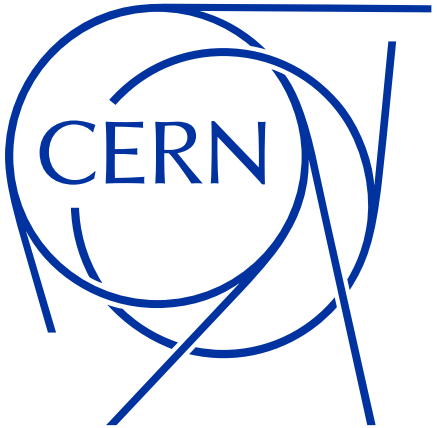
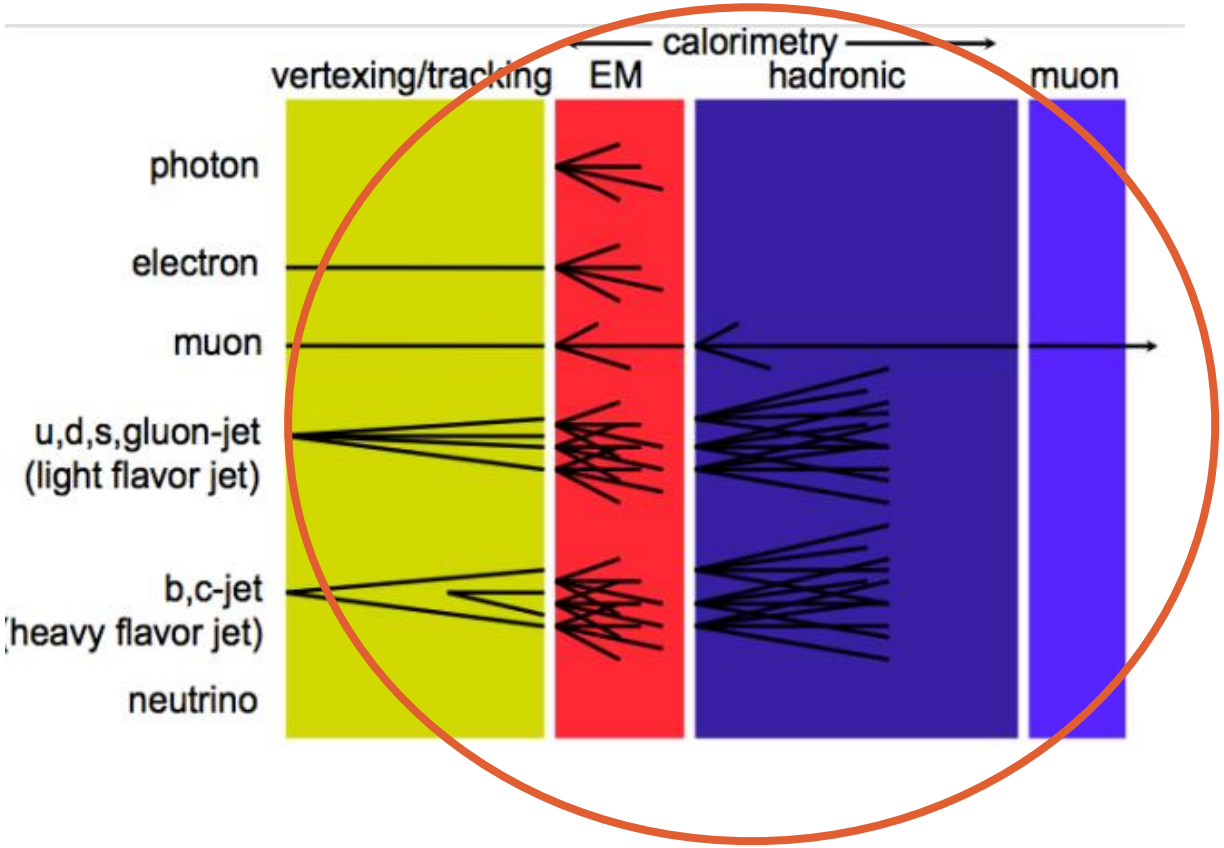


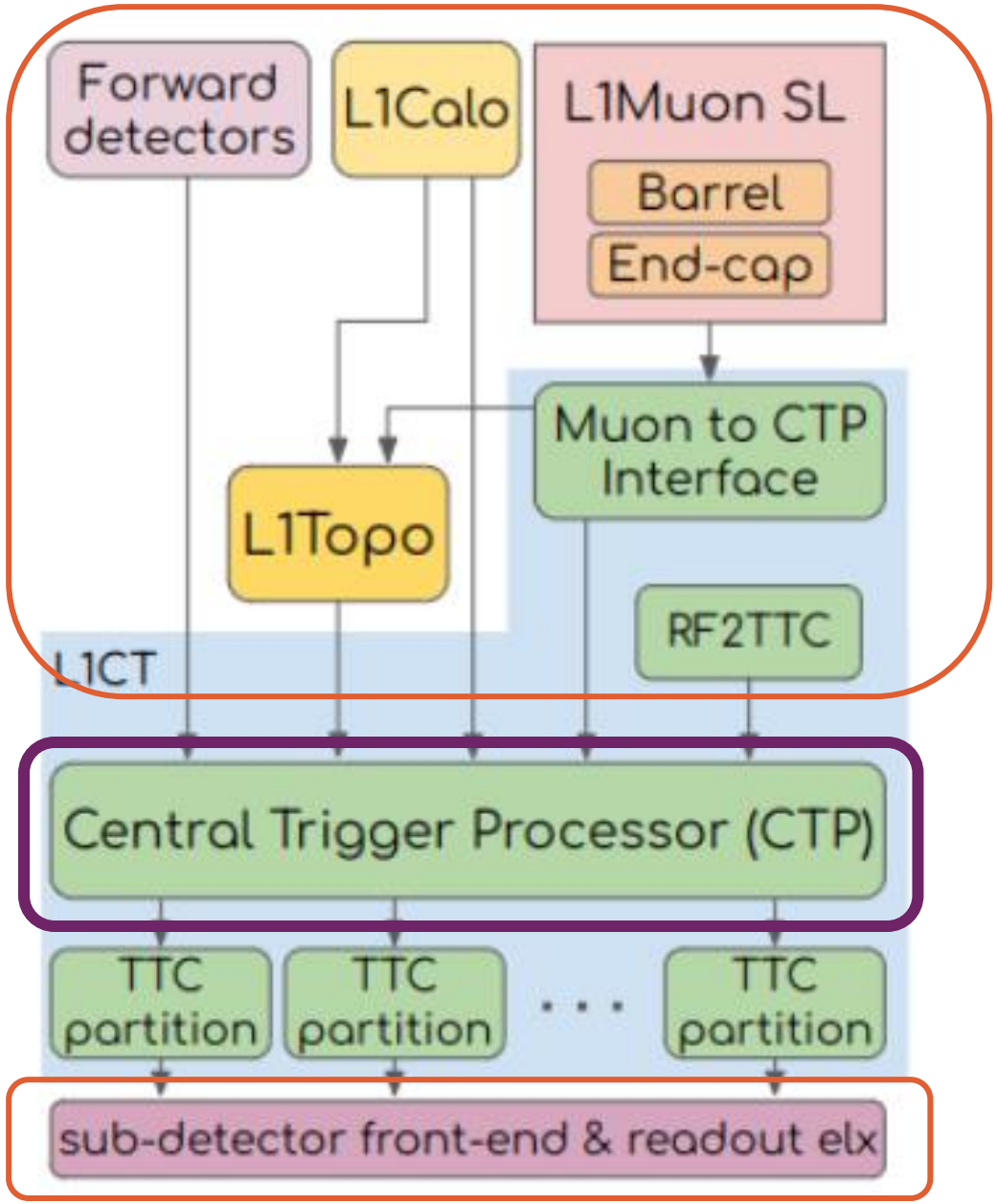
Deadtime Simulation for ATLAS Level 1 Central Trigger Mechanism

Sarah L. MacHarg

June 22, 2023

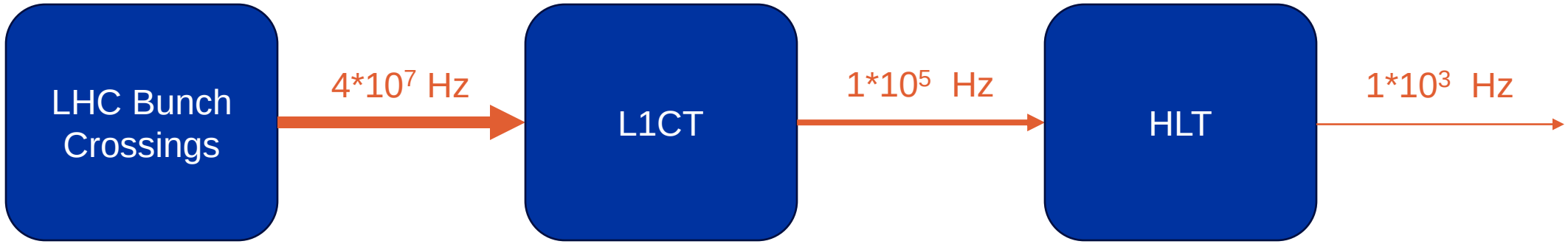
L1CT Mechanism





ATLAS & LHC – the Big Data Problem

- **LHC: Proton bunches**
  - 3564 bunches per orbit, 25ns time separation → 40 MHz bunch crossing rate
  - Cannot record all this data – time, money limitations → triggers (filter events), deadtime (ignore events)
- **Level 1 Central Trigger (L1CT) – Hardware, Level 2 High Level Trigger (HLT) - Software**
  - L1CT: First level of trigger filtration, high input rates mean need fast processing rates
  - Increased complexity of trigger calculation as input rate decreases



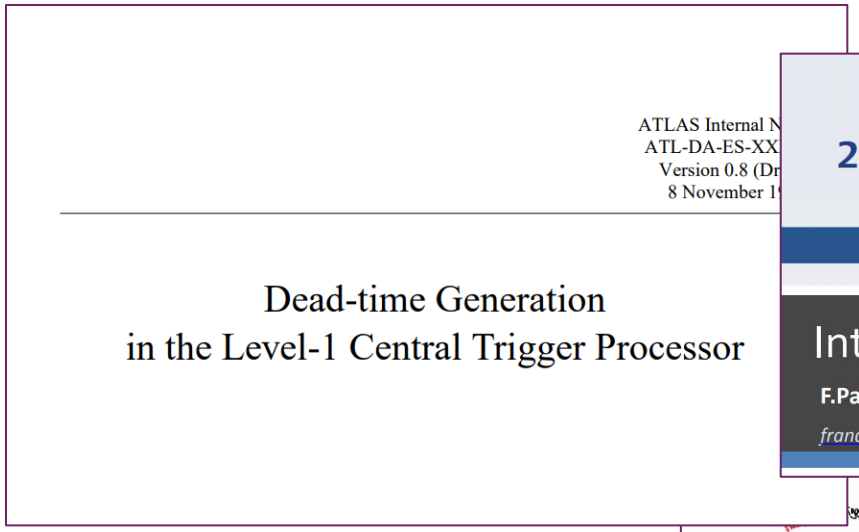
Deadtime Simulation

- **Simple**
  - Ex: Veto any L1 accepts for four bunch crossings after an accept
- **Complex**
  - Ex: Leaky bucket algorithm
- **Programmable**
- **Total deadtime varies based on incoming events → simulator**

→ Initial Project: Add existing simulator to online tool dashboard for experts-on-call

This week

- **Familiarize self with**
  - Trigger mechanisms, deadtime
  - Simulation code repository
    - Brainstorm changes
- **Aligning goals**
  - New projects
    - Detector calibration
    - Physics analysis (who/how TBD)


ATLAS Internal N
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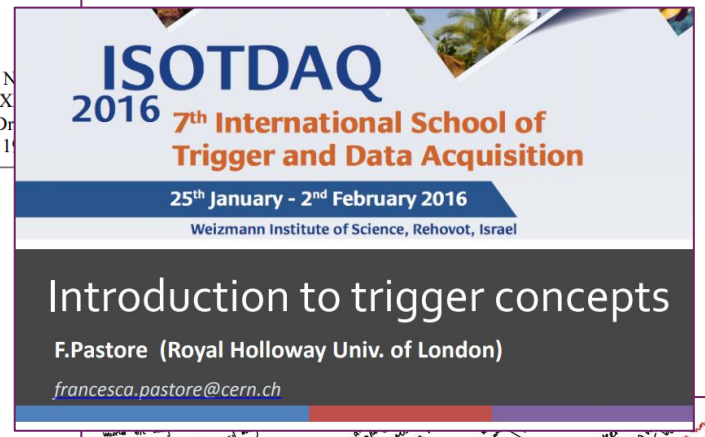
Version 0.8 (Dr
8 November 1

Dead-time Generation
in the Level-1 Central Trigger Processor



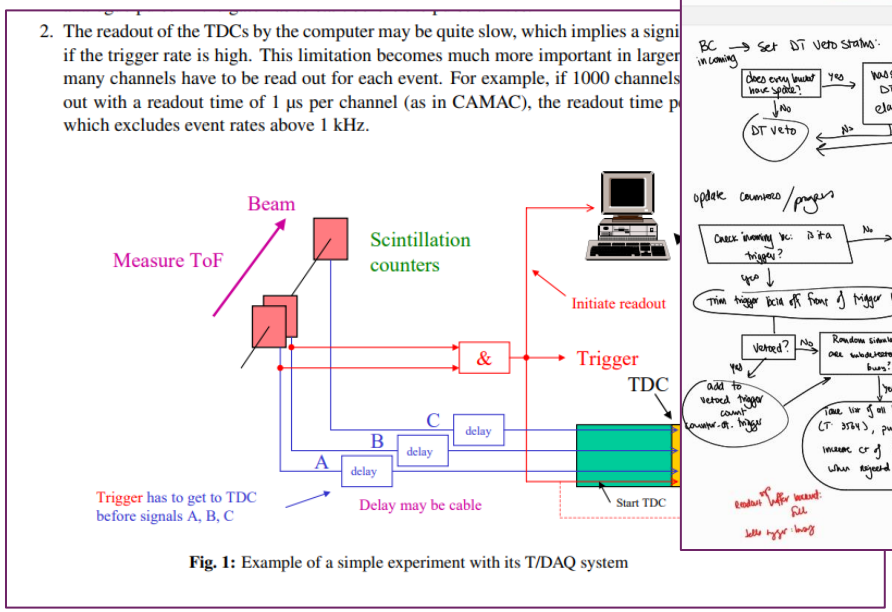
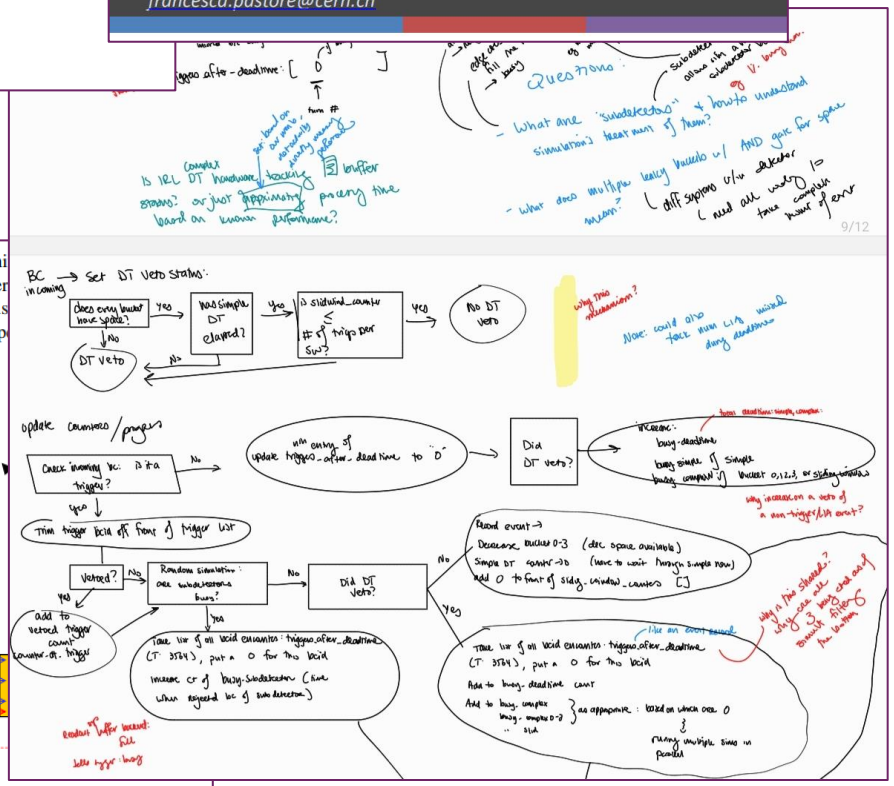
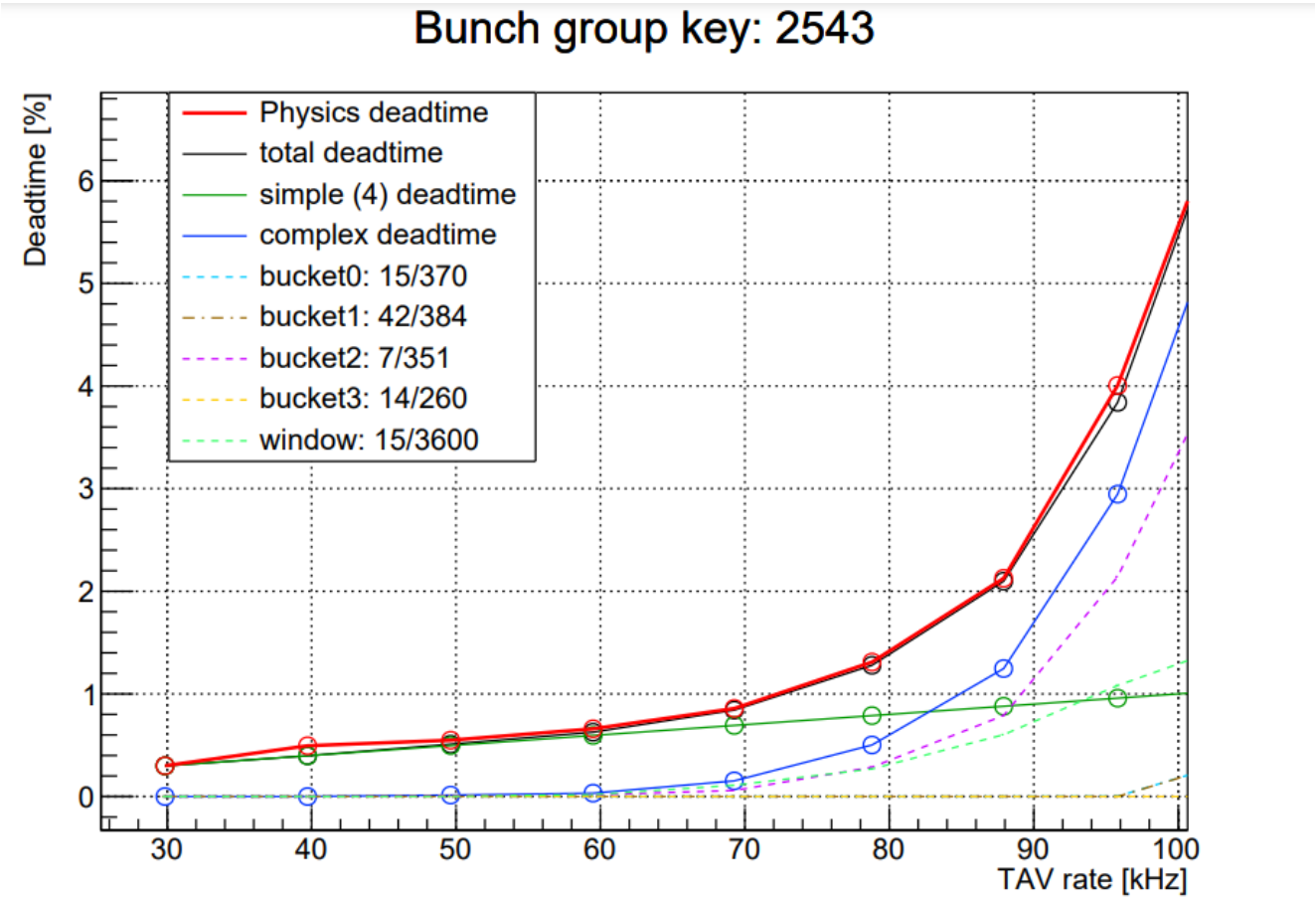

2. The readout of the TDCs by the computer may be quite slow, which implies a signi
if the trigger rate is high. This limitation becomes much more important in larger
many channels have to be read out for each event. For example, if 1000 channels
out with a readout time of 1 µs per channel (as in CAMAC), the readout time p
which excludes event rates above 1 kHz.

Fig. 1: Example of a simple experiment with its T/DAQ system



Up next

- **Get to know web dashboard repo**
  - Learn/refresh web app basics
- **Get app running**
- **Side project tasks TBD**
  - Learn ROOT?



Pictures from the week

home.cern