



Contribution ID: 47

Type: Talk

Beam sharing in cyclotron-based proton therapy facilities

Thursday, 10 May 2012 14:20 (20 minutes)

In cyclotron based proton therapy facilities using volumetric scanning the beam energy beam is varied with a degrader and energy selection system (ESS) to control the beam quality. This system is located directly behind the cyclotron and is shared by all treatment rooms. Consequently the switching of the beam between rooms requires retuning of the ESS and the common beam line and a logical process to couple the ESS with another irradiation setup. This timeconsuming process reduces the treatment capacity of larger facilities.

We propose an optimized layout with a separate ESS for each setup and a system for rapid switching or beam splitting, which increases patient throughput. Beam splitting allows simultaneous irradiations in all treatment rooms and gives the largest gain. The independent control of the beam intensity in the different treatment rooms is, however, a challenge. The rapid switching is in this respect straightforward. It allows quasi-simultaneous treatment: during field changes in one treatment room the beam can be used in another room. The fixed beam energy in the common beam line makes it possible to use permanent magnet quadrupoles in this line.

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talk

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Session Classification: Projects and studies