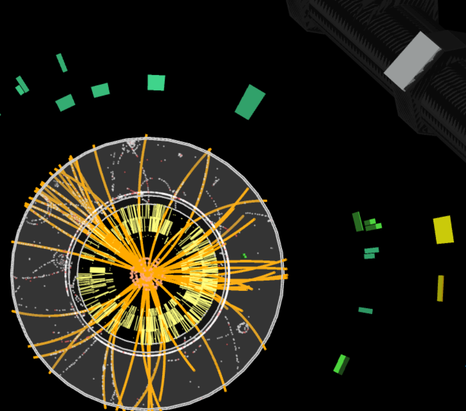
ATLAS activities at KTH

Fysikdagarna 2022, June 15-17, Lund

Christian Ohm, KTH



The KTH ATLAS group

Rabia Shaheen

Giulia Ripellino

Alex Leopold

David Shope

Olle Lundberg

Christian Ohm

Jonas Strandberg

Bengt Lund Jensen

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As you'll see, we collaborate quite closely with the SU ATLAS group on many topics!

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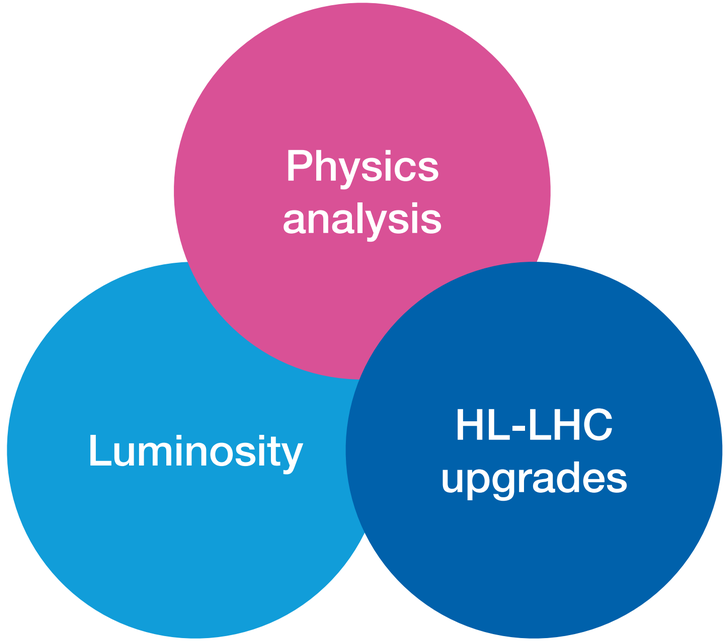
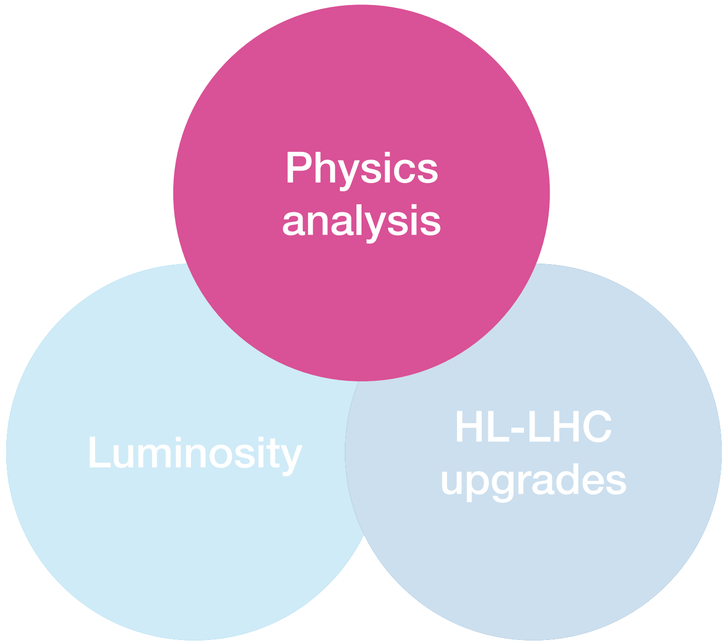
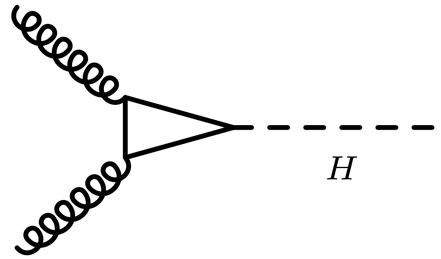


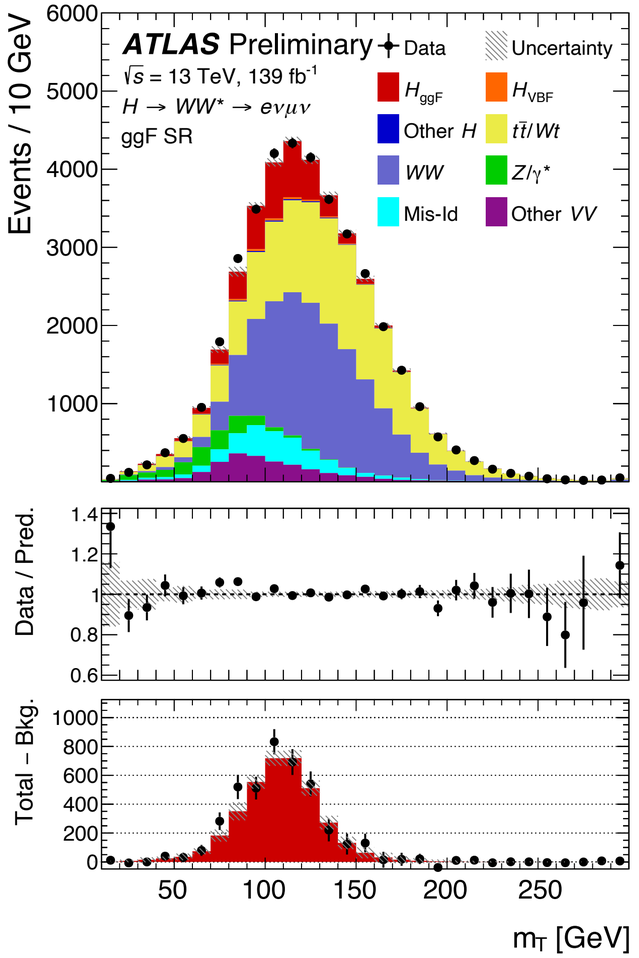

Physics analysis
Luminosity
HL-LHC upgrades

Higgs physics

- Cornerstone of LHC program
  - Run-2 measurements of $H \rightarrow WW$
    - Diff xsecs
    - Couplings
  - Searches for HH production - big goal of HL-LHC program



ATLAS-CONF-2021-014 (briefing)



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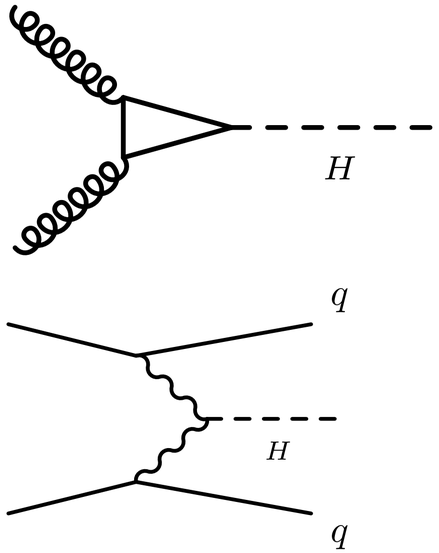

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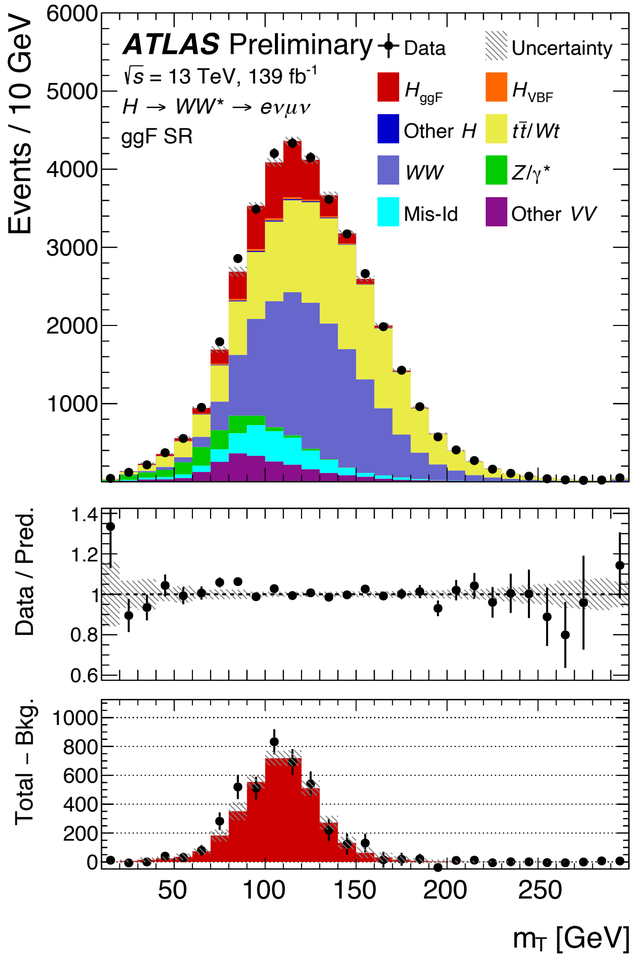




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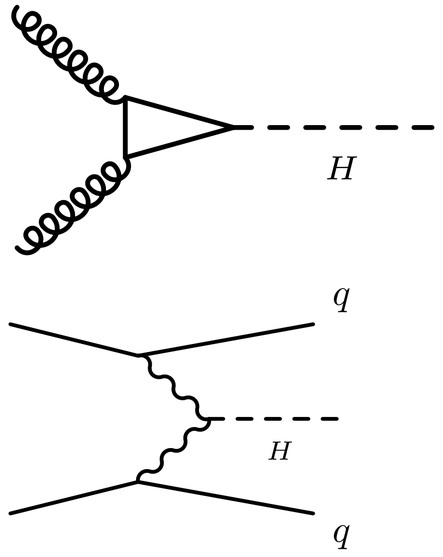

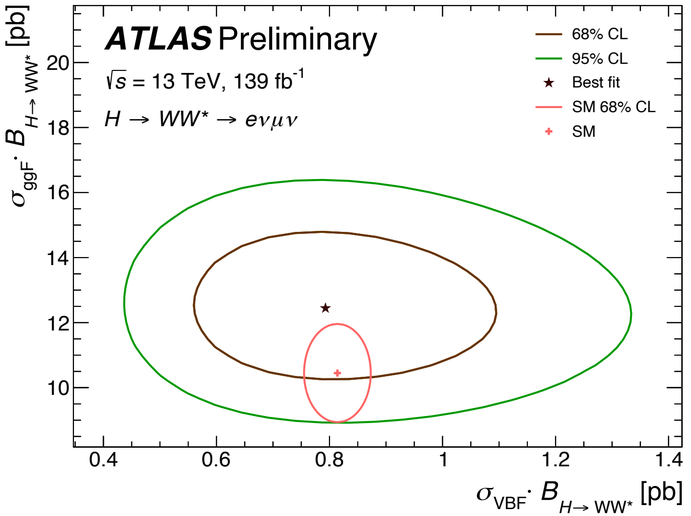

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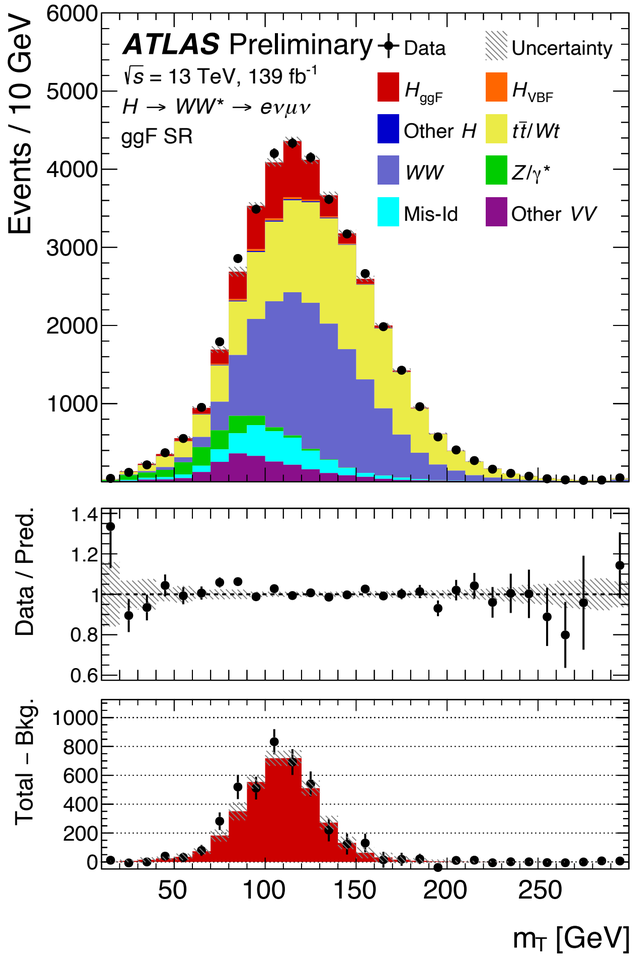




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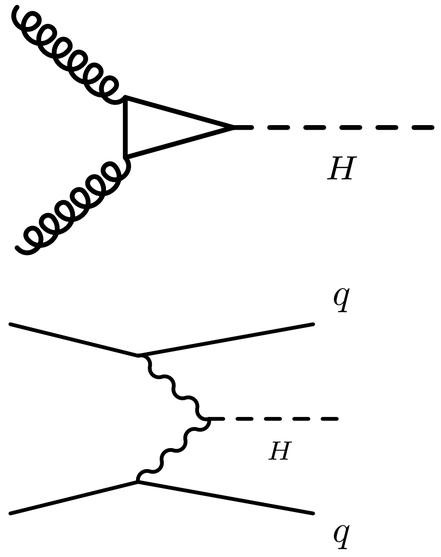
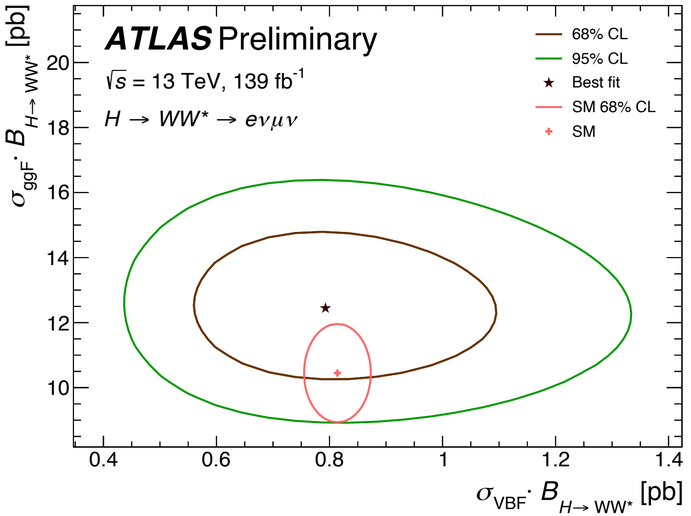
—> see also Yosse's talk!





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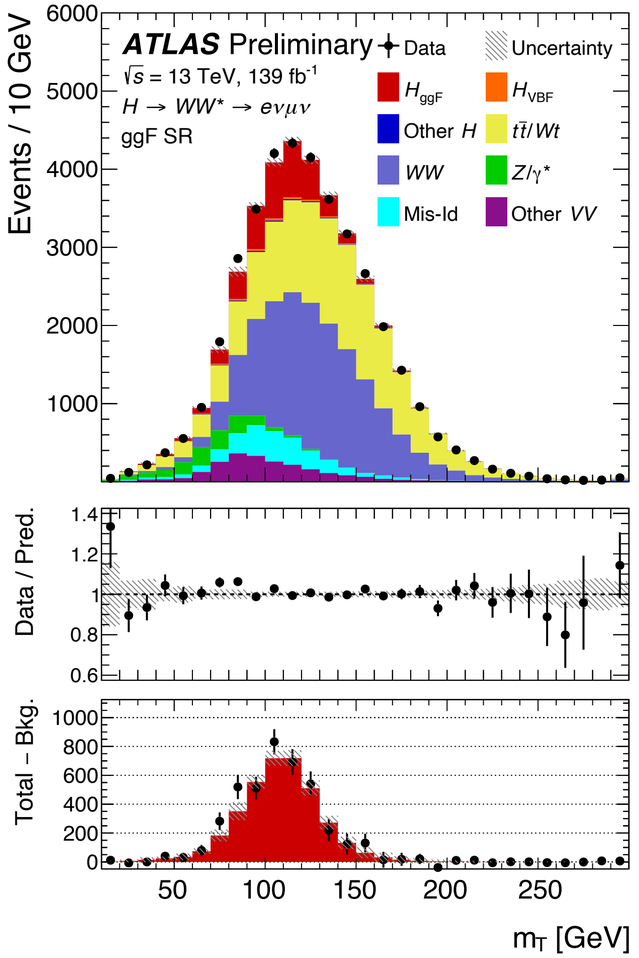
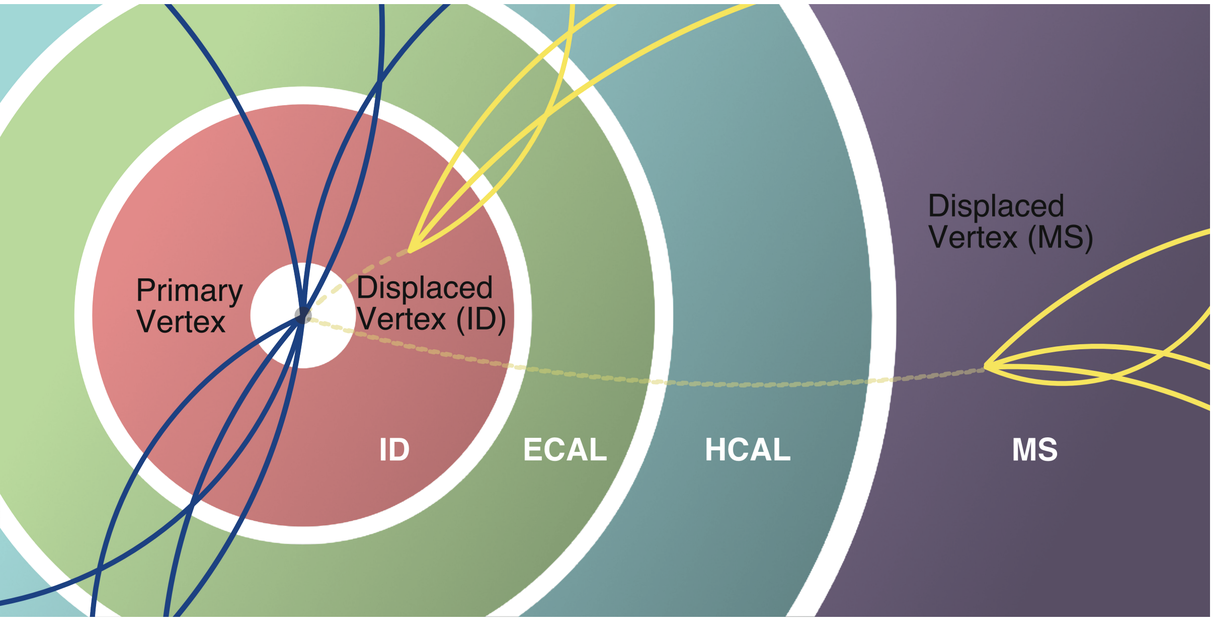
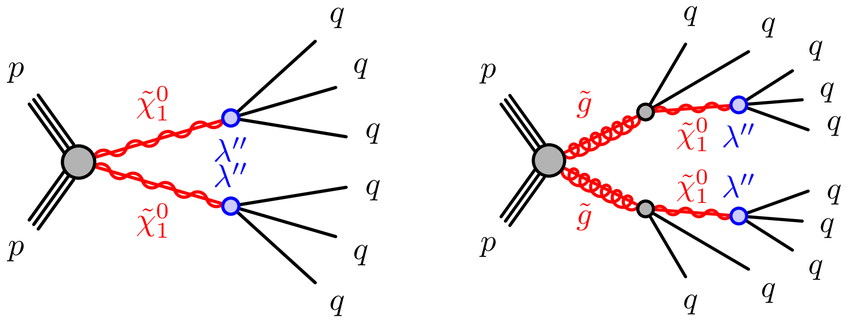





Physics: BSM with long-lived particles





Long-lived neutralinos decaying via *small RPV couplings*

- New long-lived particles appear in many BSM theories
- Suite of searches targeting signatures with displaced vertices (DVs) in inner tracker
- Search for DVs in multijet events just unblinded but not yet public — except in Giulia's thesis 😎



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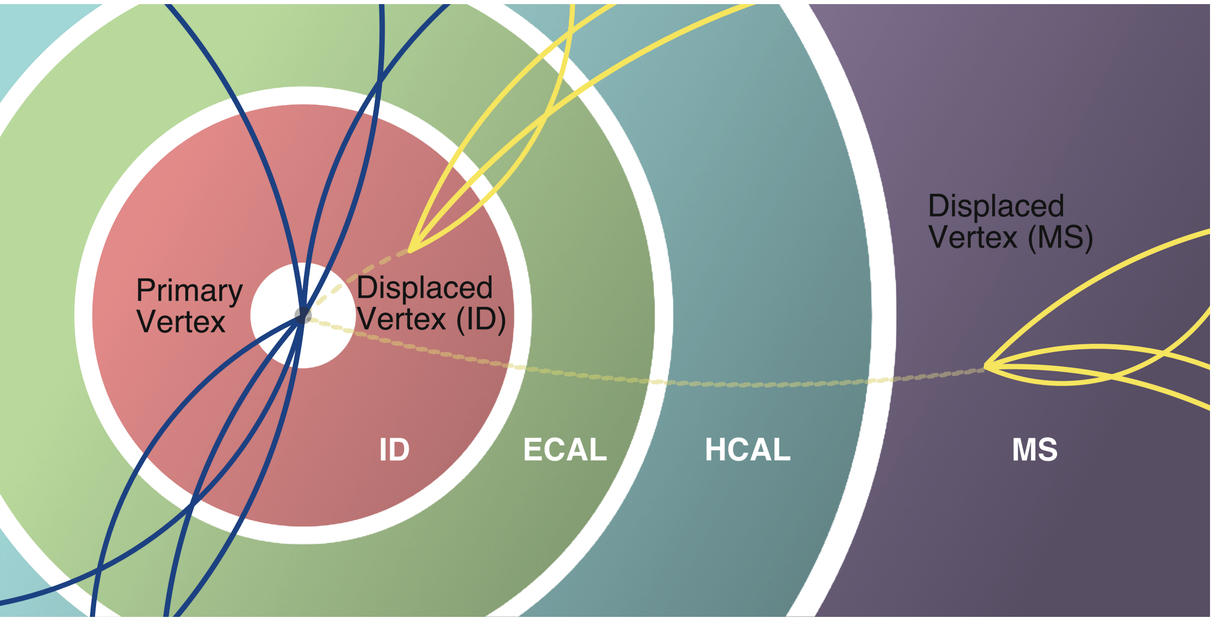

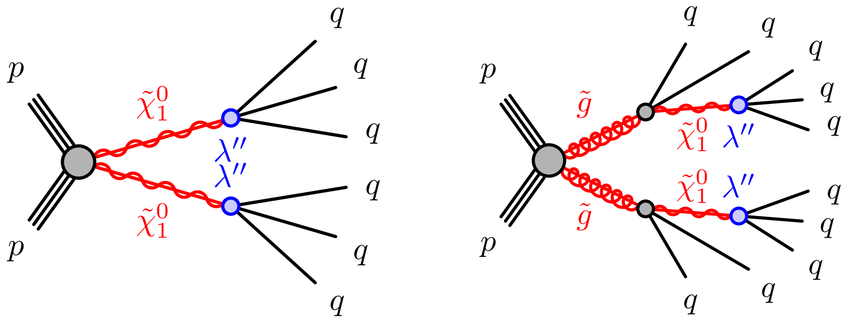

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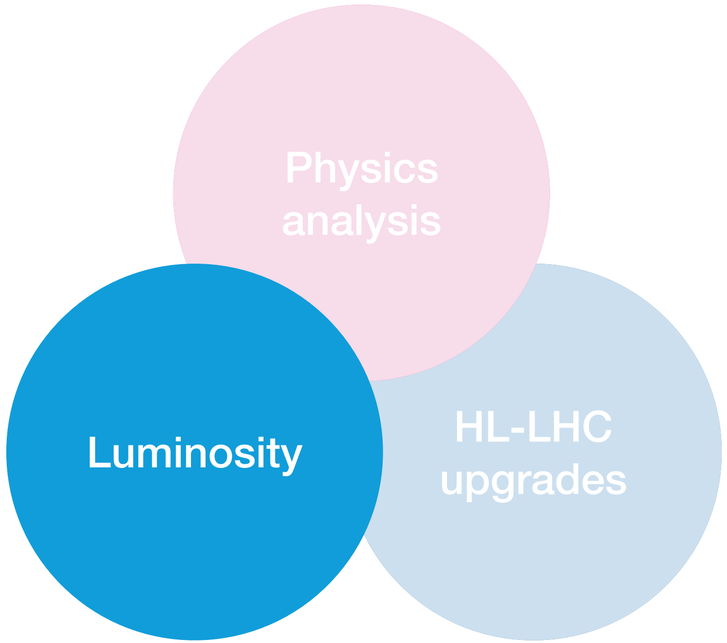
See also Filip's talk in a few mins!


Physics
analysis
Luminosity
HL-LHC
upgrades

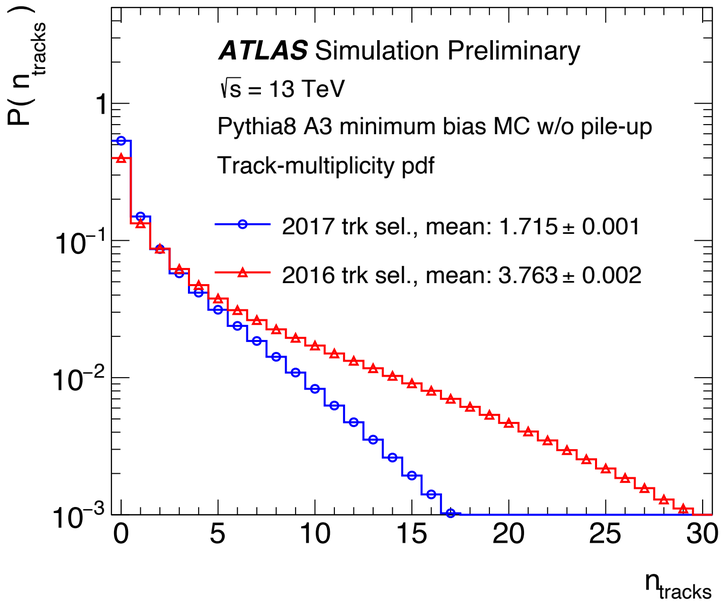
Luminosity with tracks

- Luminosity critical component of all physics analyses
  → uncertainty can limit precision of measurements (e.g. xsec)

- Redundancy is key → many algs!

- Alex & Giulia conveners of Inner Detector Luminosity group

- Rabia studies *emittance scans* to help time stability of calibration



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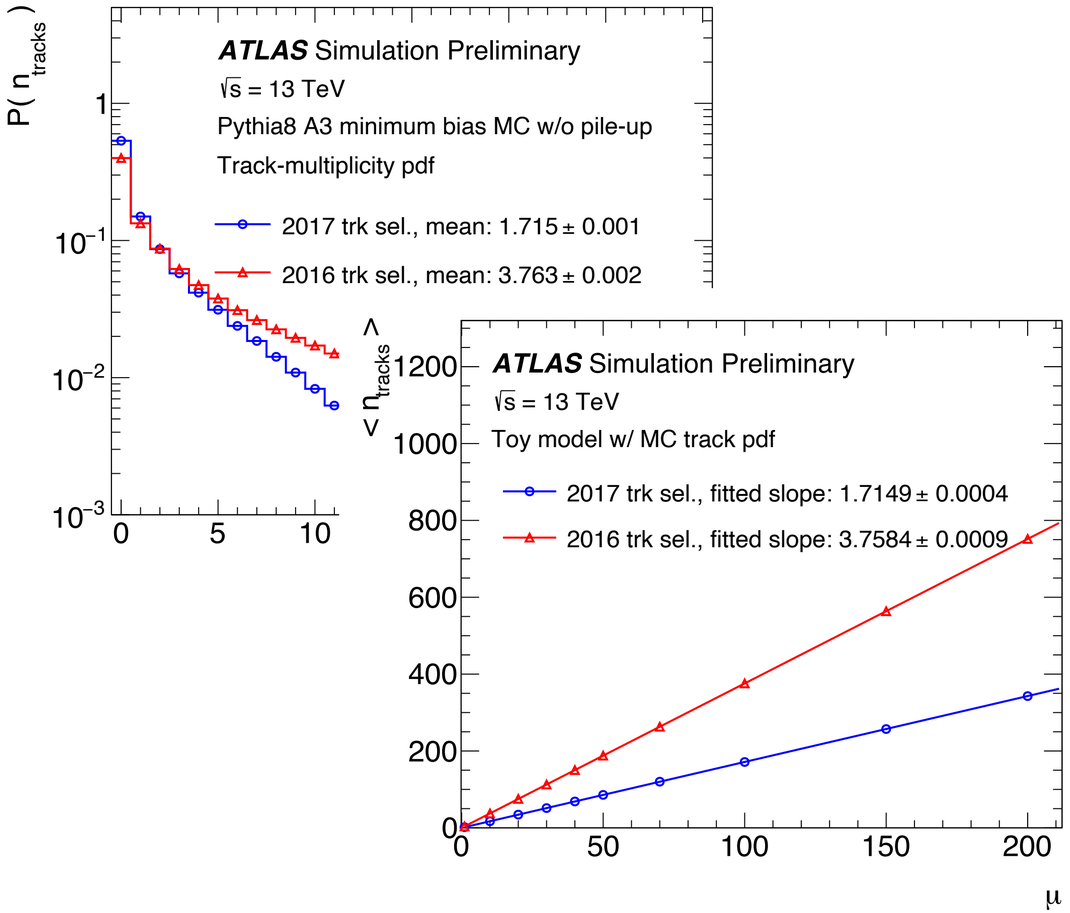

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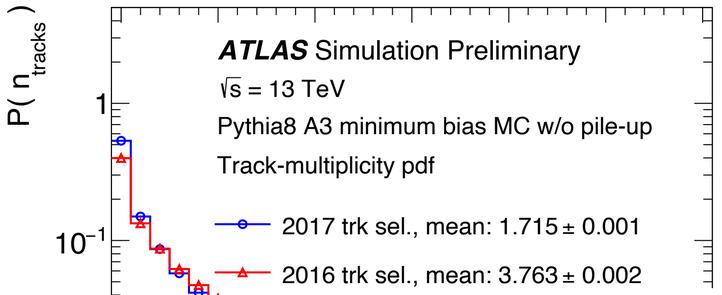
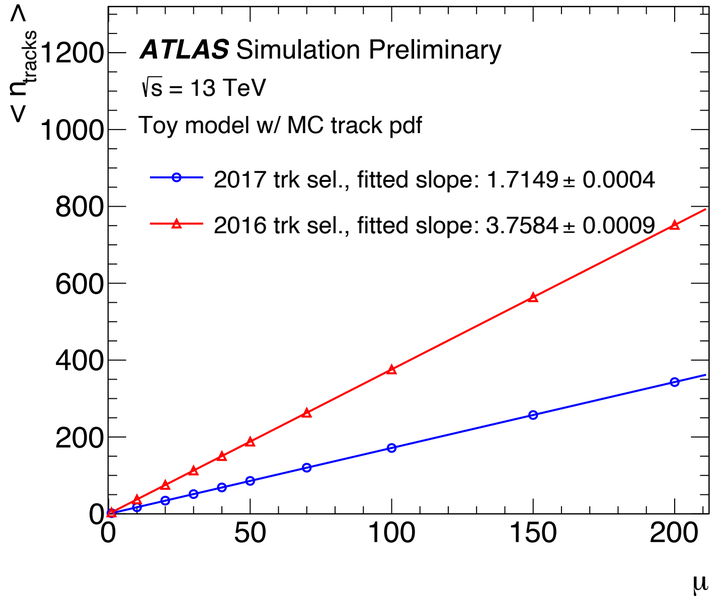
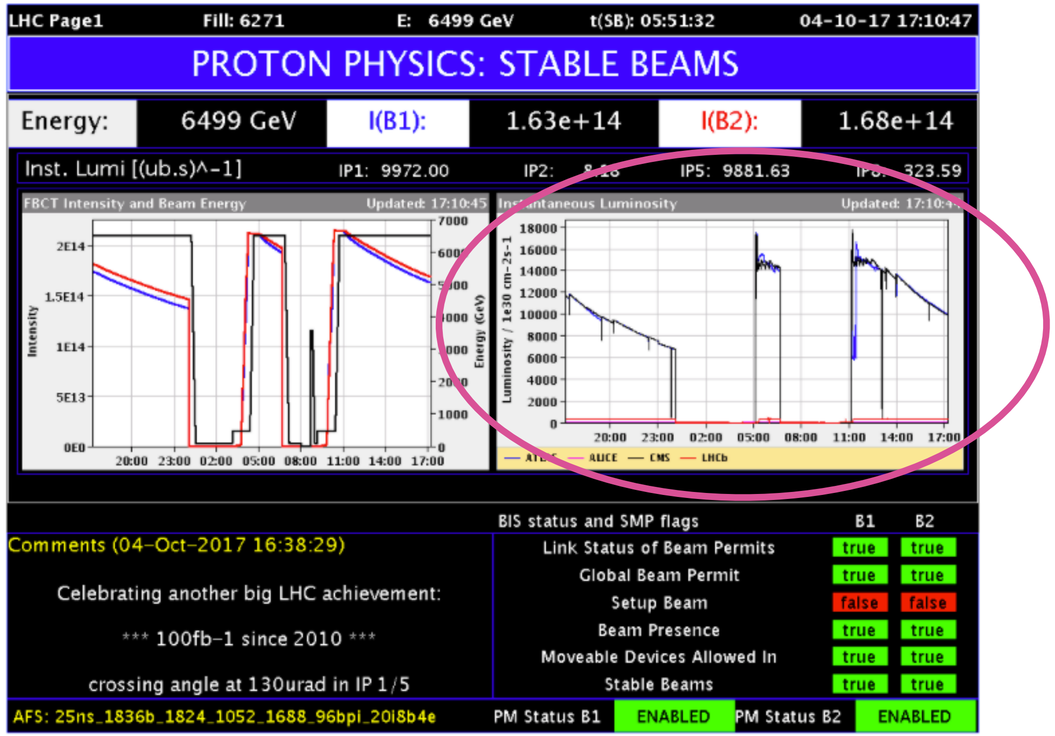




Preliminary Run-2 luminosity in ATLAS-CONF-2019-021, hard work on reducing uncertainties since, soon final result and paper…

Online luminosity

- Luminosity must be measured during data taking for e.g.
  - Feedback to LHC machine
  - Adjustment of menu and noise thresholds etc for trigger system
- Olle & CO conveners of Luminosity Operations & Online Software group



Exciting May-June with Run 3 starting and collisions back in LHC!

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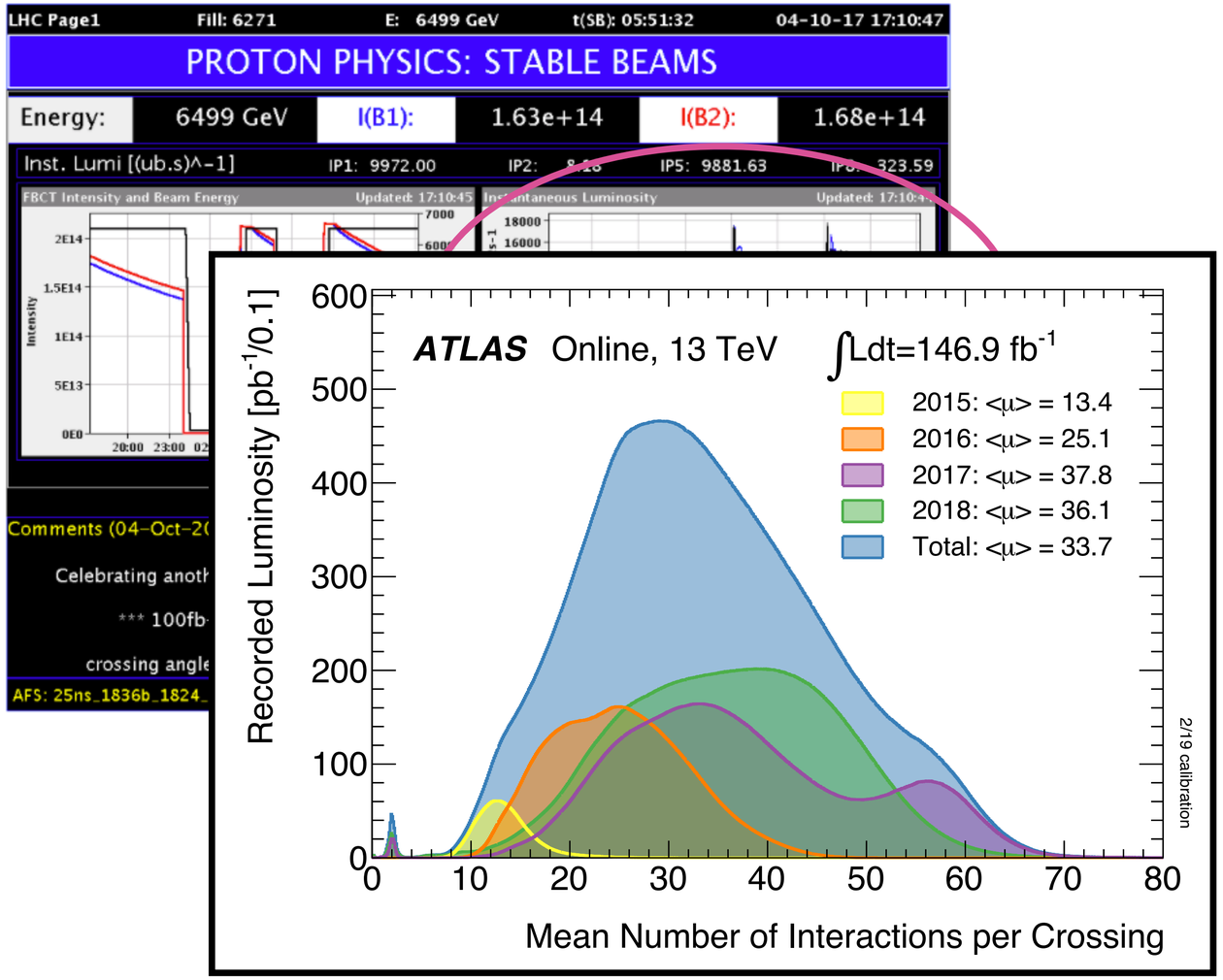

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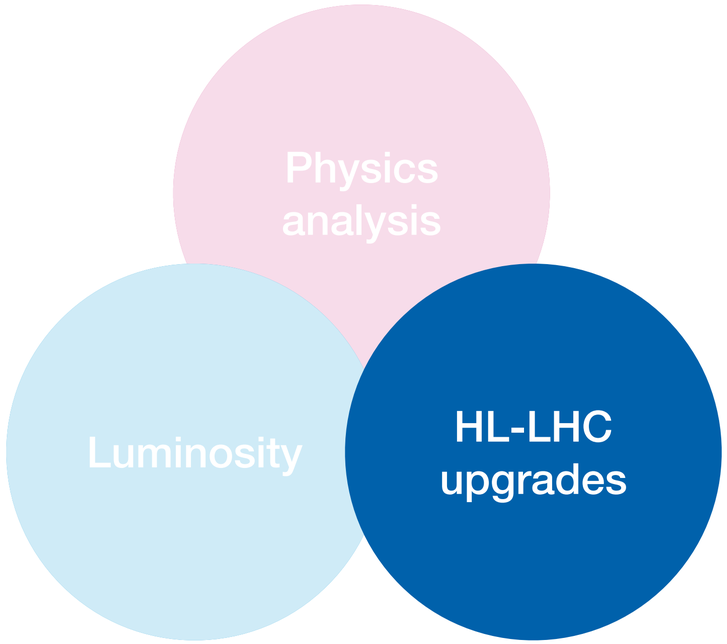
Physics
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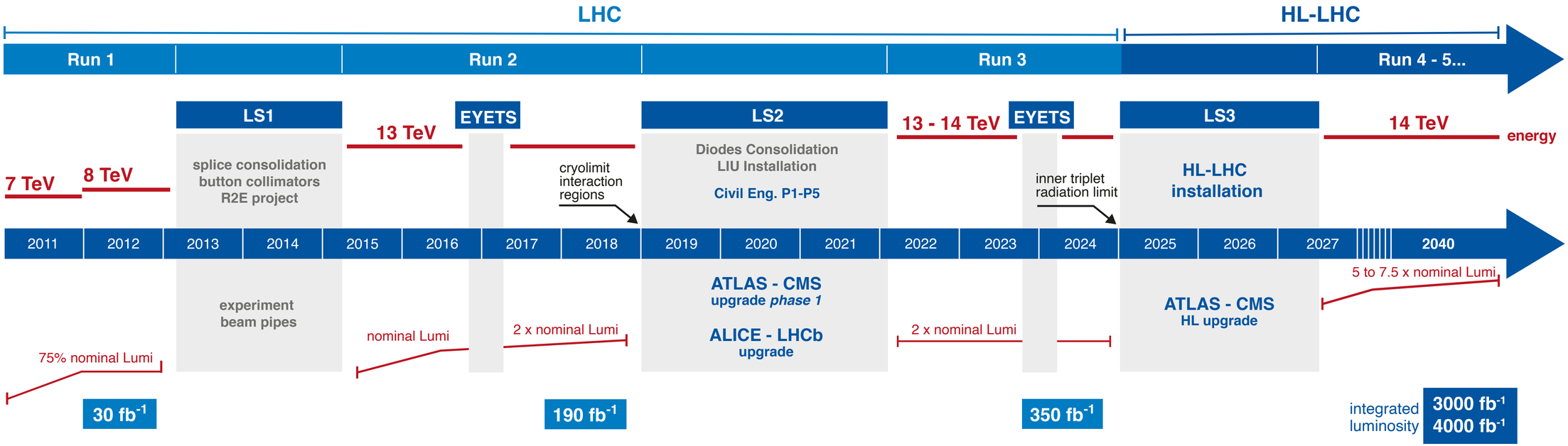
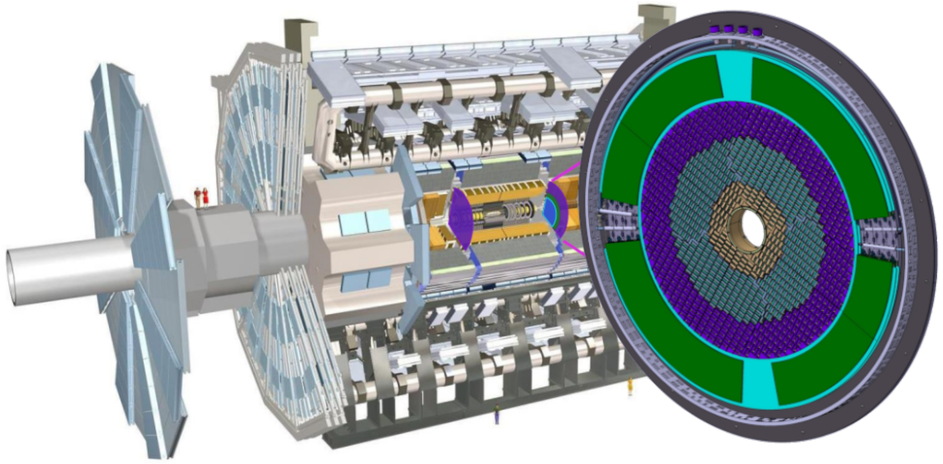
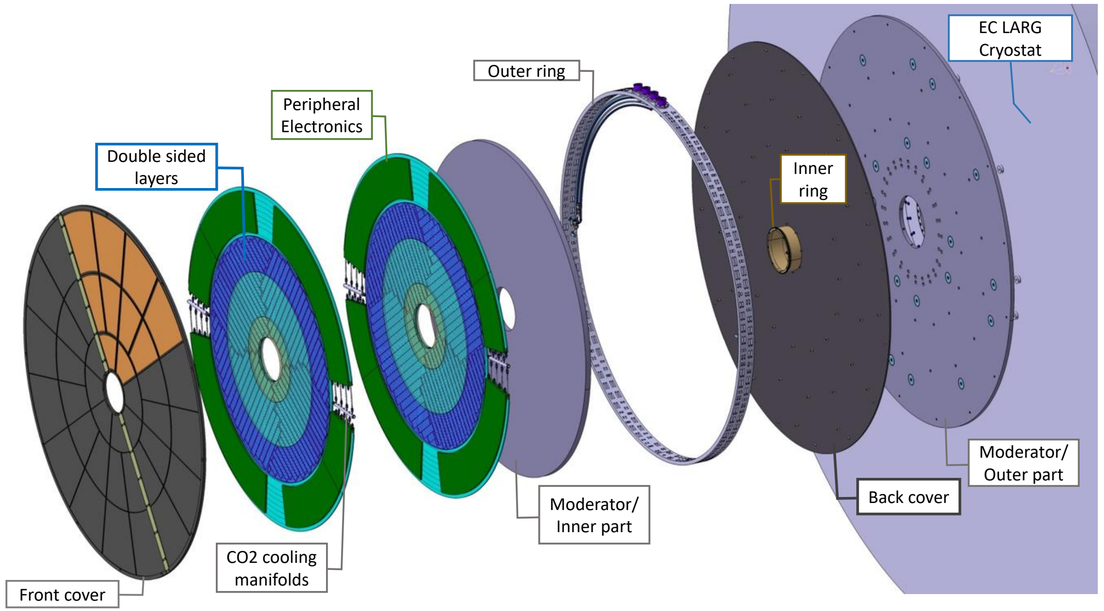
HL-LHC throughout 2030s



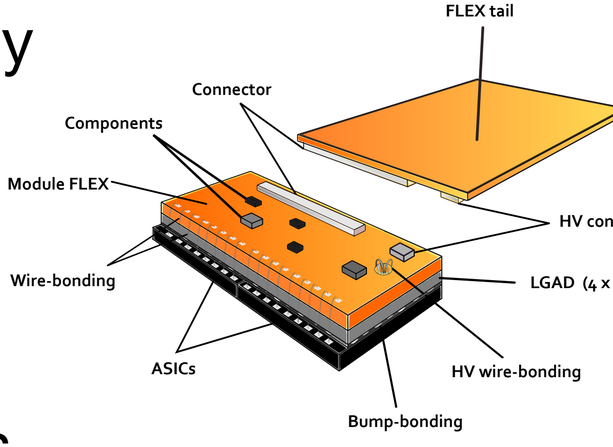
- High-Luminosity phase of LHC will deliver 90% of the data during 2030s
- Up to 200 *pp* interactions per bunch crossing, necessitating substantial detector upgrades

High-Granularity Timing Detector





- New type of detector, separates interactions in same bunch crossing in *time dimension*
- Low-Gain Avalanche Diode silicon technology
- 3.6M channels
- $\sigma(t) = 30$ ps for charged particles

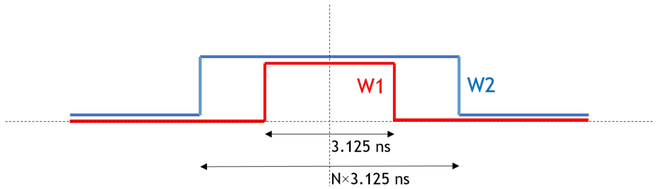


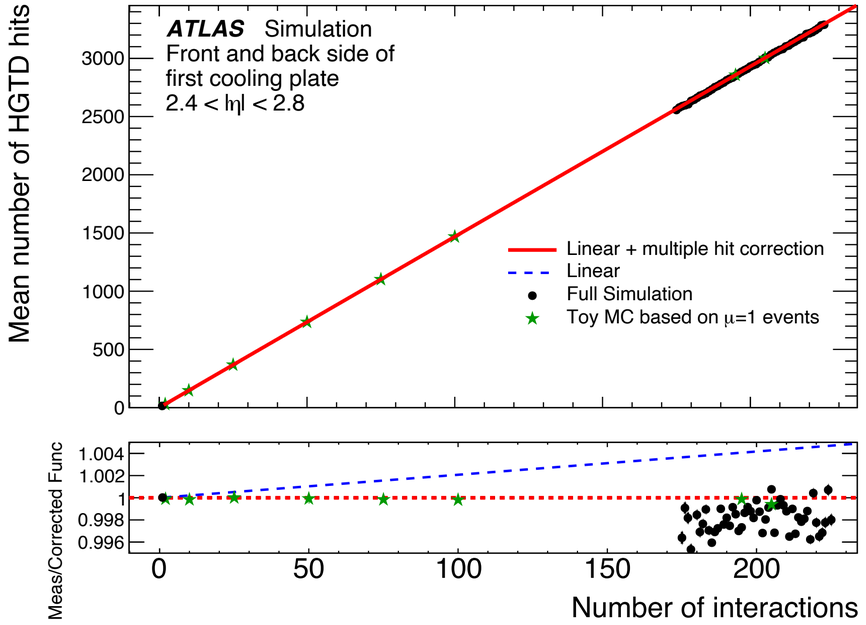
(TDR here!)

HGTD lumi readout system

- High-granularity → low occupancy
  → good linearity vs μ

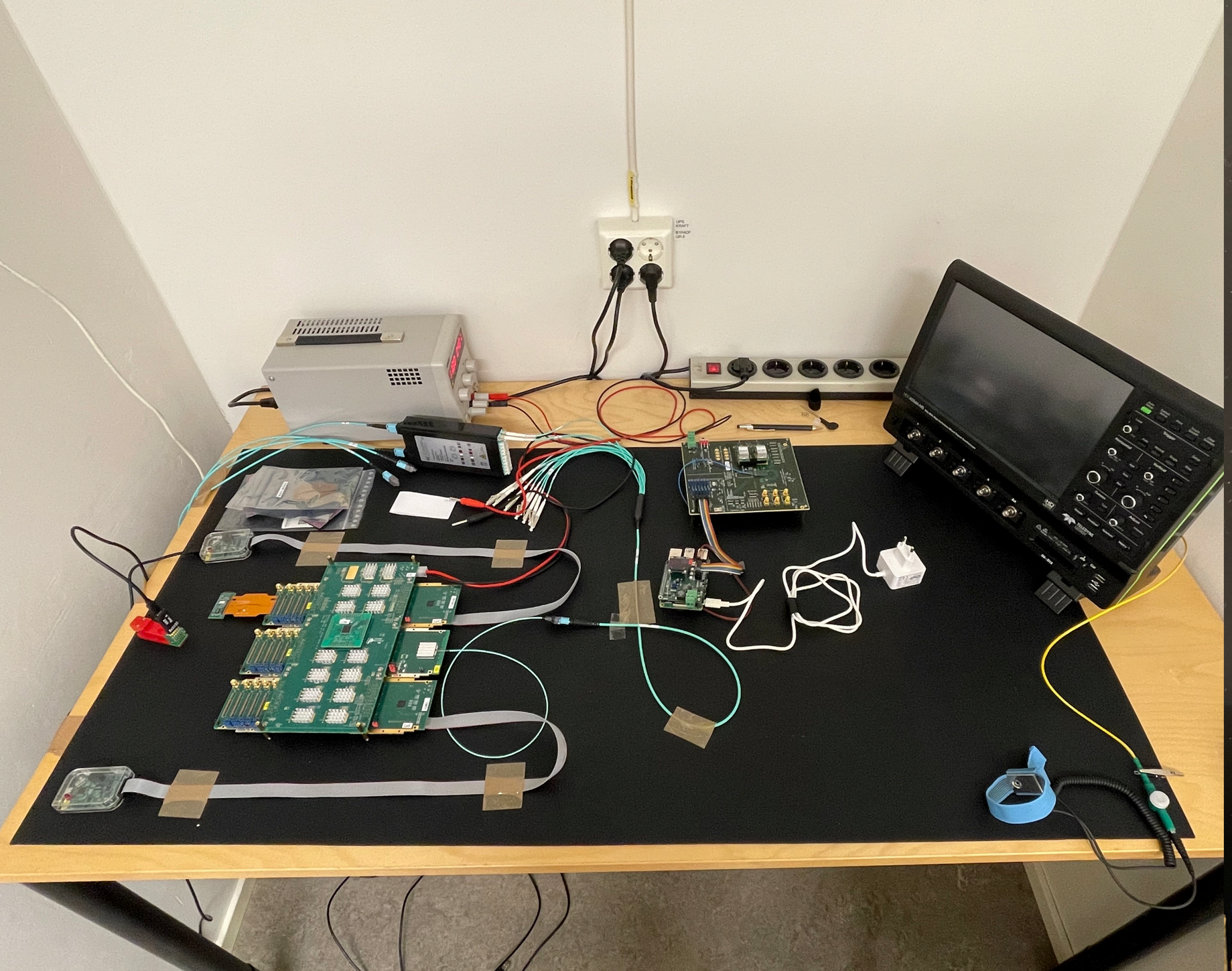
- Excellent timing resolution provides handle on tricky backgrounds





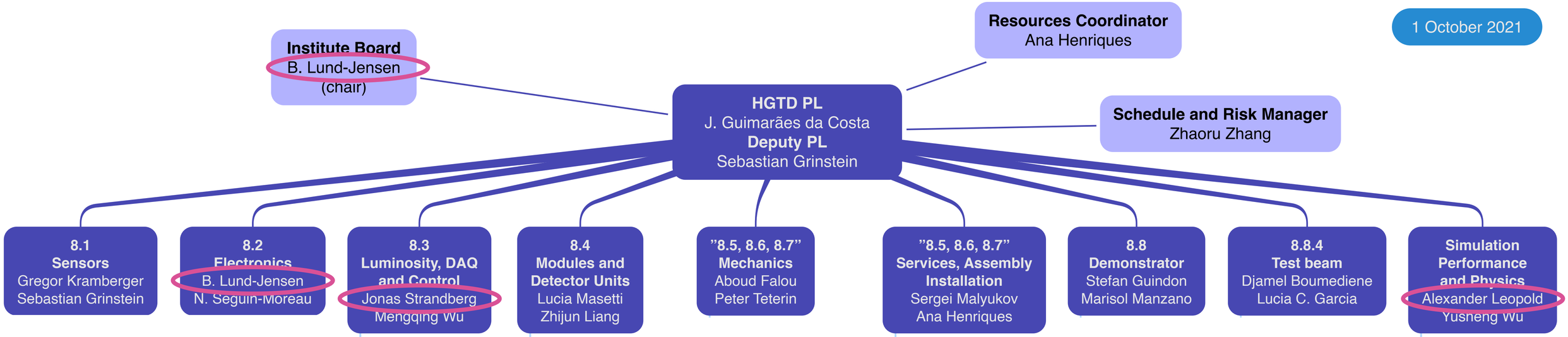
- KTH initiated project to equip HGTD with luminometer capabilities
  → responsible for developing luminosity readout system

- Also significant software activities: simulation development, reconstruction and performance studies




Module emulator V2
hanl@smail.nju.edu.cn
E30
FLEX Cat. 65mm
29
Uni Mainz
Prisma Detector lab
M. Robles
HGTD Flex Demo Nov2021
GND
M0
M1

HGTD leadership roles



Summary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- Physics analysis: Higgs measurements, *HH*, BSM with LLP searches
- Luminosity: ID luminosity measurements, operations & online software
- Upgrades for HL-LHC: High-Granularity Timing Detector