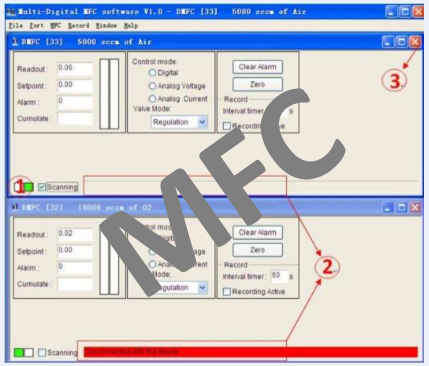
Integrated Utilisation Environment (IUE)

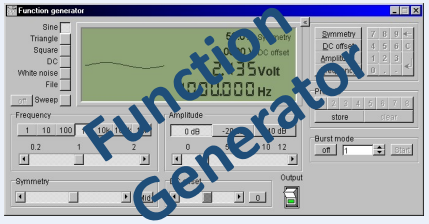
Just as Integrated Development Environment (IDE) provides a self contained complete environment for development, testing and deployment, an IUE automates the sub systems of an experimental setup, their interaction with each other and interaction of the user with the sub systems in the required sequence

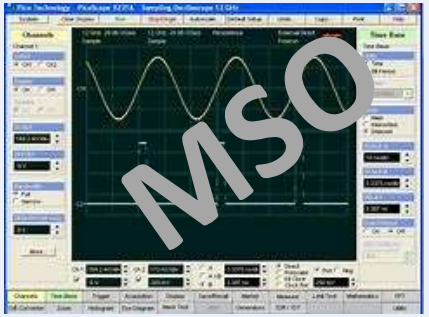
Standard instruments are supplied along with test software: Utilisation is possible only in stand alone mode and no scope for customisation

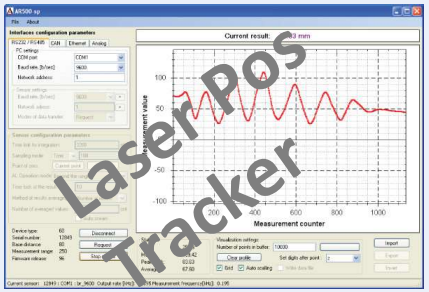
IUE is a common umbrella for utilization of experimental facilities that provides benefits of perfect synchronisation among various stages of an experiment and accurate processing of data with no human error factor.

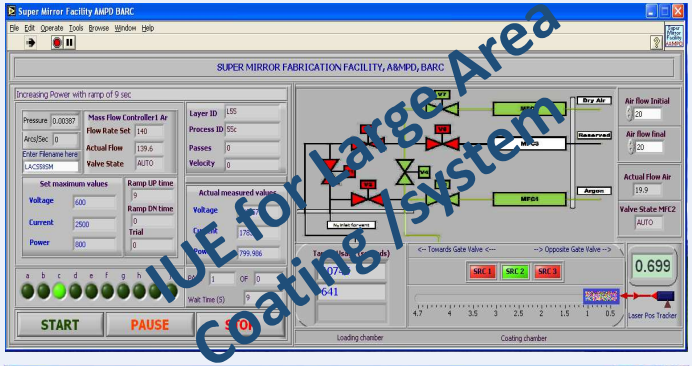
IUE has great advantages of Scalability, Portability, Maintainability derived from customized in house development that requires COHERENT SYNERGY among participating disciplines, an inherent strength of Atomic & Molecular Physics Division of Physics Group, BARC

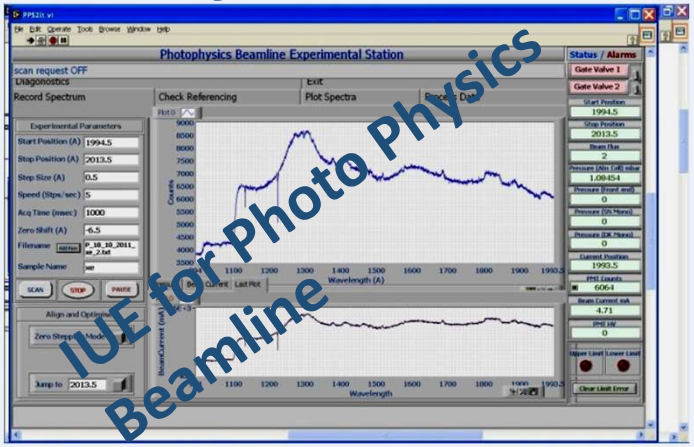


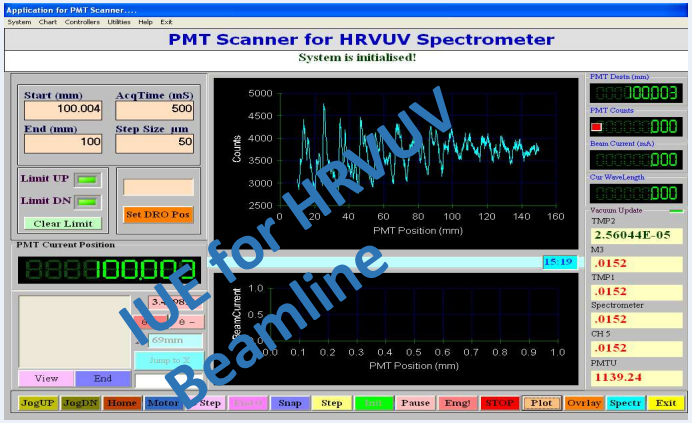












COHERENT SYNERGY OF WIDE VARIETY OF DISCIPLINES EXISTING IN A&MPD : PHYSICS GROUP

IUE is implemented as the GUI software that serves as an umbrella encompassing the sub systems providing for their utility in a variety of modes

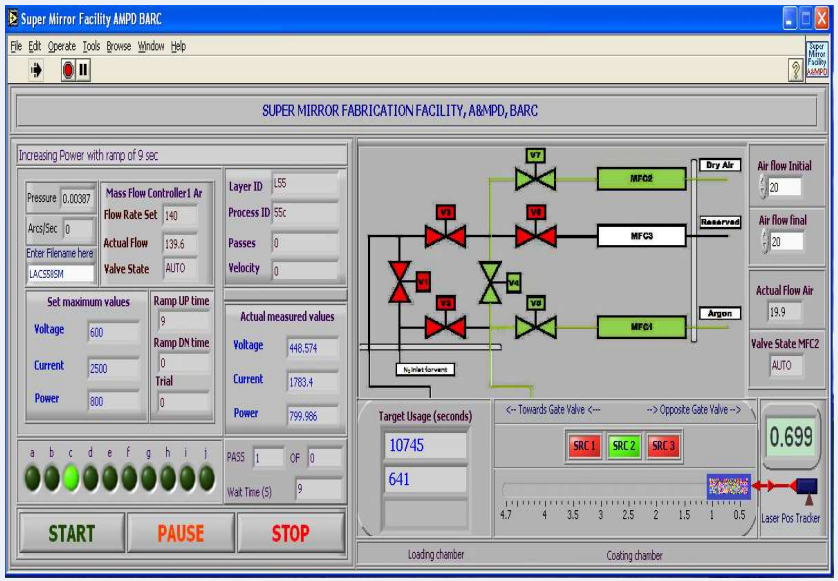
Thorough resonance of thought process among members of participating disciplines is a must at every one of these six steps of IUE development

The much needed resonance comes as a natural consequence of continuous interaction of members from all the participating disciplines, as all of them are in house with familiarity about interface areas of their respective disciplines – EASE OF CONVEYING THE REQUIREMENTS BY DESIGNER & PROPER UNDERSTADING OF REQUIREMENTS BY DEVELOPER

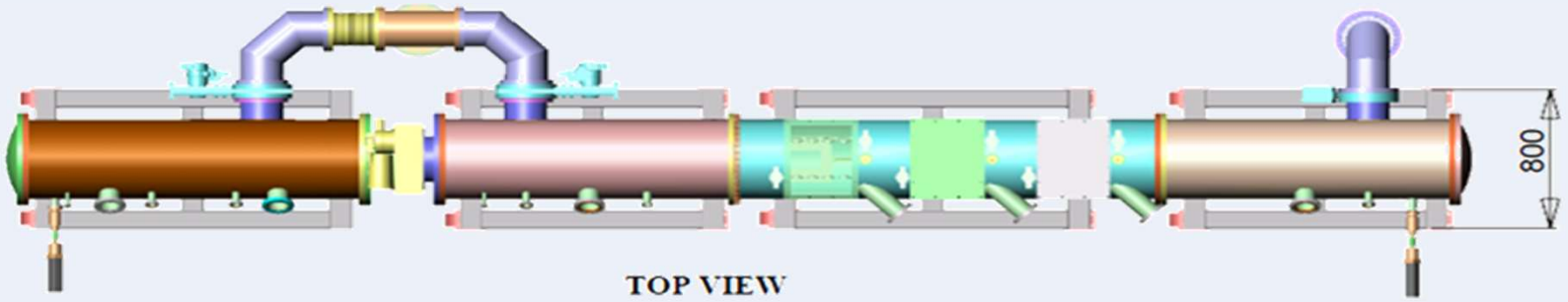
IUE for Process control of the Large Area Coating System for fabrication of Neutron Super Mirrors

- DC Magnetron sputtering based PVD system capable of fabricating 150cm x 15 cm super mirrors

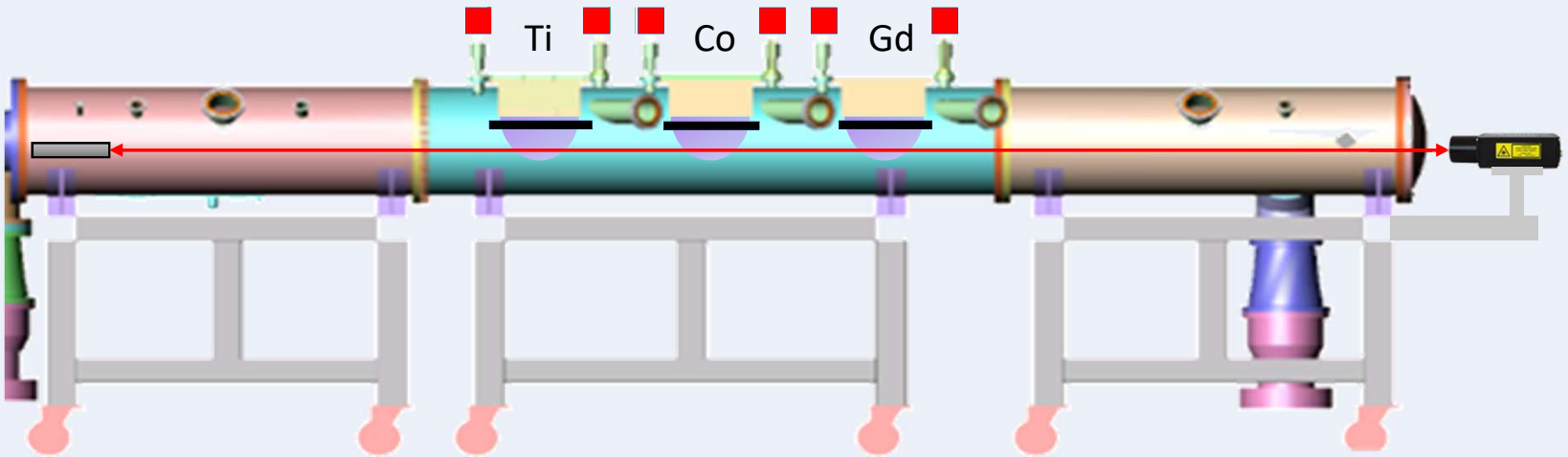
- Sub systems:
  - Shuttle Movement Controller – Microcontroller based
  - Function generator for fine movement – RS-232
  - Plasma Power supply control – Profibus – serial
  - Mass flow controllers – RS-232 and USB
  - Gas manifold controller – Microcontroller based
  - Laser position tracker - Rs-232
  - Quartz crystal microbalance – SCPI telegrams-RS-232
  - Vacuum monitoring – RS-232
  - Shutter & Gate valve control – Microcontroller based

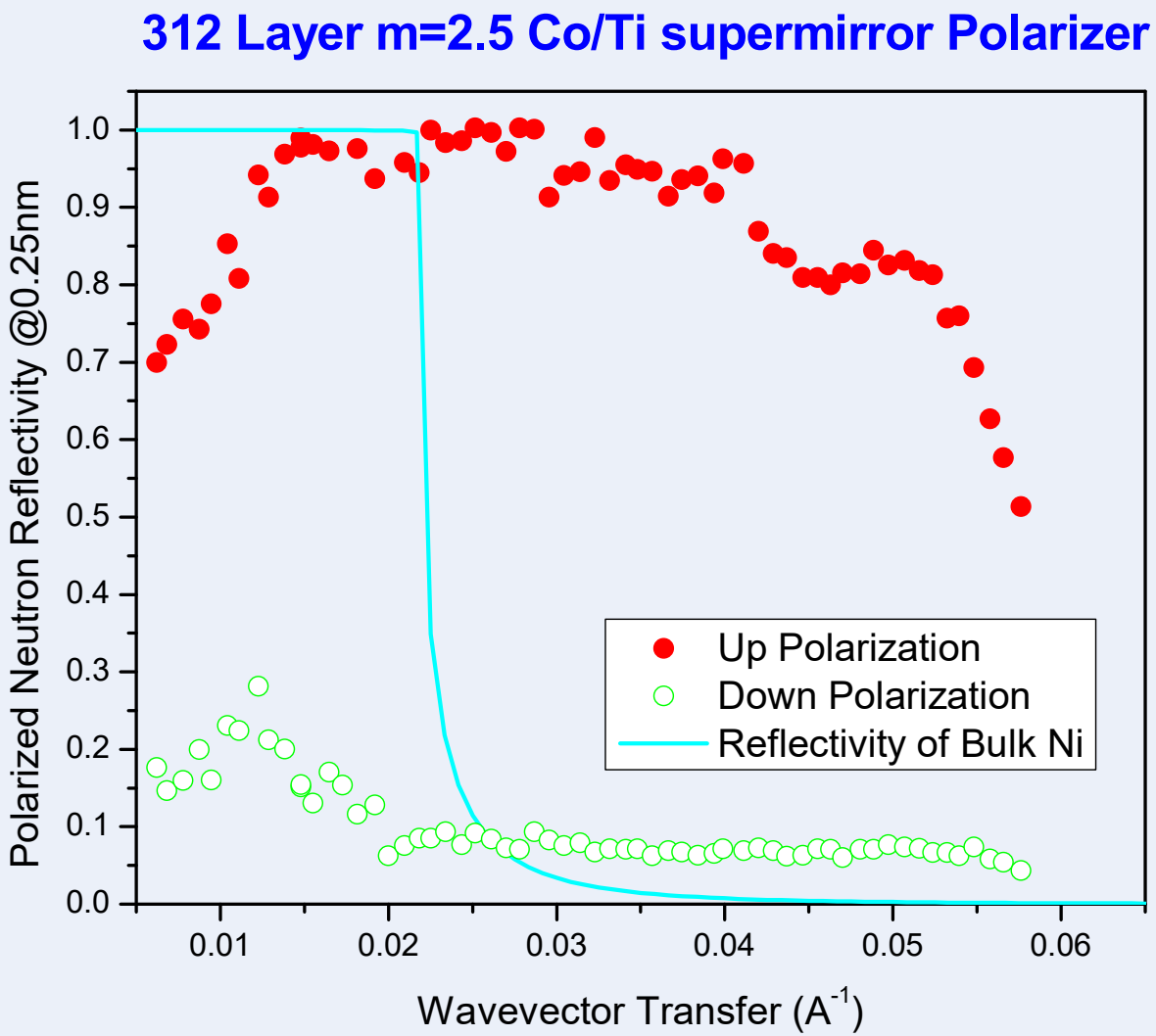


- Layer table fed by the Thin film physicist
- Target material parameters are fed in a file
- IUE generates process table that divides the process in to sub processes starting from a to j
- Once the Layer table is set, whole deposition process starts with the click of a button and goes on without human intervention and process parameters are logged for online compliance
- Provision to pause process and restart with corrected parameters in case of deviations
- On panel mimic of gas manifold status and substrate movement

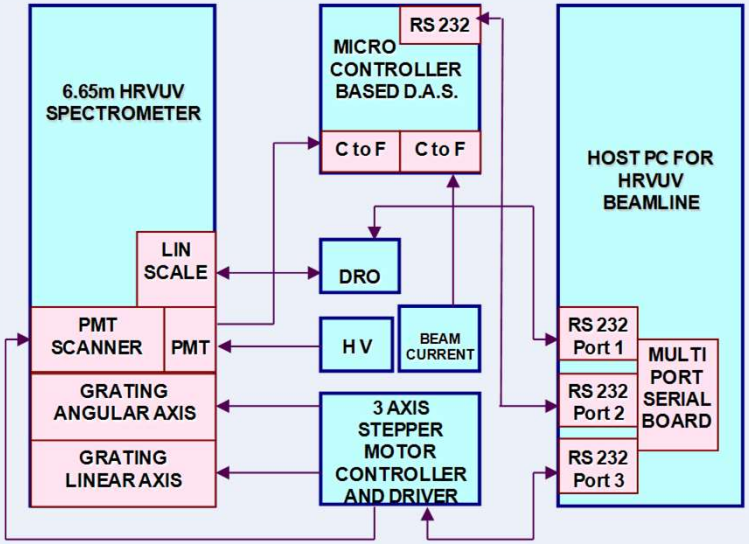


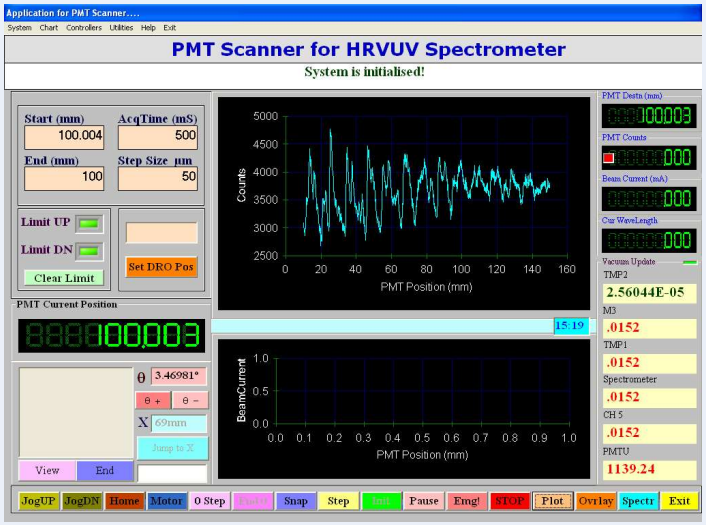
TOP VIEW

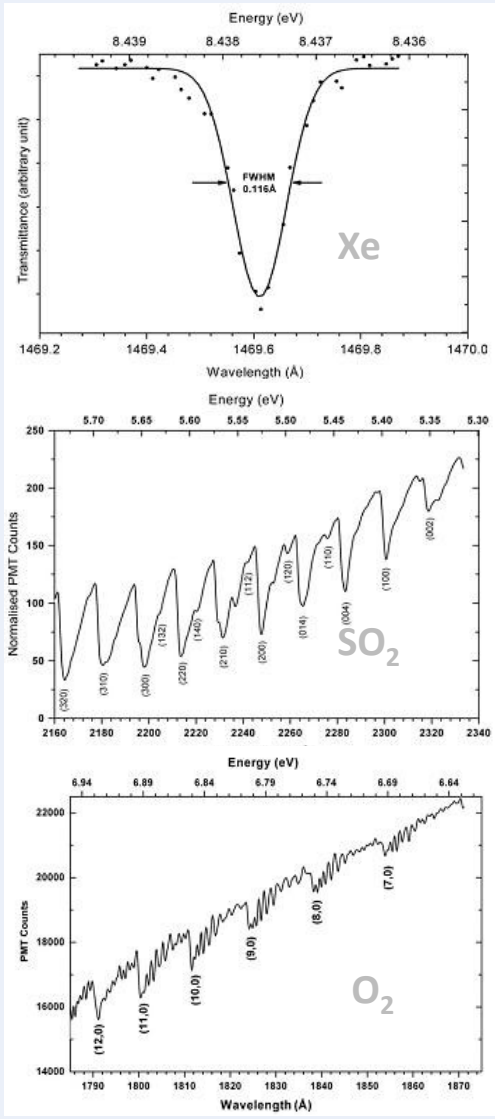



312 Layer m=2.5 Co/Ti supermirror Polarizer
Polarized Neutron Reflectivity @0.25nm
Wavevector Transfer (A-1)
Up Polarization
Down Polarization
Reflectivity of Bulk Ni
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1.0
0.01
0.02
0.03
0.04
0.05
0.06

IUE for Control and data acquisition from HRVUV beamline

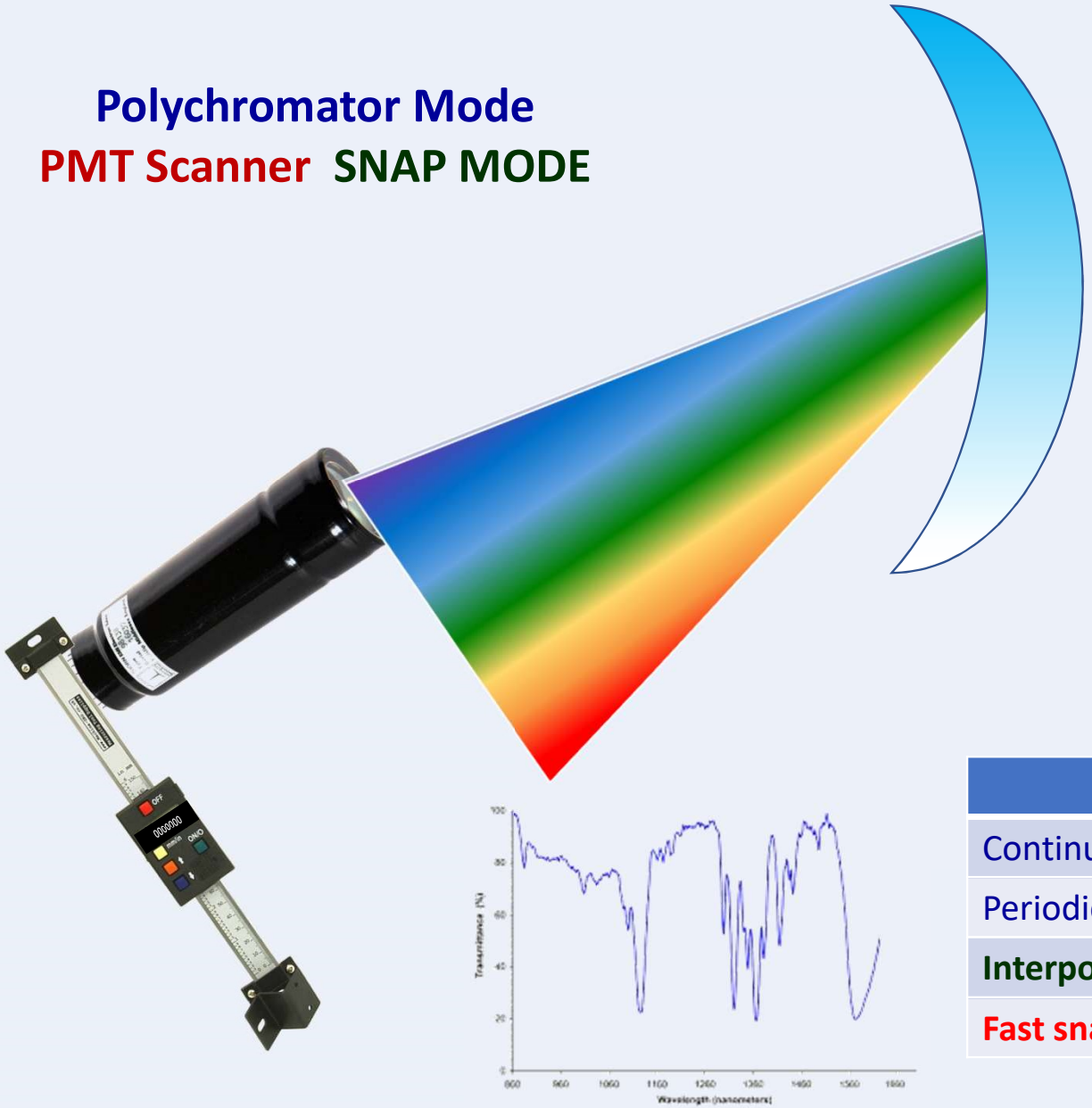






- Atmel 89C52 Microcontroller based 2 channel DAS
- Lo and Hi Sensitivity settings
- Embedded ActiveX object for Supervisory motor control system
- Visual BASIC 6.0 based IUE
- Move to calculated position corresponding to central wavelength
- Background monitoring of pressure at various points
- Single button homing of X,Y and R axes
- Input data validation and interaction sequencing

Polychromator Mode
PMT Scanner SNAP MODE

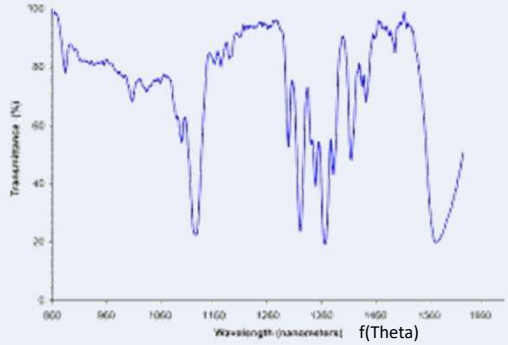


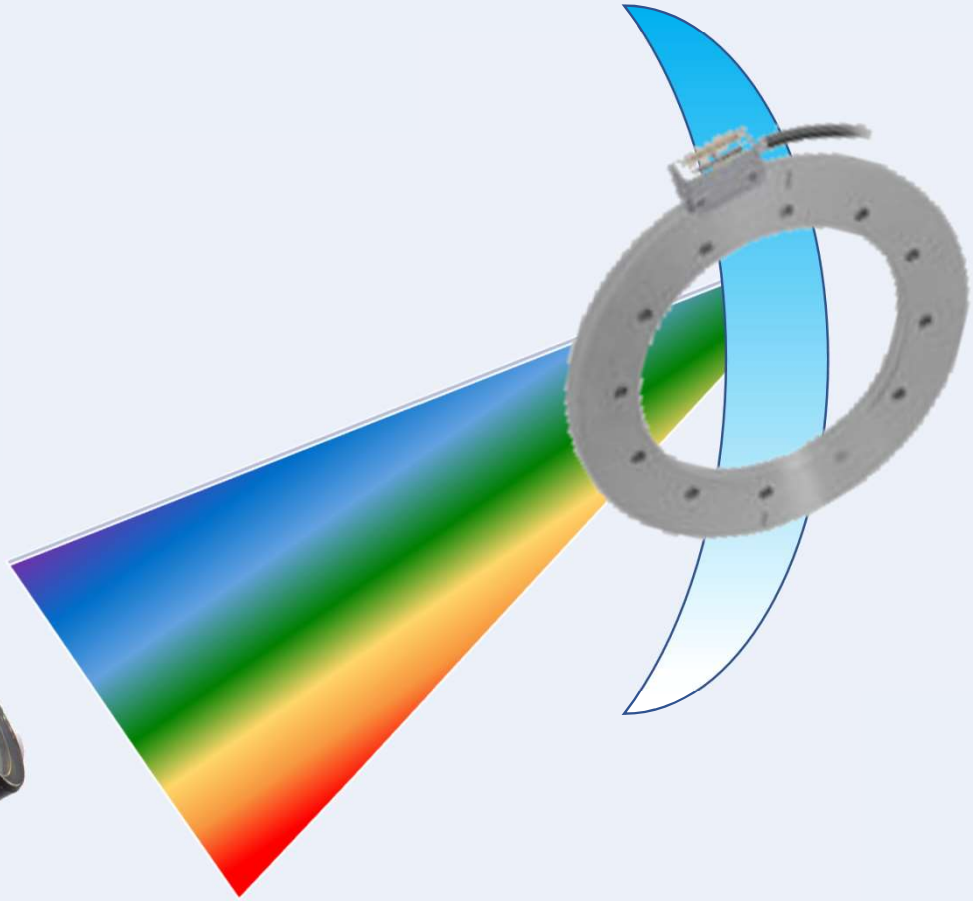
- Grating at fixed position, PMT motion in Y axis
- Spectral lines on image plane - Y axis
- Reciprocal Linear dispersion of 1.24A/mm at the image plane – Y axis – PMT movement
- 10mm Pitch of Linear actuator
- 1m linear scale with 1 micron least count
- 1:60 reduction by Worm & Wheel arrangement
- One revolution of motor : 166.66 um Y motion
- Micro stepping setting at 2000 for smoothness
- 0.08 um Per motor step << Least count of 1 um
- 1 micron least count corresponds to 0.124 pm
- Two channel DRO with position data logging
- Compact 4 channel data acquisition system
- User selectable sensitivity for data acquisition
- Online Beam current and pressure monitoring

SNAP MODE	STEP SCAN
Continuous PMT movement	Step by step movement
Periodic acquisition	Acquisition at every step
Interpolation of data	Actual PMT position (DRO)
Fast snapshot of wide range	Specific small region scan

Monochromator Mode - Grating angle Scanner

- PMT at fixed position, Grating motion in R axis
- Spectral lines at central wavelength position
- Renishaw make 15cm Ring Encoder
- Ultra high vacuum compatible ring
- 20 um pitch on 15 cm ring : 23571 ppr
- Further Interpolation by 4000 : 94284000 ppr
- USB-QUAD08 fast pulse counter
- Visual C++ based driver for the pulse counter
- Exact angular displacement of the grating in known, as ring is installed on grating mount
- Non contact readhead
- Angular position readable with minimum step size of 3.6 microdegrees corresponding to 0.0005A at the image plane
- Integration of 0.5 monochromator for fluorescence studies

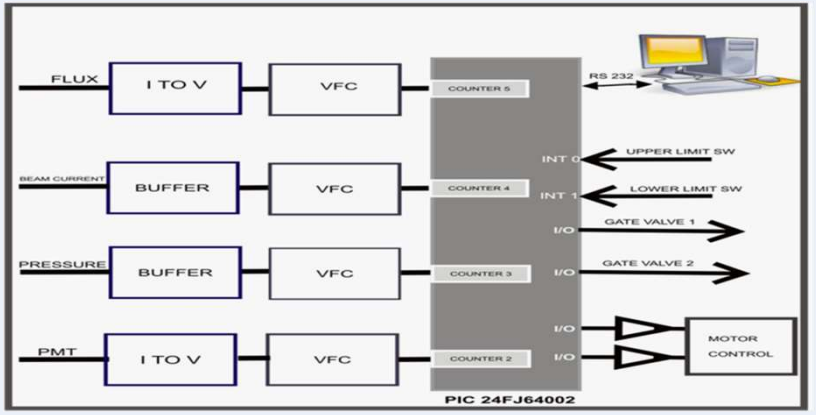


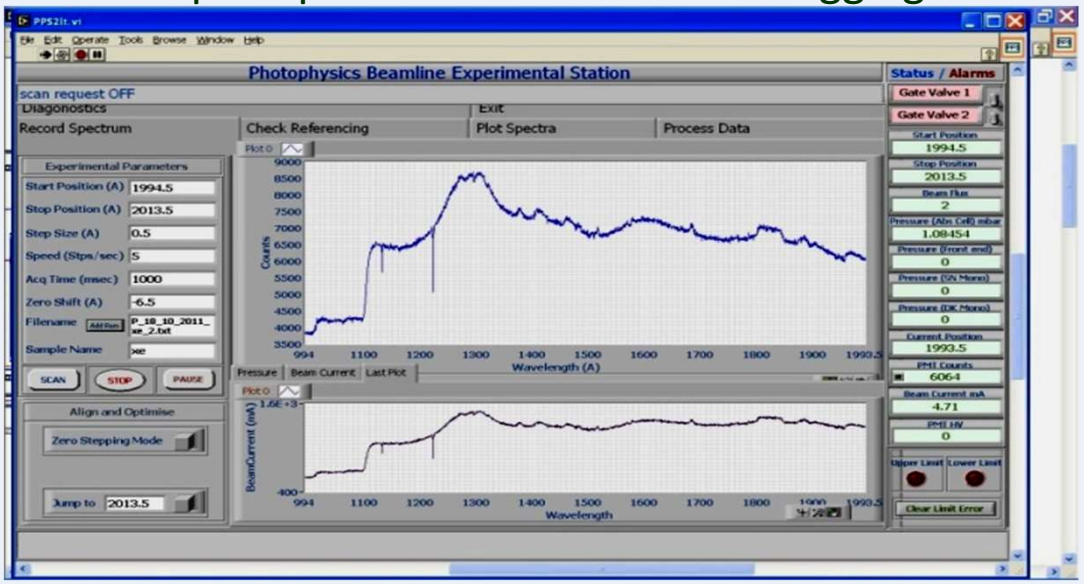


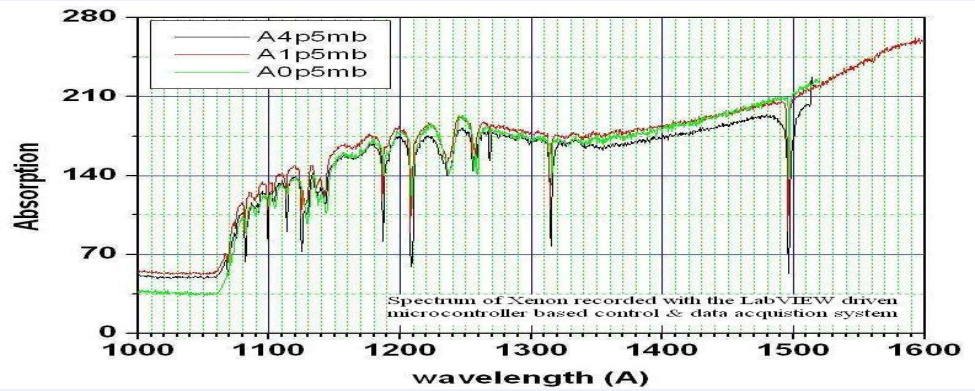
f(Theta)

Integrated Utilisation Environment - software for PPS beamline

- PIC24FJ64GA002 Microcontroller based movement control and 4 channel data acquisition system
- C to F converter based DAS with 10^6 dynamic range
- Simultaneous acquisition from all channels for fast scan
- LabVIEW based experimental station software (IUE)
- Overlaid display of PMT signal, beam current, cell pressure and previous spectrum
- Improved resolution of 0.6A with microstepper (MODBUS–RTU)
- User prompts and user interaction logging

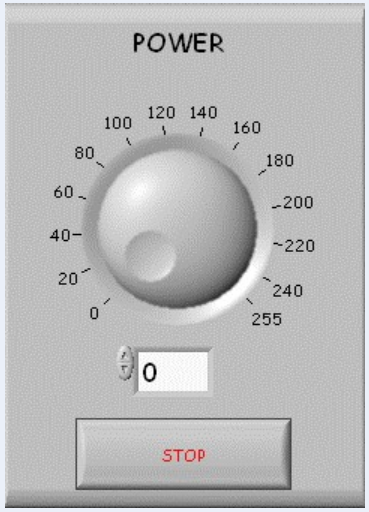


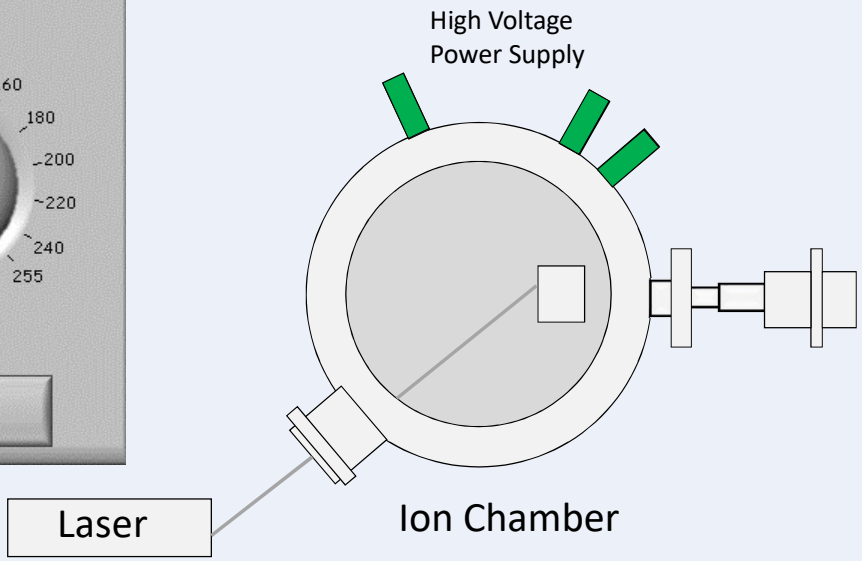


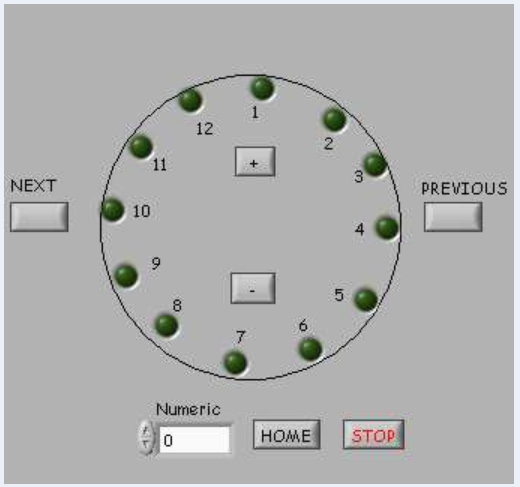


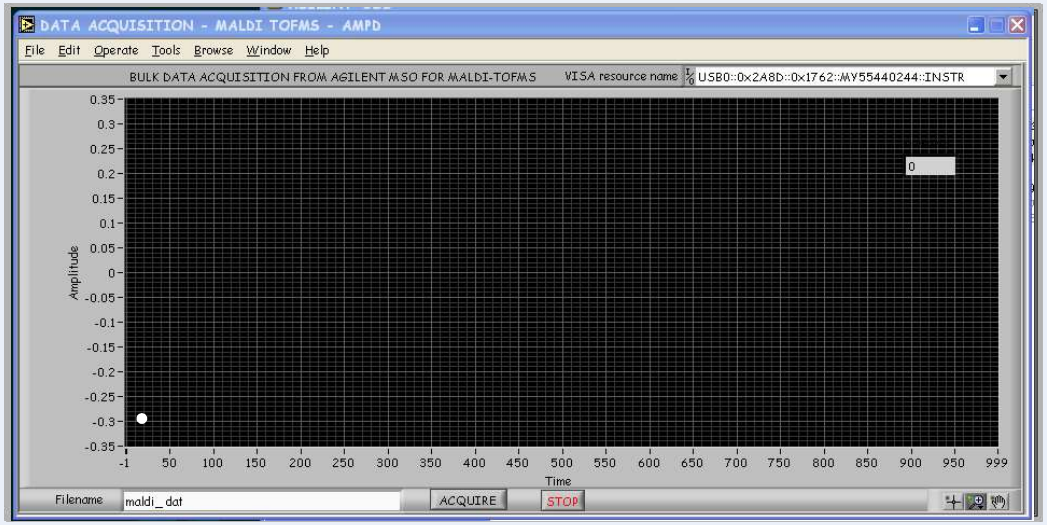
- Zero order calibration of movement control system
- Tested by recording Xenon spectrum at different pressures of 0.5, 1.5 and 4.5 mbar
- Reproducible spectra without non linear shift

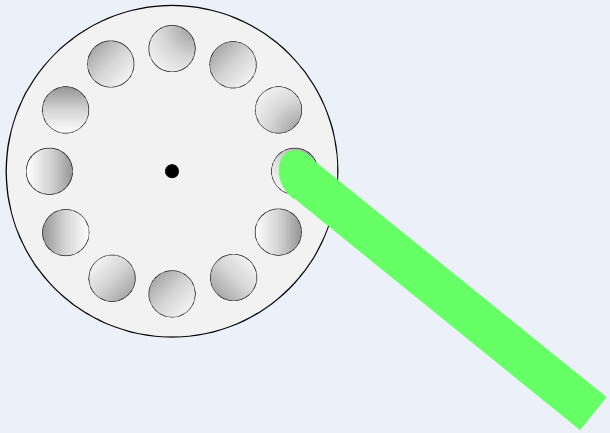
Integrated Utilisation Environment – Matrix Assisted Laser Desorption Ionisation Spectrometer (MALDI)



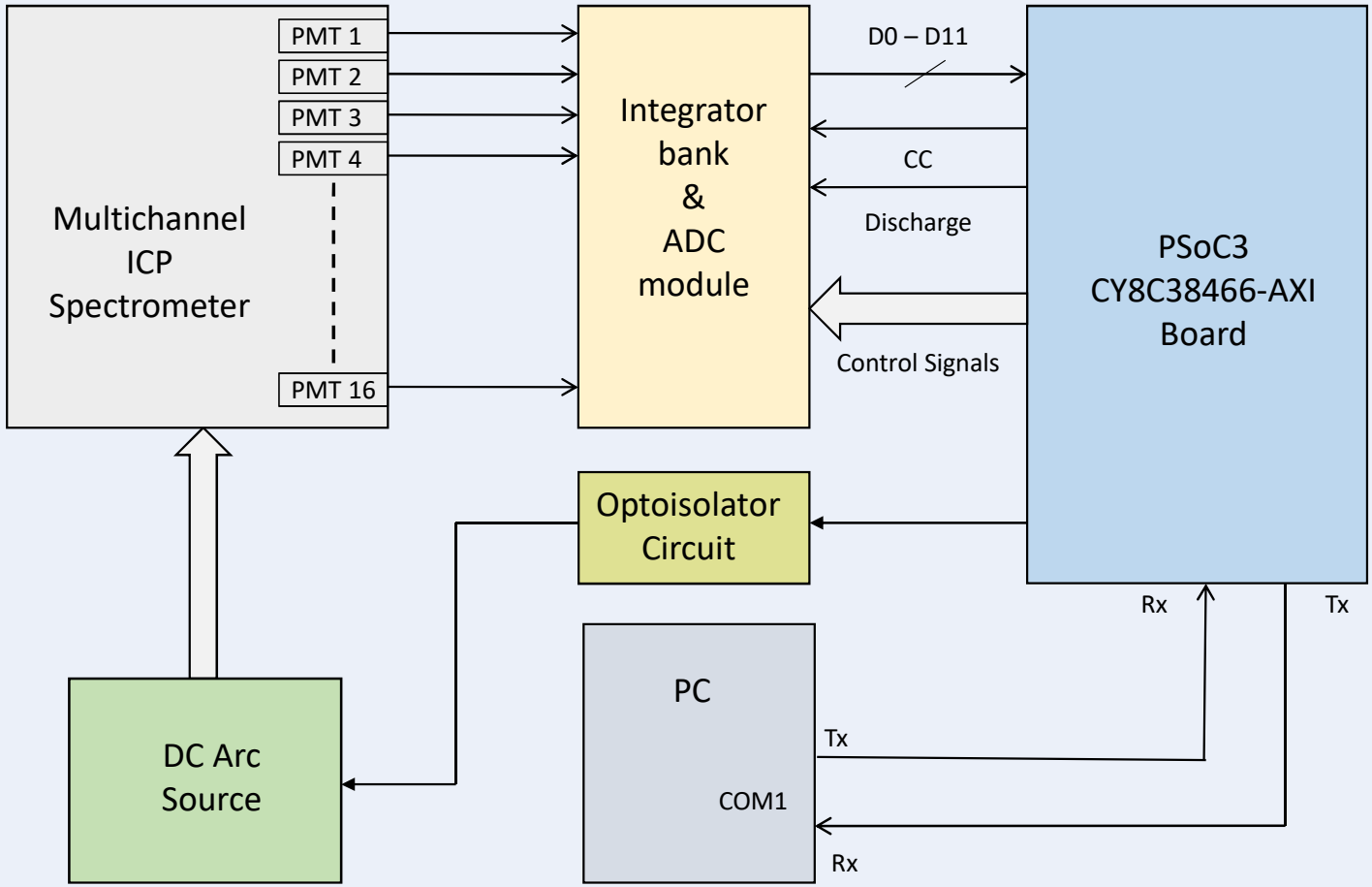




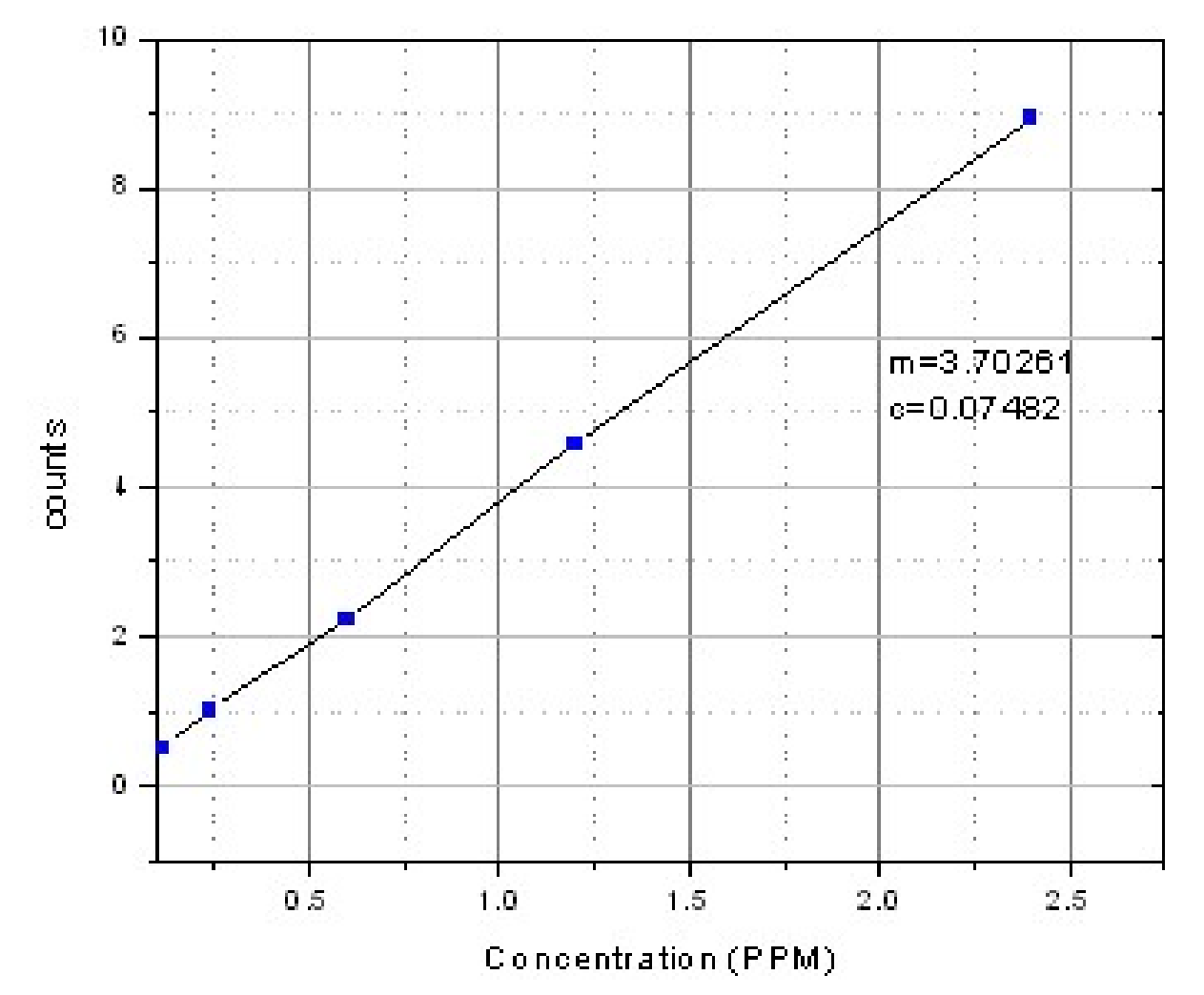




PSoC based Control & Data Acquisition System for Multichannel ICP Spectrometer



Spectro Chemical Analysis : Calibration curves



Systems being developed:

1. Process control system for VERA VTD electron beam evaporation based PVD system

1. PLC based controller for analog and digital control and monitoring of sub sys
2. Integration of XTC
3. Integration of Optical Monitor
4. Industrial PC and IUE for process control

2. Portable instrument for HDO detection

1. 16 bit DAC for bias control ramp for tuning of Diode Laser
2. Analog to digital converters for data acquisition
3. I/O controls for pump control
4. PSoc3 based embedded control
5. GUI on HMI

3. Movement control system and data analysis software of Optical Coherence Tomography based instruments for estimation of surface roughness of components made of high density materials

1. Microstepping motor control
2. Data analysis software for 3D plotting and estimation of error signal to compute surface roughness