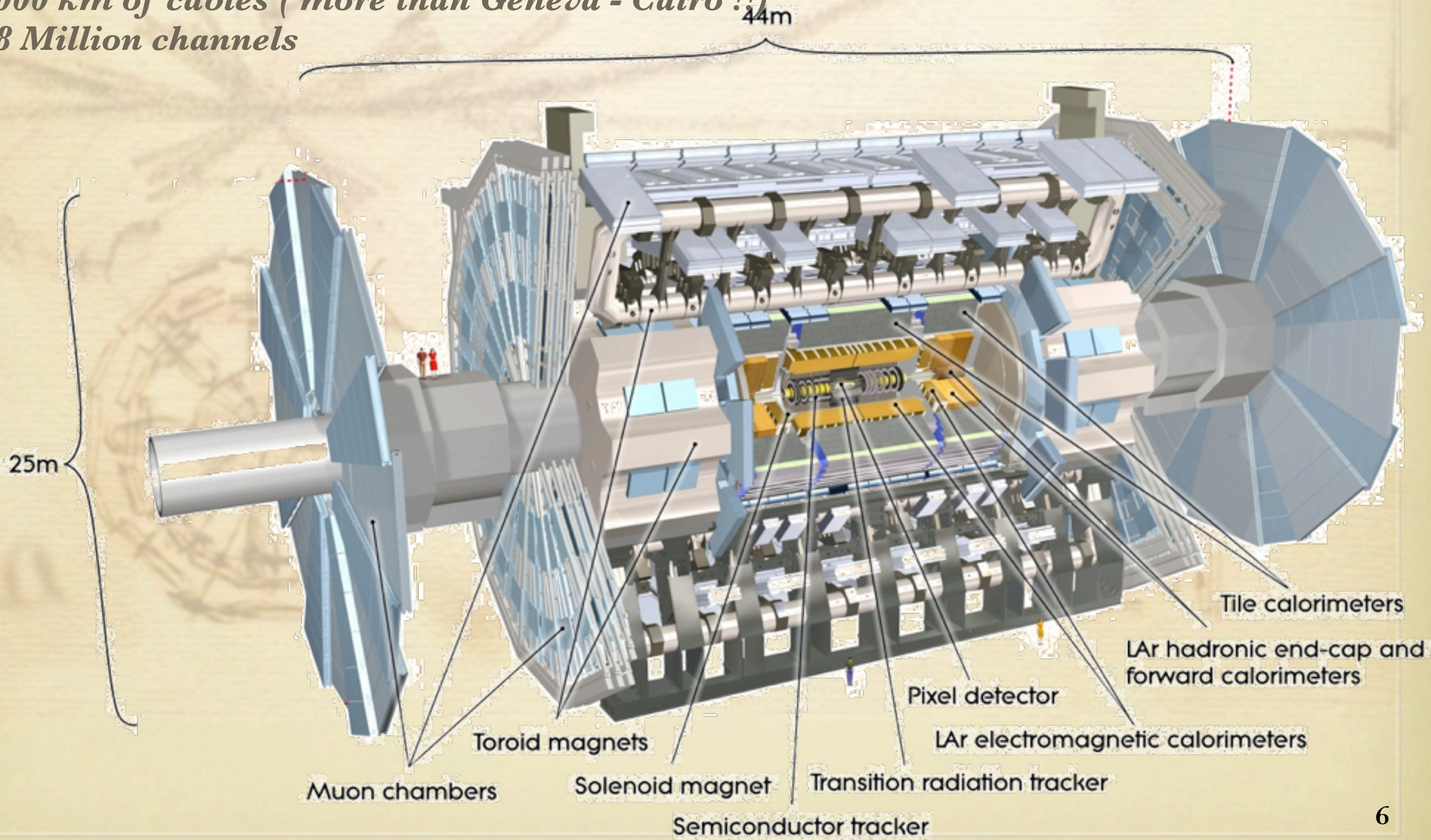
Toroid (~ 0.5T in barrel; ~1T end-cap)

2T solenoid

7000 tons (~ tour Eiffel)

3000 km of cables (more than Geneva - Cairo !!)

88 Million channels



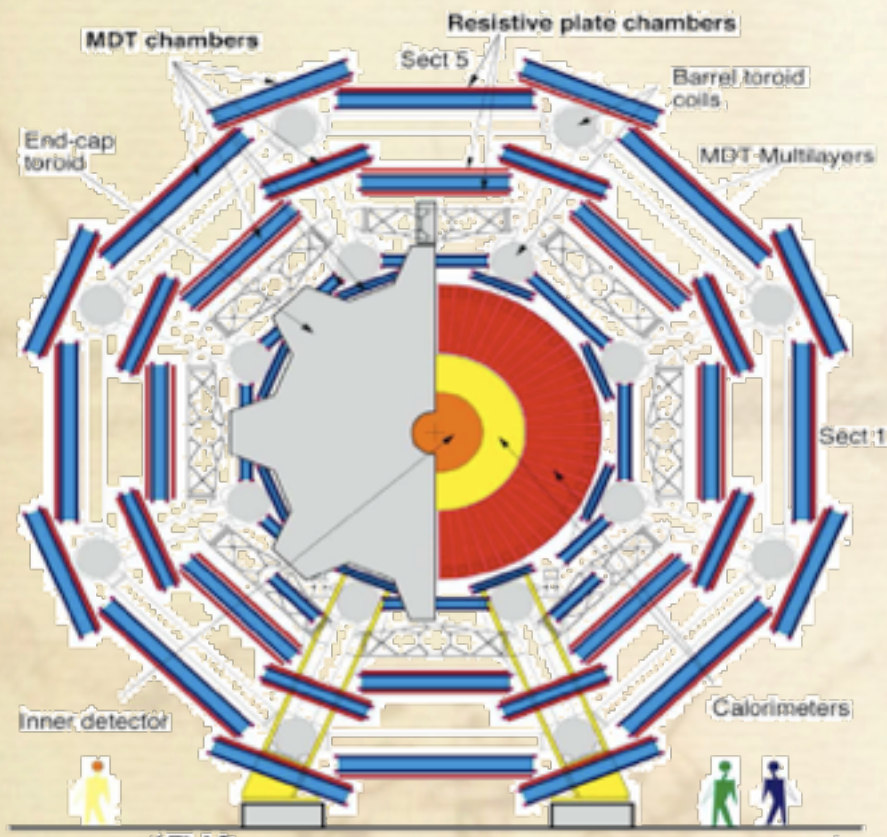
Hector Berlioz, "Les Troyens", opera in five acts

Valencia, Palau de les Arts Reina Sofia, 31 October -12 November 2009

MUON SPECTROMETER



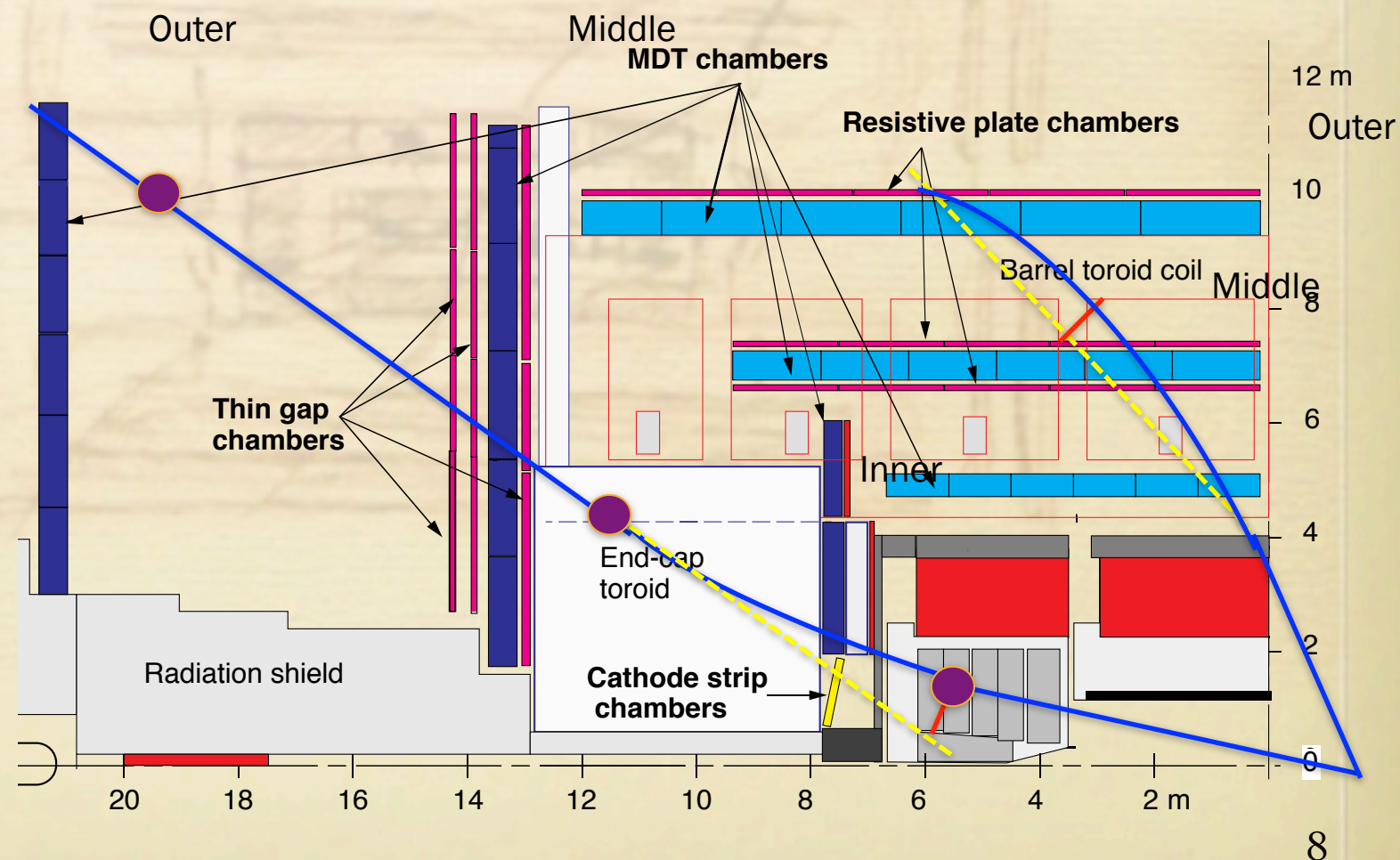
THE ATLAS MUON SPECTROMETER



- The ATLAS muon spectrometer (MS):
 - Air-core toroid magnetic field:
 - Covers up to $|\eta| = 2.7$
 - Triggers on muons (single and di-muon)
 - Standalone operation + extrap. to vertex
 - Combined mode with ID

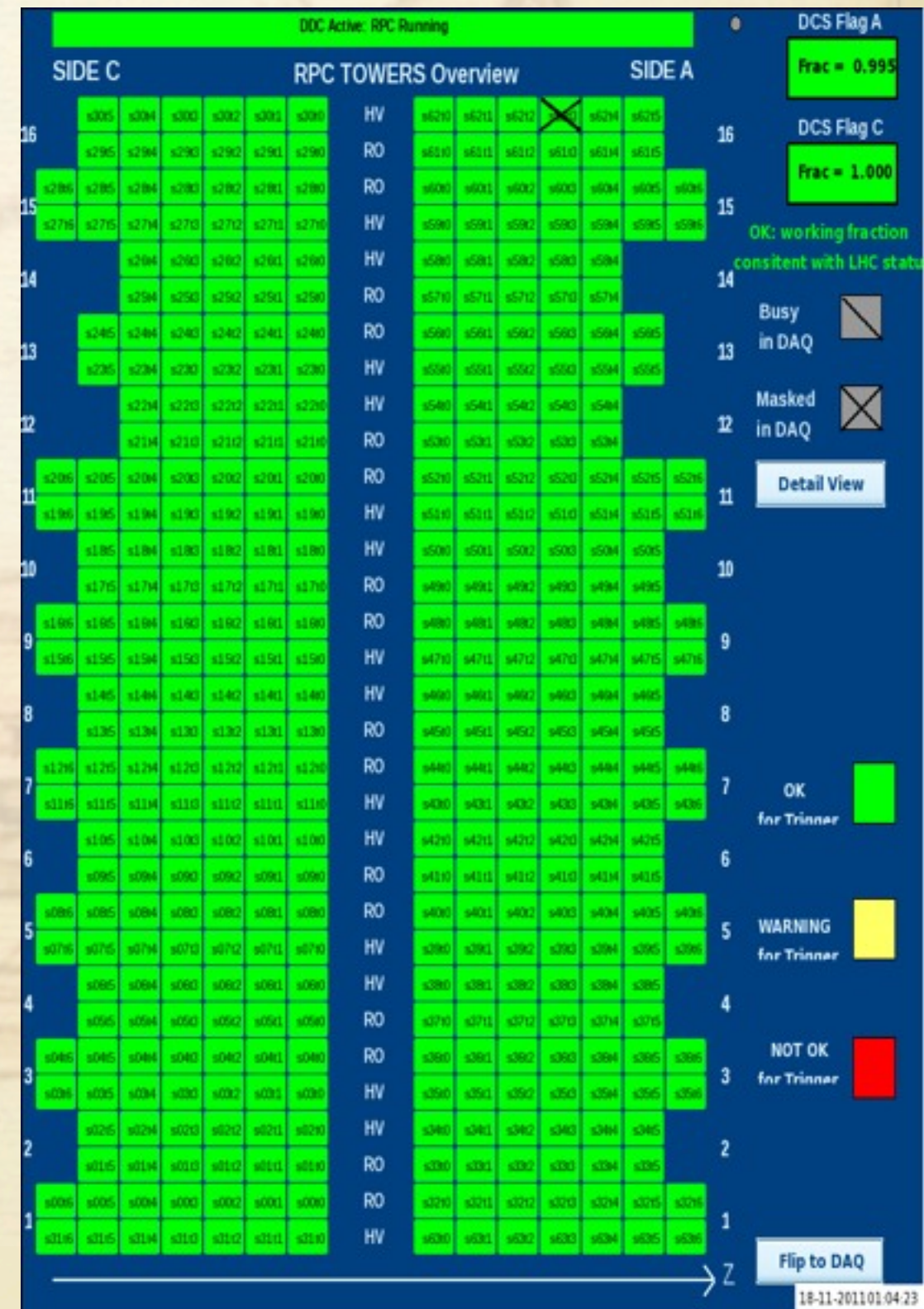
How muons are detected:

- filtering provided by the calorimeters
- tracking in B field for momentum
- measurement matching with Inner Detector (ID) to improve resolution and vertex capabilities



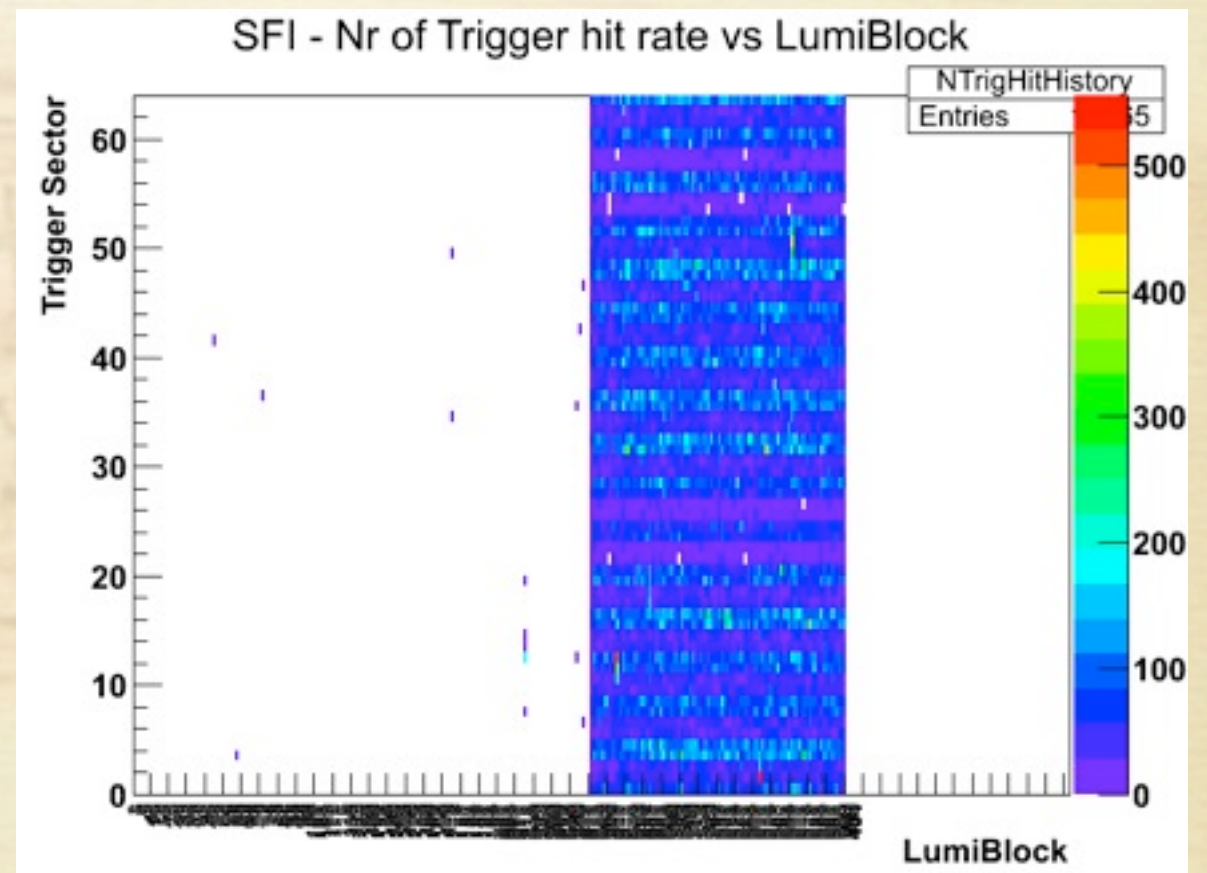
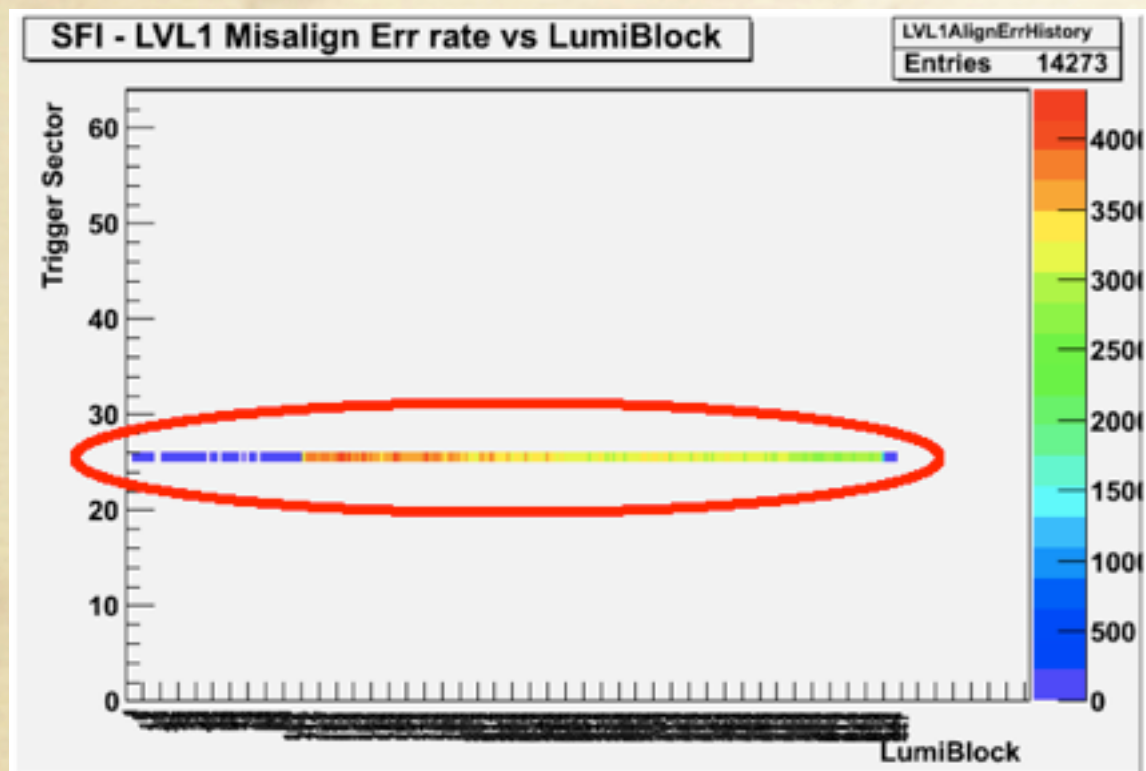
DETECTOR STATUS

- Generally running with
 - active readout channels: 97%
- Disconnected Gas Gaps
 - 47 (out of 3592) gaps disconnected from HV, mostly on BOL chambers (broken gas inlets)
 - 23 gaps on HV Recovery channels
- Constant Repairing Activities
 - Repaired and reconnected 32 broken gas inlets, (2 are still in progress)
 - 128 pairs of the input/output mass-flow meters re-calibrated all on all 5 distribution rack
 - On the rack 63 (sectors 1 and 9) were changed the capillaries (input impedance)
 - to equalize easier the flows in each line/ chamber
 - avoid big correlation of the flow if one chamber in the line gets a leak



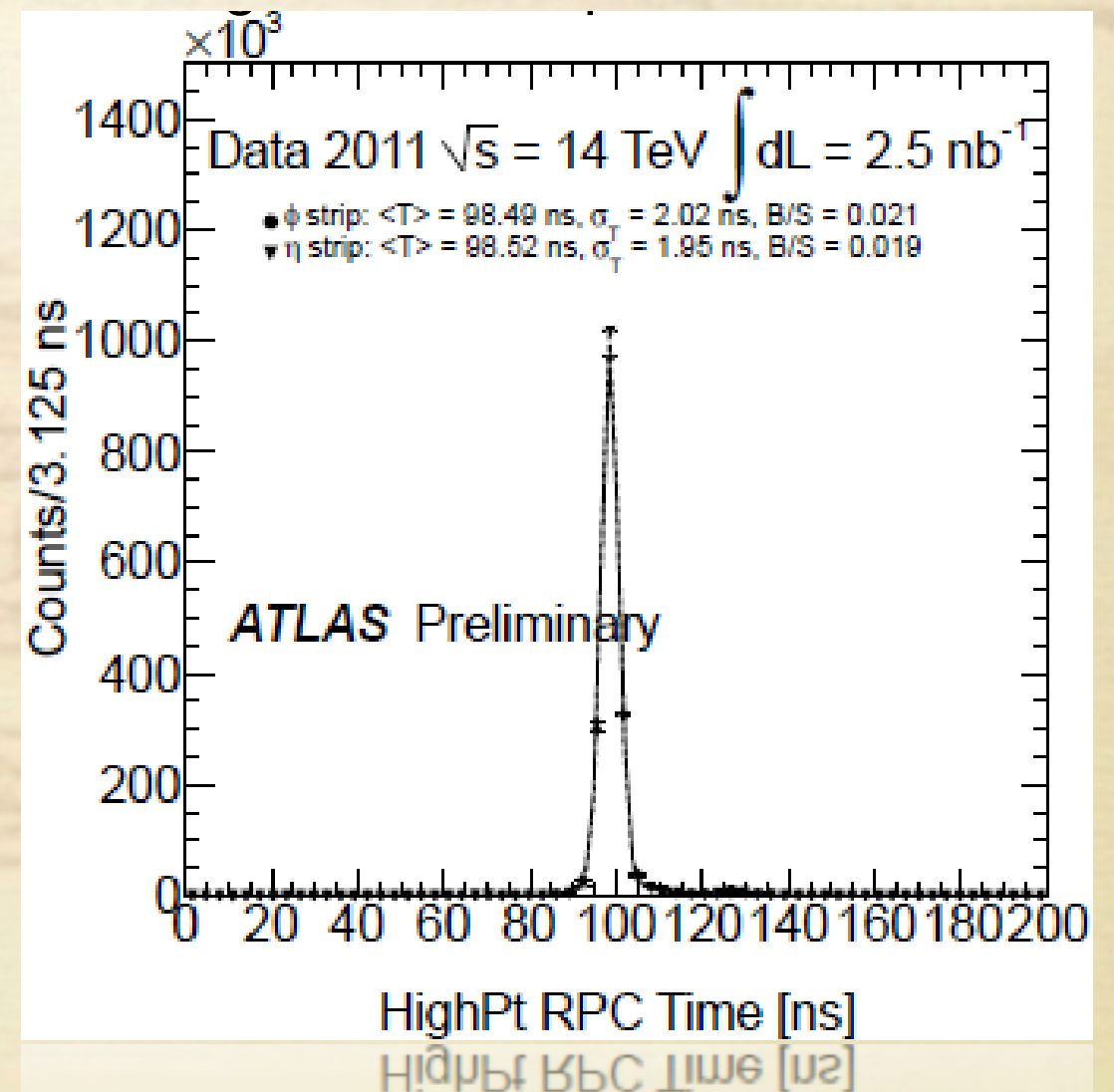
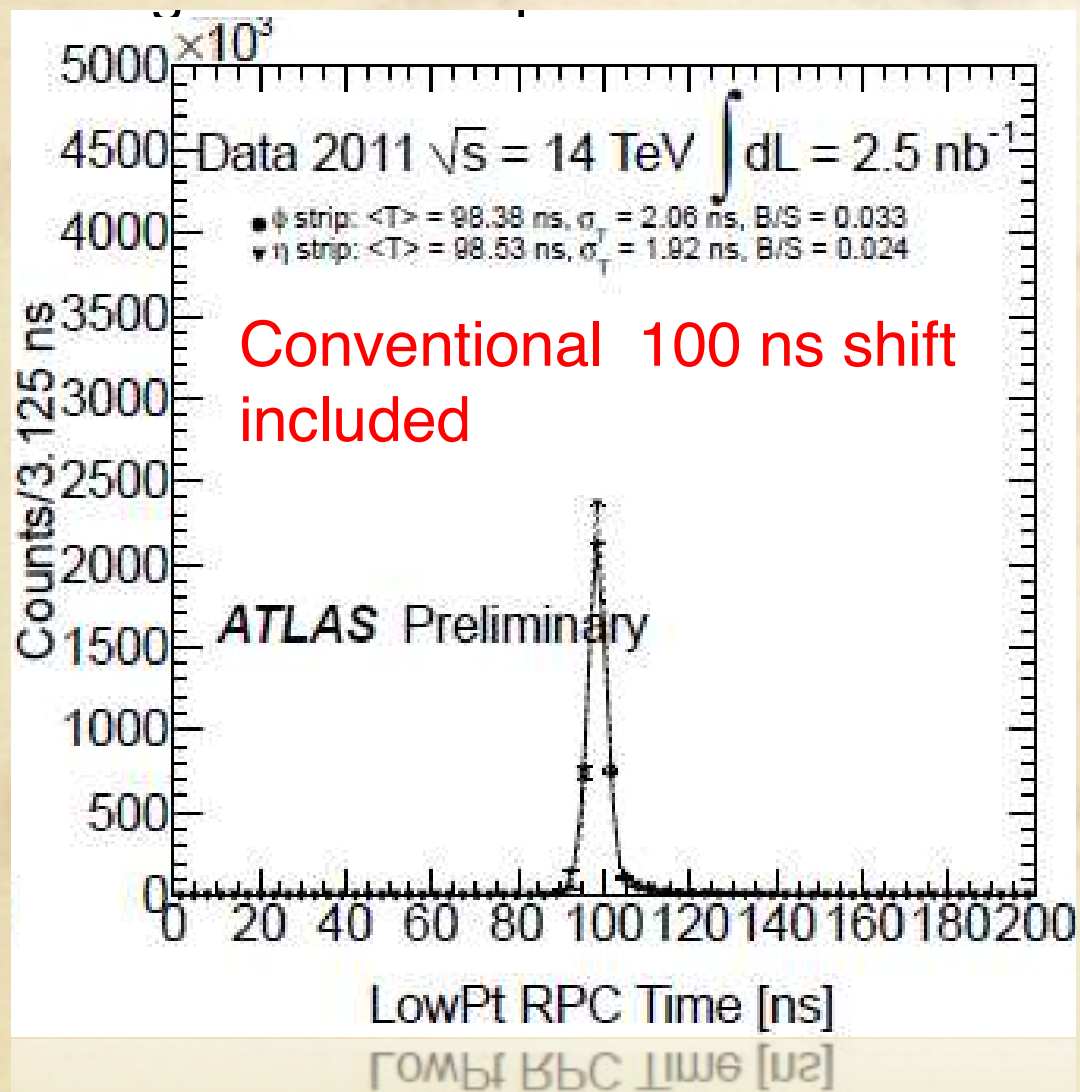
ONLINE MONITORING

- Still in progress to cope new requirements:
 - Need to find synchronization problem that can appear (and disappear) during a run.
 - More dynamic view of the online status of trigger and detector.

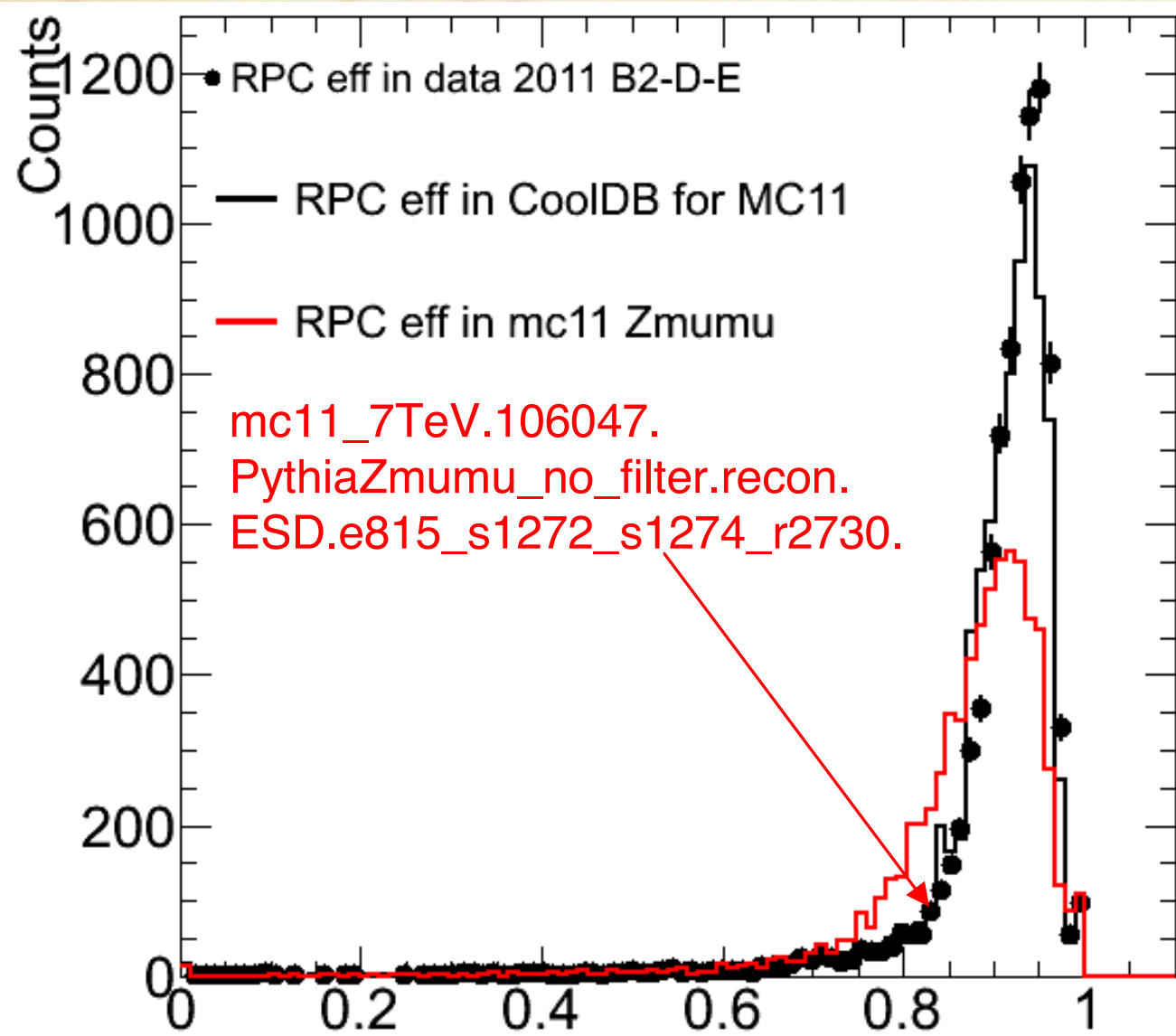


TIME RESOLUTION

- Data sample not used in calibration. Calibration + unfolding signal propagation along readout strips

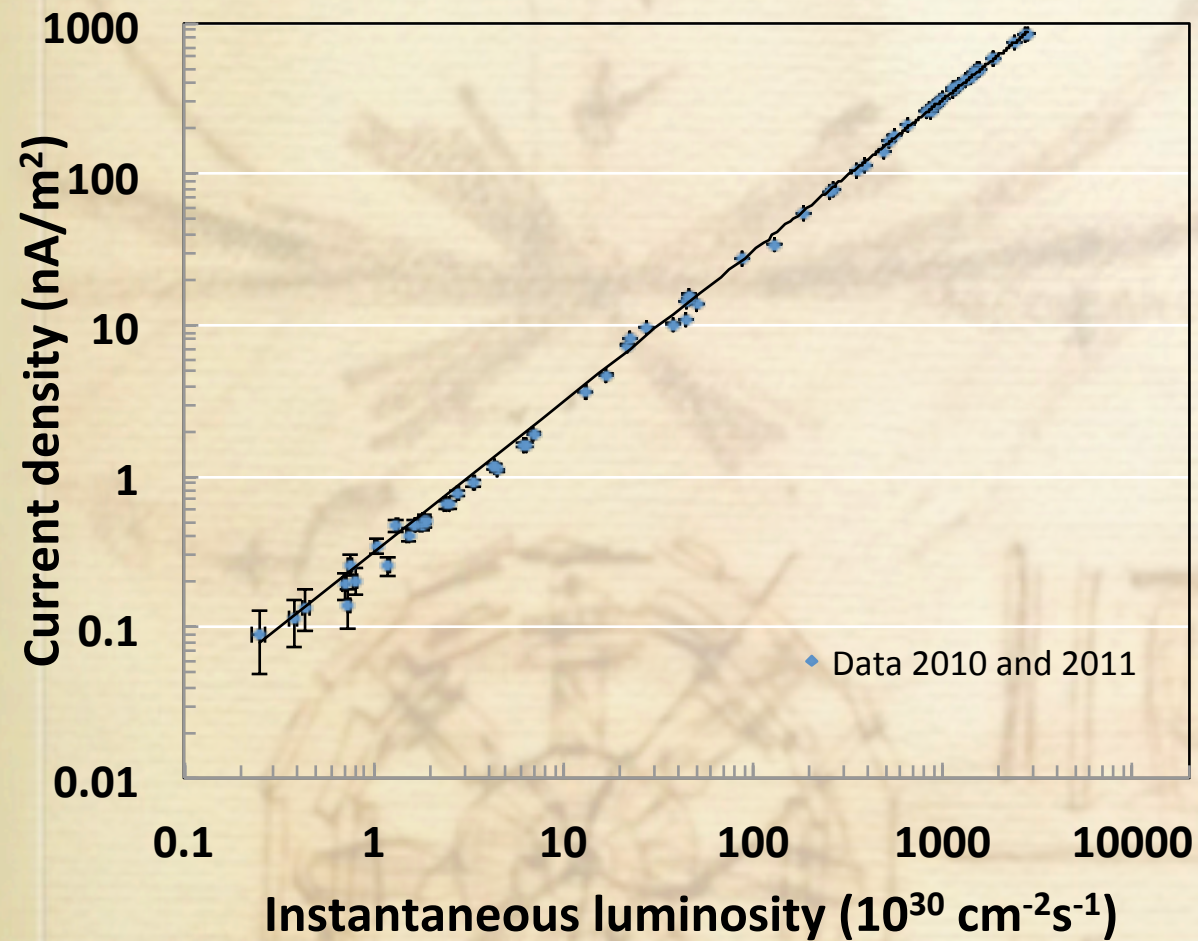


PANEL EFFICIENCY



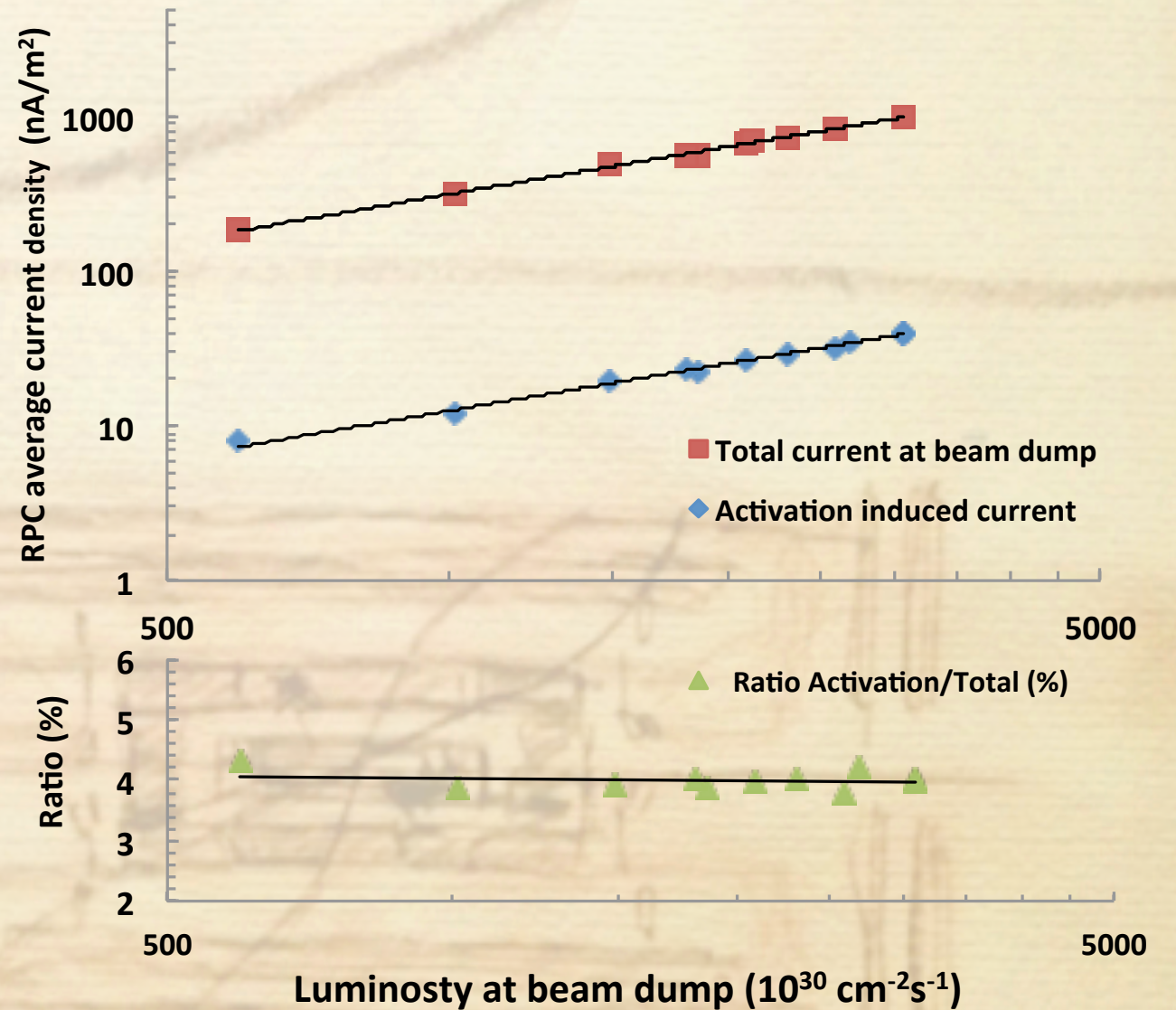
CAVERN BACKGROUND

RPC average beam induced current density vs. luminosity



Slope= $(0.312 \pm 0.001) \text{ nA m}^{-2} / 10^{30} \text{ cm}^{-2} \text{ s}^{-1}$

rate $10 \text{ Hz}/\text{cm}^2$ @ 10^{34} (30 pC per count)



Ratio Total vs activation induced current

ATLAS Detector Status

Subdetector	Number of Channels	Approximate Operational Fraction
Pixels	80 M	96.4%
SCT Silicon Strips	6.3 M	99.2%
TRT Transition Radiation Tracker	350 k	97.5%
LAr EM Calorimeter	170 k	99.8%
Tile calorimeter	9800	96.2%
Hadronic endcap LAr calorimeter	5600	99.6%
Forward LAr calorimeter	3500	99.8%
LVL1 Calo trigger	7160	99.9%
LVL1 Muon RPC trigger	370 k100	99.0%
LVL1 Muon TGC trigger	320 k	100%
MDT Muon Drift Tubes	350 k	99.7%
CSC Cathode Strip Chambers	31 k	97.7%
RPC Barrel Muon Chambers	370 k	97.0%
TGC Endcap Muon Chambers	320 k	97.9%

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RPC Barrel Muon Chambers	370 k	97.0%
TGC Endcap Muon	320 k	100%

Inner Tracking Detectors			Calorimeters				Muon Detectors				Magnets	
Pixel	SCT	TRT	LAr EM	LAr HAD	LAr FWD	Tile	MDT	RPC	CSC	TGC	Solenoid	Toroid
99.9	99.8	100	89.0	92.4	94.2	99.7	99.8	99.7	99.8	99.7	99.3	99.0

Luminosity weighted relative detector uptime and good quality data delivery during 2011 stable beams in pp collisions at $\sqrt{s}=7$ TeV between March 13th and June 29th (in %). The inefficiencies in the LAr calorimeter will partially be recovered in the future. The magnets were not operational for a 3-day period at the start of the data taking.

ATLAS Detector Status

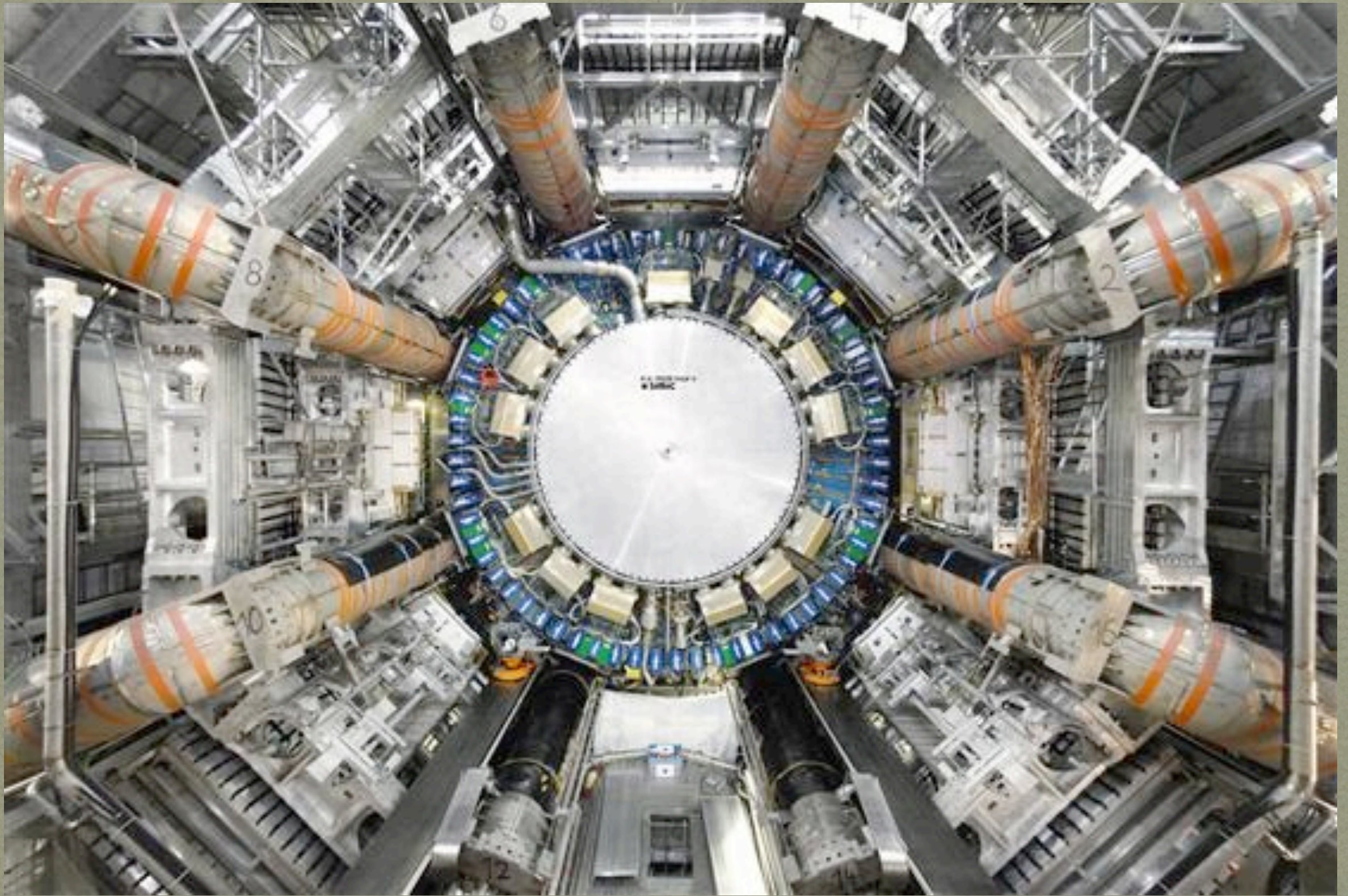
Subdetector			Number of Channels	Approximate Operational Fraction						
Pixels			80 M	96.4%						
L1			HLT							
Muon	Calo	CTP	electron	photon	muon	tau	jet	b-jet	missing E _T	
99.0	100	99.8	99.3	99.3	100	99.9	98.6	99.9	99.3	

Luminosity weighted relative relative fraction of good trigger data quality delivery during 2011 stable beams in pp collisions at $\sqrt{s}=7$ TeV between 13 March and 30 October (in %).

LVL1 Calo trigger	7160	99.9%
LVL1 Muon RPC trigger	370 k100	99.0%
LVL1 Muon TGC trigger	320 k	100%
MDT Muon Drift Tubes	350 k	99.7%
CSC Cathode Strip Chambers	31 k	97.7%
RPC Barrel Muon Chambers	370 k	97.0%
TGC Endcap M	300 k	97.0%

Inner Tracking Detectors			Calorimeters				Muon Detectors				Magnets	
Pixel	SCT	TRT	LAr EM	LAr HAD	LAr FWD	Tile	MDT	RPC	CSC	TGC	Solenoid	Toroid
99.9	99.8	100	89.0	92.4	94.2	99.7	99.8	99.7	99.8	99.7	99.3	99.0

Luminosity weighted relative detector uptime and good quality data delivery during 2011 stable beams in pp collisions at $\sqrt{s}=7$ TeV between March 13th and June 29th (in %). The inefficiencies in the LAr calorimeter will partially be recovered in the future. The magnets were not operational for a 3-day period at the start of the data taking.



MUON TRIGGER

ATLAS NAPOLI NEL TRIGGER

- **ATLAS L1 Coordinator:**
 - *D. della Volpe*
 - *TDAQ Steering Group*
 - *Muon Steering Group*
- **Detector Maintenance:**
 - *R. De Asmundis, G. Sekhniaidze*
- **L1 Muon Barrel Operation:**
 - *D. della Volpe, M. Della Pietra, P. Iengo, V. Izzo*
- **L1 Muon Online Monitoring & Data Quality**
 - *V. Canale, M. Della Pietra, A. Sanchez*
- **L1 Muon Performance:**
 - *F. Conventi, E. Musto, N. Calace, D. della Volpe, E. Rossi*, A. Sanchez*

THE ATLAS TRIGGER



We need to select this ...

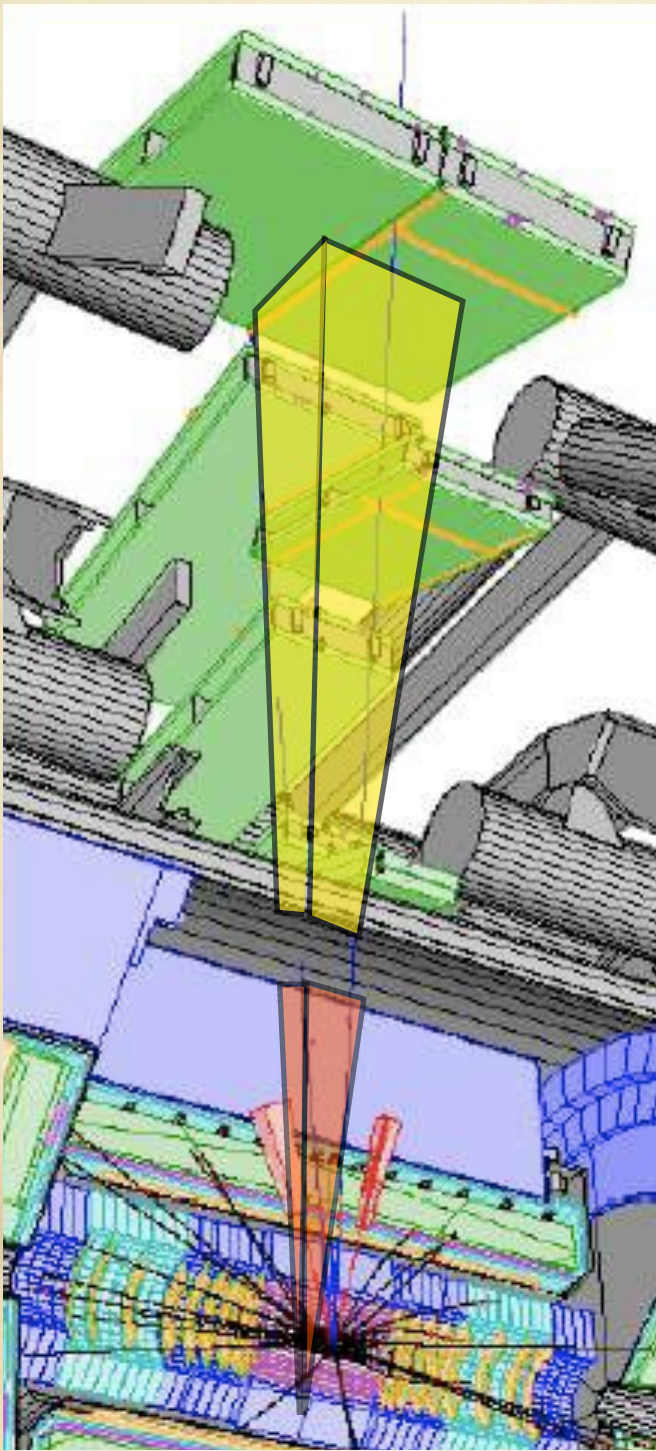
THE ATLAS TRIGGER



We need to select this ...

out of these ... every 25 ns !!

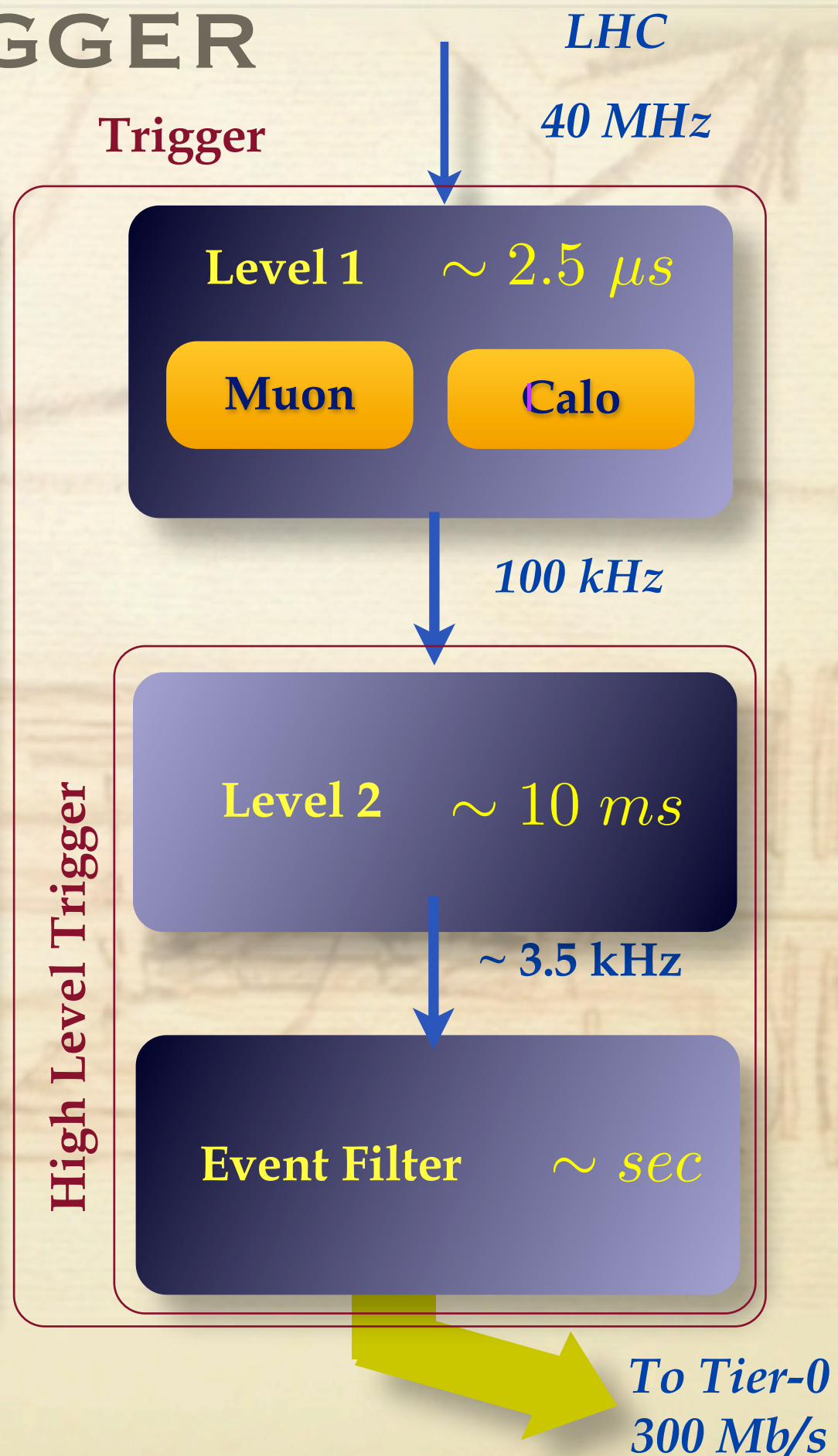
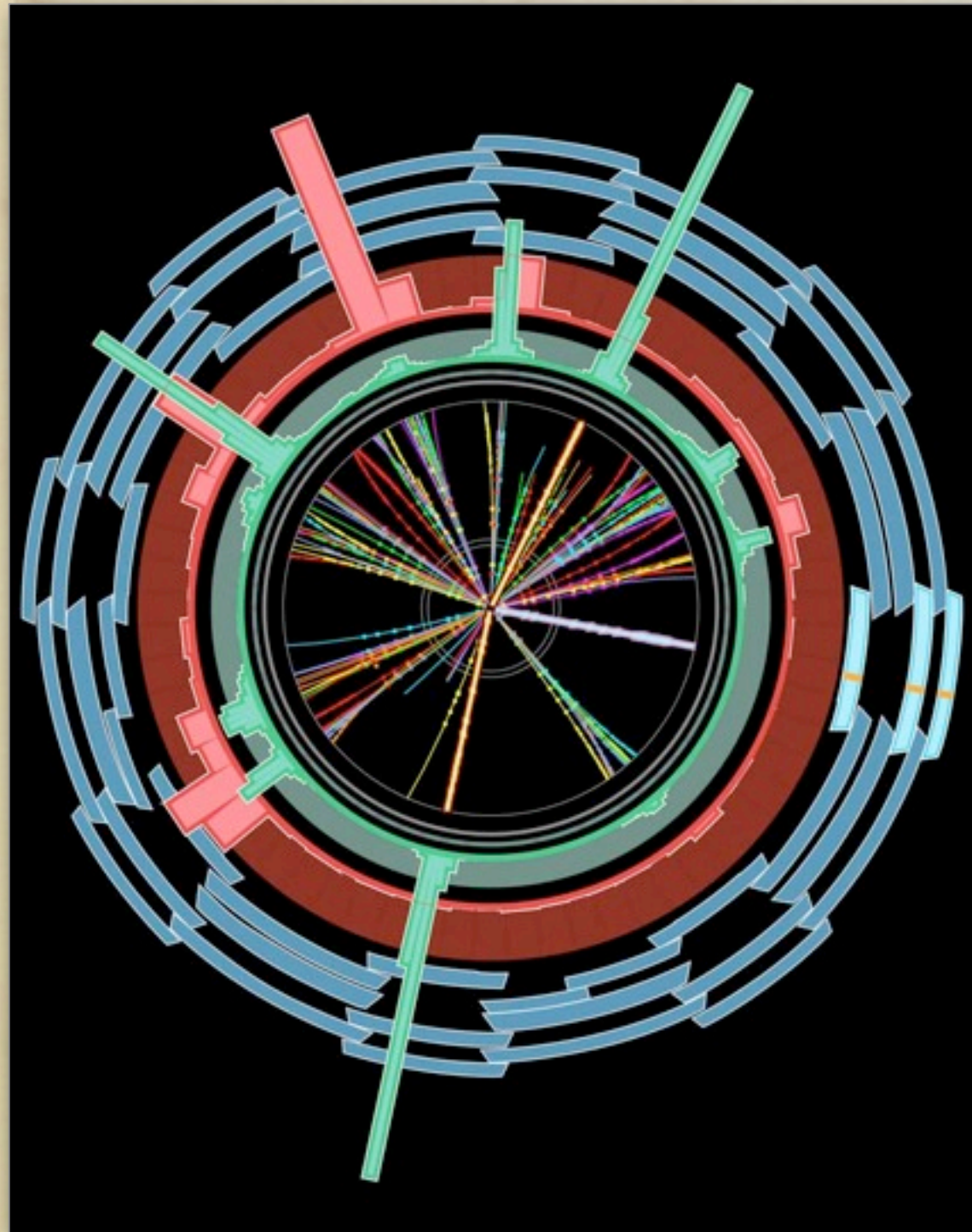
THE ATLAS TRIGGER



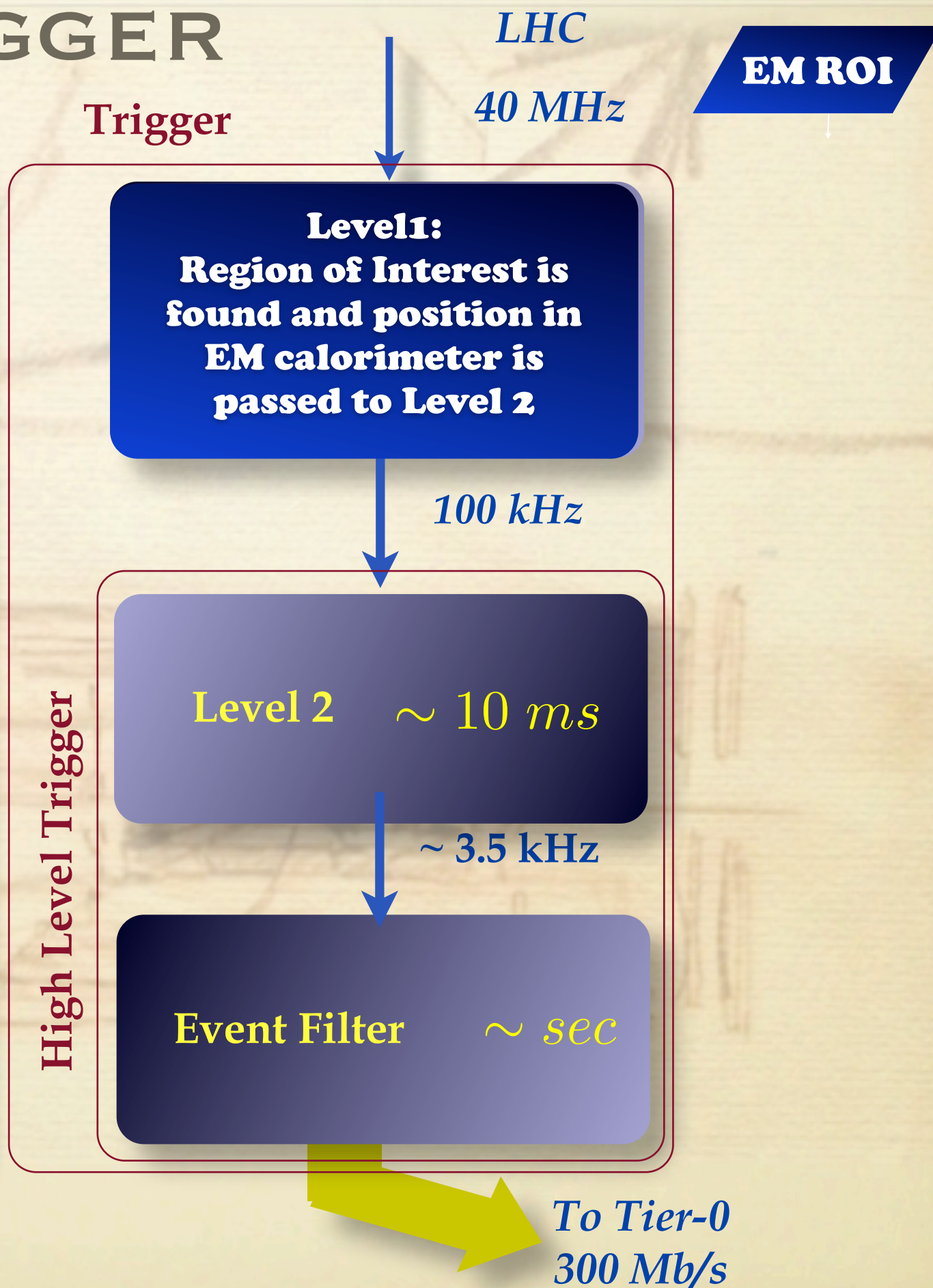
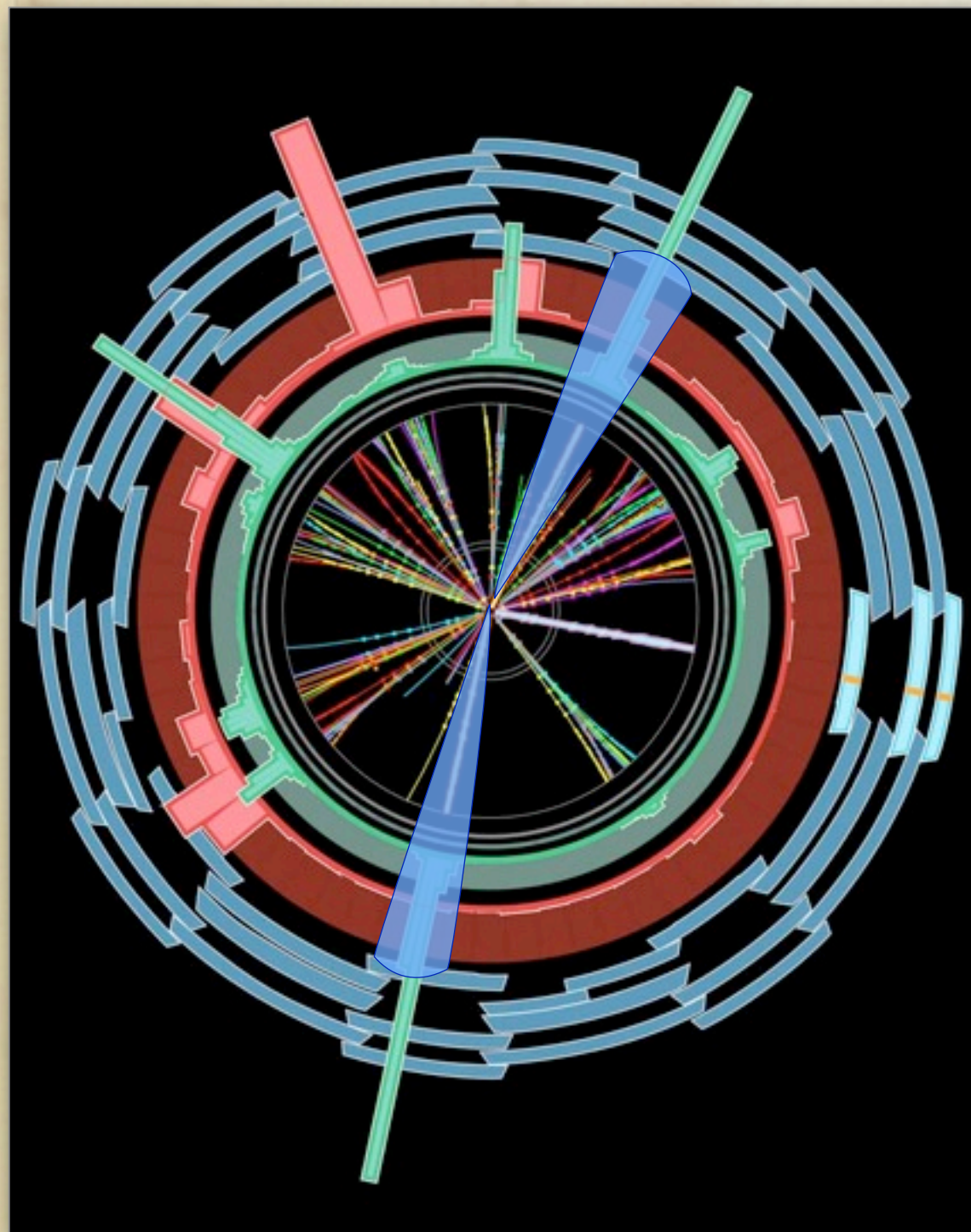
To reduce the amount of data to write to disk and of unnecessary data transfer

- ❖ “Region of Interest” mechanism
- ❖ Three -level Trigger Architecture
 - ❖ LVL1 (100 kHz): Hardware
 - ❖ LVL2 (4 kHz): Software on reduced granularity (regions of interest)
 - ❖ EF (≈ 300 Hz): Based on Offline Reconstruction Full Granularity

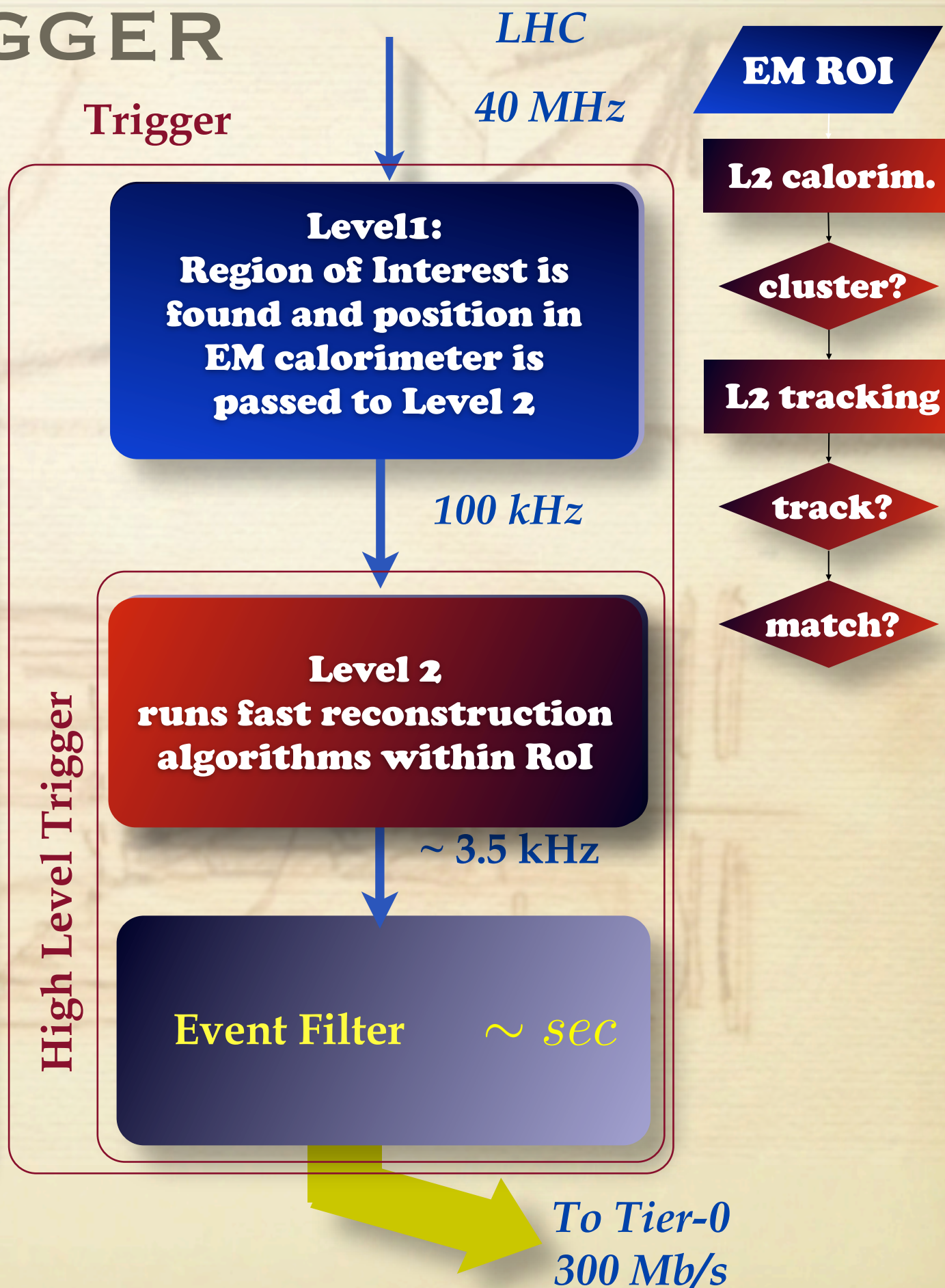
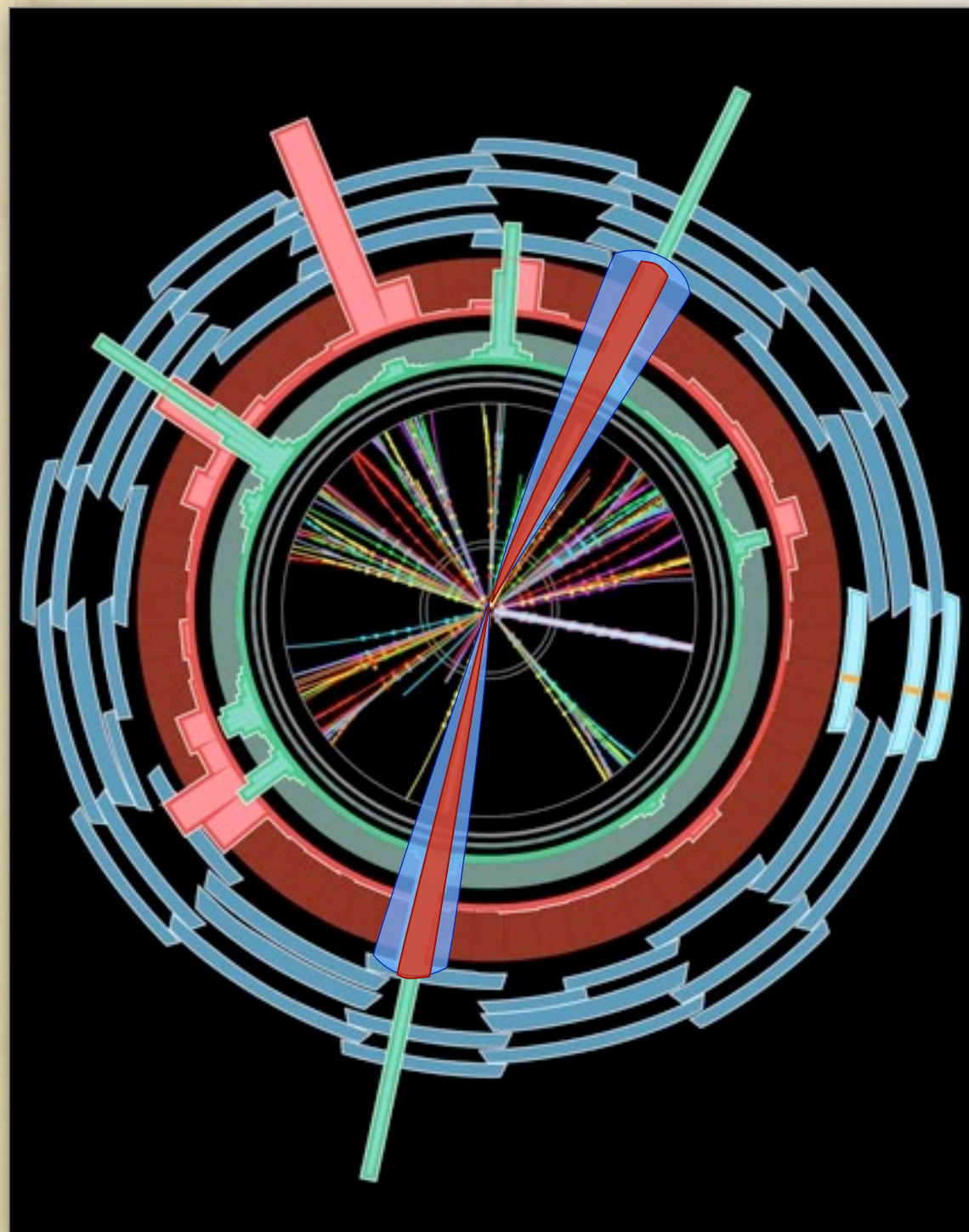
THE ATLAS TRIGGER



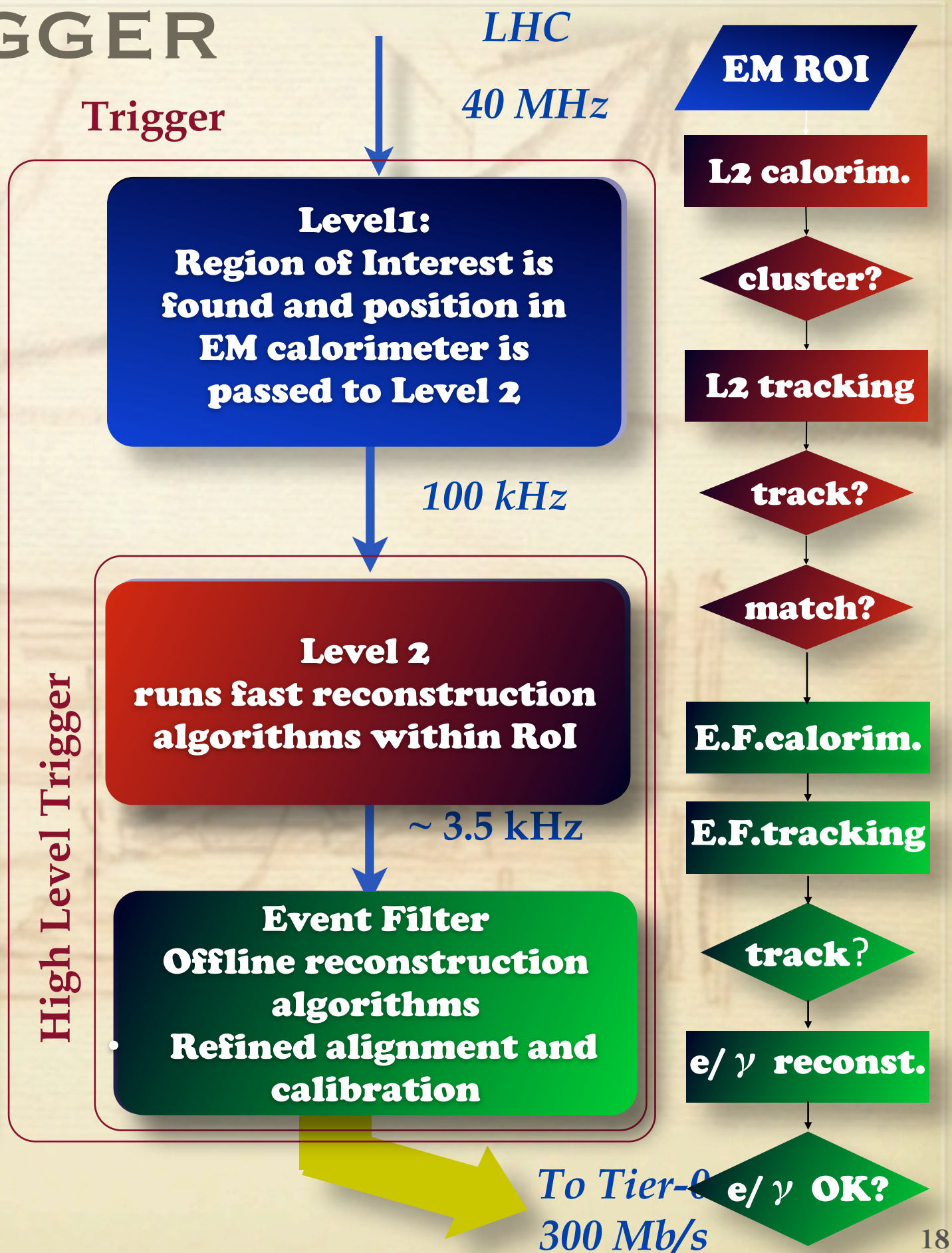
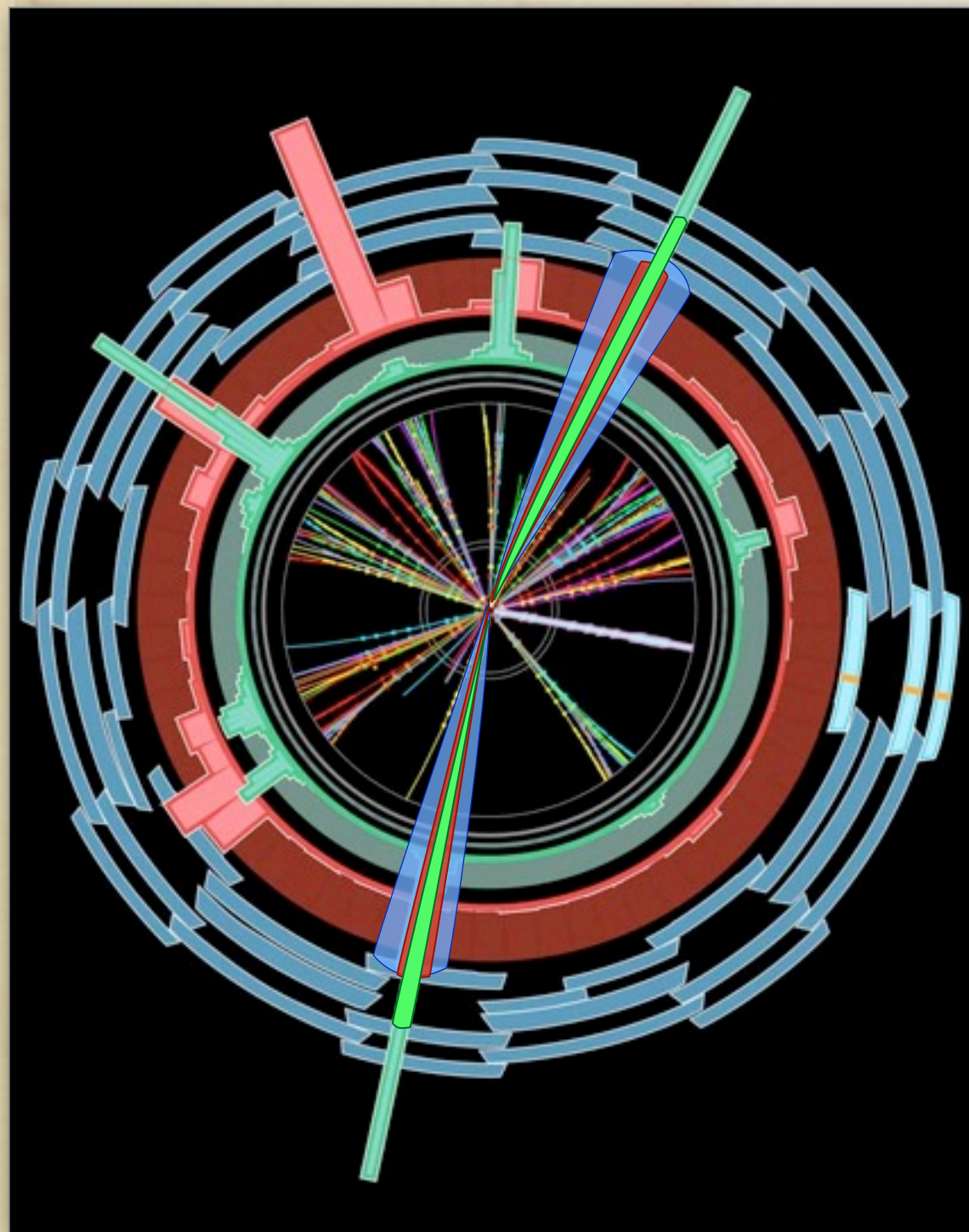
THE ATLAS TRIGGER



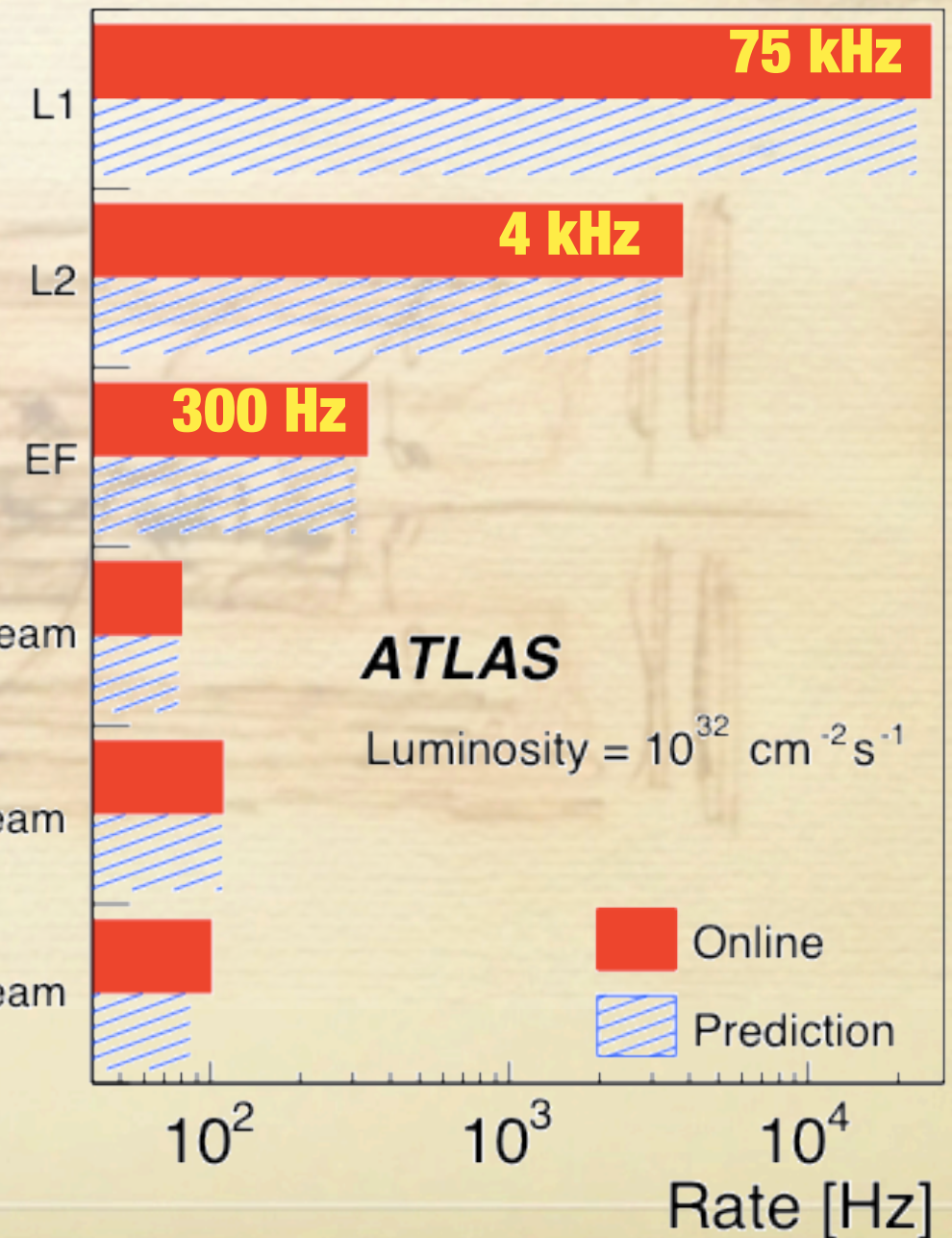
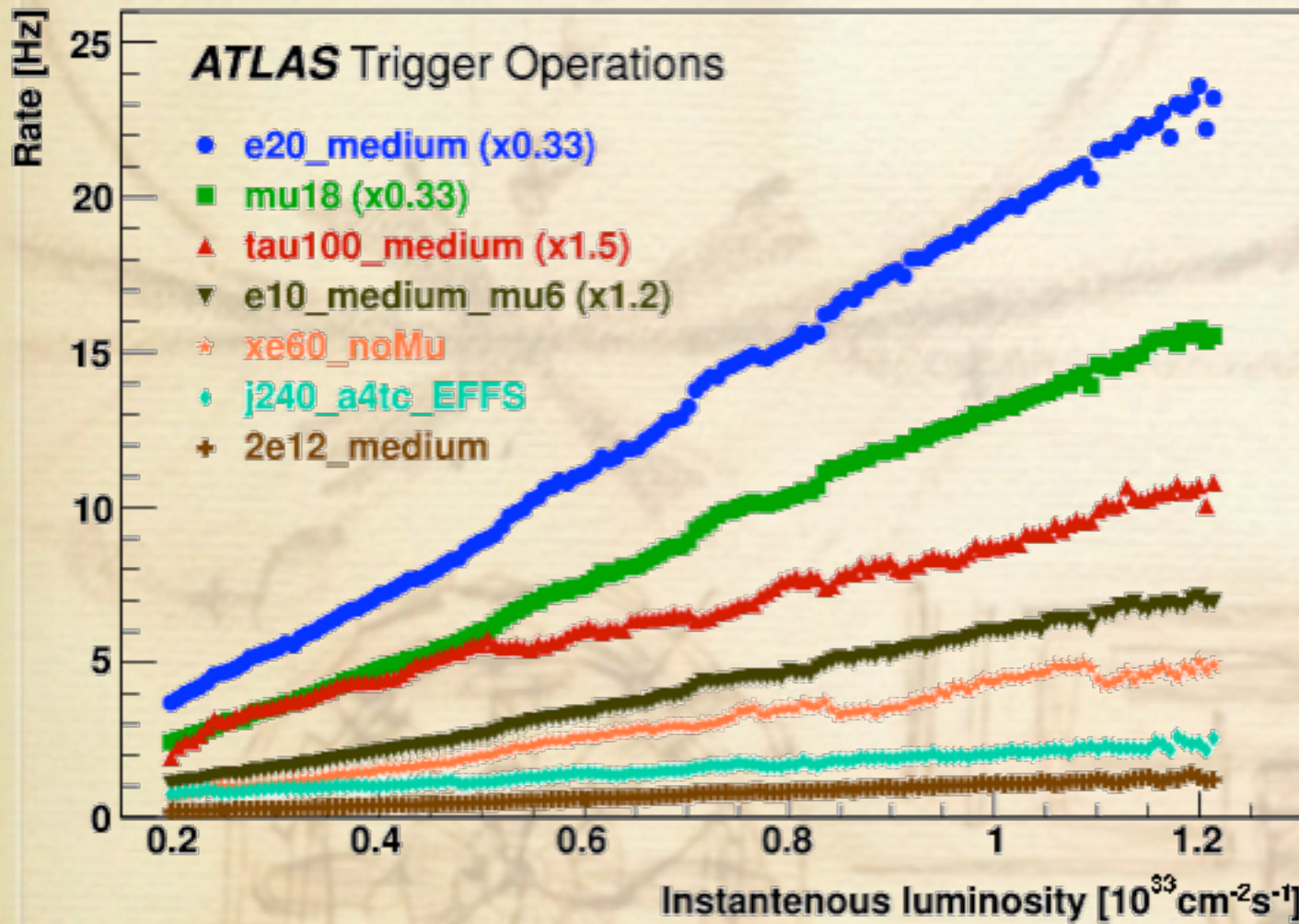
THE ATLAS TRIGGER



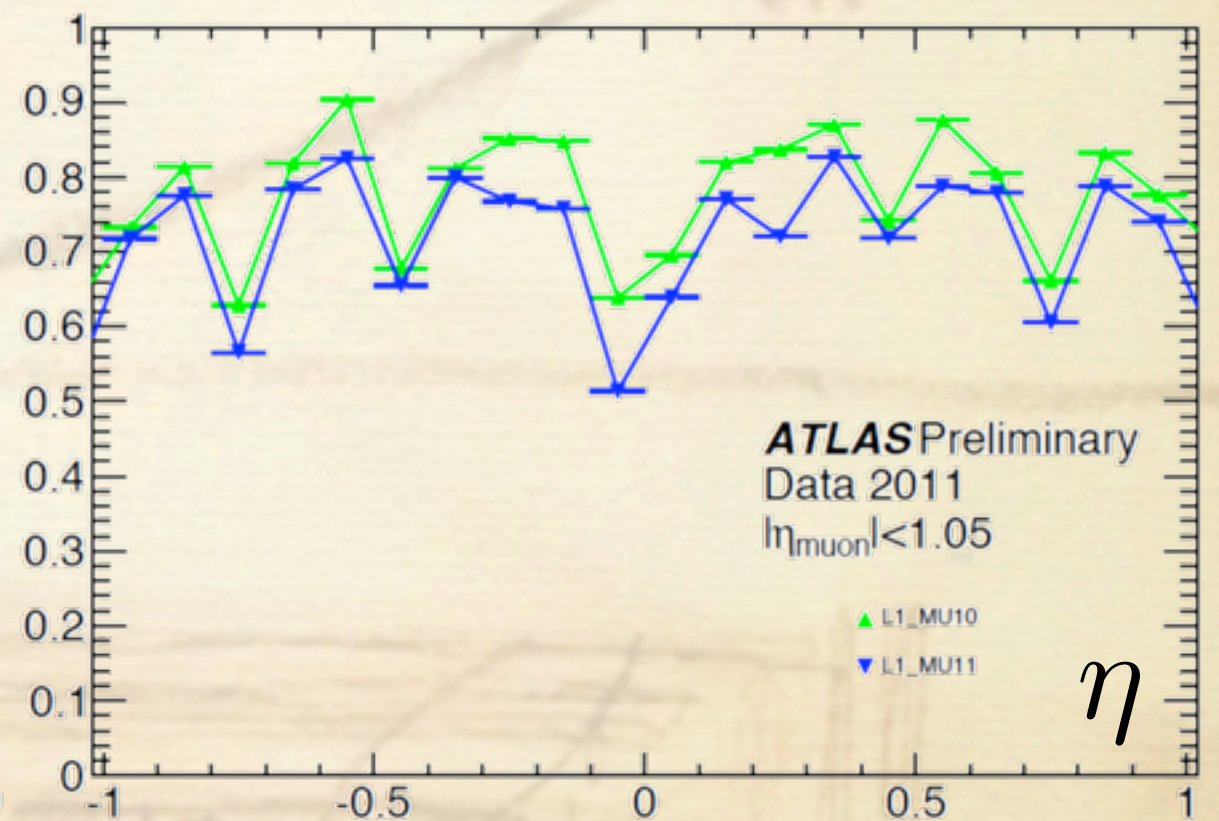
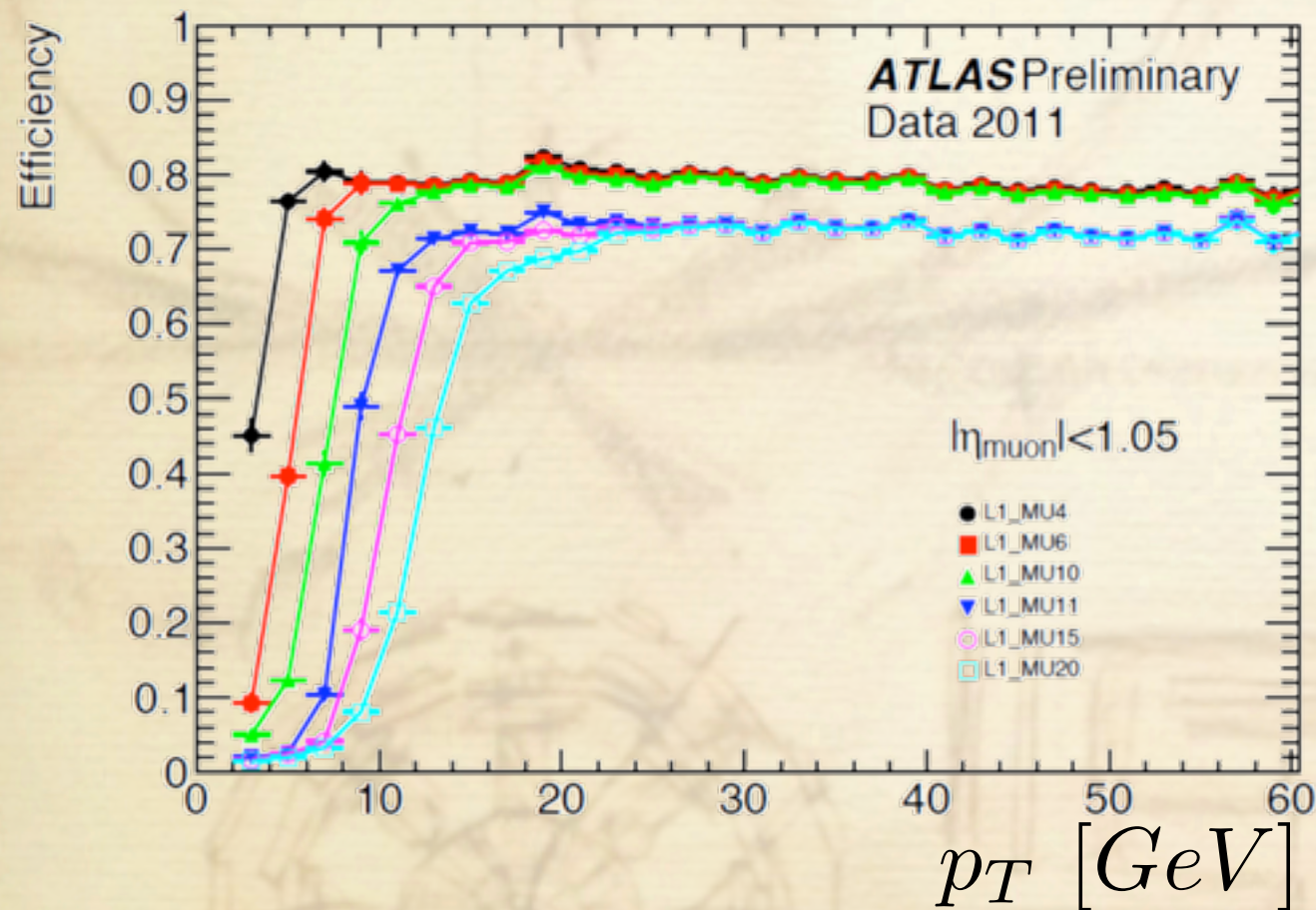
THE ATLAS TRIGGER



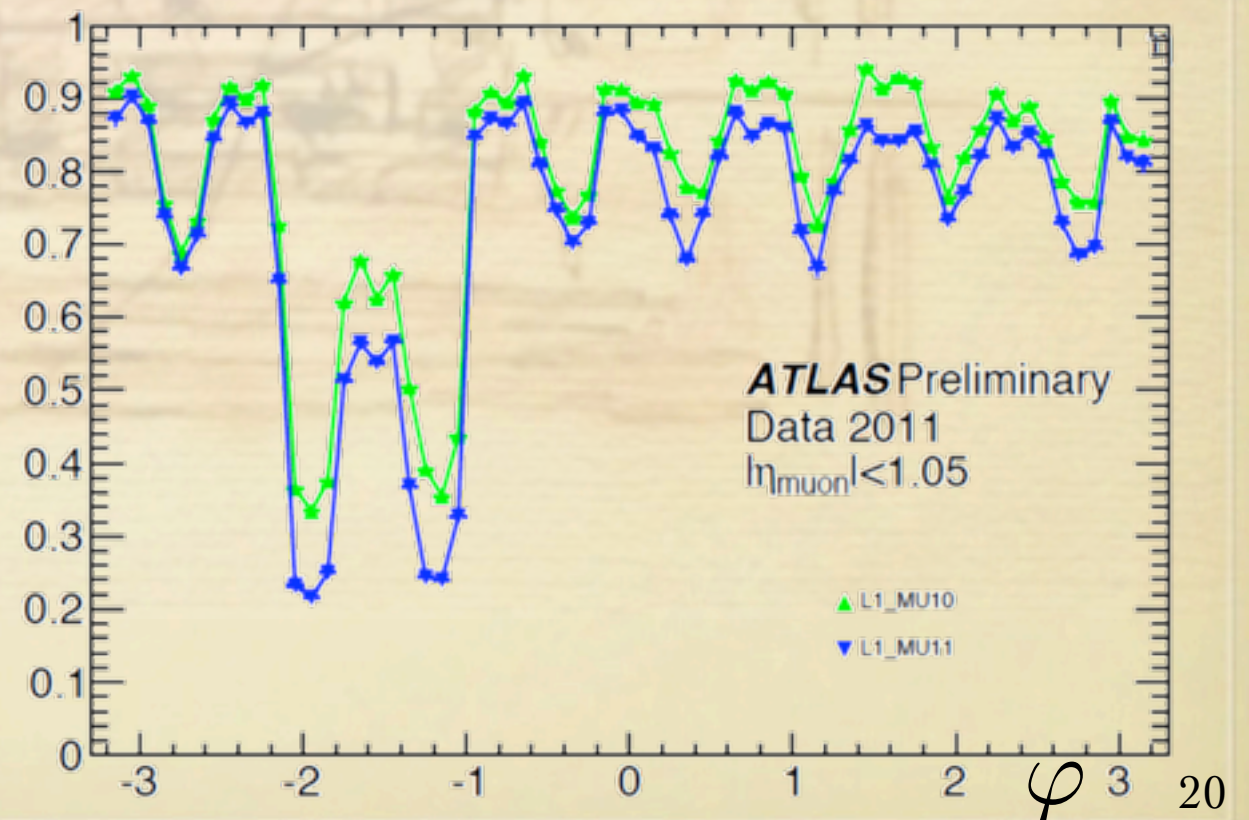
TRIGGER OPERATIONS



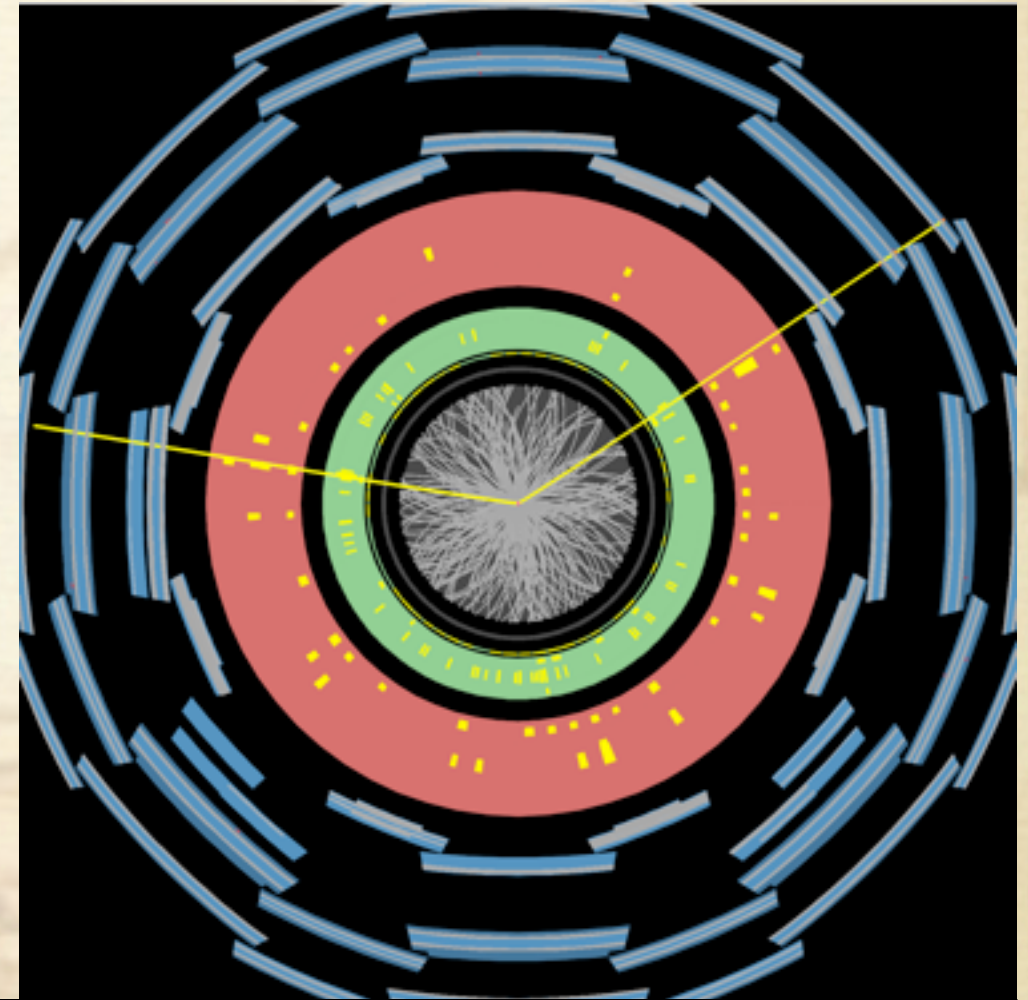
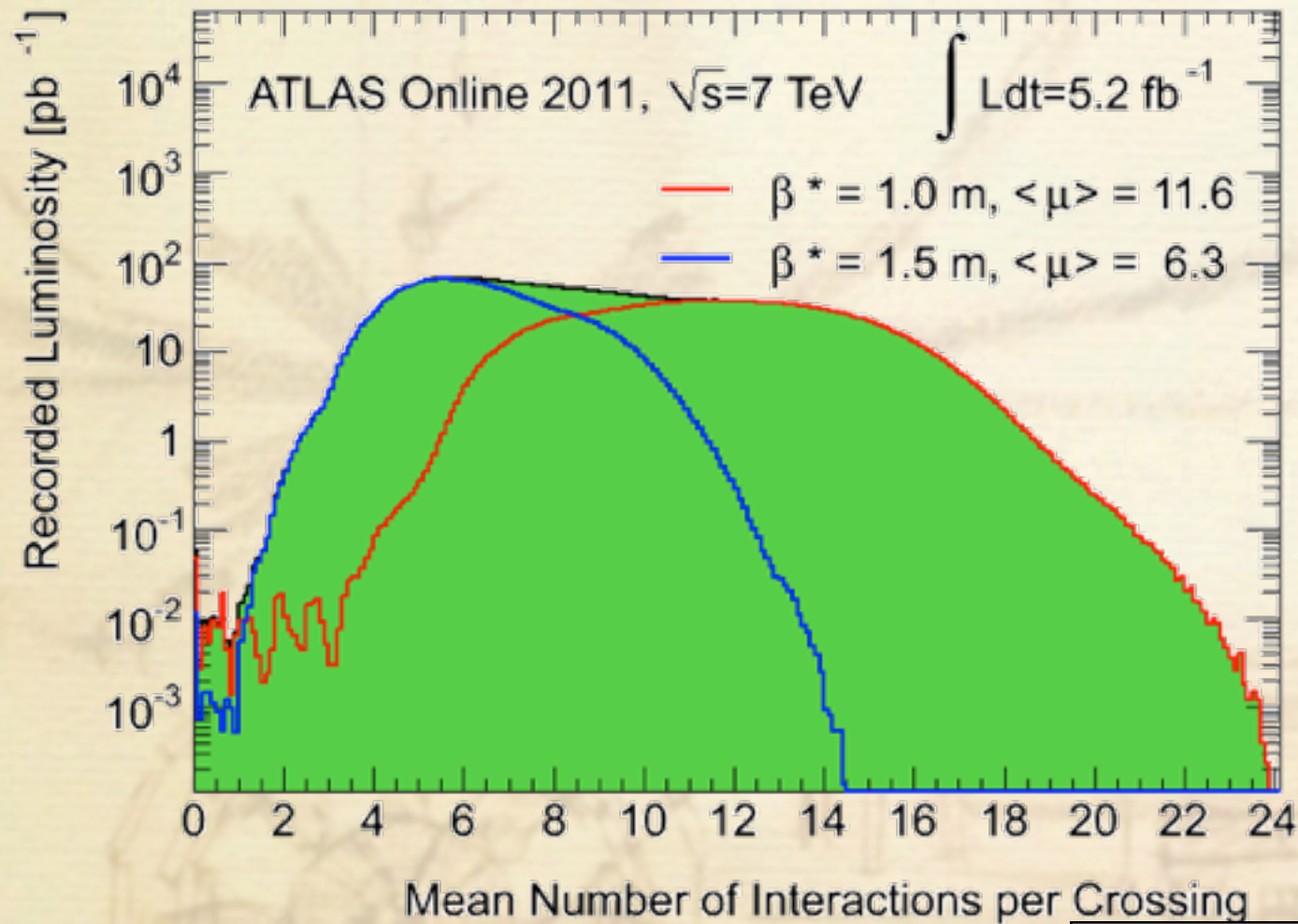
L1 MUON TRIGGER PERFORMANCE



- $Z \Rightarrow \mu\mu$ Tag & probe
- Trigger efficiency at nominal (80% coverage)
- Slightly different coverage between Low and High $p_T \sim 7-8\%$



THE PILE-UP CHALLENGE



A candidate $Z \rightarrow \mu\mu$ decay with 20 vertices.

A potential issue for:

Trigger

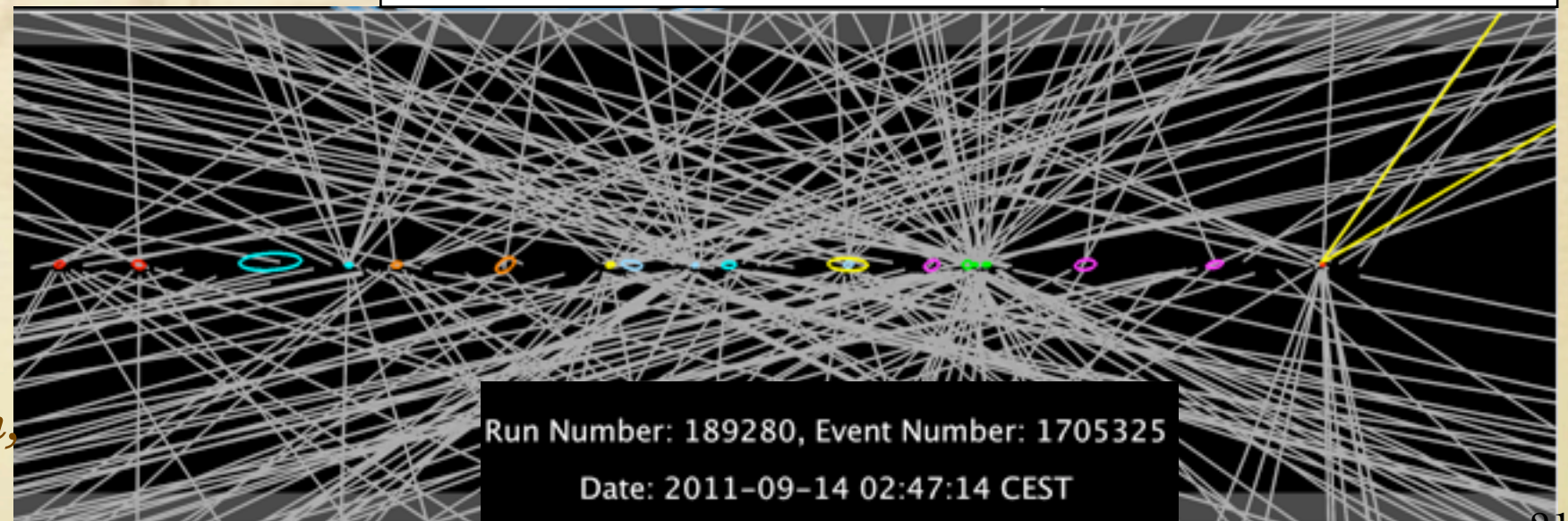
Lepton Isolation,

Vertexing,

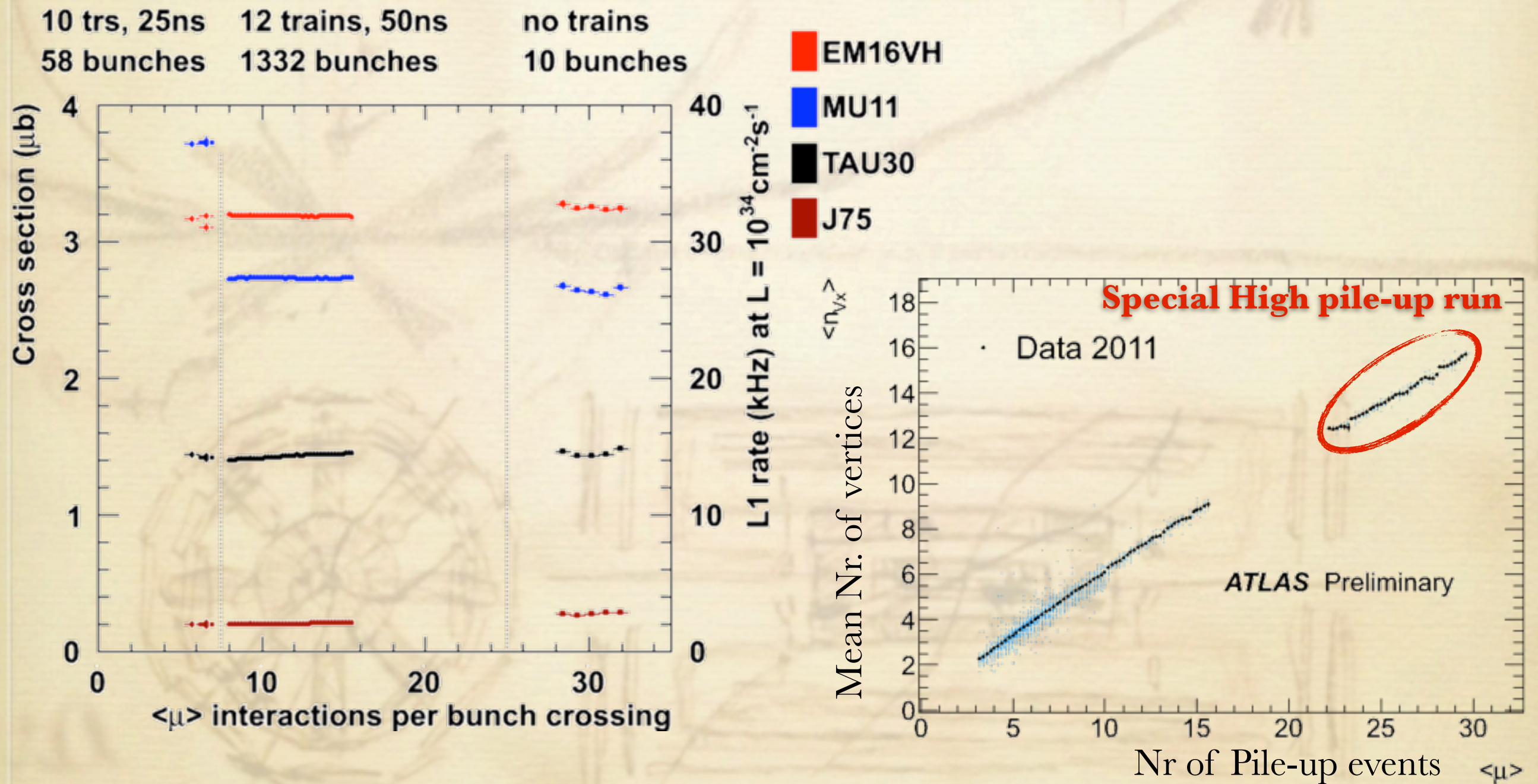
CPU time/event size,

Jet Energy Scale/Resolution,

E_T miss.

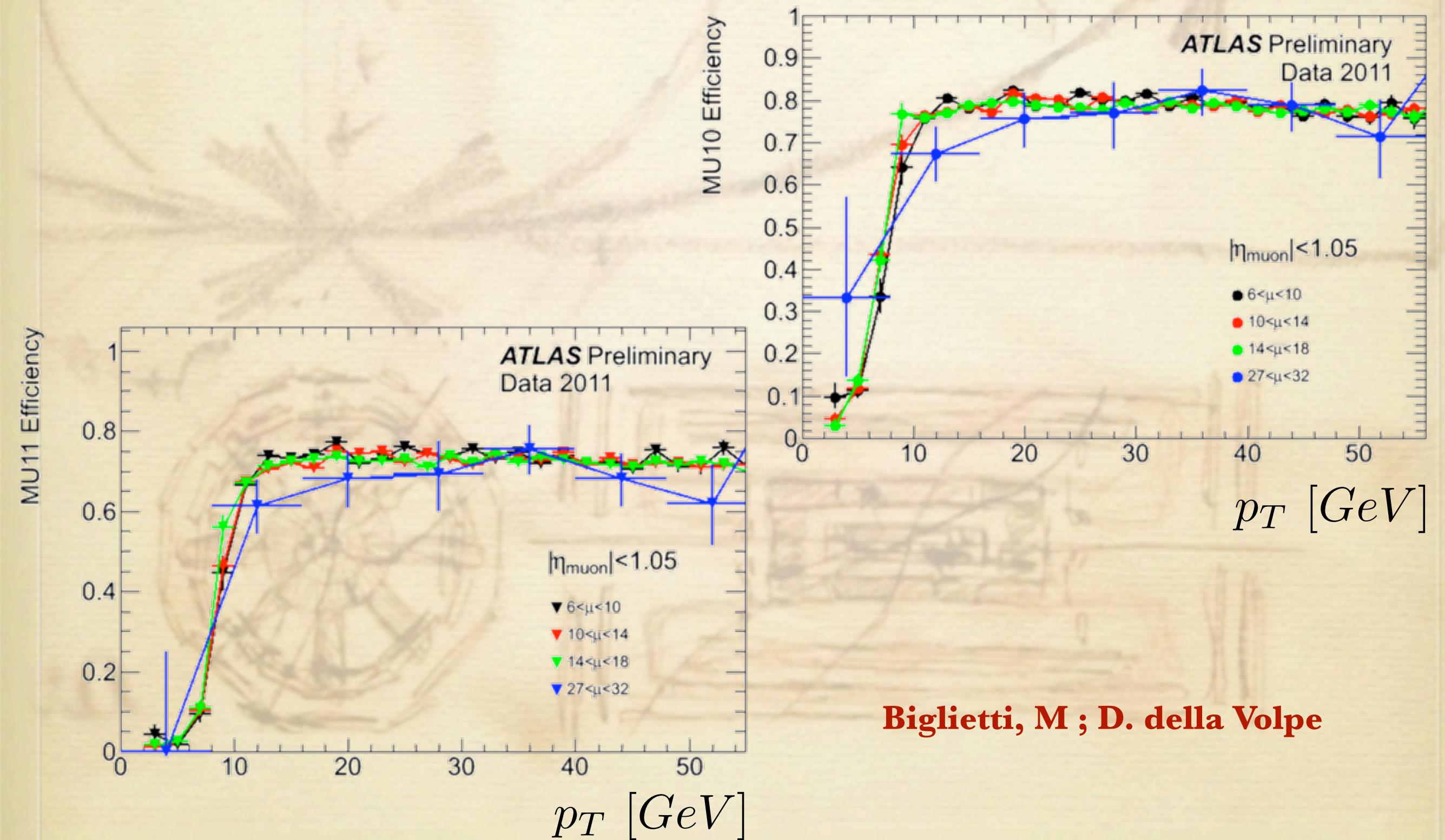


PILE-UP DEPENDANCE



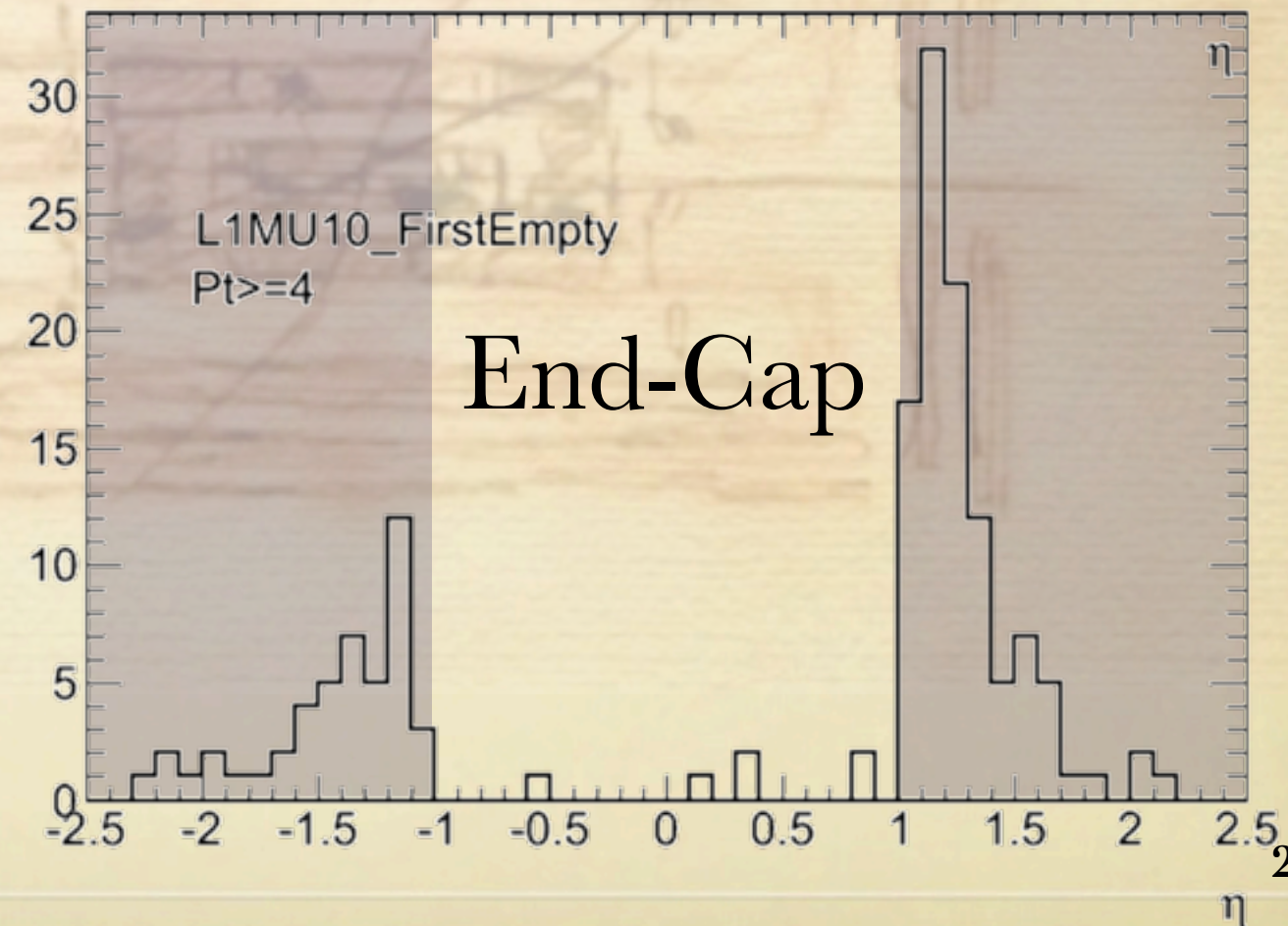
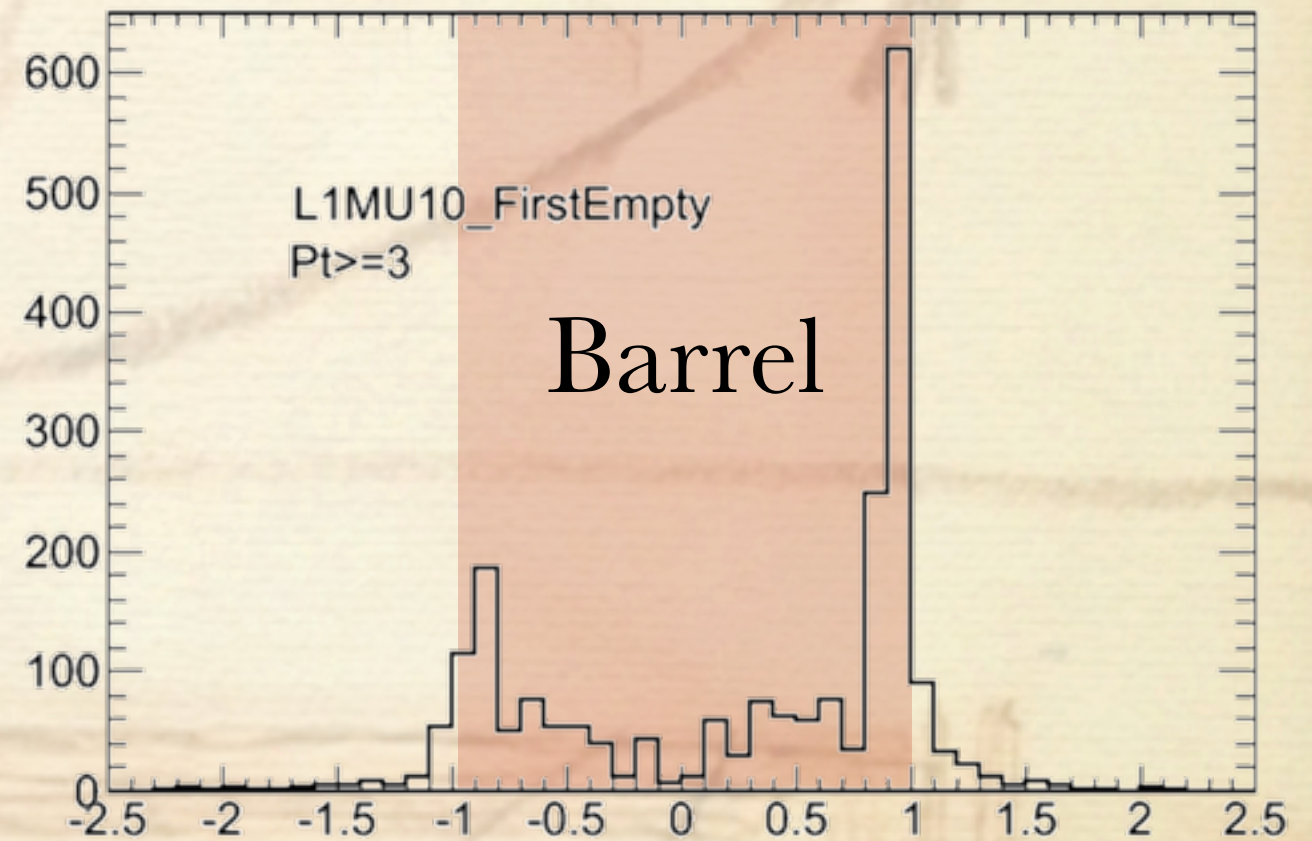
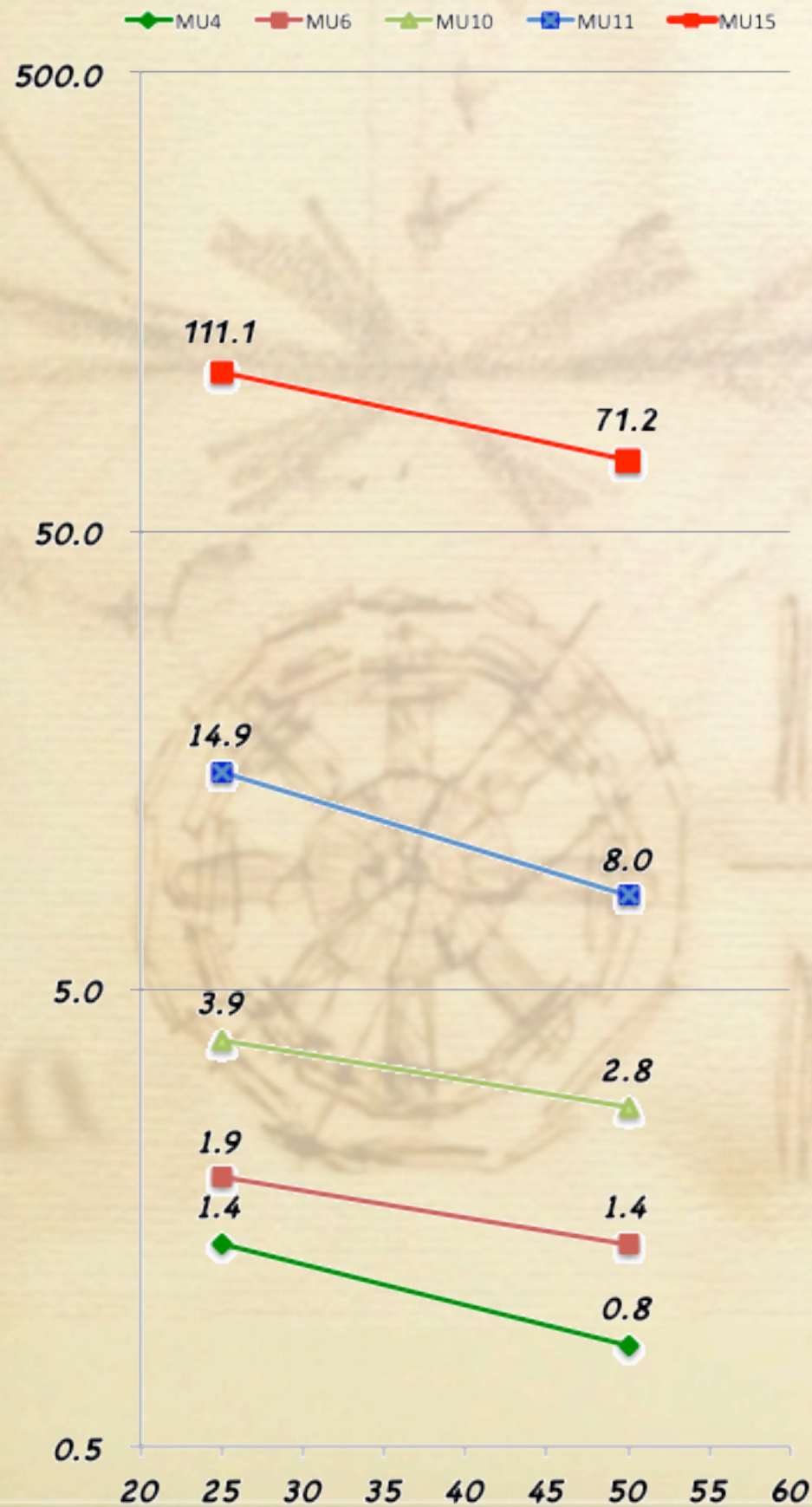
- Optimal performance also with a pile -up up to 30

PILE-UP (IN)-DEPENDENCE



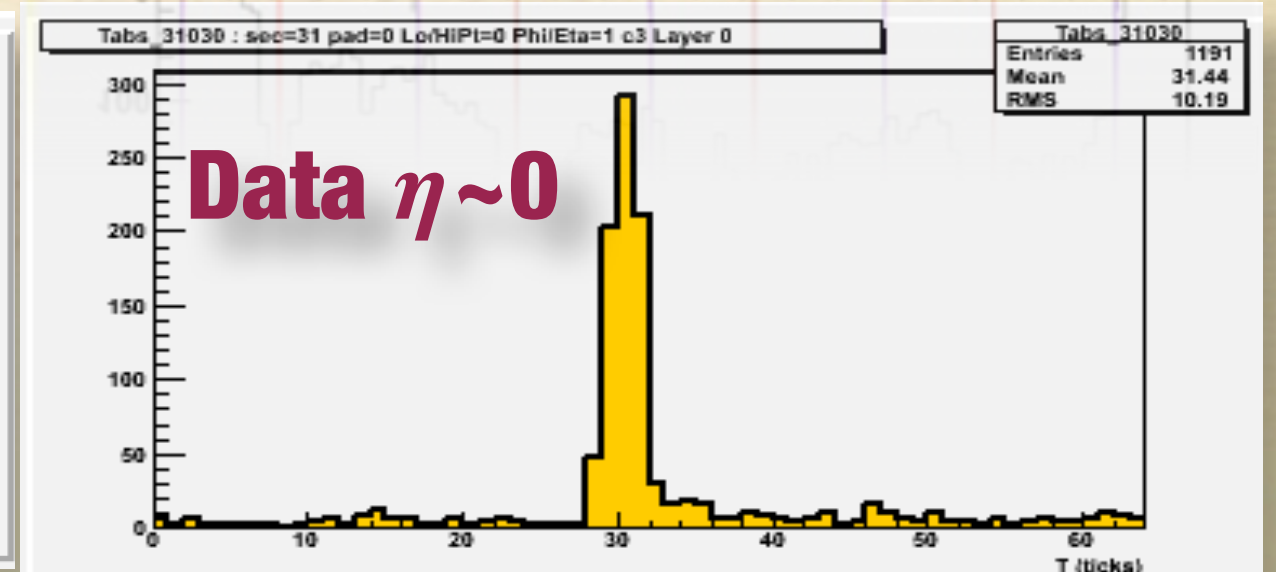
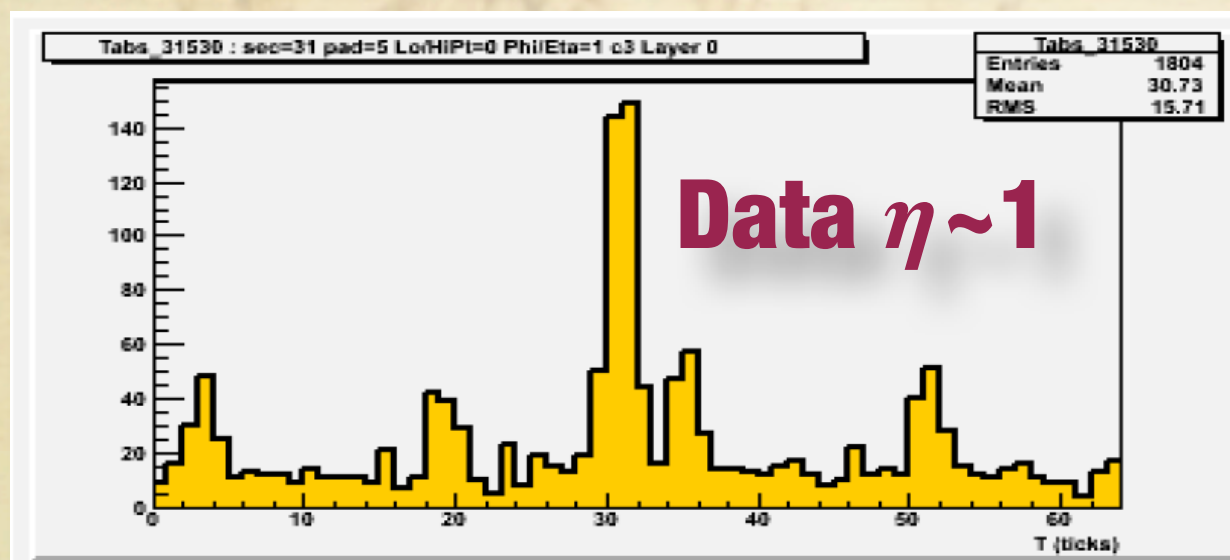
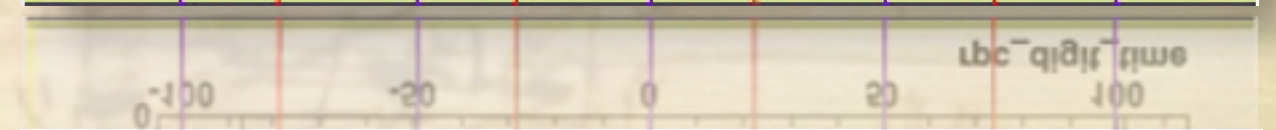
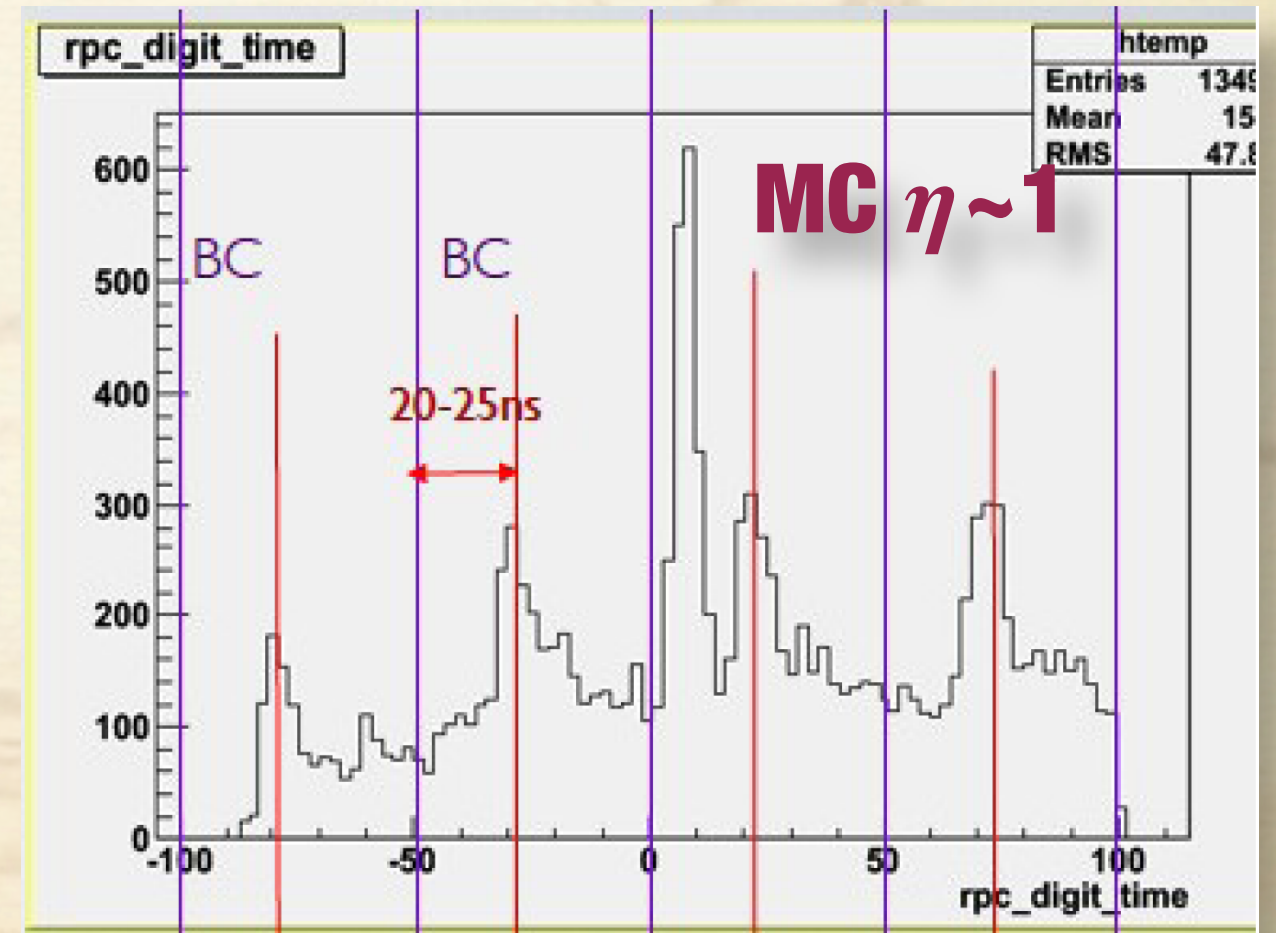
Biglietti, M ; D. della Volpe

BUNCH SPACING DEPENDANCE



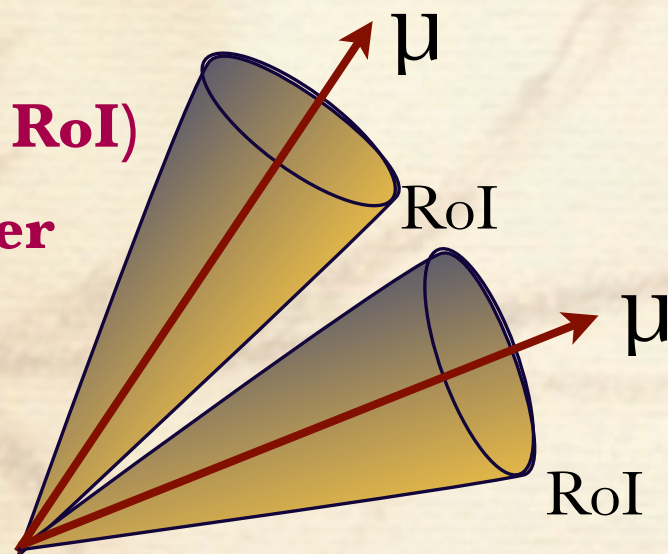
BUNCH SPACING DEPENDANCE

- There is a photon/neutron component of background which is time correlated with BC,
- when particles hit the beam pipe around $|z|=6.8\text{m}$, their interaction products can go out an unshielded channel and hit the barrel chambers
- *A new Shield is going to be installed during this winter shutdown*

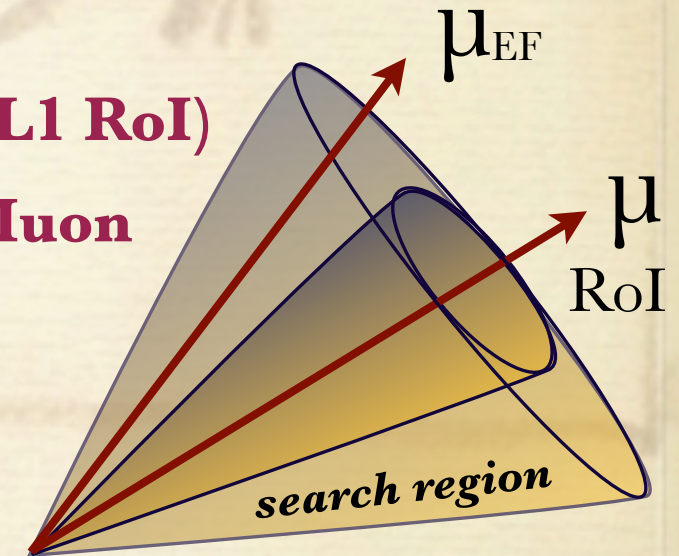


DI-MUON TRIGGER FOR B-PHYSICS

Topological (2 L1 RoI)
L1 di-muon trigger



Non Topological (1 L1 RoI)
1 L1 Muon + 1 EF Muon



Event passing $EF_mu4_Jpsimumu \ \&\& \ EF_mu4$

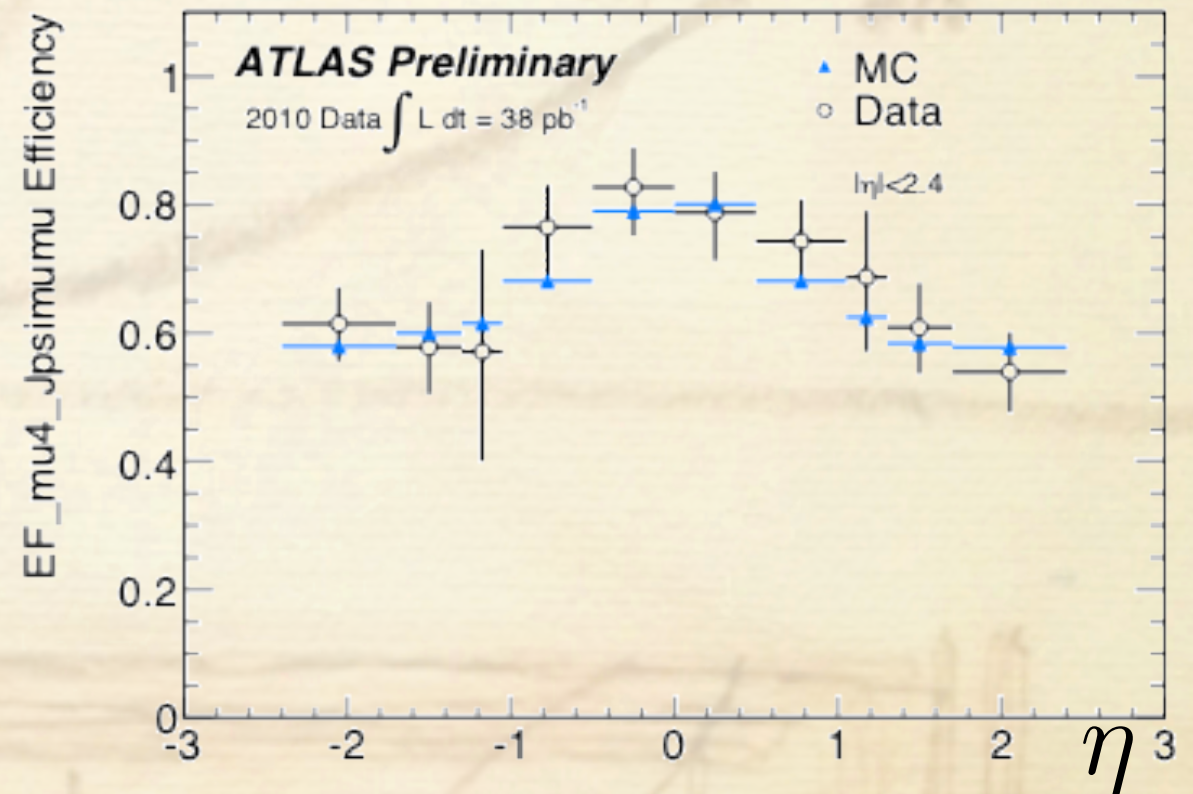
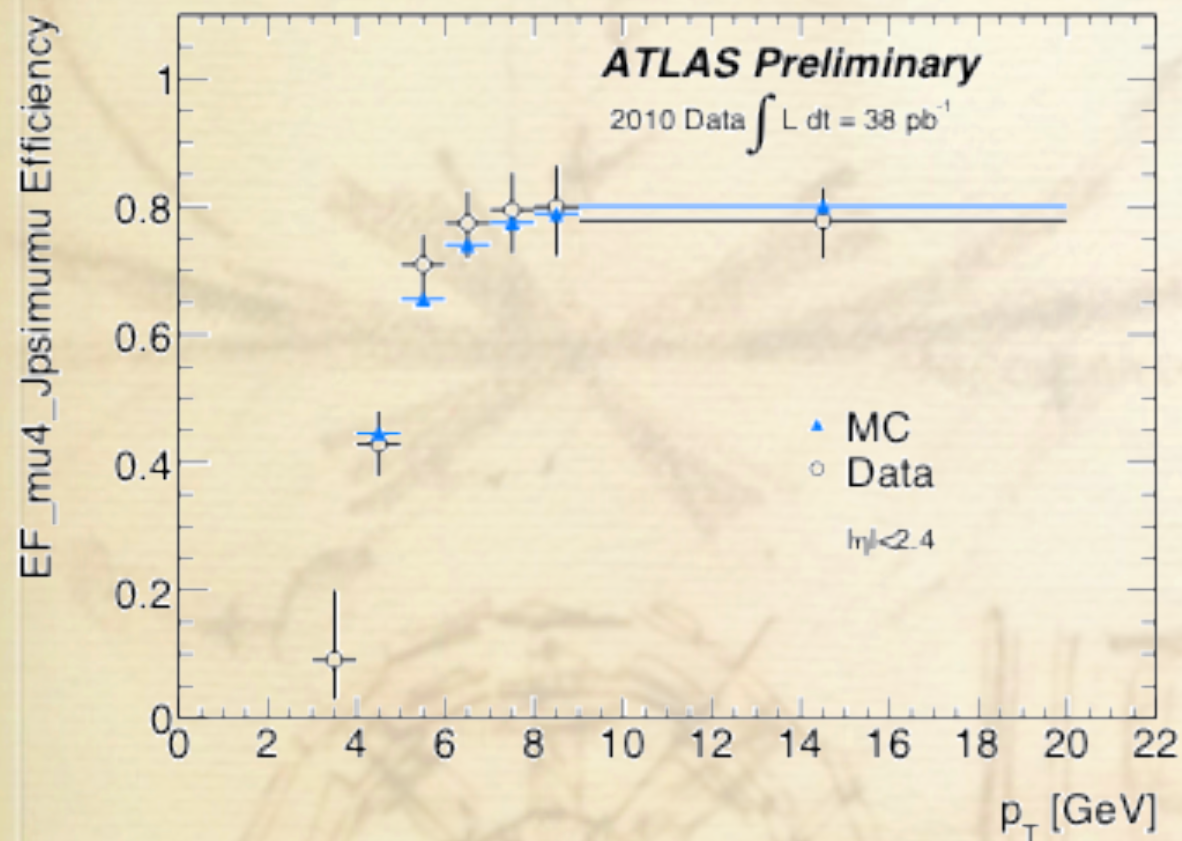
Event passing EF_mu4

$$P(EF_mu4_Jpsimumu) = \frac{P(EF_mu4) P(EF_mu4_Jpsimumu | EF_mu4)}{P(EF_mu4 | EF_mu4_Jpsimumu)}$$

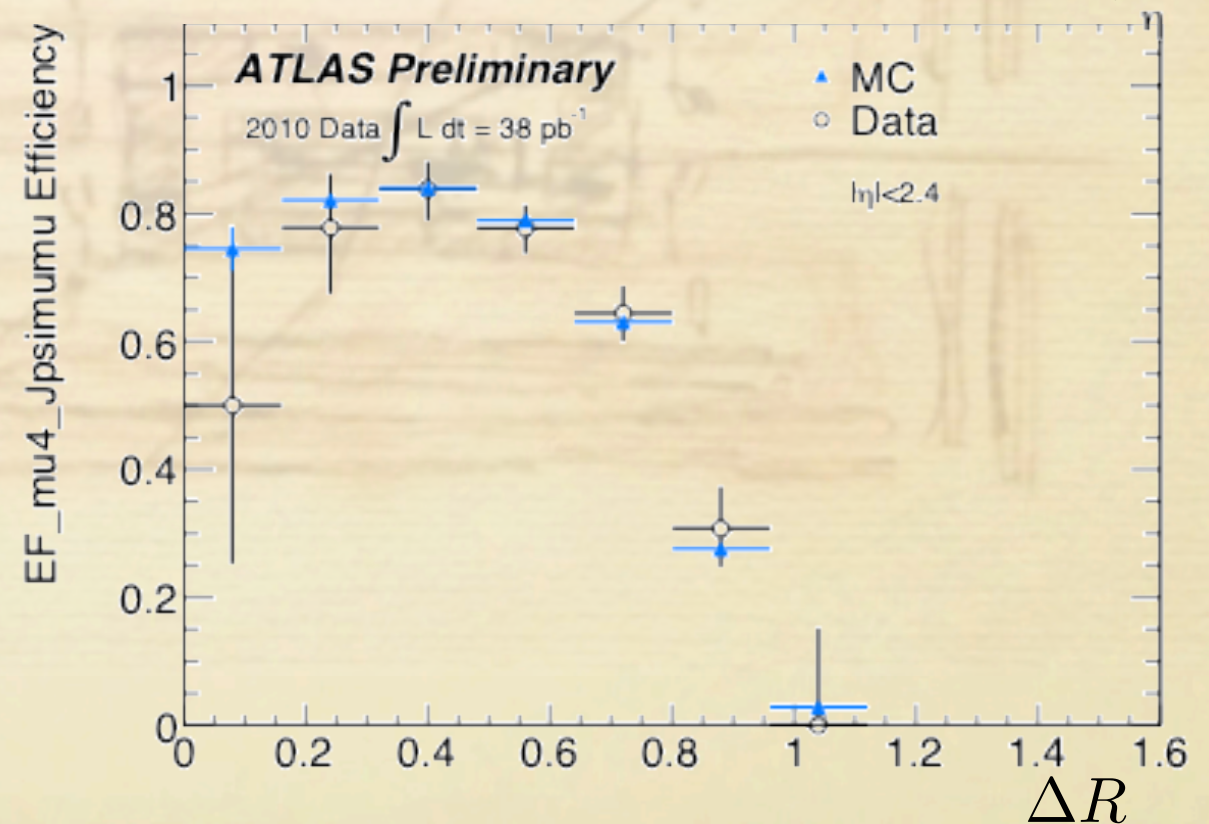
J/psi tag & probe

*from MC - too high
prescaled in data*

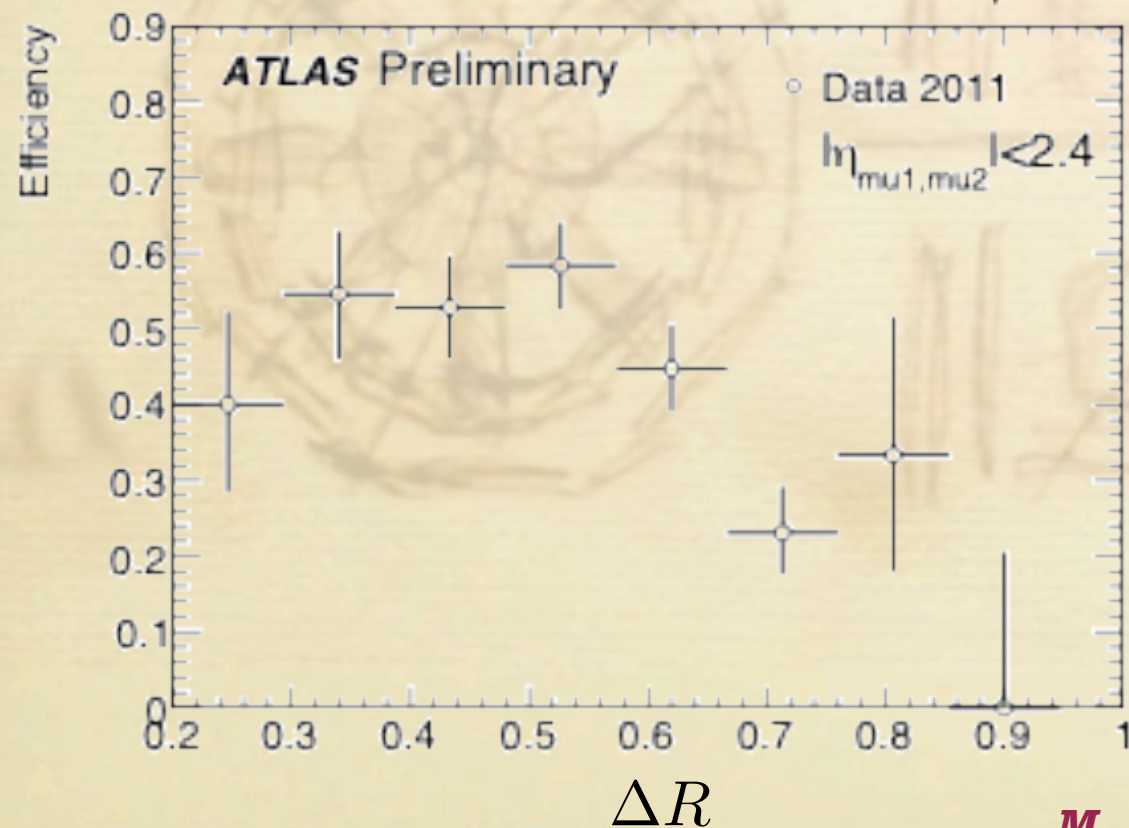
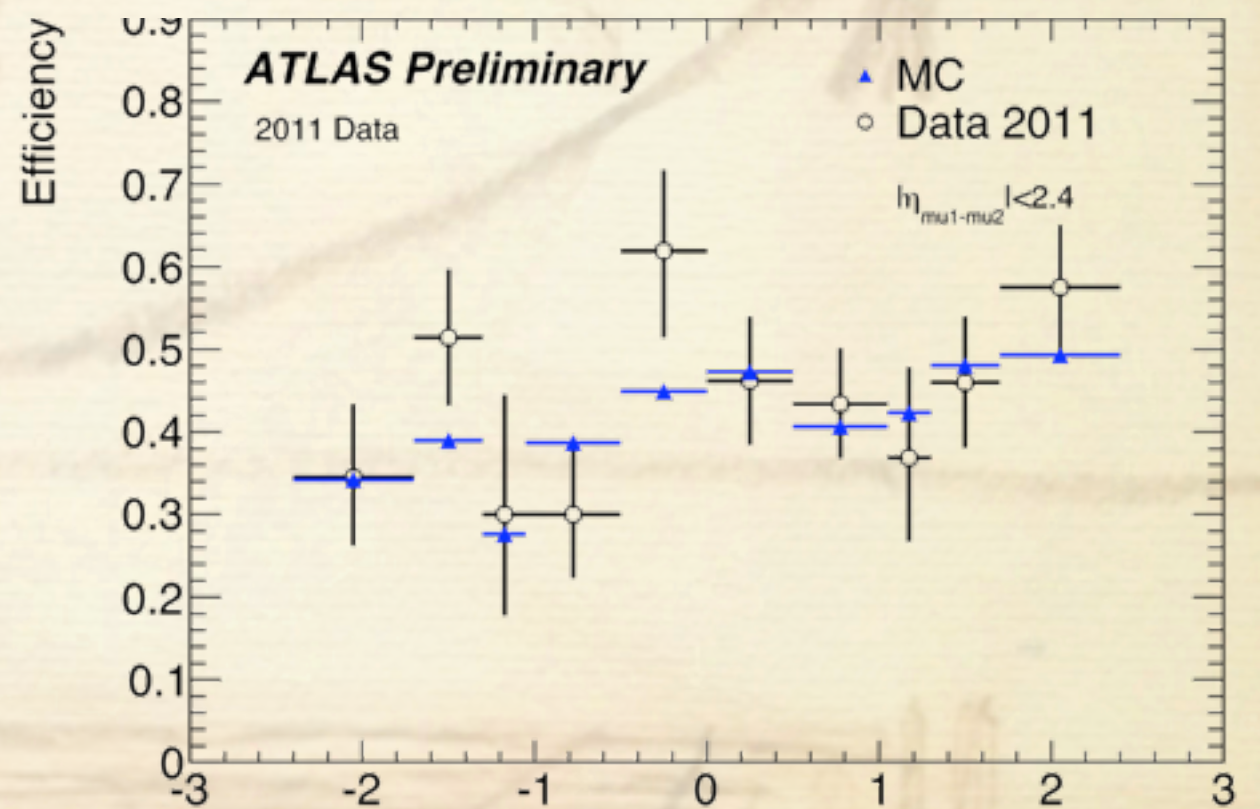
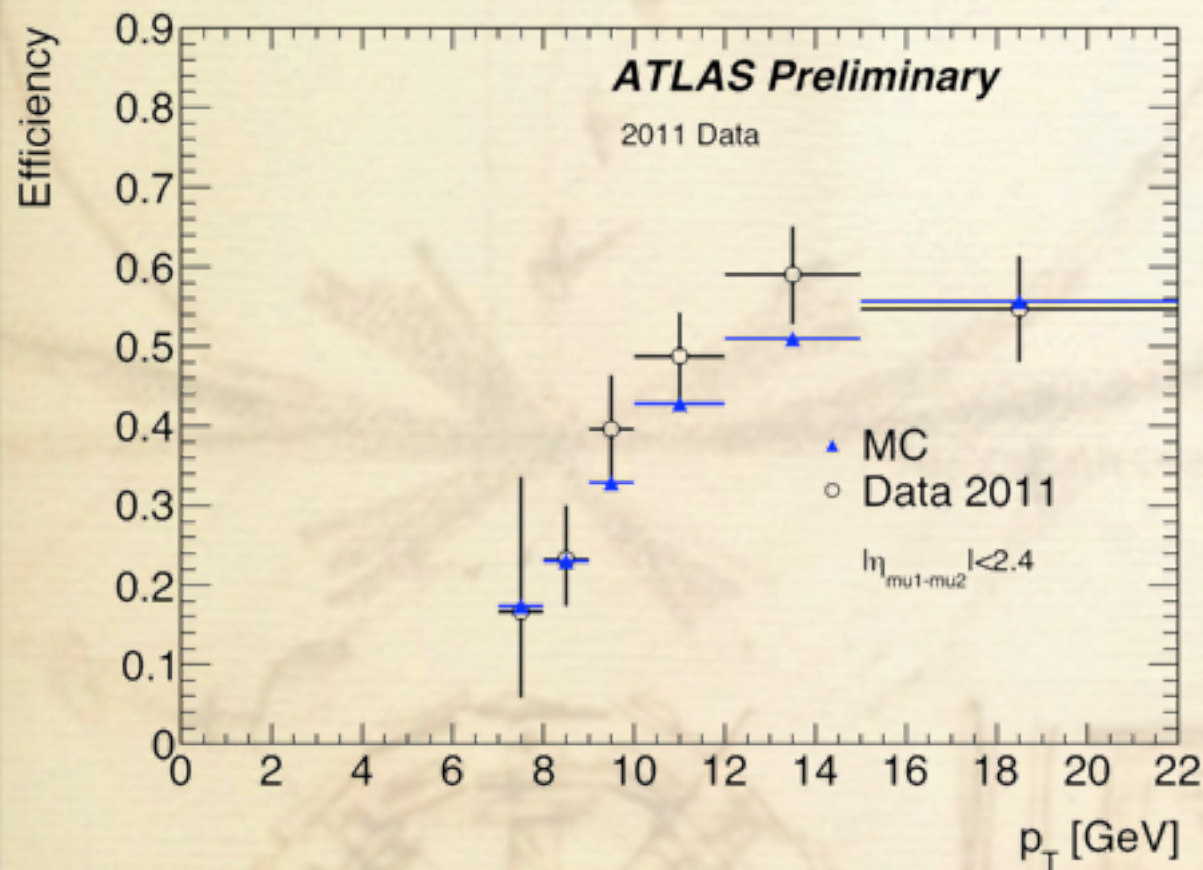
NON TOPOLOGICAL TRIGGER



- J/psi Tag & Probe -
- 2010 Data 38 pb^{-1}
- Efficiency:
 - 78.7 ± 0.5 (%) Data
 - 78.6 ± 0.3 (%) MC



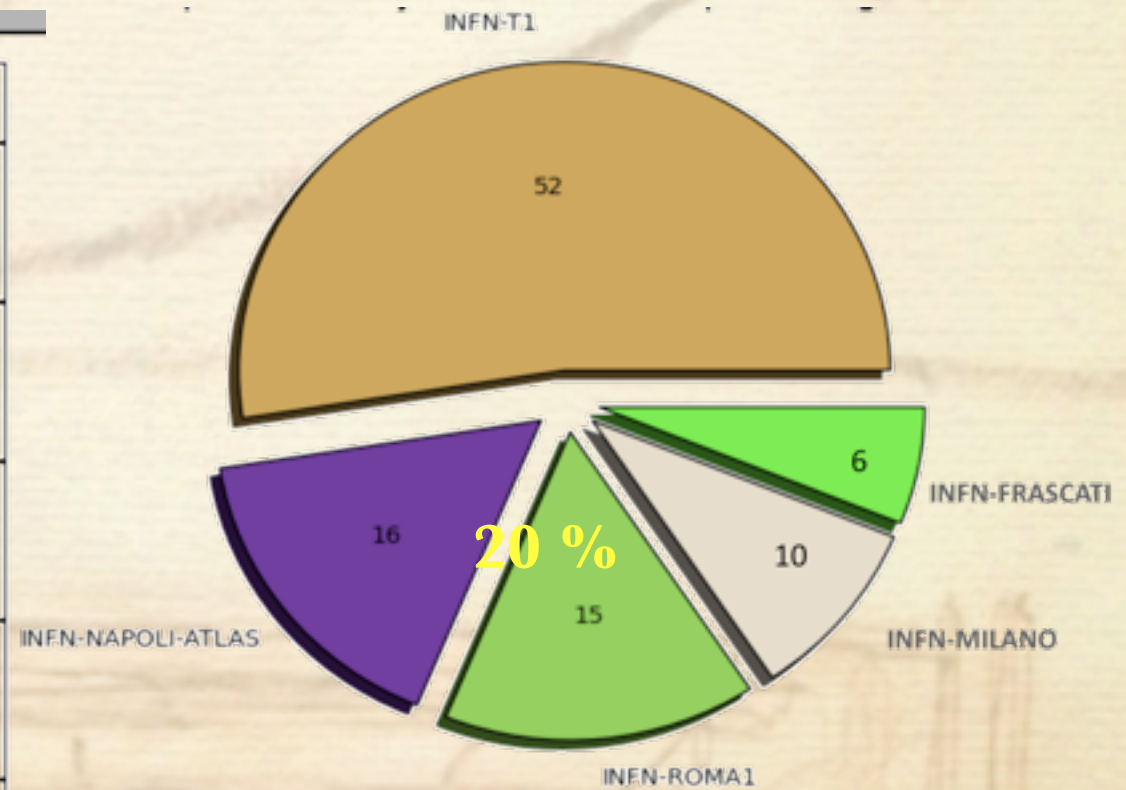
TOPOLOGICAL



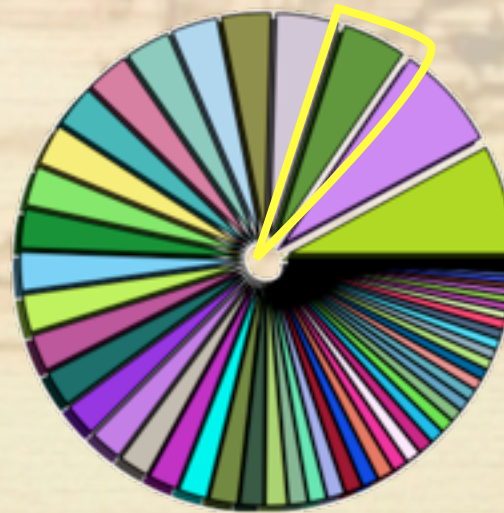
- J/psi Tag & Probe - 2011 Data 1.25 fb^{-1} η
- Not optimal for J/psi
- Better performance with more massive resonance (Bs) less boosted
- The statistical uncertainty is dominated by the large prescale factor applied on the EF_mu4 trigger item.

NAPOLI IL TIER-2

Average Efficiency based on Success/all accomplished jobs

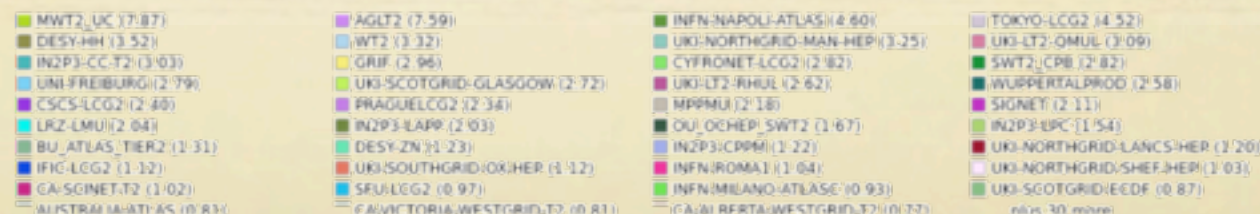


Napoli è il 6° dei Tier-2 di ATLAS nei job di Analisi



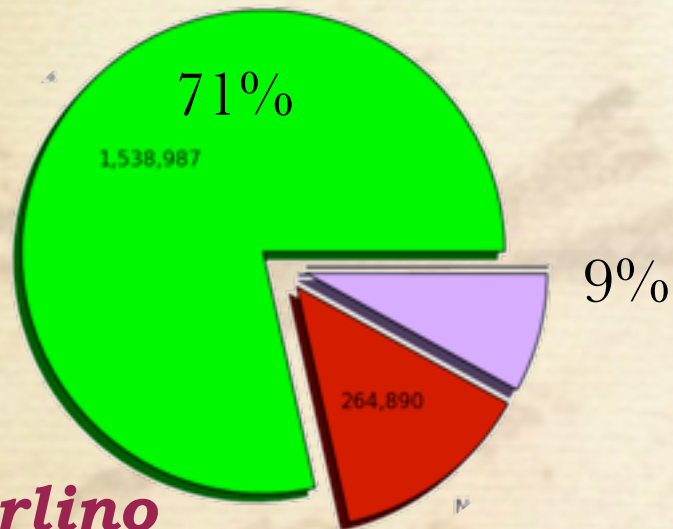
Napoli è stato il 3° Tier-2 nell'estate

1500 Core
1PB di Storage



ATLAS COMPUTING - NAPOLI TIER-2

Number of Successful and Failed jobs



G. Carlino

- Resp Naz. del Colcolo di ATLAS

- Chair del Computing Speakers

Committee

C. Di Donato,

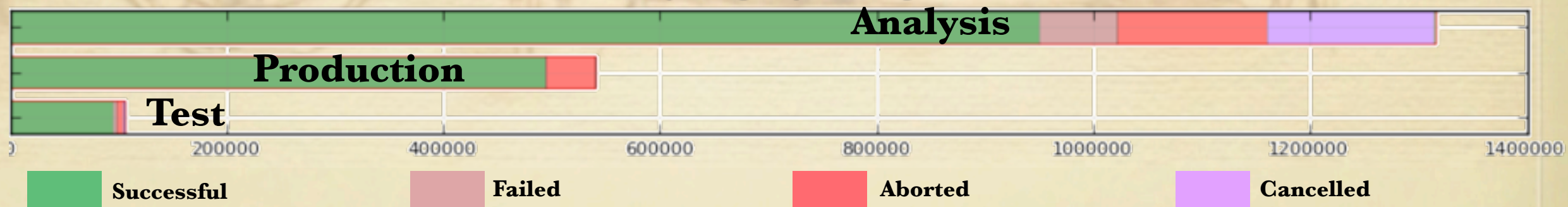
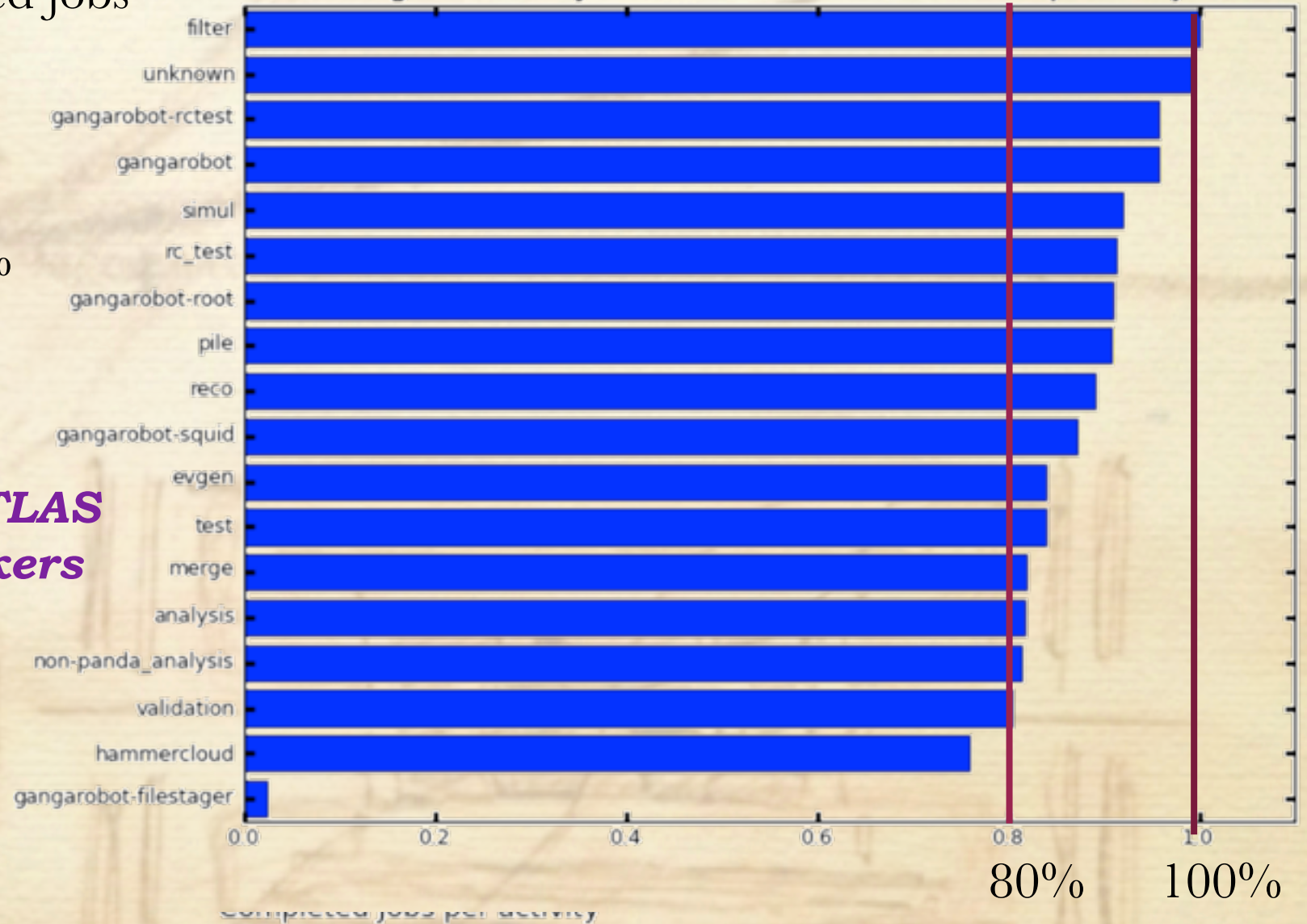
A. Doria,

- Responsabile del Tier-2

L. Merola,

G. Russo

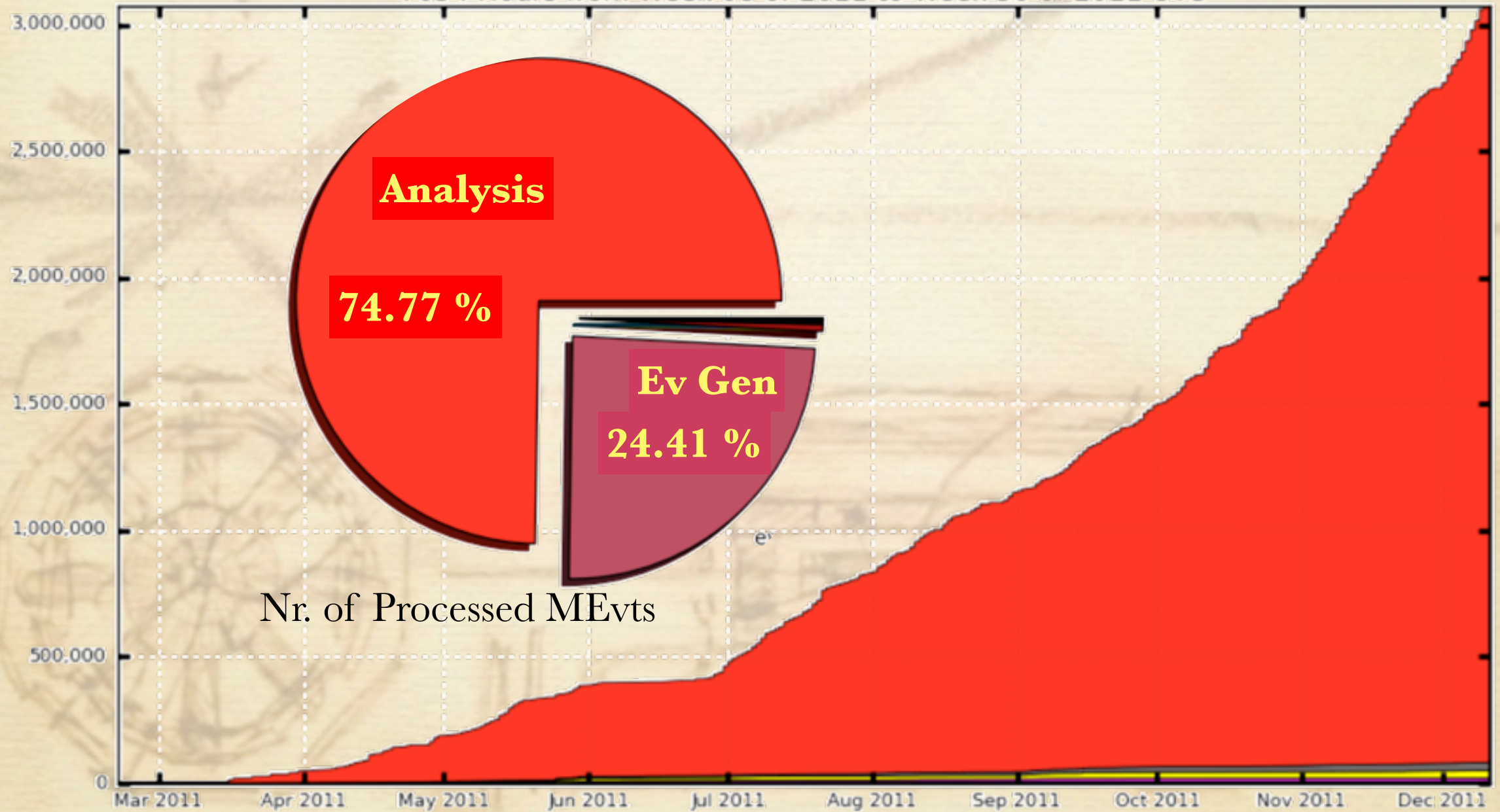
Average Efficiency based on Success/all accomplished jobs



TIER-2 USAGE

NBytes Processed in GBs (Cumulative Graph)

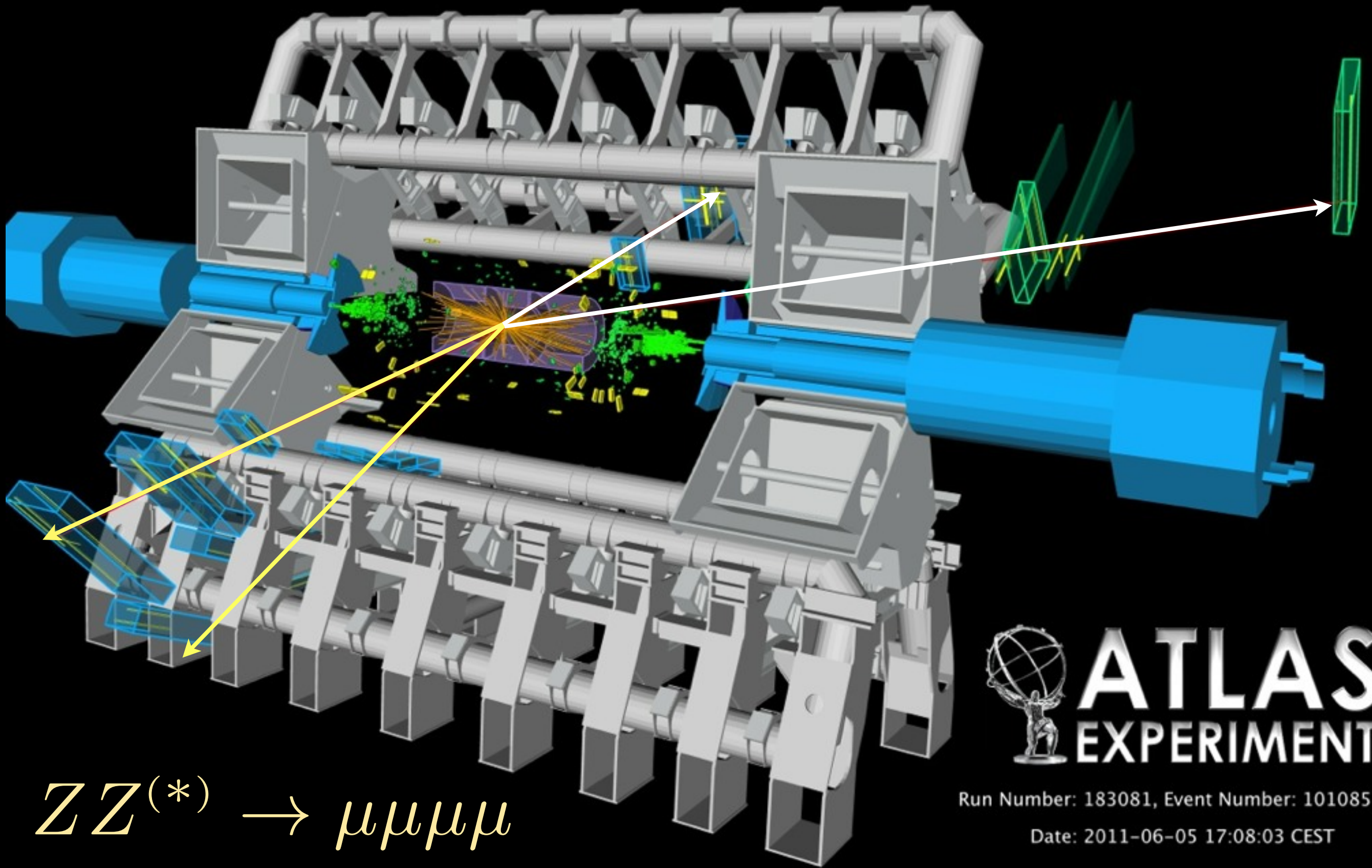
7054 Hours from Week 08 of 2011 to Week 50 of 2011 UTC



analysis (2,993,941)	pile (29,830)	reco (12,740)	simul (32,519)
validation (2,386)	merge (5,461)	filter (82,88)	rc_test (9,78)
test (0.69)	gangarobot-filestager (0.00)	unknown (0.00)	gangarobot-rctest (0.00)
evgen (0.00)	non-panda_analysis (0.00)	hammercloud (0.00)	gangarobot-squid (0.00)
gangarobot (0.00)	gangarobot-root (0.00)		

Total: 3,076,973 , Average Rate: 0.12 /s

Siamo pronti a triggerarne molte altre....



$ZZ^{(*)} \rightarrow \mu\mu\mu\mu$



ATLAS
EXPERIMENT

Run Number: 183081, Event Number: 1010851

Date: 2011-06-05 17:08:03 CEST