

Plans for ATLAS

Strategy meeting for particle physics in Sweden

Christian Ohm, with input from the groups at
Lund, Stockholm, Uppsala and KTH

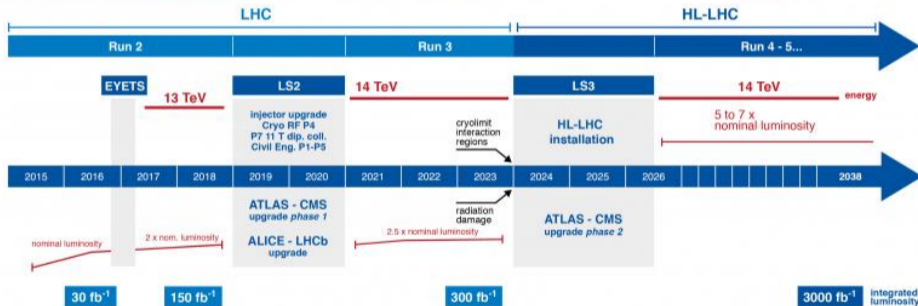
Mar 13, 2018



Schedule for the LHC



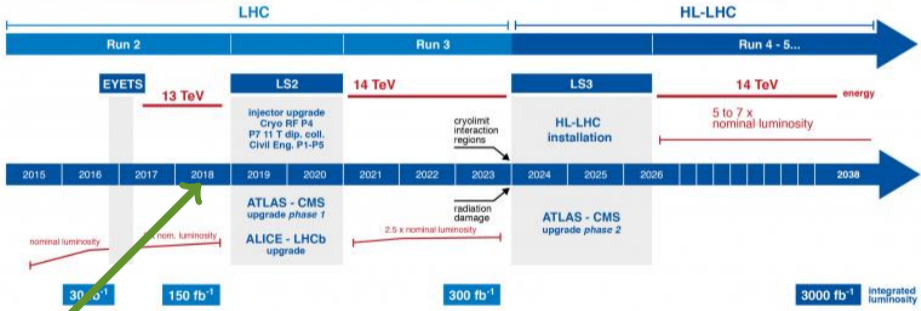
LHC / HL-LHC Plan



Schedule for the LHC

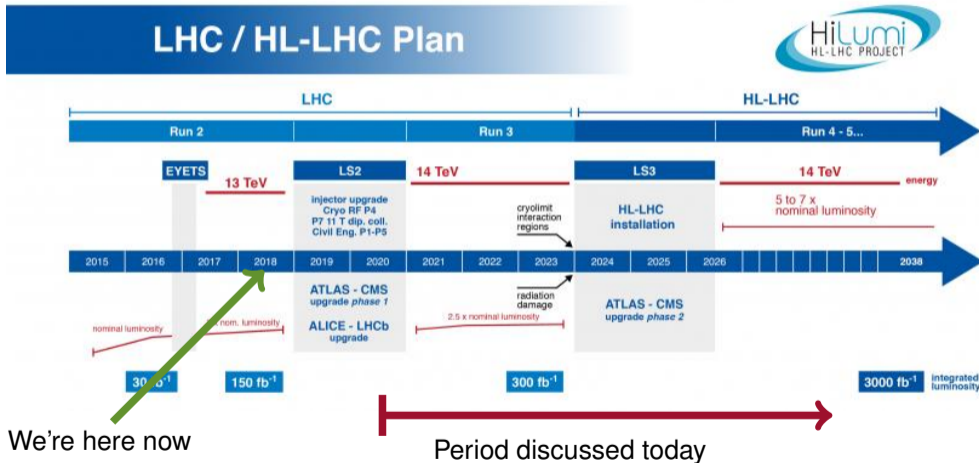


LHC / HL-LHC Plan



We're here now

Schedule for the LHC



Updated European strategy in 2013



ORGANISATION EUROPEENNE POUR LA RECHERCHE NUCLEAIRE **CERN** EUROPEAN ORGANIZATION FOR NUCLEAR RESEARCH

Action to be taken

Voting Procedure

For Approval	EUROPEAN STRATEGY SESSION OF COUNCIL 16 th Session - 30 May 2013 European Commission Berlaymont Building - Brussels	Simple Majority of Member States represented and voting
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ORGANISATION EUROPEENNE POUR LA RECHERCHE NUCLEAIRE **CERN** EUROPEAN ORGANIZATION FOR NUCLEAR RESEARCH

High-priority large-scale scientific activities

After careful analysis of many possible large-scale scientific activities requiring significant resources, sizeable collaborations and sustained commitment, the following four activities have been identified as carrying the highest priority.

c) The discovery of the Higgs boson is the start of a major programme of work to measure this particle's properties with the highest possible precision for testing the validity of the Standard Model and to search for further new physics at the energy frontier. The LHC is in a unique position to pursue this programme. *Europe's top priority should be the exploitation of the full potential of the LHC, including the high-luminosity upgrade of the machine and detectors with a view to collecting ten times more data than in the initial design, by around 2030. This upgrade programme will also provide further exciting opportunities for the study of flavour physics and the quark-gluon plasma.*

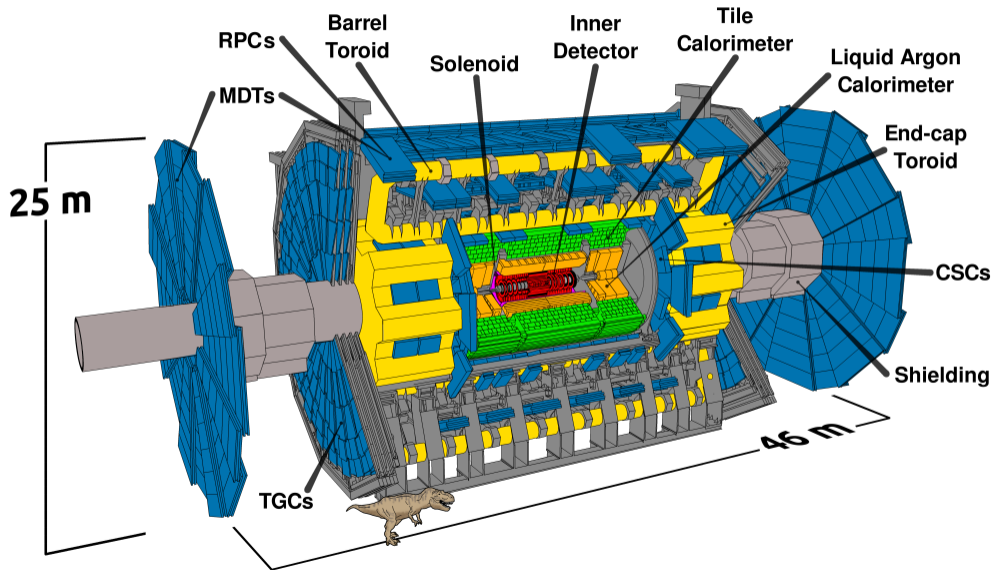
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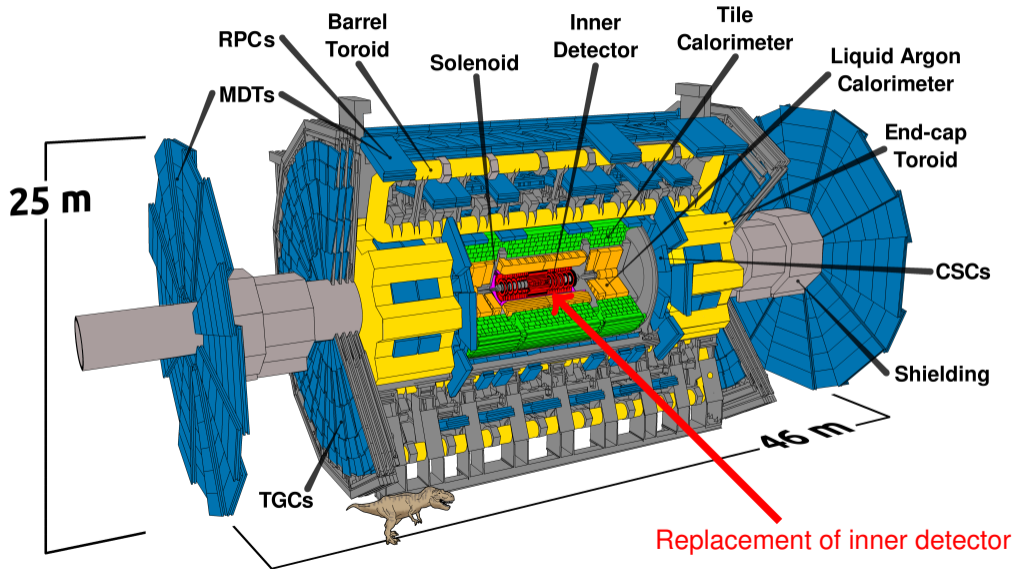
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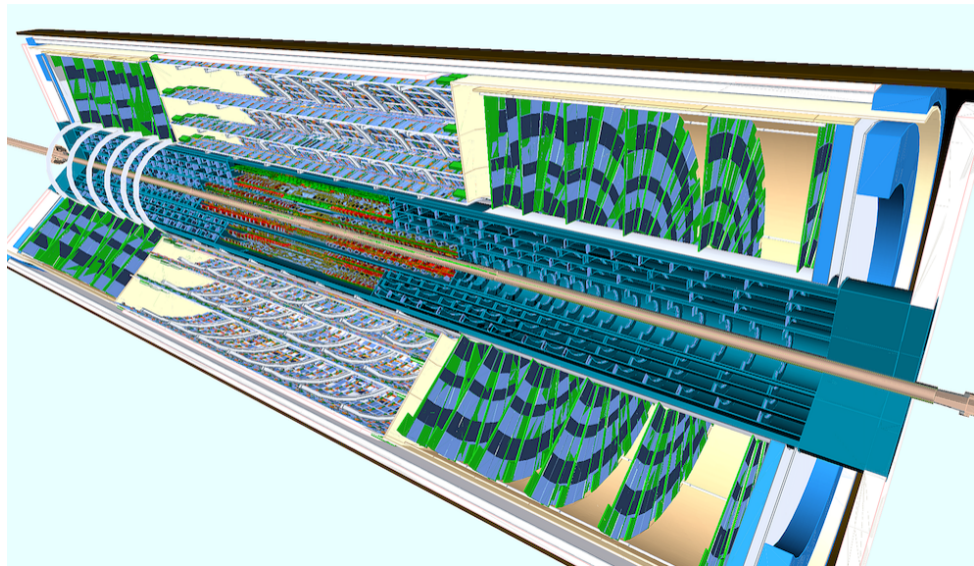
Upgrades of the ATLAS detector



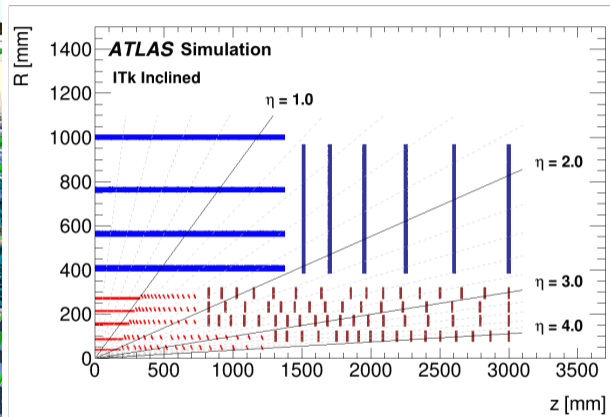
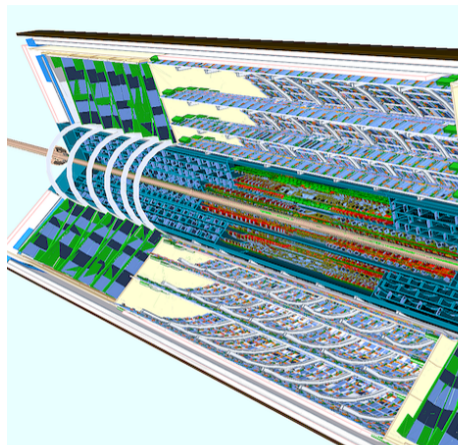
Upgrades of the ATLAS detector



Inner Tracker (ITk), silicon strips: Lund & Uppsala (+NBI, UiO?)

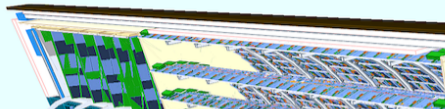


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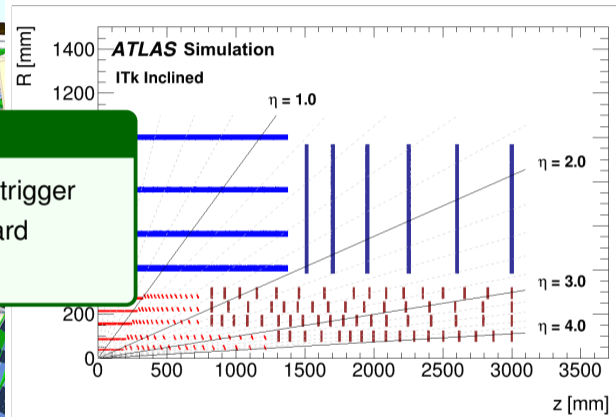
Plan to deliver 648 modules in total (two types), production in industry (NOTE, Norrtälje), quality control in new clean rooms at institutes.

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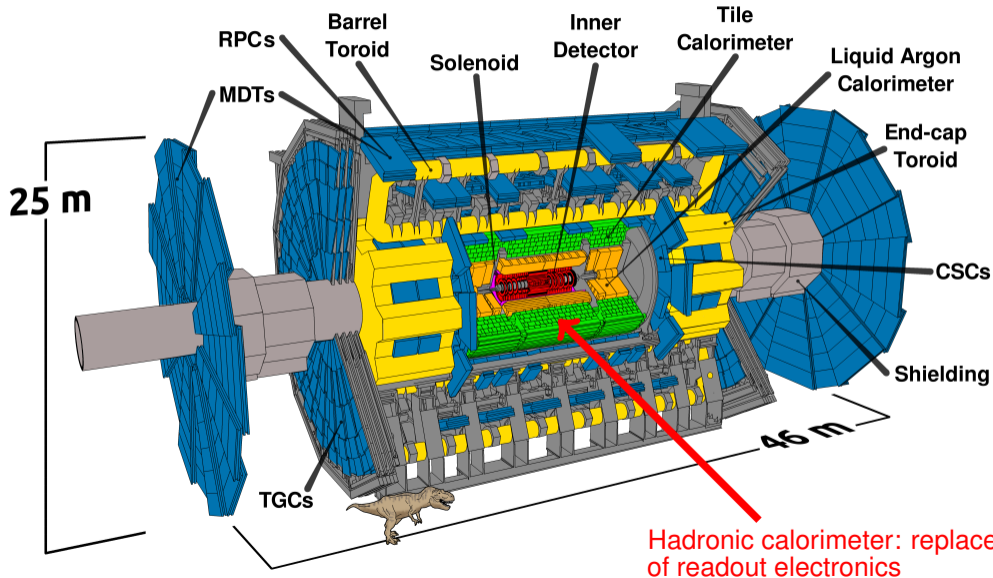
Hardware-based track trigger

- ▶ Uppsala also contributing to track trigger
- ▶ Pattern Recognition Mezzanine card
- ▶ Fast ML-based methods



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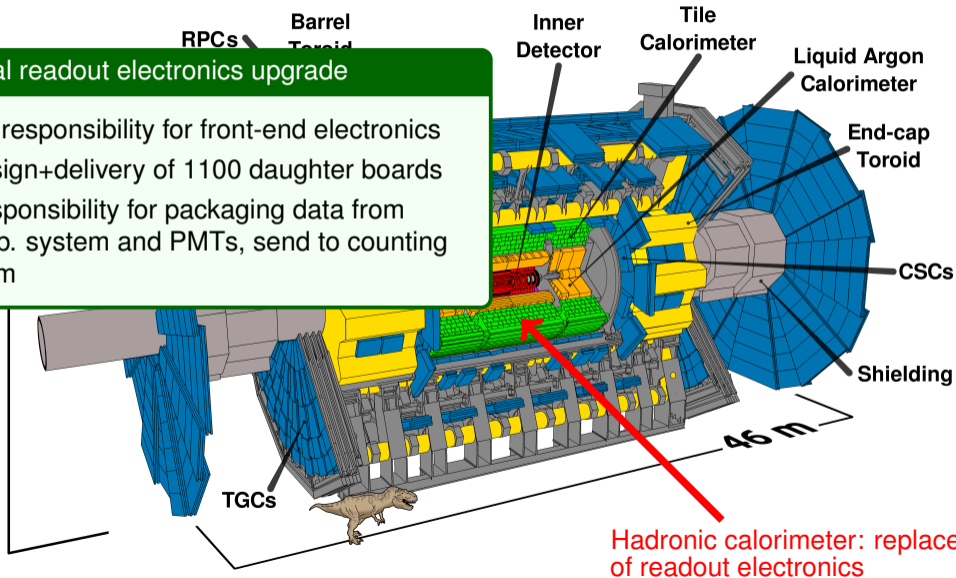
Upgrades of the ATLAS detector



Upgrades of the ATLAS detector

TileCal readout electronics upgrade

- ▶ Big responsibility for front-end electronics
- ▶ Design+delivery of 1100 daughter boards
- ▶ Responsibility for packaging data from calib. system and PMTs, send to counting room

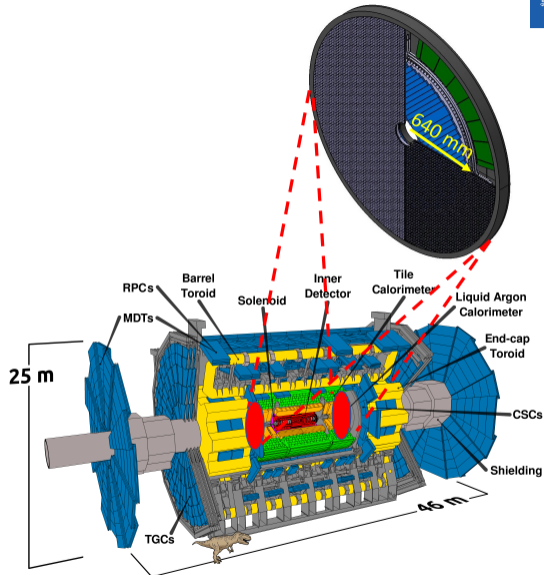
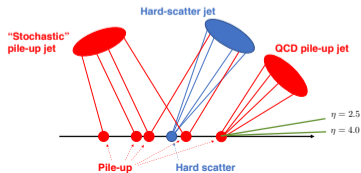


Hadronic calorimeter: replacement of readout electronics

High-Granularity Timing Detector (HGTD): KTH

Mitigate pileup by exploiting that beam spot has *time dimension*, spread ~ 200 ps

- ▶ Two endcap disks at $z = \pm 3.5$ m, Si-based Low Gain Avalanche Diode technology, 1.3×1.3 mm² pixels
- ▶ $\sigma_t = 30$ ps/track in acceptance:
 $120 \text{ mm} < R < 640 \text{ mm} \Rightarrow 2.4 < |\eta| < 4.0$
- ▶ KTH responsibility: functionality to allow use as luminometer \Rightarrow off-detector FPGA-based electronics boards



Plans for data analysis, of course subject to change since there's plenty of time/data between now and the HL-LHC start and things can happen on the way!

Beyond-SM searches:

- ▶ Dark Matter (LU, SU, KTH)
- ▶ Dijet final-state (LU): DM mediator resonance, angular spectra, top tagging
- ▶ Lepton final states (LU): same-sign ll
- ▶ Top partners: VLQ, SUSY (SU, UU)
- ▶ Long-lived particles (KTH)

Higgs-related:

- ▶ SM Higgs measurements (KTH)
- ▶ Extended Higgs sectors (UU, KTH)
- ▶ Di-Higgs production (UU, SU)
- ▶ Composite Higgs (UU)

And much more: VV scattering, m_W

Crucial ingredient for nearly all physics measurements: luminosity (Lund, Stockholm, KTH)

Thanks!