

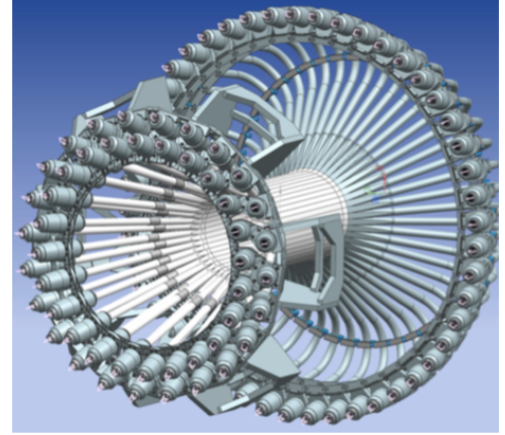
CLAS12 – Central Time-of-Flight (CTOF)

The CLAS12 CTOF system will be part of the Central Detector used for identification of charged particles (PID) emerging from the target via their time-of-flight (TOF).

The CTOF system includes 48 plastic scintillators with double-sided photomultiplier (PMT) readout via 1 m-long upstream and 1.6 m-long downstream focusing light guides, respectively.

The array of 48 counters forms a hermetic barrel around the target. The barrel is aligned with the beam axis inside the 5T solenoid. The PMTs are placed in the region of 1000 G fringe field of the solenoid and enclosed into the triple dynamical magnetic shield that provides 0.2 G internal PMT field.

The CTOF system is required to have 65 ps timing resolution for particle identification.



CTOF - TECHNICAL PARAMETERS

PARAMETER	DESIGN VALUE	#
CTOF Barrel:		
Angular Coverage	θ : (35°, 125°) ϕ : (-180°, 180°)	
Counter Dimensions	BC-408 Trapezoidal cross section $\sim 3 \times 3 \times 92 \text{ cm}^3$	48
PMTs	R2083 (PC 46 mm, H2431-MOD assembly)	96
Light Guides Upstream	OD=2", 1m-long, focusing design, straight	48
Light Guides Downstream	OD=2", 1.6 m-long, focusing design, bent 135°	48
Magnetic Shields	Three layer: Iron/Hiperm-49/Conetic	96
Magnetic Shields	Compensating coils around innermost cylinder	96
Design Resolution	65 ps	
PID:		
π/K Separation	3.3σ separation up to 0.64 GeV	
K/p Separation	3.3σ separation up to 1.00 GeV	
π/p Separation	3.3σ separation up to 1.25 GeV	

- **Construction Strategy and Project Leadership:**

CTOF Group Leader: Daniel S. Carman

- **Construction Strategy:**

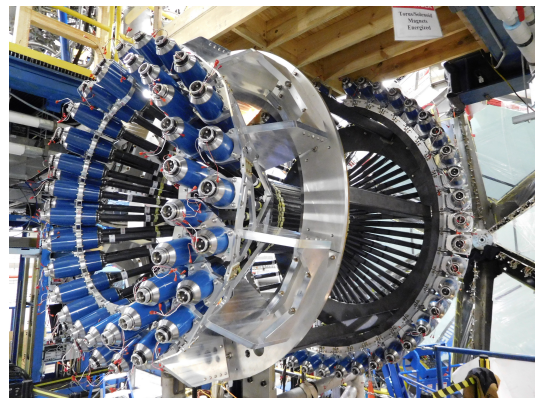
- Magnetic shields designed at JLab
- Compensation coils wound at JLab
- PMTs from Hamamatsu Inc.; stabilized dividers-JLab design
- Scintillators fabricated by Eljen Technology
- CTOF counter assembly and QA done at JLab
- Light monitoring system design done at JLab

- **Significant Dates:**

- Nov. 2014: Gluing/wrapping of counters finished
- Apr. 2015: 48 counters with PMTs and shields installed
- May 2015 – Dec. 2016: Cosmic ray testing
- Jan. 2017: CTOF installed in Hall B temporary solenoid mock-up
- Feb. 2017: KPP beam run
- Feb. 2017: CTOF counters de-installed and moved to storage
- Summer 2017: Final installation in CLAS12 solenoid

- **Project Status:**

- CTOF Hardware:
 - Counters assembly completed
 - Bench test testing completed
 - Light monitoring system testing completed
- CTOF installation fixtures and tooling:
 - System successfully used to install counters in solenoid mock-up for KPP beam run
- CTOF software:
 - Reconstruction code written
 - validation in progress
 - Calibration suite well advanced
 - Used for KPP beam run data
 - GEMC hit process routine developed and validated
 - Monitoring tools being developed



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