

# Weekly Report for 06/01/2015

## Highlights

- Presented first abort kicker studies results at the weekly APS-U Physics meeting (with J. Dooling and V. Sajaev). (Kathy Harkay)
- Prepared a slide on SCU1 commissioning for A. Zholents (for S. Streiffer, weekly DOE Operations call), with input from S. Shastri, L. Emery, and Y. Ivanyushenkov. (Kathy Harkay)

## APS Renewal and Upgrade

- Added multiple ionization to the ion simulation code. Showed the simulation gives qualitative agreement with PAR tune shift data. Working on refining the model by including beam size and pressure variation with charge, as well as the variation of pressure around the ring. (Joe Calvey)
- Discussed plans to install RGAs in the PAR with the vacuum group. (Joe Calvey)
- Continued discussing Booster upgrades and PAR/Booster charge limitation with CY Yao. (Kathy Harkay)
- Participated in teleconference with CERN vacuum group and J. Carter (visiting CERN) to discuss synchrotron radiation simulation comparison with two codes (Cornell and CERN). (Kathy Harkay)
- Attended APS-U Physics meeting. Prepared presentation on APS abort kicker studies (postponed to next week). (Kathy Harkay)
- Discussed APS-U and non-APS-U related injector upgrades with N. Grossman. (Kathy Harkay)
- Presented first abort kicker studies results at the weekly APS-U Physics meeting, two shifts (with J. Dooling and V. Sajaev). (Kathy Harkay)
- Organized next Injector Working Group meeting (6/22) with theme: Booster RF. Speaking are CY Yao, D. Horan, and T. Berenc. (Kathy Harkay)
- Continued simulations of collective effects in booster by beginning to investigate the role of varying chromaticity on beam stability. (Ryan Lindberg)
- Generating a list of injector obsolescence items/issues (and resolutions?) (Stan Pasky)
- Ran simulation of APS-U commissioning procedure for different values of alignment errors. Found that increasing tolerances beyond initially assumed 100 um rms for girders and 30um rms for individual elements significantly reduces the success rate of the commissioning procedure (for example, doubling girder errors reduces success rate from 95% to 15%). (Vadim Sajaev)
- Worked to improving APS-U commissioning procedure in hope to improve the success rate for larger alignment errors. No improvements so far. (Vadim Sajaev)
- Continue work on injection simulation. Reviewed results and clean up jobs caused by blues problem. (Aimin Xiao)
- Worked on BTS line design. Discussed with Louis and Vadim on various reference system issues. (Aimin Xiao)
- Summarized septum leakage field simulation. Gave an updates on the MBA physics group meeting. (Aimin Xiao)
- MOGA optimization of nominal and alternate upgrade lattices with reverse bends. (Yipeng Sun)
- MOGA scripts development to improve performance with error ensembles. (Yipeng Sun)

# MCR Operations

## Storage Ring Operations

- Obtained approval for SCU1 PRD. (Kathy Harkay)
- Requested formal approval to operate SCU1. (Kathy Harkay)
- Discussed 130 mA operation issues with J. Cross. (Kathy Harkay)
- Carried out SCU0 coupling FF checkout. Summarized for machine studies meeting. (Kathy Harkay)
- Switched final lattice to RHB, corrected lattice, adjusted BPM gains. Installed new calibrated model and new ubop files in SR and SBPMs. Fixed S21 commutation error in "24 singlets" BPM waveform file, installed it. Steered centers of sectors 14,16,18,33 in X and 14,17,18 in Y to reduce P5 setpoints. Increased setpoints of several A:HV3 magnets to reduce their noise. (Vadim Sajaev)
- Tested hybrid sextupoles with RHB lattice. Injection, lifetime, and accumulation limit were all fine without any adjustments. We will provide hybrid RHB this run. (Vadim Sajaev)
- Assisted the MCR with turning beam over to the Users. (Karen Schroeder)
- Performed single gap scans at User request during User beam. Restored x-ray bpms back to orbit control if possible. (Karen Schroeder)
- Investigated beam motion during User operations and remove/added bpms/correctors as needed. Discussed the absence of S23ID:P2 in orbit control with Users at 23-ID. Hahne was able to re-align blades and do a scan during machine studies. Put the BPM back in orbit control and informed the Users. (Karen Schroeder)
- Investigated the partial beam loss and discussed with Emery who gave additional suggestions as to what to investigate. Could find no reason this should have happened. Assisted operators with the refill. (Karen Schroeder)
- Discussed Gespac problems with MCR and gave instructions in case of certain beam loss events. (Karen Schroeder)

## Booster Operations

- Performed booster energy scans and found that booster needs +0.4% energy increase to match SR energy (together with L. Emery). This would allow us to eliminate synchrotron oscillations of injected beam. (Vadim Sajaev)

## Linac Operations

- Studied the possible cause of arcing for 3G2 that was taken out of RG2 slot during April/May maintenance. An arc was observed between the cathode stalk and the gun backplate (knife-edge). Possibly caused by the broken W-spring behind the gun backplate as the cathode stalk has lost its eccentricity, or maybe the broken spring is the results of the arc. An area of arc mark is observed. The collapsed rf waveforms observed when the gun was in operation might be due to the arc at this area. (Yin-e Sun)

## MCR Operations administrative/misc.

- Attended OPS Directorate and gave an update on start-up activities. Prepared the downtime report and gave to Flood for presentation. (Karen Schroeder)
- Reviewed and approved non-RSS SR work requests. (Karen Schroeder)

- Updated 2015-2 Run to reflect the change to all RHB. Worked with Hammond to get the new hybrid rhb fill pattern incorporated into the software. (Karen Schroeder)
- Mode modifications to excel file, pdf and html files for the new 2015-3 Run on the long-range schedule. Sent to webmaster for posting on the web. (Karen Schroeder)
- Reviewed updated SR procedures and added pertinent ones to operator required reading. (Karen Schroeder)

## APS Machine Studies

### Storage Ring Studies

- Presented summary of SCU1 commissioning and abort kicker studies at the weekly machine studies meeting. Also presented issues that arose during SCU0 coupling FF checkout. (Kathy Harkay)
- Made a local version of SRInjectionTools to trigger on MPS, and acquired FPGA bpm turn history data for single bunch kicked with the abort kicker AK0. V. Sajaev assisted with plotting and post-processing the data, and he modified his script SRInjectionTools to add a tab for MPS dumps. (Kathy Harkay)
- Supported K. Harkay's study of the abort kicker. Helped to process FPGA bpm data, which showed that the bpm sum signal disappears after first half of sector 40. This confirmed our expectation of the single bunch being kicked into the septum magnet chamber. (Vadim Sajaev)
- During abort kicker studies it appeared as if trigger moment for some FPGA sectors was varying from shot to shot. Wrote a program that analyzes FPGA turn-by-turn data to determine the moment of an event (event could be a position change after the kick or the sum signal change as during abort kicker shot). Will use this program in future studies to diagnose trigger behaviour. (Vadim Sajaev)
- Joined the SCU1 user beam steering experiment. (Aimin Xiao)
- Performed gap scans and restored X-ray bpms to orbit control which had been removed due to steering. (Karen Schroeder)
- Prepared the beam-related portion of the studies schedule and updated both non-beam and beam-related as necessary. (Karen Schroeder)

### PAR Studies

- Continued measurements of PAR/PTB beam size and booster injection efficiency vs bunch charge. (Joe Calvey)

### Linac Studies

- Took injector beam bunch charge variation measurements, from the RF gun to BTS . Concluded that when the repetition rate is not varied, the linac bunch charge variation from pulse to pulse is less than 2%. When the injection timing sequence is changed (number of pulses are varied), the charge per pulse varies up to 9%. (Yin-e Sun)
- Support was provide to the RF Group with validating L1 - L3 machine protection circuits. i.e. VSWR. (Stan Pasky)

## APS Machine Research and Development

## Storage Ring Research and Development

- Discussed scheduling and dosimeter placement in Zone F radiation survey for abort kicker studies with J. Vacca and J. Dooling. (Kathy Harkay)
- Determined mapping of dosimeter array in s, guided by latest abort kicker beam loss locations (BPM turn history, analyzed by V. Sajaev), and consulting with J. Dooling. (Kathy Harkay)
- Discussed proposed new SCU0 vacuum chamber with AES engineers (E. Trakhtenberg, P. DenHartog), ASD/MD SCU personnel, and L. Emery. (Kathy Harkay)
- Analyzed FPGA BPM data from abort kicker studies (FPGABpmTurnHistory). (Kathy Harkay)
- Prepared a slide on SCU1 commissioning for A. Zholents (for S. Streiffer, weekly DOE Operations call), with input from S. Shastri, L. Emery, and Y. Ivanyushenkov. (Kathy Harkay)

## PAR Research and Development

- Did a systematic comparison of PAR vacuum gauges with nearby ion pumps. (Joe Calvey)

## Linac Research and Development

- Looked into linac lattice for the transverse-mode cavity installation, based on the draft installation map. Checked beam line diagnostics and steering magnets upstream and downstream of the tcav in the lattice file. Will need to verify in the linac tunnel to ensure sufficient diagnostics/steering magnets of the e-beam before and after it goes through the tcav. (Yin-e Sun)
- Worked on double-emittance exchanger simulations using GPT, set up a double dogleg beamline with space charge and csr. Working on adding transverse mode cavity. (Yin-e Sun)
- Met with J. Power to review plan for repair of the pgun laser heads; specifically cleaning rods, replacing chiller fluid, and replacing laser pump diodes. (Jeff Dooling)
- Disassembled DS laser head and removed laser rod in L3119 lab. (Jeff Dooling)
- Collected sample of rod surface contamination. Took sample of laser rod surface material to ACL for testing Friday. (Jeff Dooling)
- Preliminary tests revealed significant amounts of copper in the material, confirming D. Graczyk's (NE) hypothesis that the material is copper carbonate. (Jeff Dooling)
- Was then able to use a 0.015 molar nitric acid solution made by Graczyk to remove the deposits from the barrel surface of the rod. (Jeff Dooling)
- Provided support in thermionic rf gun development. (3G2) (Stan Pasky)

## Other Research and Development

- Communicated with Jonathan Edelen from Colorado State Univ. about possible measurement of the thermionic cathode in our RF gun. Provide RF gun superfish files, operational parameters and diagnostics abilities for his planning of the experiment. (Yin-e Sun)

## APS Machine Software

### Storage Ring

- 1, updated ID config files (IDdevices.sdds and devices.sdds) to set the ID01ds (SCU1) gap taper to 0 so that it is not included to return taps PEM. Asked Marty fixed ID01:USorDSselect pv value to "us"

sot hat the gap feedback forward won't be affected by SCU1, and asked Marty to set the gap readback to 180mm when the current readback is less than 5A. Increase the gap tolerance to 0.05 due to the gap readback fluctuation of ID01ds. (Hairong Shang)

- added "Remove out-of-range PVs" button to SROrbitControllaw to remove the out-of-range PVs from tests file and restart PV test so that orbit correction can continue. During the operation, found that the orbit correction and pv test were running on defaultXRDP, however, this link was changed 4 times on 6/3, the newest was not being used for orbit correction -- we had no idea to find out the real configuration that orbit correction was running with, therefore, decide to use the numbered configuration for orbit correction and pvtest option, this change is transparent to operator, the GUI is not changed, operatou still type defaultXRDP for orbit correction. However, just noticed that orbit correction option has to use link names for checking if the orbit correction is running with required config, pvtest option uses the numbered config for debugging purpose. (Hairong Shang)

- improved the post-processing to attenuator scan of P0FBScan and added plots for attenuator scan. (Hairong Shang)

- changed the steering goodness pv for sector 1-9 with format ID01:SteeringGoodness due to the PV name changes. (Hairong Shang)

## Injectors

- created DC ramp template and modified SetBoosterDCAmplitude to use this reference template. (Hairong Shang)

- wrote scripts for booster DC mode study: 1) standardizing pem for all the main magnet 2) corrector DC bump scan. (Hairong Shang)

- tested booster response measurement scripts and collected data, and added 3ms gap between timing segments to reduce the overlapping. (Hairong Shang)

## Publications, papers and report

- Finally submitted "Compact representations of partially coherent undulator radiation suitable for wave propagation" to PRSTAB. (Ryan Lindberg)

## Meetings, workshops, conferences, committees, LMS related, and reviews

- Served in the linac structure straightening committee and co-authored the committee report. (Yin-e Sun)

- Revied LDRD proposal and submitted recommendations online. (Yin-e Sun)

- Hosted Photo-injector physics meeting. (Yin-e Sun)

- Participated the emittance exchange experiment at AWA/ANL. (Yin-e Sun)

- Reviewed two proposals for NSF Accelerator Science call. (Kathy Harkay)

- Reviewed paper for IEEE Transactions on Nuclear Science. (Kathy Harkay)

- Attended lab-wide Performace Appraisal focus group and participated in the discussion. (Kathy Harkay)

- Sent out announcement for B&A seminar scheduled for 6/19. (Kathy Harkay)

- Reviewed NSF proposal. (Ryan Lindberg)

- Evaluated and voted on submissions for contributed talks at FEL 2015 as part of the scientific committee. (Ryan Lindberg)
- Attended the floor coordinator pre-run briefing and provided information as needed. (Karen Schroeder)

## Safety and Required Training

- Took CPR training. (Yin-e Sun)
- Completed ESH-114 LOTO training on-line. (Jeff Dooling)
- Completed ESH 223 Computer Security. (Kathy Harkay)

## Miscellaneous

- Attended vacuum factory tour given by J. Gagliano. (Joe Calvey)
- Provide elegant run support to people working at JLAB. (Aimin Xiao)
- Discussed the steering web page being used by four beamlines during the start of the run with operators on shift. Showed some how to respond to the requests. (Karen Schroeder)
- Provided information to the F.C. about the PV changes made so that all Users could have "steering goodness" PV for steering optimizations. (Karen Schroeder)
- Verified the top-up dates for Flood (Karen Schroeder)