

Weekly Report for 11/02/2015

Highlights

- With V. Sajaev and J. Dooling, found an abort kicker configuration that works--no SCU quenches. The kicker trigger was delayed with respect to MPS (V. Sajaev's idea). Further studies are needed to resolve an RF trip issue. (Kathy Harkay)
- Presented first thoughts on a beam abort system for APS-U, at the weekly APS-U physics meeting. Discussed goals, abort-related considerations, and initial plans. Discussed experience with the abort kicker and IK2 in the present APS, where we discovered a strong dependence of beam loss location on sextupoles. (Kathy Harkay)

APS Renewal and Upgrade

- Participated in PAR high-charge, stored beam studies with CY Yao and J. Calvey. My idea was to measure the horizontal beam size as a function of stored charge, from which we could extract the energy spread. We observed a sharp rise in σ_X around 16 nC, which is consistent with microwave instability onset, and is correlated with the synchrotron spectrum switching from multiple fs sidebands to a continuum. (Kathy Harkay)
- Presented first thoughts on a beam abort system for APS-U, at the weekly APS-U physics meeting. Discussed goals, abort-related considerations (i.e. BPLD and ray tracing), initial abort concept, and plans. Discussed experience with the abort kicker and IK2 in the present APS. (Kathy Harkay)
- MOGA optimization for V6 lattice with high beta injection for accumulation. (Yipeng Sun)
- Worked with B. Soliday to increase speed of FASTION code by roughly an order of magnitude. (Joe Calvey)
- Continued investigating different combinations of shaking parameters with FASTION code. (Joe Calvey)

MCR Operations

Storage Ring Operations

- Continued to discuss automatic quench logging with Mary Smith and Rich Diviero. (Kathy Harkay)

Linac Operations

- Discussed noise problem on the MV200 frame grabber (FG) with S. Shoaf (AES-CTL); this noise makes analysis difficult when integrating in the x-direction to obtain the y-profile. (Jeff Dooling)
- Shoaf confirmed that the mac-based LFG systems have "coring" turned off (threshold level=0). (Jeff Dooling)

Procedures

- Starting the review process for procedures due for review in December 2015. (Stan Pasky)
- Validation for the Linac RF Waveguide Switching System (APS_1431254) (Stan Pasky)
- Completed an alternate LOTO for the Linac. This LOTO will allow Linac L2 conditioning during the Jan 2016 maintenance period. (Stan Pasky)

APS Machine Studies

Storage Ring Studies

- Tried firing the abort kicker at 10 kV with 60 & 90 usec delay relative to MPS (with V. Sajaev and J.

Dooling). With 90 usec, BLM signals are small at ID1 (SCU1) and ID6 (SCU0), and neither device quenched when powered to usual user main coil current setpoints. Remaining issue is that S38 rf cavity 1 & 2 gave arc detector trips for this kicker configuration, possibly because some beam is getting lost at S38B:Q2 upstream of the cavities. Further studies are planned (lower voltage and/or less delay). Prepared slides for weekly machine studies meeting, presented by J. Dooling. (Kathy Harkay)

- Repeated ID6 BLM calibration to confirm data from 2014, with J. Dooling, who acquired the BLM scope data. Set up the IK2 kicker and acquired turn histories. Initially, the beam losses were relatively small in ID6 and did not vary with bunch position on the kicker waveform. Using the turn history sum, discovered that the main beam loss location is ID5, not ID6, with the hybrid lattice (high chromaticity, RHB). Changed to the standard 24-bunch lattice (low chrom, RHB), and reproduced earlier results that the main losses are in ID6: high BLM signal, and turn history sum consistent. Prepared two slides for weekly machine studies presentation. (Kathy Harkay)
- Done orbit switch from 24 to Hybrid. (Aimin Xiao)
- Participate in ID steering test. (Aimin Xiao)
- Develop new APS optics for small physical aperture at helical SCU at S32. Achieved 15mm to 8mm diameter in optics design. (Yipeng Sun)
- Performed machine studies for 10mm diameter in X, $\beta_x < 2.2\text{m}$ in HSCU. (Yipeng Sun)
- Monday participated in an abort kicker (AK) study with K. Harkay and V. Sajaev. Tried Vadim's idea of delaying AK 15-25 turns after MPS. This worked. (Jeff Dooling)
- With AK at 10 kV, BLM signals were low and energized SCUs did not quench with beam dump from 100 mA. Presented results at the Studies meeting Thursday. (Jeff Dooling)

PAR Studies

- Continued PAR stored mode studies. Measured bunch length, spectrum, and beam size vs charge, up to 20 nC. Results suggest microwave instability above ~ 16 nC. Compared spectrum with 12th harmonic cavity on/off. (Joe Calvey)

Linac Studies

- Tuesday, conducted PC Gun study with YE Sun, S. Pasky, and S. Zholents. Successfully transported beam through the linac; however, profiles in the L3 matching section are highly distorted. (Jeff Dooling)
- Observed maximum bunch charge of 460 pC. (Jeff Dooling)
- Analyzed quantum efficiency (QE) data from Friday 10/30 pccgun study and compared QE vs. rf gradient with theoretical model of Dowell and Schmerge. (Jeff Dooling)
- Found that by modifying the work function, could obtain a good fit to the data. (Jeff Dooling)

APS Machine Research and Development

Storage Ring Research and Development

- Carried out elegant simulations of the abort kicker for different lattices. Found that the loss locations are very sensitive to the sextupoles used in the simulation. It also explains why no ID1, ID6 beam losses were predicted (24-bunch default chromaticity of (4.2,6)), whereas ID1, ID6 beam losses were detected in machine studies. Repeat simulations using calibrated sexts (giving chrom of (1.9,1.9)) do give losses at ID1, ID6, which is consistent with studies. (Kathy Harkay)

- Was asked by M. Borland to determine the dose on the SR injection septa from abort kicker beam dumps using MARS. (Jeff Dooling)

ITS Research and Development

- Coordinating installation efforts of the High Gradient Compact S-Band Accelerating Structure in the ITS as well as supporting waveguide from Linac L6 rf system to the Injector Test Stand. This includes all machine protection interlocks for L6. (Stan Pasky)

APS Machine Software

AOP Applications Software

- working on RCDS optimization software, not done yet. (Hairong Shang)

Storage Ring

- study manual of the replacement scope for SR scope. (Hairong Shang)
- did machine study with Mike Hahne for his MOBO gap scan to align xray bpms. Fixed the problem of GlennSquareMatrix through replacing nonexistent S2A:P0 by S2A:P1 so that Mike could continue the experiment. (Hairong Shang)
- working on SRIDSteering improvement: 1) modified steering to transfer the setpoint of pollted xray bpms which was not considered before. 2) modified gap scan pem to set the scanned xray bpms' setpoint to zero after new gap FF table is installed 3) working on SRIDSteering to apply setpoint changes of in-bound bpms and xray bpms including the adjust waveform and feedforward setpoint waveforms, and apply the corrector changes to corrector delta waveform -- ready for test. And did machine study with Louis on SRIDSteering, 1) change was installed. -- so that there are non-zero setpoint of xray bpms now. (Hairong Shang)
- made improvement of gap scan pem 1) zero the setpoint of scanned xray bpms when installing new FF table 2) make new SR UBOP to keep the correct setpoints after gap scans. (Hairong Shang)
- commented out "set homeDir [pwd]" in SROrbitControllaw since it is not being used anywhere else (but caused errors when restart the application which complained that can not access parent directories: no such file or directory). (Hairong Shang)
- collectSRTuneSpectra to collecting SR FPGA tune spectra and added it to OAGapps menu. (Hairong Shang)

Injectors

- did 1Hz booster machine study with CY. (Hairong Shang)

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

- Attended a meeting to revive the LEUTL tunnel for the photocathode gun beam and explore interleaving operations between the LEUTL and PAR. (1) Introduction (Zholents) (2) PC Gun Beam In APS Linac: Simulations, Measurements and Operation Considerations (Sun) (Stan Pasky)
- Attended first Dec./Jan scheduling meeting. (Stan Pasky)
- Conducted search committee work for TRIUMF ALD for Accelerators. (Kathy Harkay)
- Reviewed one manuscript for PRST-AB. (Yipeng Sun)

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- Attended the RSSCDR meeting Thursday. (Jeff Dooling)
- Attended BPM/bellows mini-workshop hosted by B. Stillwell. (Joe Calvey)

Safety and Required Training

- Completed safety training EQO140. (Kathy Harkay)

Miscellaneous

- Completed open enrollment... (Stan Pasky)
- Made machine study schedule for next week. (Aimin Xiao)
- Discuss beam dump issues with Kathy. (Aimin Xiao)
- Read paper on beam transfer line. (Aimin Xiao)
- Discussed ion trapping/instabilities with A. Blednykh. Talked about possible collaboration on this topic. (Joe Calvey)