WEPV005

EXPERIMENT AUTOMATION USING EPICS

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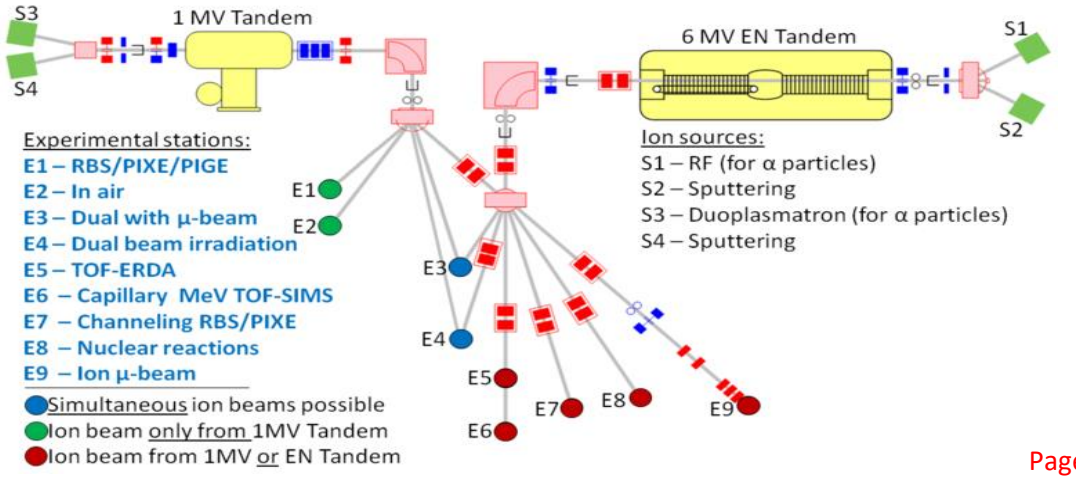
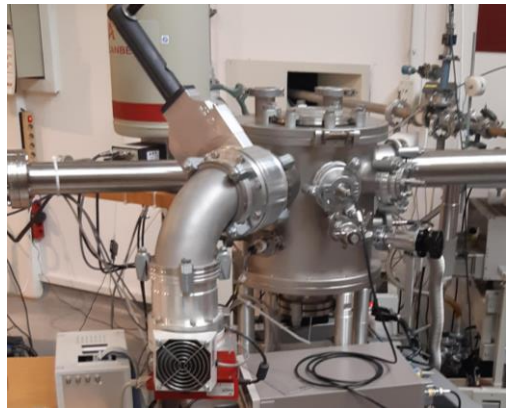


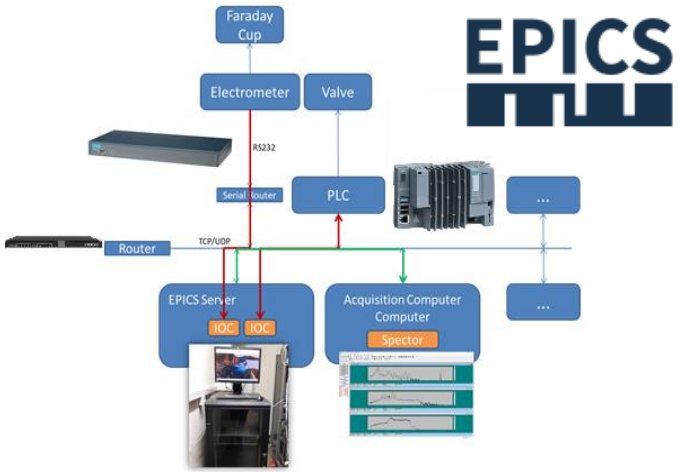
Page 2

Aerosol Beam Line – E1

- Routine experiments performed on many samples
- PIXE, RBS methods used with three detectors in a stable setup
- Requires precise measurement of the amount of charge deposited by the beam on each sample while measuring

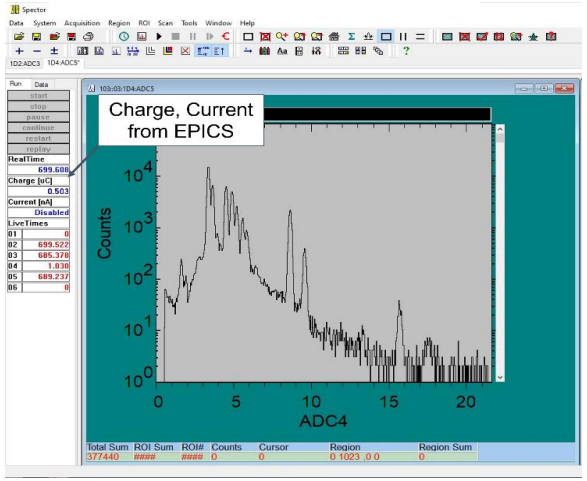


Page 3



- Instruments integrated into EPICS
- Input output controllers (IOCs) created for each instrument

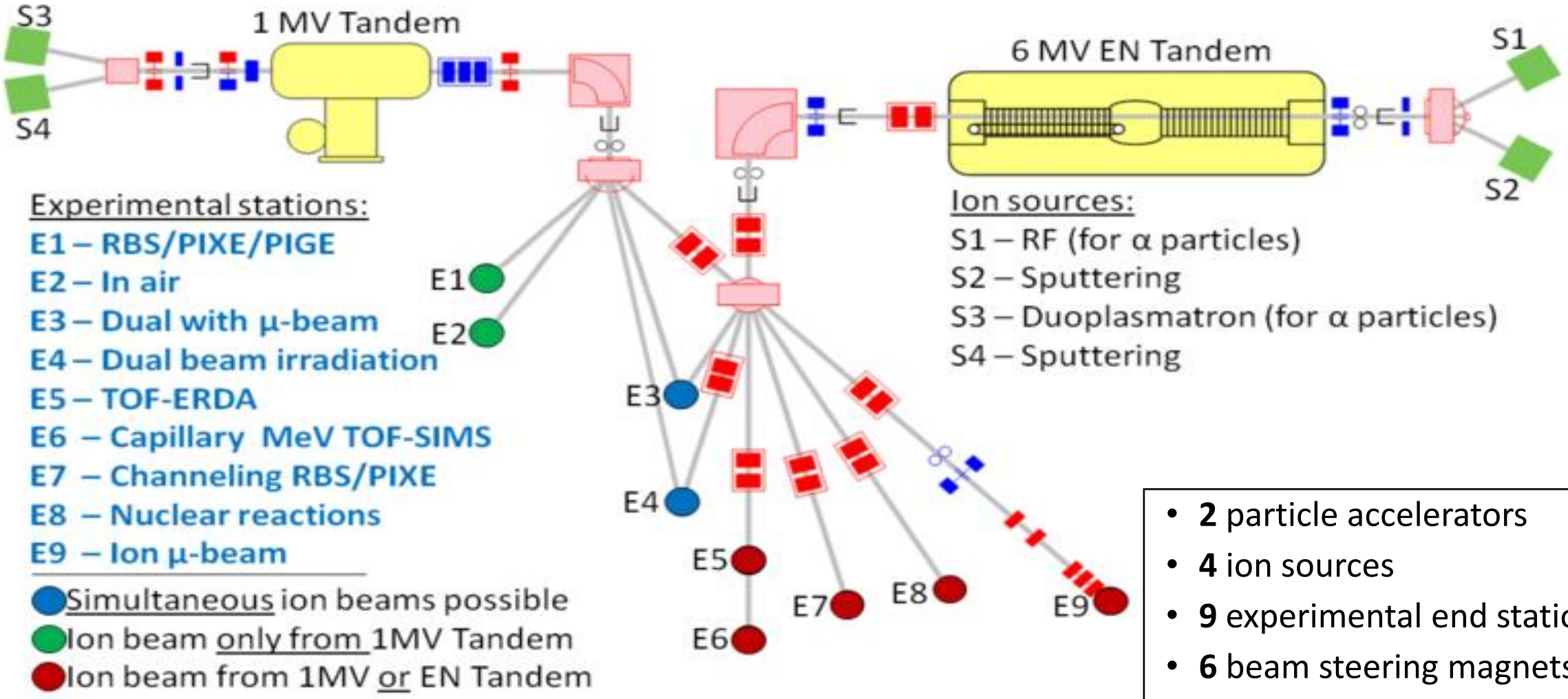
Page 4



- EPICS C library integrated into SPECTOR DAQ software
- Valve control and electrometer reading added to acquisition sequence in software
- Operating procedure for researchers does not change

Page 5

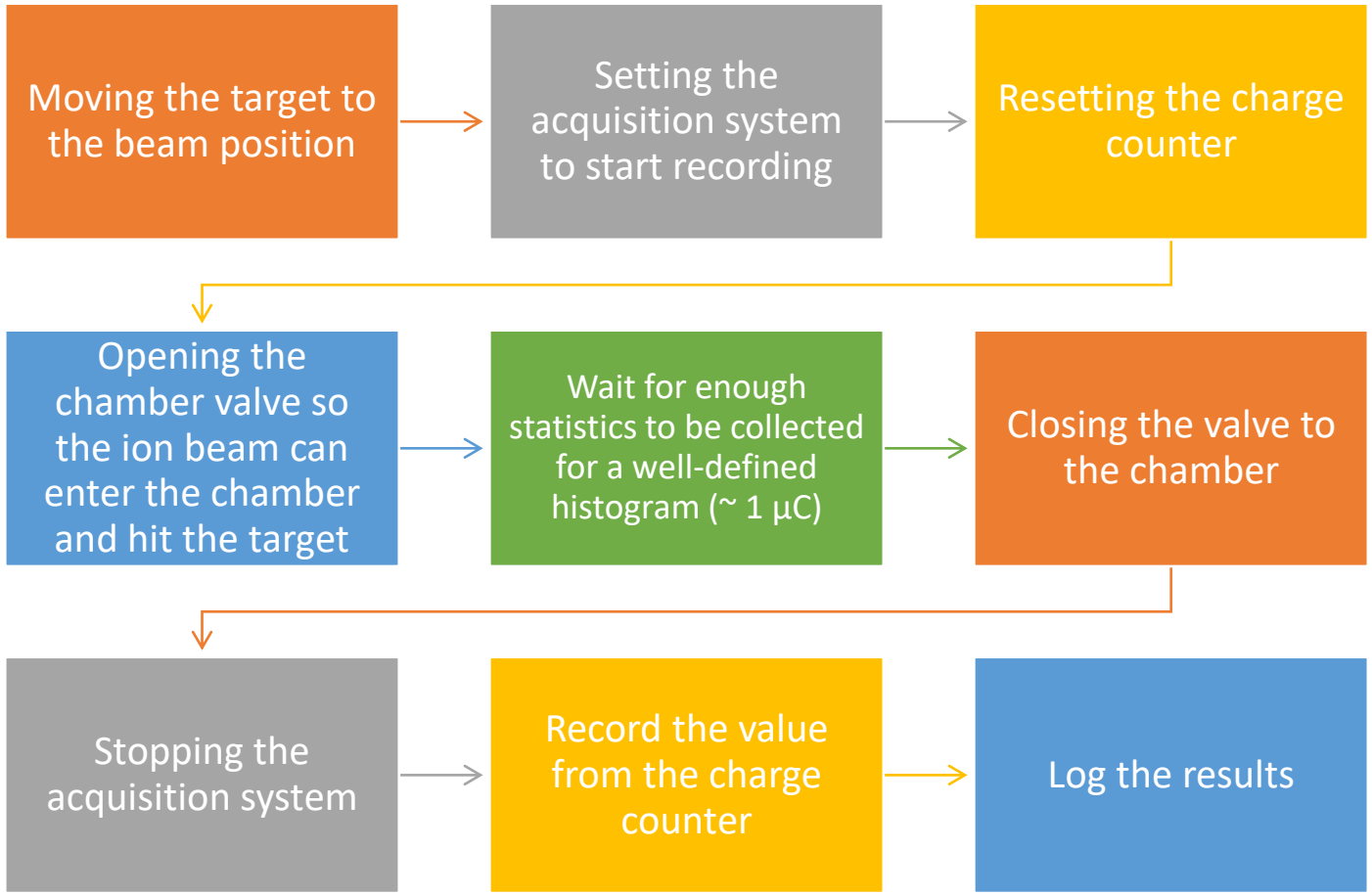
Laboratory for Ion Beam Interactions



- **2** particle accelerators
- **4** ion sources
- **9** experimental end stations
- **6** beam steering magnets
- **12** beam focusing magnets

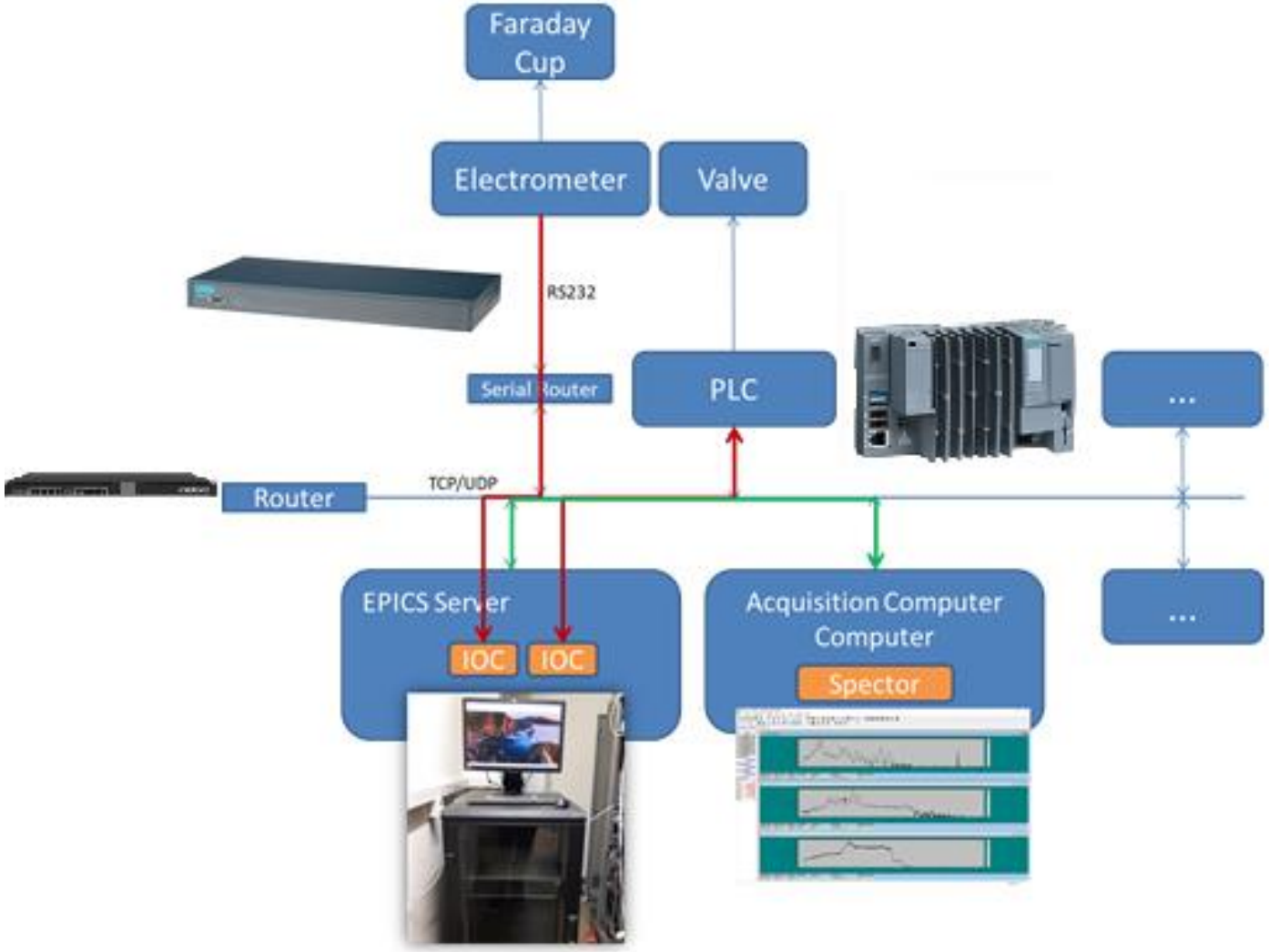
Measurement Procedure at Aerosol Beam Line

- 9 steps must be repeated for each sample being measured which in one day could be as many as 30 times
- Repetitive processes are prone to human error
- Many of these steps can be automated if the various hardware and software components could be controlled remotely
- EPICS used for interconnection of all the elements because it creates a common communication framework

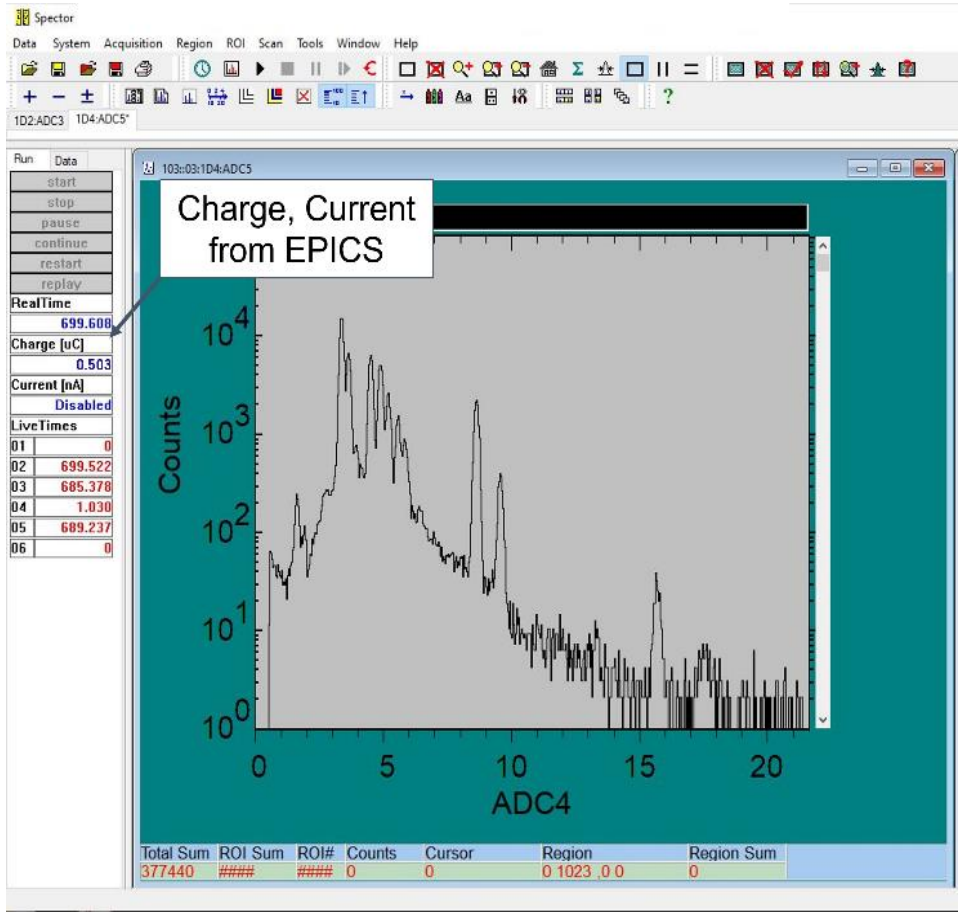


EPICS Implementation

- IOC for PLC database access:
  - Get valve status
  - Control position of the valve
- IOC for electrometer operation:
  - Initialization (Zero set, zero correct)
  - Set mode to Charge measurement
  - Calculate the current by monitoring the charge difference over a set time interval
- EPICS communication is implemented into the acquisition software - “Spector”
- Server is set up to host created IOCs



DAQ Software



Results

Upgrade well accepted by researches due to minimum changes in measurement procedure

Increased beam time utilization efficiency, by automation of sample analisys

Highly reliable, error free system is achieved

Stimulated researches to suggest further automation on other beam lines

Challenges Faced

Unpredictable response time due to hardware delay

Pneumatic valve delay

Spector written in C with WIN32 libraries. Difficult to modify due to unstructured code

Ongoing Upgrades

Integration of sample position reader into EPICS for feedback loop implementation

Acquisition system integration in EPICS