Abstract: Synchronized ramping of an assembly of magnets is critical for operation of beam in an accelerator. Magnet currents must remain within the operational limits to avoid misalignment of electron beam. In order to comply with the design specifications of ERL and ELENS project, two different software control mechanisms have been developed. The ramp profile is automated and maintained by tracking current in all dipole magnets at ERL and superconducting solenoid magnets at ELENS. This mechanism speeds up operations and adds a level of protection. The purpose of this application is to reduce unnecessary interlocks of the personnel protection system. This paper will describe the power supply arrangement, communication mechanism and the state machine algorithm used for feedback and control. A report on operating experience will be presented.

Energy Recovery Linac Magnets

Quadrupole, Solenoid, and Precision Steering Supplies – 23 main quadrupoles, some small dipoles/solenoids. ~ 10 Amps, 15 Volts, 100 ppm, Bipolar, DC supplies

Key Software Features

- `erlMagMan` is a program written to co-ordinate DC ramps of several dipole, quadrupole and solenoid magnets at ERL’s gun to dump beam line
- Each magnet is represented as a software object with configurable parameters such as correction angles, relationship coefficient with reference dipole magnet, maximum output current threshold
- Output currents of each supply in the system is compared against a threshold value which is set to be at 4% of PASS system maximum. An alarm is raised at violation of this threshold
- This software is also used as underlying link between orbit correction application and magnets
- Work is under progress for implementing a magnet hysteresis compensation algorithm

Electron LENS

Fig 2. Blue ELENS ramping from 0 to 5.8 Tesla field main

Key Software Features

- `elenSrigMan` is a program to ramp four superconducting solenoids simultaneously for blue and yellow ELENS or individually. This software interfaces with the RHIC Wave Form Generator is described in detail elsewhere [1]
- ELENS magnet profile is broken down into various states such as IDLE, RAMP, SLOWRAMP, STOP, and RESUME
- These states are implemented in C++ in form of a state machine
- Software allows easy transition between staggering ramps fig1 and smooth ramps fig2
- The user interface allows for selection of multiple magnetic fields (from Zero to Six Tesla) for the system and relevant parameters are automatically loaded from a lookup table

References