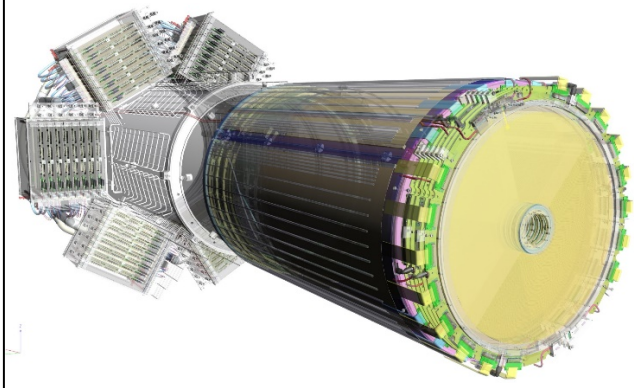
CLAS12 - MVT

The Micromegas Vertex Tracker is designed to improve the track reconstruction in the vicinity of the target. It is located inside the 5 T magnet where the particle flux is the highest.
The MVT is composed of two elements to maximize the angular coverage:

- a Barrel tracker made of 18 cylindrical detectors arranged in 6 layers. In combination with the SVT it covers the region from 35 to 125° and greatly enhances the polar angle resolution.
- a Forward tracker made of 6 circular, flat detectors from 6 to 29°. It improves the vertex resolutions by a factor 3 to 10 compared to the Drift Chambers.



MVT - TECHNICAL PARAMETERS

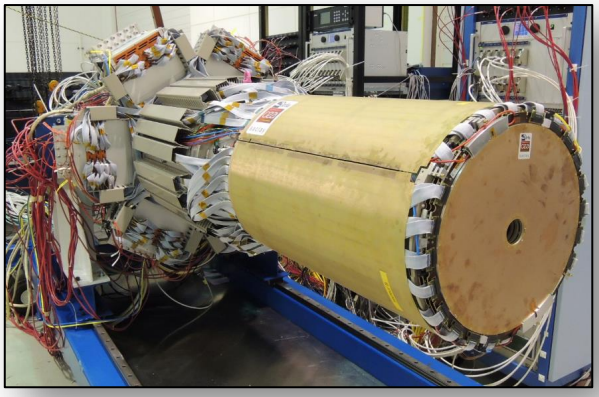
PARAMETER	DESIGN VALUE	
Elements	Barrel	Forward
Micromegas technology	Bulk with resistive strips	
PCB thickness	200 µm	
Radiation length	0.33% / layer	
Electronic chip	DREAM	
Sampling frequency	20 MHz	
Cables	1.5-2 m coaxial from Hitachi, 50 pF/m	
Time resolution	10 ns	
Total active area	2.9 m²	0.6 m²
Number of readout elements	15,000	6,000
Angular coverage	35-125°	6-29°
Number of detectors	18	6
Gas mixture	Ar+10%iC_4H_{10}	Ne+10%C_2H_6+10%CF_4
Drift gap	3 mm	5 mm
Drift electric field	Z: 6 kV/cm; C: 5 kV/cm	1 kV/cm
Micro-mesh transparency	Z: 50%; C: 75%	~100%
Effective gain	5,000	3,000
Lorentz angle	20°	NA
Particle flux per layer	4 MHz	12-20 MHz
Strip Pitch	Z:540 µm; C:330-900 µm	500 µm

• Construction Strategy and Project Leadership:

- The project is lead by the Service de Physique Nucléaire at Irfu, CEA-Saclay. The lead physicist is Franck Sabatié.
- The R&D, including prototypes and lab tests, was performed at Saclay. A few beam and laser tests have been organized both at CERN and JLab.
- The final detectors (PCB and bulk) are made at CERN and integrated at Saclay.
- The whole MVT will be installed in CLAS12 in 2 phases, the first one corresponding to half the Forward tracker and 2 layers of the Barrel (MVT-B2) occurred in December 2015, the rest of the barrel and forward detectors will be installed in the fall of 2017.

• Significant Dates:

- 2006-2007: simulations of CLAS12 Micromegas.
- 2008: implementation of the MVT in GEMC.
  and determination of its tracking performance.
- 05/2009: MVT review at JLab.
- 11/2010: MVT-SVT review at JLab.
- 11/2011: MVT project review at Irfu.
- 2012: first test of large, curved, resistive detector.
- 09/2013: choice of the resistive strip technology.
- 09/2014 : tests of pre-series detectors.
- Summer 2015 : start of production for full MVT.
- Fall 2015 : Successful integration and test of MVT-B2 and 4 layers of SVT.



Integration of MVT and SVT in Dec. 2015

• Project Status:

- **Electronics**: All electronics are in house for the final installation phase. Tests with the Back-End and CODA occurred in June 2015. Full DAQ tests along with SVT were conducted since December 2015 at Jefferson Lab.
- **Detectors**: All forward discs and the outer barrel layers have been produced at CERN. Inner barrel production started, to be delivered in June 2017.
- **Mechanics**: All support structures produced for phase 1 install. Phase 2 parts have been produced and will be delivered with the inner barrel detectors.
- **Integration at JLab:** Complete forward detector and 1/3 of the barrel detectors were successfully integrated at JLab, along with the 4-layer SVT, at the end of 2015.

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