Contribution ID: **168** Type: **Mini Oral and Poster**

Safety Interlock System Design for Proton Therapy System

Tuesday 13 October 2020 16:16 (1 minute)

As the most complx medical equipment, proton therapy system(PTS) must have a safety interlock system(SIS) which completely avoid non-necessary radiation dose to patients or personnel during operation. Due to the proton beam moves with around two thirds of light speed, the safety interlock system should cut off the proton beam within specified time to ensure the over dose in each field less than 0,25 Gy according to the IEC60601-2-64 standard.

The SIS for PTS consists of three subsystems, which are patient safety interlock personnel safety interlock and equipment safety interlock. Patient safety interlock is responsible for beam off interlock during patient treatment. In order to quickly recover the PTS from the interlock state, patient safety interlock adopts hierarchical beam cutting off strategy according to the severity of the system interlock. The personnel safety interlock is responsible for the safety management of operators or visitors and access control of the radiation area. The equipment safety interlock is responsible for the safety protection of accelerator and beamline equipment. Both equipment and personnel interlock can trigger to shut off the beam.

Hardware module with signal transmission and logic realization is used to ensure the microsecond level response of patient interlock. The configuration of safety interlock system follows the SIL3 level standard, the controller and field equipment adopt SIL3 level hardware. In addition, the beam breaking interlock routine of the safety interlock system adopts redundant design, from the controller to the interlock equipment and the hardware circuit between them.

Minioral

Yes

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No

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Presenter: FENG, Hansheng

Session Classification: Poster session B-01

Track Classification: Real Time Safety and Security