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# Pilot study of HDR brachytherapy dosimetry audit in Poland

**Wioletta Ślusarczyk-Kacprzyk, Paulina Wesołowska, Iwona Grabska, Marcin Szymański, Adam Kowalczyk**

**The Secondary Standards Dosimetry Laboratory, Department of Medical Physics,
Maria Sklodowska-Curie National Research Institute of Oncology, Warsaw, Poland**

# Introduction

Dosimetry audits are recommended by the International Atomic Energy Agency as an independent verification of the radiation therapy devices. Such verification should be performed prior to implementation of each device for clinical use, after major repairs or after significant updates to treatment planning systems. In addition, regular participation in dosimetry audits should be included in quality control procedures. The main purpose of such audits is to ensure the safety of the patients being treated.

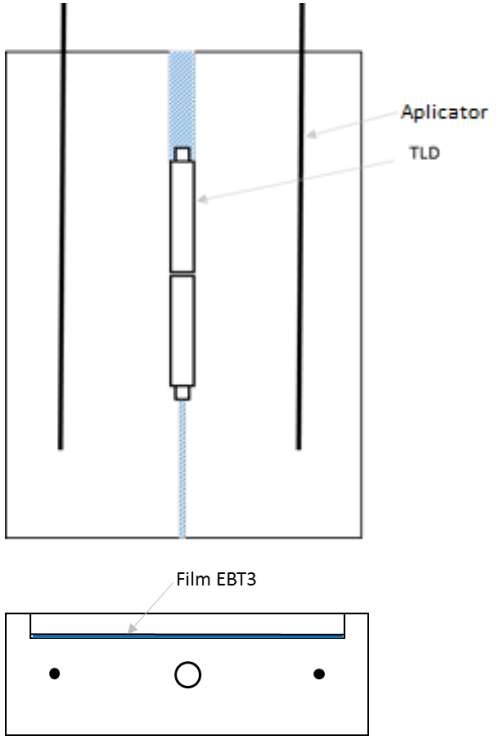
Each year in Poland, approximately 99000 patients undergo radiotherapy, of which 86% are treated with teletherapy and 14% with brachytherapy. Brachytherapy is a technique that has generally received less attention when conducting audits worldwide.

# Materials

The Secondary Standards Dosimetry Laboratory (SSDL) in Warsaw, Poland, prepared a dosimetry audit methodology for HDR devices with Ir-192 source used in brachytherapy. In order to validate the prepared procedure, a pilot audit is being conducted for several centres.

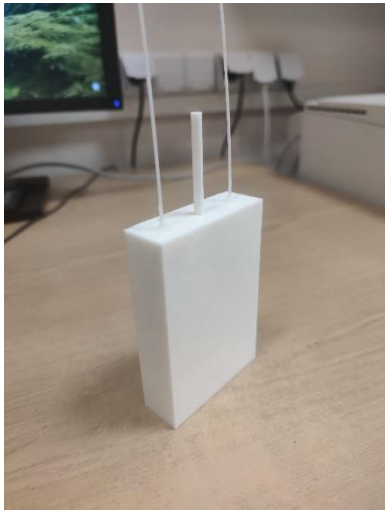
# Methods

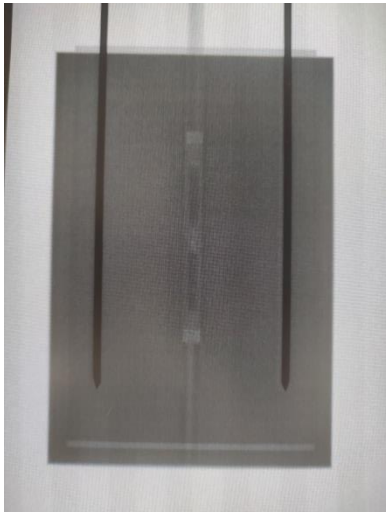
The audit methodology involves the use of thermoluminescent (TL) detectors to measure dose and gafchromic film to measure dose distribution. TL detectors are routinely used for dosimetric auditing (to measure dose in water) of photon beams from conventional linear accelerators. Their preparation in application to Ir-192 sources required the determination of an energy correction and corrections associated with the phantom used. Gafchromic films also required the preparation of calibrations in terms of the doses used. Due to the high gradient of dose distributions from radioactive sources, it was necessary to define a precise measurement geometry.



# Methods

For this purpose, a phantom was designed in which two capsules of TL powder are placed exactly between two applicator positions and a gafchromic film on the side to verify the dose distribution. A 3D printer, which is available in the Department of Medical Physics, was used to make the phantom. The audit methodology is to deliver a homogeneous dose to a volume of TL powder capsules located between two applicators placed in a geometric phantom that provides precise measurement geometry.

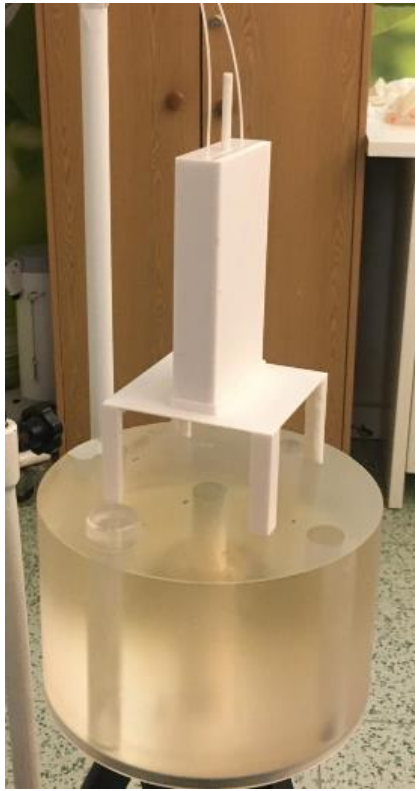




# Methods

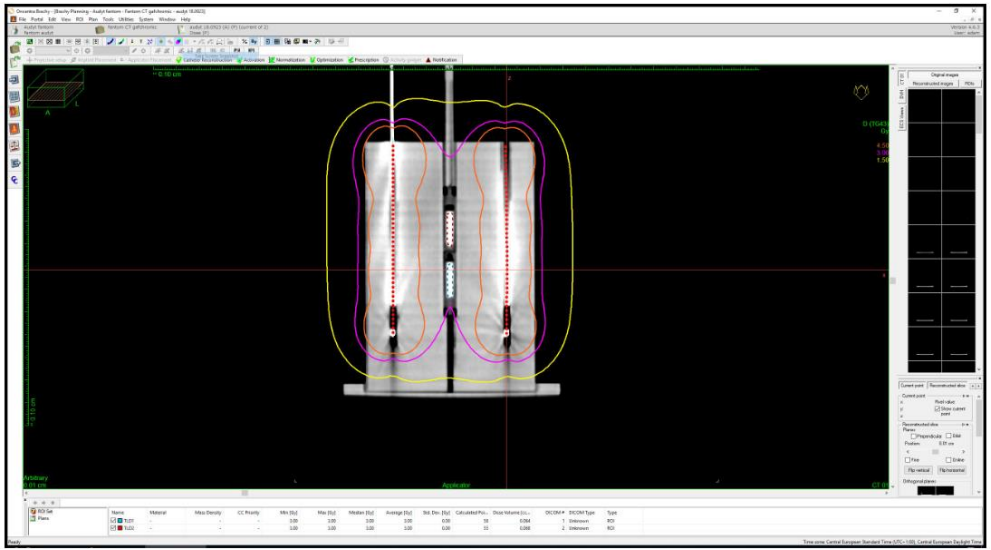
TLD reading were done using FIMEL PCL3 reader available at Department of Medical Physics. Film scanning was carried out on a EPSON 750Pro scanner and analysis was performed using FilmQA Pro software from Ashland. The phantom was printed on Flash Forge Guider 2 3D printer using PLA material. All preliminary measurements for the preparation of detector characteristics as well as for the testing of the audit methodology was performed on the HDR equipment available at the local Brachytherapy Department.

The pilot phase will be carried out in collaboration with several centres in and near Warsaw that agree to participate in the pilot phase of the project.



# Conclusions

The newly developed brachytherapy audit methodology allows for the expansion of the scope of audits available in Poland. The implementation of this methodology at a national level will verify the accuracy and quality of brachytherapy treatment, resulting in increased safety of HDR therapy treatment using the Ir-192 source.



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