Projects for PHY 564

Colliders

i. Electron-positron colliders
ii. Hadron colliders
iii. Muon collider
iv. Electron-hadron collider

Radiation

i. Synchrotron radiation
ii. Undulator radiation
iii. Free Electron Lasers
iv. Transition radiation

Cooling

i. Radiation cooling of beams
ii. Ionization cooling
iii. Electron cooling
iv. Stochastic cooling
v. Coherent Electron Cooling

Beam dynamics

i. Beam – beam effects in colliders
ii. Nonlinear resonances
iii. Space charge effects
iv. Intra-beam scattering
v. Touschek effect – beam lifetime

Sources of particles

i. Thermionic gun
ii. Photo-emission guns
iii. Hadron beam sources
iv. Polarized sources of electrons
v. Polarized sources of hadrons
vi. Sources of positrons
vii. Sources of antiprotons
viii. Sources of muons

Applications

i. Light Sources
ii. Medical accelerators
iii. Accelerators for ion implantation
iv. Accelerators for grain and food processing
v. Industrial accelerators: welding, improving cables quality, …..