

# First Data from the Commissioned ICARUS Side Cosmic Ray Tagger

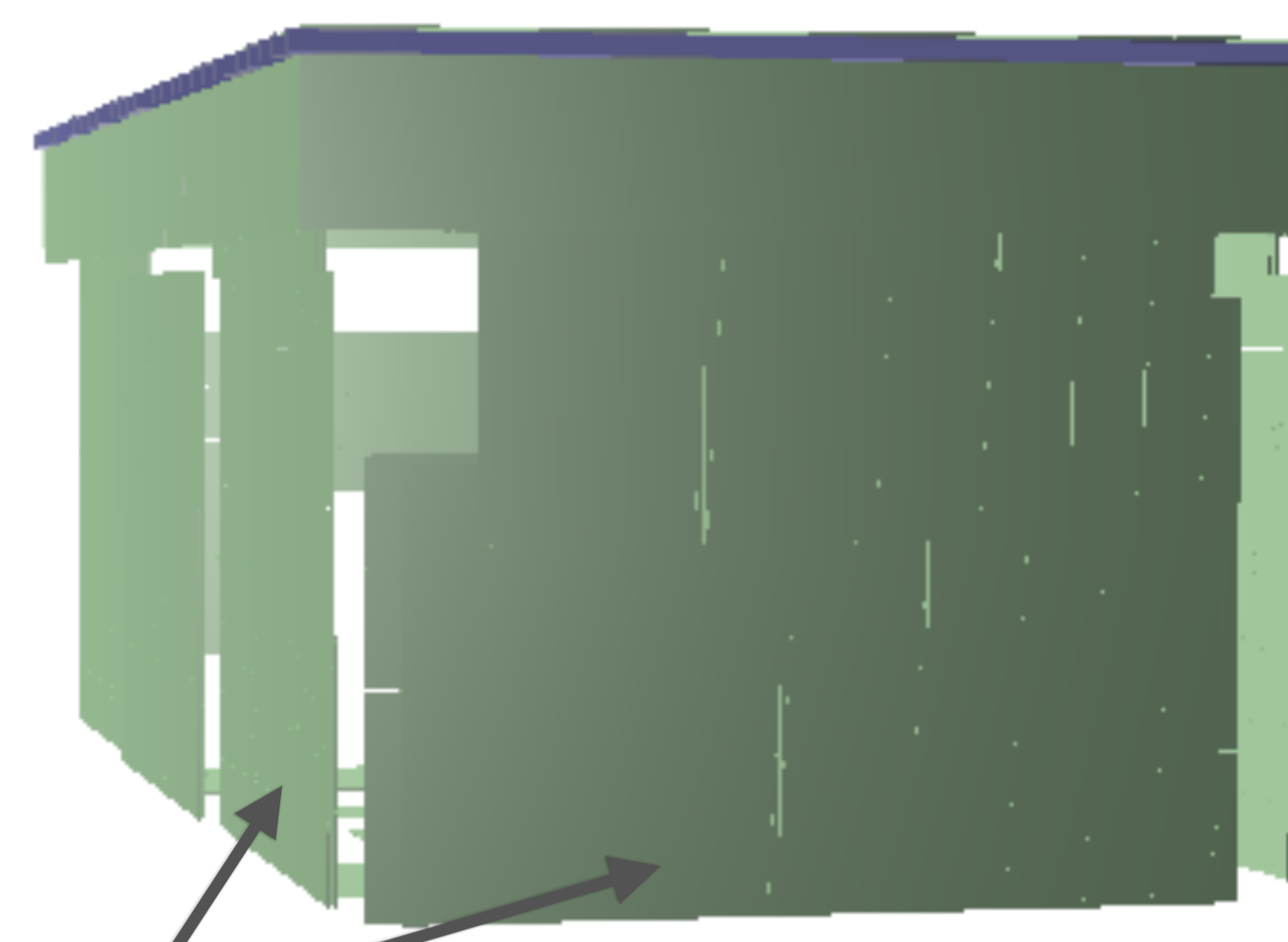
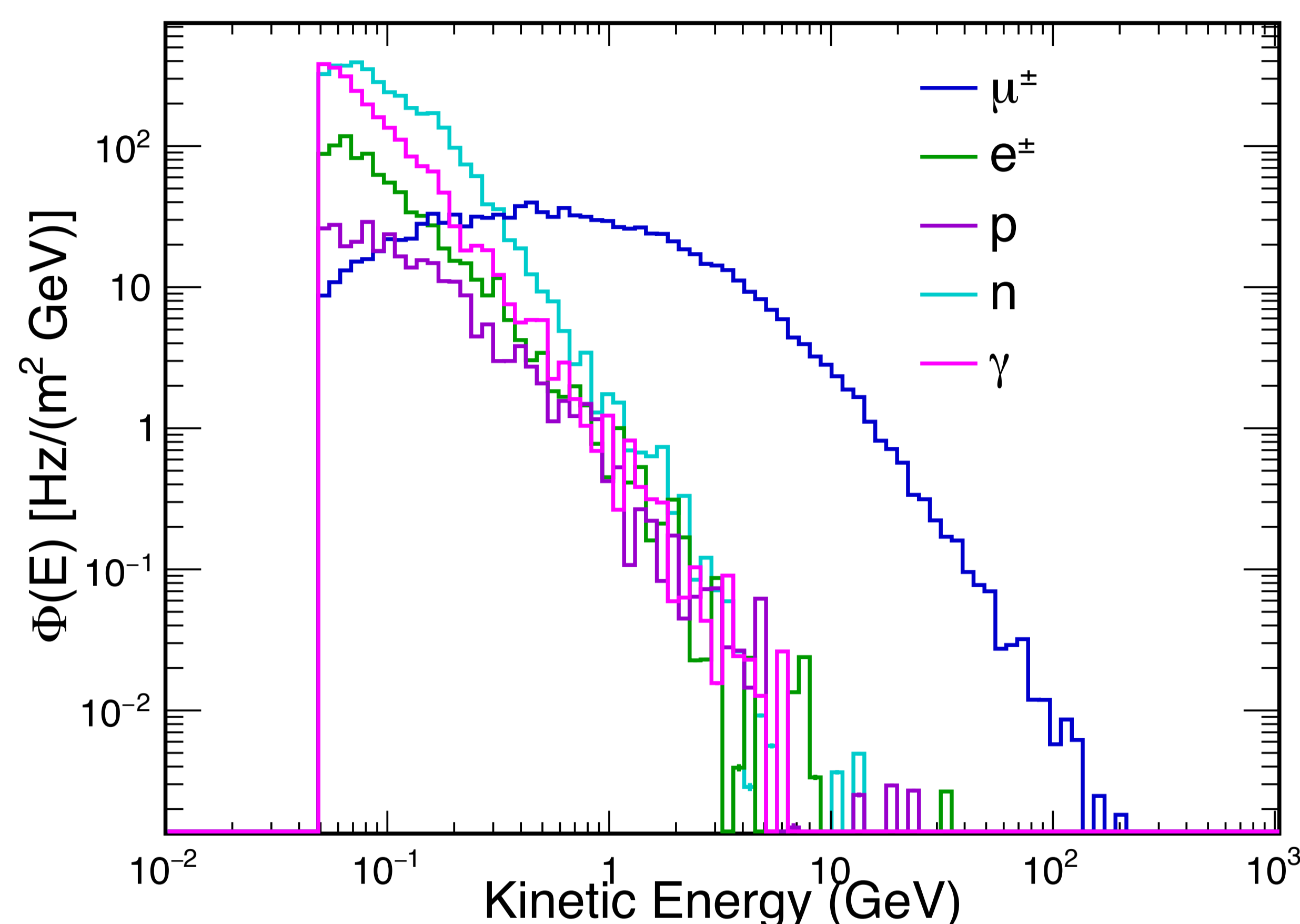
Biswaranjan Behera,  
Colorado State University  
for the ICARUS Collaboration



## 1. Motivation

ICARUS is on the surface and exposed to huge cosmic activity, is the primary background for several physics analysis.

CORSIKA: v7.4003 ICARUS Simulation



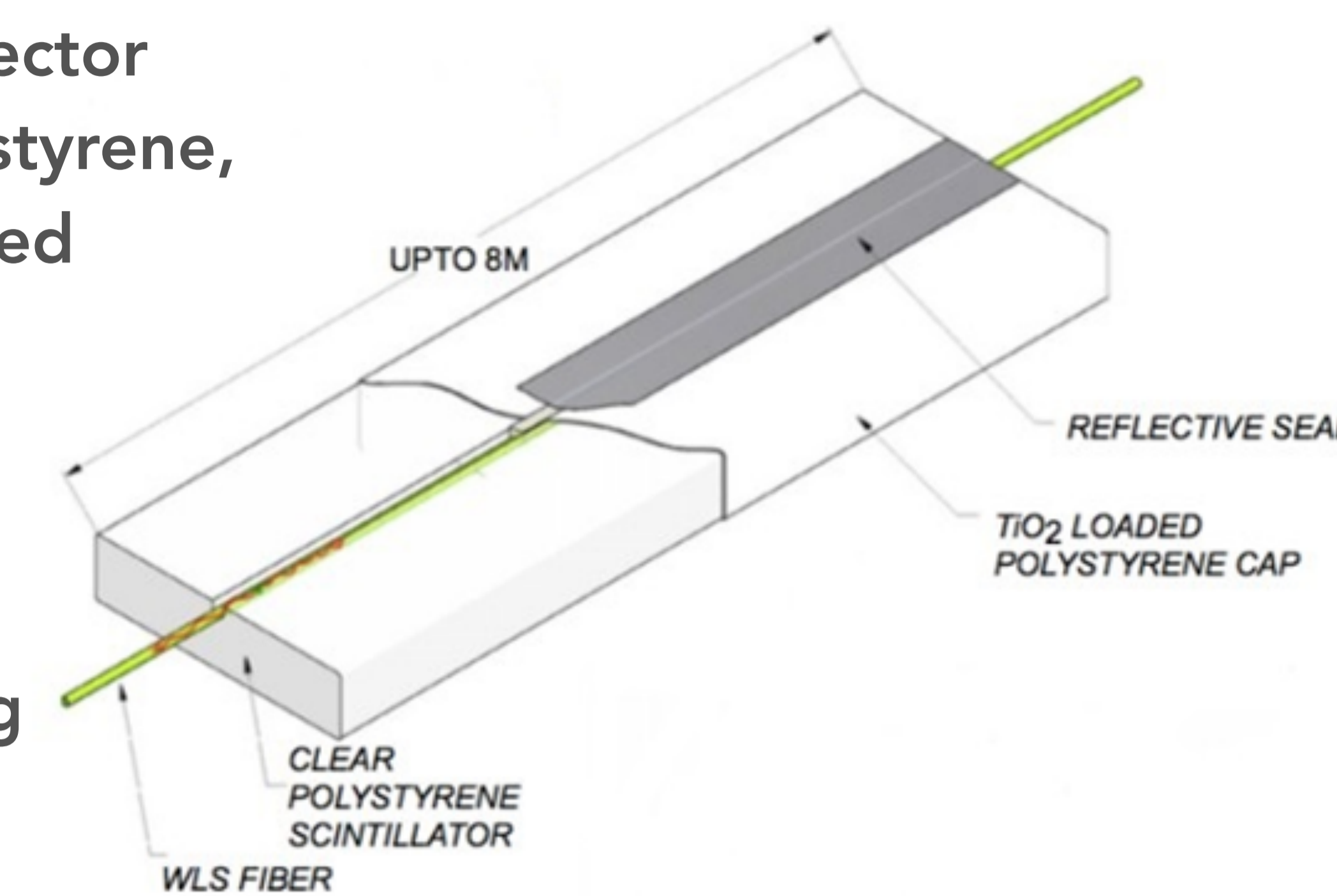
ICARUS time projection chamber is covered by side CRT.

In ICARUS neutrino over in spill cosmic ray is 1/4.

14 out of spill cosmic rays during each TPC drift time.

## 2. ICARUS Side Cosmic Ray Tagger (CRT)

- Side CRTs are recycled from MINOS detector
- Extruded scintillator, composed by polystyrene, 1.5 % pTP, 0.03 % POPOP, TiO<sub>2</sub> co-extruded
- Dimension : 800 (L) x4 (W)x1 (H) in cm
- 20 strips per module
- Single fiber per scintillator strip
- Designing new SiPM-based readout
- Read out at one or both ends depending on region
- 20% intercepted flux for side CRT



## 5. Summary

Side CRT installation completed.

Commissioning of side CRT walls in progress.

First commissioning data shows all the channels are active and cosmic rate looks great.

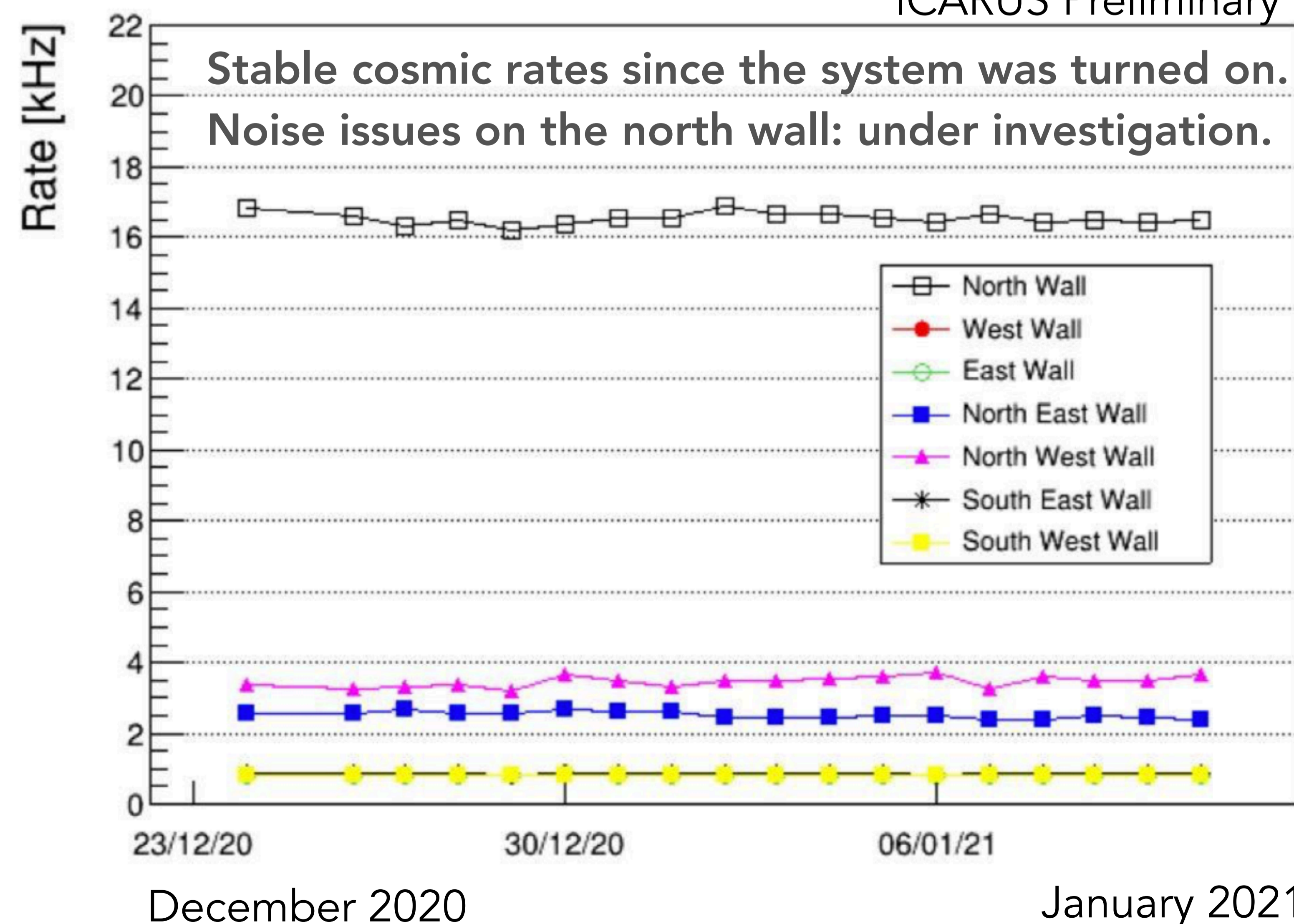
CRT hit reconstruction are fully understood.

First physics run will be on October 2021.

## 3. Side CRT Commissioning Data

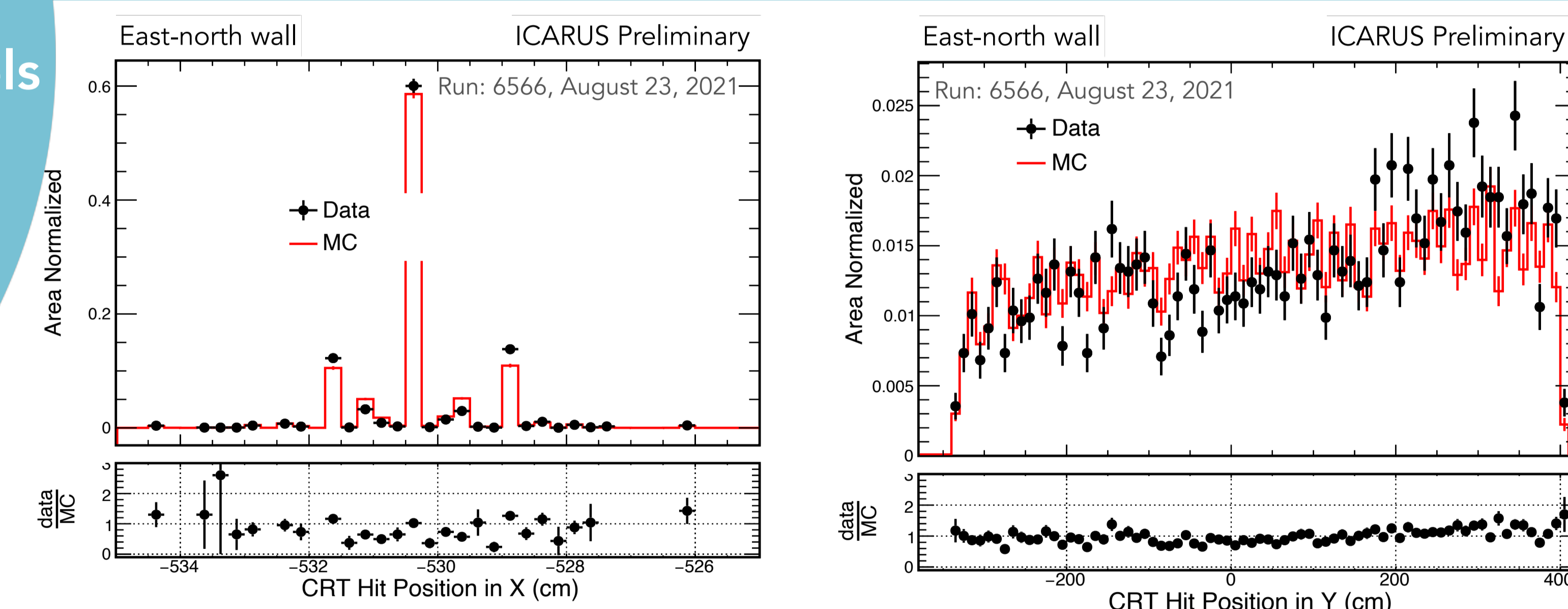
ICARUS Preliminary

Stable cosmic rates since the system was turned on.  
Noise issues on the north wall: under investigation.



Cosmic rates are higher where Front-End Boards are near the cryogenics system.

## 4. CRT Hit Reconstruction



- Looking for hits coincidence between front-end-board (FEBs) residing in adjacent layers.
- The channel with the largest amplitude is the channel that generated the FEB trigger signal.
- When the FEB is triggered, the charge in all other FEB channels is sampled simultaneously (where the track crosses multiple strips in each layer). Position is extracted based on global coordinates of CRT scintillator strip.