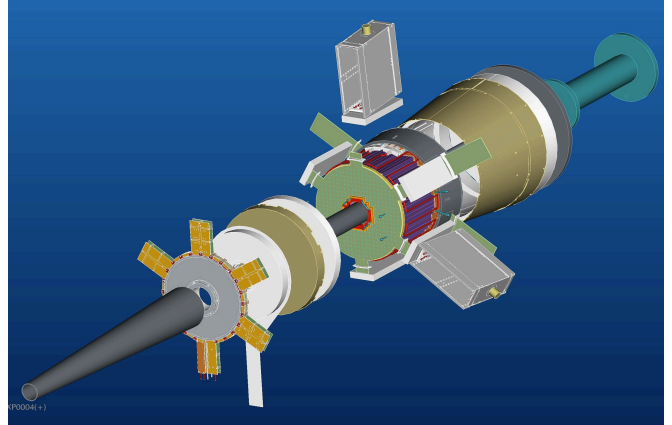


CLAS12 – Forward Tagger

The Forward Tagger (FT) extends the CLAS12 capability to detect electrons and photons at small angles down to 2.5° in ϑ_{Lab} . Detection of forward-going electrons enables running of electroproduction experiments at low- Q^2 providing an energy-tagged, polarized, high-intensity, quasi-real photon beam necessary to run an extensive hadron spectroscopy program. The additional capability of detecting forward-going, high-energy photons in the DVCS reaction will extend the reach of the Hall B leading physics program.



The FT is comprised of a PbWO electromagnetic calorimeter (FT-Cal) to identify electrons, measure the electromagnetic shower energy and provide a fast trigger signal; a tracker (FT-Trck) to measure the scattering angles with the required accuracy; and a scintillation counter (FT-Hodo) to provide e/γ separation.

Detector - TECHNICAL PARAMETERS

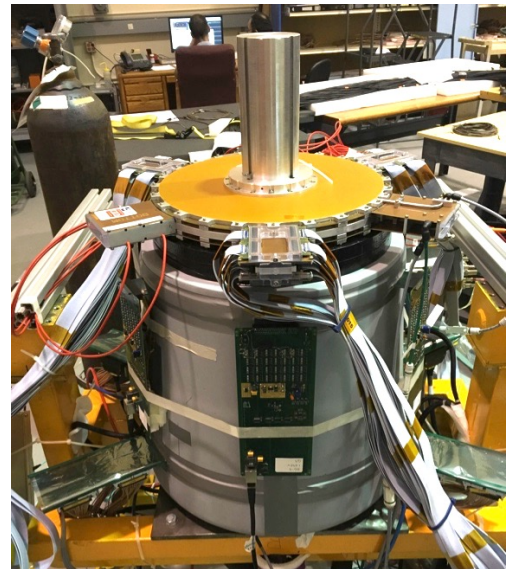
PARAMETER	DESIGN VALUE
FT-Cal	
Calorimeter type	PbWO ₄ , homogeneous
Crystal number and size	332, 15x15x200 mm ³
Readout sensors	Hamamatsu LAAPD s8664-1010
Working Temperature	T = (0 – 18) °C ($\Delta T \leq 0.1$ °C)
FT-Trck	
Tracking technology	two double-layers, bi-face bulk MicroMega
Detector type	Strips, 3392 channels
Spatial resolution	$\Delta X, \Delta Y \leq 150 \mu\text{m}$
FT-Hodo	
Detector technology	2 layers of plastic scintillator tiles
Tiles number and size	74 (30x30x15 mm ³) + 42 (15x15x7 mm ³)
Readout sensors	Hamamatsu SiPM S10362-100
Expected Performance	VALUE
Azimuthal angular coverage	2.5° to 4.5°
EM shower energy range	$E_{\text{max}} - E_{\text{min}} = (0.5 - 8.0) \text{ GeV}$
Energy resolution	$\sigma_E/E \leq 2\%/ \sqrt{E(\text{GeV})} \oplus 1\%$
Angular resolution	$\sigma_\vartheta/\vartheta \leq 1.5 \%, \sigma_\varphi \leq 2^\circ$
Time resolution	$\leq 300 \text{ ps}$

- **Construction Strategy and Project Leadership:**

- Project is lead by INFN-GE (IT) (lead scientists M.Battaglieri and R. De Vita) and includes University of Edinburgh (UK), CEA-Saclay (Fr), Ohio University, James Madison University, Norfolk State University.
- The mounting and testing of the three components of the FT took place in Genova (FT-Cal), Edinburgh (FT-Hodo) and Saclay (FT-Trck).
- The whole FT has been assembled and tested with cosmic rays at JLab.
- It is ready for installation in CLAS12 and integration in the Hall services.

- **Significant Dates:**

- FT-TDR released in December 2012
- Assembly of the FT-Cal and FT-Hodo started in January 2015
- FT-Cal (Genova), FT-Hodo (Edinburgh) and FT-Trck (CEA/Saclay) checked out at JLab in fall 2015
- FT tested with cosmic rays in EEL building in 2016
- FT installation in CLAS12 in summer 2017



- **Project Status:**

The three components of the FT (Cal, Hodo, and Trck) have been individually checked out and assembled together in the JLab EEL building. The detector has been commissioned and calibrated using cosmic muons. The installation in CLAS12 is expected in July 2017 and the complete implementation in the CLAS12 DAQ by the end of the summer. The on-beam commissioning is expected in fall 2017 during the first CLAS12 data taking. Reconstruction, calibration, and (on-line) monitoring software has been developed within the COATJAVA framework.

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