Weekly Report for 01/11/2016

Highlights

• Convened one Injector Working Group meeting and organized the agenda for another. (Kathy Harkay)

• Analyzed synchrotron radiation heating on helical SCU (HSCU), comparing hard-edge model with including fringe field effect, for a range of HSCU chamber apertures, chamber lengths, and two longitudinal placements in the ID straight. (Kathy Harkay)

• Presented physics assumptions for APS-U BM1 ray tracing, at a meeting on steering limits for quad-doublet ray tracing, convened by J. Carwardine. (Kathy Harkay)

• Determined path changes from the Decker distortion (repeating the method of E. Crobie) to make the ring close to an accuracy 1e-12 m. This is needed to compare APS-U lattice magnet locations with present APS magnets. (Louis Emery)

APS Renewal and Upgrade

• Investigating how numerical parameters (eg. the number of bunch macroparticles) effects the results of the FASTION simulation. (Joe Calvey)

• Running ion instability simulations for APS, APS-U, and NSLS-II with realistic pressure variation around the ring. (Joe Calvey)

• Convened an Injector Working Group meeting. Agenda includes Injector R&D status (me), PAR rf cavity measurements (T. Berenc), and Testing long Booster ramps in 1-Hz mode (CY Yao). (Kathy Harkay)

• Presented physics assumptions for BM1 ray tracing, at a meeting on steering limits for quad-doublet ray tracing, convened by J. Carwardine. (Kathy Harkay)

• Followed up with B. Stillwell after J. Carwardine's meeting. Wrote him a spreadsheet that computes the single-orbit-distortion (OD) extreme orbit ellipse at the exit of each BM1 segment for a given downstream vacuum chamber geometry. This is a track-forward approach. We discussed how to implement H. Cease's idea to track back from the sensitive surface (with clearance) and check whether photons can exist inside the OD phase space. Turns out that I neglected to include the x-offset of the source, which becomes important for source points well inside BM1. This could be neglected for APS and IDs (e.g.recent work on HSCU heating). Work is ongoing. (Kathy Harkay)

• Generated a new spreadsheet from elegant for B. Stillwell for the Ver6 lattice, with BM1 broken into ~4-mm segments for his ray tracing calculations. (Kathy Harkay)

• Organized an agenda for an Injector Working Group meeting next week, focusing on Booster RF modeling and upgrade requirements and options. (Kathy Harkay)

• Continued injection simulations of the various candidate lattice for the upgrade. Reworked model to include local impedances and element-by-element tracking over serval hundred turns. Found that longitudinal mismatch between booster and ring may excite transverse oscillations resulting in beam loss. (Ryan Lindberg)

• Further optimization of MOGA solution of V6 lattice (with high ?betax for accumulation) for commissioning simulations, added constraints on maximum sextupole gradients. (Yipeng Sun)

• MOGA optimization of alternate lattice for better performance with high? betax; removed harmonic sextupoles in all the sectors. (Yipeng Sun)

• Attended MBA injector working goup and accelerator physics meetings. (Jeff Dooling)

• Worked on accumulated injection design for alternate MBA optics. Assessed on required kicker strength, aperture requirement, etc. Presented results on MBA working group meeting. (Aimin Xiao)

• Discussed new Septum design with Melike. Emphasized that the 3 mrad vertical bend angle for injection beam is unacceptable, and we need to do detail analysis on the resulting skew Quad error to stored beam. (Aimin Xiao)

MCR Operations

Storage Ring Operations

• Fitting orbit from 11/25/2015 mps dump. Determined S10A:Q2 from the fit. However this must be wrong since S10AQ3 was shown to glitch. Eddy current must be modified somehow. Described a conjecture where the eddy currents got distributed along the whole VC following the principle that the mode with the longest length scale would have the longest time constant. (Nov) (Louis Emery)

• As a result of some discovered problem in the setup of tune measurement (albeit after some repair on the 2nd week of the run), discussed adoption of a plan to make tune measurement more reliable from the start of the run.(Dec) (Louis Emery)

• Arranged for careful reboot of IEX magnets along with A. Xiao. Investigation of PS group on-going, but I left instructions to operators.(Dec) (Louis Emery)

• Determined the source of a 6-hour long 100-Hz BW orbit motion to be at S4B:H2 or S4B:H3. (At tunnel opening next week, EAS-MOM found that it was S4B:H3).(Dec) (Louis Emery)

PAR Operations

• All of the vacuum pumps and gauging in LTP, PAR and PTB have been replaced during this Dec./Jan. maintenance period. (Stan Pasky)

• During the pump change out process the LTP, PAR and PTB were put under a nitrogen purge. This purging process can produce low level moisture with-in the open areas. To extract/remove this moisture will require re-conditioning. Restoring vacuum integrity to what we once had with beam, may take many hours of scrubbing with beam from the linac. (Stan Pasky)

• Took advantage of the week-end to start this BEAM SCRUBBING in the LTP, PAR and PTB. To accomplish this, the Linac Power Supplies and RF Systems were turned over to MCR operation on Friday 22nd at the latest. (Stan Pasky)

• Scrubbing approach - We will start by obtaining good beam in the Linac followed by injecting low level beam charge into the LTP followed by PAR and PTB. I would guess we should start out using 1 pulse, ~ (.5nC) from the linac while monitoring vacuum. I would expect to see some out gassing when beam is first introduce. As vacuum improves the linac charge, and selected pulses can increase unit we reach a safe level for operations. (Stan Pasky)

Linac Operations

• Coordinated Linac Tunnel Closure for RF Conditioning of Linac rf system L2. Provided conditioning instructions and guidance to APS MCR Operators. (Stan Pasky)

• Assisted APS MOM Group technicians with troubleshooting Linac water station water flow issues. It was discovered that an in line mesh filter was the cause of decreasing flow. (Stan Pasky)

• Tuned up linac beam transport with Yine Sun and saved new operating files. (Stan Pasky)

• After modifications to the LACIS wiring, was able to successfully open the ACIS and Linac shutters to allow low-power alignment laser light from the Laser Room into the Linac Tunnel. (Jeff Dooling)

• Modified procedure APS-1865105 to include the use of the LACIS Bypass key (D587) which allows the Linac shutter to open. (Jeff Dooling)

• Asked M. Hahne (ASD-DIA) to work on a mount for the wire grid polarizer. (Jeff Dooling)

• Requested that P. Dombrowski (ASD-DIA) place clasps on the linac optics table enclosure sliding doos to provide a better light and dust seal. Also asked Dobrowski to come up with a mount for the snow gun. (Jeff Dooling)

Procedures

• Updated the SCU1 Alternate LOTO to include starting with full LOTO during a shutdown, as well as making some additions/changes the operators requested to add clarity. (Karen Schroeder)

MCR Operations administrative/misc.

• Attended OPS Directorate and gave update as to issues during shutdown (Karen Schroeder)

• Updated the SR tunnel closure sign-off lists, MPS validations and Top-up sign-off for sign-off in MCR. (Karen Schroeder)

• Reviewed and approved non-RSS SR work requests. (Karen Schroeder)

APS Machine Studies

Storage Ring Studies

• Discussed plan on how to study abort-kicked induced arc-detector trips in S38 C1 and C2. D. Horan will install a fiber cable outside of and adjacent to the C1 waveguide at the elevation of the existing arc detector cable (downstream end), and upstairs connect it to an arc detector. If it detects a signal, then it is not an arc. (Kathy Harkay)

• Submitted machine studies plan for upcoming run to L. Emery for discussion at weekly machine studies meeting, and submitted 2 studies reqquests (I am involved in 4 studies in total). (Kathy Harkay)

• Produced the beam-related portion of the machine studies schedule and updated it along with the non-beam portion as needed. (Karen Schroeder)

• Write GUI for angle bum local impedance measurement. Took data. (Dec) (Louis Emery)

• Test optimizer with orbit bump feedforward with H. Shang on ID27 beamline. This is the final test for rolling out all steering software for all beamlines. (Dec) (Louis Emery)

• Reviewed last runs' studies and discussed this run's studies with group. (Jan) (Louis Emery)

• Obtained C code for bunch current monitor processing from E. Norum (by way of S. Shoaf) in order to handle baseline subtraction hybrid mode bunch pattern. (Louis Emery)

• Submitted studies request to L. Emery for upcoming run. (Jeff Dooling)

PAR Studies

• Measured PAR beam properties (beam size, tune) at high pressure post-shutdown. (Joe Calvey)

APS Machine Research and Development

Storage Ring Research and Development

• Continued to study resistive-wall heating for the helical SCU (HSCU). Added an alternative calculation to my script to compare straight normal (NSE) vs. anomalous skin effect (ASE). Found that ASE dominates for Cu, and is relatively weak for Al. (Kathy Harkay)

• Analyzed synchrotron radiation heating on helical SCU (HSCU), comparing hard-edge model with including fringe field effect, for a range of HSCU chamber apertures, chamber lengths, and two longitudinal placements in the ID straight. Sent result to Y. Ivanyushenkov, J. Fuerst, and others, for ideal orbit. Analysis of power under OD extreme orbits is ongoing. (Kathy Harkay)

• Reading CDR on magnetic measurement requirements, discussed with ASD-MD current magnetic measurements for APS-U and its storage. (Dec) (Louis Emery)

• Discussed with rf group the measurement of HOM in the tests cavity. This is for determining whether we should worry about HOMs in APS-U. (Jan) (Louis Emery)

• Determined path changes from the Decker distortion (repeating the method of E. Crobie). Applied with slightly different dipole effective length. Modified aps.lte template, leaving an option flag to ignore them. Fitted distance between S3 and Q4 more exactly so that ther clusre error is 1e-12 m. (Louis Emery)

PAR Research and Development

• Discussed operation of new PAR RGAs with J. Carter and J. Zientek. Measured PAR vacuum composition. (Joe Calvey)

Linac Research and Development

• Collected uv profile data in the transport box for M-squared measurements. (Jeff Dooling)

• Attended PiP meeting and presented results of recent measurements of laser and pcgun beams. (Jeff Dooling)

• Attended follow-up meeting to discuss pcgun beam alignment issues and recent survey data. (Jeff Dooling)

• With Yine Sune, made Hall probe magnetic field measurements in the pc gun beam line. Found significant magnetic fields especially near "hot spots" where earth's field (primarily By) is being concentrated by high-permeabilty steel. (Jeff Dooling)

• Sent photos of pcgun solenoid to C. Doose (ASD-MD). (Jeff Dooling)

• After taking Hall probe measurements, met with M. Borland and Yine Sun. Borland suggested using an air core to buck the earth's field. (Jeff Dooling)

ITS Research and Development

• Continue to assist and provide direction for the ITS High Gradient Structure Test. (Stan Pasky)

APS Machine Software

Storage Ring

• further improving SRIDSteering.new: added SCR save of SR bpm and corrector setpoints when launching the ID sector dialog box, and added changing the corrector rangeError limits to 50A before steering and restore them after steering to avoid suspend global orbit correction during steering. And added transfer DacAI to RangeErrorCALC.B after steering. (Hairong Shang)

• Improved SRBMSteering.new: 1) added SCR save of SR bpm and corrector setpoints when launching the sector dialog box to be able to undo the steering later 2) added changing the corrector rangeError limits before steering so that the global orbit correction can continue working during steering, and the corrector rangeError limits are restored after steering 3) the ADT display is brought to different display 4) fixed the computation of xray bpm position. (Hairong Shang)

• Improved SRCUSteering.new: added SCR save of SR bpm and corrector setpoints when launching the sector dialog box, and changed the ADT dislay so that the ADT is brought up in different display.x (Hairong Shang)

• Improved gap scan scripts and pems: added moving gaps to 20mm before scan gaps to make sure the xray bpm gains are non-zero. (Hairong Shang)

• Developed and tested SR ID and BM intensity optimization with new steering method: 1) added setIDSteeringAngles.new for setting ID steering setpoints with new method. 2) modifed ID and BM intensity optimization scripts to use new steering method during optimization. (Hairong Shang)

Injectors

• tested and installed swith to booster 1Hz/2Hz IRamp pems, and added loading IRamp reference and loading RampTing, InjTiming, InjPulsedPS. AFG, and Bcontrol, from SCR for switching to 1Hz/2Hz IRamp pem. (Hairong Shang)

• added RampTiming category for restoring to BPSSetFullPower pem. (Hairong Shang)

• moved the ramp load to after loading the AFG gain and delays for loading safety ramps, to avoid ramp loading errors when existing gain is too big. (Hairong Shang)

• modified linac RF gun kicker valiation pems: comment out setting the timing system because It:L:RFG:10Hz_rate_bo.VAL pv no longer exist. (Hairong Shang)

• added missing arguments of sddscasr for restoring waveforms in switching to 1Hz/2Hz IRamp pems. (Hairong Shang)

• added setting proper bunch cleaning start time delay (P:DG1:aDelayAO) for switching to 1Hz (or 2Hz) ramps. (Hairong Shang)

General

• working on c and tcl coding for controlling HP5452 scope. (Hairong Shang)

Simulation Software

• working 4x4 SR feedback simulation software, preparing for parallel optimization. (Hairong Shang)

Publications, papers and report

• Reported on my recent finding regarding theoretical and simulation analysis of collective effects at the AOP group meeting. (Ryan Lindberg)

• Report the following to MCR Operators - The SI Group will be validating the new LEUTL ACIS several times as well as debugging the system. The test duration is from now until April Shutdown. During this time the LEUTL signals to the Linac and Booster ACIS have been disabled, like they have since the LEUTL ACIS Shutdown year ago. Doing so prevents all the LEUTL trips and gun inhibits from effecting the machines. (Stan Pasky)

• Also the BTL Single Stop is mechanically blocked closed and BB-BM1 and BB-BM2 are

administratively locked out during this time. The good news is the LEUTL ACIS is connected and running right now, but is not ready for prime time yet. (Stan Pasky)

• Action Items - (Stan Pasky)

• The SI Group will need to change the LEUTL ACIS Operations and Search procedure. (Stan Pasky)

• Not to mention a USI for pending SAD changes or actual SAD changes. (Stan Pasky)

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

• Reviewed an SBIR proposal. (Joe Calvey)

• Attended TWIG meeting and provided information during question & answer portion of Louis Emery's talks (Karen Schroeder)

• Attended Beam Stability Working group meeting and provided information as needed. (Karen Schroeder)

• Completed and submitted review of SBIR proposal (Ryan Lindberg)

• Reviewed and approved - (Stan Pasky)

• Validation of the Storage Ring Dipole Interlocks Indicating the Magnet Fields are Operating above 6 GeV. (Stan Pasky)

• BTL Radiation Stop - With the ACIS LEUTL upgrade the LEUTL radiation stop needed to be blocked in the close position r. AES-SI - Installed Clamping Device on LEUTL Radiation Stop to Prevent Opening - Approve for work (APS_1692418) (Stan Pasky)

• Attended - (Stan Pasky)

• Injector Working Group meeting and discussed Injector R&D status, PAR RF cavity measurements and Testing longer ramps in Booster 1-Hz operation. (Stan Pasky)

• PC gun alignment follow-up meeting to discuss measurements on the PC gun and L1&L2 structure alignments. (Stan Pasky)

• L3 water station configuration meeting to discuss proper use of machine protection interlocks. (Stan Pasky)

• Refereed two papers (PRSTAB in Dec and J. Inst in Jan) and one SBIR (Jan). (Louis Emery)

• Gave lecture to AOP group on local impedance measurement with angle bumps. (Dec) (Louis Emery)

• Reviewed one paper for NIM-A, Nuclear Instruments and Methods in Physics Research Section A: Accelerators, Spectrometers, Detectors and Associated Equipment. (Yipeng Sun)

Safety and Required Training

• Took LOTO practical (Karen Schroeder)

Miscellaneous

• Wrote reference letters for last summer's Lee Teng intern for graduate studies applications.(Dec) (Louis Emery)

• Responded to A. Khounsary (IIT) on helping him answer a beam-related question for an x-ray optics paper he is submitting.(Jan) (Louis Emery)

• Discussed with CY on future injection beam study. Discussed study plan on the group meeting. (Aimin Xiao)