

Weekly Report for 01/13/2014

Highlights

- Summarized vertical injection design to a tech note. (Aimin Xiao)
- Carried out measurements of beam dump induced beam losses at SCU0 vs ID28 horizontal bump amplitude with A. Xiao and J. Dooling. Proposed that we run with a -7 mm bump, which produced half the beam loss signal and 2-3x lower magnet core temperature spikes compared to the -5 mm bump. (Kathy Harkay)
- Led the preliminary simulations of radiation heating for an SCU in the MBA ring, and documented the results (with students A. Vella (UIUC) and L. Boon (ASD/Purdue)). (Kathy Harkay)
- Developing APS upgrade lattice with off-axis injection (accumulation) scheme. (Yipeng Sun)
- Worked with Ju on the spec. of FID pulser order. (Chih-Yuan Yao)

APS Renewal and Upgrade

- Worked on simulating lattice correction for MBA. Completed for the pre-wiggler lattice based on one-sector lattice. Extending now to two-sector lattice (some scripts were explicitly using element naming S01...). (Vadim Sajaev)
- Continued working on power supply specification table. (Vadim Sajaev)
- Continued on the vertical injection design. Simulated ring's acceptance with various optical errors. Summarized work results and presented to the MBA-PHY group meeting. (Aimin Xiao)
- Wrote simulation results to a tech note AOP-TN-2014-005. (Aimin Xiao)
- Developed case studies for preliminary synrad3d simulations of radiation heating for an SCU in the MBA ring, which Andrea Vella (UIUC) carried out. Discussed her results with her and L. Boon. Documented the results in presentation form, writing the introductory material. A. Vella added her simulation results, L. Boon added a description of synrad3d, and I added a section on future work and conclusions. Distributed results to interested parties (Y. Ivanyushenkov and H. Cease et al.) (Kathy Harkay)
- Participated in SynRad/MoIFlow training via teleconference with CERN. Participated in discussions prior to training and suggested physics questions to CERN. (Kathy Harkay)
- Participated in M. Borland's 4GSR physics meeting. (Kathy Harkay)
- Developing APS upgrade lattice with off-axis injection (accumulation) scheme. (Yipeng Sun)
- Worked on impedance modeling of booster bellow, vacuum port, and cavity together with Xiang Sun and Leonard Morrison. (Chih-Yuan Yao)
- Started learning about modeling wakes and impedances using simplified models. The hope is that this formalism can be used to understand/check more sophisticated codes, and eventually predict performance using faster methods. (Ryan Lindberg)

MCR Operations

Storage Ring Operations

- Established first injection after the shutdown. The complications were due to confusion with initial corrector setup, and due to moved corrector S26B:V4. Normally, we punch down moved correctors in advance, but failed to do it this time due to lack of time. (Vadim Sajaev)
- Set up lattice for operations: lattice correction, chromaticity adjustment, BPM gain adjustment.

(Vadim Sajaev)

- Submitted a PO for tune measurement system MXA OS/processor upgrade. This will be replacement for the VSA. (Chih-Yuan Yao)
- Escorted two individuals from 1-ID beamline into the SR tunnel so they could take pictures of the how the rf bpps and X-ray bpps are mounted. They have had difficulties with drift and are trying to determine whether the problem is at their beamline or possibly on our end. (Karen Schroeder)
- Sent Soliday updated list on which correctors were removed and which changed to fast correctors. Updated the corrector status management tool with the same information. (Karen Schroeder)
- Responded to F.C. request for information about the best time to do steering optimizations and gap scans. (Karen Schroeder)

Linac Operations

- went through the components of the LINAC down to the LEUTL using the MEDM screens and existing LINAC lattice files. (Yin-e Sun)
- Continued study on the LINAC lattice setup tool. (Yin-e Sun)
- Annual LACIS validation was completed on Wednesday with assistance from M. Hahne and G. Markovich. (Jeff Dooling)

ITS Operations

- Had HP survey minilite laser components. After being cleared by HP moved the laser head to L2112 Diagnostics lab and stored the power supply in the Laser Vestibule. This laser will be inactive until return to the laser room in roughly 1-years time. (Jeff Dooling)

MCR Operations administrative/misc.

- Provided list of work done during the shutdown to several people and sent the list to Flood for posting on the web. (Karen Schroeder)
- Reviewed and approved non-RSS Storage-ring Work requests. (Karen Schroeder)
- Led daily 4 o'clock meetings held in the MCR. (Karen Schroeder)
- Verified top-up file had correct times and dates. (Karen Schroeder)

APS Machine Studies

Storage Ring Studies

- Together with L. Emery and A. Xiao, participated in high-coupling study. We found that x emittance decreases more than expected on the coupling resonance and y emittance increases more than expected. (Vadim Sajaev)
- Carried out beam-based alignment measurement of SCU0 chamber; alignment is within 50 microns of last measurement Oct 15, 2013, and observed that all sensor positions move together. (Kathy Harkay)
- Carried out measurements of beam dump induced beam losses at 4 new BLMs at SCU0 (my initiative) vs ID28 horizontal bump amplitude with A. Xiao and J. Dooling. Jeff analyzed the integrated PMT charge signals for each beam dump. I analyzed the US/DS/Total charge and magnet core temperature spikes vs bump amplitude for all the beam dumps (13 in all). The -7 mm bump looks

promising -- half the beam loss signal and 2-3x lower magnet core temperature spikes compared to -5 mm bump -- and proposed that it be used in the upcoming run to test whether it mitigates SCU0 quenches. (Kathy Harkay)

- Presented summary of SCU0-related studies at the weekly studies meeting. Also reported on the effect of the chilled water shutdown (Dec 26) on SCU0. (Kathy Harkay)
- Participated in PAR high-charge studies with C.-Y. Yao, suggesting PAR configurations to test. Suggested tweaking the injection kicker bump when we observed an accumulation limit, which allowed more charge to be stored. (Kathy Harkay)
- Performed SR tunnel walkthroughs to evaluate the on-going work and readiness for tunnel closure. (Karen Schroeder)
- Prepared tunnel closure sign-off sheets (Karen Schroeder)
- Prepared BPLD validation list for Bui's studies (Karen Schroeder)
- Prepared the machine studies and updated several times as needed. (Karen Schroeder)
- Verified we were ready to store beam (checked all sign-off needs, verified flags working, verified scrapers all out, scopes working, etc.) (Karen Schroeder)
- Assisted with storing first beam after shutdown. (Karen Schroeder)
- Reviewed the Top-up Readiness data and passed on information about a couple of BPMs to Sereno (Karen Schroeder)
- Assisted Sereno with OAG tools during his studies. (Karen Schroeder)

APS Machine Research and Development

Storage Ring Research and Development

- Carried out SCU0 heater studies with Y. Shiroyanagi, M. Kasa, and C. Doose. I recommended that we study the SCU0 cooling capacity with chamber temperatures at levels observed during operation. I calculated that 3 W was needed for 8 K (for 324-bunch ops), and 19 W for 13 K (for 24-bunch ops). We also studied 19 K (avg power for chamber center + chamber ends), which was obtained with 35 W (on the Cu bar heaters). We observed heat leaking to the 4 K circuit, which C. Doose quantified based on the thermosyphon heater rate. (Kathy Harkay)
- Documented two pressure bumps in the SCU0 vs. chamber temperatures when the chamber was heated (no beam; during the Dec/Jan shutdown) and asked H. Cease to compute the wall gas load. I will use these results to predict the pressure / gas load with warm-up to to 300 K, which will be performed during the 2014 Apr shutdown. (Kathy Harkay)
- Provided technicians working with M. Merritt and C. Doose components for the fast beam loss monitor installation in ID6 near the SCU0 cryostat. (Jeff Dooling)
- Working directly with C. Doose, calibrated the four BLM channels; set the PMT HV bias to -600 V. (Jeff Dooling)
- Corrected error in calculation of deposited energy in aluminum scraper pointed out by J. Liu. Sent Liu temporal MARS data separated by Pass for aluminum to be analyzed with ANSYS. (Jeff Dooling)
- Worked on low-emittance lattice: study detuning of TME cells and potential lattices for lower emittance; reviewing coupling theory (Chun-xi Wang)

Booster Research and Development

- Continue to work on booster SD/SF current regulation/non-linear reference algorithm. Proposed a method that separates trigger delay error and gain error modes before apply ramp corrections. (Chih-Yuan Yao)
- Installed and tested new firing cards on all main ramp supplies with Ju, Frank and Bob Laird. (Chih-Yuan Yao)

Linac Research and Development

- worked on the beam dynamics simulations of a 20pC high-brightness beam from the PC gun and then compressed by the chicane. Used multi-objective optimization via ASTRA for beam from cathode to the entrance of the chicane. Load beam into ELEGANT for chicane and all the way through LEUTL simulations. Presented the results on the meeting on Jan 14 to a group of visitors from Univ. of Wisconsin for possible future collaborations on experiments. Continuing work on refining the simulations results. (Yin-e Sun)
- Measured reflectance of dielectric-coated and metal mirrors for use as the final reflector in the vacuum of the ITS beamline. First pair of dielectric and metal reflectivities were found to be approximately 95 and 85 percent, respectively. (Jeff Dooling)

ITS Research and Development

- Worked with Hairong in an OAGapps tool for PC gun RF conditioning data logger at the ITS, with capability to add PVs during conditioning and write comments. Added new PVs into the manual datalog as power cables are connected etc.; checking PV list for data logging on ITS water, vacuum, power and RF systems. (Yin-e Sun)
- worked with Stan on setting up a PMT at the ITS for use during RF conditioning. (Yin-e Sun)
- Studied in detail SLAC's PC gun conditioning data logs, and modified our PCgun conditioning plan (from starting at 200ns to 500ns RF pulse width) after discussing with Ali. (Yin-e Sun)
- Organized a meeting to discuss installation of an arc detector for protection of the new pc gun during upcoming conditioning studies. (Jeff Dooling)
- Pulled arc detector fiber optic cable from the ITS rf gun room to the linac gallery with assistance from W. Berg. (Jeff Dooling)

Other Research and Development

- Met with a group visiting from Univ. Wisconsin; discussed possible implementation of a laser-undulator FEL device in the LEUTL tunnel. Began investigating the potential for "beam conditioning" to improve performance. (Ryan Lindberg)

APS Machine Software

Storage Ring

- Updated the SRUpDownDoubleSector machine procedure because a few corrector magnets were removed. (Robert Soliday)
- updated SR FPGA BPM waveform configuration to include the new FPGA bpms, and added new config for Xray BPMs per HBui's request. (Hairong Shang)
- added S27, S28 FPGA bpm waveform viewer menu to OAGapps. (Hairong Shang)

- modified collectFPGAdata, makeSBPMReqFile, makeSBPMWaveformConfigFile, makeSRbpmStatsMonitorFile, FPGABpmTurnHistory, and FPGABpmWaveformConfig so that they no longer obtain FPGA bpm sectors from a config file since now FPGA bps are installed in all 40 sectors. (Hairong Shang)
- added Xray BPM type to MpBPMWaveformViewer. (Hairong Shang)

Injectors

- Updated the APSMpPARTurnOnRfSystem machine procedure to better handle situations when the fundamental RF phase loops don't lock. This still needs to be tested. (Robert Soliday)
- Added a step in the BPSSetFullPower machine procedure to restore the It:Bs:StartRamp2BslpRngC, 60Hz extended mode PV, from the SCR file. Per CY's request. (Robert Soliday)
- Investigated and fixed a problem with PAR RF1 turn on pem with help from Bob Soliday. When there is stored beam in the PAR RF1 phase loop would not close. We added statement to dump the stored beam before turning on the RF. (Chih-Yuan Yao)
- Investigated and fixed an error in booster ramp supply start up pem that misses restoration of the timing 60Hz extended mode PV with help from Bob Soliday. (Chih-Yuan Yao)

General

- Helped Sereno find an issue with an input file for plaindata2sdds. (Robert Soliday)
- Built sddspseudoinverse using Intel MKL libraries. Further testing needs to be done to resolve some differences in the output files. (Robert Soliday)
- implemented sddsanalyticssignal for computing analytical signal, and added unwrapping phase feature later. (Hairong Shang)
- added unwrapLimit to -fullOutput option of sddsfft to compute and output the unwrapped phase with/without relative magnitude limit. (Hairong Shang)

IOC/EPICS/Controls/Linux/Solaris/Linux Clusters/Data Loggers/Simulation software

- Shutdown and restarted cluster during break for cooling maintenance. (Robert Soliday)
- Wrote new script to watch the PSS system and send out emails when trips occur. (Robert Soliday)
- Added PVs to various data loggers for Pasky. (Robert Soliday)
- Rebuilt SDDS software on orthros after the operating system was upgraded. (Robert Soliday)
- Requested the pv_crawler be restarted so that updated data logger input files can be created for the next run. (Robert Soliday)

Publications, papers and report

- Wrote tech note AOP-TN-2014-004 and AOP-TN-2014-005 (Aimin Xiao)
- Presented injector high charge study at group physics meeting. (Chih-Yuan Yao)
- Posted Technical note "Equilibrium emittances of coupled lattices." Made several edits/additions so that now the results are more or less complete. (Ryan Lindberg)

Web Site

- Maintained AOP wiki website, Next-Generation Storage Ring Meetings. (Yipeng Sun)

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

- Reviewed SBIR Phase II proposal for DOE. (Yin-e Sun)
- Met with technical staff from the University of Wisconsin, Madison SRC to discuss possible collaboration building a compact soft-xray FEL. (Jeff Dooling)

Safety and Required Training

- Took required LOTO and other safety trainings (Aimin Xiao)
- ESH114PR LOTO training. (Kathy Harkay)
- Refreshed several required trainings. (Chih-Yuan Yao)
- Attended Dayforce training. (Ryan Lindberg)
- Completed ESH 114 LOTO training. Monday. (Jeff Dooling)
- Took Practical Lock-out Tag-out (Karen Schroeder)
- Took Dayforce training (Karen Schroeder)

Miscellaneous

- Helped Xiaofang Zhu (FNAL) with elegant, shower and oagtcish on a Windows system. (Robert Soliday)
- Took 1 vacation day off (Aimin Xiao)
- Worked on LDRD on graphene window: discussed graphene window improvement with CNM and cathode design for rf test with AWA. (Chun-xi Wang)