

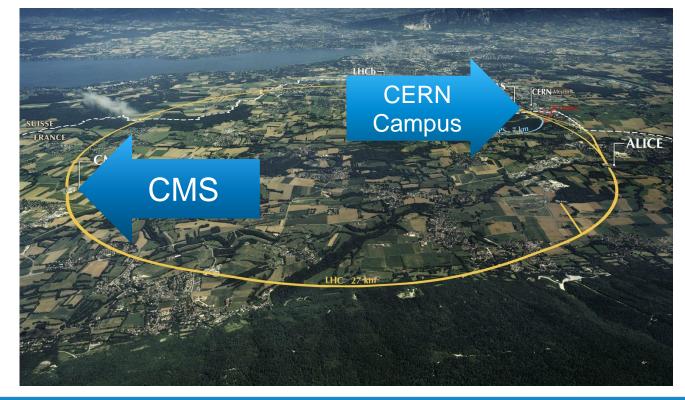


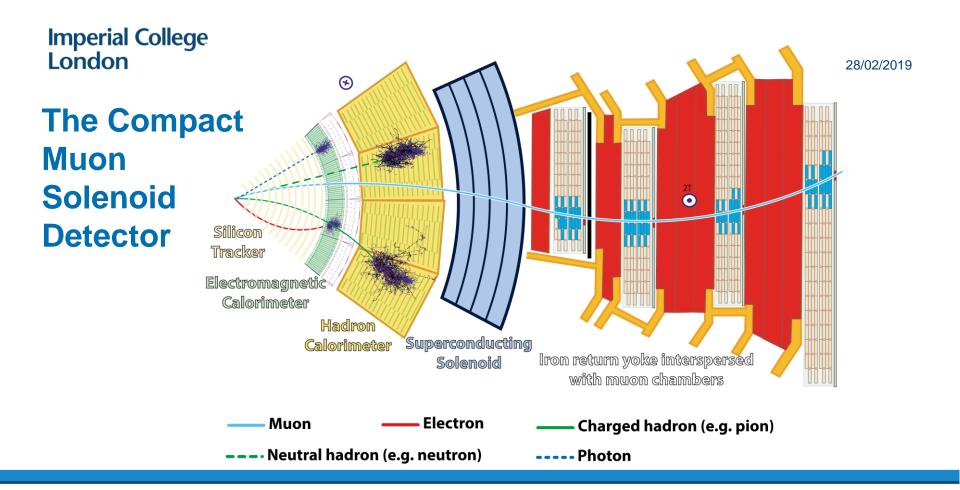
Exploring Algorithmic Solutions in Software and Firmware for the CMS L1 Trigger In Preparation for HL-LHC

David Monk

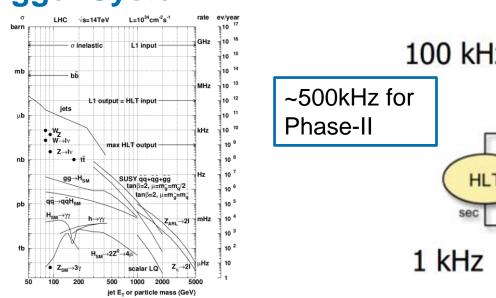
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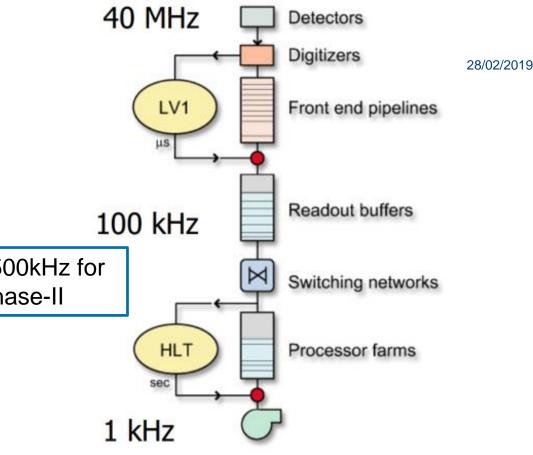
The Large Hadron Collider (LHC)





The CMS Trigger System





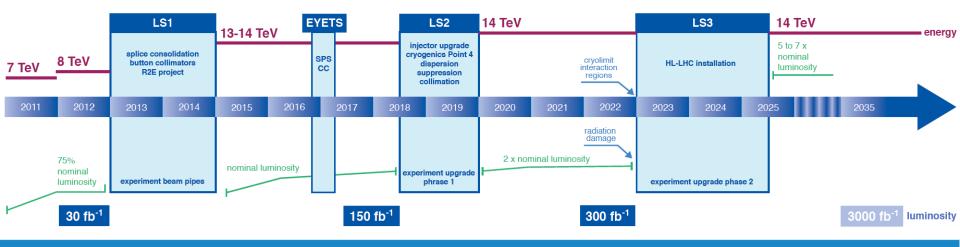
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LHC / HL-LHC Plan

LHC



HL_LHC



The Track are sent to L1 Correlator stubs arrive at DTC tracks arrive at L1 Correlator $(t_0 + 1\mu s)$ Trigger ------ $(t_0 + 5\mu s)$ p-p interaction full data triggered to High Level Trigger @ t₀ $(t_0 + < 12.5 \mu s)$ DAQ track reconstruction & L1 decision stub pre-processing fitting FE module L1 Correlator control DTC Track Finder stub data @ 40MHz L1 accept @ <750kHz full hit data @ <750kHz L1 tracks @ 40MHz other trigger primitives @ 40MHz

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other trigger primitives

Imperial	College
London	•

Proposed Algorithms

HT+KF (Imperial College)

- Hough Transform provides seeds for the track fitting
- Kalman filter fits tracks through an iterative process

Tracklet (USA)

- Seeded by projecting stubs from first two layers
- Fitting by a χ^2 method

Hybrid (Imperial & CERN)

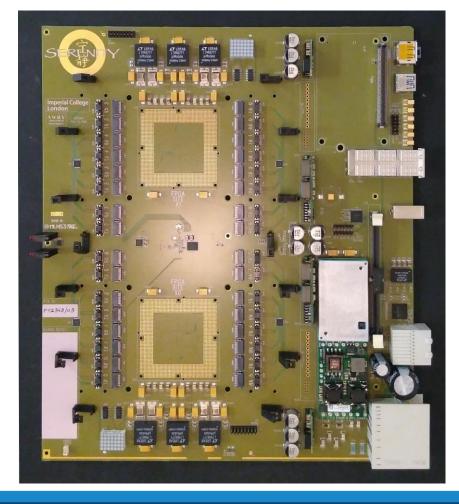
- Uses Tracklet
 seeding process
- Followed by a Kalman Filter

Combinatorial Kalman Filter (David Monk?)

- Move the Kalman Filter to as early a stage as possible in the process
- Potential to greatly improve performance

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Serenity Hardware Demonstrator



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Thank you for listening!