



ATL-TDR-029 · LHCC-2017-020

ATLAS

TDAQ Phase-II Upgrade



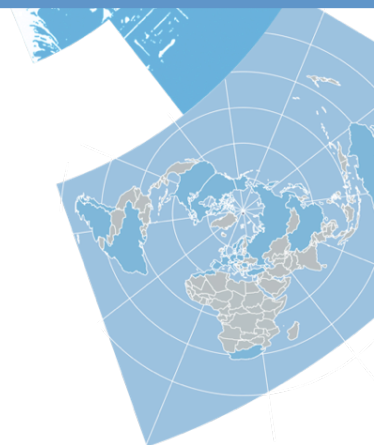
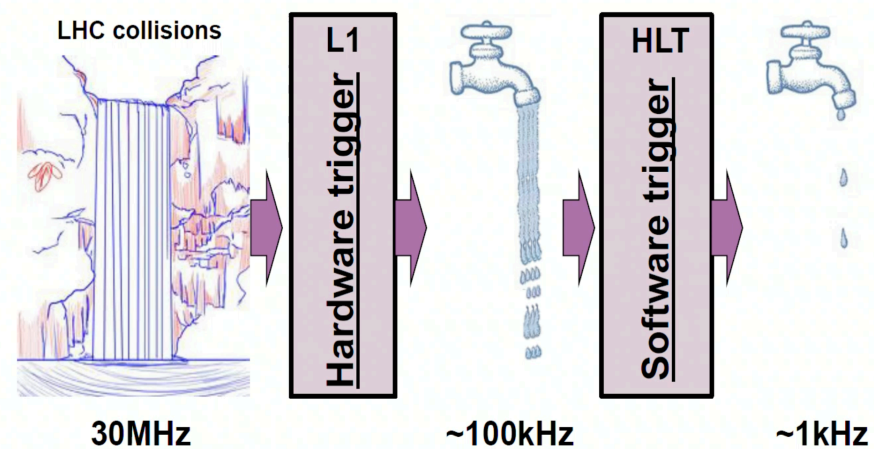
Technical Design Report

ATLAS

Mapping the secrets of the universe

TRIGGERING ON PHYSICS

The ATLAS / CMS paradigm

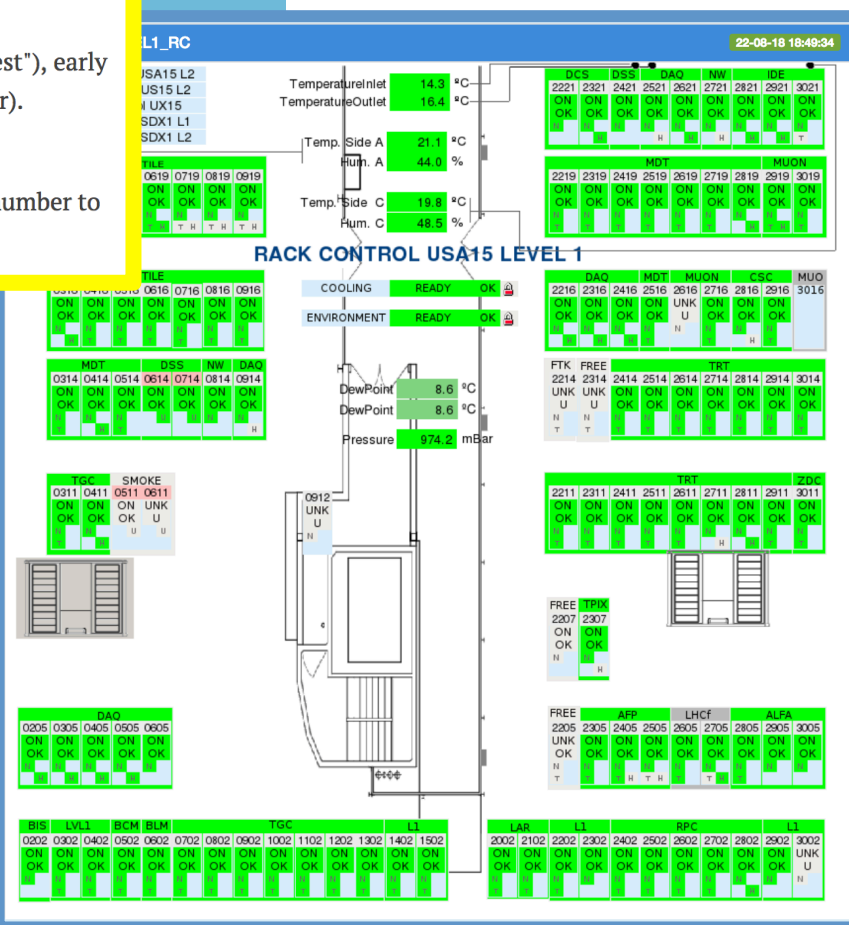


See [chapter 7.2](#) of the almost-ready ATLAS 25 book :

- the 3 key concepts are: start with a regional reconstruction ("Regions of Interest"), early rejection (as soon as each criteria is not fulfilled), fast algorithms (refined later).
- Run 1: ~400 trigger menus, 200-400 Hz. $3.6 \cdot 10^9$ events recorded
- Run 2: ~2000 trigger menus, 1-2 kHz. $12.6 \cdot 10^9$ events recorded up to 2017 [number to be updated at the end of 2018]

Run 2 achievements

2017 saw a significant increase of the luminosity, which lead to new optimisations but also alternative solutions such as partial event building and delayed streams. The L1 topological trigger proved to be a crucial component for maintaining the ability to trigger on low momentum signatures with luminosities of $1.7 \cdot 10^{34} \text{ cm}^{-2} \text{ s}^{-1}$ (up to $2 \cdot 10^{34}$ at the end of the year). In 2018 (and thus all of Run 2) the Pt thresholds could be maintained and the main physics channels remained unscaled. New triggers were added to target previously uncovered phase space, for BSM searches in particular, and special attention was given to the channels sensitive to pile-up conditions.



HL-LHC challenges

Manpower: the TDAQ Phase II Upgrade TDR provides estimates of the manpower needs. It quotes ~ 700 FTE in total, spread over 2018-2016. 40% scientists, 40% engineers, 20% students from 20 contributing countries plus - of course - CERN.