AbstractID: 7197 Title: Radiation Shielding Calculations in the Post-NCRP 49 Era

Designers of shielded rooms for radiation therapy with megavoltage electron linear accelerators rely principally upon the use of three documents: NCRP #49 (which superceded NCRP #34), NCRP #51 and NCRP #79. However, it is well recognized that these documents, published in 1976, 1977 and 1984, respectively, though they provide a conservative framework for calculating shielding barrier thicknesses, are nevertheless incomplete in terms of data or methodology for solving certain shielding problems, particularly those associated with high energy machines. Since the last report appeared, a substantial amount of literature has been published on many aspects of shielding design, particularly on high-energy machines and neutron production. Preparation of an update of the three existing reports to cover these new situations is currently being addressed by AAPM TG-57 that also doubles as an NCRP committee, SC46-13.

The purpose of this refresher course is to review the application of the basic shielding equations for primary, scatter and leakage radiation and discuss general principles of room design and layout. Included in this discussion are the concepts of workload, use and occupancy factors and current regulations on maximum permissible exposure and their effect on design. The special circumstance where an existing facility is upgraded from a low to a high energy machine where additional shielding space is limited will be addressed.

In addition to these considerations, particular shielding problems related to high energy machines, such as door shielding for neutrons and capture γ rays at the end of a maze, laminated primary shielding and neutron generation and edge effects for doors that shield for direct secondary radiation from the target. The impact of special procedures such as TBI, SRS and IMRT will also be discussed.

Educational objectives:

1. Familiarize the audience with the basic concepts of primary, scatter and leakage radiation for megavoltage x-rays and their application to concrete barriers. Discus the general principles of room design and layout.
2. Review shielding literature published since the last NCRP report on this topic.
3. Review new methodologies and data for calculating door shielding for high energy accelerators, with or without a maze.
4. Review specific examples of shielding problems either not covered or inadequately covered in existing NCRP literature.
5. Discuss impact of new treatment modalities and regulations on shielding design, particularly IMRT.