Applications of Particle Physics in Cancer Treatment at Mayo Clinic

Most radiotherapy in the United States is delivered by photon beams, which is sparsely ionizing and can cause injury in normal tissues surrounding tumor cells being targeted for cancer treatment with radiation. Particle beams, which are composed of hadrons with charge and mass, have a finite range in matter and can be utilized to more precisely target medical radiation. This targeting capacity, as well the unique radiobiological interaction between human DNA and heavier charged particles, can be exploited to reduce the risk of injury of medical radiotherapy in normal tissues and reduce the long term risk of a radiation therapy induced malignancy.

Mayo Clinic is currently constructing two particle accelerators, one in Rochester, MN and the other in Phoenix, AZ, that will be used to accelerate protons to use in cancer treatment. This talk will review the basic principles of atomic physics behind the use of charged particles in cancer therapy. It will also briefly review prior clinical uses of accelerator beams in cancer treatment as well Mayo Clinic’s plans for future use in oncological therapy.