ATLAS Status and News

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Outline

- ATLAS collaboration composition
- Detector status
- Data collection
- First results

3030 active scientists:

- **~ 1830 with a PhD → contribute to M&O share**
- **~ 1200 students**

174 Institutions, 38 Countries, 6 Continents

Argentina	Morocco
Armenia	Netherlands
Australia	Norway
Austria	Poland
Azerbaijan	Portugal
Belarus	Romania
Brazil	Russia
Canada	Serbia
Chile	Slovakia
China	Slovenia
Colombia	South Africa
Czech Republic	Spain
Denmark	Sweden
France	Switzerland
Georgia	Taiwan
Germany	Turkey
Greece	UK
Israel	USA
Italy	CERN
Japan	JINR

ATLAS Collaboration

July 2010

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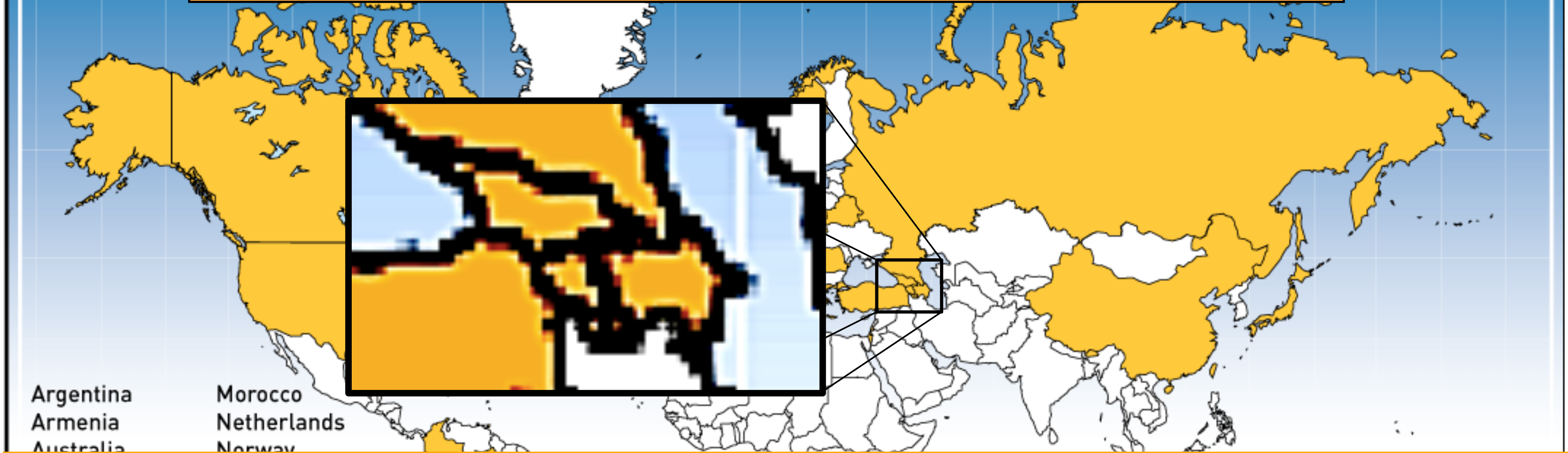
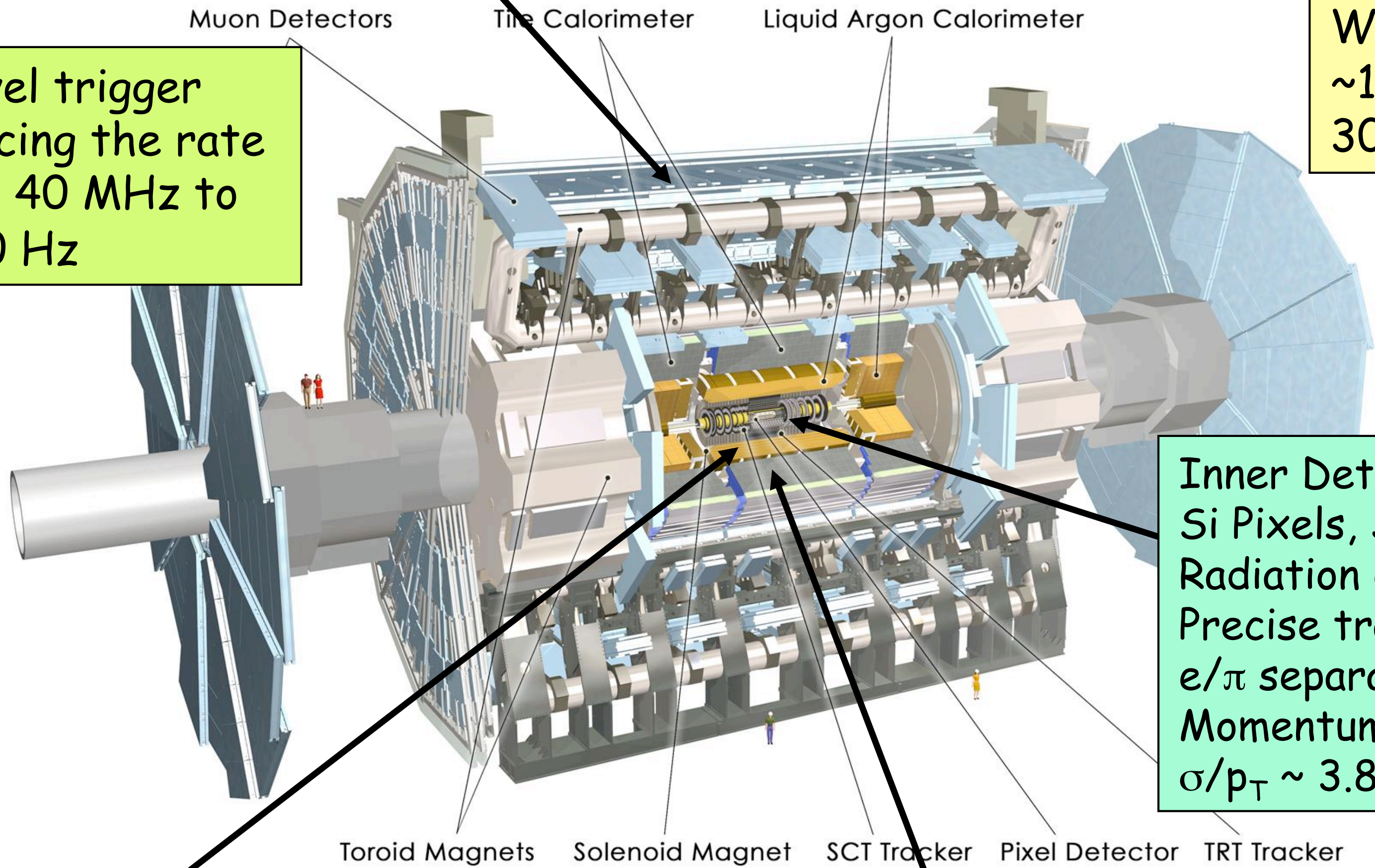


Albany, Alberta, NIKHEF Amsterdam, Ankara, LAPP Annecy, Argonne NL, Arizona, UT Arlington, Athens, NTU Athens, **Baku**, IFAE Barcelona, Belgrade, Bergen, Berkeley LBL and UC, HU Berlin, Bern, Birmingham, UAN Bogota, Bologna, Bonn, Boston, Brandeis, Brasil Cluster, Bratislava/SAS Kosice, Brookhaven NL, Buenos Aires, Bucharest, Cambridge, Carleton, CERN, Chinese Cluster, Chicago, Chile, Clermont-Ferrand, Columbia, NBI Copenhagen, Cosenza, AGH UST Cracow, IFJ PAN Cracow, SMU Dallas, UT Dallas, DESY, Dortmund, TU Dresden, JINR Dubna, Duke, Edinburgh, Frascati, Freiburg, Geneva, Genoa, Giessen, Glasgow, Göttingen, LPSC Grenoble, Technion Haifa, Hampton, Harvard, Heidelberg, Hiroshima IT, Indiana, Innsbruck, Iowa SU, Iowa, UC Irvine, Istanbul Bogazici, Johannesburg/Witwatersrand, KEK, Kobe, Kyoto, Kyoto UE, Lancaster, UN La Plata, Lecce, Lisbon LIP, Liverpool, Ljubljana, QMW London, RHBNC London, UC London, Lund, UA Madrid, Mainz, Manchester, CPPM Marseille, Massachusetts, MIT, Melbourne, Michigan, Michigan SU, Milano, Minsk NAS, Minsk NCPHEP, Montreal, McGill Montreal, RUPHE Morocco, FIAN Moscow, ITEP Moscow, MEPhI Moscow, MSU Moscow, Munich LMU, MPI Munich, Nagasaki IAS, Nagoya, Naples, New Mexico, New York, Nijmegen, Northern Illinois University, BINP Novosibirsk, NPI Petersburg, Ohio SU, Okayama, Oklahoma, Oklahoma SU, Olomouc, Oregon, LAL Orsay, Osaka, Oslo, Oxford, Paris VI and VII, Pavia, Pennsylvania, Pisa, Pittsburgh, CAS Prague, CU Prague, TU Prague, IHEP Protvino, Regina, Rome I, Rome II, Rome III, Rutherford Appleton Laboratory, DAPNIA Saclay, Santa Cruz UC, Sheffield, Shinshu, Siegen, Simon Fraser Burnaby, SLAC, Stockholm, KTH Stockholm, Stony Brook, Sydney, Sussex, AS Taipei, **Tbilisi**, Tel Aviv, Thessaloniki, Tokyo ICEPP, Tokyo MU, Tokyo Tech, Toronto, TRIUMF, Tsukuba, Tufts, Udine/ICTP, Uppsala, UI Urbana, Valencia, UBC Vancouver, Victoria, Waseda, Washington, Weizmann Rehovot, FH Wiener Neustadt, Wisconsin, Wuppertal, Würzburg, Yale, **Yerevan**

Muon Spectrometer ($|\eta|<2.7$) : air-core toroids with gas-based muon chambers
Muon trigger and measurement with momentum resolution < 10% up to E_μ ~ 1 TeV

Length : ~ 46 m
Radius : ~ 12 m
Weight : ~ 7000 tons
~10^8 electronic channels
3000 km of cables

3-level trigger reducing the rate from 40 MHz to ~200 Hz

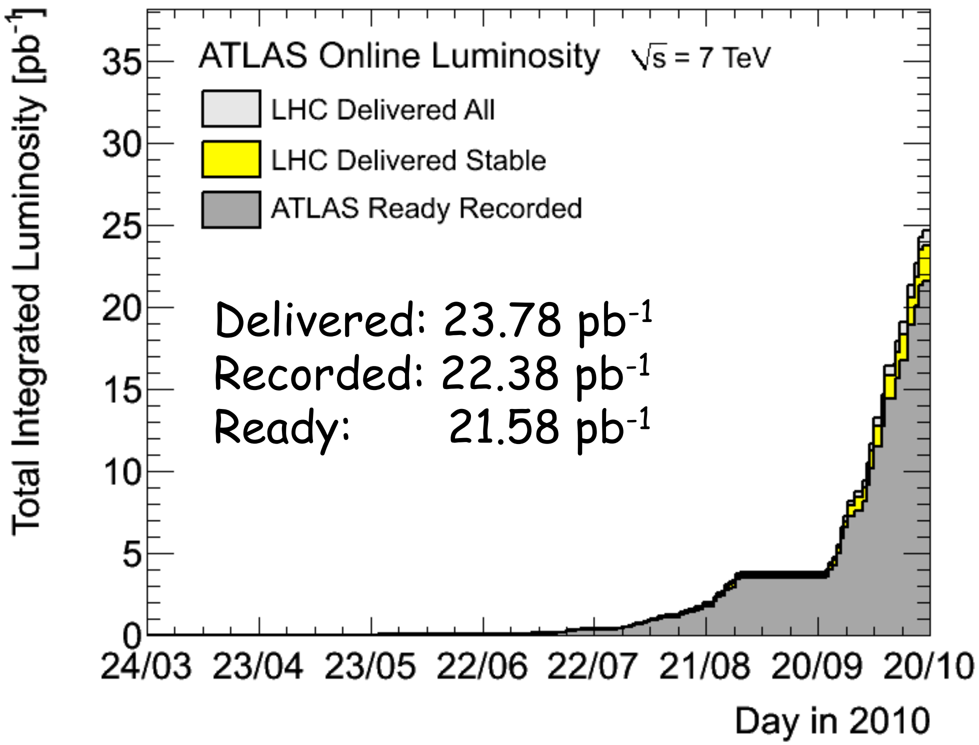


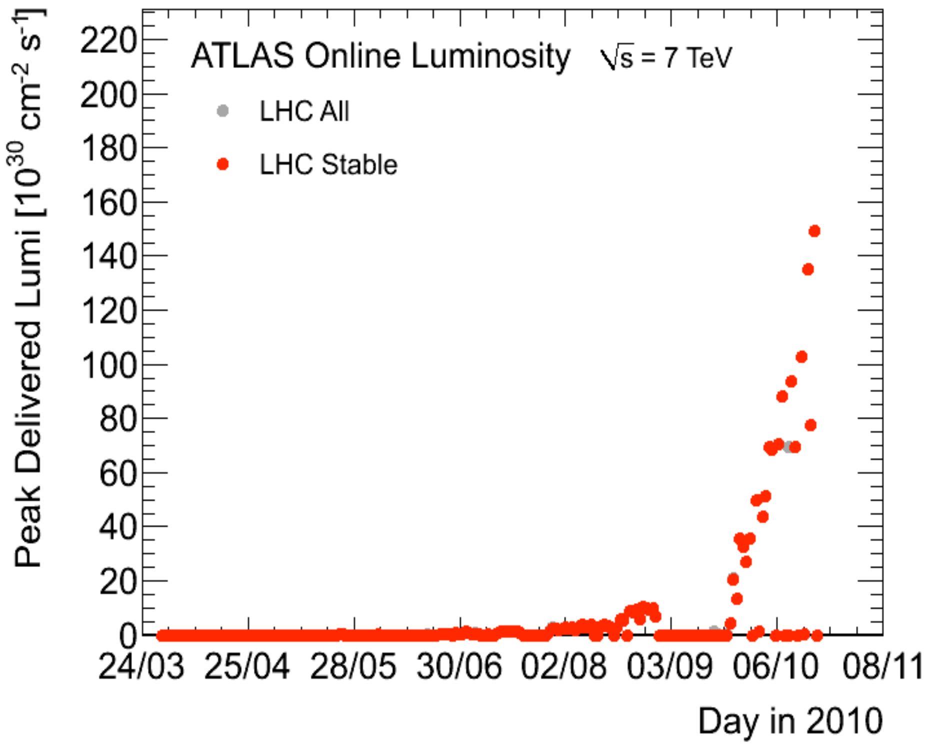
Inner Detector ($|\eta|<2.5$, B=2T):
Si Pixels, Si strips, Transition Radiation detector (straws)
Precise tracking and vertexing, e/π separation
Momentum resolution:
$\sigma/p_T \sim 3.8\times10^{-4}\, p_T\,(\mathrm{GeV}) \oplus 0.015$

EM calorimeter: Pb-LAr Accordion
e/γ trigger, identification and measurement
E-resolution: $\sigma/E \sim 10\%/\sqrt{E}$

HAD calorimetry ($|\eta|<5$): segmentation, hermeticity
Fe/scintillator Tiles (central), Cu/W-LAr (fwd)
Trigger and measurement of jets and missing E_T
E-resolution: $\sigma/E \sim 50\%/\sqrt{E} \oplus 0.03$

Luminosity overview



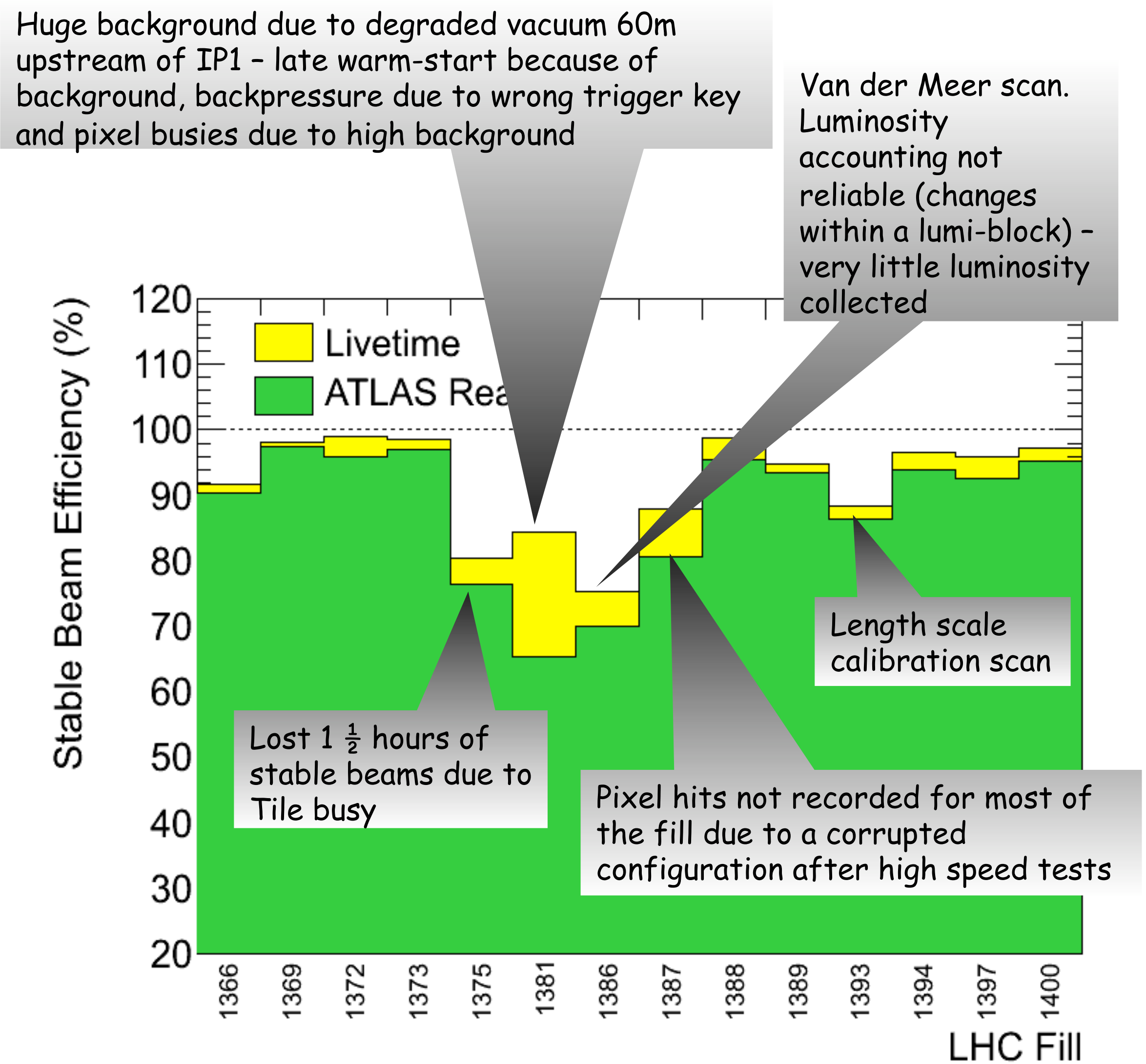


- Integrated luminosity: ready recorded 21.58 pb^{-1}
  - Efficiency: 90.7%
- Peak luminosity: 1.49×10^{32} $cm^{-2}s^{-1}$ (LHC reaches goal)

Data-taking efficiency

- The total luminosity weighted efficiency since the beginning of the year is **90.9%**

- Inefficiency is dominated by a problematic week when most of the integrated luminosity was recorded



Detector status

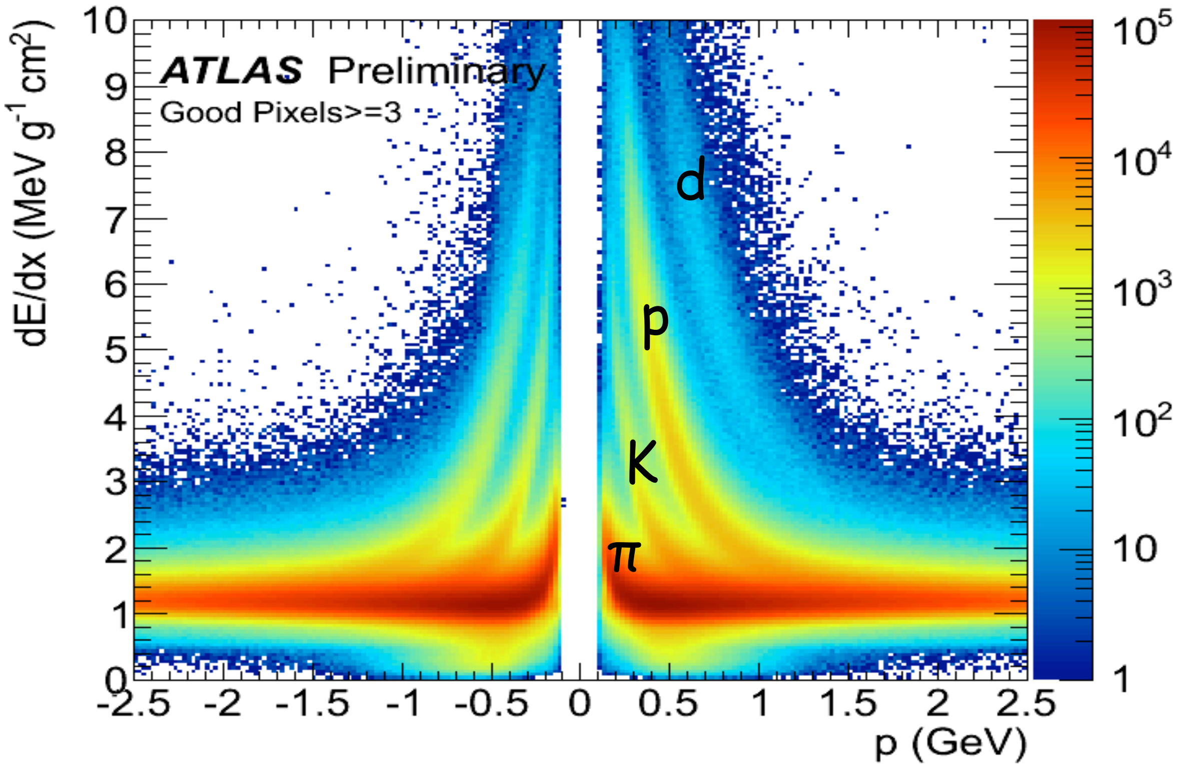
Subdetector	Number of Channels	Approximate Operational Fraction
Pixels	80 M	97.3%
SCT Silicon Strips	6.3 M	99.2%
TRT Transition Radiation Tracker	350 k	97.1%
LAr EM Calorimeter	170 k	98.1%
Tile calorimeter	9800	96.9%
Hadronic endcap LAr calorimeter	5600	99.9%
Forward LAr calorimeter	3500	100%
LVL1 Calo trigger	7160	99.9%
LVL1 Muon RPC trigger	370 k	99.5%
LVL1 Muon TGC trigger	320 k	100%
MDT Muon Drift Tubes	350 k	99.7%
CSC Cathode Strip Chambers	31 k	98.5%
RPC Barrel Muon Chambers	370 k	97.0%
TGC Endcap Muon Chambers	320 k	98.6%

All subdetectors have operational fractions in the upper 90's.

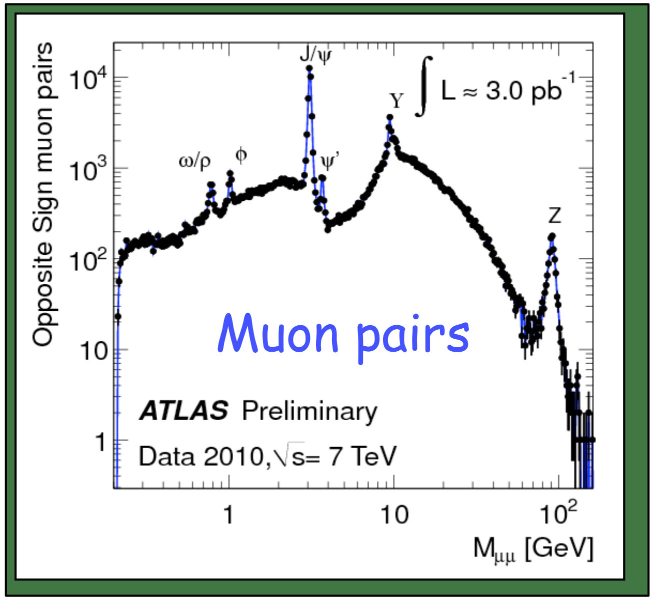
N.B. we are tightening the definition of "operational"– e.g. a TRT wire now needs to be at least 60% efficient to be counted as operational.

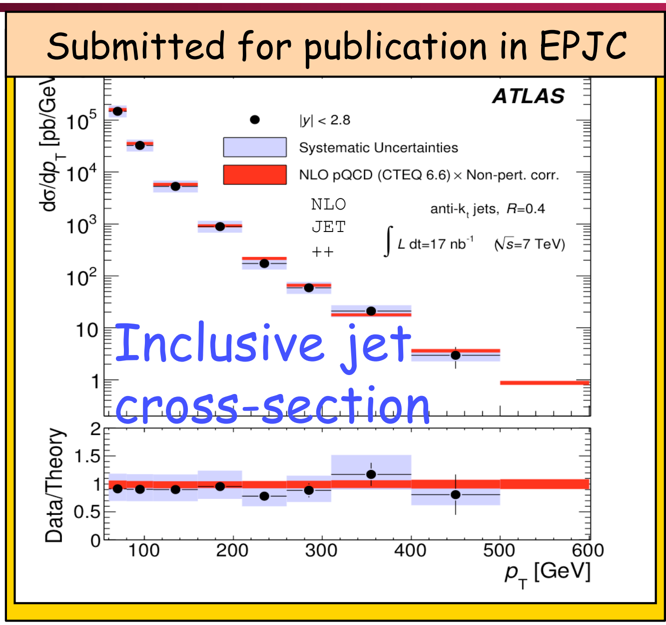
Comment on detector performance

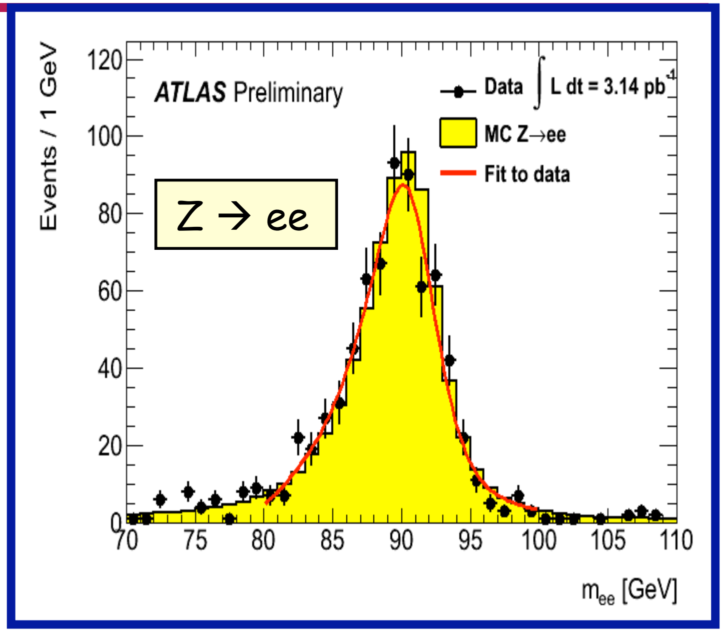
- All detectors are performing close to the highest expectations
  - Some go much beyond that
- The Pixel detector was designed to measure 3 space points on tracks of p_T > 1 GeV
  - In reality it can also measure dE/dx for particles of momentum as low as 100 MeV and provide particle identification thanks to the Time-over-Threshold capability of each pixel

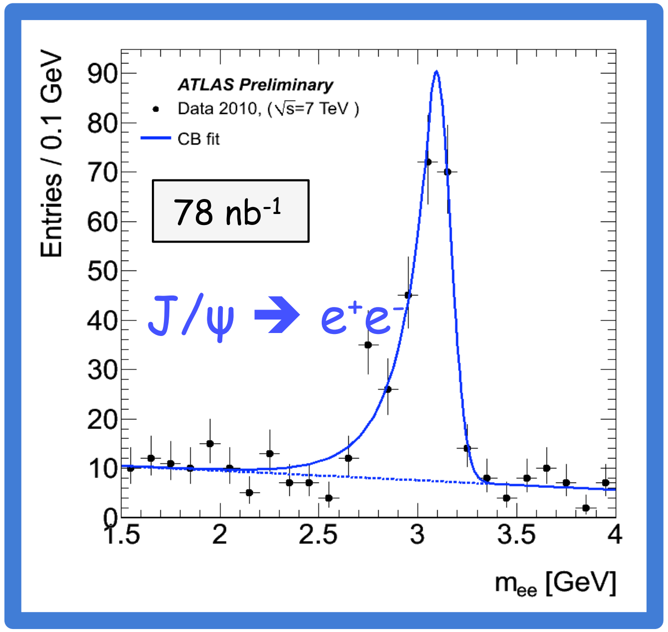


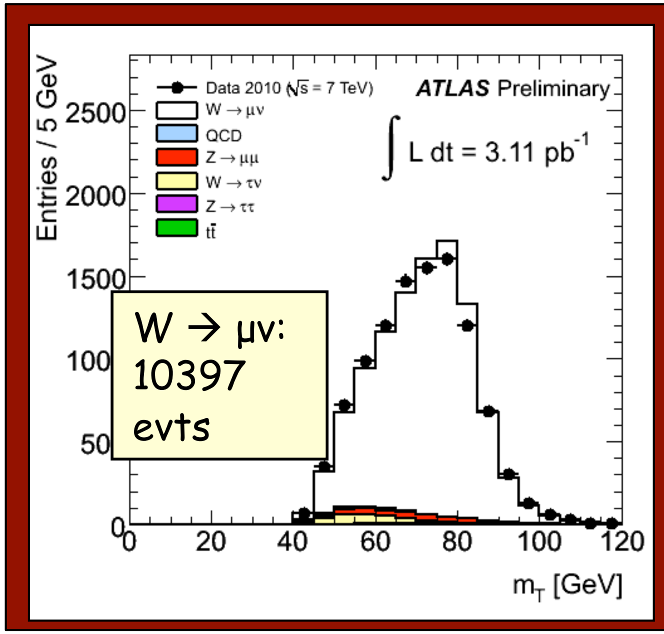
First results: "old" physics

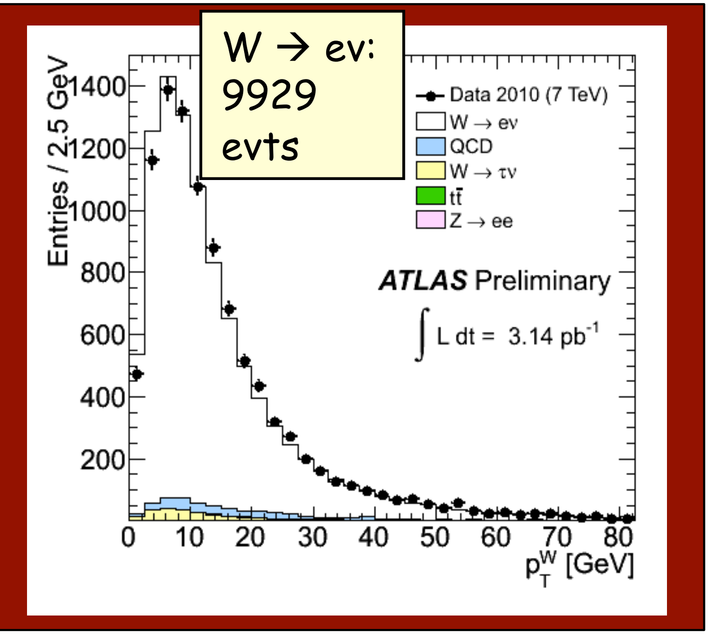






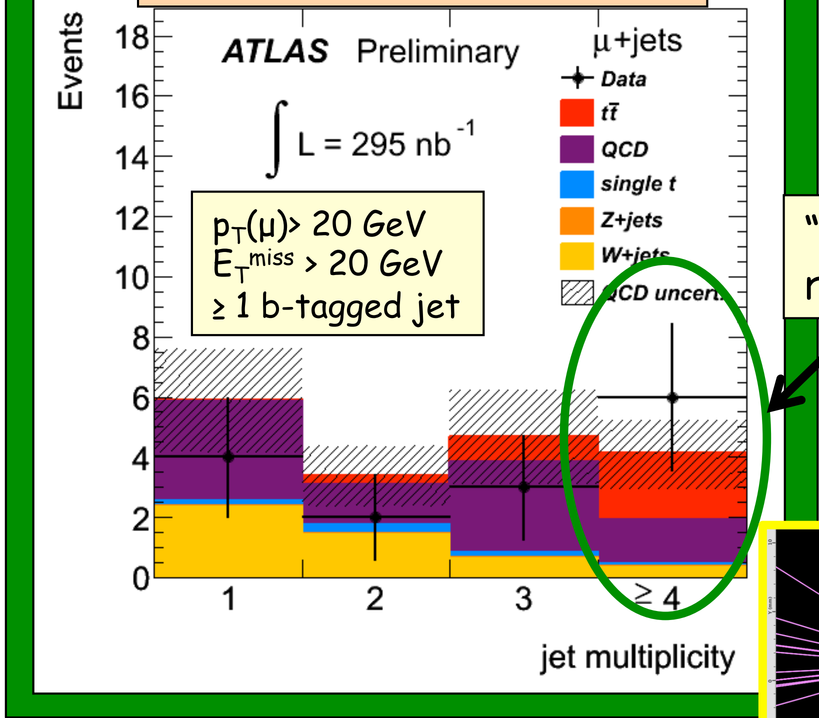






Next: top physics

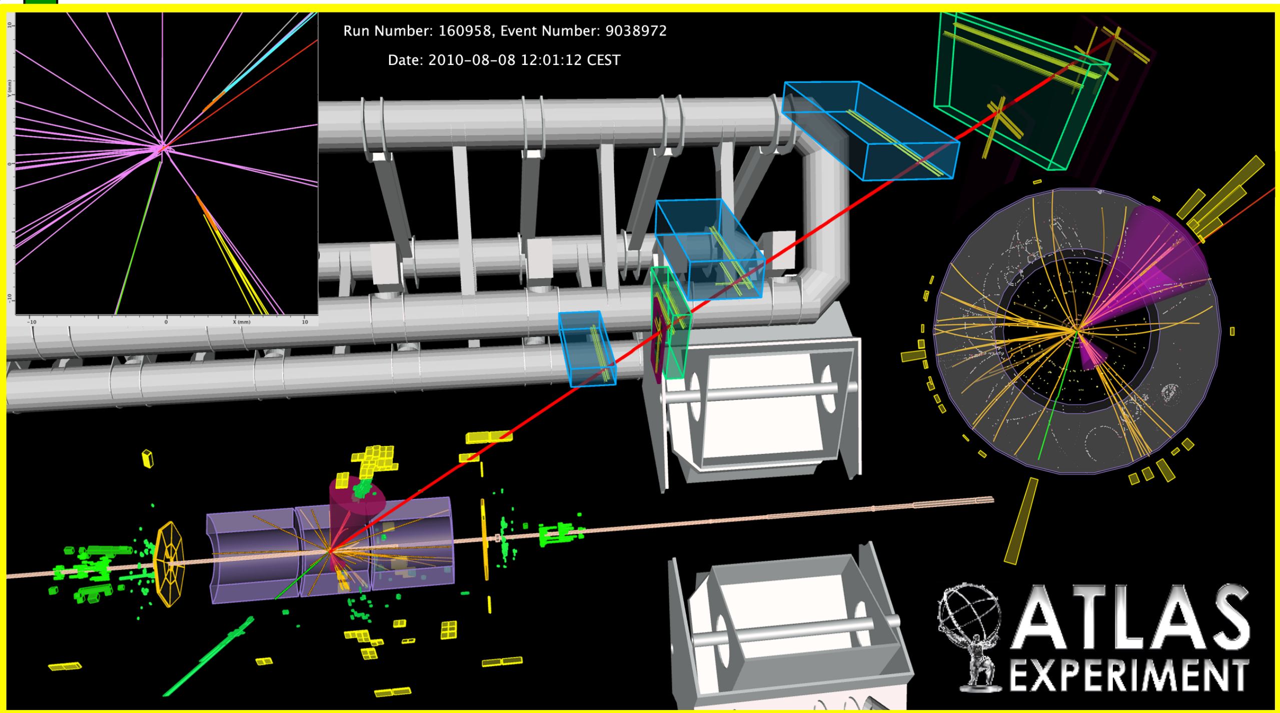
July 2010 (~ 300 nb^{-1})



"Signal" region

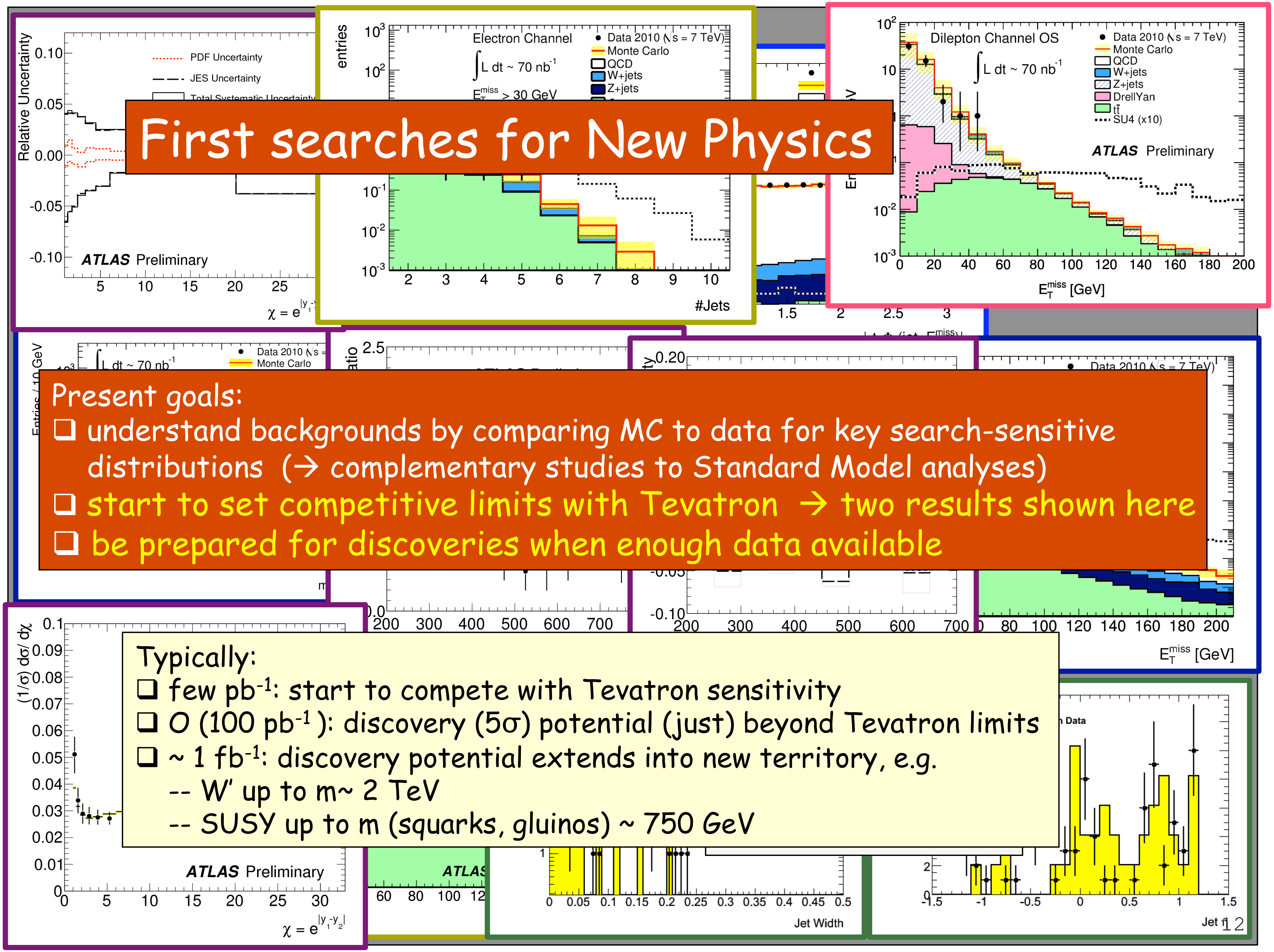
The era of top-quark physics at the LHC has started

A gold-plated tt → bev bμv candidate



$p_T(\mu)$= 51 GeV
$p_T(e)$=66 GeV
p_T (b-tagged jets) = 174, 45 GeV
E_T^{miss} = 113 GeV,
Secondary vertices:
-- distance from primary vertex: 4mm, 3.9 mm
-- vertex mass : ~2 GeV, ~ 4 GeV

First searches for New Physics



Present goals:

- ❑ understand backgrounds by comparing MC to data for key search-sensitive distributions (→ complementary studies to Standard Model analyses)
- ❑ start to set competitive limits with Tevatron → two results shown here
- ❑ be prepared for discoveries when enough data available

Typically:

- ❑ few pb^{-1}: start to compete with Tevatron sensitivity
- ❑ O (100 pb^{-1}): discovery (5σ) potential (just) beyond Tevatron limits
- ❑ ~ 1 fb^{-1}: discovery potential extends into new territory, e.g.
  - -- W' up to m~ 2 TeV
  - -- SUSY up to m (squarks, gluinos) ~ 750 GeV

Since 30 March, ATLAS has recorded > 20 pb^{-1} at $\sqrt{s}$ =7 TeV

We are very grateful to the LHC team for their effort to bring the machine to such excellent performance !

- ❑ The whole experiment has worked efficiently and fast, from data taking at the pit (with efficiency > 90%), through data processing and transfer worldwide, to prompt delivery of performance and physics results.
- ❑ The performance of the detector and the quality of the reconstruction and simulation software are much better than expected at this (initial) stage of the experiment (and close to nominal in some cases …).
- ❑ The Grid is a success, and has been crucial to enable the worldwide Collaboration to participate in the data analysis quickly and effectively

ATLAS has started to exploit in earnest the LHC physics potential, in particular:

- ❑ measurements of the jets, W, Z cross-sections → submitted for publication
- ❑ observation of the top quark
- ❑ searches for New Physics → first limits exceeding the Tevatron published or submitted
- ❑~ 100 results/notes submitted to Summer Conferences
- ❑ 3 papers published, 3 more submitted for publication

→ Results will become more and more rich and exciting in the months to come

In parallel: detector consolidation and Upgrade activities progress with vigor, e.g.:

- ❑ First Upgrade TDR (IBL) approved by the Collaboration → submitted to the LHCC
- ❑ R&D work, projects (e.g. FTK) and plans for Phase 1 and Phase 2
- ❑ Organizational and management structure of the Upgrade projects being finalized
- ❑ First ideas about MoU and funding model being discussed with CERN Management and National Contact Physicists

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