January 20, 2009

ADDENDUM TO PTCOG REPORT 1: SHIELDING DESIGN AND RADIATION SAFETY OF CHARGED PARTICLE THERAPY FACILITIES

This addendum is a stand-alone document and will be updated annually to include brief descriptions of new facilities as they become available. This document is not peer-reviewed.

A. Brief Description of New Facilities

A.1 WPE gGmbH, Essen, Germany.

The Westdeutsches Protonentherapiezentrum Essen gGmbH (WPE), is realized as a partnership of Universitätsklinikum Essen (UK Essen) and STRIBA, a joint venture of STRABAG, Vienna, Austria and Ion Beam Applications, Louvain-au-Neuve, Belgium.

The WPE uses a standard IBA 230 MeV cyclotron with a layout of four treatment rooms and five beamlines. Three of the treatment rooms use rotating, iso-centric gantries. The fourth treatment room includes both a fixed, horizontal beamline, and a dedicated eye treatment line.

Two types of scanning nozzles are to be fitted in the WPE: 1) A “universal nozzle” providing uniform (large beam spot) scanning, small spot non-uniform scanning, and traditional scattering. 2) A dedicated scanning system with vacuum extended closer to the isocenter providing a smaller beam spot. The WPE arrangement provides 2 gantries with dedicated scanning only, 1 gantry with a full universal nozzle and a horizontal beam universal nozzle without scattering.

The facility is at present undergoing the acceptance tests and is highlighted in Figure A.1.1 The first patient treatment is anticipated in 2010. The confirmation of the radiological shielding was carried out using the deterministic Moyer Model (Reference 1). The efficacy of the shielding material was carried out using the MCNPX 2.6 code (Reference 2).

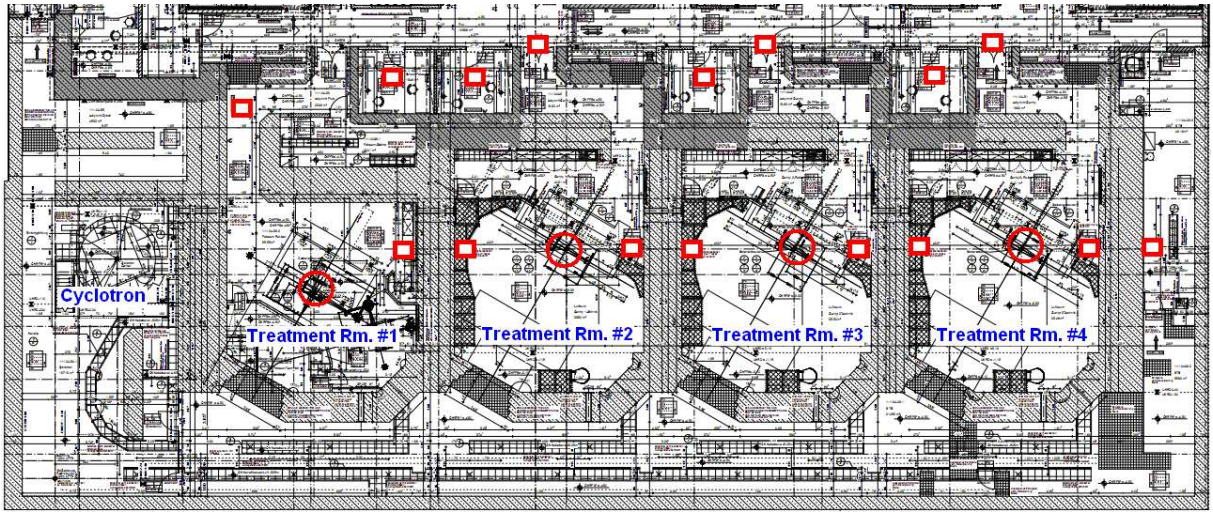

Figure A.1.1. Showing the treatment rooms of the WPE facility, which is based on an IBA Proteus 230 room temperature proton cyclotron, one fixed beam Treatment Room (#1) and three gantry Treatment Rooms (#2 - #4). The circles and rectangles indicate the radiation sources (proton impact points) used for radiation safety calculations and locations of neutron and gamma dose equivalent rate measurement respectively.

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References:

1. B. Mukherjee, J Farr, C. Bäumer and R. Hentschel: Radiation shielding design for proton therapy treatment rooms (oral presentation). ECPM XXXVII, 28-31 October 2009, Gronningen, the Netherlands.

2. B. Mukherjee, R. Hentschel, C. Bäumer and J Farr: Monte Carlo Simulation of a novel composite shielding for high-energy neutrons produced by proton therapy cyclotrons (poster presentation). ECPM XXXVII, 28-31 October 2009, Gronningen, the Netherlands.

Table 1.1 Summary of the site, neutron source, shielding material, and detector properties

Site	Projectile	Target	Neutron source and measured angle	Shield material (thickness)	Detector
WPE gGmbH, Essen, Germany	80, 150, 230 MeV proton	Polystyrene, Brass	White spectrum, 0^o and 90^o	Normal-Concrete (2.3 m)	FHT 762 (Wendi-2) and BDPND (Bubble Detector)