



Contribution ID: 243

Type: Poster

Comissioning of Radiotherapy Treatment Planning Systems: Optimization of the Dosimetric Test of the IAEA TECDOC-1583 guidelines

Background: Independent external audits play an important role in quality assurance in radiation oncology, for this reason the International Atomic Energy Agency (IAEA), in its technical document IAEA-TECDOC-1583, recommends a procedure to establish quality assurance of Radiotherapy Planning System (RTPS) using the IMRT Thorax Phantom (CIRS - 002LFC). The procedure is based on an anatomical test to verify the digitization of contours and the reproducibility of the RTPS and a dosimetric test to check the range of clinical treatment, which consists of eight cases able to simulate clinical situations. This research was focused in optimizing the dosimetric test, keeping tolerance limits and configuration proposed by IAEA.

Methods: This study consisted in correcting the previous mentioned procedure giving the fact that measurements were not done in water cavities, if not in lung, muscle or bone equivalent materials. It was applied for six combination of planning algorithms and high energy photon beams. The CIRS was scanned with a computed tomography (CT) and treatment plans for eight different test cases were planned on local RTPS. The phantom was irradiated following the treatment plans for these test cases and doses in eight specific points were measured with a semiflex ionization chamber.

Results: Differences between the measured and calculated doses were reported by both methodologies. Slightly differences between measurements with and without the correction were appreciably for those tested in bone and lung equivalent materials, being even less in muscle.

Conclusions: This work showed a methodology to optimize the procedure described by the IAEA, bringing the measured dose closer to the planned dose, being these results extensible to advanced techniques quality assurance, such as VIMAT and SRS. It also help us to better understand a more real way to employ the TEC-DOC 1583.

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Session Classification: Poster Session - MP

Track Classification: Medical Physics