

LEReC Controls: Tasks for FY17

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8/15/2016

Main Sequence of Activities

- **Laser Testing** – Late Sep
- **DC Gun Installation & Testing** – Oct
- **DC Gun Conditioning** – Oct/Nov
- **Initial Beamline Installation & Testing** – Sep through Dec
- **180° Bend Magnet Testing** – Fall, prep for FY18
- **Dry Run** – Dec?
- **Laser & E-gun Beam Operations** – Dec through ?

Laser Testing

- Bob Olsen has started the software interface development for the Applied Motion Products ST5-Q-RE model motion controller
 - Expected to be primary controller for all LEReC sub-systems
 - Working through test setup communication problem at the moment
 - Basic functionality should be available soon
 - Need to establish more detailed specs, especially for special roles (ex. Solenoid magnet alignment)
 - Do we need faster than 1Hz updates on position readbacks anywhere?
 - Which cases might require sequenced motion between multiple planes?
 - What features need to be included in lower-level ADO software, versus a higher-level ADO manager?
- When will the laser stabilization system be tested?
- Offline discussions are needed on other laser diagnostic tools
 - Autocorrelator measurement
 - Laser light power meters
 - Flipper Mirror
 - Filter Wheel

DC Gun Installation & Testing

- DC Gun Interface Software
 - Prerana has beta version developed
 - Features needed for operations (ex. alarming, conditioning sequence tools) need development
 - How much testing time might be needed once the gun is online? 1 wk?
 - Prerana will join C-AD crew on Cornell site visit to witness conditioning with their EPICS interface

DC Gun Conditioning

- Vacuum Systems
 - “Hot Cathode” Gauge Controllers
 - Vacuum Group reported last week that they’ve chosen a model and expect delivery by sometime in Sep
 - Will be needed for high vacuum measurements and machine protection
 - We’ll do our best to prepare a software interface once details are available
 - This task is currently the highest risk for the project... lab testing will be needed prior to the start of gun conditioning
 - Other more familiar systems will require administrative configuration
- Cooling Systems
 - No separate interfaces planned... is something missing here?

Initial Beamline Installation & Testing

(1/5)

- Timing System
 - Fast Timing
 - When does the initial version need to be available for the Laser?
 - Are we missing any specifications?
 - Slow Timing (Beamsync)
 - Will there be any need to have Beamsync running prior to the Fast system being online with a live reference?
 - Should we deploy the same hardware/software scheme used at CeC, using V194/V202 combo for maximum Instrumentation flexibility?
 - Need to sort out Beamsync events
 - Likely need to develop Timing ADO manager like CeC's, though this case is potentially more complex due to Fast system
 - Application interfaces
 - An updated version of EventLinkDisplay will be needed for the Beamsync portion of the system (at least)
 - How will the Fast system activity be monitored? Off-normal event capture rather than all activity?

Initial Beamline Installation & Testing

(2/5)

- Machine Protection
 - National Instruments CRiO platform implementation is planned, similar to Elens/ERL/CeC
 - Will need LabView and ADO manager software development, though no novel functionality is anticipated
 - Mode of operation input
 - Anticipate the requirement to lock input enable statuses AND analog input trip thresholds for operations (using BisConfig, by FY18?)
 - Syndi display interface expected (a la CeC)

Initial Beamline Installation & Testing

(3/5)

- Instrumentation
 - Winston has started Zynq platform FPGA/ADO development for the following sub-systems
 - FCTs
 - Faraday Cups
 - ICT
 - Halo Scrapers (?)
 - Clear specs need to be established for the MPS functionality for any required sub-systems
 - GigE cameras (laser profiles, e-beam profiles, cathode imaging)
 - A new Allied Vision Prosilica camera supporting a color imaging sensor and programmable iris is on order
 - Bob will work on adding feature support to the existing ADO manager
 - Wenge will work on adding support for the new features to the cameraViewer application and ADO manager
 - When are these needed for testing?

Initial Beamline Installation & Testing

(4/5)

- Instrumentation
 - PMT BLM system
 - Met twice in last three weeks to establish development plans for existing JLab VME board firmware and our ADO/driver software
 - Plan to make use of external input for capturing BLM post-mortem data on all MPS interlocks
 - I'm tasked with the ADO manager development that will provide a mechanism for baseline taking, expert calibration control, as well as info sharing with an updated application
 - Goal is to be ready to test completed system by early Dec
 - How should post-mortem data be visualized?
 - BPMs
 - Anticipate using Libera units for upcoming year
 - V301s will also be used
 - Expecting completion of an ADO manager by Peggy that will aggregate data, which will require changes to orbitDisplayApp
 - When might machine protection "locking" of threshold controls be needed in ADOs?
 - DCCT
 - ERL DCCT platform, consisting of NI PXIe hardware will be moved to LEReC
 - Don't anticipate much Controls support needed here
 - What are the specs for diagnostics AND machine protection, if any?

Initial Beamline Installation & Testing

(5/5)

- Instrumentation
 - Beamline (and Dump?) Thermocouples
 - What functionality is required?
 - Diagnostics at $\sim < 1$ Hz rates?
 - Machine protection?
 - Support administrative configuration of all support systems (ex. analog/digital I/O, AC resets)
- Power Supplies
 - Administrative configuration for power supplies being appropriated from ERL
 - Some potential interface improvements (ex. alarm functionality) to ERL PS software
 - Configuration of Caen PS remote interface software
 - Expected in Sep, after racks are ready
- Controls Workstations
 - We plan on moving two machines from the ERL CR to 1002D when infrastructure is available

180° Bend Magnet Testing

- Original plan calls for independent magnet testing using NSLS-II PSC/PSI hardware
- Andrei has developed a EPICS/ADO bridge interface that can support the initial testing
- There is an alternate PS controller being evaluated from Caylar that includes an NMR input
- Has a decision been made on the alternate plan?
- Are we still using a DCCT from the PS as an input to the MPS, rather than using the NMR output status?

Dry Run

- Dmitry has requested one as part of his Commissioning Plan
- Should be executed no more than about three weeks prior to anticipated start of operations, to allow time for most development to be completed in advance as well as time for corrections to be applied afterwards
- Should be independent of RHIC Dry Run where possible
- Is there a logical range of available dates?
- Controls Group typically helps with technical organization, with a champion from AP Group
- Expect to get both Timing systems online, double check Instrumentation, validate machine protection, confirm software interfaces are working

Laser & E-gun Beam Operations (1/2)

- Operations Tools
 - Cathode Quantum Efficiency scanning
 - Software development is needed for:
 - Hardware interface ADO (Newport controller?)
 - Correlation of X/Y motion on cathode versus instrumentation signal (done for ERL, with issues due to previous HW) via ADO manager
 - GUI for visualization, comparing scans (Erdong has provided some initial specs)
 - Orbit/Optics Corrections
 - Model Server integration effort needed
 - Considering interfaces now
 - Spin-off magnet manager will need to be created, similar to CeC/ERL (...R line, ATR)
 - Combine BPM readings, magnet currents, emittance measurements from profile monitors with model for corrections on demand at a rate of seconds to minutes per request
 - Will orbitDisplayApp provide a primary interface?
 - Sergei has interest in developing server/user interface tools here

Laser & E-gun Beam Operations (2/2)

- Operations Tools
 - Measurement scans
 - Dmitry has shown an example scanning tool from another facility that we would like to replicate
 - Requires integration with Model Server
 - Custom Displays
 - Anticipate supporting AP Group development of synoptic displays using SyndiBuilder, similar to CeC (ex. LEReC RF)
 - Are there any novel operations processes that will require user interface tools for LEReC?

General Concerns

- We don't have all of the hardware in yet
- Some specifications need refinement (...offline discussions preferable to additional meetings, where possible)
- We need to develop realistic milestones, including a Dry Run date
- Some projects may need a steward from the Controls Group (ex. Model Server integration) in order to meet milestones
- What is missing???
 - Water Flow PLC?