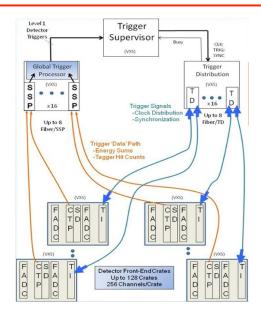# *CLAS12* – DAq/Trigger Electronics

System Goals and Physics Requirements

• 200kHz average L1 Trigger Rate, Dead-timeless, Pipelined, 2ns bunch crossing (CW Beam)

• Sector based L1 trigger supporting streaming subsystem hit patterns and energy summing with low threshold suppression

• Scalable trigger distribution scheme (Up to 128 front-end L1 crates)

• Low cost front-end & trigger electronics solution

• *Reconfigurable firmware* – CLAS12 (Hall B) will use different programmable features for each Detector that participates in the L1 trigger

DAq/Trigger System - TECHNICAL PARAMETERS

PARAMETER	DESIGN VALUE
Module Format/Bus	VITA 41 - VME64x and VXS (High Speed Serial Extensions)
Number of Readout Crates	61
Number of L1 Crates	30
Serial Interface Technology	2.5 Gbps and 5 Gbps
Serial Interface Transmission	Backplane and Multi-Fiber Optic
VME64x Data Bus Transfer	200 MB/sec
Trigger Distribution Method	High Speed Serial over Fiber Optic
Full L1 System Latency	$< 8\mu s$
Trigger Rate Capability	200 kHz
Trigger Resolution	4 ns
Trigger Types	32
Front End Acquisition Clock	250 MHz
Synchronicity (All crates)	4 ns
Bit Error Rate	TBD

- **Construction Strategy and Project Leadership:**
  - DAQ hardware has been installed in the Hall where feasible
  - Subsystem DAq/Trigger testing infrastructure planned to be ready before detector systems installed
  - CODA DAq system software tests as detectors are commissioned
  - Staff Scientist Leadership: S. Boyarinov
  - Support Group: Fast Electronics – B. Raydo, C. Cuevas

- **Significant Dates:**
  - May 2015
    - Successful custom pipeline cluster trigger finding algorithm used for HPS experiment
    - HPS DAQ synchronization of ECal and Silicon Vertex Tracker readout.
  - December 2015
    - Barrel Micromegas and CLAS12 SVT synchronized for cosmic ray tracking.
  - February 2017
    - CLAS12 KPP run – first use of whole CLAS12 DAQ and Trigger systems

- **Project Status:**
  - Forward Carriage DAQ installed (ECAL, PCAL, FTOF, LTCC)
  - CLAS12 Trigger System installed
  - Subway DAQ installed (Drift Chamber)
  - Space Frame DAQ 50% installed (HTCC, CTOF, SVT)
  - Pipeline Trigger synchronization testing in progress
  - Trigger algorithms development in progress

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Jefferson Lab   JSA   U.S. DEPARTMENT OF ENERGY

Contact: S. Boyarinov, Hall B Staff Scientist (boiarino@jlab.org) 757-269-5795
C. Cuevas, Fast Electronics Group Leader (cuevas@jlab.org) 757-269-5053
L. Elouadrhiri, Control Account Manager (latifa@jlab.org) 757-269-7303
G. Young, Associate Project Manager for Physics (young@jlab.org) 757-269-6904
V. D. Burkert, Hall B Group Leader (burkert@jlab.org) 757-269-7540