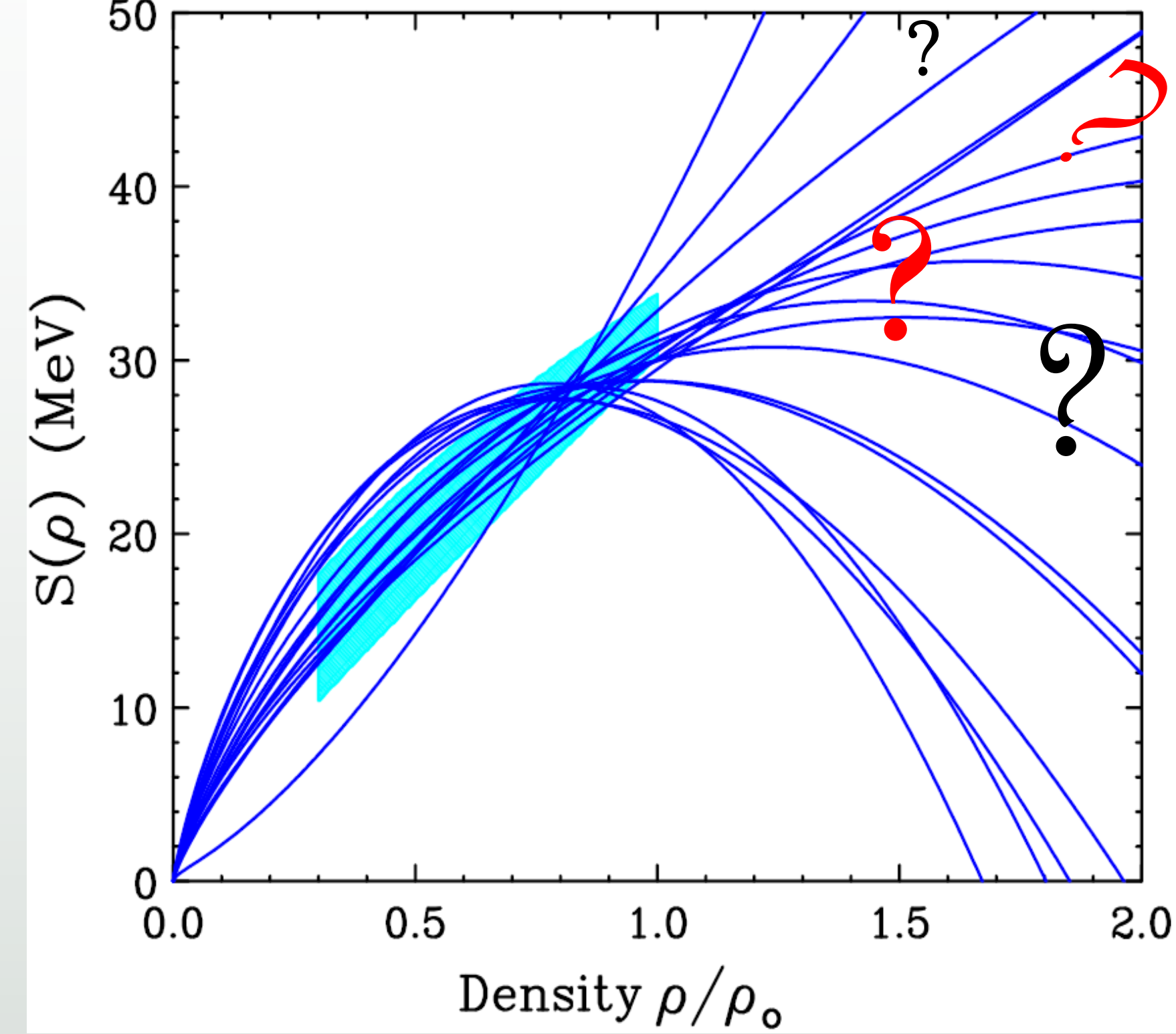


Testing Time Projection Chambers with ^{90}Sr and Cosmic Rays

Resheng Wang for SAMURAI TPC Collaboration

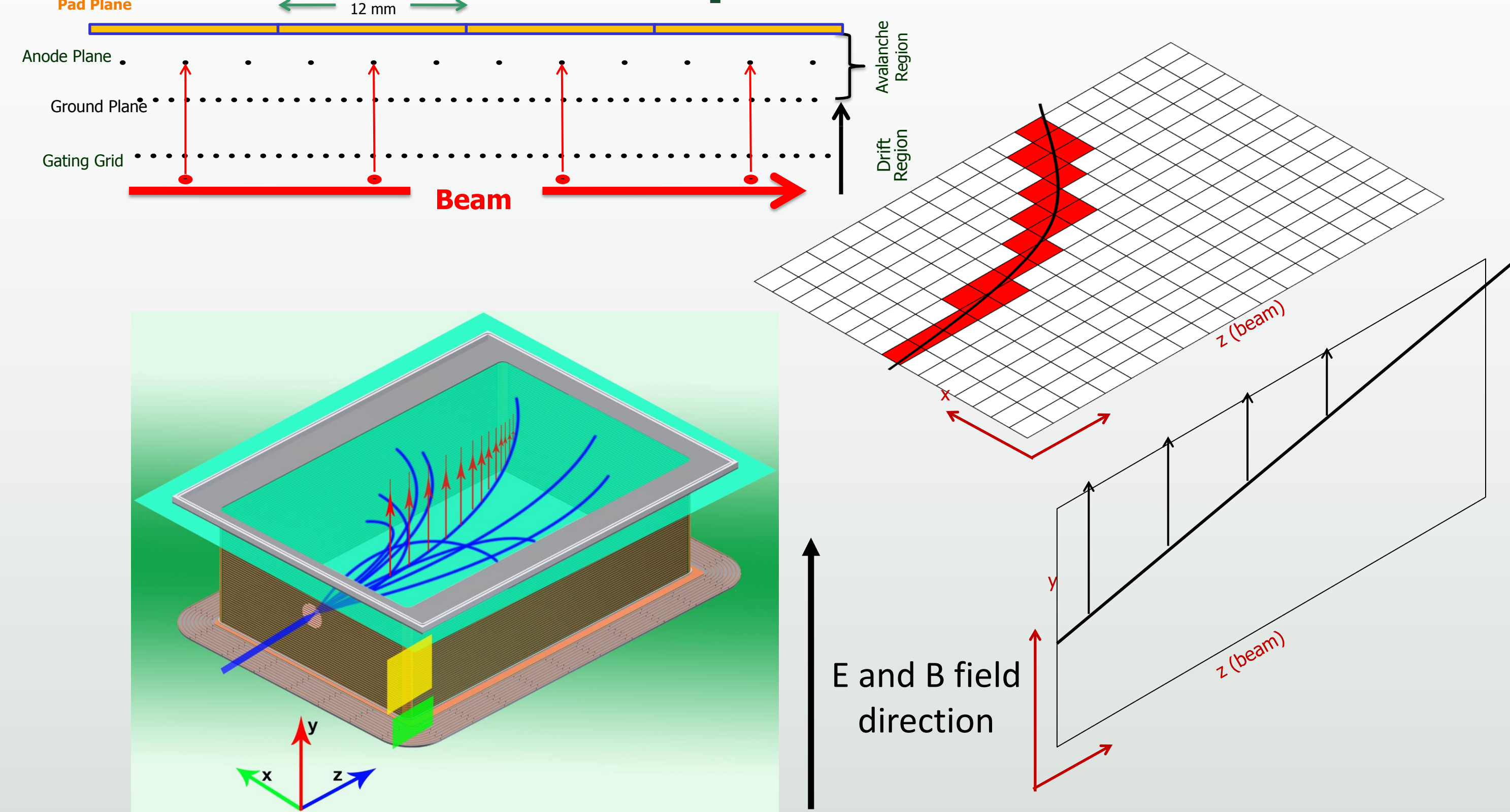
Physics Motive



B.A. Brown, PRL85(2000)5296
Tsang et al, PRL102, 122701(2009)

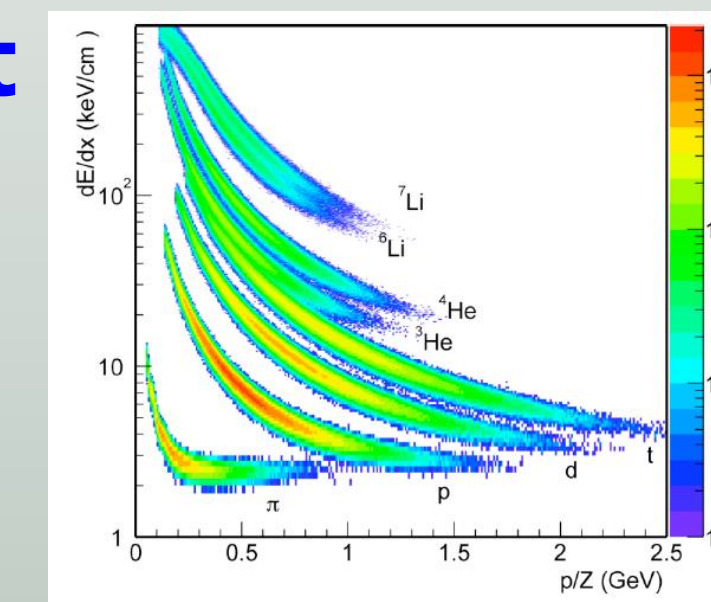
The symmetry energy influences many properties of nuclei and neutron stars and supernova. Currently it is highly uncertain at high density. Current plans include measurements of pions produced in heavy ion reactions at high energy. Transport calculations show that $Y(\pi^-)/Y(\pi^+)$ ratios, are sensitive to the symmetry energy. Time projection chambers have been used successfully to measure pions and light charged particles.

How to detect those particles?

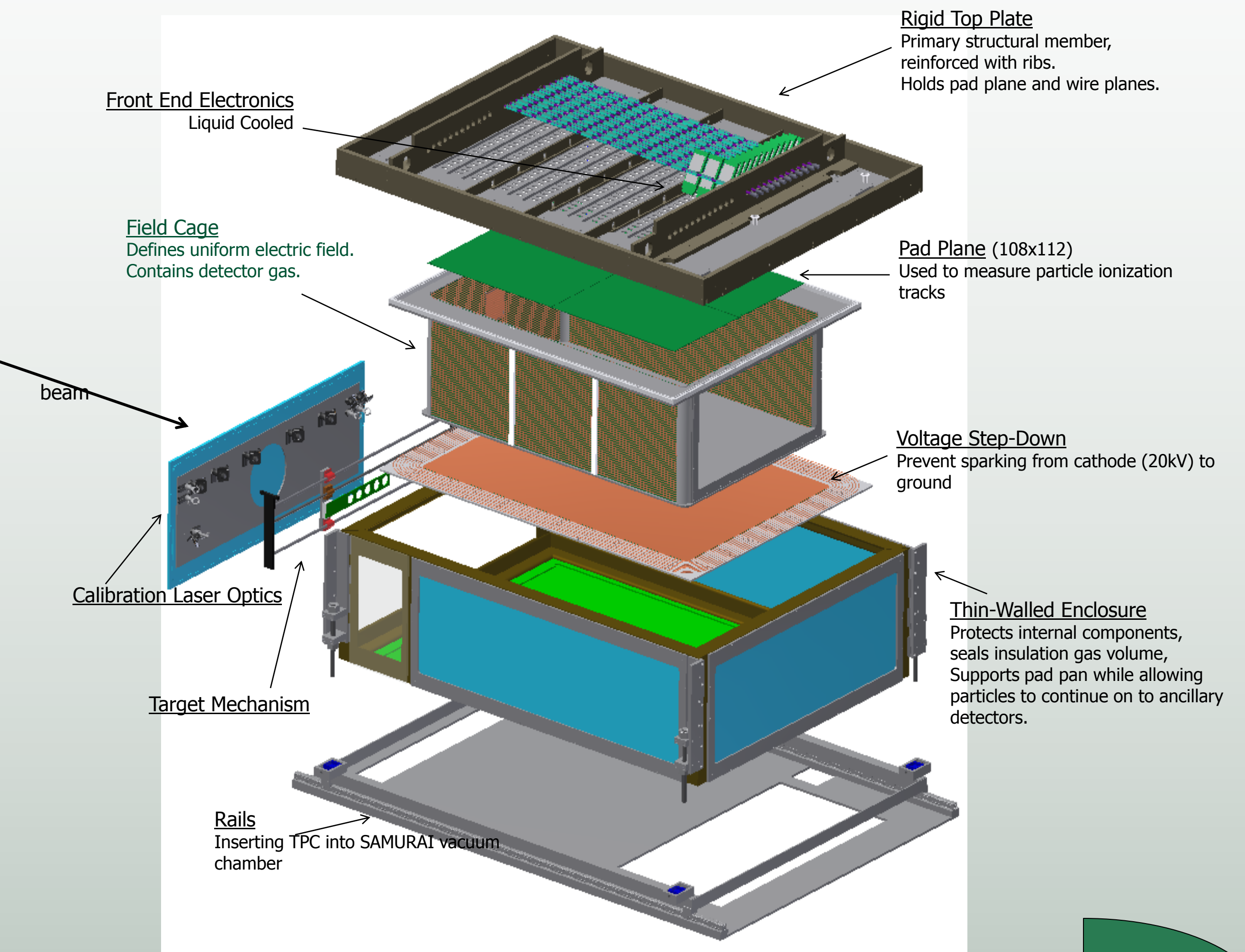


TPC is an ion tracker sitting inside a magnet

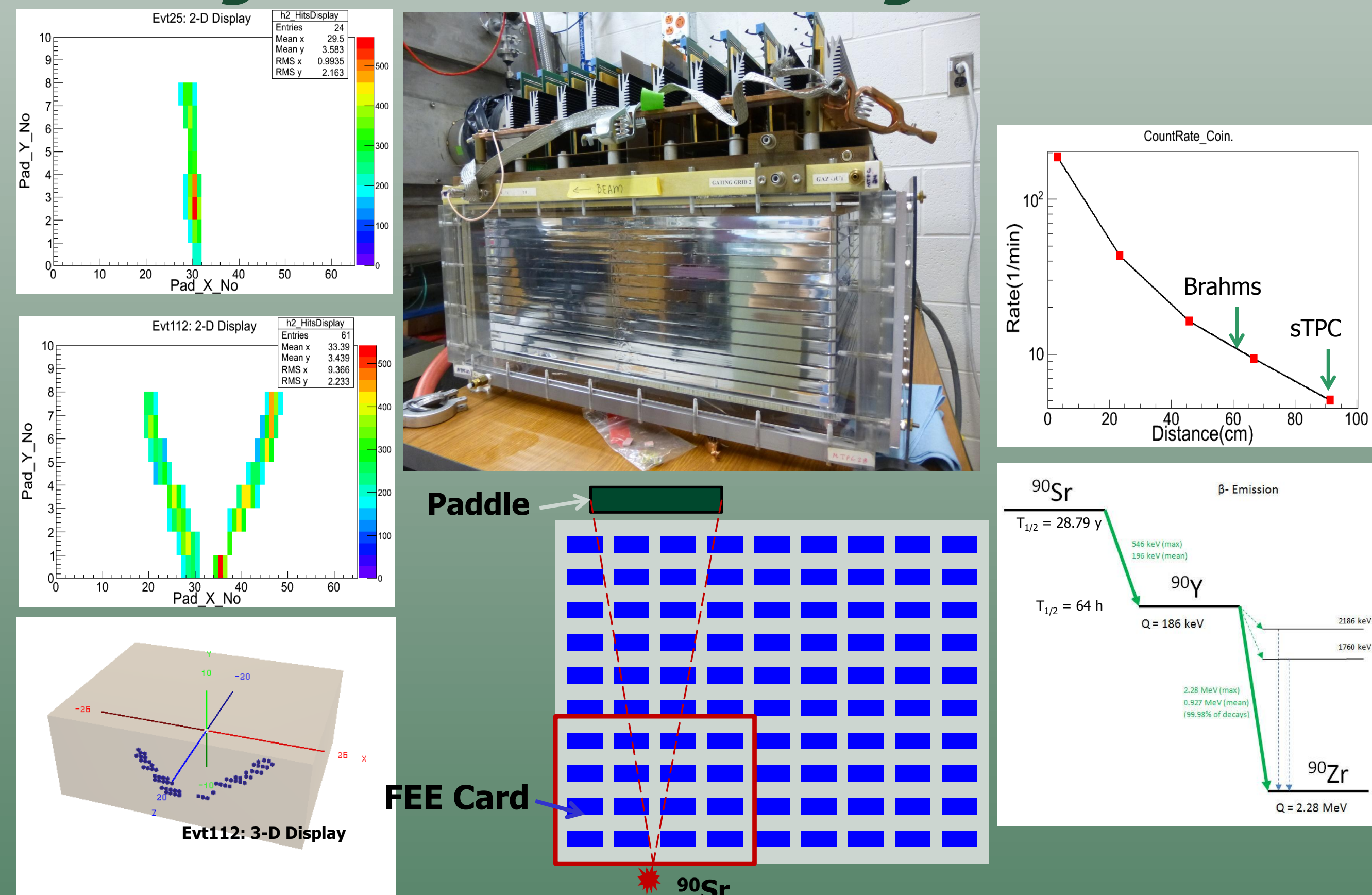
- Charged collision fragments ionize detector gas
- Electrons drift in E-field toward charge-sensing pads
- Positions** and **time** of arrival \rightarrow 3D path
- Momentum from curvature of path in B-field
- Particle type from energy loss and magnetic rigidity



SAMURAI – Time Projection Chamber being constructed at MSU.



Testing of Brahms TPC using ^{90}Sr source

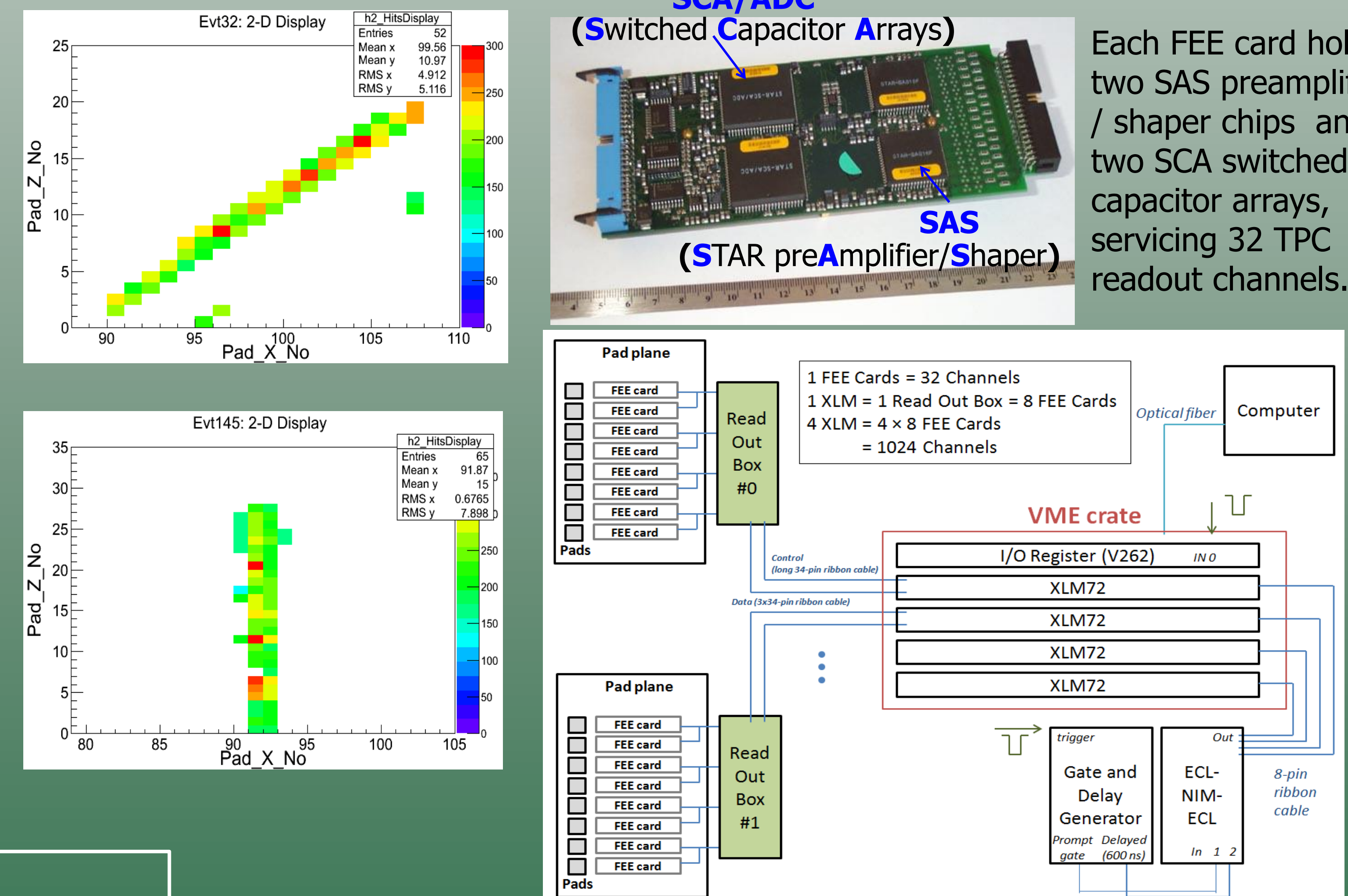


The high energy β passes through the Brahms TPC and detected by a scintillator paddle, which triggers the DAQ. We plan to use two thin scintillators placed behind the source to test the sTPC.

Future Plans For the SAMURAI-TPC

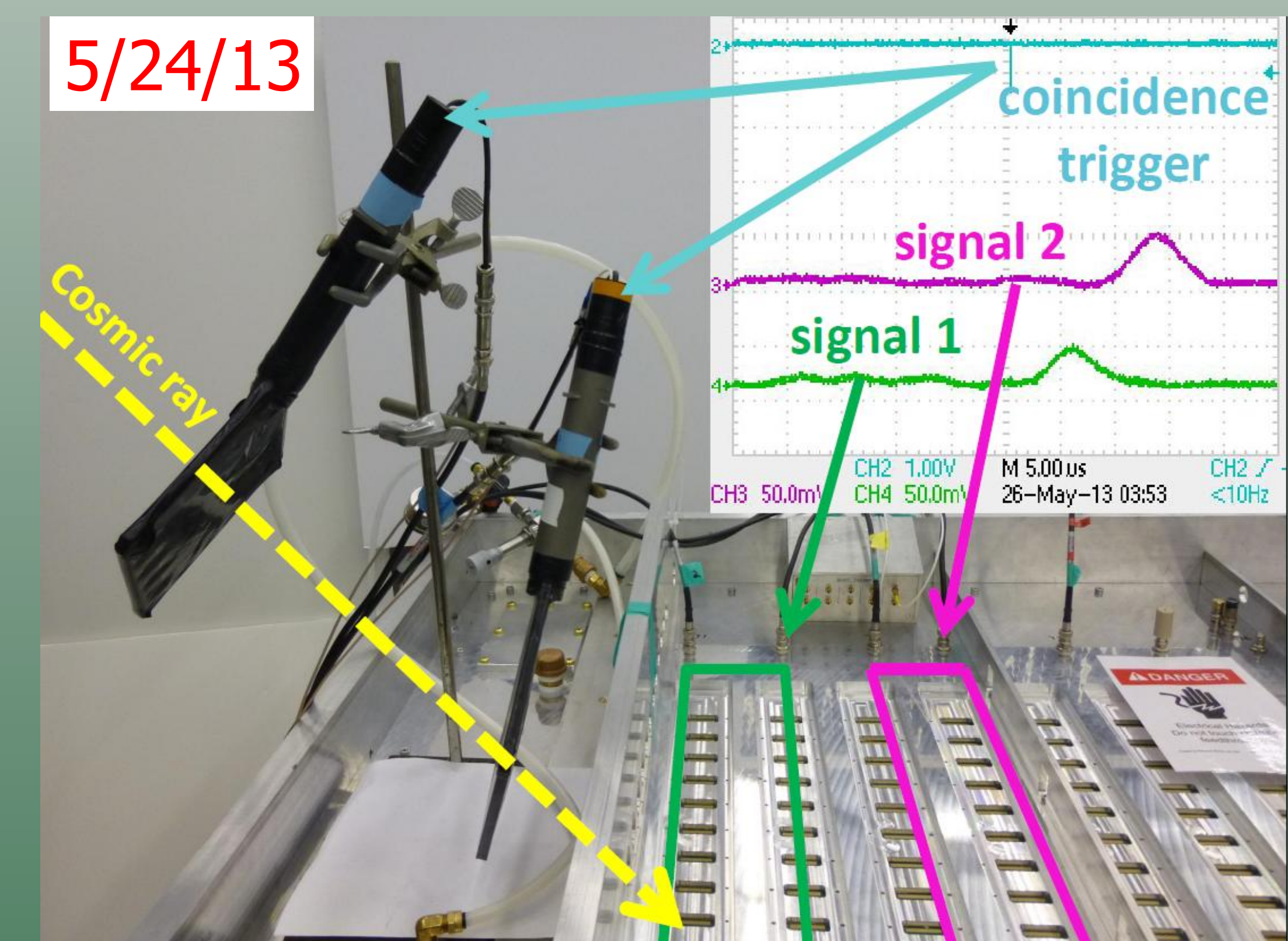
- Install and test the GET electronics when it becomes available
- 7 day Experiments in RIKEN have been approved.
- We plan to do $^{132}\text{Sn}+^{124}\text{Sn}$ and $^{124}\text{Sn}+^{124}\text{Sn}$ reactions in 2014.

Electronic testing and Data Acquisition (DAQ) with STAR electronics



Adopts readout software used for DAQ of S800 Spectrometer at NSCL.

Detection of cosmic rays in the TPC



Cosmic rays passing through two scintillator paddles will pass through the sTPC. We use the coincidence signals in the two paddles as triggers for DAQ. The recorded events are then analyzed to reconstruct the tracks.

MICHIGAN STATE UNIVERSITY

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