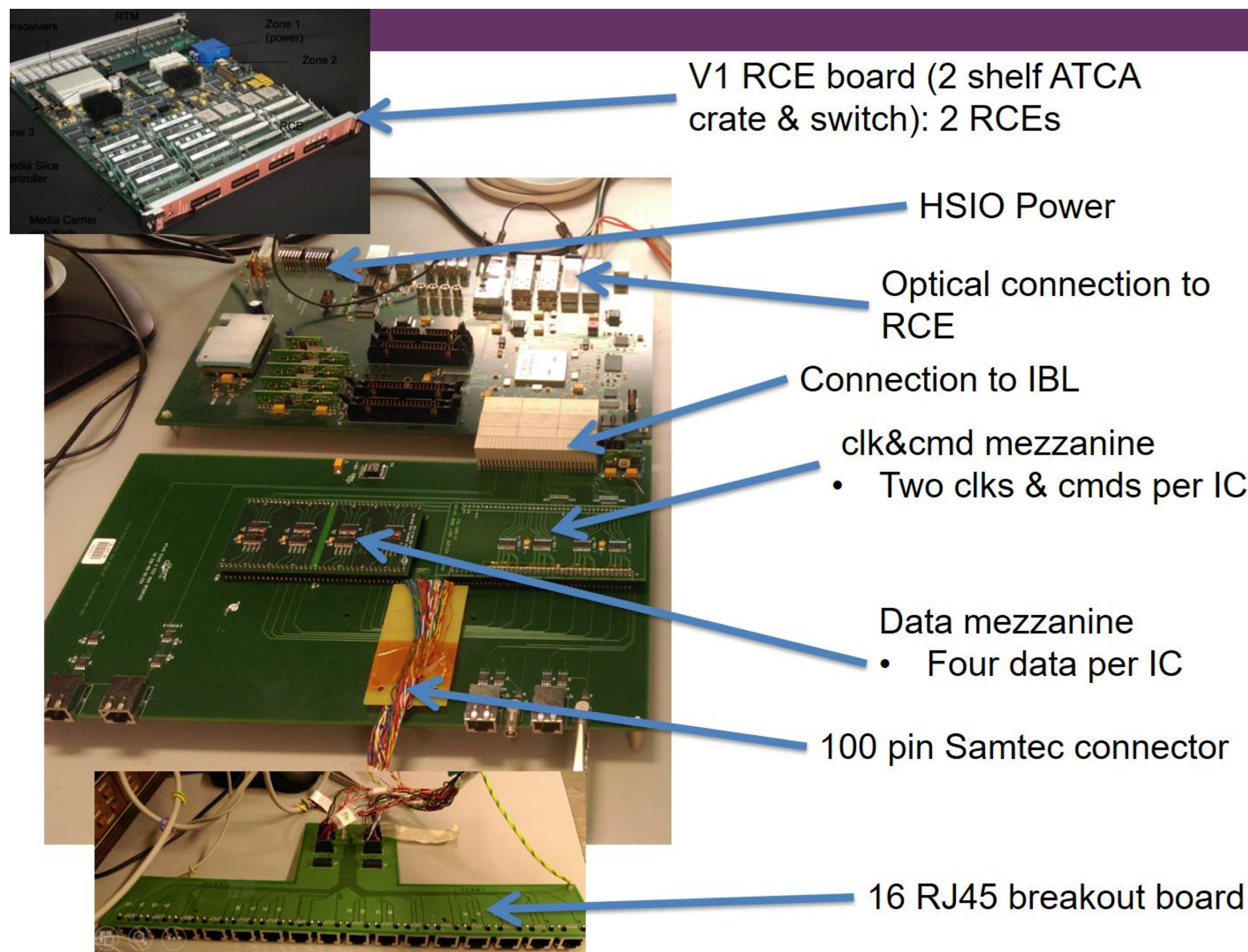


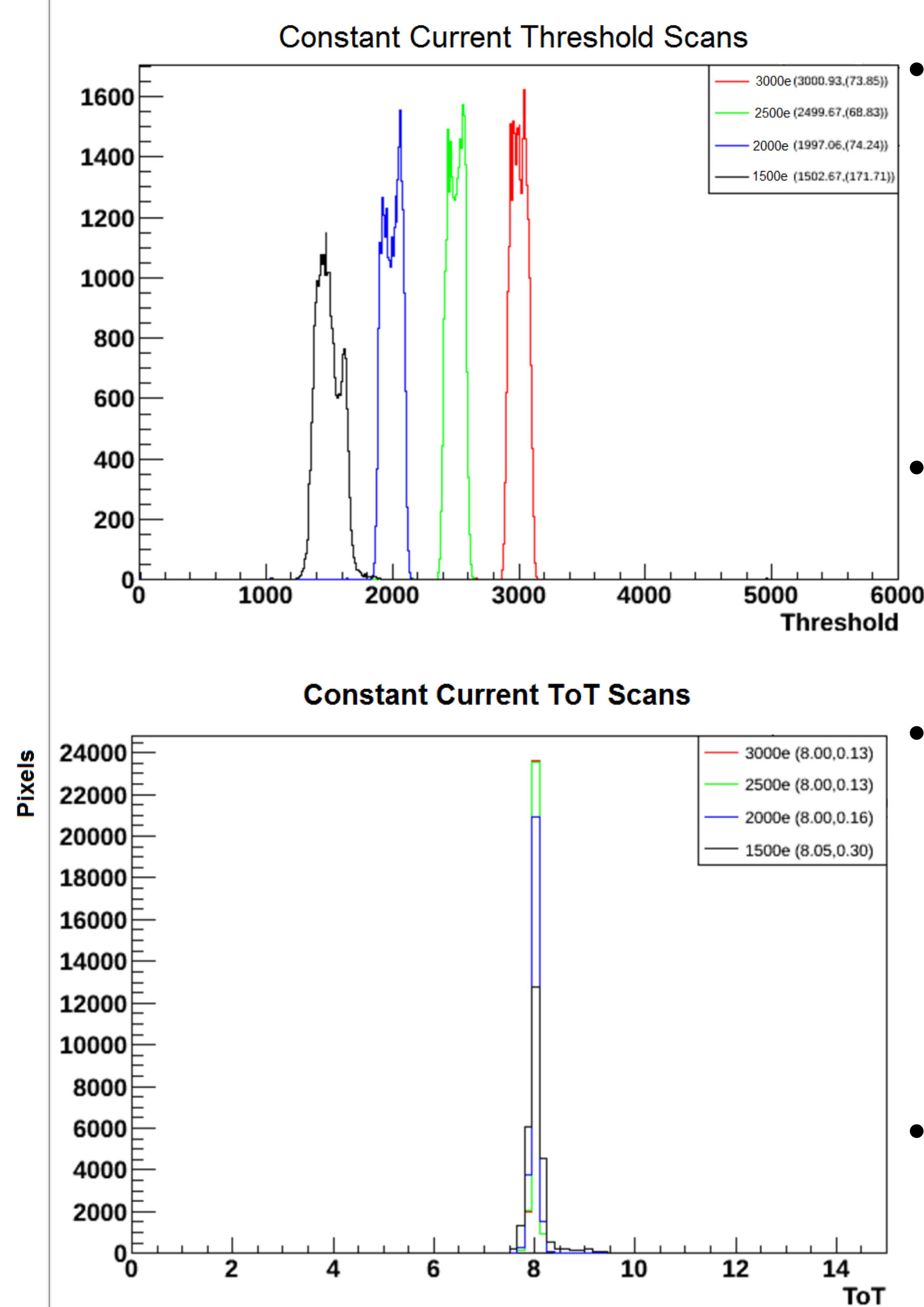
Abstract

The ATLAS experiment currently uses constant voltage sources to power the inner tracking detectors. The problem with this is that each module needs to be separately powered, leading to an excessive amount of cables. The cabling material deflects some of the particles, decreasing image resolution. Constant current sources will be able to power each module in a series chain, greatly reducing the amount of cables needed. This multi-module project focuses on testing the viability of constant current by combining multiple FE-I4 integrated circuit sensor prototype modules into a single, stable, constant current system.

Apparatus



Constant Current

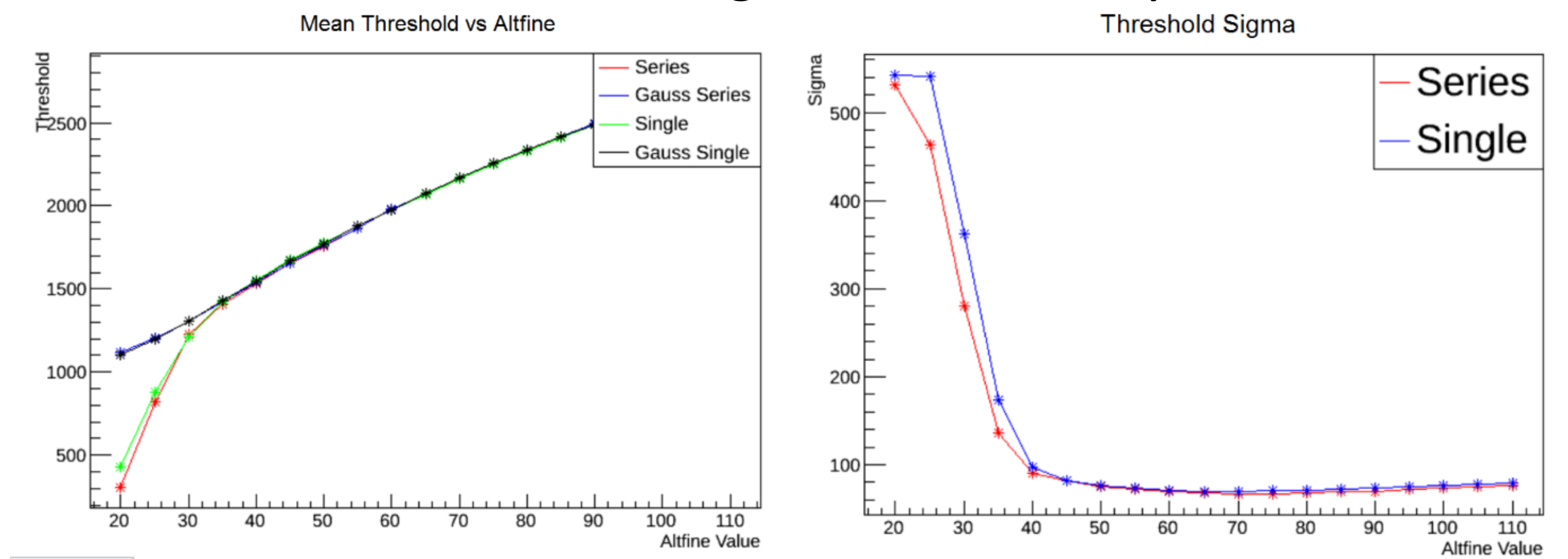


- The suitability of constant current as a power source for a single module is tested using threshold and time over threshold (ToT) scans
- Threshold scans measure the threshold response of each of the modules pixels
- The ToT scan injects a pre determined amount of charge into the pixels and measures the time taken for the signal to be processed
- A working module should return threshold and ToT values that are similar to the pre set values

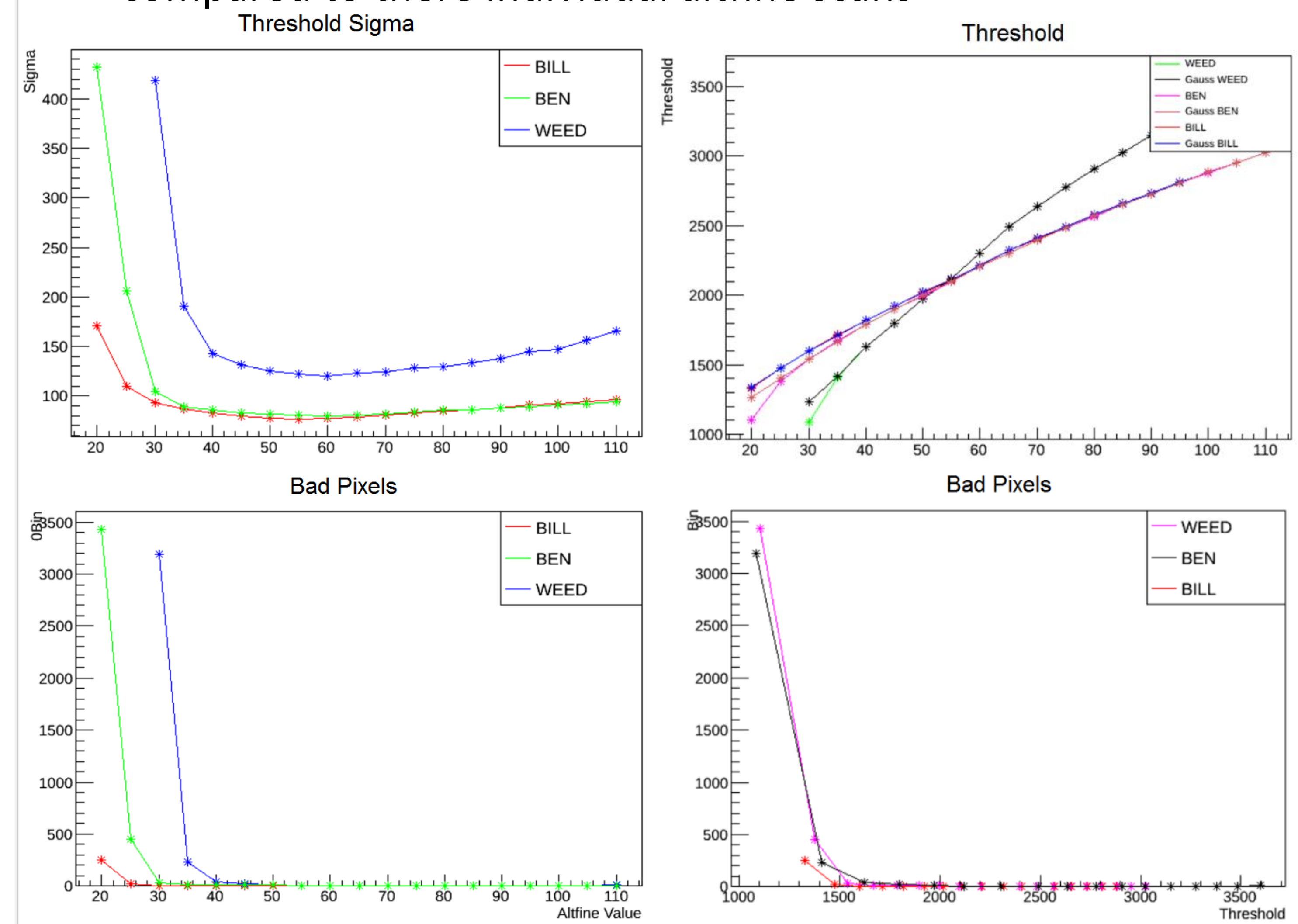
- The Gaussian histograms created from the threshold and the time over threshold scans have low sigma values and their means comply with the pre set values
- The module works individually whilst being supplied by a constant current source
- Constant current source is applicable for single modules

Multiple Modules

- Three working modules were selected; Bill, Ben and Weed.
- Bias applied to the modules pre-amp (altfine) determines the amplification of the signal
- The lowest threshold at which the sensor behaves normally determines the sensors range of functionality

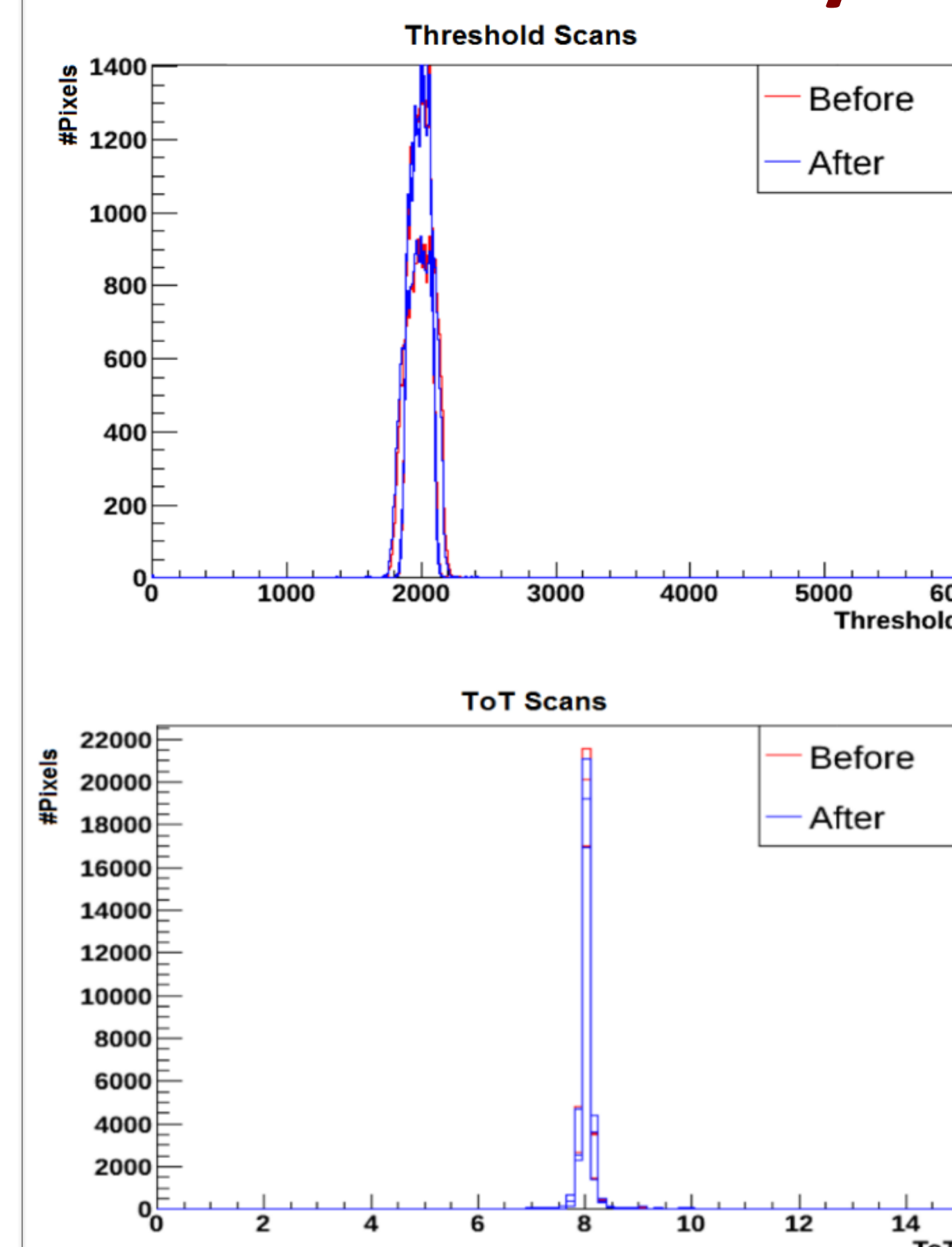


- Modules performed equally well in the series chain when compared to there individual altfine scans



- Three FE-14 modules are simultaneously operational in the constant current chain for threshold values between 1500e and 3000e

System Stability



- A dummy switch is added to the chain to simulate a working , then broken module
- The shorting of the dummy module causes the resistance of the CC system to drop
- Voltage fluctuations from the supply occur and may cause interference with neighbouring modules
- Allows stability testing of the system

- ToT and Threshold scans of before and after the switch is activated overlap → no interference occurs
- System remains stable for single module voltage fluctuations

Summary

- Multi module test system is working when supplied with constant current powering
- Constant current system is stable in the case of single module breakdown
- Constant current powering for FE-I4 sensors is viable for the ATLAS experiment