EPICS at APS Beamlines

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EPICS applications for synchrotron beamlines (synApps)

- Standard EPICS base & extensions
- Standard EPICS modules (e.g., MPF)
- synApps modules (std, motor, MCA)
- synApps-compatible clients

synApps

- Custom EPICS records
- Custom EPICS device-support modules
- Other custom infrastructure (e.g., autosave, recDynLink, saveData)
- Custom EPICS databases, MEDM displays
- Custom clients (e.g., scanSee)
- Matched to a version of EPICS base

Just to clarify…

- We didn't write everything in synApps
- One function of synApps is to bundle compatible versions of selected EPICS software – wherever developed – into a single tar file that can run a beamline

Basic record/device support

- Motors
- Scalers
- Multichannel analyzer
- Multichannel scaler
- Serial (RS-232)
- GPIB
- ADC's
- DAC's
- Encoders
- Optical table
- String calc, sequence
- Complex expressions
- Enhanced PID
- Scan
- Scan parameter
- Generic VME

Layered devices, techniques

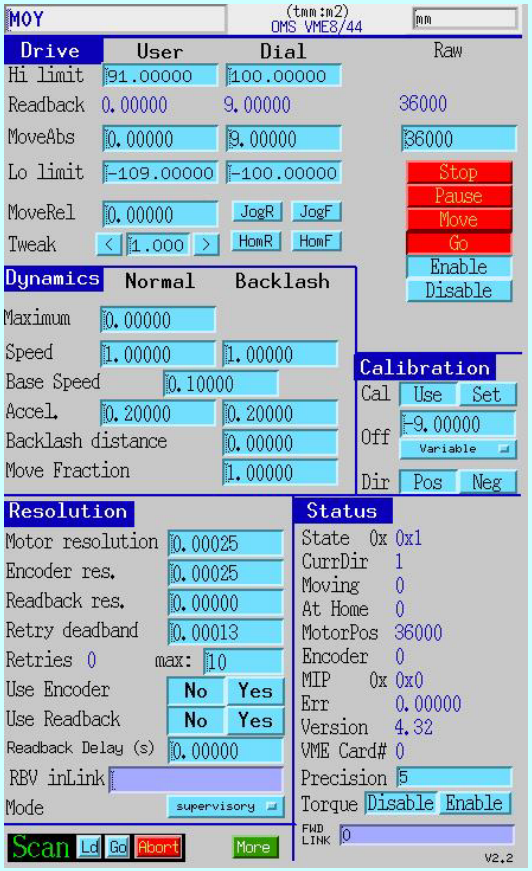
- Optical tables
- Slits
- Mirrors
- Monochromators
- Piezo controller
- Digital Multimeter
- Current preamplifier
- Interpolation
- N-step measurement
- Serial I/O block
- GPIB I/O block
- Autocollimator
- Temperature controller
- X-ray microscope
- Insertion device
- Filter/shutter

Other support

- Autosave (save parameters through reboot)
- saveData (store scan data to disk)
- Clients to display scan/MCA data
- Programs to handle MDA, NeXus data files
- recDynLink (adds notify-when-done link)

Motors

- Stepper, servo
- Oregon Microsystems
- Newport
- Intelligent Motion Systems
- McClennan
- Soft support

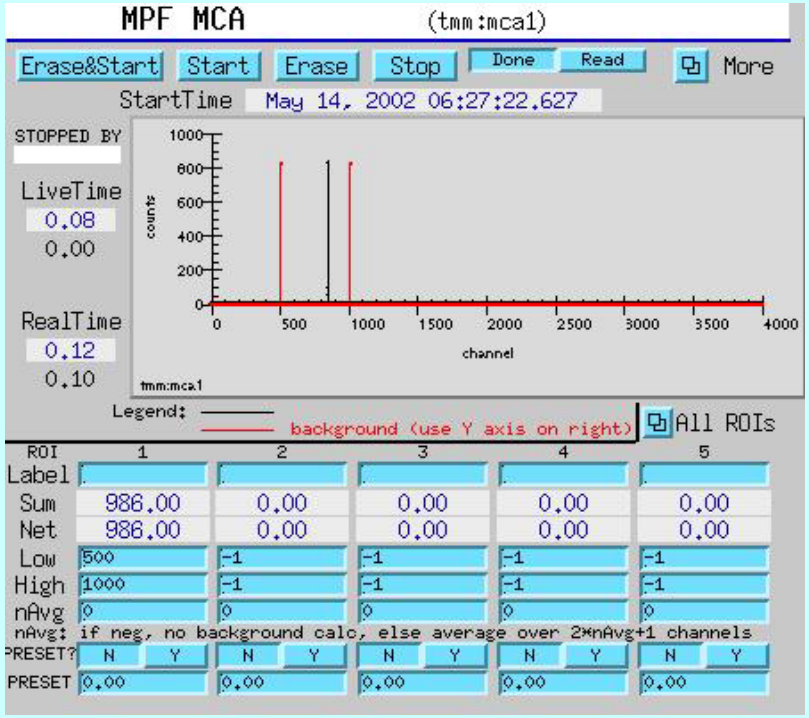


Scalers

- Multiple preset scalers
- Background count interrupted by data-acquisition count
- User-programmable end calculations

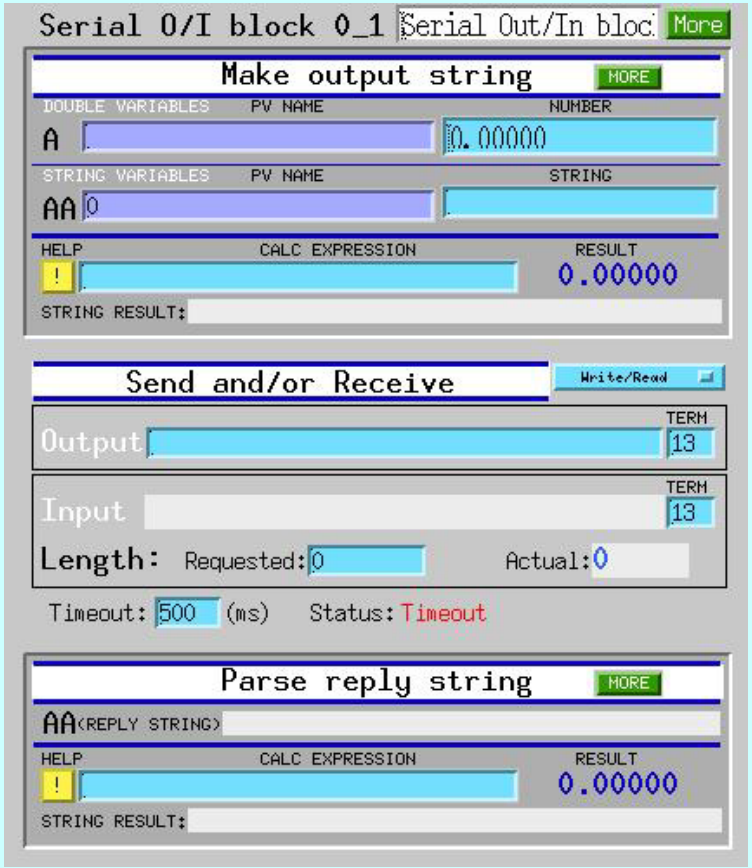
Multichannel analyzer

- Canberra AIM
- XIA DXP
- 32 regions of interest
- Halt acquisition on ROI preset
- Background subtraction for ROI sums
- Also supports sampling ADC (Acromag IP-330)



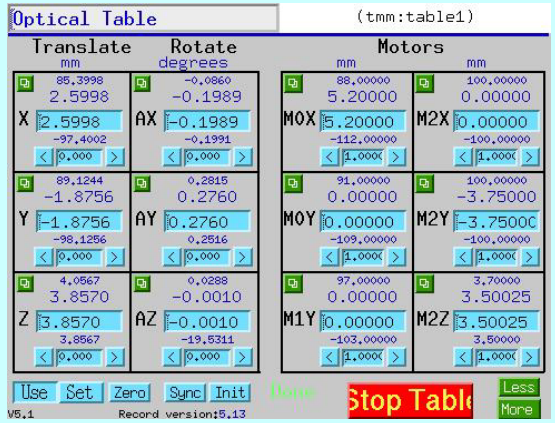
Serial O/I Block

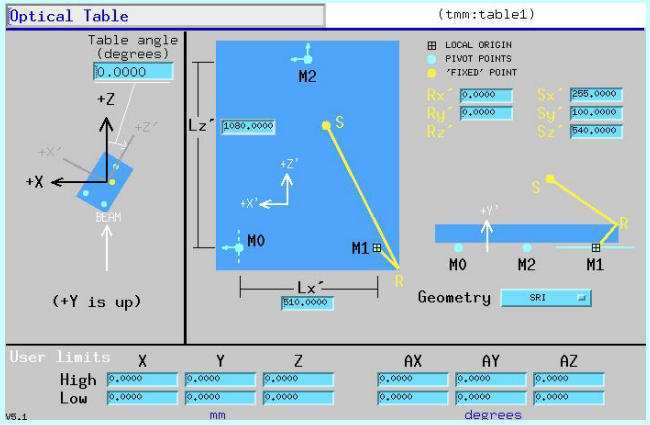
- Combination of string calc to construct output message, serial record to send and/or receive, and string calc to parse reply
- Intended for run-time programming
- Similar GPIB support



Optical table

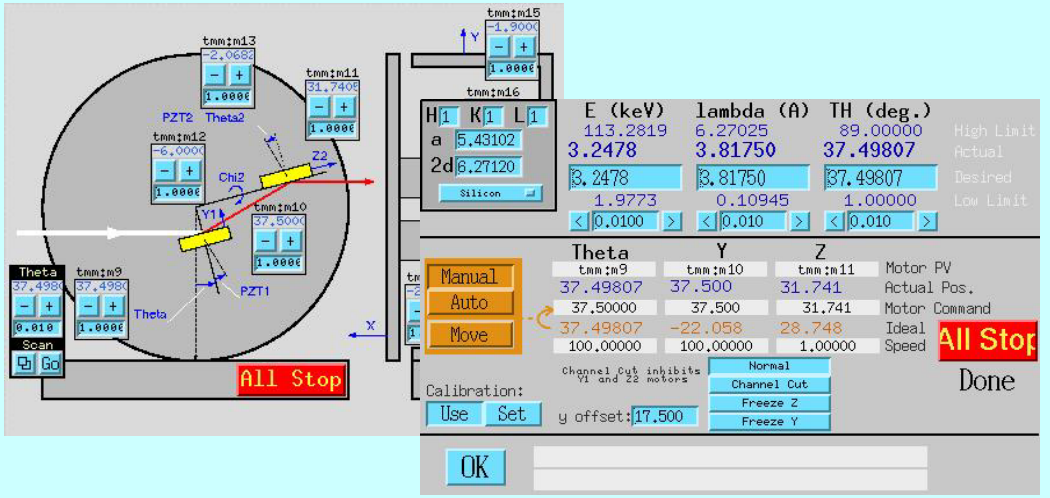
- 5/6-motor optical table
- User specifies point about which table rotates
- Exact virtual-to-motor and motor-to-virtual
- Specific geometries (adding a new geometry is hard)

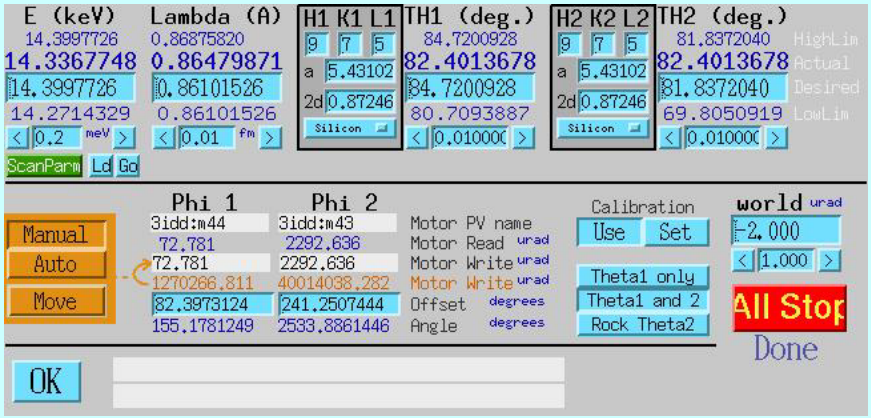


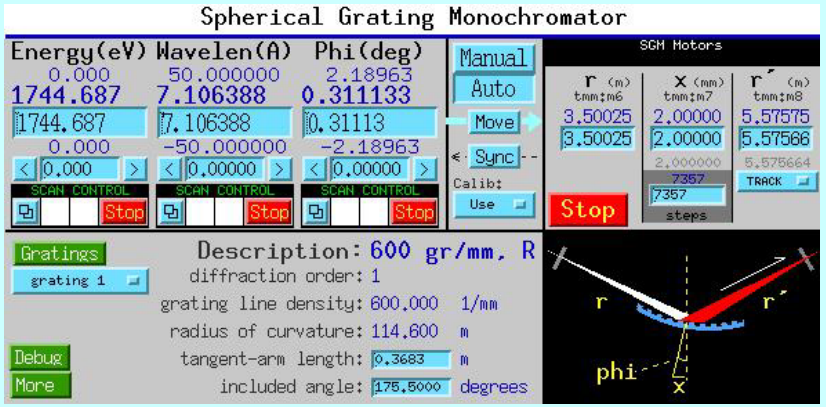


Monochromators

- Double crystal (dispersive, nondispersive)
- Spherical grating

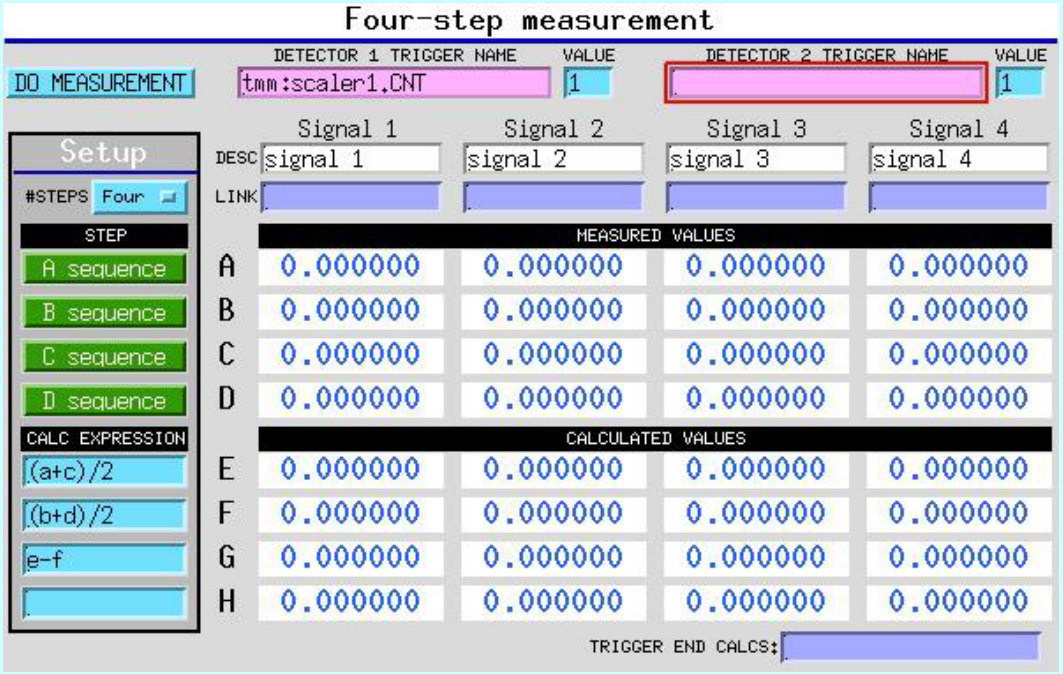


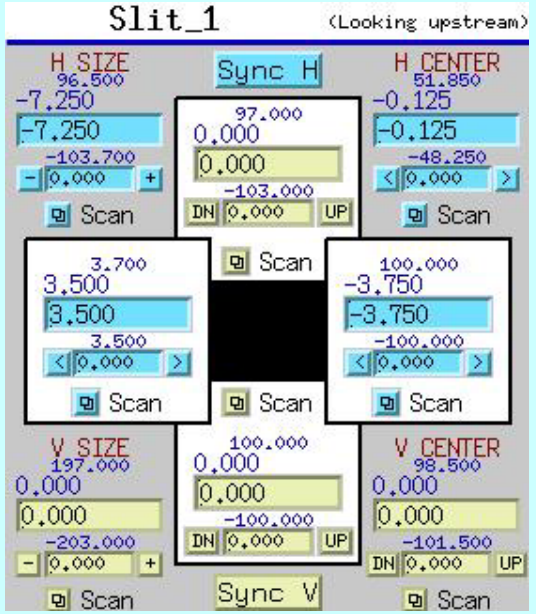




Miscellaneous

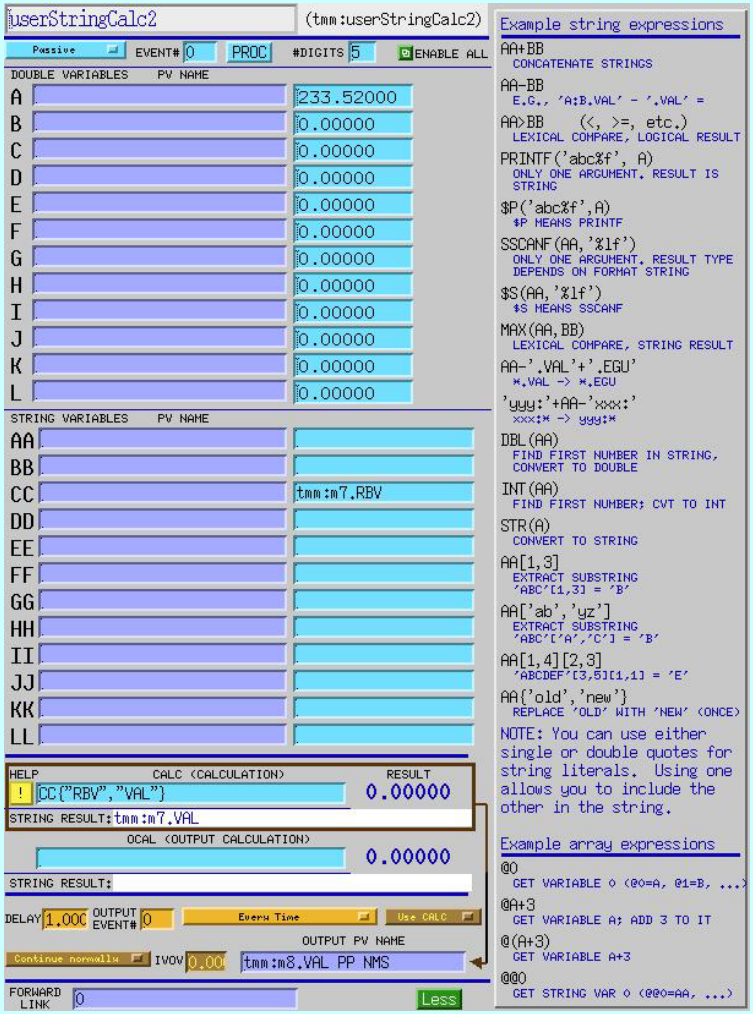
- Slit
- Sample Wheel
- 4-step measurement





String Expressions

- Extends CALC record to combine string and numeric expressions
- Useful for run-time programming of serial devices
- EPICS links are *programmable* at run time



Scans

- Multidimensional
- 4 positioners, 4 detector triggers, 70 signals
- saveData client writes data to NFS-mounted disk
- Can acquire arrays (e.g., MCA spectra)
- ~300 Hz on MV162
- Start/end, table, on-the-fly
- Also for 1-dimensional automated alignment

Clients

- MCA display (IDL program)
- scanSee (IDL program for 1D, 2D, 3D data)
- Plot_data (Python demonstration)
- PVMail (send email when PV value violates boundary)
- Misc. experiment-specific user interfaces in tcl/tk, python/tk, Igor, IDL, java
- Channel Archiver
- **B**ack**U**p/**R**estore **T**ool
- StripTool (strip chart)
- …

Autosave/restore

- Saves PV values (e.g., motor positions, scan config) through reboot
- Defends against crash during save operation
- Typically 80 values saved every 5 s, 3000 values every 30 s
- New features:
- Include files
- Macro substitution
- Dated backups (reboot history)
- Choose save/restore directories

CCD support

- CA server on CCD's native platform
- Calls vendor-supplied software
- Stores images to local disk (HDF format)
- Some simple image analysis
- Hosts EPICS PV's for control

For more information

- EPICS

  `www.aps.anl.gov/epics`
- synApps

  `www.aps.anl.gov/xfd/bcda`

  `cars9.uchicago.edu/gsecars/index.html`