cable. This effect was taken into account during treatment planning. Position verification using the PermaDoc phantom confirmed this 1 mm retraction. All radiographically measured dead spaces complied with the specifications, except for the plastic needles which were 1 mm shorter than indicated. The center of the active source is at 2.42 mm from the tip of the capsule. Combined with the 1 mm source retraction, the center of the dose distribution at the most distal position located always 3.5 mm behind the internal end-point of the source channel. Radiographic and dosimetric dead space measurements showed good agreement (<0.5mm) for all applicators.

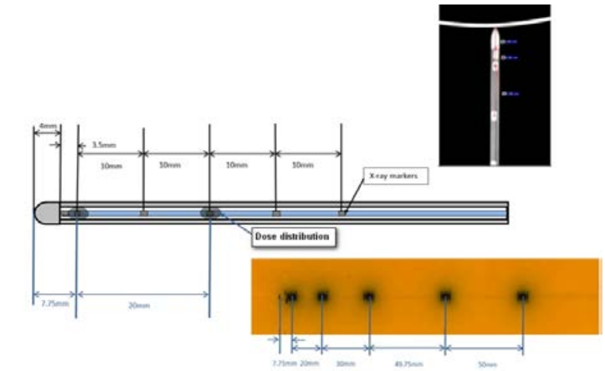

Figure 1: KV images of a stainless steel needle with x-ray markers (Right above). Distances between the physical end-point and middle of the dose distribution were measured on an EBT3 films (right under). The figure in the middle shows a small discrepancy of 0.25mm for the first source position identified using kv-images and EBT3 film.

Conclusion: Measured source position and dwell time accuracy comply with the vendor's specifications. Small deviations were found for the dwell time accuracy at the most proximal source position. Similar tests should be performed regularly to warrant the mechanical accuracy of the afterloader and the quality of the applicators and transfer tubes.

EP-1998

Real-time dosimetry for HDR brachytherapy

L. Moutinho[1], I.F.C. Castro[1], H. Freitas[1], K.A. Silva[1], P.J. Rachinhas[2], P.C.P.S. Simões[2], J.F.C.A. Veloso[1]
[1]*I3N- Physics Department- University of Aveiro, Physics Department, Aveiro, Portugal*
[2]*Hospitais da Universidade de Coimbra, Serviço de Radioterapia, Coimbra, Portugal*

Purpose or Objective: Dose verification and quality assurance in radiotherapy (RT) should be assessed in order to provide the best treatment possible and minimize risks for patient. In certain treatments there are no tools capable of performing real-time dose measurement. In addition, in-situ real-time dosimetry would enhance brachytherapy (BT) by providing technical conditions to perform treatment readjustment and real-time dose correction. Considering the current challenges, we developed a dosimeter intended for in-situ and real-time dosimetry in High Dose Rate brachytherapy (HDR-BT), e.g., prostate and breast.

Material and Methods: The dosimeter developed has a sensitive 3 m long optical fiber probe of 1mm or 0.5 mm diameter comprehending a 5 mm length scintillating optical fiber. To read the signal produced at the probe, 1x1 mm2 Silicon Photomultipliers (SiPM) from Hamamatsu were used. A custom made readout system with SiPM temperature compensation was used. The main concerns when performing dosimetry at high dose rates with high energy isotopes is the eventuality of Cherenkov light production. This form of noise accounts to the total noise signal, known as stem effect.
The dosimeter was placed in a PMMA phantom and the response was evaluated with a 10.07 Ci Ir-192 HDR-brachytherapy source (Nucletron). Measurements were repeated twice, first using a dummy probe without scintillator for stem effect quantification and second using an ionization chamber (IC) read by an electrometer for reference.

Results: The studies carried out allowed assessing the amount of stem effect produced in the optical fiber cable. In the conditions described above, the stem effect contribution is lower than 1% for both 0.5 and 1 mm probes. The measurements of the fiber dosimeter response as a function of the dose are represented in Figure 1. The small difference from the reference IC is due to the different detector volumes of the fiber dosimeter and the ionization chamber. The dosimeter shows a linear response with dose rate being capable of detecting µGy dose variations.

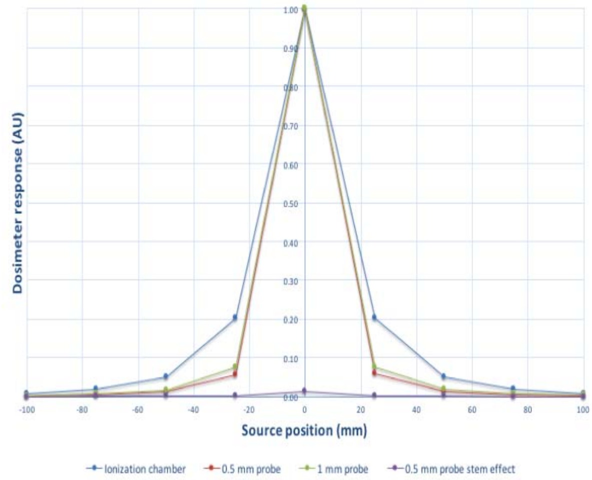

Figure 1: Fiber optic dosimeter stem-effect and response for 0.5 and 1 mm diameter versions compared to ionization chamber response.

Conclusion: The first round of in-vitro tests in clinical setting demonstrated that the fiber optical based dosimeters developed are suitable for dosimetry in regimes such as HDR prostate BT. The versatility of this kind of device and easiness of use allows application in other radiotherapy modalities. Besides fulfilling all the requirements for a dosimeter in HDR-BT, the high sensitivity of this device makes it a suitable candidate for application in LDR-BT.

Electronic Poster: Brachytherapy track: Prostate

EP-1999

Comparison of intraoperatively linked and loose seed in prostate brachytherapy using sector analysis

N. Katayama[1], M. Takemoto[2], A. Takamoto[3], K. Hisazumi[1], H. Ihara[1], K. Katsui[1], S. Ebara[3], Y. Nasu[3], S. Kanazawa[1]
[1]*Okayama University Hospital, Department of Radiology, Okayama, Japan*
[2]*Himeji Red Cross Hospital, Department of Radiotherapy, Himeji, Japan*
[3]*Okayama University Hospital, Department of Urology, Okayama, Japan*

Purpose or Objective: An intraoperatively built custom-linked (IBCL) seeds system is a push-button seed delivery system that allows the user to create intraoperatively customized linked seeds, using a combination of seeds, connectors, and spacers. To date, only three studies have compared the implant quality of IBCL seeds to loose seeds for use in permanent prostate brachytherapy (PPB). However, they did not use sector analysis. Therefore, we compared the implant quality of IBCL seeds to loose seeds in PPB using sector analysis.

Material and Methods: Between June 2012 and January 2015, 64 consecutive prostate cancer patients underwent brachytherapy with IBCL seeds (n = 32) or loose seeds (n = 32). All the patients were treated with 144Gy of brachytherapy alone. IBCL and loose seeds were alternately used basically. All patients were treated by the same radiation oncologist and urologist. We used the same dose-