ion spot scanning at IMP. Its feasibility was priliminarily verified although there is still room to improve our work.

3 - 71 Indirect Cross Calibration for Particle Spot Scanning at HIRFL-CSR

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Recently a monitor calibration procedure in terms of particle number for dynamic particle beam delivery system was developed according the protocol recommended by the International Atomic Energy Agency (IAEA), although the measurement method of the calibration factor (CF) was time-consuming and indirect. As a consequence, an indirect cross calibration method was tested for particle spot scanning in the therapy terminal at HIRFL-CSR in order to predict the CF of the monitors in a short time.

Cross calibration for particle spot scanning was based on the linear regression analysis between the dose measured in a field of 80 mm in diameter with a Markus 23343 detector and that measured for a single beam spot with a Bragg peak chamber 34070 (BPC). The measured dose with the Markus 23343 detector in the 80 mm diameter field used to calculate the CF can be predicted using the measured dose of the single beam spot with the BPC when the linear relationship was determined already. The cross calibration was performed with 200 MeV/u pencil-like carbon ion beams while the 80 mm diameter calibration field was generated by magnetically deflected pencil beam in accordance with 3mm spaced grid of scan spots.

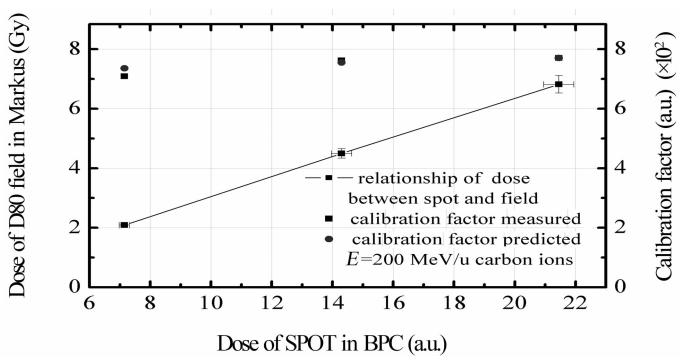

Fig. 1 Cross calibration for particle spot scanning.

The result shows that a good linear response was achieved between the dose in the 80mm diameter field measured with the Markus 23343 and that measured with the BPC for the single beam spot. So the perdicted dose is 2.17 Gy based on the linear relationship when the measured dose of the beam spot with the BPC is 7.15 Gy. The corresponding predicted CF is 735.32 with less than 3.7% deviation compared to the measured CF of 708.55, which were shown in Fig. 1.

In conclusion, the cross calibration procedure shows its feasibility and the experience acquired in this study will be very useful for improving the spot scanning technique in the project of heavy ion therapy at HIRFL-CSR.