

Physics Division Seminar

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Developments towards a Linac-based Ion Therapy Center

Host: Whitney Armstrong

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An Advanced Ion Therapy Research Center is being proposed in the Chicago area. This innovative center will combine an advanced compact ion linac, a compact superconducting carbon beam gantry and real-time MRI-guided beam delivery for therapy. The proposed center would be the first linac-based ion therapy facility in the world, with the advantage of much desired fast energy and ion beam species switching capability. Such a facility would prove a unique platform to stage the development of pre-clinical studies to prepare for FDA clearance for carbon and other ion beam therapies in the US, and pave the way to establishing a clinical therapy facility in the Chicago area. The proposed center will enable a breadth of research and applications such as cellular radiobiology, comparative studies of different ion beam therapies and the development of real-time imaging for precise and accurate dose delivery. Research and Development towards the realization of the proposed center is underway along three major axes. A conceptual design for a compact carbon ion therapy linac has been recently developed. The linac is 45 meters long and capable of accelerating ion beams from proton to neon up to an energy of 450 MeV/u. Prototypes of high-gradient accelerating structures required for the linac are being fabricated and tested. A design of a compact superconducting carbon gantry was also developed and a compact carbon beam scanner magnet is being prototyped. A preliminary concept for MRI-guided ion beam delivery was most recently developed. Other imaging options and range verification techniques, including prompt gamma, positron emission tomography, ionoacoustics and ion beam CT are being considered. Progress made in these areas of development will be presented and the path forward will be discussed.