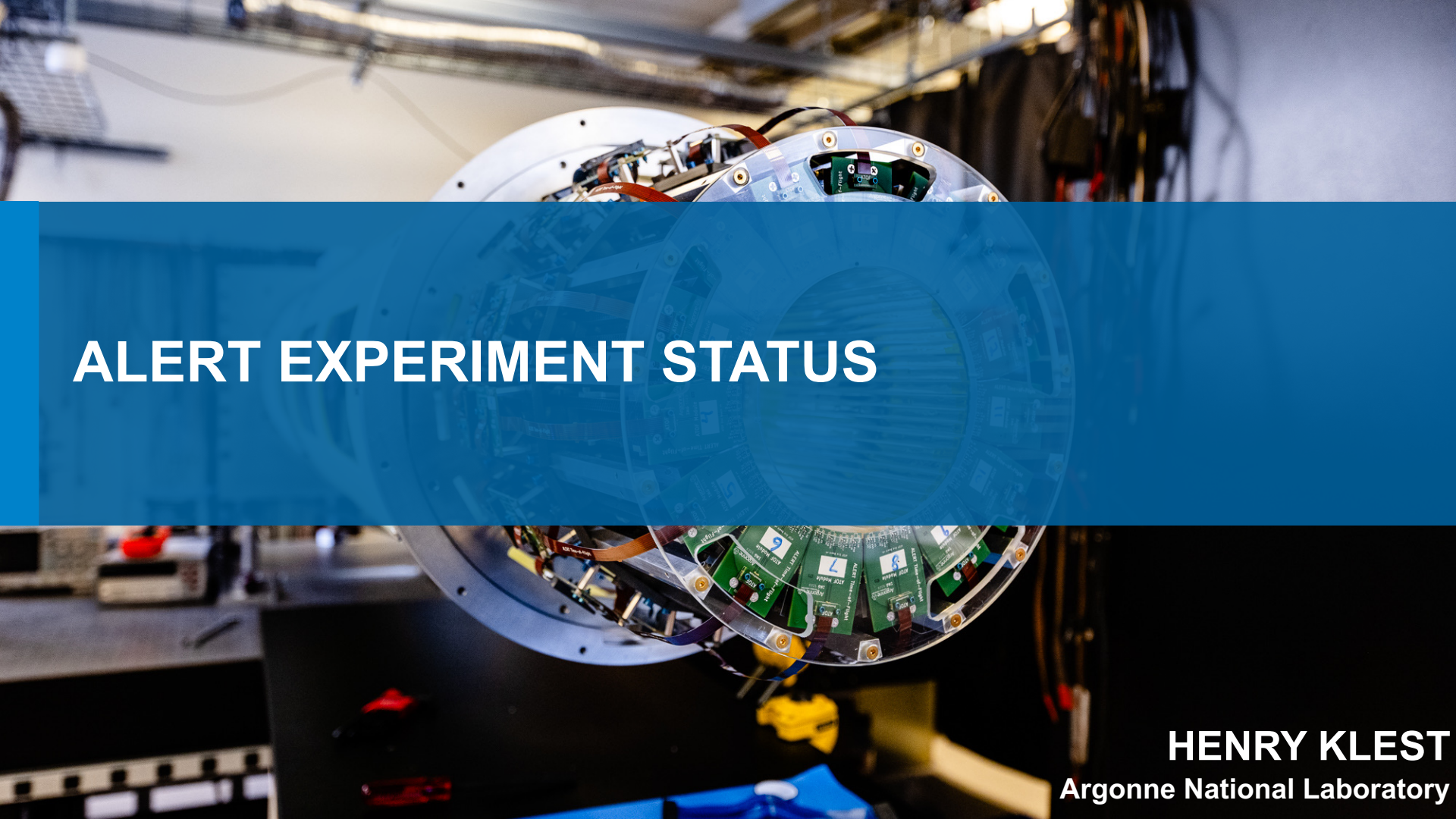


ALERT EXPERIMENT STATUS

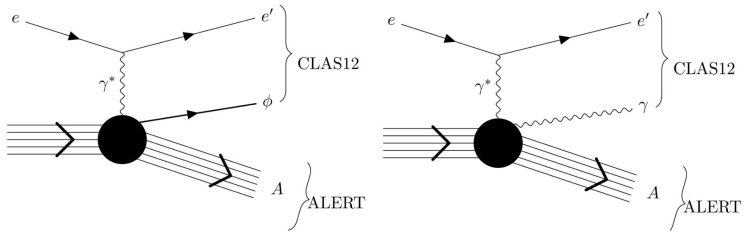
HENRY KLEST
Argonne National Laboratory

WHY ALERT?

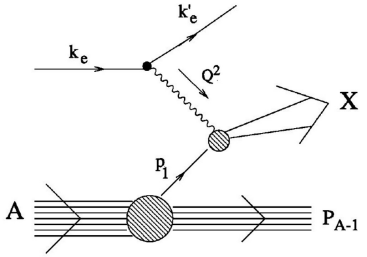
- A Low Energy Recoil Tracker (ALERT) – Designed to precisely identify and track ^{4}He, ^{3}He, t, d, p

- ^{4}He has a uniquely simple set of GPDs as a bosonic, spin 0 nucleus
  - — Can be accessed directly by a single observable!

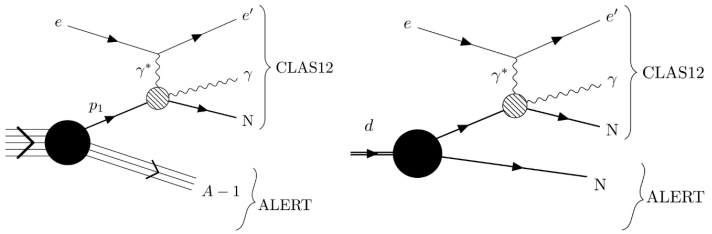
- Ability to tag spectators enables studies of nucleon modifications *in-nucleo*
  - — Do we see the EMC effect when we tag the spectator?
  - — Do the Compton form factors of bound nucleons differ from free ones?



Coherent processes for ^{4}He GPDs



Tagged DIS for EMC Effect



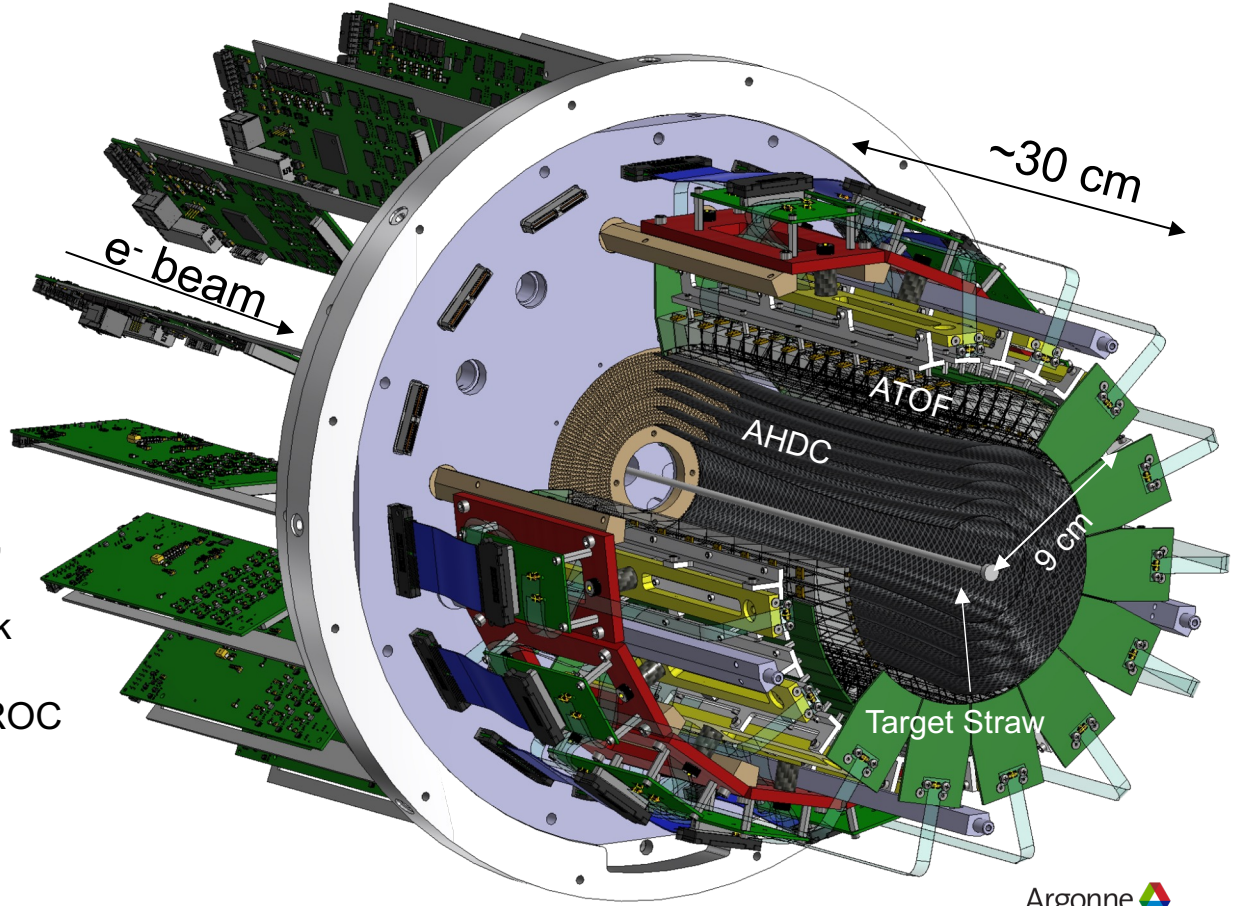
Incoherent DVCS for imaging bound nucleons

ALERT DETECTOR

- A Low Energy Recoil Tracker (ALERT) – Designed to precisely identify and track ^{4}He, ^{3}He, t, d, p

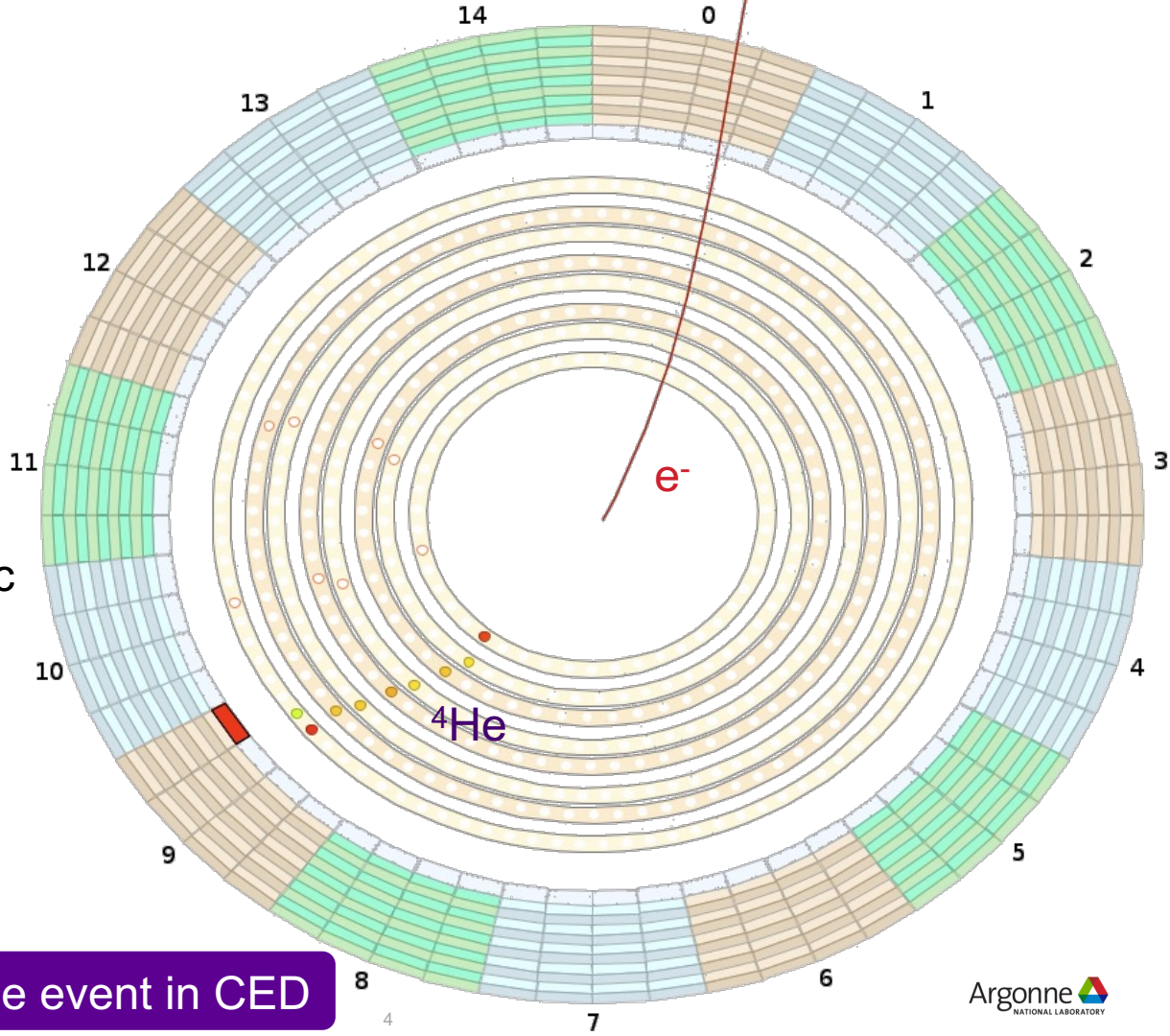
- Consists of a drift chamber (AHDC)
  - ~7 cm outer radius
  - 576 drift cells (4mm x 4mm)
  - 20° stereo angle

- And a time-of-flight (ATOF)
  - 60 bars with two-sided readout, 3mm thick & 28 cm long
  - 600 (60 in ϕ x10 in z) 2 cm thick wedges
  - SiPM photosensors with PETIROC ASICs providing ToA & ToT



RUN THUS FAR

- 4/6 – Begin commissioning with 2.2 GeV beam
- Ran hydrogen, deuterium, ^{4}He targets
- Gained very valuable elastic data for testing reconstruction of recoil in ALERT, scattered electron tells us where the recoil went



Elastic ^{4}He event in CED

RUN THUS FAR

- 4/11 – Turn the dial to 11! (GeV)
  - — Scanned beam currents & trigger configurations to find an operating point

- Lumi scan took currents up to 500 nA, **highest ever delivered to Hall B!**
  - — No issues from accelerator side, 500 nA delivered no problem!
  - — Nominally ALERT was to run 500 nA and 1 mA on a target of 44 psig
  - — 500 nA occupancies were determined to be too high for reliable reconstruction

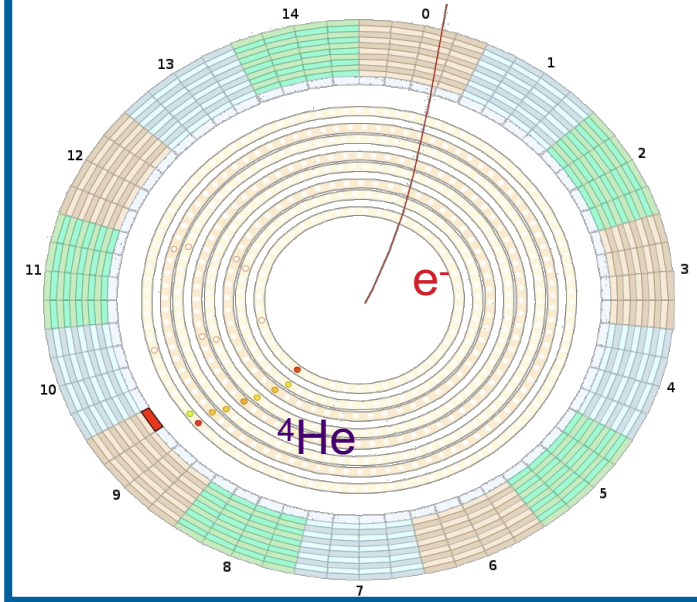
- FD & FT occupancies driven mainly by the target window, not the data we want!
  - — Increasing target pressure is a preferable avenue to more physics data

- Compromise found at **325 nA and 66 psig**

RUN THUS FAR

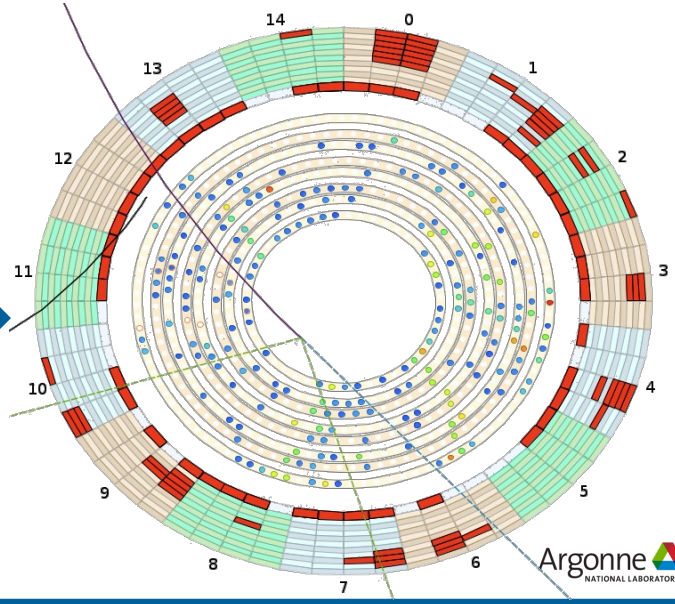
- 4/11 – Turn the dial to 11! (GeV)
  - Scanned beam currents to find a reasonable working point
  - Ran at 250 nA (safe setting) while subsystem experts analyzed the lumi scan data
  - Nominally ALERT was to run 500 nA and 1 mA on a target of 44 psig
  - Compromise found at 325 nA and 66 psig

Elastic ^{4}He at 2.2 GeV 😎



+ 8.5 GeV & 300 nA

10.7 GeV @ 325 nA! 😱

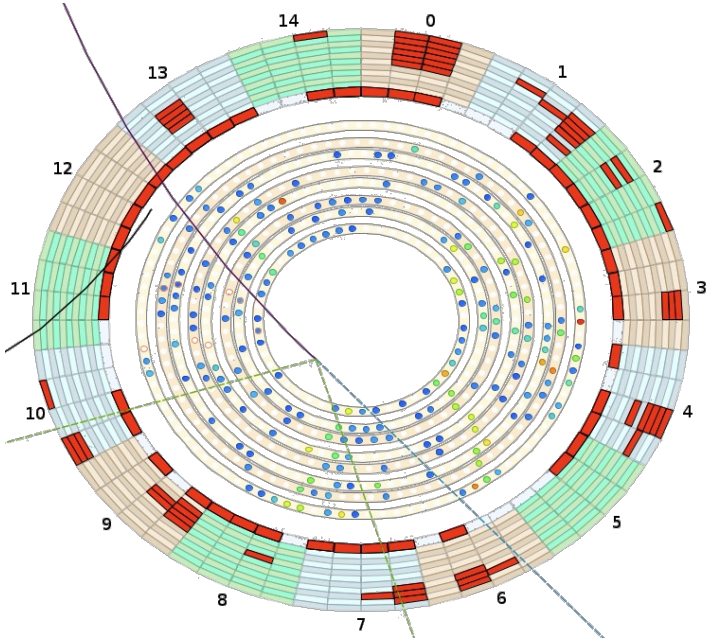


RUN THUS FAR

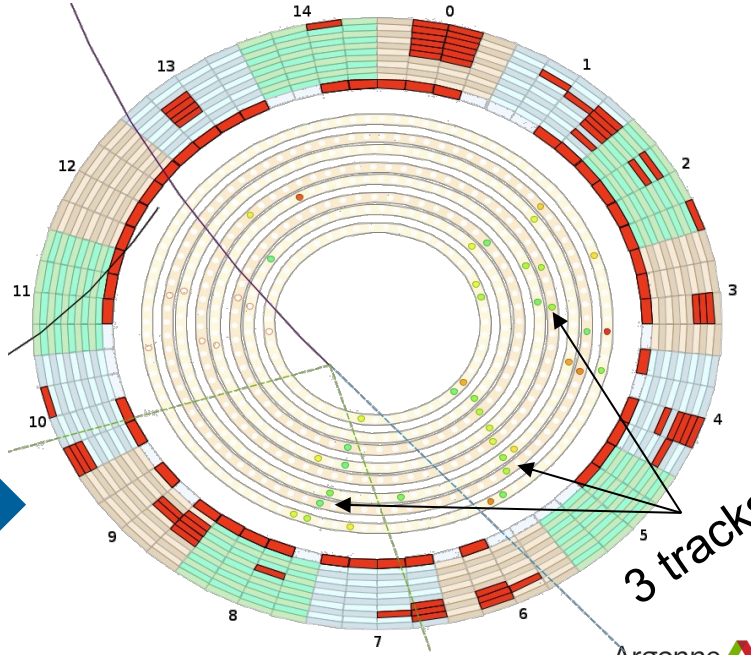
***CED makes it look a lot worse than it is**

Most ATOF hits are outside the timing peak & AHDC hits are tiny ADC

Both are easy to reject!



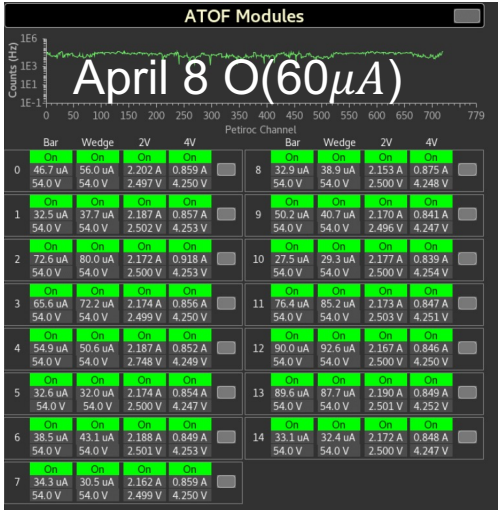
ADC Cut on AHDC

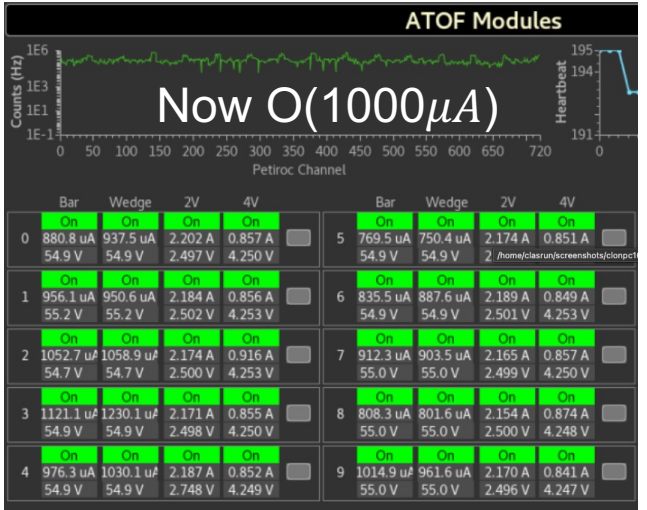


Argonne NATIONAL LABORATORY

TRIALS AND TRIBULATIONS

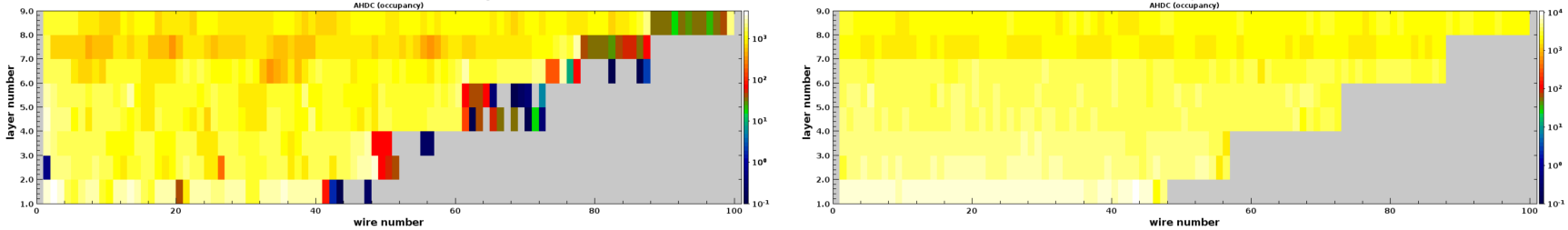
- 4/6 – Run starts
  - — Immediately a few issues with the target
    - Control system is very finnicky and would occasionally break
      - — By now Felix has tamed the dragon and regularly operates it stably ☺
    - Pressure fluctuating several psi on timescale of hours – Solenoid valve wasn't operating properly in the field of the CLAS12 solenoid…
- ATOF currents grow rapidly as expected from rad damage of SiPMs
  - — Meant we had to swap a power supply for a higher current model (thankfully Yuri had one on hand!)
  - — Also meant thresholds & HV have needed tweaking throughout the run
- ATOF electronics (which control HV, LV) also sit close to the beam, produces various strange issues from SEUs, HV control





TRIALS AND TRIBULATIONS

- 4/18 - Broken AHDC wire caused by solenoid trip
  - Fix involved removing the broken wire, recovered basically 100%!



- 4/30 – ATOF HV died in 1/30th of the azimuthal angle
  - Not a supply issue, Fixed by replacing the module with a fresh one
- 5/6 to 5/24 – Almost no usable beam due to persistent beam quality issues
  - Ran well for a while with Halls B, C, & D
  - When Halls A&C were both down, hard to guide the beam due to low beam current (can't see it well on the BPMs)
  - Adding Hall A into the mix further exacerbated the beam steering & bleedthrough issues

TRIALS AND TRIBULATIONS

- A few intermittent issues with ALERT electronics
  - AHDC DREAM connectors were occasionally breaking, presumably due to overcurrents caused by sparks in the chamber itself
    - Lowered AHDC voltages reduced the rate of losses
  - ATOF HV supplied via the PETIROC board, single event upsets in those boards (which sit very close to the beamline) can cause HV weirdness
    - Requires reboot of ATOF LV, HV, and clondaq11, and/or clearing MPOD events

- Beginning of June saw some trouble with the torus & solenoid
  - Fast ramp down and unable to ramp to full field, initially concerning
  - In the end, issue was tracked down to LCW flow sensors

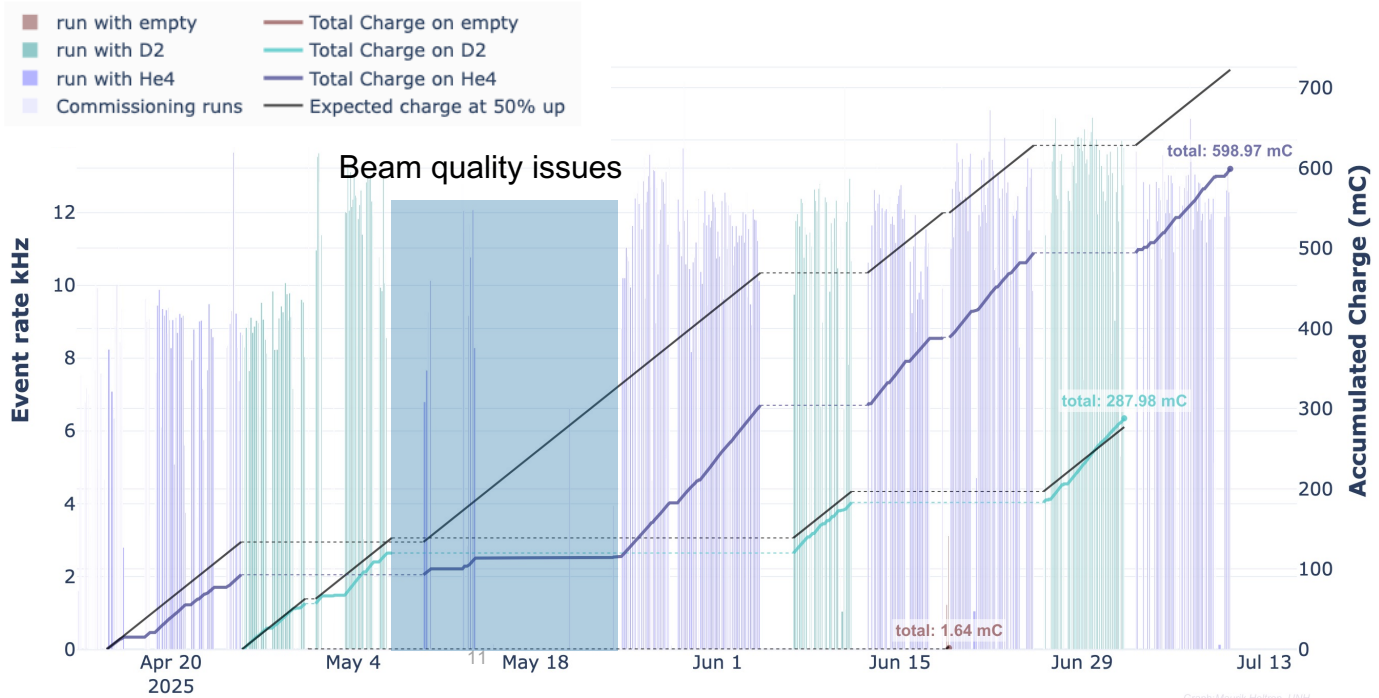
- **Since then, quite smooth running overall!**

COLLECTED CHARGE SUMMARY

- ALERT approved for ~2.6 coulombs of charge on a 3 atm target
  - — Corresponds to 155 fb^{-1}
  - — Been running 325 nA on a 4.6 atm target

Configurations	Proposals	Targets	Beam time request	Beam current	Luminosity*
			days	nA	n/cm^2/s
Commissioning	All†	^{1}H, ^{4}He	5	Various	Various
A	Nuclear GPDs	^{4}He	10	1000	6×10^{34}
B	Tagged EMC & DVCS	^{2}H	20	500	3×10^{34}
C	All†	^{4}He	20	500	3×10^{34}
TOTAL			**55**		

- Collected so far:
  - — ~60 fb^{-1} of ^{4}He
  - — ~30 fb^{-1} of ^{2}H
- In the last week, got **100 mC!**
  - — 400 mC since June 12
- **Projected to get ~120 of the approved 155 fb^{-1}!**
  - — If things go this smoothly until 8/3…



11

CALIBRATIONS

- Lots of good RG-L calibration work ongoing for FD & FT
  - DC alignments & beam offsets completed
    - Very helpful for calibration of ALERT!
  - Global timing, RF, DC time offset, FTOF, ECal, FT-cal, & Cherenkov calibrations ongoing

- **Making record progress** for CLAS12 calibration thanks to experience from recent run groups and efforts of many people!

- For status of ALERT calibrations, see Michael's talk from Tuesday!

FUTURE PLANS

- ALERT → SRC-ALERT on 8/7 (See Florian's talk)
  - Plan to run 6.4 GeV on ^{4}He
  - Tag the final-state spectator in quasi-elastic ^{4}He(e,e'pd$_s$)n, ^{4}He(e,e't$_s$)p
  - Enables a fully exclusive study of proton-neutron SRC pairing!
  - Also provides a useful dataset at lower energies for calibrating the end of the non-SRC ALERT

- Much work to be done on reconstruction of real data in ALERT!
  - Valiant efforts of CLAS12 calibration team are expediting this process!

7/31/25	Thursday	2.12	Run Group L
8/1/25	Friday	2.12	Run Group L
8/2/25	Saturday	2.12	Run Group L
8/3/25	Sunday	2.12	Run Group L
8/4/25	Monday	2.12	Pass change
8/5/25	Tuesday	2.12	Run Group L
8/6/25	Wednesday	2.12	Run Group L
8/7/25	Thursday	2.12	Pass change
8/8/25	Friday	2.12	E12-23-013
8/9/25	Saturday	2.12	E12-23-013
8/10/25	Sunday	2.12	E12-23-013
8/11/25	Monday	2.12	E12-23-013
8/12/25	Tuesday	2.12	E12-23-013
8/13/25	Wednesday	2.12	E12-23-013
8/14/25	Thursday	2.12	E12-23-013
8/15/25	Friday	2.12	E12-23-013
8/16/25	Saturday	2.12	E12-23-013
8/17/25	Sunday	2.12	E12-23-013
8/18/25	Monday	2.12	E12-23-013
8/19/25	Tuesday	2.12	E12-23-013
8/20/25	Wednesday	2.12	E12-23-013
8/21/25	Thursday	2.12	E12-23-013
8/22/25	Friday	2.12	E12-23-013
8/23/25	Saturday	2.12	E12-23-013
8/24/25	Sunday	2.12	E12-23-013
8/25/25	Monday	2.12	E12-23-013
8/26/25	Tuesday	2.12	E12-23-013
8/27/25	Wednesday	2.12	E12-23-013
8/28/25	Thursday	2.12	E12-23-013
8/29/25	Friday	2.12	E12-23-013
8/30/25	Saturday	2.12	E12-23-013
8/31/25	Sunday	2.12	E12-23-013
9/1/25	Monday	2.12	E12-23-013
9/2/25	Tuesday	2.12	E12-23-013
9/3/25	Wednesday		

CONCLUSION

- After some hiccups, RG-L run now progressing nicely
  - On track for ~120 fb^{-1} of 155 fb^{-1} from proposals
  - Aiming for a final data set which consists of 2/3 ^{4}He target and 1/3 ^{2}H
  - Commissioning phase completed as planned
  - No major issues!

- Next steps are CLAS12 & ALERT calibrations, combined reconstruction, data analysis

Thanks!