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Development and commissioning of the beam diagnostics for CIAE proton therapy beamline system

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A superconducting cyclotron based proton therapy system has been developed at China Institute of Atomic Energy (CIAE) for years. The system has technical advantages such as high dose rate, fast energy varying, compact structure, and low energy consumption. From the cyclotron to the nozzle, the beam line employed 51 magnets, including six 30° , one 60° , and two 75° dipoles. It can be seen that its strict symmetry ensures the better beam optics, such as chromatic aberration for the beam with wide energy range. In order to meet the beam commissioning needs of such high-quality beam lines, the beam diagnostics system has been developed in house successfully. Along the beam line, the system includes: 1) 7 standardized comprehensive diagnostic units (a combination of Faraday cup, dual wires scanner, and optical beam profile monitor); 2) 4 pairs of X-Y slits for energy selection and emittance re-definition; 3) several separate circular collimators, fast beam cutoff devices, and online monitoring ionization chambers for beam position, as well as Faraday cup for measuring beam intensity in the air section for flexible use. In this paper, the design of the diagnostic system, the specialized electronics, the EMC consideration will be given. And the dual wire structure for pA level weak beam will be introduced, the Ce doped yttrium aluminum garnet (Ce:YAG), which is an important photonic material that is used as a yellow phosphor for white light emitting diodes, has very low intensity threshold for proton beam profile measurement will also presented in detail.

Minioral

Yes

IEEE Member

No

Are you a student?

No

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