SRS Systems Update

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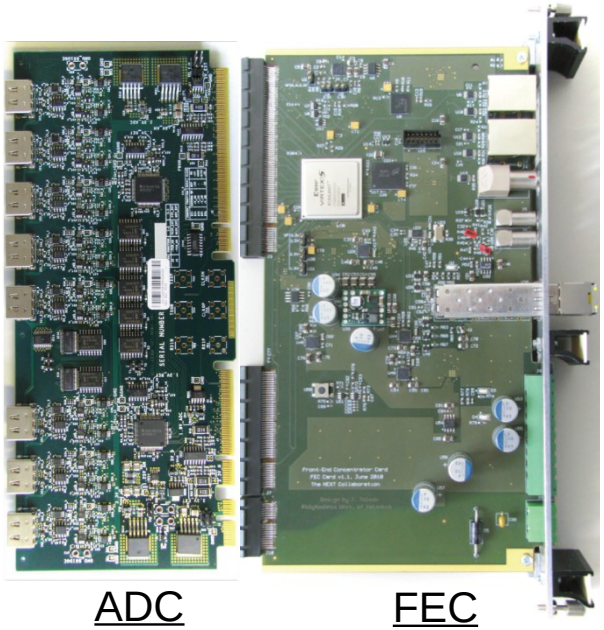
Project Goals

- Establish a functioning Scalable Readout System (SRS) with DAQ software for use with JLab's 15x15 GEM detector
  - Build a test apparatus for taking data under cosmics/source
  - Establish a baseline behavior of this chamber using the DATE DAQ software for comparison with measurements from CODA
- Re-implement the entire SRS system using CODA as the primary DAQ software
  - Identify and implement the necessary functions from DATE and Slow_Control libraries
  - Repeat measurements using the cosmic/source test apparatus

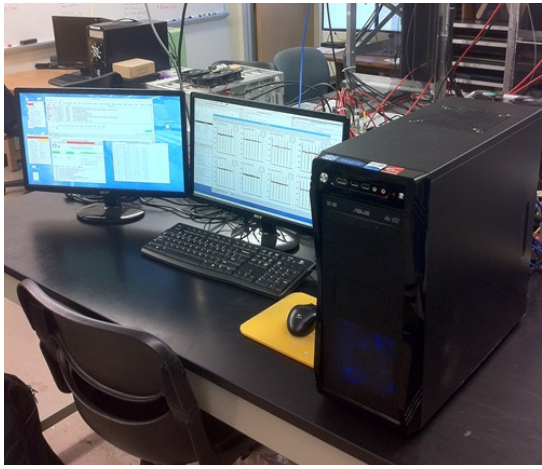
Scalable Readout System

- Scalable Readout System (SRS) developed by the RD51 collaboration at CERN.
- Current test apparatus is using 6 APV25 hybrids connected to a single FEC/ADC pair

HDMI



Gb Ethernet



APV25 Hybrid

- 128 channel APV25 chip
- 192-deep analog sampling memory
- Master/slave configuration
- Diode protection against discharge
- RD51 standard 130-pin Panasonic connector interfaces to detector
- HDMI mini (type C) connector

ADC / FEC

- 2 x 12-Bit Octal ADC
- 8 x HDMI input channels (16 APV hybrids)
- Virtex LX50T FPGA
- SFP/Gb Ethernet/DTC interface
- NIM/LVDS GPIO (trigger, clock synch, etc.)

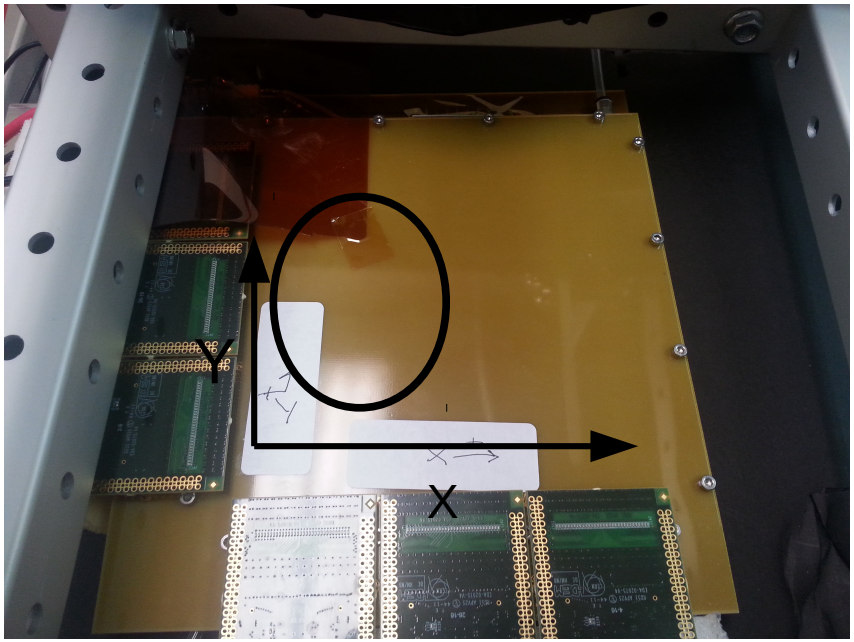
DAQ Computer

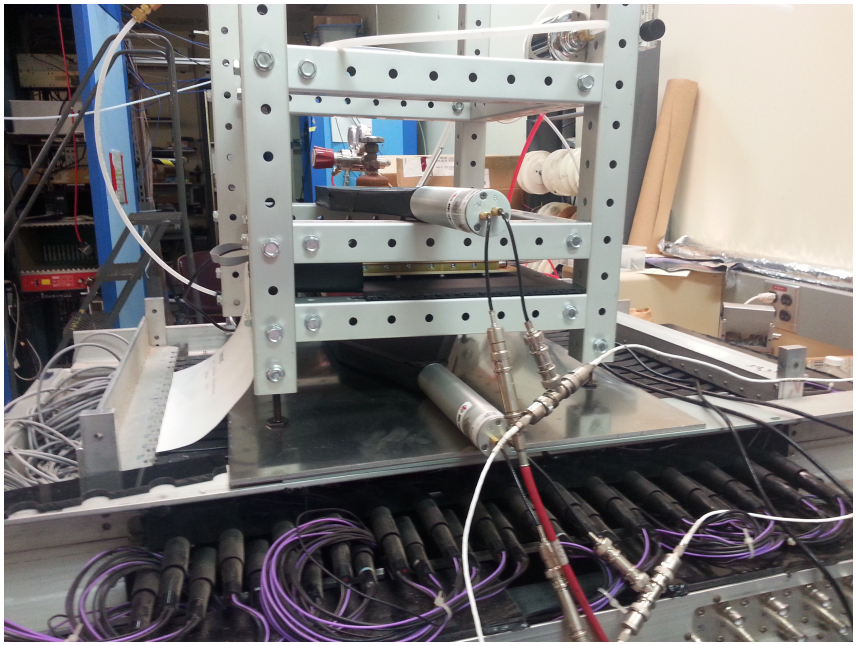
- Data Acquisition using DATE (ALICE @ CERN)
- Support added for data transfer via UDP
- Slow control via ethernet
- Online and offline analysis using custom package for AMORE (ALICE @ CERN)

J. Toledo, et al., "The Front-End Concentrator card for the RD51 Scalable Readout System," in *Topical Workshop on Electronics for Particle Physics*, Vienna, 2011.

Cosmic Ray Test

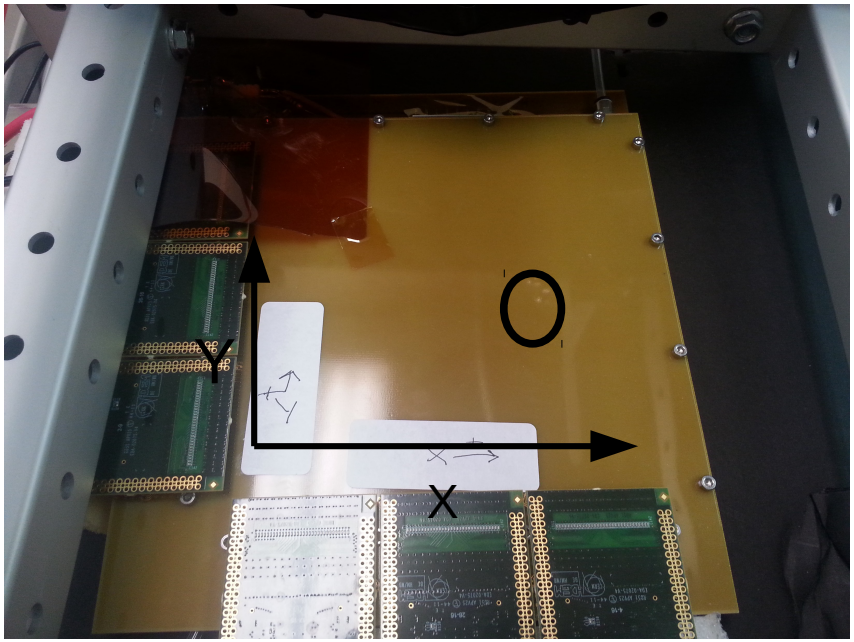
- Approximate rate of 0.8 Hz using a coincidence signal from cosmics
- Unable to properly cover the entire active area of the GEM detector
  - Majority of signal limited to the first two APVs in either plane

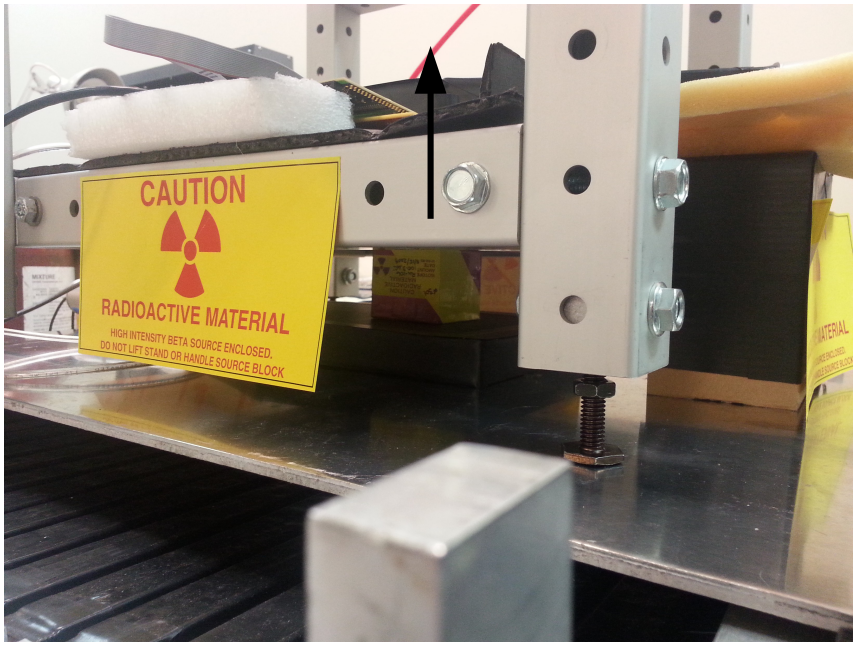




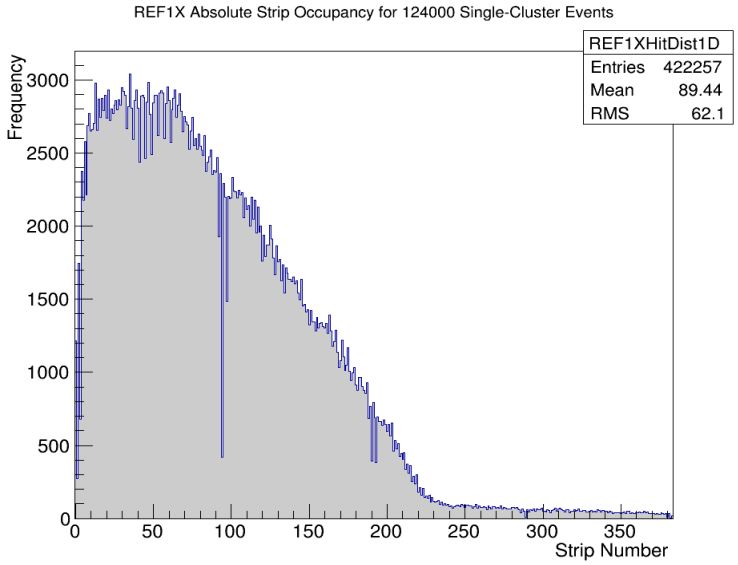
Radioactive Source Test

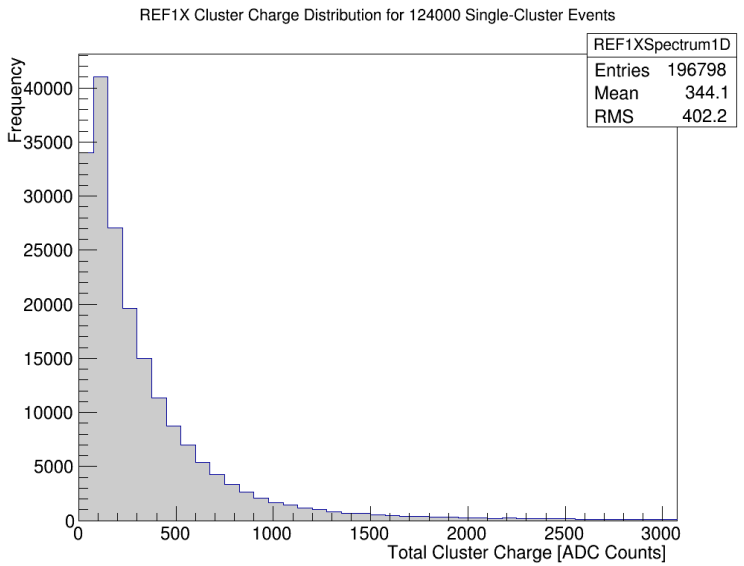
- Approximate rate of 70 Hz using a discriminated signal from a single scintillator
- Performed using a collimated Ru-106 source
  - All signal limited to a single APV in either plane

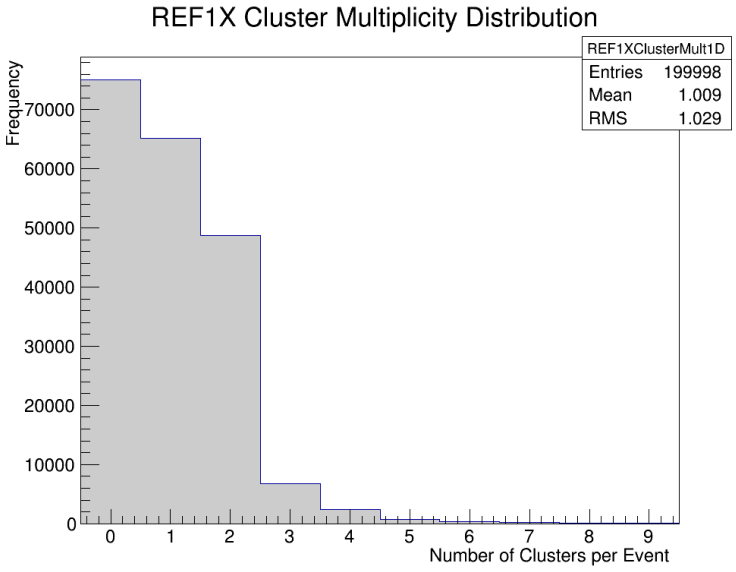


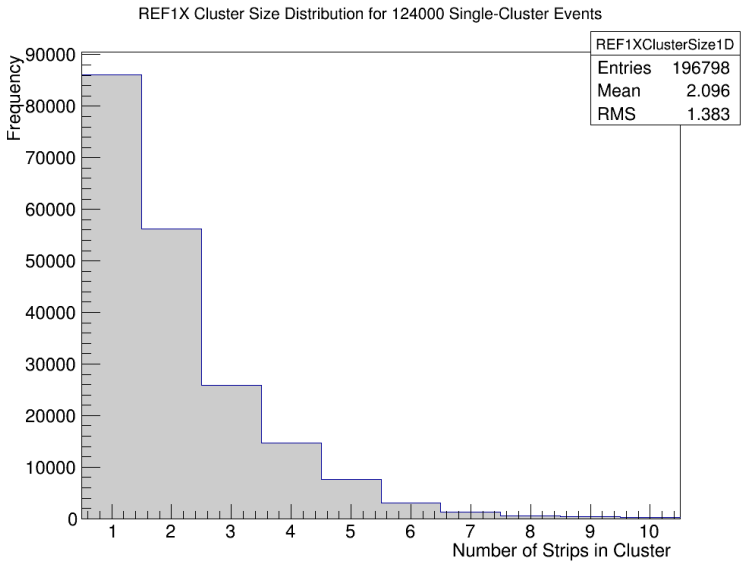


X-Plane of JLab 15x15 chamber - REF1

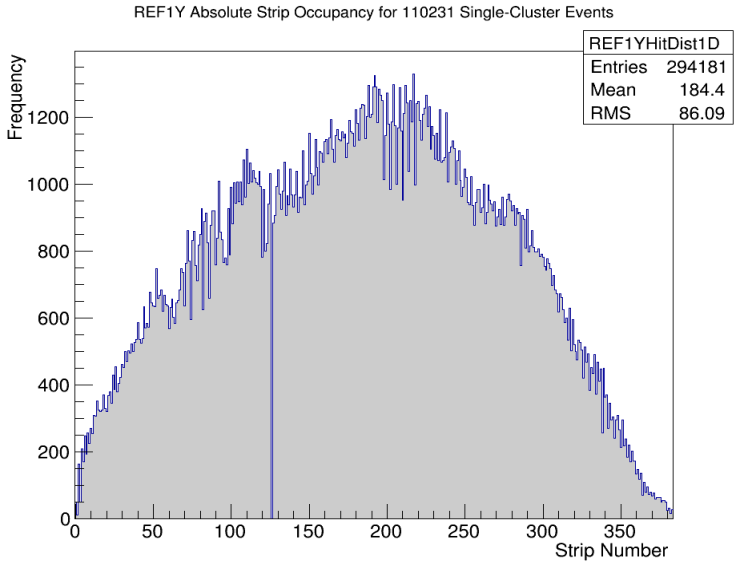


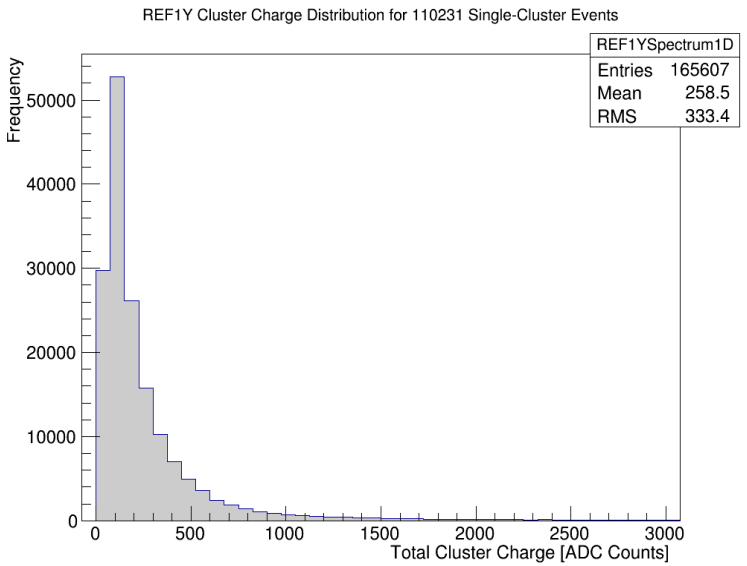


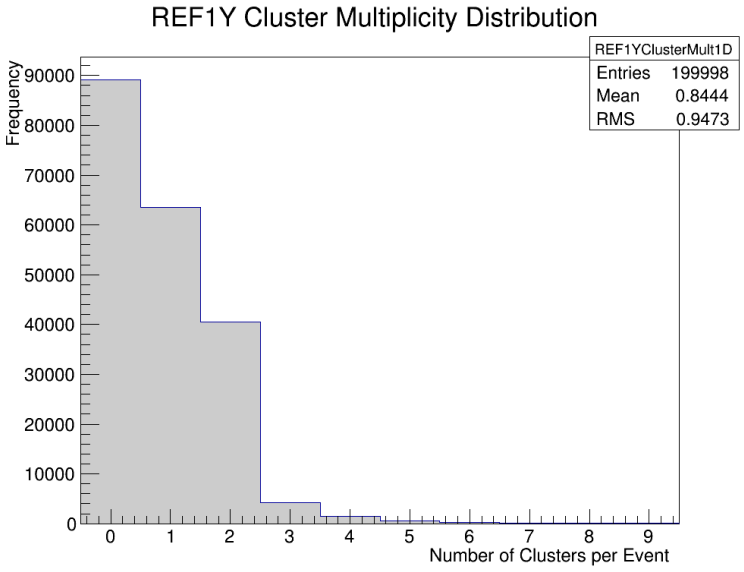


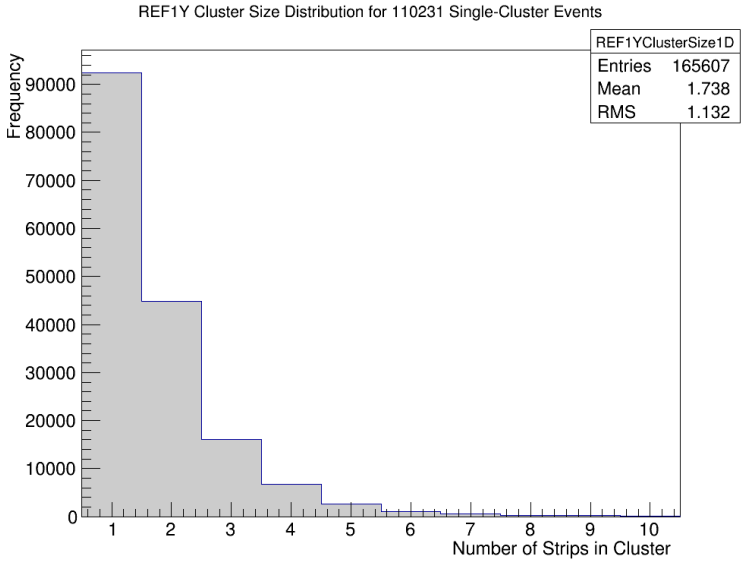


Y-Plane of JLab 15x15 chamber - REF1

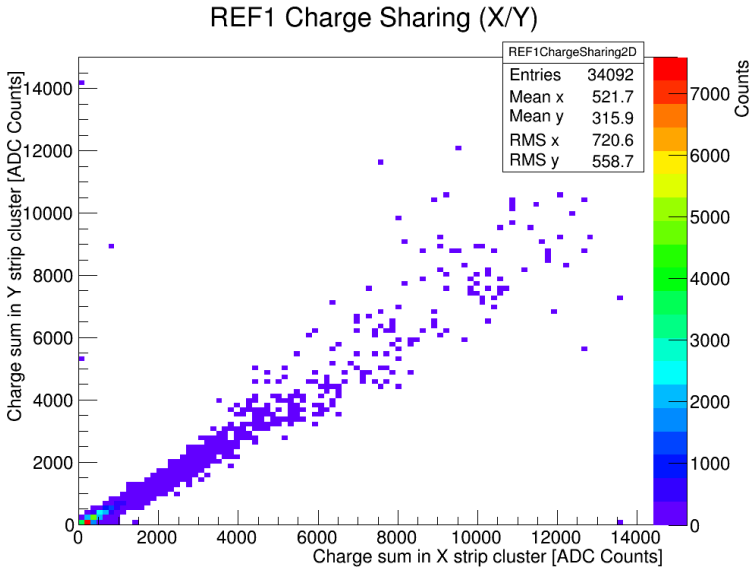


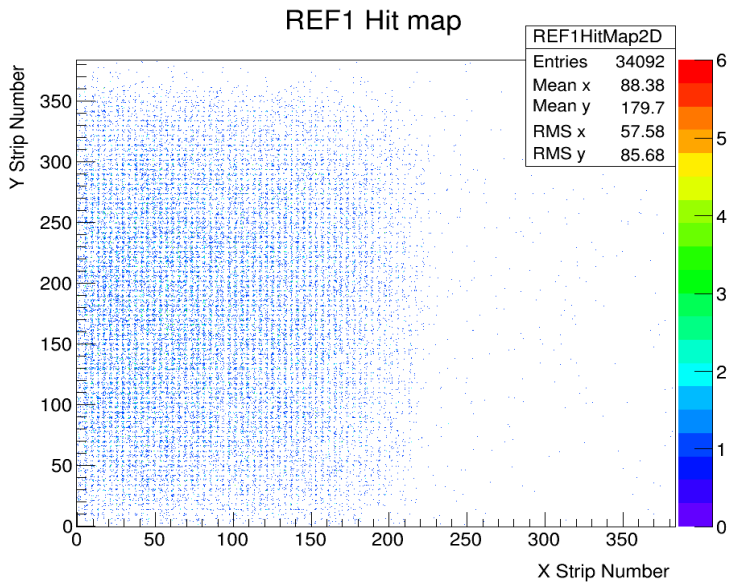


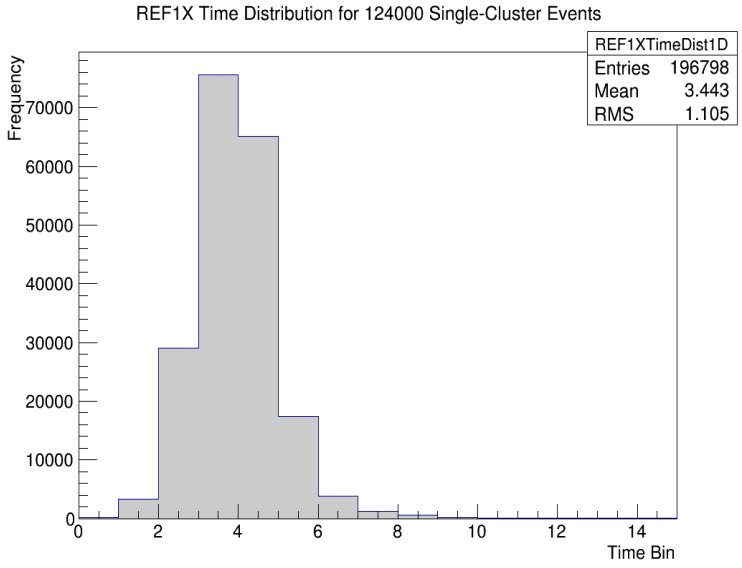


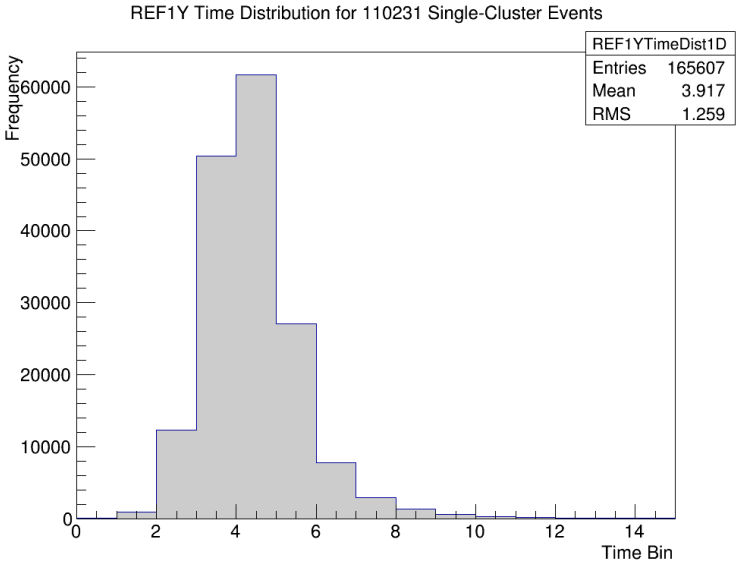


X-Y Planes of JLab 15x15 chamber - REF1

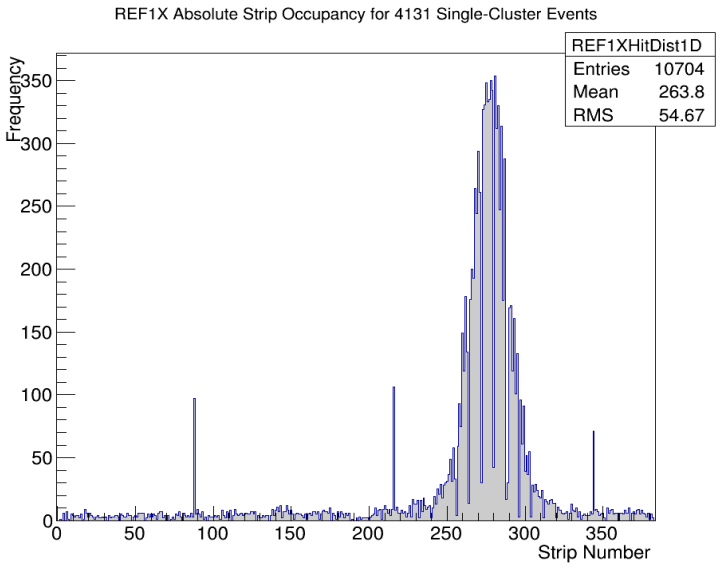


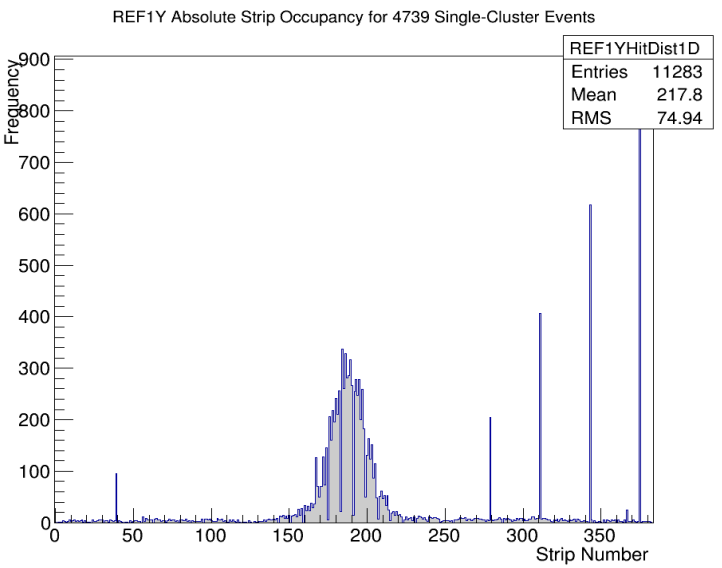


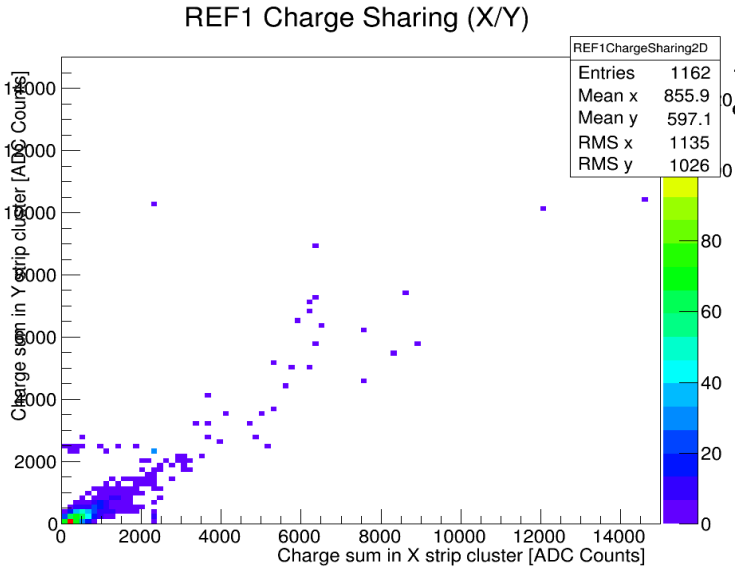


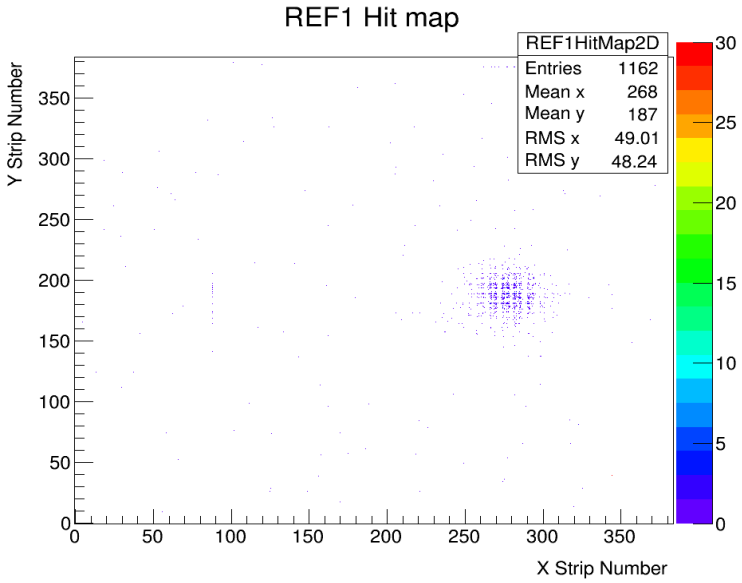


Source Irradiation of JLab 15x15 chamber - REF1









Summary

- JLab's 15x15 chamber is functioning and showing expected behavior
  - A test apparatus for taking data under cosmics is in place and provides reasonable results
  - A baseline has been established for the behavior of this chamber that can be used as a comparison for the results using the CODA system
- Hardware is in place for the implementation of CODA
  - The next step will be identification and implementation of the necessary functions from DATE and Slow_Control
  - Once this system is in place measurements will be repeated to make sure the behavior of the electronics remains unchanged
  - Final tasks will encompass measurements of the maximum rate our system is capable of sustaining without recording errors

Source Irradiation of JLab 15x15 chamber - REF1