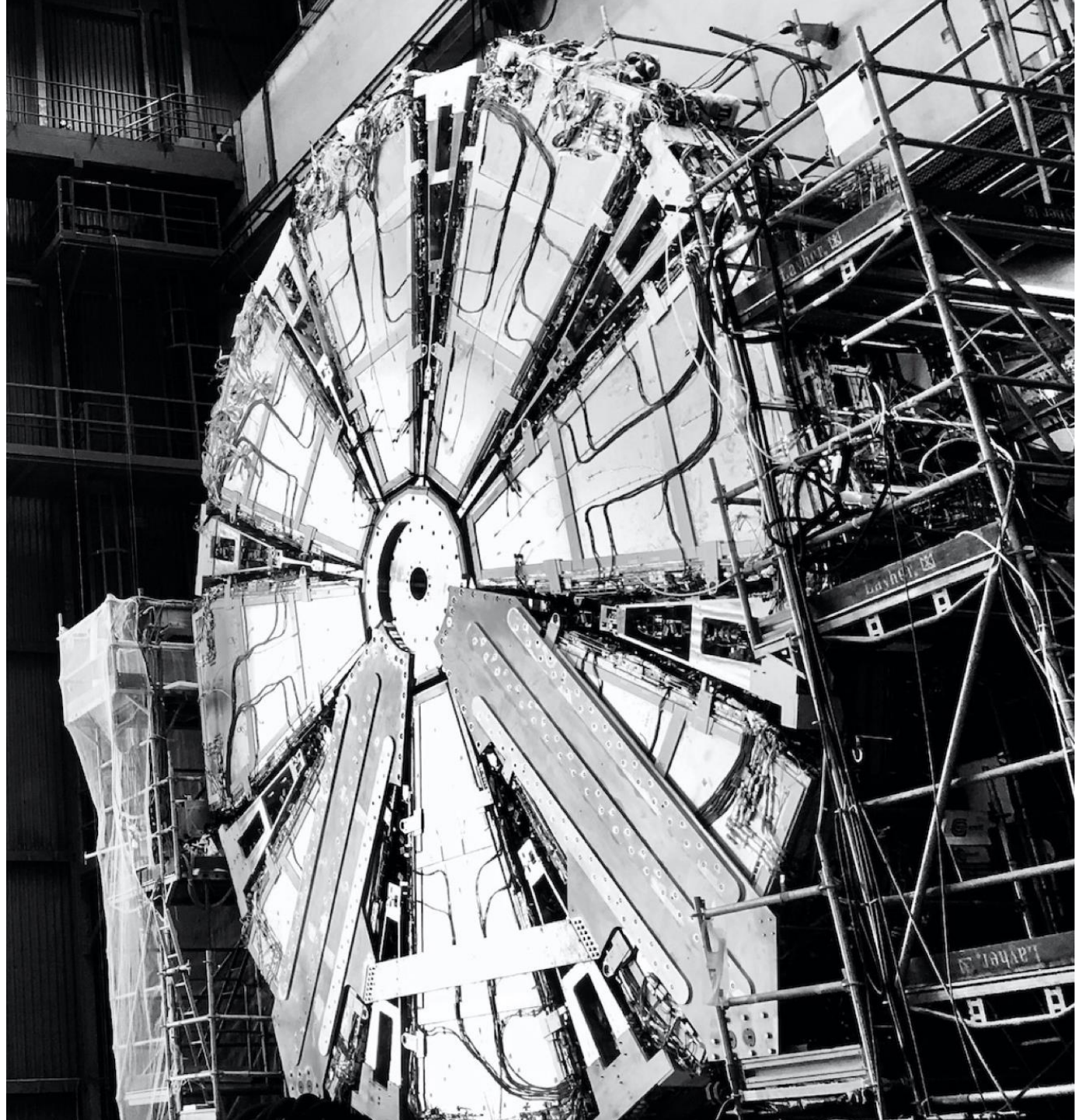


ATLAS Update

Max Swiatlowski, obo the ATLAS team



The TRIUMF ATLAS Group

BAE Scientists:

- Nigel Hessey
- Kate Pachal (adj. UBC)
- Oliver Stelzer-Chilton (adj. UBC)
- Reda Tafirout
- Maximilian Swiatlowski
- Isabel Trigger (adj. UVic)

University Joint Faculty

- Doug Gingrich (Alberta)
- Pierre Savard (Toronto)
- Bernd Stelzer (SFU)
- Mike Vetterli (SFU)

Affiliated Scientists

- Matthias Danninger (SFU)
- Rob McPherson (Victoria)

Detector Physicists

- Leonid Kurchaninov
- Luise Poley

Postdoctoral Fellows

- E. Filmer
- M. Basso
- D. Portillo (at CERN)
- E. Perez (at CERN)
- S. Tsigaridas (at CERN)
- M. Valente

Graduate Students

- R. Bate (UBC)
 - L. Brown (Victoria)
 - A. Bunka (UBC)
 - E. Carlson* (Victoria)
 - K. Leong (UBC)
 - C. McCracken (UBC)
 - S. Ramen (UBC)
- Plus 2-3 undergraduates throughout the year

- J.C. Rivera (Victoria)
- R. Salami (SFU)
- D. Sheppard (SFU)
- T. Saarinen (UBC)
- K. Usmanov (UBC)

Plus ~15 engineers, technicians, and Tier 1 computing personnel

* *Just graduated!* 🎓

The New “Small” Wheels: Upgraded Muon Detectors

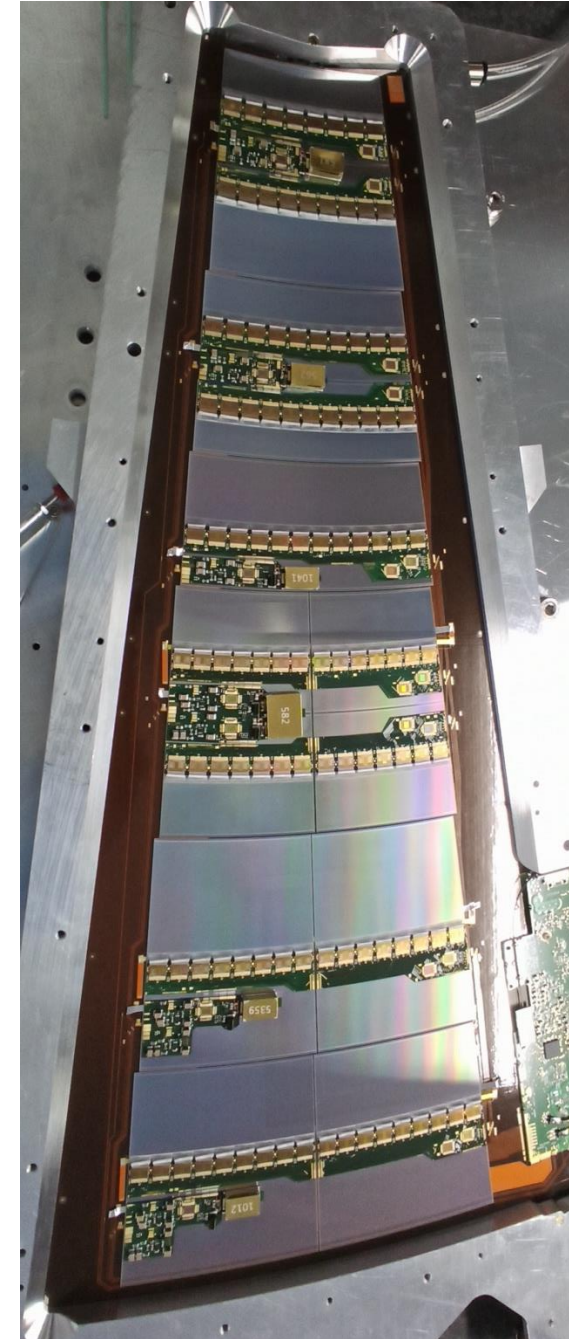
- Both wheels installed and operational since 2022
- First deployment in triggering: regularly participating in 2023 and 2024 triggering
- Current focus on high voltage failures during high lumi pp collisions: leading long-term GIF++ aging studies and investigations at CERN

- **5YP Goals: Continue NSW strip trigger commissioning in preparation for HL-LHC**

- Critical upgrade for trigger muons at high luminosity
- Major TRIUMF contributions to construction (half-gaps for 54 quadruplets)
- Significant TRIUMF contributions to installation and operation
- Leadership: R. McPherson (sTGC project leader), E. Perez (NSW deputy project leader), I. Trigger (sTGC coordinator), S. Tsigaridas (sTGC operations manager)

ITK: the Inner Tracker Upgrade

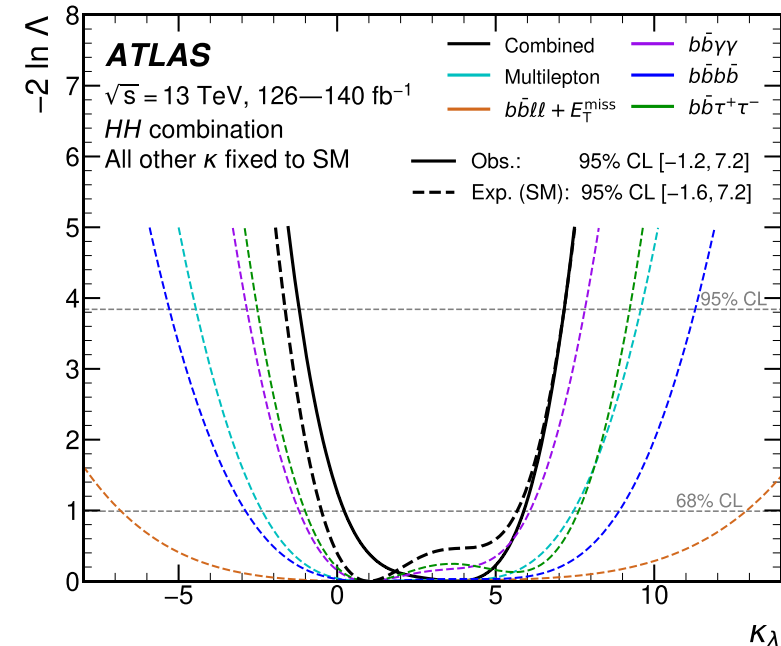
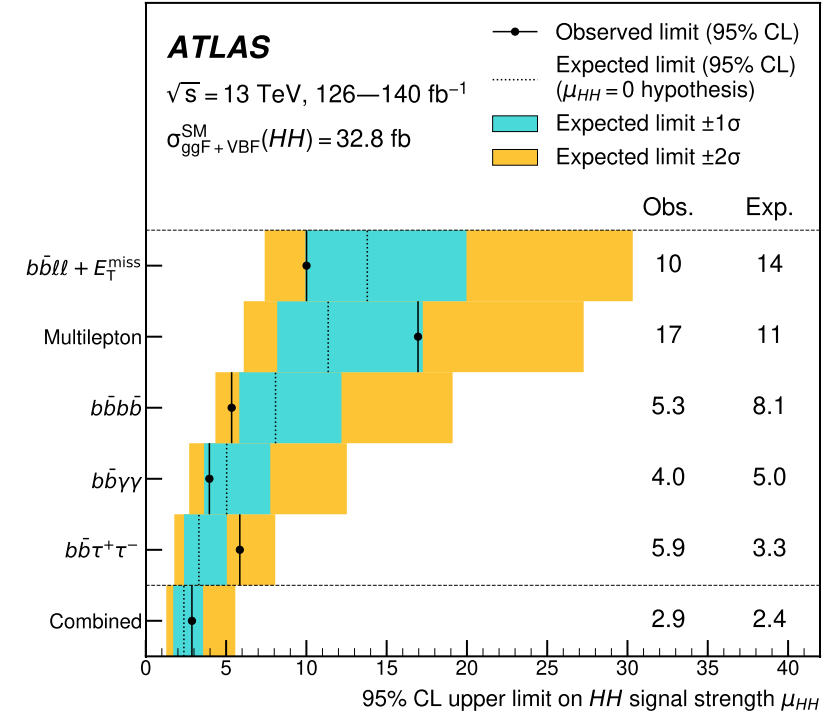
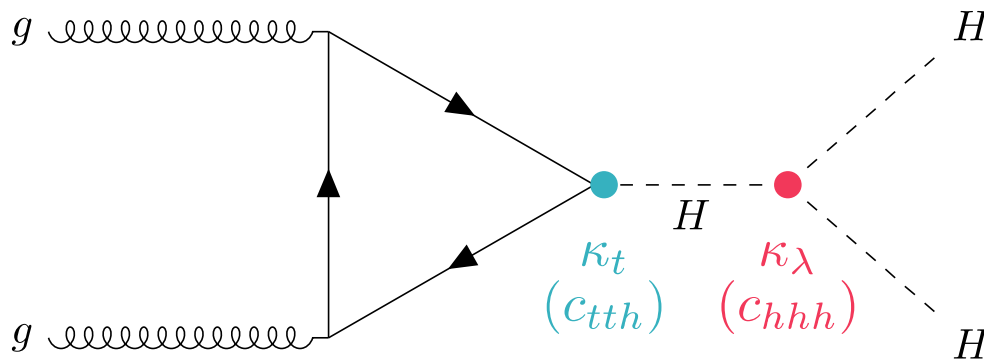
- Major upgrade to ATLAS inner tracker: $\frac{1}{4}$ of endcap petals and $\frac{1}{6}$ of module production, $\frac{1}{4}$ of sensor testing, at SFU/TRIUMF
- Significant TRIUMF leadership: L. Poley (strip module coordinator), B. Stelzer (module mounting coordinator)
- Recent progress:
 - Vancouver team leading investigations & solutions to 'module cracking' in endcap
 - Reliability problem at low temperatures
 - Produced only two petals with both potential solutions fully deployed: key for next ATLAS FDR
 - Leading central reporting framework development
- **5YP Goals: production and commissioning ITk**



Physics Highlight: DiHiggs

Measuring Higgs pair production allows for measurement of the Higgs potential via $\kappa\lambda$ coupling

- Latest combination of searches using Run 2 data published: [Phys. Rev. Lett. 133 \(2024\) 101801](#)
- ATLAS sub-group led by M. Valente, several papers led by M. Valente and M. Swiatlowski (including forthcoming ATLAS+CMS combination)
- **5YP Goals: Full Run3 combination (focus on 4b+comb), pushing towards 3σ with CMS**



Trigger and Performance:

- Muon trigger scale factors, Global Performance and Particle Flow development (group convener), Trigger Upgrade Physics coordinator

LAr Phase 1 and Phase 2 Upgrades:

- LAr phase 1 upgrade commissioned and operational: significant trigger bandwidth improvements
- Phase 2 frontend ASIC being developed at TRIUMF: fully digital readout, all 2σ cells read out at 40 MHz

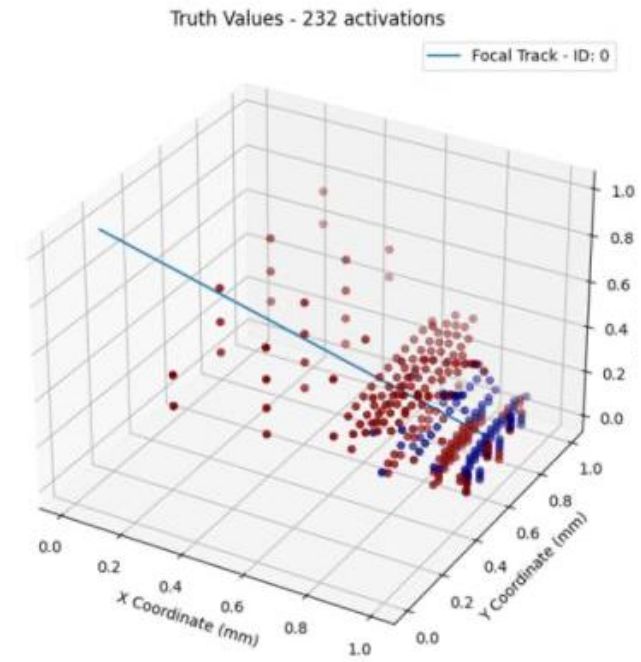
Tier 1 computing center operations and upgrade

- Running at high efficiency
- CFI application for HL-LHC operations submitting soon

Physics analysis: measurements and searches

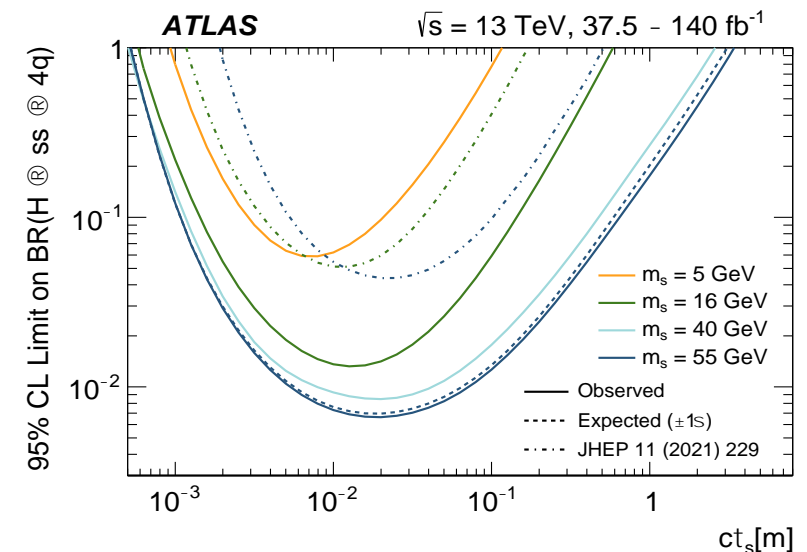
- Higgs properties (WW* channel group convener)
- BSM searches (especially long-lived)
- Diboson production measurements, including EFT

5YP Goals: Deliver upgrade, push BSM searches, develop Higgs and EWK measurements



ML models for PFlow and Trigger

Limits on Higgs decays to LLPs



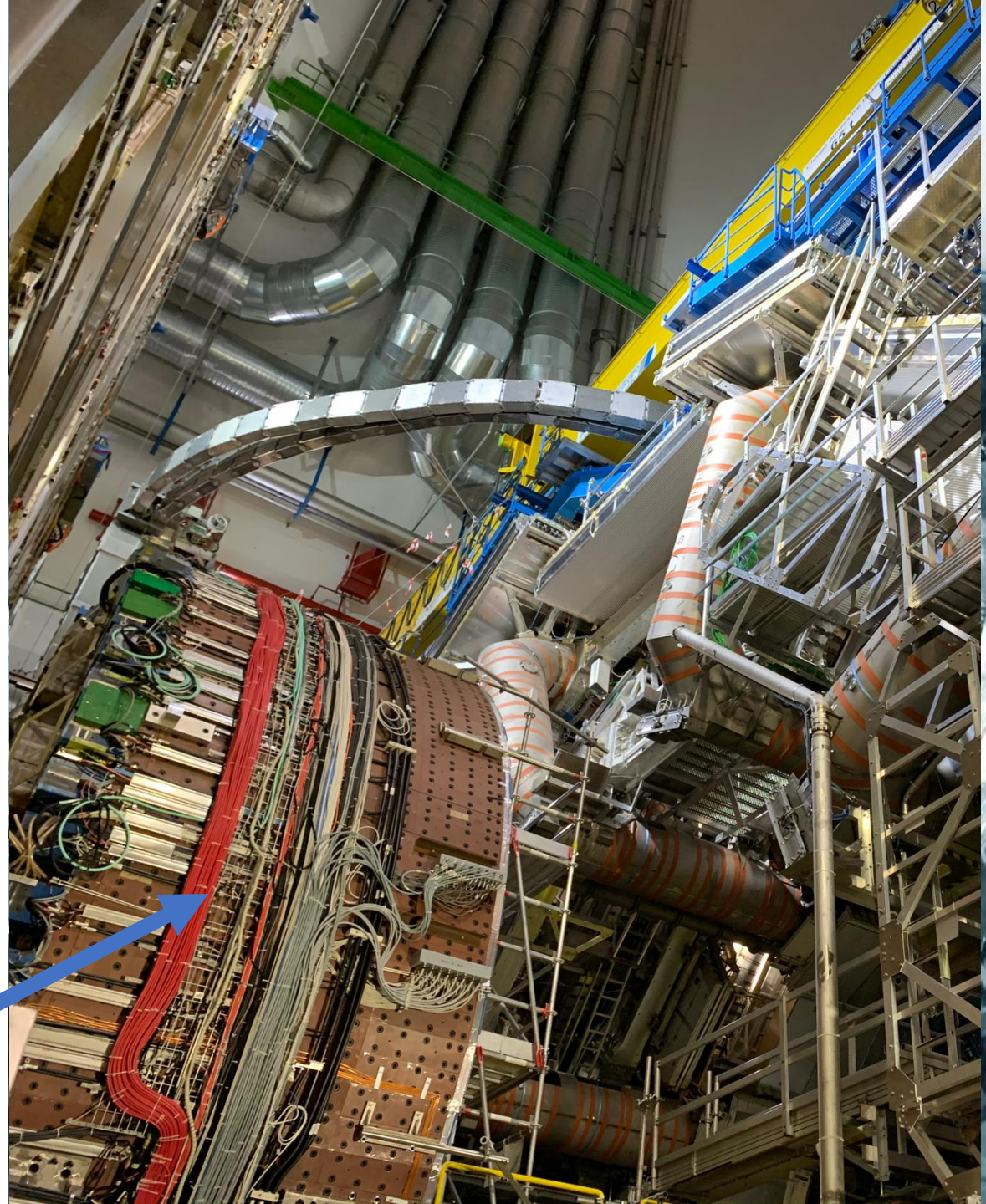
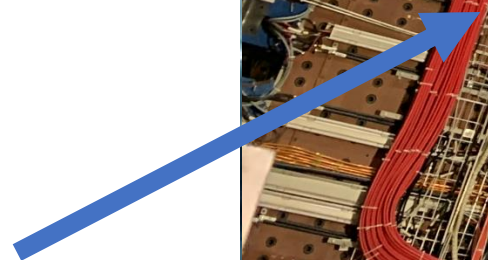
Thank you
Merci

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Hadronic Endcap Calorimeter:
Produced at TRIUMF!



Liquid Argon Calorimeter Electronics Upgrades

- Key component of ATLAS trigger strategy for Run-3
- Canadian expertise in Hadronic Endcap from original ATLAS detector design and construction
- Improve granularity of information supplied to the Level-1 trigger to improve background suppression
- Phase 1: Implementation requires new Front-End Crate “baseplanes”
 - Design, prototyping and assembly at TRIUMF
 - Fully installed and commissioned for 2022
- Phase 2: Complete replacement of Front End (FE)
 - TRIUMF focus on new FE ASIC design
 - Preproduction yield 92%
 - Full production and packaging in progress
 - Radiation testing and QC tests soon

