in-vitro cell survival experiments after photon or ion irradiation. For each radiation quality in the PIDE-Database, the corresponding ICS distributions (ICSD) were calculated with the PTB Track structure code (PTra) [4, 5] for specific nanodosimetric parameters, such as size, shape and material composition of the specified target volume (STV), as well as its distance and direction with respect to the particle beam.

Results: Nanodosimetric quantities were calculated from the aforementioned ICSDs (i.e. the mean ionisation cluster size M_1, or the cumulative probability distribution F_K of ICS, given the probability that an ICS of K or larger is produced in the target volume). The ascertained correlations to the biological data will be presented.

Conclusions: The database application is a useful resource for investigating the range of validity of the nanodosimetric approach.

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Proposal of thermal neutron detector stability for peripheral dose estimation in clinac at a novel neutron facility

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Purpose/Objective: This work aims to design a stability verification system for thermal neutron detectors, based on the characterization and implementation of a fixed neutron fluence beam from a 3 MV tandem facility. The goal would be to minimize the noticed loss of sensitivity with accumulated dose in time and the constancy of the physical-chemical deposition of *TNRD* detector. This will guaranteed a correct behavior of these detectors for peripheral neutron dose estimation [1] in clinical environments when using photon beams over 8 MV.

Materials and Methods: Neutron beams can be obtained by means the $^7Li(p,n)$ and D(d,n) reactions, setup shown in Figure (a). *TNRD (Thermal Neutron Rate Detector)* [2], as most of the neutron detectors are mainly sensitive to the thermal component but photon presence can disturb the signal. Preliminary tests (detector-source distances and angles, plastic material thickness and photon rejection) were performed with epithermal neutron beam (0-100 keV neutron energy) following a quasi-Gaussian distribution by means of the $^7Li(p,n)$, with proton energy near-threshold, in order to have an appropriate neutron thermal fluence. With this information, several Monte Carlo simulations have been carried out to propose an optimal solution.

Results: As expected, tests showed that photon contribution increases when getting closer to the beam and thermal neutron signal increases when a thicker polyethylene block is used while decreases with distance. Thus a compromise between these aspects has to be found in order to ensure an acceptable noise-signal ratio. A solution based on the D(d,n) reaction at E_d=500 keV [3] was found with MCNPX simulations. Figure (b) shows the simulated normalized neutron flux integrated over the cell, with the dimensions of the *TNDR*. One million neutrons can be achieved with 1 hour irradiation using 500 nA deuterium current, polyethylene thickness of 2 cm, 2.1 cm distance between *TNDR* and neutron production target and the detector perpendicular to the beam.

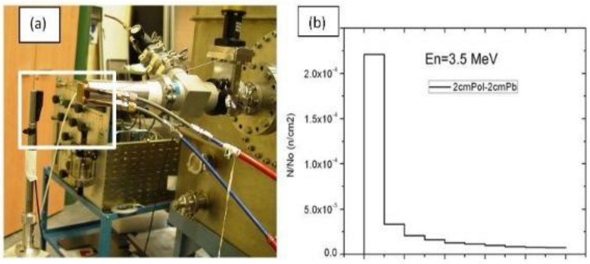

Figure. *(a) Neutron beam setup with TNRD detector located in front of the target. (b) Simulated neutron flux integrated over the TNDR normalized to the total number of neutrons generated in the simulation.*

Conclusions: Periodic measurements in a reference neutron facility should be considered to ensure thermal neutron detectors accuracy. The proposed setup added to the tandem facility, could be an adequate system to perform periodic stability measurements for this type of devices. The neutron spectra obtained from the D(d,n) reaction and polyethylene moderator may fulfill the requirements. Additional future measurements will be performed to verify the viability of the facility for neutron detectors stability verification and to study the possibility to establish as future calibration procedures.

Ref.

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Investigation of new phantom materials for QA in deep hyperthermia treatments

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