

# Weekly Report for 05/19/2014

## Highlights

- Made a presentation on APS ray tracing guidelines to AES/MED group and interested parties. (Kathy Harkay)
- Preparing for APS machine start up and performed machine study on "Orbit Recovery" "CPU check up" and "IEX check up" (Aimin Xiao)

## APS Renewal and Upgrade

- Discussed methods for wakefield simulations with Boris Podobedov (BNL). Tried out his method for extracting point charge wakefields from finite length bunches. In process of writing brief note about this. (Ryan Lindberg)
- Performed force calculation of fast kicker with estate program. Added force integral with Hairong. I concluded that the force on the blades is not serious concern as long as the impedance is matched. (Chih-Yuan Yao)
- Prepared feedthrough specification for the fast kicker R&D. (Chih-Yuan Yao)
- Drafted "injector modification" part of the CDR for APS upgrade and provide kicker simulation draft to Frank. (Chih-Yuan Yao)
- Discussed PAR RF1/RF12 detuning requirement and possible upgrade with Aditya Goel, the RF engineer in charge. (Chih-Yuan Yao)

## MCR Operations

### Storage Ring Operations

- Performed single gap scans during Users operations and restored X-ray bpms which were removed during steering. (Karen Schroeder)
- Assisted MCR with a couple of problems which occurred during steering. (Karen Schroeder)
- Removed rf bpms which appeared to be affecting the orbit. (Karen Schroeder)
- Reviewed and approved non-RSS SR work requests, as well as a few RSS and non-SR requests when appropriate AOP personnel were unavailable. (Karen Schroeder)
- Sent information to Soliday about which correctors/QS4s had been returned to the ring and which ones had been upgraded to the Fast Correctors. Updated the power supply management tool to include these changes. (Karen Schroeder)
- Attended Y. Ivanyushenkov's weekly SCU meeting to discuss storage ring startup and the SCU0 chamber alignment measurement. M. Kasa agreed to arrange that Survey & Alignment staff stand by in case the chamber needs realignment. Organized access through K. Schroeder for Q. Hasse to shut off SCU0 fan. (Kathy Harkay)
- Observed LHe pressure rate and discussed with Y. Ivanyushenkov, K. Schroeder, M. Smith, and SCU0 Team. (Kathy Harkay)

### Booster Operations

- Investigated and assisted the MOM Group in isolating a vacuum leak in the Booster. This resulted in the replacement of the B:IK ceramic chamber. (Stan Pasky)
- Investigated vacuum leak problem and decided to go ahead with leak checking and repair. (Chih-Yuan Yao)

- Investigated B4C8V water leak problem and proposed to run it without water (due to its relative low current and available monitoring PVs. ) (Chih-Yuan Yao)

## PAR Operations

- Worked with Tony and Bob Keane in upgrading PTB current monitor PV and display. (Chih-Yuan Yao)

## Linac Operations

- Participated and over seen - (Stan Pasky)
- Recovery of all the injector after a site wide power bump. This included verification of beam operation in all injectors prior to allowing normal beam studies to occur. (Stan Pasky)
- PEMtool performance followed by corrections by Bob Soliday. (Stan Pasky)
- Was contacted about the L2:WS1 high water temperature. As a result - the flow in to the heat exchanger needed to be increased so the water skid would have more cooling water. (Stan Pasky)
- Met with N. Sereno, Y-e. Sun, and W. Michalek (AES-MOM) to discuss rf thermionic gun testing in the vacuum lab. (Jeff Dooling)
- studied meeting notes and emails on linac and par current limit set up configurations. (Yin-e Sun)
- participated the low level rf measurement of L3G3 that was move out from RG1 in previous maintenance period. (Yin-e Sun)
- discussed possible straightening of the linac structures and considered possible options as which one to try first. (Yin-e Sun)

## ITS Operations

- Assisted in the Injector Test Stand (ITS) PCGun rf conditioning and beam operations. (Stan Pasky)

## MCR Operations administrative/misc.

- Attended OPS Directorate in for Flood. (Karen Schroeder)
- Produced the two modified 2014-3 Run schedules for discussion at OPS Directorate and for presentation to Users. (Karen Schroeder)
- Produced the tunnel closure, MPS and top-up sign-off sheets (Karen Schroeder)
- Determined which BPLD's needed to be validated based on information from Bui, Erwin and the past validations and produced a sign-off sheet for Bui. (Karen Schroeder)
- Lead 4 o'clock meetings held in the MCR. (Karen Schroeder)
- Reviewed the top-up file for correct start/end times/dates and passed on information to Flood for correction. (Karen Schroeder)

## APS Machine Studies

### Storage Ring Studies

- Assisted Sereno with some of the tools used for gap scans. (Karen Schroeder)

- Passed on information to Sajaev, Xiao and Emery regarding problems noted by operators when doing Top-up verification studies and other studies. (Karen Schroeder)
- Modified the machine studies schedule to accommodate the late start and notified studiers. May several other adjustments to the machine studies schedule as needed. (Karen Schroeder)
- Coordinated emergency accesses into the SR with the MCR and studiers. (Karen Schroeder)
- Came in to assist the MCR with recovery after a power bump. (Karen Schroeder)
- Prepared a detailed procedure for SCU0 vertical chamber alignment and prepared all the processing and plotting scripts for V. Sajaev to execute. The SCU0 chamber alignment is satisfactory; no realignment was done. (Kathy Harkay)
- Checked the SCU0 skew quadrupole feedforward and the compensation works well with the old file, so no adjustment was required. (Kathy Harkay)
- Performed orbit recovery before and after lattice correction. Many BPMs were changed during the shut down, especially for S19-S30. Orbit recovered successfully except ID22 and ID23. ID22 xray BPM seems having problem, ID23 is hard to tell. (Aimin Xiao)
- Performed CPU check up. Correction table works fine, coupling was remeasured and corrected for H and V modes, so coupling variation between these two modes should be smaller. (Aimin Xiao)
- Performed IEX check up. Correction table works fine, except H mode negative ramping. Added one more correction point within the ramping curve. 2 or 3 more points may needed. (Aimin Xiao)
- Helped A. Xiao with BPM rf setpoints and errors (April). (Louis Emery)
- Held meeting to review machine studies. Discussed with G. Pile AES's method to track tasks. May be useful for machine studies.(April and May). (Louis Emery)
- Commented on the 4ID perturbation to the orbit. The perturbation is compensated for by the nearest H correctors in sectors 4 and 5. So the two photon beams of CPU and 4ID are equally perturbed (May). (Louis Emery)
- Set up SR bpm-dependent files for start-up (May) (Louis Emery)

## Booster Studies

- Performed booster IRamp studies with Hairong and Shifu. (Chih-Yuan Yao)
- Performed booster high charge study with non-linear ramp. Achieved 6 nC BTS charge in low emittance lattice. (Chih-Yuan Yao)
- Also did booster BM ramp bus-tie test and concluded that switching the BM away from SR circuit provides cleaning harmonics. But no significant improvement in ramp performance. (Chih-Yuan Yao)

## Linac Studies

- Continued working on the PC gun front end beamline elements design. (Yin-e Sun)
- Ordered the 1" YAG screen to Crytur to be used in the linac diagnostics stations. (Yin-e Sun)
- worked with mechanical engineer on to finalize the beam line. (Yin-e Sun)

## ITS Studies

- analyzed previous electron beam commissioning measurement data and presented it to the PiP meeting. (Yin-e Sun)
- Coordinated colleagues and set up a schedule for PC gun e-beam measurements for the next two months. (Yin-e Sun)
- Took PC gun electron beam measurements. measured QE at about  $4e-5$ , emittance  $1\mu\text{m}$  for 35-55 pC. Tried to vary solenoid and gun gradient, phase to optimize for emittance. various initial laser conditions also. Dark current was measured to be around 100pC. Vacuum is improved from  $1.3e-9$  to  $9e-10$ Torr in the gun. (Yin-e Sun)
- performed beam-based alignment to center the beam in solenoid and quadrupoles. (Yin-e Sun)
- Attempted to measure beam energy and energy spread. (Yin-e Sun)

## APS Machine Research and Development

### Storage Ring Research and Development

- Discussed updated ray tracing studies for the S35DCCT move to ID31 with M. Erdmann. He showed the results at the MED group meeting where I also presented. (Kathy Harkay)
- Made a presentation on APS ray tracing guidelines to AES/MED group and interested parties; uploaded in ICMS. (Kathy Harkay)
- Converted histogram of SCU0 main coil current to hrs of operation, combining data acquired at two different repetition rates and subtracting commissioning time. (Kathy Harkay)
- Met with Erdman and AES-MED to discuss the photon fan in the planned changes of ID35. Decided on a reduced orbit angle error of 2.5 mrad (March). (Louis Emery)
- Discussed and did experiments of unified orbit correction (RTFB and datapool running with differently partitioned matrix) with N. Sereno (March and April). (Louis Emery)
- Discussed form factors and off-axis field integrals with Waldschmidt (April). (Louis Emery)
- Updated for Torres project spreadsheet of skew quadrupoles (April and May). (Louis Emery)
- Discussed line integral around conductor cross-section with CY (April). (Louis Emery)
- Looked at T. Berenc MATLAB GUI for double rf system control (May). (Louis Emery)
- Discussed with Xiang Sun various impedance questions (May). (Louis Emery)
- Worked with Leonard and Xiang on S31 horizontal new stripline design and simulation. (Chih-Yuan Yao)

### Booster Research and Development

- Found an algorithm that fit gain and delay of BM current waveform relative to the reference. Installed an operational configuration that works as good as the VRamp mode and allows non-linear ramps for chromaticity and tune adjustment. (Chih-Yuan Yao)

### Linac Research and Development

- Attended PC Gun planning meeting; discussed pc gun installation in the linac during the

August-September shutdown. Gun conditioning in the ITS is scheduled to start May 27th. (Jeff Dooling)

## ITS Research and Development

- Replaced 1000 micron pinhole with 800 micron size. (Jeff Dooling)
- Cleaned optics in the ITS. (Jeff Dooling)
- With tighter focusing of the laser beam, needed to add back the attenuator ahead of the virtual cathode camera. (Jeff Dooling)
- Tested linux laptop with wine to see if BeamView s/w could work with Coherent camera h/w in the laser room. (Jeff Dooling)
- Unfortunately, could not get the s/w to see the camera; will therefore pursue having a Windows operating system installed on a Dell Latitude 6400 recently acquired from V. Sajaev. (Jeff Dooling)
- Studied the ITS dipole spectrometer with and without quadrupole configurations. simulated and calculated the dispersions. (Yin-e Sun)

## Other Research and Development

- CathodeR&D: Participated in a power-up test of a UV lamp with G. Sprau (ASD/PS), Z. Yusof (IIT). We determined that the bulb did not turn on. G. Sprau will investigate. (Kathy Harkay)
- Electron cloud R&D: Reviewed L. Boon's data analysis for the QE paper and made suggestions. (Kathy Harkay)
- Ran some simulations to see if a sheared laser-based FEL might be possible with the new PC gun. Found that the required >5J laser energy may make this unreasonable. (Ryan Lindberg)

## APS Machine Software

### Storage Ring

- debugged and fixed SR orbit controllaw issues: 1) the "Start" button did not work because of "DisableTabs" command no longer worked after APSTabFrame switched to use tk::notebook, updated the tab disable/enable command to use tk::notebook commands. 2) fixed the test button for checking corrector vectors. 3) some nonexistent A:V4 readback with 150A, which prevents the datapool orbit correction. Tried with old commands, which set the DacAI.AOFF to 32678, however, it did not work this time, worked with Tom Forres, fixed the problem through setting DacAI.AOFF and DacAI.ASLO to 0 for non-existent correctors. However, for existing correctors, the DacAI.ASLO should be 1; to bring down the corrector value to 0, one has to do in following steps a) change the corrector mode (ControlSrcBO) to maintenance mode (0), set :CurrentAO to 0 and wait for the readback goes to zero b) switch the corrector mode to operation (1), set :DacAI.AOFF and DacAI.ASLO to 0. c) switch between maintenance and operation mode, check if the setpoint is 0 or <150 (some correctors could not go to zero because of realtime feedback -- need ask Frank to remove the non-existent correctors from realtime feedback). (Hairong Shang)
- SROrbitControllaw gave big difference for S33 and S34 bpm between vector and scalar pvs -- asked Frank to check the datapool IOC, it turned out that the datapool ioc was not updating the waveform. It turned back to work after power cycling the IOC. (Hairong Shang)
- SRBunchTrain had problem with updating the pv values, debugged and found that SRBunchTrain used "pv umon" to monitor the pv values, since "pv umon" does not work properly in oagwish8.6, changed SRBunchTrain to use oagwish8.5. (Hairong Shang)

- modified CollectRFSpectrum to use MXA replacing VSA, modified the instrument setup and data measurement; need to verify the setup for tune measurement though. (Hairong Shang)

## Injectors

- new soft IOC gave wrong IRamp RMS value for BM, debugged and found that the soft IOC changed the BM IRam reference waveform -- set it to zero before the left BM points used for computing gain and after the right BM points used for computing gain, fixed the problem through making a copy of the IRamp reference waveform and working with the copy instead of the reference waveform. Also found out that BControl fit start and end were changed by Booster UBOP, this caused the RMS computed by IOC disagree with script computation, updated the booster UBOP to have the correct bcontrol fit start (25) and fit end (120) values. (Hairong Shang)
- updated booster IRamp configuration 1) changed the booster IRamp delay units to ms so that it is more meaningful to users, 2) added IRamp gain and delay setpoint, measurement and error computation, so that IRamp looks the same VRamp now. updated the soft IOC code and ramp correction code, it works well now. 3) added new IRamp PVs (gain and delay setpoint) to booster ramp parameters logger and booster SCR. (Hairong Shang)
- developed BoosterSextBumpScanOpt for optimizing the booster efficiency through scanning the booster sextupole current ramp. (Hairong Shang)
- Installed IRamp software, including autoRampCorrection, bcontrol, injection tune, ioc, and MEDM screens with Hairong, Shifu and Greg Fystro. (Chih-Yuan Yao)
- Fixed a PV updating problem of bunch cleaning verification pem that is reported by Greg Fystro with Hairong. (Chih-Yuan Yao)

## Simulation Software

- Debugged clinchor on how it read HOM input for longitudinal modes in multiple pages. Basically the call realloc in C doesn't initialize the newly added memory. Found another bug in clinchor, which affected past longitudinal calculations (making the growth rates too small by 2x). Added widgets to select which bunch pattern to run for the clinchorRingAnalysis. Added postprocessing to clinchorRingAnalysis for further understanding of of growth rate distribution and HOM frequency distribution (May). (Louis Emery)
- Attended meeting with CST developer with other ANL people. Gave list of possible desirable new features, and commented on how we use CST in general (May). (Louis Emery)

## Publications, papers and report

- worked on a ipac14 paper with co-authors. (Yin-e Sun)
- Worked on IPAC2014 paper on SCU0 operation with Y. Ivanyushenkov. Prepared several figures and text. Final draft went to editor. (Kathy Harkay)
- Writing CDR section on multi-bunch instability (April and May). Reviewed Lindberg's single bunch contribution to CDR (May). (Louis Emery)

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

- Attended RSPPC meeting to discuss ACIS changes for higher charge. (Karen Schroeder)
- Attended pre-run operations F.C. meeting and provided information about possible issues having to do with steering and x-ray bpms. (Karen Schroeder)
- Attended the following - (Stan Pasky)

- THz meeting, radiabeam technologies to more formally introduce and discuss the preliminary plans for a thermionic gun based THz production experiment to be performed in the ITS. Emphasis will be placed on technical preparation for radiabeam's upcoming visit to ANL on Wednesday June 11th. (Stan Pasky)
- Attended the Radiation Safety Policy and Procedures Committee (RSPPC) Meeting to discuss possible changes to the Operational and Accelerator Safety Envelopes (OSE and ASE) for the PAR and Booster to support high-charge MBA (Jeff Dooling)
- hosted a Photoinjector Physics meeting. Presented the preliminary electron beam commissioning results. (Yin-e Sun)
- Hosted a PC gun/T-cav meeting. (Yin-e Sun)
- reviewed a PRSTAB paper. (Yin-e Sun)
- Attended collaboration meetings with Univ. of Wisconsin on sheared laser FEL. (Yin-e Sun)
- Attended AWA outreach meeting and presented a topic on emittance exchange. (Yin-e Sun)
- interviewed a candidate for AOP postdoc search. (Yin-e Sun)
- Attended kick-off meeting with Radiabeam. Suggestion to add a current monitor after the alpha-magnet scraper is adopted. (Yin-e Sun)
- Organized announcements for Beams and Applications seminars for May 23 and Jun 2. (Kathy Harkay)
- Accepted invitation to run for elections of Member-at-Large for the IEEE Particle Accelerator Science and Technology Topical Committee (PAST-TC). (Kathy Harkay)
- Participated in Search Committee activities for the AOP postdoc position. (Kathy Harkay)
- Chaired an internal review of Higher Harmonic Cavities for APS-U project (May). (Louis Emery)
- Arranged for xray optics group to give talk to AOP group about photon beam spatial coherence measurement. (Louis Emery)
- Presented Booster ACIS changes for high charge to review committee. (Chih-Yuan Yao)
- Provide slides on injector upgrade work for Sasha's U.C, review talk. (Chih-Yuan Yao)

## Safety and Required Training

- Took multiple on-line required training courses over the past four weeks. (Karen Schroeder)
- Completed ESH700 Radiological Worker Training Level I. (Stan Pasky)
- completed ESH108401 and JHQ100 classes. (Yin-e Sun)

## Miscellaneous

- Coordinated getting linesmen out to change the 13.2kV lockout on for RF2 and RF3 and the ACIS validations with operators. (Karen Schroeder)
- Held AOP meeting to discuss studies and electronic log books, continued discussion and editing of

our documentation work-flow with consultant B. Fisher of JESR (March and April). (Louis Emery)

- Read Lindberg's note on including IBS in coupling (April). (Louis Emery)
- Set up an initial svn area and eventually a useful cvs area for APS-U MBA CDR (April). Fixed some latex problems with special figure file of Lindberg and diagnostics subsections of Sereno. Found that minipage is incompatible with floatrow package. (April). (Louis Emery)
- Gave B. Hettel (SLAC) some of my old these damping ring parameters (April). (Louis Emery)
- Looking into htlatex, a program to convert latex to html with sections and subsections on separate web pages. This should be
- feasible on all our documentation (May). (Louis Emery)
- Tried emasclient with the hope of being more efficient in managing various emacs session. Not worth the trouble (April May). (Louis Emery)