



# Readout System Enhancements for ATLAS ITk Project

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# Agenda

**Introduction  
HL-LHC & ITk**

**Our Progress  
Acknowledgements**

## **Introduction**

### HL-LHC & ITk

## Our Progress

### Acknowledgements



# ATLAS & the Inner Detector



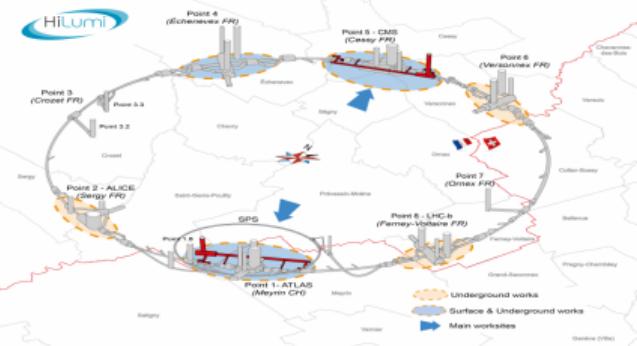
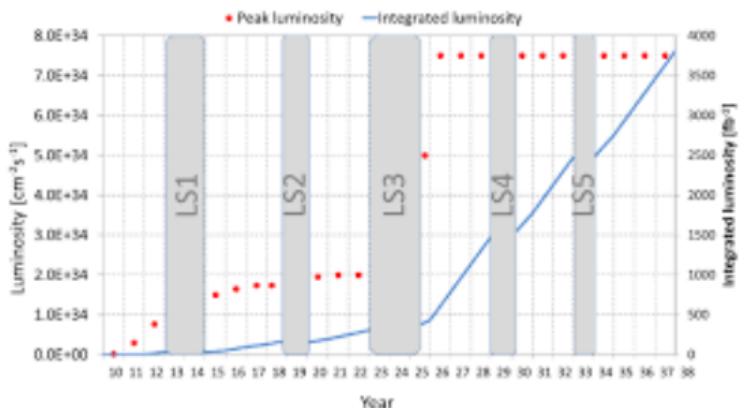
## Introduction **HL-LHC & ITk**

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# High Luminosity LHC & ITk Upgrades

x10 increase in instantaneous luminosity!

$$\blacktriangleright L = 1\text{e}73 \text{ fb}^{-1} \text{ s}^{-1} \rightarrow L = 1\text{e}74 \text{ fb}^{-1} \text{ s}^{-1}$$

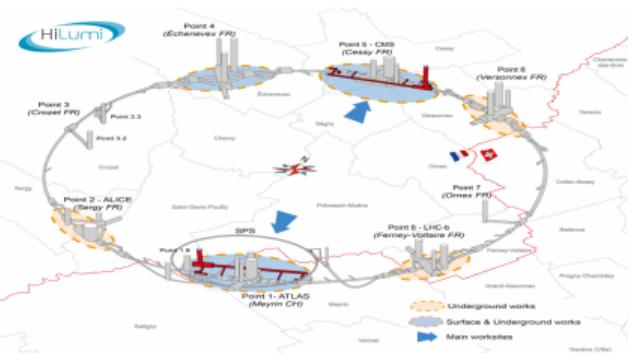
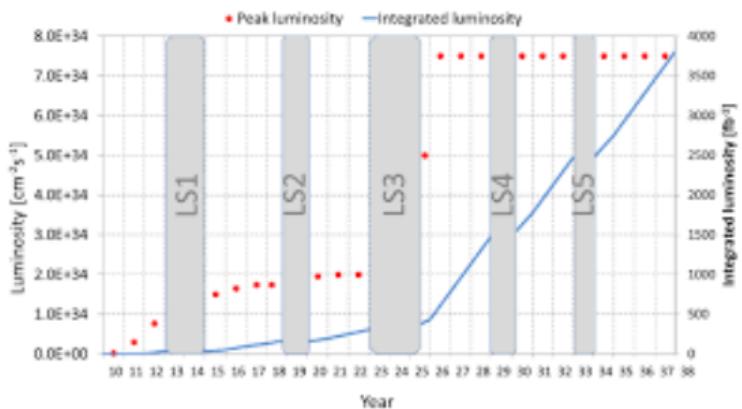


p1-figs/hl-plan.jpg

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- More particles, more problems



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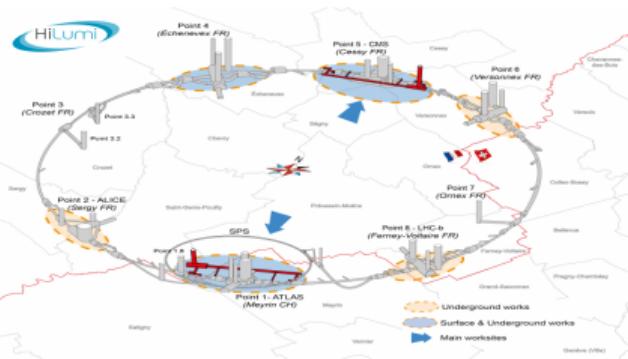
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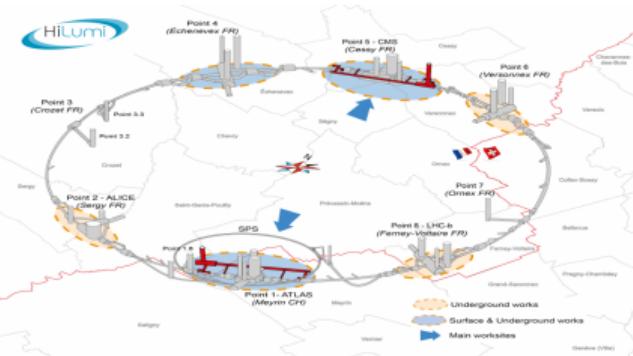
- radiation hardness
- granularity
- readout bandwidth
- trigger readout speed/storage



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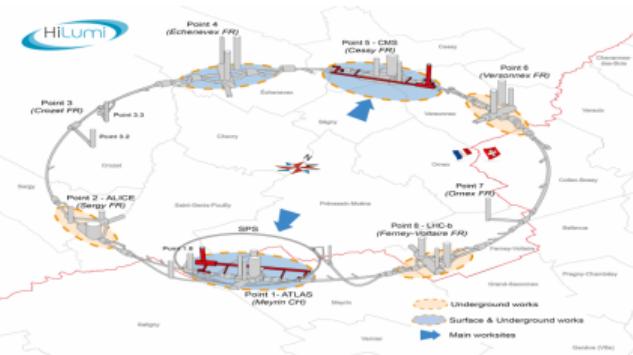
The inner detector has insufficient:

- ▶ radiation hardness: HL-LHC will deliver  $4000 \text{ fb}^{-1}$  fluence. ID PIX is designed for  $400 \text{ fb}^{-1}$ , ID SCT for  $700 \text{ fb}^{-1}$ , IBL for  $800 \text{ fb}^{-1}$

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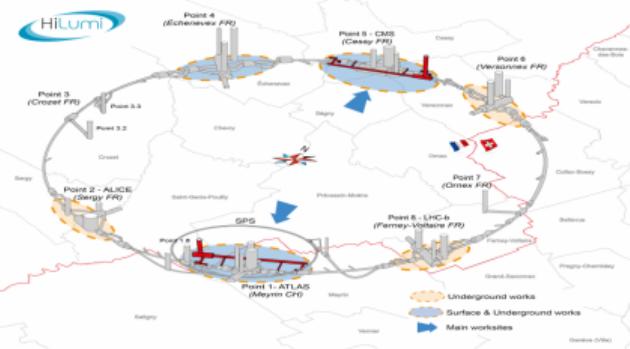
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- granularity: Increasing fluence means higher granularity is needed to maintain performance; compensate for intrinsic dead time

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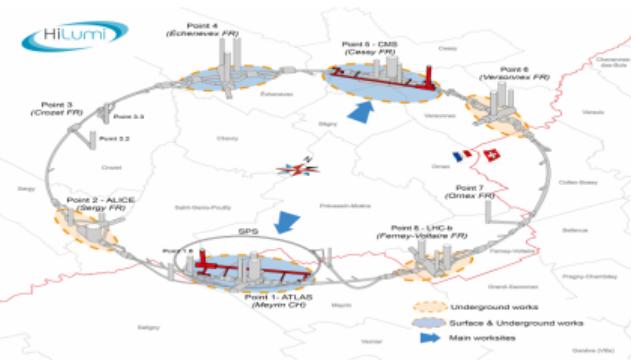
The inner detector has insufficient:

- ▶ readout bandwidth: HL-LHC will roughly quadruple ID designed bandwidth saturation

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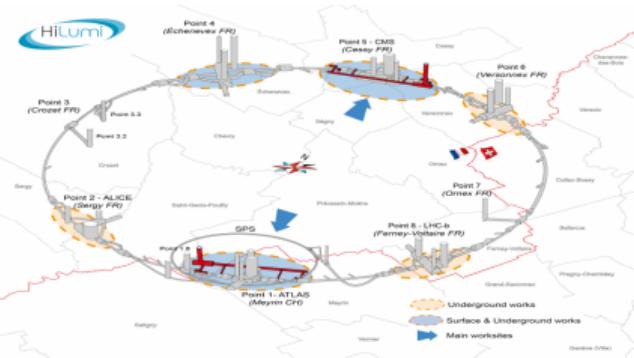
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- ▶ trigger readout speed/storage: readout chain must accomodate much higher hardware (level 1) trigger rate

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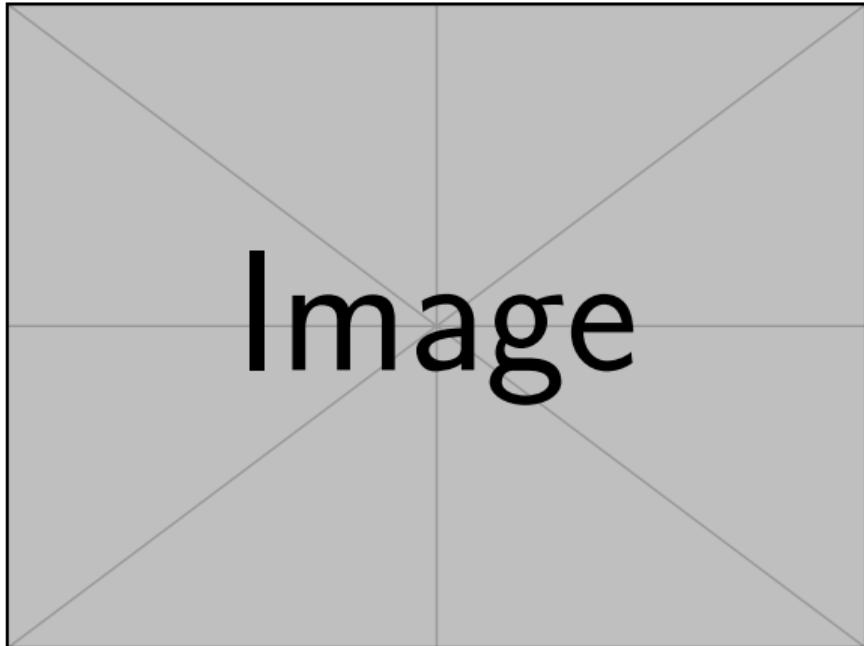
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Goal of ITk:

Same or better performance than ID in harsh environment of HL-LHC

# ITk design

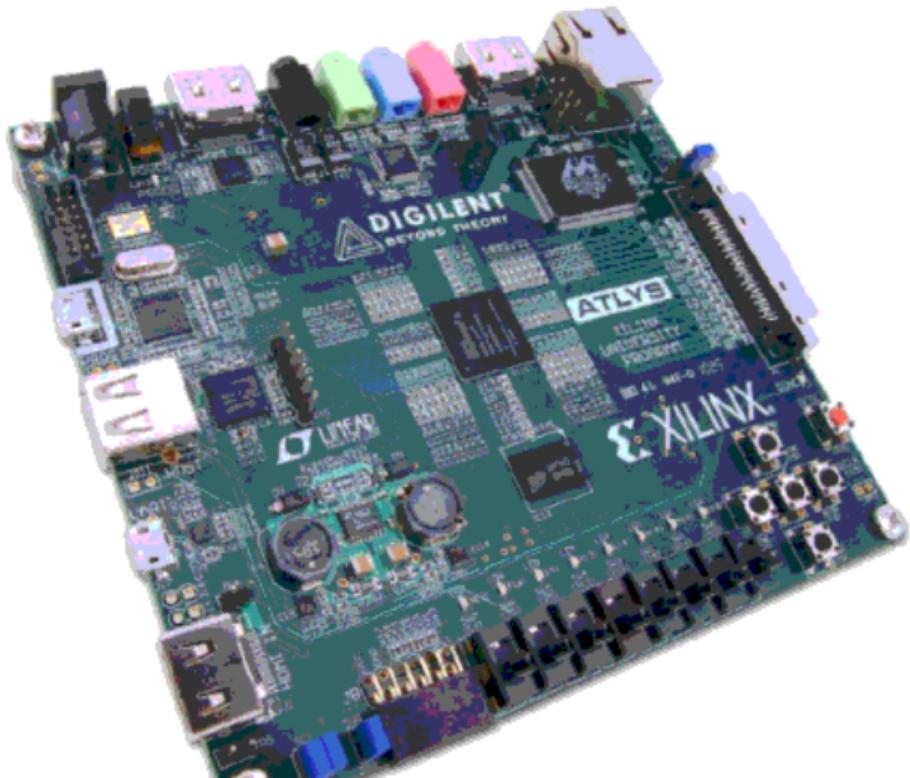


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# ATLYS Board



# Obstacles

fuck

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# Acknowledgements

We would like to acknowledge the University of Michigan Department of Physics, specifically Jean Krisch, Tom Schwarz, and Steven Goldfarb.  
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