

The ATLAS Run-2 Trigger Menu



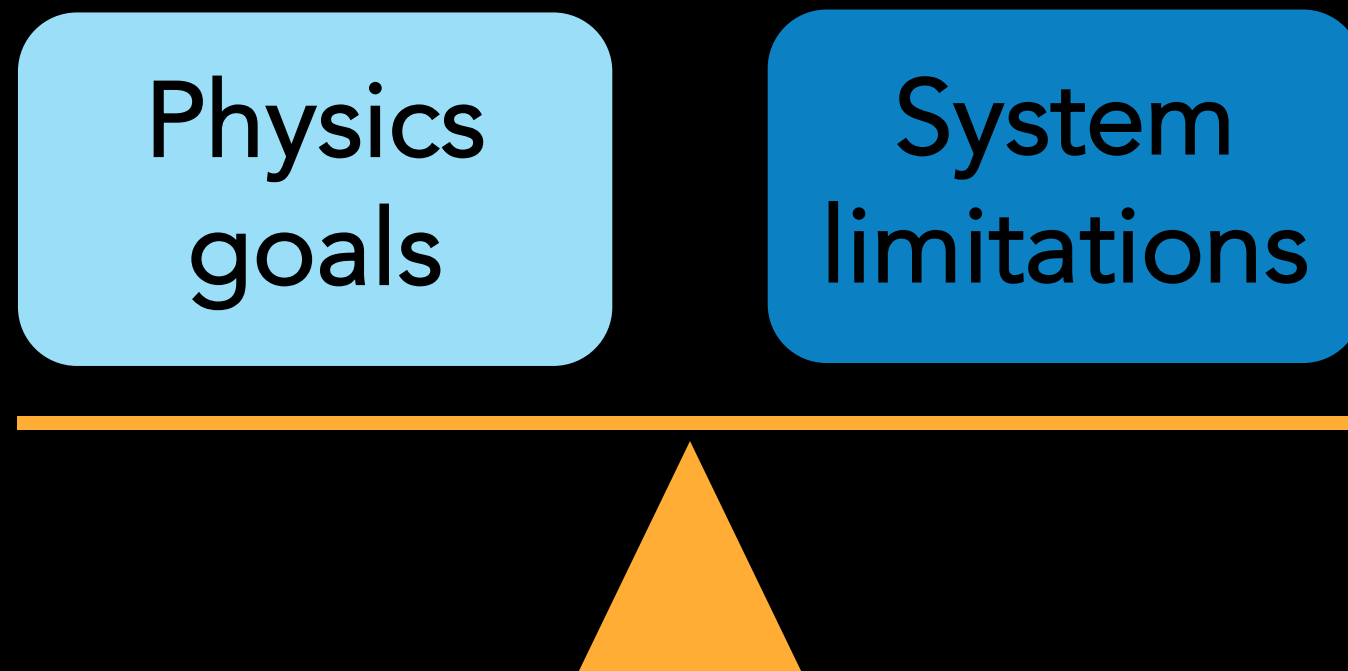
EPS – HEP2019
10 – 17 July 2019

Heather Russell – McGill University
On behalf of the ATLAS Collaboration

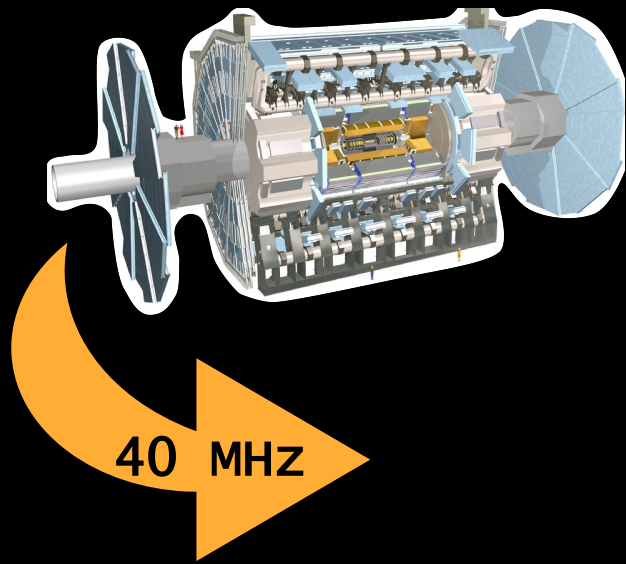


A trigger menu...

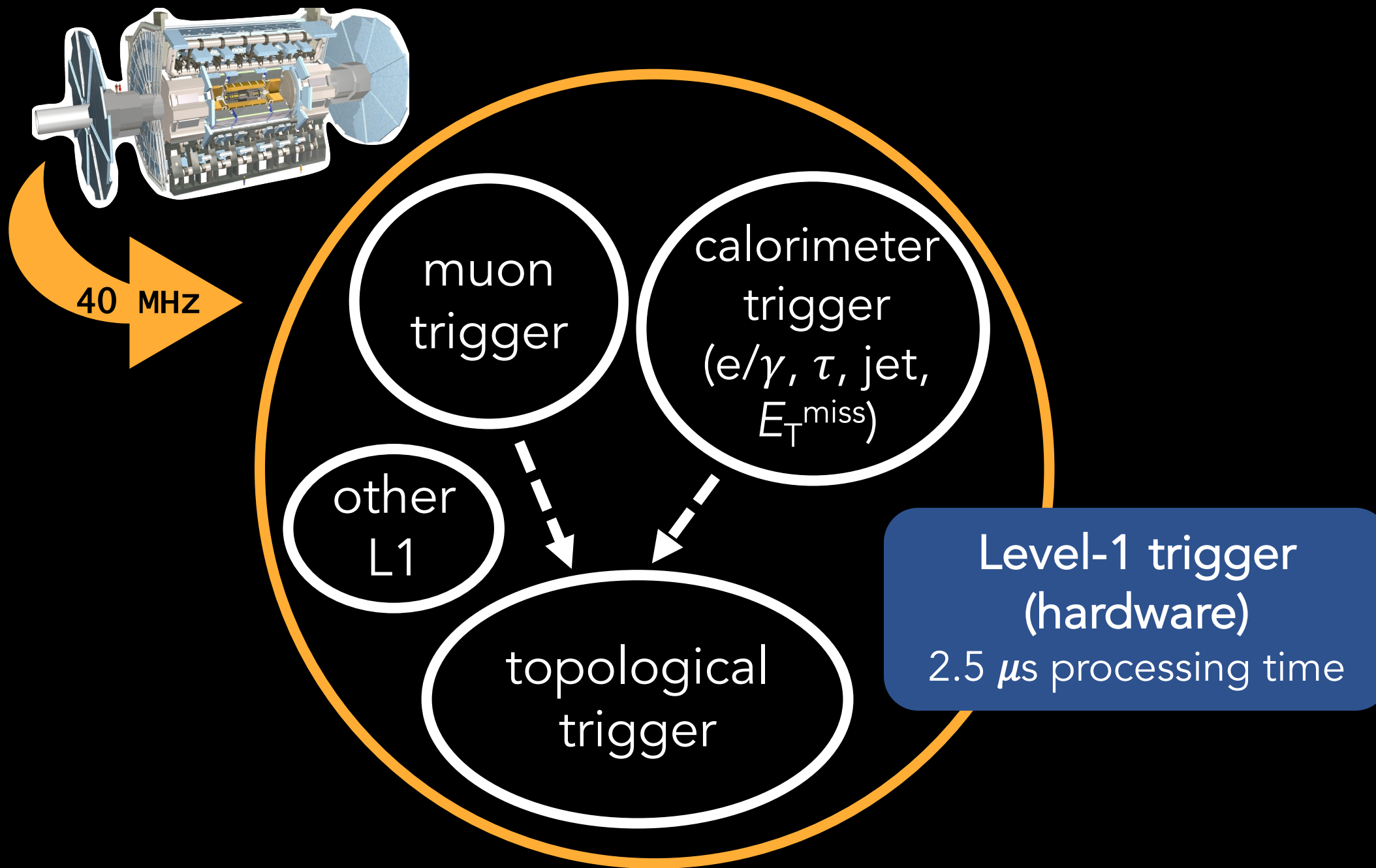
specifies both which types of events to select in the hardware (L1) and software (HLT) triggers and how many of each type to save



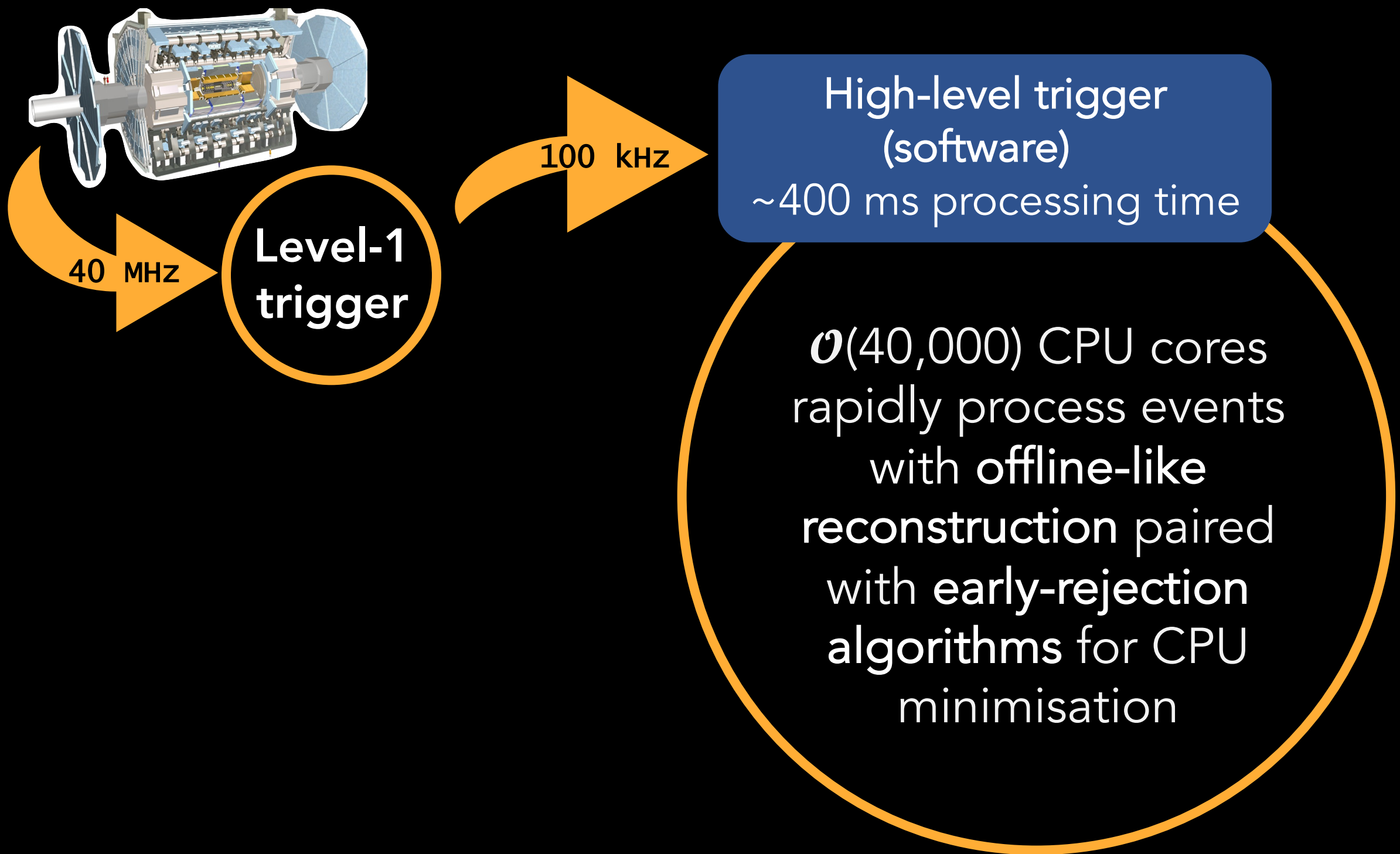
Trigger and data acquisition workflow



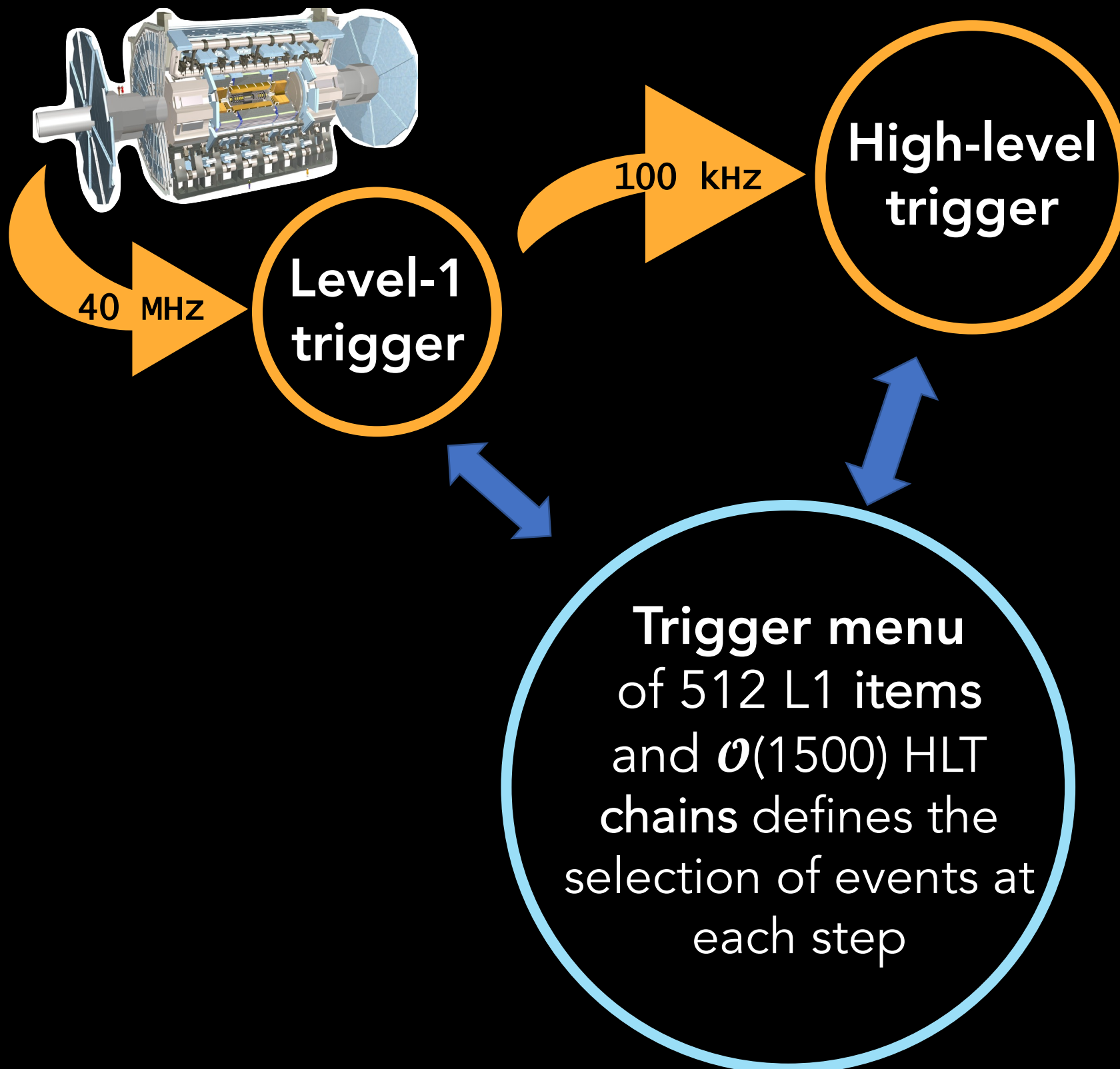
Trigger and data acquisition workflow



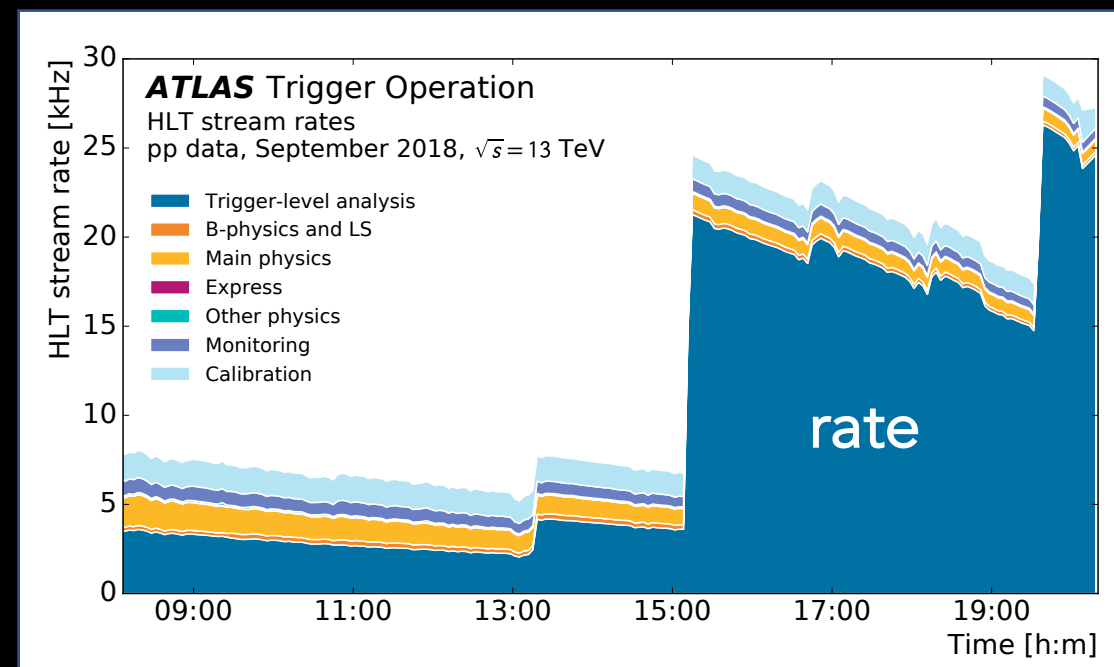
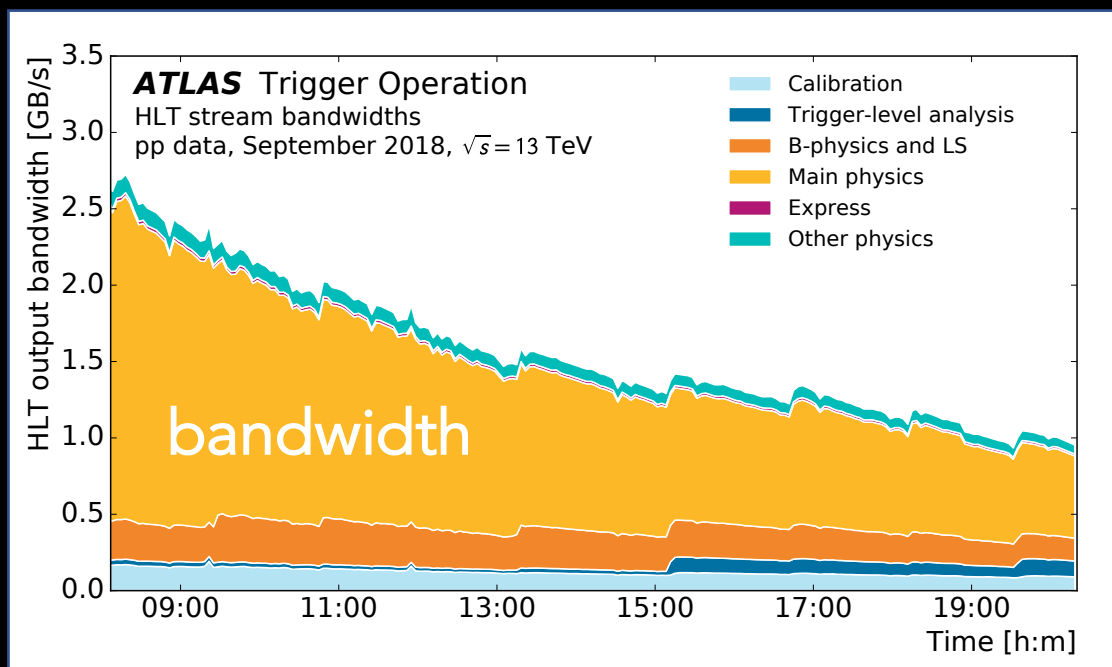
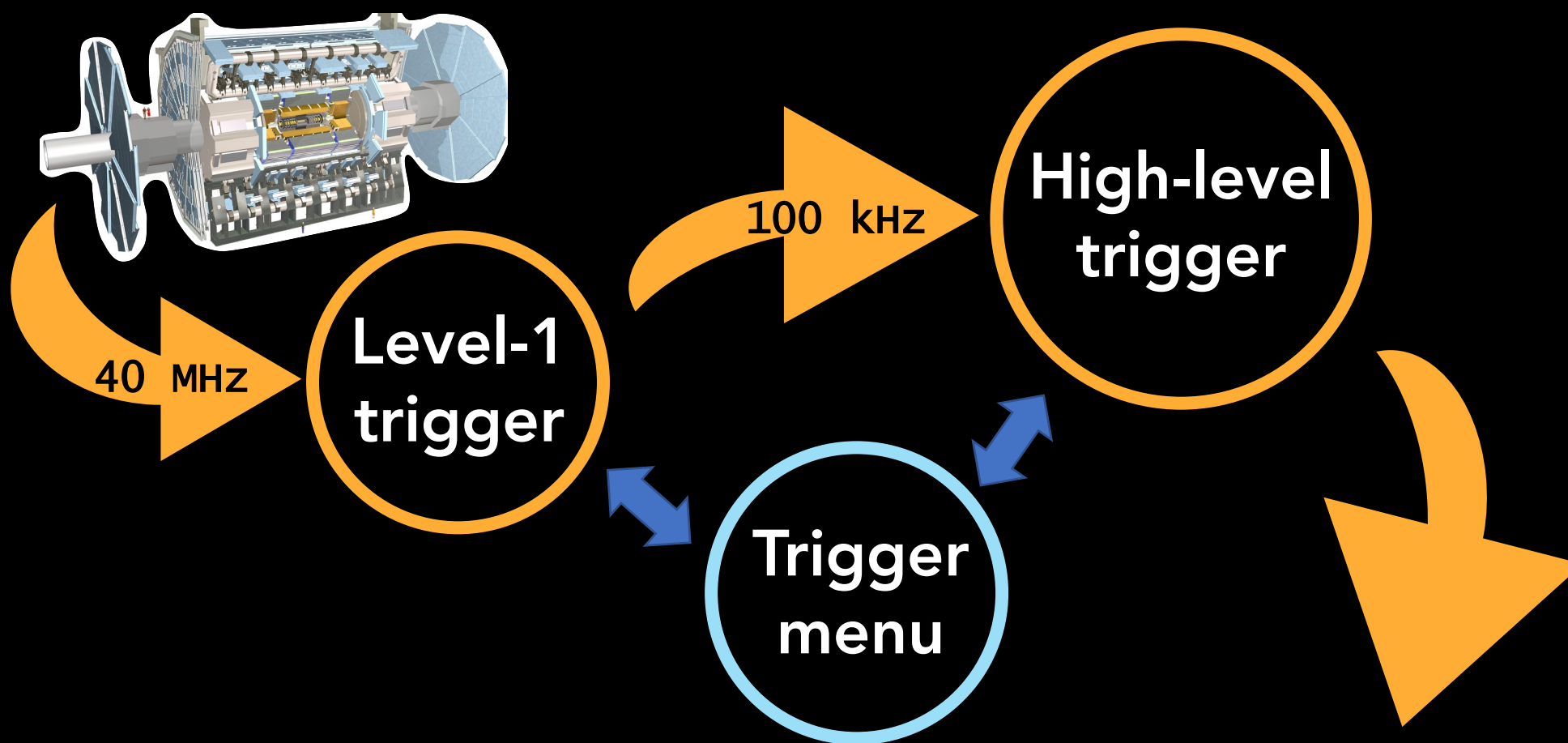
Trigger and data acquisition workflow



Trigger and data acquisition workflow

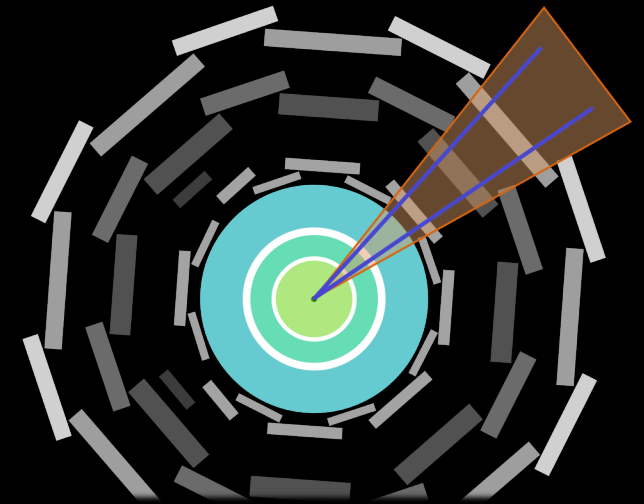


Trigger and data acquisition workflow



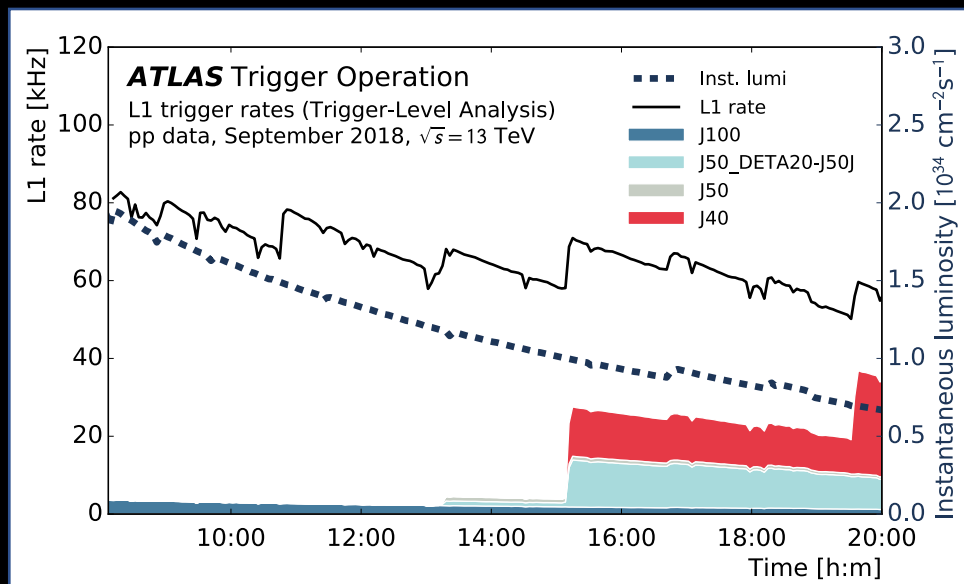
Non-standard data-taking strategies

Partial Event Building (PEB) techniques shrink event size by only recording **sub-detectors, modules, or trigger information** explicitly required for offline study



e.g. events for low- p_T muon performance save only data in cone around $J/\psi \rightarrow \mu\mu$ candidate

Smaller event sizes mean we can
record more events

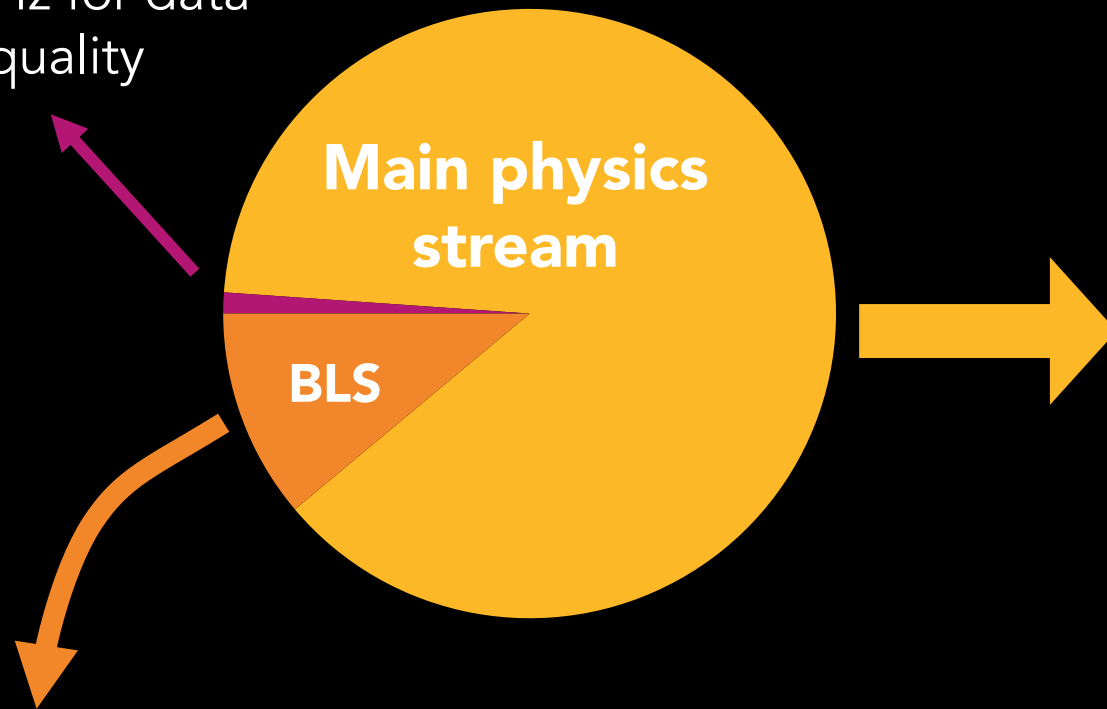


End-of-fill techniques enable high rate or CPU intensive triggers below luminosities where there are no longer system limitations

Physics menu composition

$$* \text{At } L = 2 \times 10^{34} \text{ cm}^{-2} \text{s}^{-1}$$

Express stream
~20 Hz for data
quality



B-physics and Light States (BLS) stream

Multi-lepton triggers targeting **low-mass resonances**

Separate for delayed processing to circumvent offline reconstruction limitations

Triggers exploit **end-of-fill** strategies

Main physics stream

Averages 1 kHz over the year

Composition is balanced between different types of events

Menu is continuously improved: both new triggers for dedicated event topologies and improvements to existing triggers





Thank you!

References: <https://twiki.cern.ch/twiki/bin/view/AtlasPublic/TriggerOperationPublicResults>
ATL-DAQ-PUB-2017-003, ATL-DAQ-PUB-2018-002, Full Poster: ATL-DAQ-SLIDE-2019-327