ACCELERATOR DEVELOPMENTS

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Work has continued on a variety of accelerator developments at the SRC over the past year. The low emittance operating mode "LF15" is now routinely run for all 800 MeV beams. This gives a factor of three reduction in horizontal beam size, with unchanged vertical beam size and beam lifetime. The exception to routine LF15 running is when vacuum work is done in the ring, after which Base Lattice is run for the first few weeks.

LF15 cannot be run at 1 GeV due to power supply, cabling, and magnet limitations. For reduced emittance at 1 GeV, an alternate lattice with emittance between LF15 and Base Lattice has been designed. Operation will require upgraded cables on some of the quadrupoles, and this is presently being pursued. However, LF15 can be run at 950 MeV, requiring only the cable upgrades. Tests of 950 MeV LF15 have been encouraging. We are also investigating other low emittance 950 MeV lattices.

We continued to make improvements made in beam stability. An additional feedback loop was installed in the main RF system to reduce coherent synchrotron oscillations of the beam. This, combined with a general reduction of 60 Hz harmonics on the beam, has reduced noise levels on the infrared beamlines so that they can now be used when running low emittance beam. Undulator compensation has progressed to the point that U1 and U3 can now be scanned over their full ranges in LF15. Compensation work is continuing with U2, and in Base Lattice.

In an effort to improve beam lifetime, we are continuing studies to more fully understand beam loss mechanisms. To increase lifetime, it may be necessary to open up some limiting apertures in the ring.

Other projects completed over the past year include upgrading the accelerator control system CPUs, coating the injection kicker ceramics to reduce wakefields and radiated RF, and installation of a modern scripting language on the control system. Scripts are used to simplify accelerator operations, implement control algorithms to improve beam stability, and perform experiments during accelerator development periods.