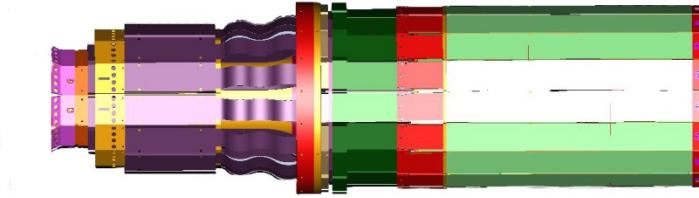


CLAS12 – Silicon Vertex Tracker (SVT)

The **CLAS12 SVT** system is a part of the Central Detector and will be used to measure the momentum and determine the vertex of charged particles emerging from the target. The SVT system includes 4 regions with 10, 14, 18, and 24 sectors of double-sided modules (silicon sensors on both sides of the backing structure) instrumented with digital readout ASICs, FSSR2s.

The system is designed to operate at a luminosity of $10^{35} \text{ cm}^{-2}\text{s}^{-1}$ and to have a momentum resolution of $\sim 5\%$ for 1 GeV particles emerging from the target at $\theta = 90^\circ$.



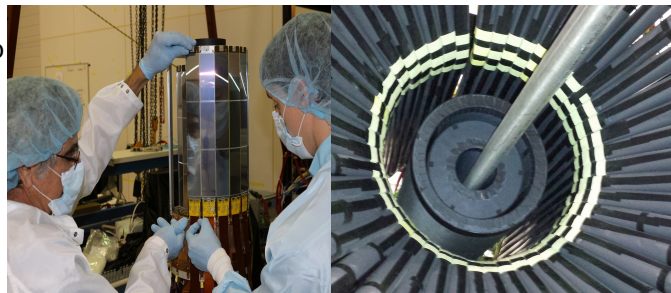
SVT - TECHNICAL PARAMETERS

PARAMETER	DESIGN VALUE
Number of regions (radii, mm)	4 (65, 93, 120, 161)
Sectors (modules)/region	10, 14, 18, 24
Module dimensions (L x W x T)	41.9 cm x 4.2 cm x 0.39 cm
Number of silicon layers/module	2 (U, V)
Strip layout	(0°— 3°) Graded angle
Sensor thickness	320 μm
Readout pitch	156 μm (hybrid side)
Number of readout channels/module	512
Total number of readout channels	33,792
Readout ASIC	FSSR2
Backend electronics	Custom-made VXS cards
Angular coverage θ	35°–125°
Angular coverage Φ	$\sim 2\pi$
Spatial resolution	50-65 μm
Momentum resolution	$\sim 6\%$
θ resolution	10–20 mrad
ϕ resolution	~ 5 mrad
Designed to operate at a luminosity of	$10^{35} \text{ cm}^{-2}\text{s}^{-1}$

- **Construction Strategy and Project Leadership:**
 - SVT Project Lead: Latifa Elouadrhiri
 - Modules fabricated at Fermilab under the direction of the SVT Technical Lead Yuri Gotra
 - QA/QC and final assembly done at JLab under the direction of the SVT Technical Lead Yuri Gotra

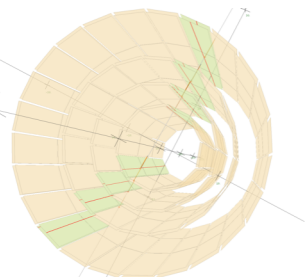
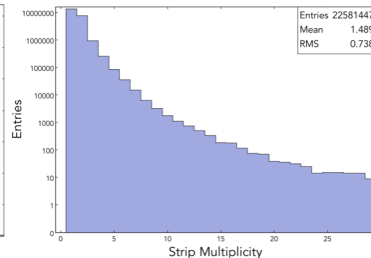
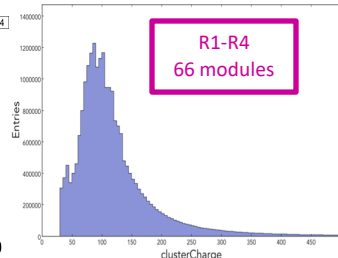
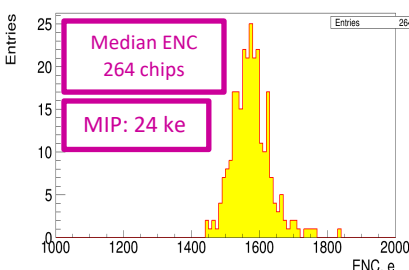
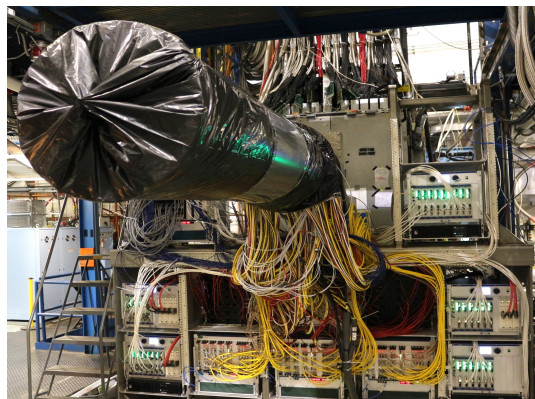
- **Significant Dates:**

- Mar. 2014 – Feb. 2015: Module production at Fermilab
- Jun. 2014 – July 2015: QA and barrel assembly at JLab
- August 2015: SVT integration at JLab (regions 1-4)
- August 2015 – Sep. 2017: Detector commissioning
- August 2016: Noise test in the experimental hall
- Feb. 2017: Beam test during KPP run
- July 2017: Central tracker integration (SVT and MVT)
- Sep. 2017: Installation in the Hall



- **Project Status:**

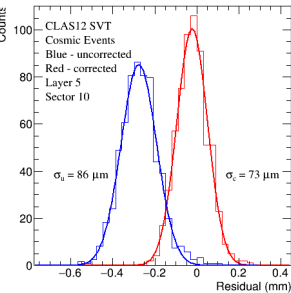
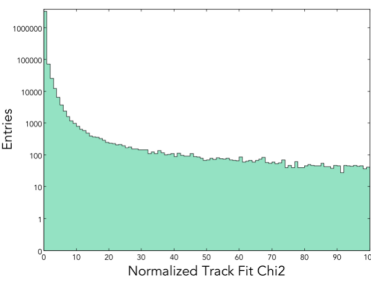
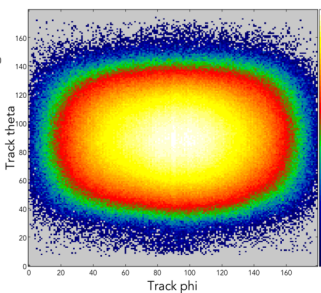
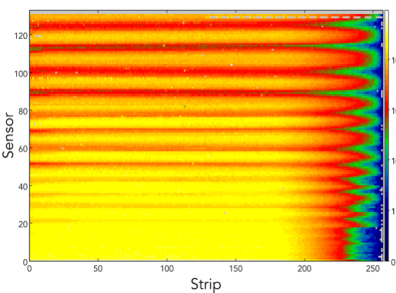
- Beam tests conducted at Protvino, JLab, and Fermilab
- Long term stability test with production modules since Oct. 2013
- Sources (Am^{241} and Sr^{90}) based signal and S/N ratio measured
- Cosmic rays based signal and signal to noise ratio measured
- All production modules completed and tested
- Detector Safety System validated
- SVT assembled, integrated, and calibrated
- **99.9% channels operational**
- SVT is running stable, performance monitored, data logged
- Detector performance tested in the hall during the KPP run
- **SVT commissioning in progress, taking cosmic data**
- **100 M SVT tracks and 20 M SVT/MVT tracks collected**



Calibration

Local Reconstruction

Cosmic Event



Hit Occupancy

Track Reconstruction

Alignment

Last Updated: December 3, 2019

Jefferson Lab

JSA

U.S. DEPARTMENT OF ENERGY

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