Induced activity and complex shielding geometries

Val Kostroun

The various components of the ERL, electron gun, linac, bending magnets, collimators, insertion devices, etc. are all sources of radiation fields produced either by the confined electron beam or by stray electrons. Depending on the primary electron energy, the resulting radiation fields consist of energetic photons, lower energy electrons, positrons, neutrons, muons, or some combination thereof. The radiation fields produced along different parts of the ERL have to be shielded against in order to prevent dangerous exposure to personnel, and radiation damage to electronics and other components. The shielding often requires complex geometries that are evaluated using Monte Carlo codes such as MCNPX, FLUKA, and EGS5. There are two parts to this project. One is to use FLUKA or EGS5 to calculate properties of different shielding geometries, and the other involves taking and analyzing radiation data recorded at different parts along CESR and the Phase IA ERL. The data in turn will be used to verify code calculations. Neutron fluxes will be determined from activation foils analyzed by an intrinsic germanium gamma detector. To determine gamma doses, a gamma ionization chamber will be used, as well as film badges or dosimeters sandwiched between absorbers.