# DAQ for ATLAS SCT macro-assembly

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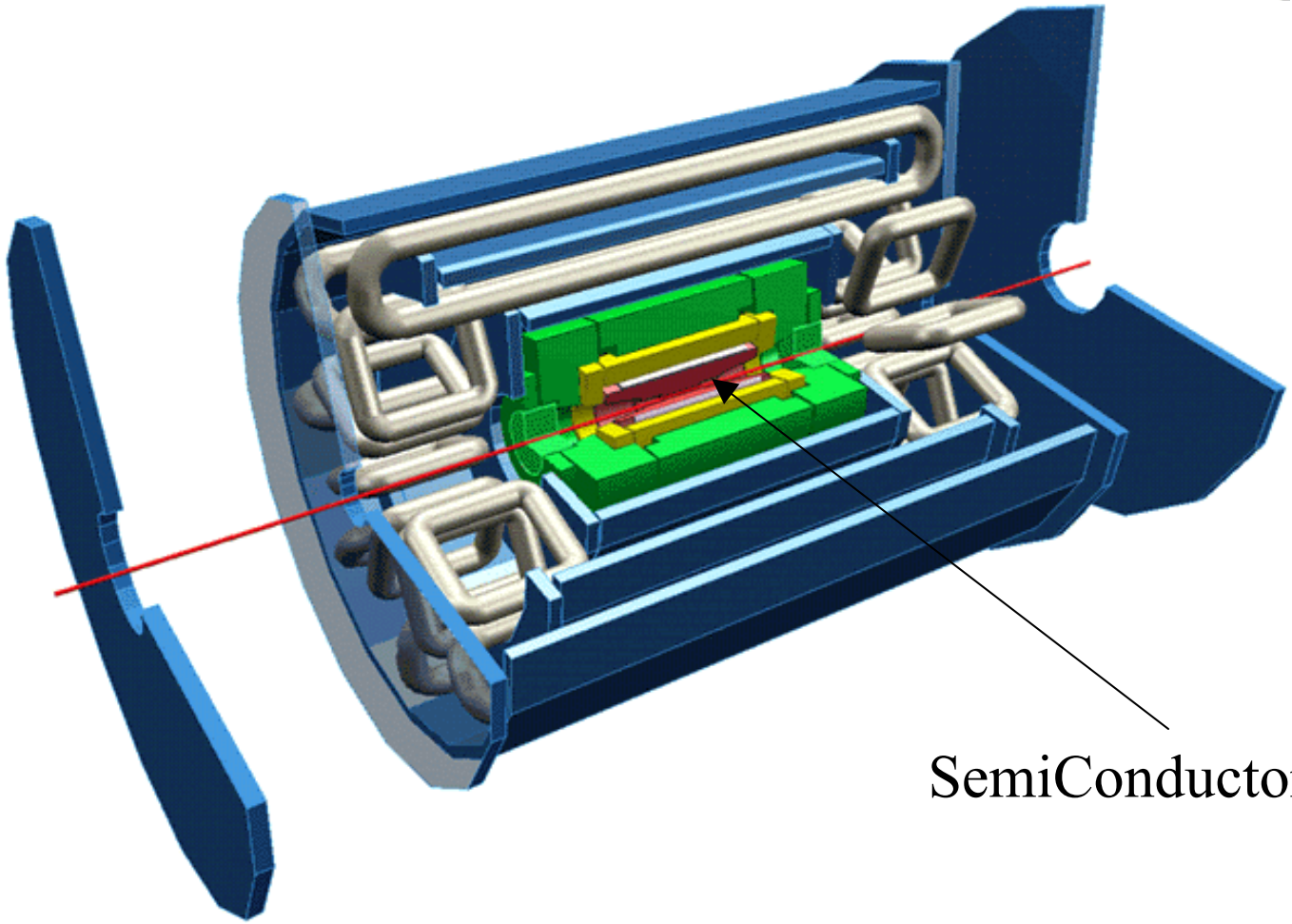
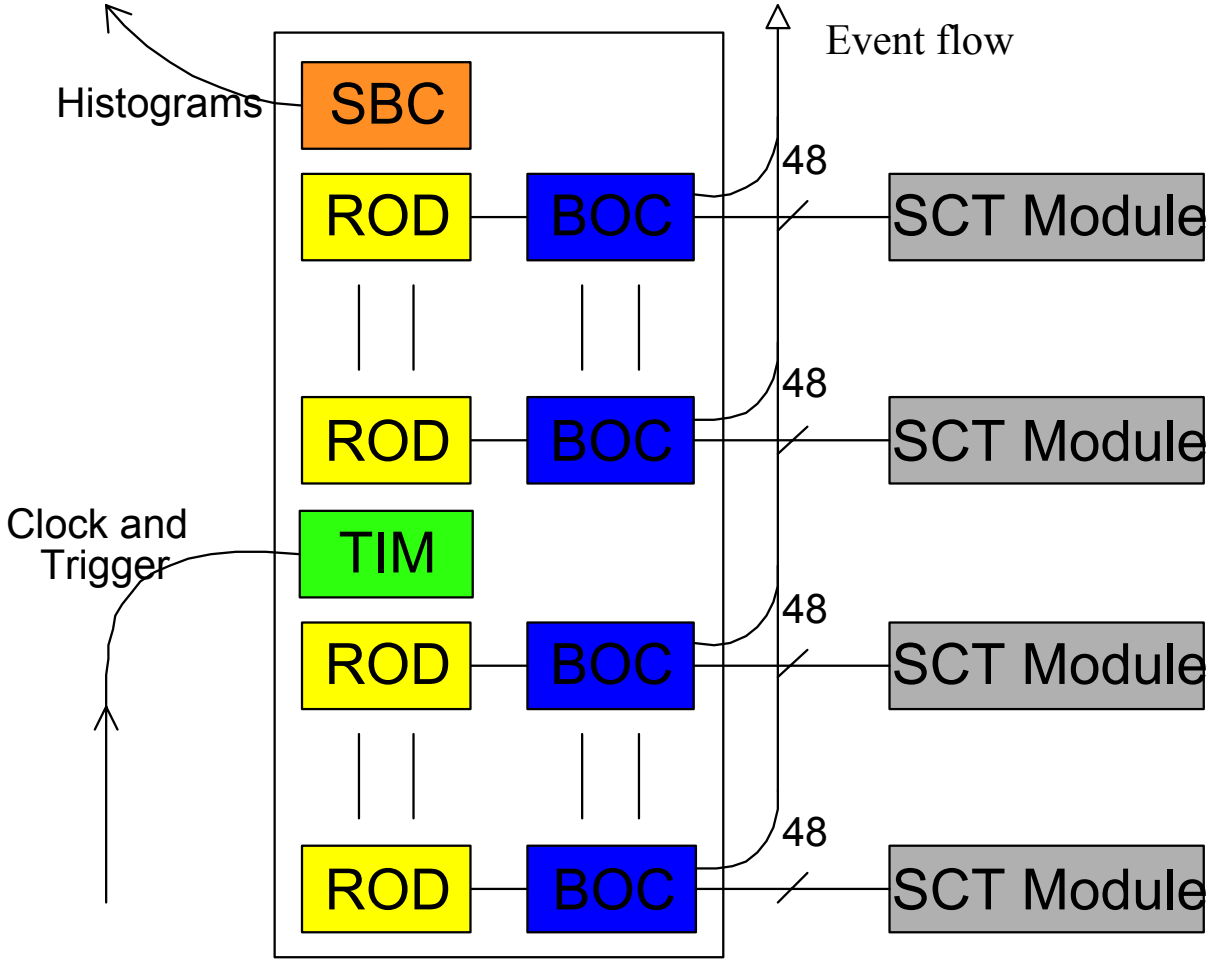
# ATLAS



# SCT Barrel

- 4 Barrels with a total of 2112 modules
  - Each module has 1536 binary strips
- Modules will be assembled onto the barrels at Oxford
  - Up to 672 modules on one barrel
- The barrels will be inserted into each other at CERN

# DAQ Hardware




ROD – Read Out Device

BOC – Back of Crate Card

SBC – Single Board Computer

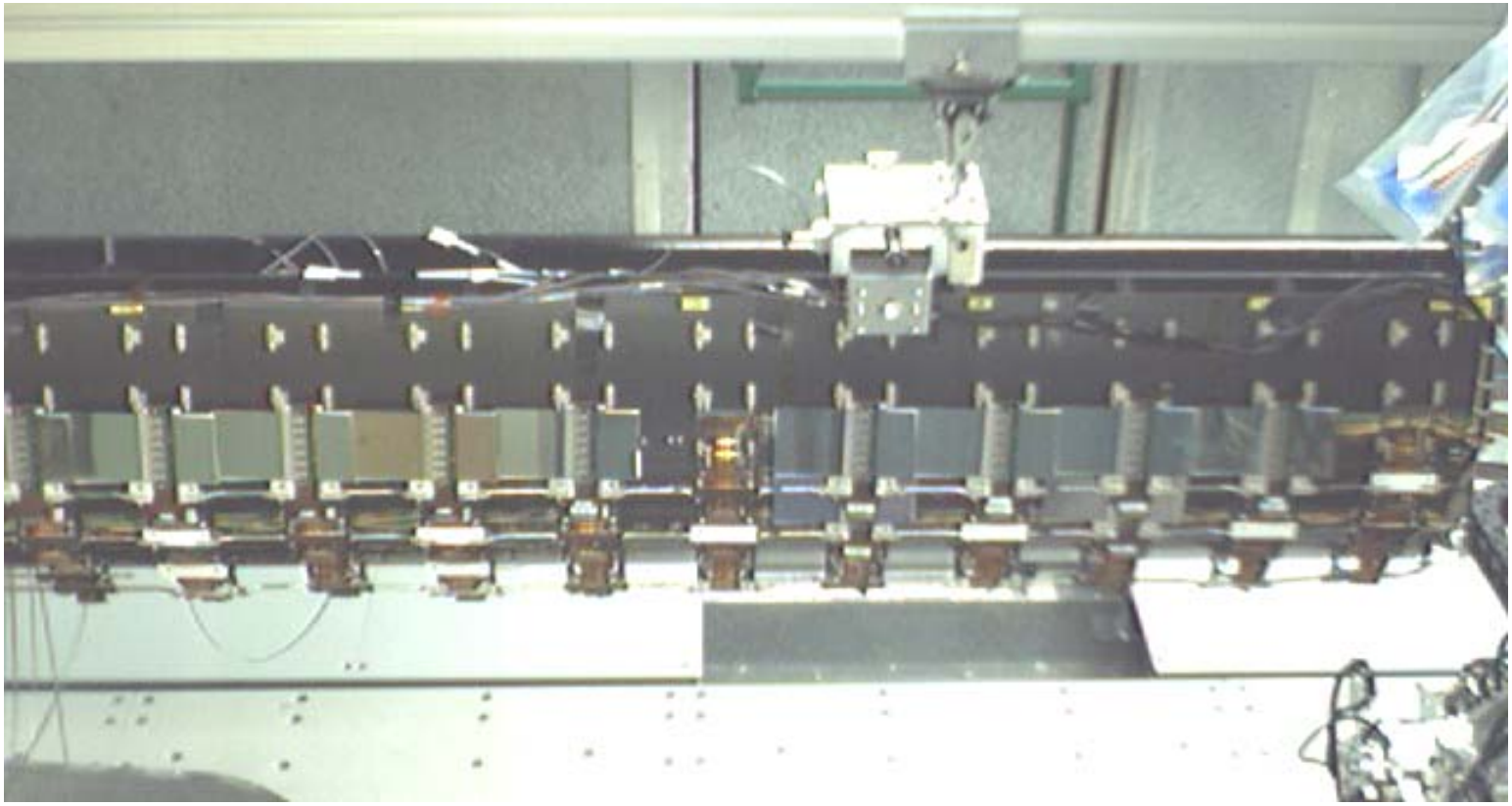
TIM – Timing Module

# Oxford testing

- While at Oxford the modules need testing
  - Comparison with production results
  - Base point for inner detector tests
- This will make use of the DAQ hardware designed for use in ATLAS for the first time
- Integration of the DAQ system software is done at Oxford where more modules can be used
  - Cooling system in place for macro-assembly

# Development at Oxford

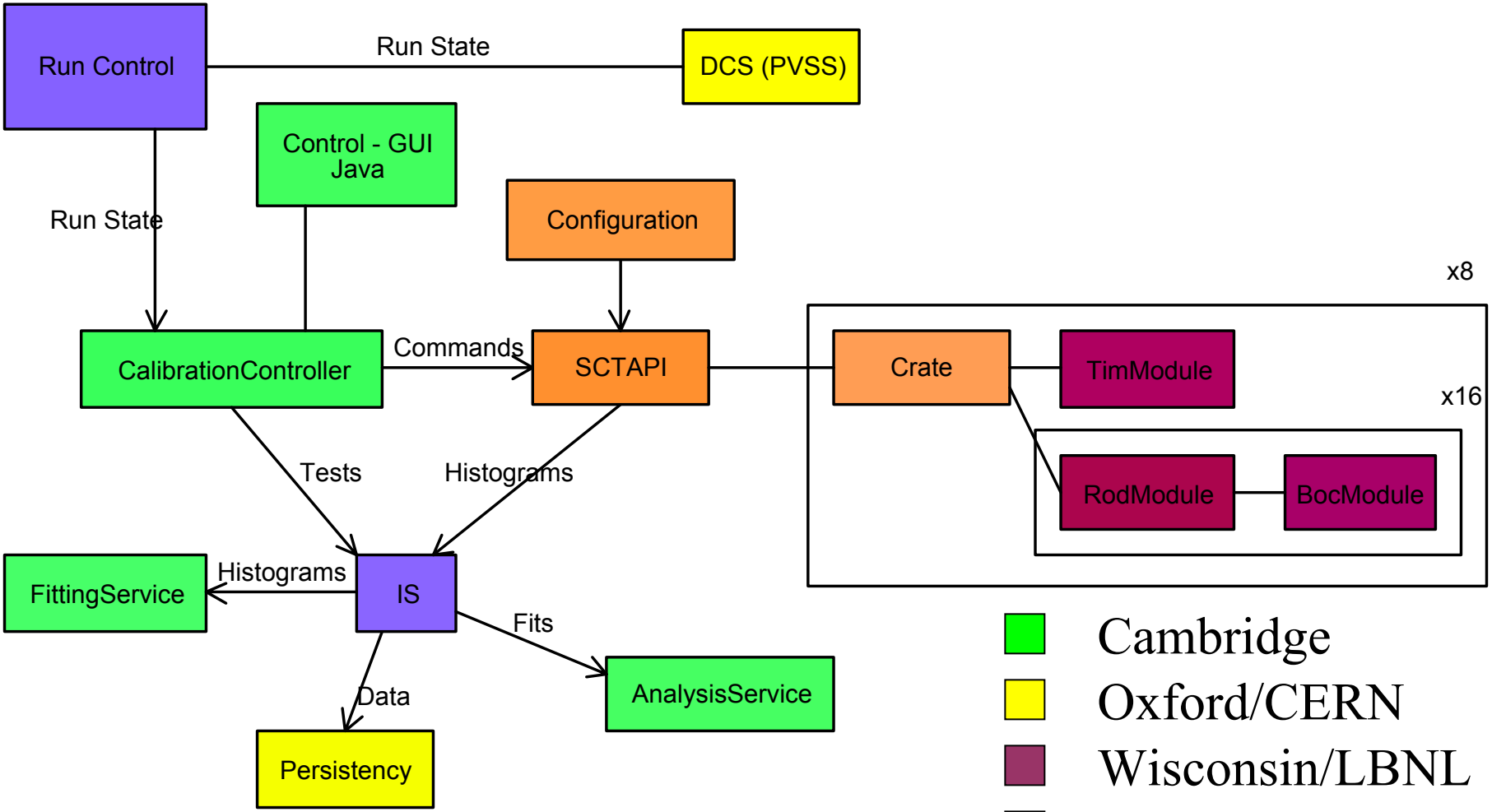
- Barrel sector with up to 12 modules on 3 harnesses



# SCTAPI software

- Configure modules with calibration constants
- Monitor and coordinate histogramming on up to 16 RODs in a crate
- “Probe” feature checks status of module before running scan
- Allow histogramming of events while scanning over different variables

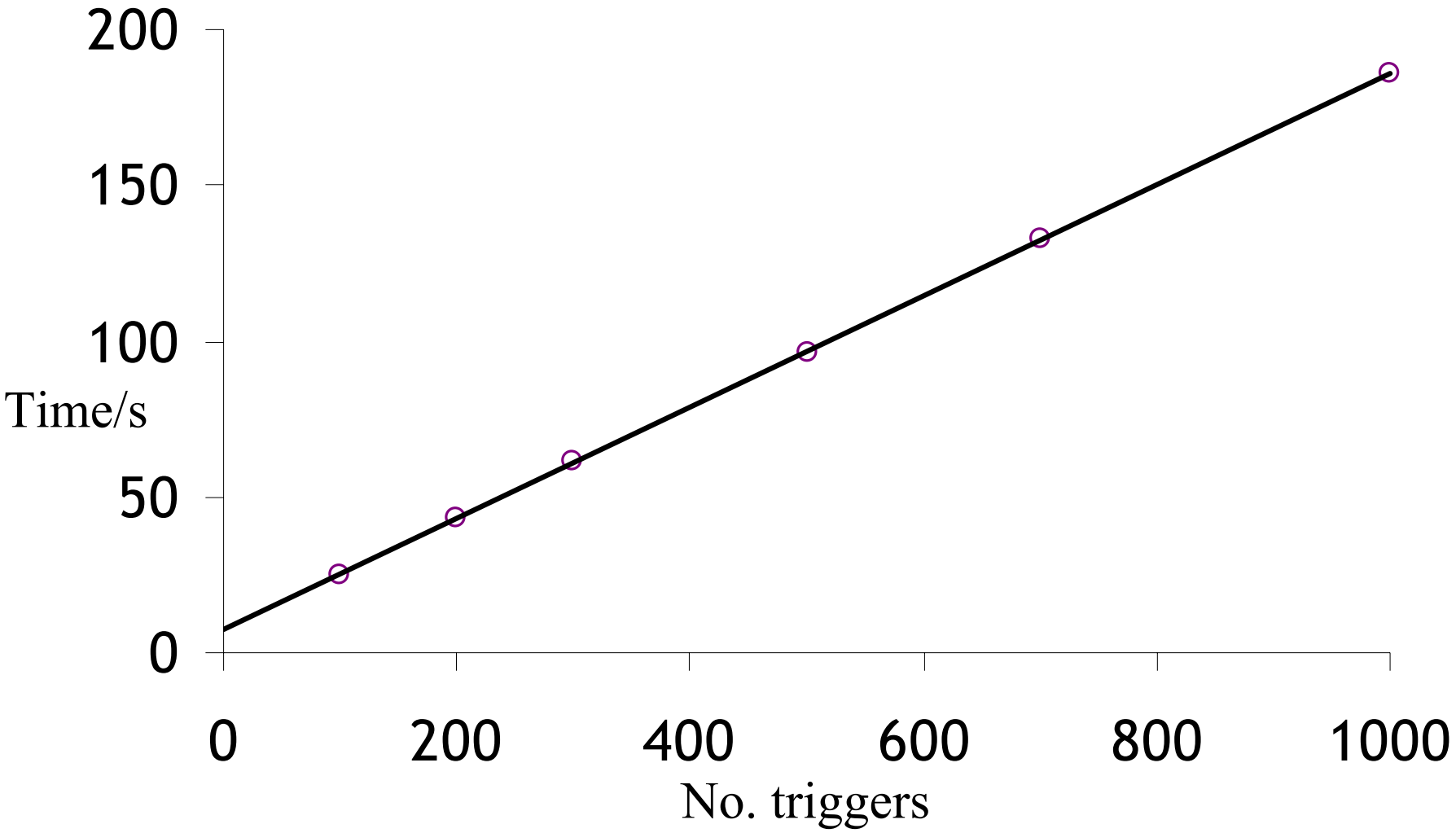
# Software Overview



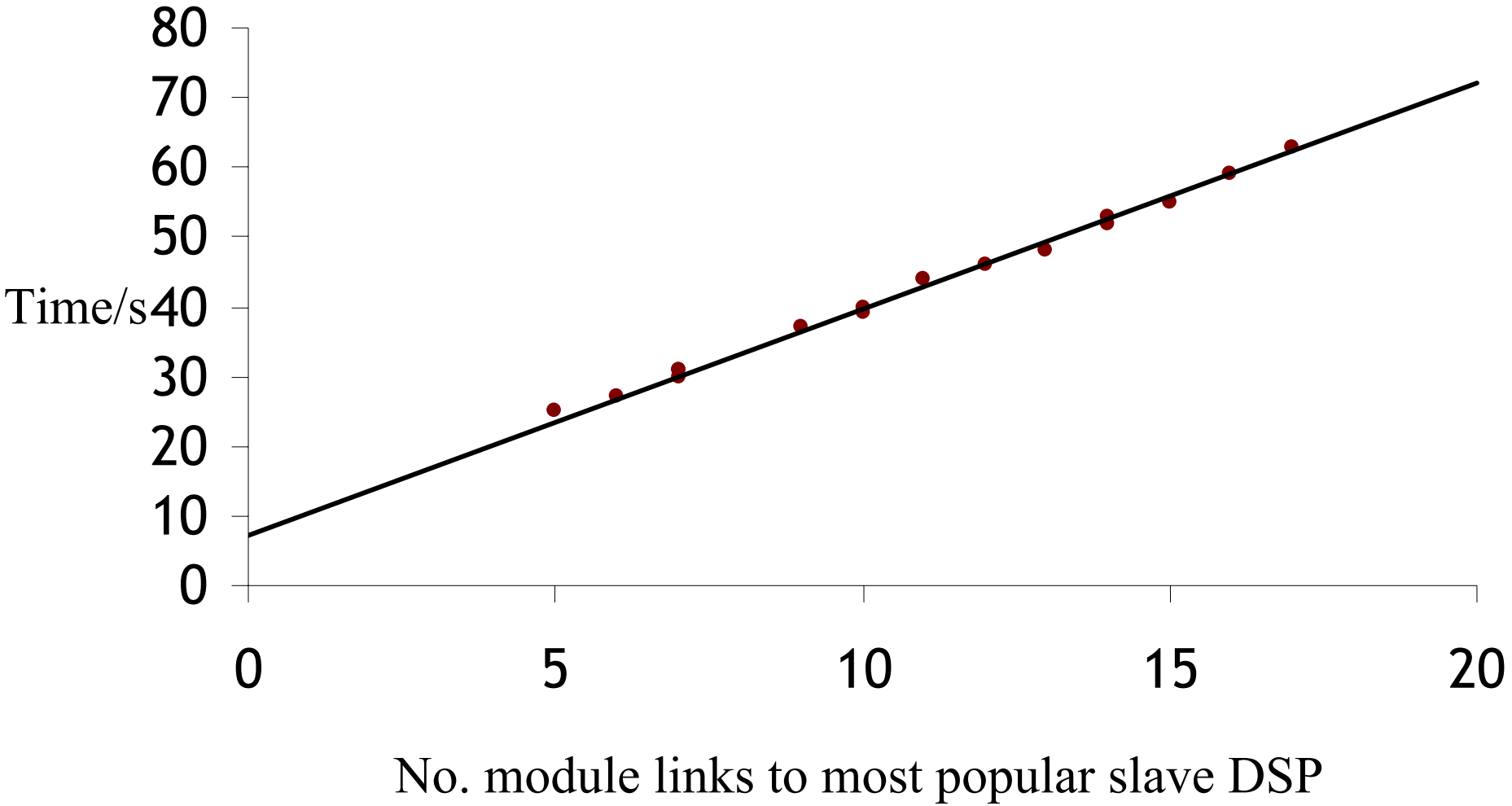
# Scalability

- Theoretical maximum speed for all modules is 1/12 of single module
- 4 DSPs on each ROD carry out histogramming on 12 modules each
- Check scalability

# Affect of increased trigger count



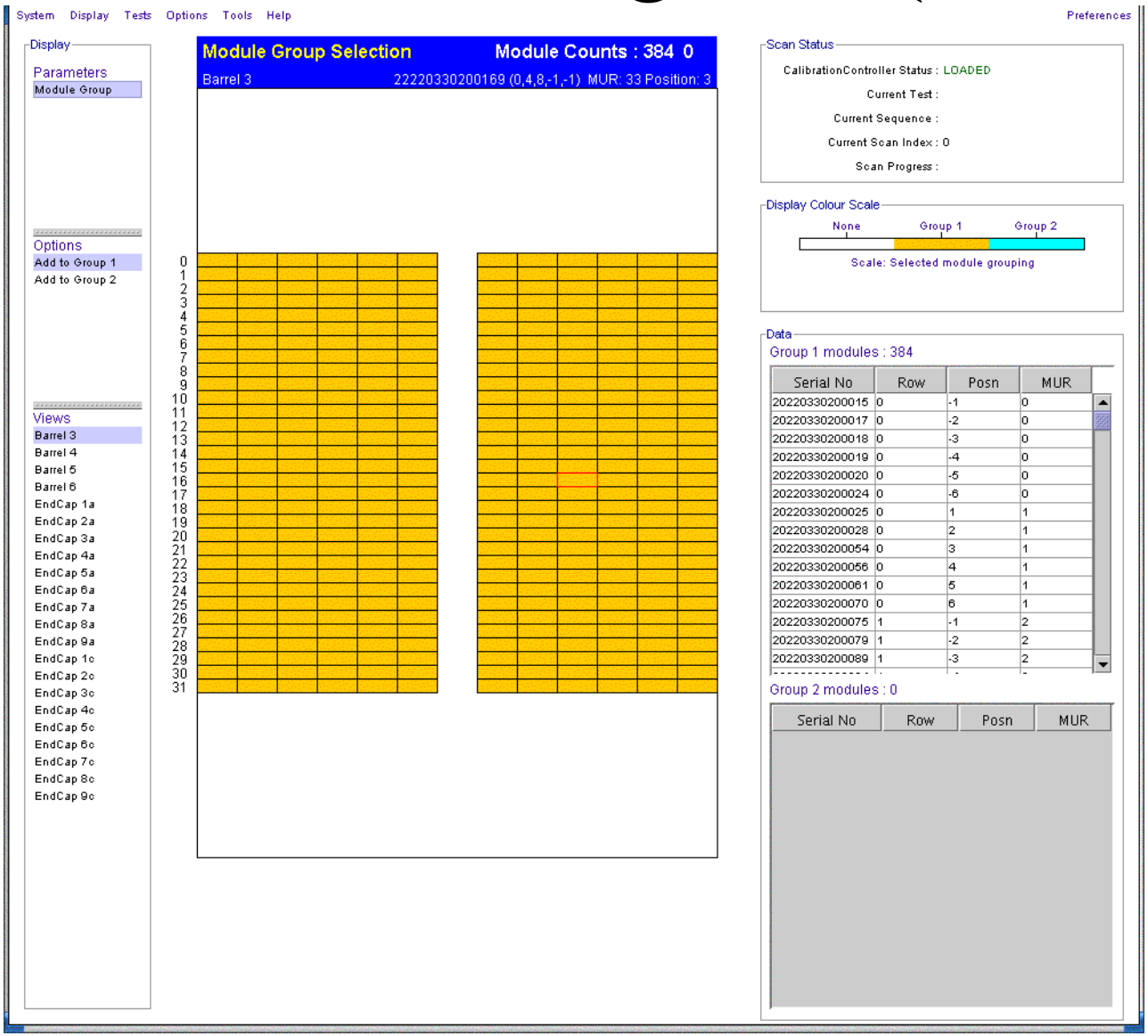
# Increased number of modules



# Analysis software

- Interprets fits of the histograms to calibrate the modules
- Need check of module quality against production tests
- System developed for automatic comparison of analyses with production DAQ software
  - This has been used to test the software under the load of a virtual barrel 3
  - Comparisons have been made with the results of over 120 production modules with negligible differences

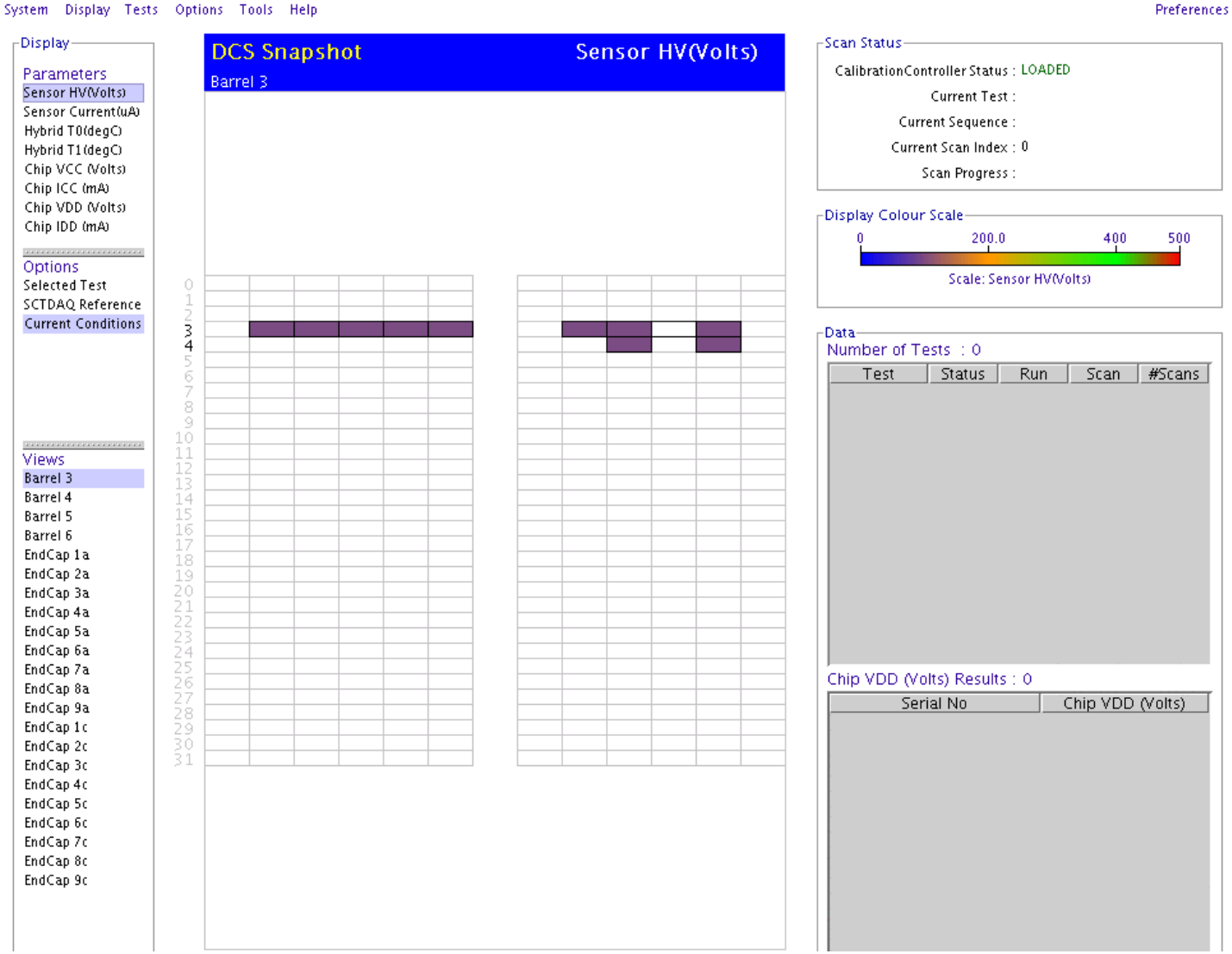
# Full Barrel 3 configured (virtually)



# DCS (Detector Control System)

- This controls the power supplies and other electrical connections to the modules
- Need agreement between the DAQ and DCS for redundant clock selection
- Control and monitoring of DCS system from the DAQ GUI

# Real modules with DCS readout



# Conclusion

- DAQ system mostly ready for macro-assembly
- Some optimisations
  - Reduce histogram overheads
- Some higher-level integration still to be done
  - More testing with more than one ROD
- Usability improvements
  - System in use at CERN, currently getting feedback