

Weekly Report for 01/27/2014

Highlights

- Wrote ArbitraryWaveformEditor which can be used to edit a waveform using various mathematical functions and save the results to an SDDS file. The SDDS file can then be used to set a PV using the sddswput command. (Robert Soliday)
- Calculated ion trapping and fast ion instability growth rates for the MBA upgrade lattice, per guidance by Y.-C. Chae. (Kathy Harkay)
- Studied SCU0 beam loss monitor (BLM) signals both for unplanned beam dumps during operations and in studies, with J. Dooling and A. Xiao. The most significant finding is that 6ID shields the SCU0 upstream end when the gap is closed. Also, the integrated loss charge scales approx. linearly with dumped beam current when all the ID gaps are open, but not when they're closed. (Kathy Harkay)
- Simulate vertical beam injection for the new 3PW MBA lattice. (Aimin Xiao)
- Investigate vertical beam motion and pin point the source to be S11B:V4. (Aimin Xiao)

APS Renewal and Upgrade

- Computed the geometric and resistive wall kick tables for H7BA-TwoSector-nux95-nuy36-3PW-version1 lattice (Yong Chul Chae)
- Compute the total ring impedance for H7BA-TwoSector-nux95-nuy36-3PW-version1 lattice (Yong Chul Chae)
- Determined the impedance budget based on the 4.2 mA per bunch requirement for H7BA-TwoSector-nux95-nuy36-3PW-version1 lattice (Yong Chul Chae)
- Computed the collective effects of Intrabeam scattering effect and lifetime for H7BA-TwoSector-nux95-nuy36-3PW-version1 lattice (Yong Chul Chae)
- Investigated the active Landau cavity effect to find that it increased the single bunch current (or lower the chromaticity), decreased the IBS effect and increased the lifetime (Yong Chul Chae)
- Continued NEG impedance R&D - meeting with H. Cease, B. Stilwell, R. Lill, meeting with ESRF vacuum group (Yong Chul Chae)
- Prepared the presentation on single-bunch collective effect for the MBA beam-physics review (Yong Chul Chae)
- Reviewed PAR and booster safety and operating envelope in light of the high charge studies. (Chih-Yuan Yao)
- Did simulation of faster kicker transition geometry. (Chih-Yuan Yao)
- Prepare presentation "injector high charge development" for the 02/13 review. (Chih-Yuan Yao)
- Calculated ion trapping and fast ion instability growth rates for the MBA upgrade lattice H7BA...3PW...Version1, per guidance by Y.-C. Chae. Ion trapping theory predicts significant ion trapping in APS, which is not observed, and less but not zero ion trapping for MBA. The fast ion instability results are speculative, given that the theory may not agree with observations. (Kathy Harkay)
- Reviewed a few early papers (ca. 1995) on fast ion instability theory, as well as presentations at the 2014 TWIICE Workshop. (Kathy Harkay)
- Prepared 3 slides on ion and electron cloud (EC) effects for inclusion in L. Emery's talk on

multibunch instabilities at the MBA upgrade physics review (Feb 13-14). The EC effects statement is based on my experience (no specific computations yet, but not expected to be a significant issue). It was decided not to show these slides at this review given that it's preliminary. (Kathy Harkay)

- Attended MBA upgrade physics review dry runs. (Kathy Harkay)
- Continued working on power supply specification table for the MBA lattice. (Vadim Sajaev)
- Continued working on simulating lattice correction for MBA using the latest lattice. (Vadim Sajaev)
- Prepared a talk for MBA physics review on tolerances and stability. (Vadim Sajaev)
- Performed vertical injection simulation study for the new 3PW MBA lattice. Results show the original design is still valid. Summarize simulation results and presented to the MBA physical group meeting. (Aimin Xiao)

MCR Operations

Storage Ring Operations

- Assisted operators with turning beam over to the Users after machine studies. (Karen Schroeder)
- Received call from MCR overnight regarding increased vertical emittance. Fystro noted the emittance increase but no change in lifetime, but while giving the information the beam recovered. Investigated and could not find cause. Left instructions for MCR if this reoccurred and sent information to Emery to investigate in the morning. (Karen Schroeder)
- Discussed beam position with 2-BM. Could not find anything unusual. (Karen Schroeder)
- Discussed moving 1-ID away from BPLD limits with Shastri. During IEX steerings the BPLD limits went into minor alarm. He asked that we wait until the next machine studies since there the experiment was very sensitive to any position changes of the X-rays. (Karen Schroeder)
- Spent some time trying to set up the spare Teslameter borrowed from MD. Could not get stable readback. P.S. group will attempt to set-up the measurement with the spare probe and interleaving magnet in their cage to verify it is not the probe/cable. (Karen Schroeder)
- Made new workstation-based orbit configuration files to match the datapool configurations. Responded to RMD which erroneously reported that a bpm which was not in use was showing up on the bpm error adt launched from SROrbitControllaw gui and explained, for the operators who may not know, how the ADT is configured. (Karen Schroeder)
- Sent requested information to User at 31-ID about boms available for use. (Karen Schroeder)
- Assisted the MCR with minor problems with steering, orbit motion while taking tunes, etc. (Karen Schroeder)
- Investigated a beam instability problem reported by the operators. (Chih-Yuan Yao)
- Worked with Bob Keane and Randy to swap and restore P0 Feedback amplifiers. (Chih-Yuan Yao)
- Made plan to install SR tune VSA in order to clean up S4 area. (Chih-Yuan Yao)
- Investigated and corrected H-loop stability problem of P0 feedback system and it was traced to a polarity reverse after repair. (Chih-Yuan Yao)
- Studied SCU0 BLM data for 4 unplanned beam dumps during operations, with J. Dooling, who

integrated the loss charge. Discovered one of these did not quench the SCU0. (Kathy Harkay)

- Measured lattice before the start of the user run. Confirmed good lattice, good injection. Installed calibrated lattice. (Vadim Sajaev)
- Steered the beam at 24ID by 200 microns up in order to move away from BLPD trip limit warning. Identified S25A:P1 as going bad. (Louis Emery)

Procedures

- Enclosure ODH Alarm (APS_1191928) (Randy Flood)
- Synchrotron RF-3/5 Klystron ACIS Switch (APS_1192727) (Randy Flood)

Training

- Attended all three types of sessions for the new Dayforce reporting system. (Randy Flood)
- Trained new operators on use of alarm handlers (Randy Flood)
- Providing new operator training. (Stan Pasky)

MCR Operations administrative/misc.

- Sent information regarding changes to SR tunnel air temperatures and where snubbers were installed for the F.C. pre-run briefing. (Karen Schroeder)
- Provided information to Flood for Barkalow regarding change in SR current during 12 hours in the 324 singlet fills. (Karen Schroeder)
- Reviewed and approved non-RSS SR work requests. (Karen Schroeder)
- Produced the downtime report and gave to Flood for presentation to OPS Directorate. (Karen Schroeder)
- Wrote "permanent" template of operators' schedules for HR (Randy Flood)
- Wrote operators schedules into Dayforce (Randy Flood)
- Approved operators' time cards (Randy Flood)
- Approved vacation requests, set up coverage and updated the online schedule (Randy Flood)
- Approve CTLs, IT and Other work requests (Randy Flood)
- Review and clean the asdops mail account at least twice (Randy Flood)
- Check the status of open RMD's (Randy Flood)

APS Machine Studies

Storage Ring Studies

- Sent Sereno information about the bad behavior of a few bpms during our Top-Up Verification test over the previous weekend. (Karen Schroeder)
- Performed and evaluated gap scans after which I restored X-ray BPMs to the orbit configuration which had been removed due to steerings. (Karen Schroeder)

- Produced the beam-related portion of machine studies schedule and updated both beam and non-beam portion with late and emergency requests. (Karen Schroeder)
- Noticed one of the new radiation monitors was not on the radiation mon. PV monitor watchdog. Checked and found a few others had not been added. Asked Christensen to update the file with the correct ones. (Karen Schroeder)
- Carried out measurements of beam dump induced beam losses at SCU0 BLMs vs ID gaps, scrapers, and ID28 bump with A. Xiao and J. Dooling. Presented findings at weekly machine studies meeting. (Kathy Harkay)
- Checked skew quadrupole FF compensation for SCU0, and found that a scaling factor of 2.5 had to be applied to correct for coupling blowup. Updated FF file in oagData, on instructions from L. Emery. (Kathy Harkay)
- Assisted Harkay in checking out the FF correction of SCU0. (Louis Emery)
- Recorded user operation beam dumps on the ID6 BLM. Found the amplitudes of the US and DS waveforms had shifted with significantly smaller signals US and somewhat higher signals DS. (Jeff Dooling)

Booster Studies

- Performed booster ramp supply current regulation study with partial success. Ramp correction converges. But both gain and trigger delay shows large variation. (Chih-Yuan Yao)

Linac Studies

- RG1 thermionic rf gun beam studies. (Stan Pasky)

APS Machine Research and Development

Storage Ring Research and Development

- Lead the meeting with J. Carder to investigate the S37 scraper outgassing (Yong Chul Chae)
- Lead the meeting with J. Liu for S37 engineering design (Yong Chul Chae)
- Lead the scraper upgrade meeting on February 7 (Yong Chul Chae)
- Expanded presentation on SCU0 BLM studies, to be presented at Yury's SCU0 team meeting on Monday. (Kathy Harkay)
- Participated in S37 scraper design meeting (chaired by Y.-C. Chae). (Kathy Harkay)
- Read NMR probe manual. Search old emails on how dipole field variation was measured at high rates with NMR probe outputs. (Louis Emery)
- Ran Monte Carlo of APS 352 MHz cavities for MBAlattice using weed. (Louis Emery)
- Gave Yipeng Sun BTS transfer line reference material. (Louis Emery)
- Discussed with M. Penicka his method of installing new magnets of APS upgrade. (Louis Emery)
- Investigated the vertical beam motion during user operation. The motion was 2.7 kHz and no data logger reported abnormal hardware behaviour. Using FPGA bpm data, taken at the 2nd time when such instability was onset, and compared with machine model, the error source is pointed to

S11B:V4, which agrees with Louis's result using RFTB PSD data at ~400Hz alias frequency, and the error amplitude is quite small $\sim \pm 0.005$ A sinusoid wave. (Aimin Xiao)

- Sent samples of SR gas bremsstrahlung data to R. Kersevan (CERN). Kersevan responded saying he was interested in the data and request more details for MOLFLOW calculations. Wrote back to say I would try to get him the information he asked for. (Jeff Dooling)

Booster Research and Development

- Worked with Shifu and vendor on V346 function generator programming options. (Chih-Yuan Yao)

ITS Research and Development

- On going preparations for PCGun rf conditioning. Updating medm screens and operating tools. (Stan Pasky)
- Measured uv power with proper wavelength entered in the FieldMaxII; saw no change in the measured power (wavelength in the device had been set at 355 nm, changed to 263 nm). (Jeff Dooling)
- Set up new virtual cathode optics in the ITS. Some components may need replacing (last time used was for IR not UV wavelengths). (Jeff Dooling)

Other Research and Development

- Found a significantly more efficient coherent mode representation and started rewriting the final section of the paper. (Ryan Lindberg)
- Investigated whether "beam conditioning" might reduce the required laser power for a FEL proof-of-principle experiment using the new PC gun. (Ryan Lindberg)

APS Machine Software

AOP Applications Software

- Wrote ArbitraryWaveformEditor which can be used to edit a waveform using various mathematical functions and save the results to an SDDS file. The SDDS file can then be used to set a PV using the sddswput command. (Robert Soliday)
- Updated ADT lattices files to show S26BV4 in new position. (Louis Emery)

Storage Ring

- added APSMakeSafeQualifierString to \$trigger in defining the TriggerMode parameter of FPGABpmTurnHistory to fix the errors when there are special characters in the trigger value. (Hairong Shang)

Injectors

- Improved the RFGUN startup machine procedure status message when raising the cathode heater power so that the user know what the upper and lower limits are. (Robert Soliday)
- Updated the Booster RF machine procedure so that all the system checks can be overridden if they fail. This is needed when new hardware is installed that has different operating levels than the previous hardware. (Robert Soliday)
- Also updated the Booster RF machine procedure so that the beam voltage, beam current, and waveform file come out of the SCR file instead of being hard coded. (Robert Soliday)

- modified booster current ramp software so that it computes the gain and delay factors after scaling where the offset is being removed, we expect to have better performance. will test during machine study. (Hairong Shang)

General

- Informed Brian Robinson about a problem sending email from echo. He fixed it. (Robert Soliday)
- Fixed an problem with sddsoptimize that was causing it to try to shutdown the run control connection twice under certain conditions. (Robert Soliday)
- fixed problem with sdds toolkit documentation webpage. created sddsxra.tex latex documentation, recompiled SDDS toolkit with updated sddsxra documentation. (Hairong Shang)
- revisited OpenMp, implemented OpenMP into sddsmatrixmult, tested with two 2000x2000 matrices multiplication, serial sddsmatrixmult took 63 seconds, sddsmatrixmultOpenMp too 19 seconds, improved about 3 times with 8-core computer. However, sddsmatrixop which uses LAPACK routines took only 2 seconds. -- For matrix multiplication, LAPACK is still the best. And, the results of sddsmatrixmult, sddsmatrixmultOpenMp and sddsmatrixop agree when the matrix is small. However, when matrix is 2000x2000, sddsmatrixOpenMP did not agree with sddsmatrixmult and sddsmatrixop -- OpenMp is not reliable for matrix multiplication at least. May include it in sddsprocess to test,. (Hairong Shang)
- revisited parallel SVD with scalapack, moved all my files from APEX to weed, Asked Bob install scalapack, compiled and tested parallel svd with text input file. working on incorporating SDDS. (Hairong Shang)
- Added ArbitraryWaveformEditor to OAGapps gnome menu. (Hairong Shang)

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

- Updated data loggers after PV name changes during the shutdown. (Robert Soliday)
- Added cronjobs to nike and athena to text me when the CPU load average goes high. (Robert Soliday)
- Added the newer style EPS PLC to the PSSGlobalWatchdog script. (Robert Soliday)
- Built and installed ImpedanceWake2D on the linux cluster for Chae. (Robert Soliday)
- Replaced a failed hard drive in the linux cluster backup storage system. (Robert Soliday)
- Ordered more spare hard drives. (Robert Soliday)
- Moved PSS logonchange loggers off of athena and onto arrow, in an effort to solve a problem with athena locking up at midnight. (Robert Soliday)
- Helped Chae with his urgent request to build genwake on linux. (Robert Soliday)
- Built scalapack on the linux cluster for Hairong. (Robert Soliday)
- Created several new ACIS PV's at the request of the SI group. (Randy Flood)
- Administer the EPICS CVS repository to ensure current versions are installed and conflicts are tracked down and eliminated. (Randy Flood)

Publications, papers and report

- Why should we keep Injector Studies ?? (Stan Pasky)
- Updated some of MBA tolerance related tech notes. (Vadim Sajaev)
- Wrote on DC orbit correction modelling, showing how simple orbit correction produces an error equal to the derivative of a slow perturbation. (Louis Emery)

Web Site

- Updated a few SDDS program latex documentation files with new information. (Robert Soliday)

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

- Reviewed paper for PRST-AB. (Ryan Lindberg)
- Tcavity / SPCGun meeting 2-5-2014 (Stan Pasky)
- The Injector Study Period has and will continue to support our USERS in many ways. (Stan Pasky)
- Quality time is made available during the Injector Studies to recertify operators or training new, commissioning of new components for beam physics studies or operating the injector in different modes in support of the Multi-Bend Achromat Lattice for the APS upgrade. I believe if this time is taken away the Machine Studies Period would be overwhelmed and machine performance and reliability would be at jeopardy. (Stan Pasky)
- Details at ICMS - APS_1443401 (Stan Pasky)
- Made slides on Multi-bunch Instability for review. Discussed ion-related instability with Harkay. (Louis Emery)
- Toured the shuttered IPNS facility with members of the ASRC on Friday. Though in the process of D and D, the site must still be considered an accelerator facility for safety purposes. (Jeff Dooling)

Education, Mentoring and outreach

- Advised L. Boon on her upcoming CLASSE seminar on SCU0 radiation heating analysis. (Kathy Harkay)

Safety and Required Training

- Attended Dayforce training. (Robert Soliday)
- Took Integrated Safety Management Awareness training class (Karen Schroeder)

Miscellaneous

- Took one vacation and two sick days. (Ryan Lindberg)
- took Monday off as incidental leave. (Hairong Shang)
- Attended dry runs of MBA physics review. (Louis Emery)
- Reading HHLFE documentation from Mohan. (Louis Emery)
- Reviewed a post-doc application. (Louis Emery)

- Wrote a reference letter for a POC-HP case. (Louis Emery)
- Gave CVS help. (Louis Emery)
- Looked into a replacement of latex2html that is packaged with texlive2012. (Louis Emery)
- Instructed an engineer on the Greek origins of the word "plinth" (Louis Emery)