Hadron Calorimeter (HCAL) in SBS Programs

Jhih-Ying Su, Jiwan Poudel
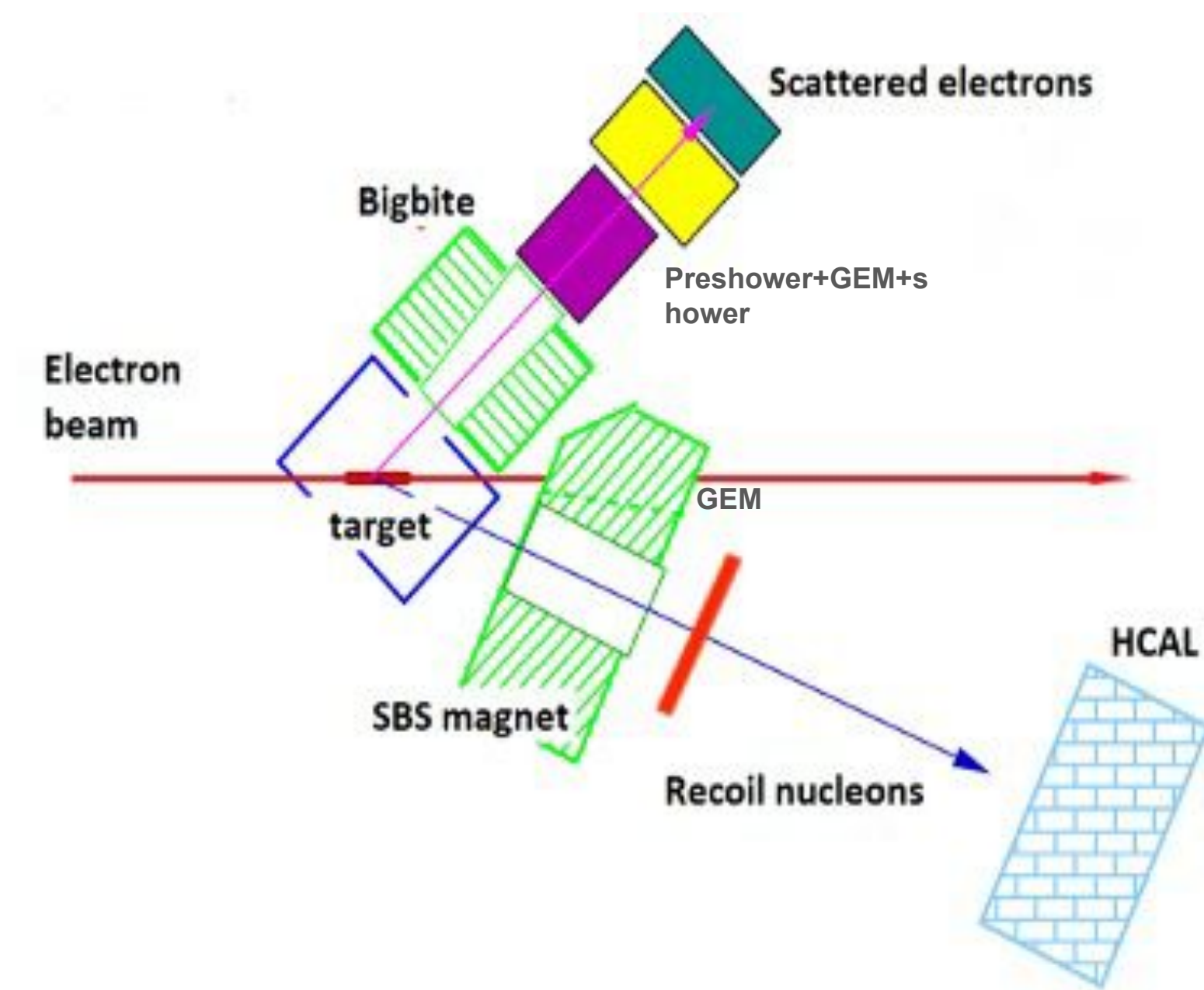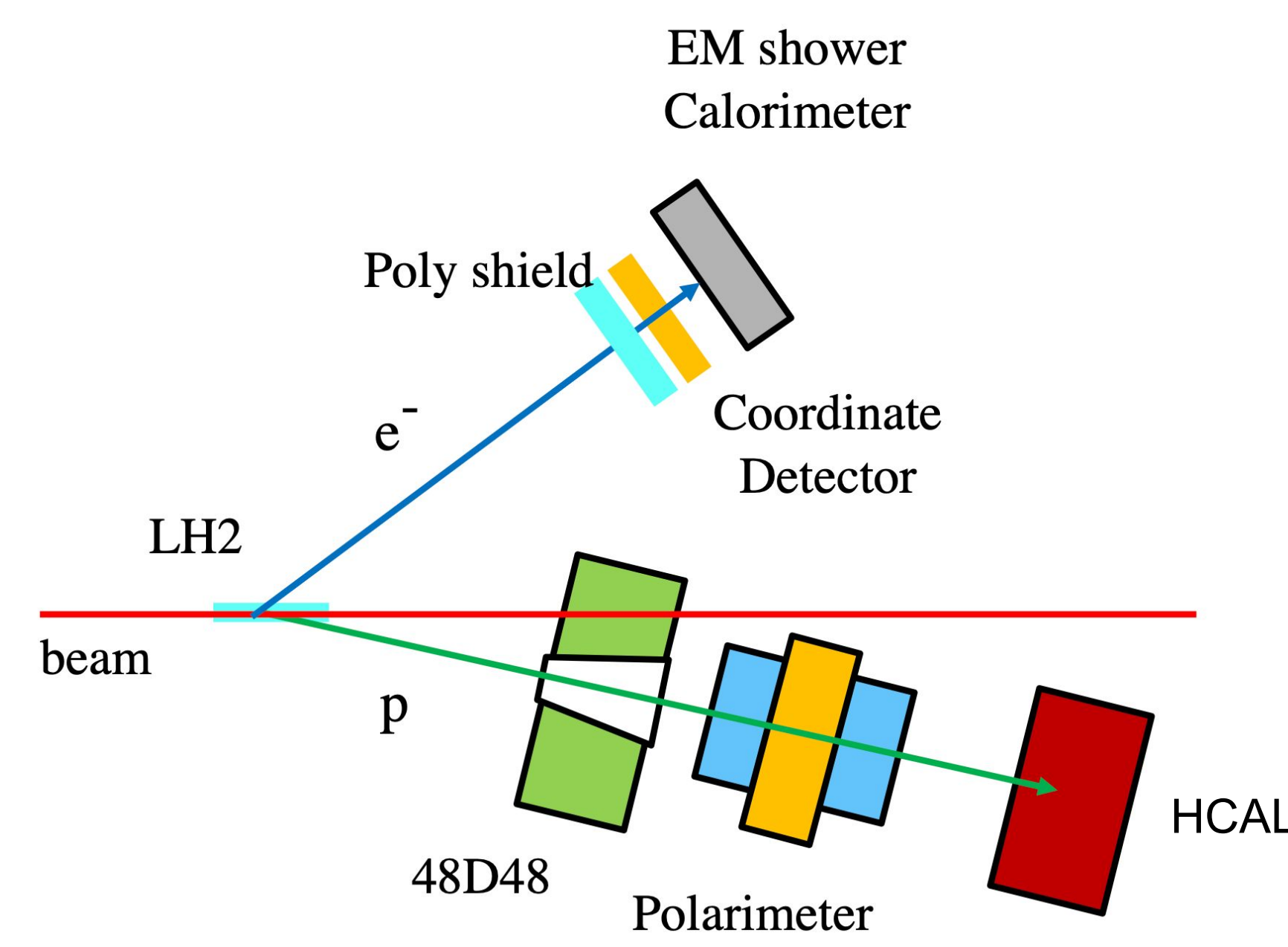(for the SBS collaboration)

Introduction

The HCAL is a primary sampling detector in Super Bigbite Spectrometer (SBS) program to detect hadrons (protons/neutrons). SBS dipole magnetic field helps to separate the protons and neutrons detected in HCAL. It is also part of the SBS coincidence trigger.
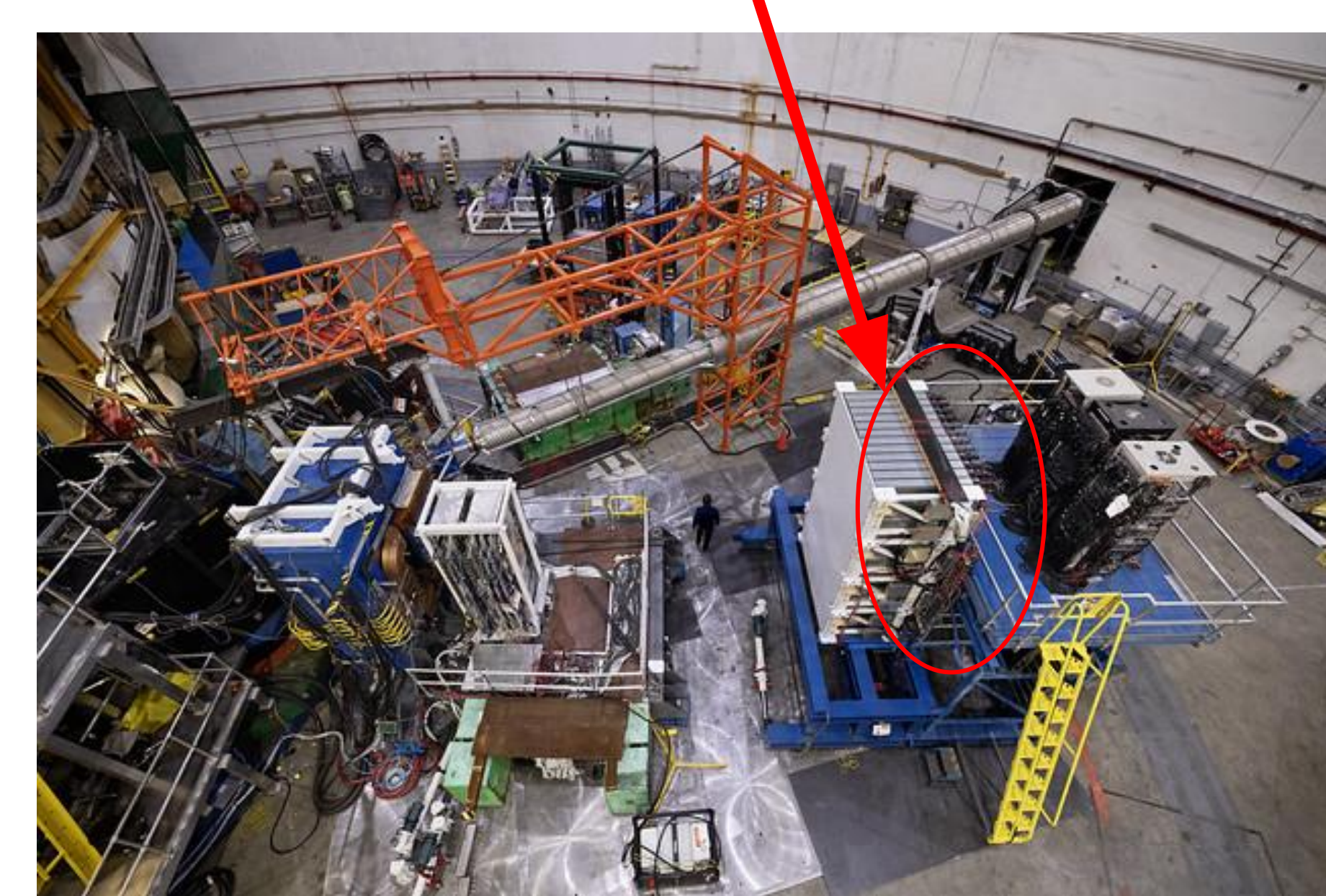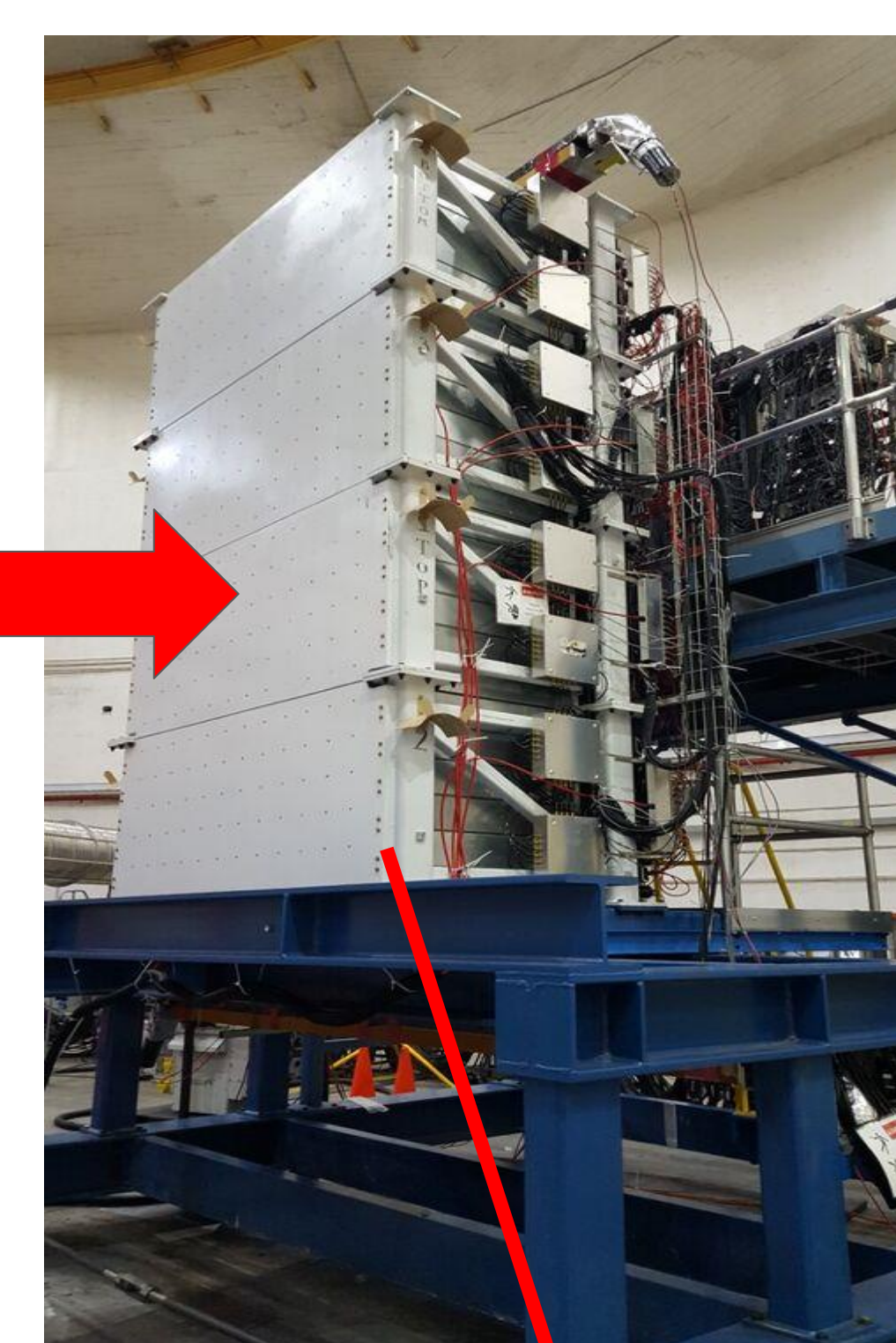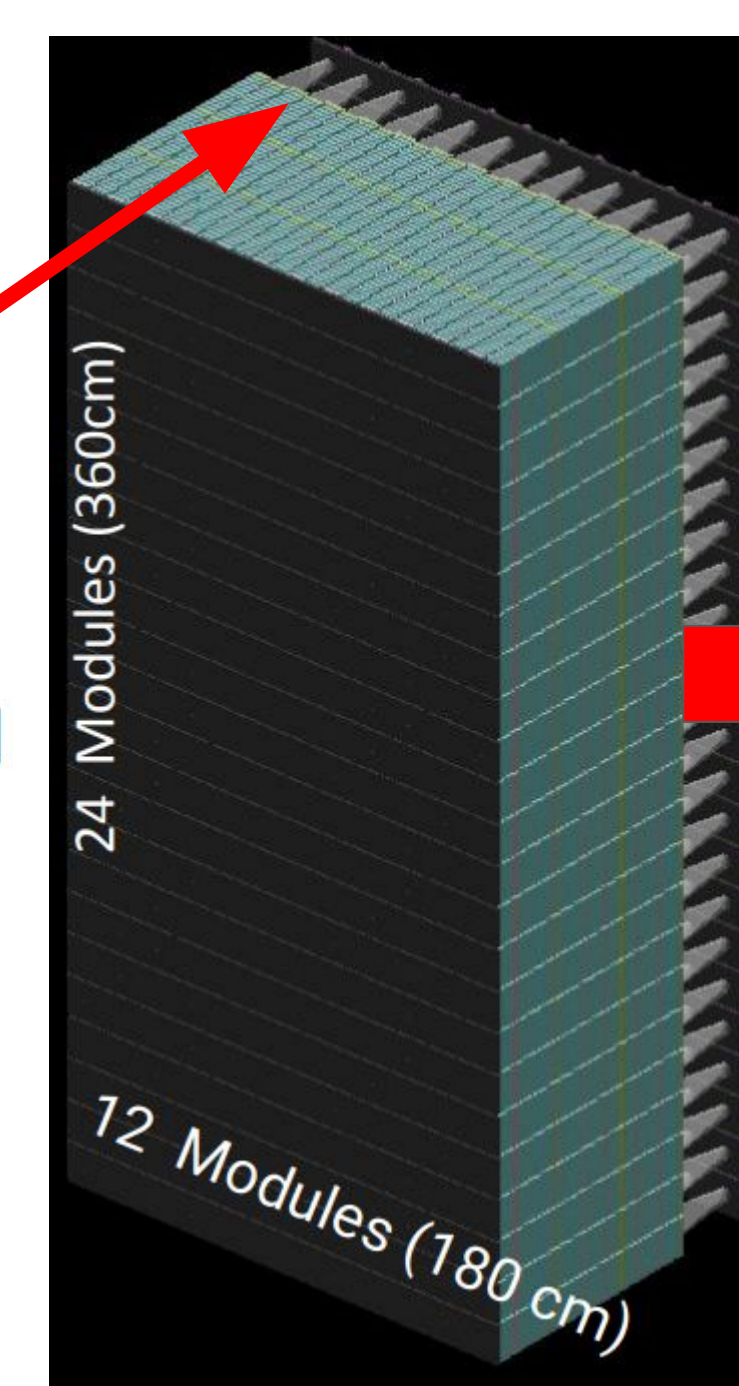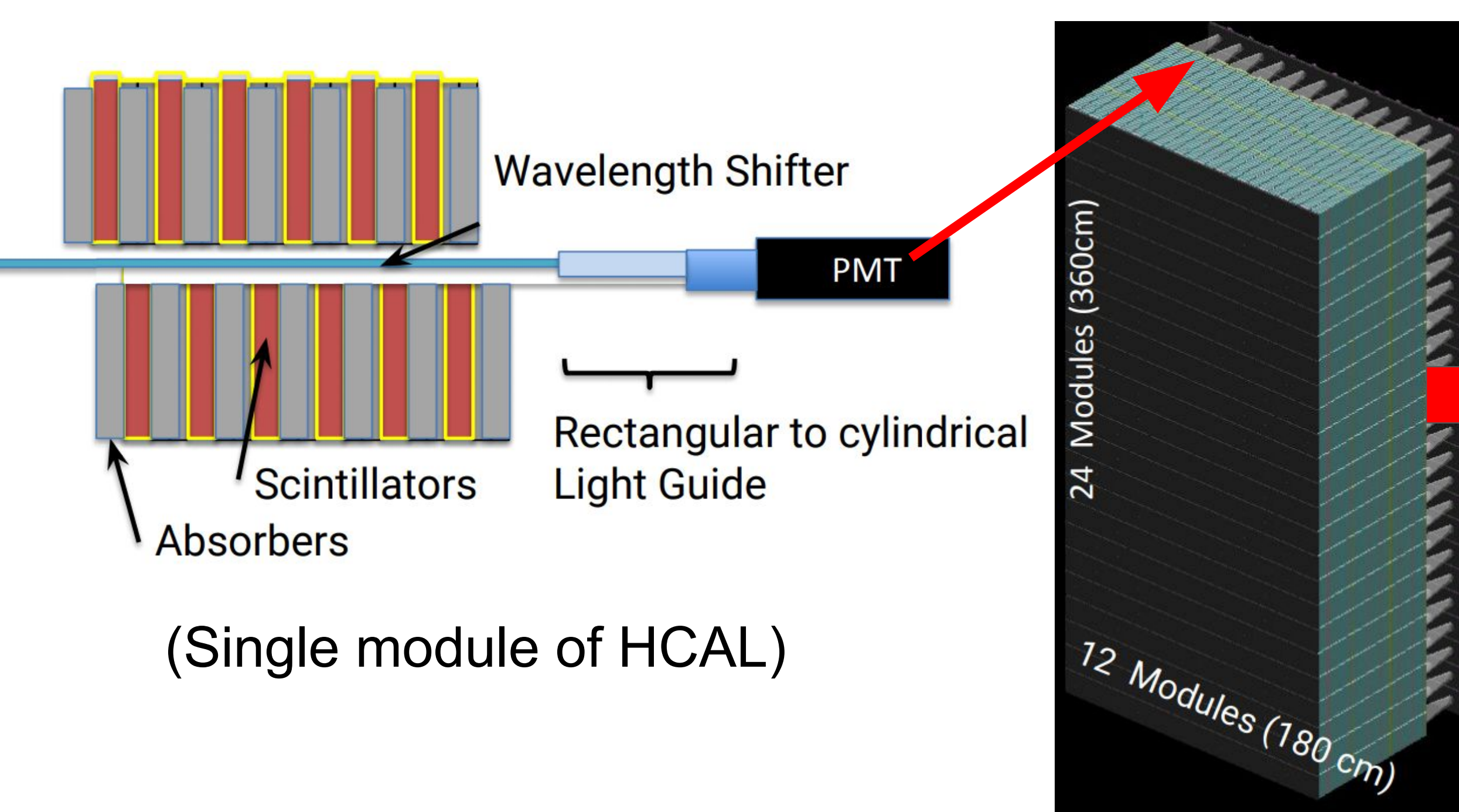

GEn Experiment

GEp Experiment

All the experiments under SBS program use the HCAL in hadron arm. Three form factor experiments (GMn, GEn, GEn-RP) are completed and GEp experiment is expected to run next year.

HCAL Detector


(Single module of HCAL)

HCAL is a segmented calorimeter detecting high energy nucleons with 288 modules (12x24 blocks of 15x15x100 cm^3). Each module is composed of 40 layers of iron absorbers alternating with scintillators. The light produced by the scintillator goes into a wavelength shifter at the center of the module. The light then passes through the light guide and goes into PMTs.

HCAL Data Dcquisition (DAQ)
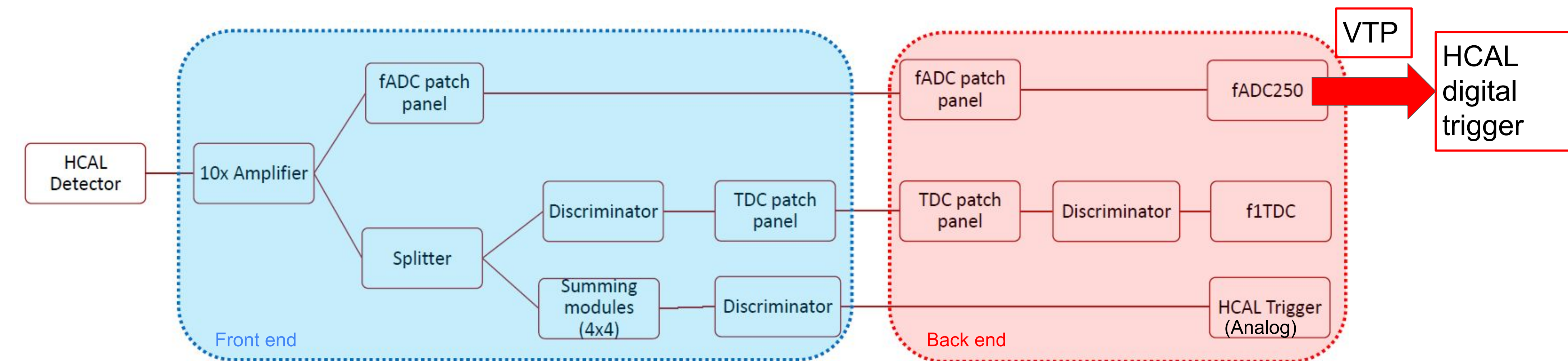
Signals amplification (10x) is done at the Front end (HCAL upper platform) and readout is performed at the back end (DAQ bunker bunker). Both waveform (ADCs) and timing (TDCs) information are recorded from HCAL. HCAL trigger is generated with a set threshold on 8x8 cluster sum.

Cosmic Test
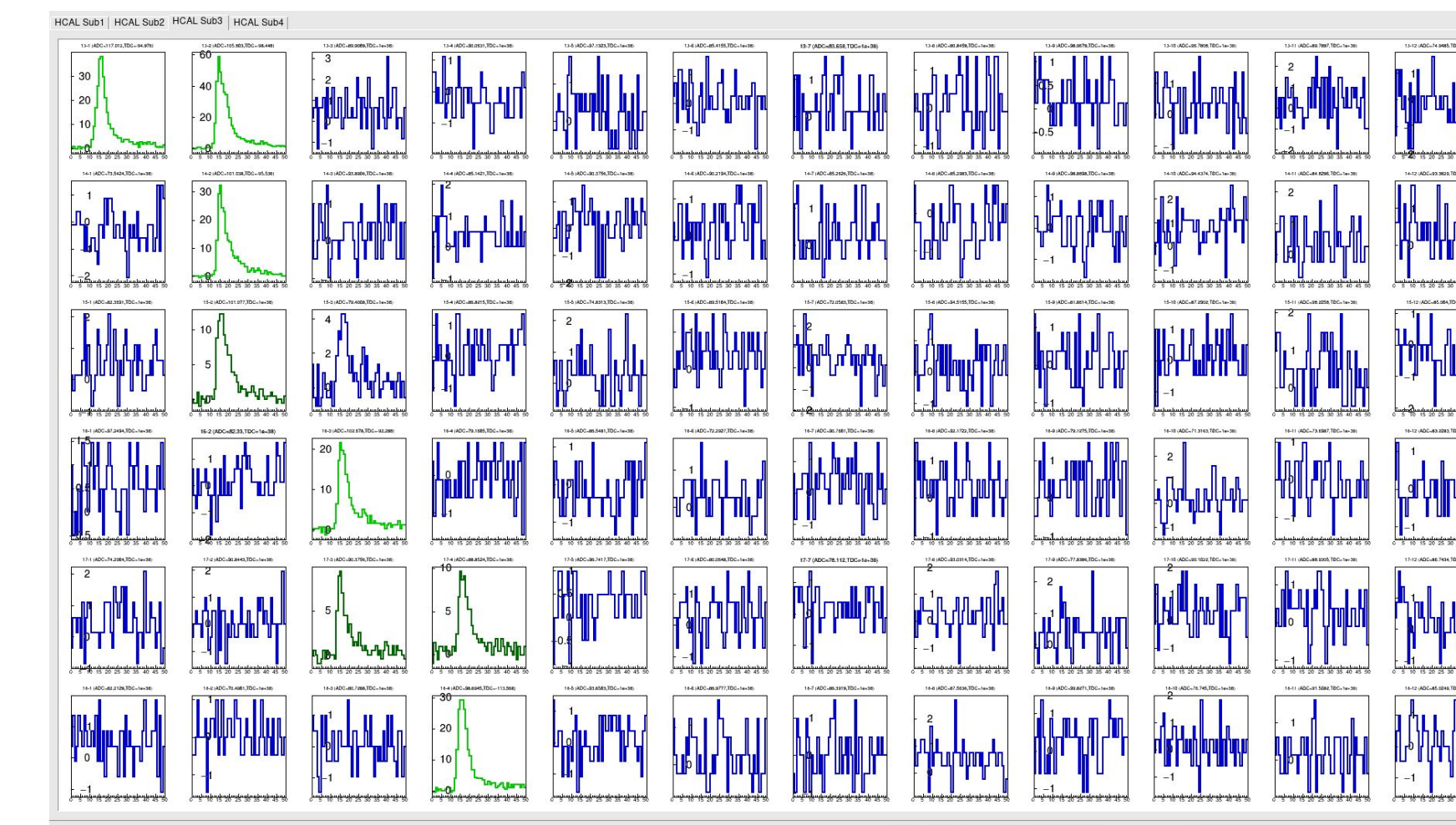
Event display showing a cosmic ray passing through the HCAL detector.

Production data with beam
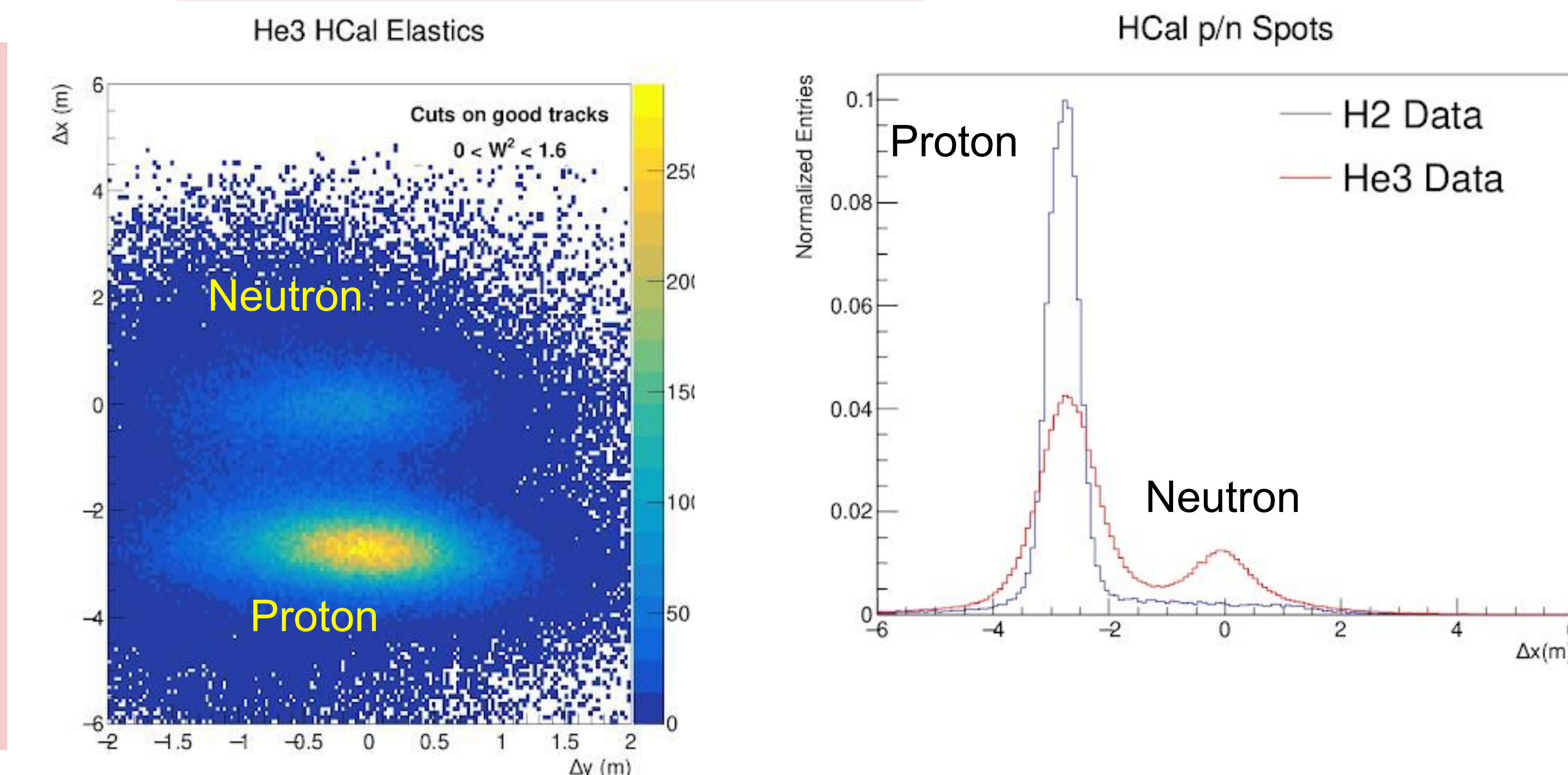
Selected elastic events detected on HCAL with good tracks on BigBite. The displacement (Δx) of the proton track from the straight-line projection based on electron track in BigBite is due to the SBS magnetic field. No displacement for neutrons since they aren't affected by the magnetic field.

Summary

The HCAL detects the elastic scattering hadrons in the experiments of the SBS program. It is prepared for the GEp experiment coming up next year.