

Commissioning and QA of the Treatment Planning Computer

Policy:

Guidelines for the Physicist to follow when commissioning and performing Quality Assurance on the treatment planning computers in the Radiation Oncology Department.

Procedure:

- A. Philips Pinnacle Treatment Planning System (TPS) Computer
 1. Beam Profiles and Percent Depth Dose for each photon and electron energy and field sizes and depth were collected using IBA Scanditronix/Wellhofer Blue Water scanning system and Omni Pro-Accept 6.5A System. The detectors were a pair of Scanditronix CC13 ionization chambers. The profiles and PDD's were collected according to the requirement of the Pinnacle Treatment Planning System. See Physics Pinnacle3 Release 8.0. Output factors were also measured using one CC13 ionization chamber and PTW Model T10010 Unidose E electrometer. The data were converted to an ASCH file in Pinnacle format using software from IBA Omni Pro. The data were transferred to the treatment planning system using removable memory chip.
 2. Profiles and PDD data were imported into Pinnacle using memory chip. Linac machine parameters, Gantry, collimator and Couch angles and direction, Jaws and MLC, wedges and block were also entered. Machine models (Rock Mackie), beam energy spectrum (Mohan 6MV, 18MV) were selected. The collected profiles and PDD were then fitted with these beam models, energy spectrum, electron contamination parameters, leaf leakage. The calculated profiles and PDD using these calculated in field, out field parameters model were then compared with those of measured data.
 3. A Linac machine is commissioned only if the calculated profiles and percent depth (PDD) agree with those of the collected measured data satisfactorily. Planning was then made using hypothetical patients to calculate several hypothetical field sizes and depths.
 4. Pinnacle performs an automatic Checksum whenever a plan is launched on all of the commissioned machines in the institution. We need only to see if there is any "Error message" when a plan is launched. Error messages will be logged in a 3 ring binder. Physicist will review these log events and follow-up with the customer, technical, or physics support.
 5. In addition to the Checksum check, an independent MUCheck will be performed on every treatment field. MUCheck is different from Checksum in that it is performed on a computer that is independent from the Treatment Planning Computer. Every single field must pass the MUCheck or the cause(s) identified; for example, calc point is in

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Radiation Oncology
Proc. 19.9.23**

the lung, or in titanium prostheses, or too close to the beam edge, etc. MUCheck will be performed on another calc point that is not in the above mentioned area. The results are printed out and included in the patient chart.

6. For an IMRT treatment planning, not only the planning has to pass the internal Checksum check and all the treatment fields have to pass the MUCheck, all the treatment fields have to also pass the intensity dose map checks. There are several accepted methods of comparing the intensity dose map: we will be using the Sun Nuclear Associated Mapcheck for these comparisons. The results of this comparison will be included in the patient chart.
 7. Mapcheck will be calibrated initially before use. The calibration consists of two parts: array calibration and dose calibration for each photon energy and Linac (if applicable). The calibration will be repeated annually.
 8. Annually a rectangular phantom of known dimensions will be CT scanned and exported to the Pinnacle TPS in a normal way as that of a patient. The dimensions of the scanned image in the TPS will be measured and confirmed with the actual physical dimensions of the phantom. The result will be printed out and kept in the same 3 ring binder as for error message.
- B. Varian Eclipse Brachyvision High Dose Rate (HDR) Treatment Planning System
1. Brachyvision HDR TPS performs calculation using single Ir-192 source. All the source characteristics were entered by the manufacturer. Site physicist and Varian physicist together perform extensive acceptance tests.
 2. There will be QA test performed on the day of a treatment and quarterly source change QA.
 3. Individual treatment planning will be checked with an independent calculation (exel.)
- C. Elekta Gamma Knife Treatment Planning System
1. Similar to the HDR system; Gamma Knife uses Co-60 supplied by the manufacturer. The treatment planning system therefore is also commissioned by the manufacturer, but went through an extensive acceptance test by the Site and manufacturer physicist.
 2. There are “day of the treatment QA”, Monthly QA”, “Annual QA”, and “5 Year and Source Change QA” established.

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