Savannah Shively on behalf of the FASER Collaboration
LHCP 2021, 7 - 12 June 2021

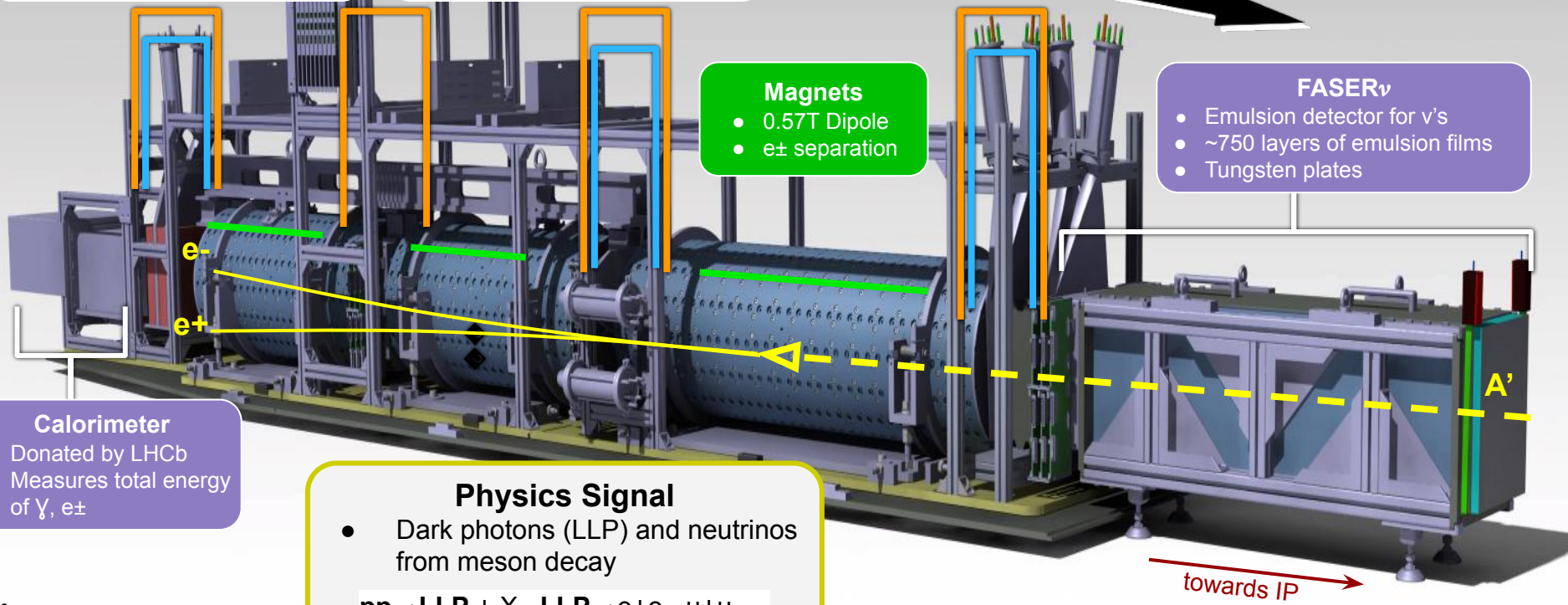
FASER

Tracking Stations
- 4 Stations, 3 planes each
- 8 SCT modules per plane
- SCTs donated by ATLAS

Scintillators
- Veto - rejects muon background
- Trigger/timing - arrival time
- Preshower - veto & 2-ɣ signal

Magnets
- 0.57T Dipole
- e± separation

FASERν
- Emulsion detector for ν's
- ~750 layers of emulsion films
- Tungsten plates



Calorimeter
- Donated by LHCb
- Measures total energy of ɣ, e±

Physics Signal
- Dark photons (LLP) and neutrinos from meson decay

$pp \rightarrow LLP + X$, $LLP \rightarrow e^+e^-, \mu^+\mu^- ...$

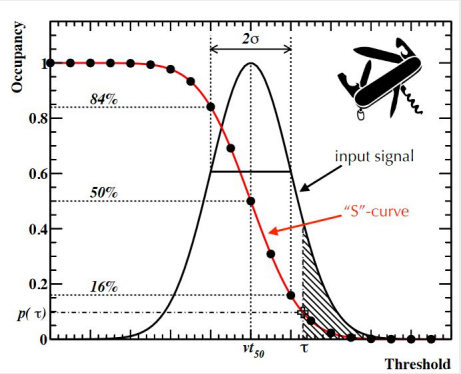
References
[1] https://arxiv.org/pdf/1811.12522.pdf
[2] https://arxiv.org/pdf/1812.09139.pdf

Preparing FASER's Trackers

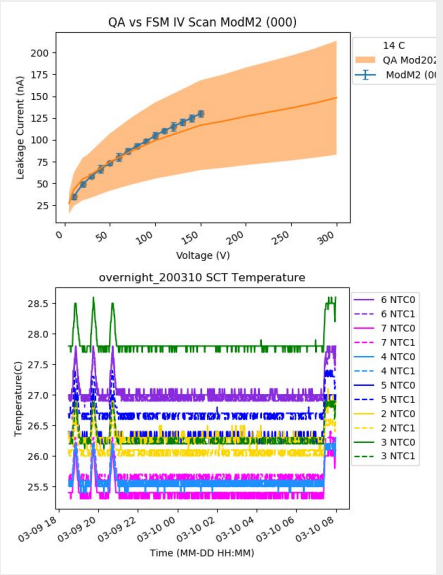
- Before testing begins, quantify/confirm properties of detector components.
  - Noise
  - Strip status (dead, noisy, "good")
- Ensure environment control functionality
  - Tracker modules operate below 30°C
  - Humidity/temperature below dew point

- Threshold scan: Discriminator threshold is varied and a fixed charge is sent many times at each threshold point
- Gain: Threshold scan with injected charges of 1.5, 2 and 2.5 fC to verify the analog performance of the modules

- Sergio Gonzales



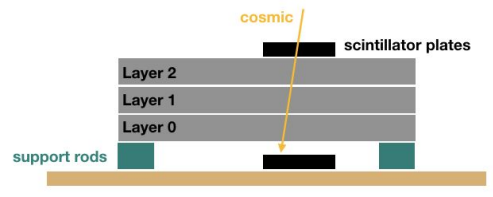
- Current vs Voltage: Assess quality of modules and if they are in agreement with earlier quality assassurance tests
- Temperature: Long-term tests show station stability



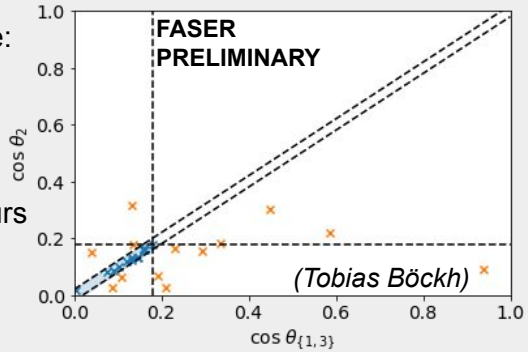
Top: An example of threshold scan input and expected occupancy
Middle: Current vs Voltage plot with initial test in orange compared to more recent test in blue.
Bottom: Tracker module temperatures overnight during a gain test

Testing FASER with Cosmics

- Cosmic ray muons used to test tracker functionality
- Single station on surface (Winter 2020)
- Full detector underground (Ongoing)
- CR simulation vs Measurement
- Helpful for testing reconstruction



- Estimate of cosmic trigger rate: *276 mHz*
- **Two-station tracks**
  - Prediction: *1/(28 hrs)*
  - 14 good tracks in 469 hours of data
  - Measured rate: *1/(33.5 +/- 8.9 hrs)*
- **Three-station tracks**
  - Prediction: *1/(82 days)*
  - *Not yet measured*



"Good" tracks shown in blue traverse two adjacent stations at compatible angles.