Contribution ID: **16** Type: **not specified**

Accelerators and Advanced Beam Technologies for a National Center for Particle Beam Radiation Therapy Research

Tuesday, 29 April 2014 15:50 (25 minutes)

As discussed in the DOE report "Accelerators for America's Future," most of the critical R&D in particle-beam therapy can only be conducted at a dedicated accelerator-based medical research facility capable of supplying the full range of ion beams from protons to carbon, oxygen or even neon. Such a facility not only requires beam energies and intensities useful for therapy and imaging but also high beam intensities for advanced radiobiology research and a wide range of Linear Energy Transfer (LET) values. NCI jointly with DOE recently organized a workshop on ion beam therapy where more than 60 experts from diverse fields related to radiation therapy were asked to define research and technical needs for advancing charged particle therapy, producing a detailed final report with requirements for a national center for particle beam radiation therapy research and development. The recommendations of the DOE-NCI workshop report for clinical requirements, in particular high dose deposition rates and motion control, imply beam intensity requirements that take us into uncharted territory for PBRT facilities. This talk addresses the current state of carbon-ion accelerator and beam technologies and the technical and engineering advances required to meet the challenges of a first-in-kind particle research and therapy facility envisioned in the NCI/DOE report.

Summary

Overview of requirements for a National facility for Particle Beam Therapy Research and current carbon-ion and proton therapy accelerators and beam delivery capabilities.

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Session Classification: Session 4. Medical Accelerators, Convener: Vladimir Mares