Italian National Agency for New Technologies, Energy and Sustainable Economic Development

ISTITUTO NAZIONALE DI METROLOGIA DELLE RADIAZIONI IONIZZANTI | ENEA

PRISM-eBT

WP1: Primary and secondary (transfer) standards for the absorbed dose rate to water with eBT devices at 1 cm depth of water

18NRM02 PRISM-eBT M30 Meeting, December 14, 2021

WP1 coordinator Massimo Pinto, ENEA-INMRI, Italy

Scope of WP1

Aims of WP1 and task structure

To carry out pre-normative research needed to *harmonise* and *simplify* dosimetric procedures for clinical use of eBT in internal radiotherapy, **to reduce uncertainties in dose determination to the level recommended by the IAEA**. This will be fulfilled by **establishing primary standards** dedicated to the assessment of the absorbed dose rate to water at 1 cm depth due to eBT sources in **Task 1.1**, by **establishing** simple and **robust secondary transfer instruments** and calibration procedures in **Task 1.2** for dissemination of the absorbed dose rate to water, and by **validation of these new standards** as traceability chains in **Task 1.3**.

Task 1.1: Establishment of primary standards for $D_{w,1\,\mathrm{cm}}$ (due Aug 2022)

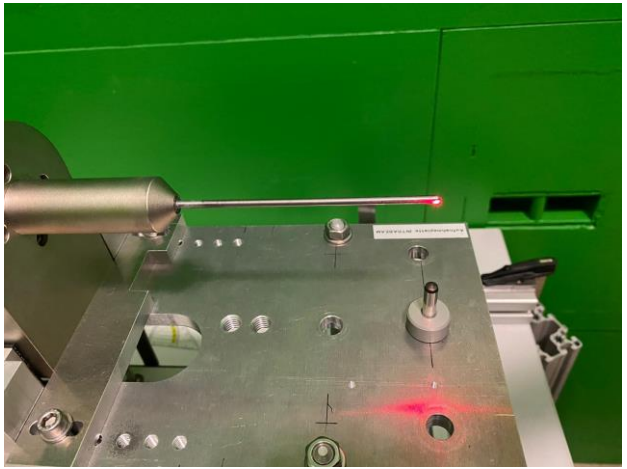
CEA, **CMI** and **ENEA** developing their D_w standard based on the determination K_a of their national standard of air kerma (free air chambers from BIPM.RI(I)-K2) and $K_a \xrightarrow{MC} D_w$ via Monte Carlo (MCNP, PENELOPE)

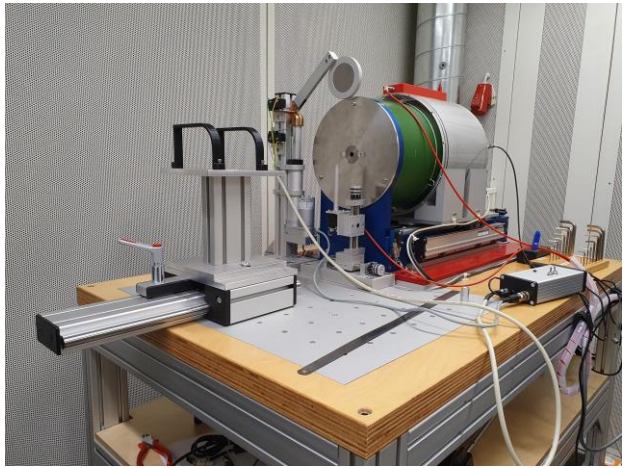
PTB will realise of $D_{w,1\,cm}$ using the existing primary standard for RAKR in brachytherapy of LDR seeds, but with adaptations (next slide)

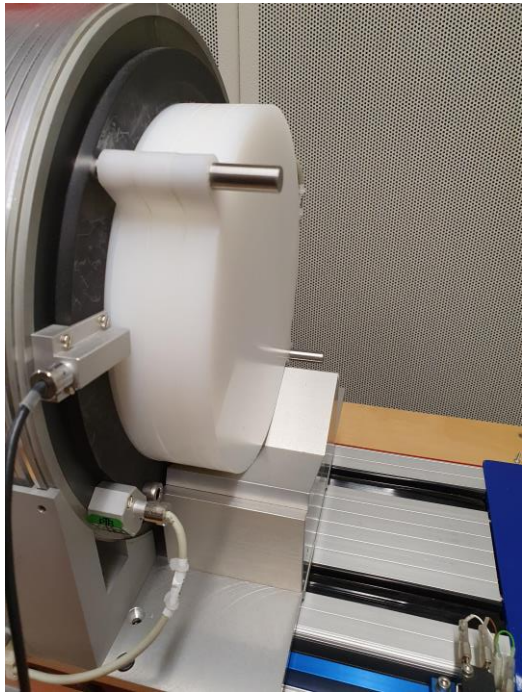
Achieved: Catalogue of the existing eBT spectra published on the project's website http://www.ebt-empir.eu/?page_id=734

And on our project's SharePoint under Work_Packages/WP1_Primary_and_Secondary_standards_of_Dw

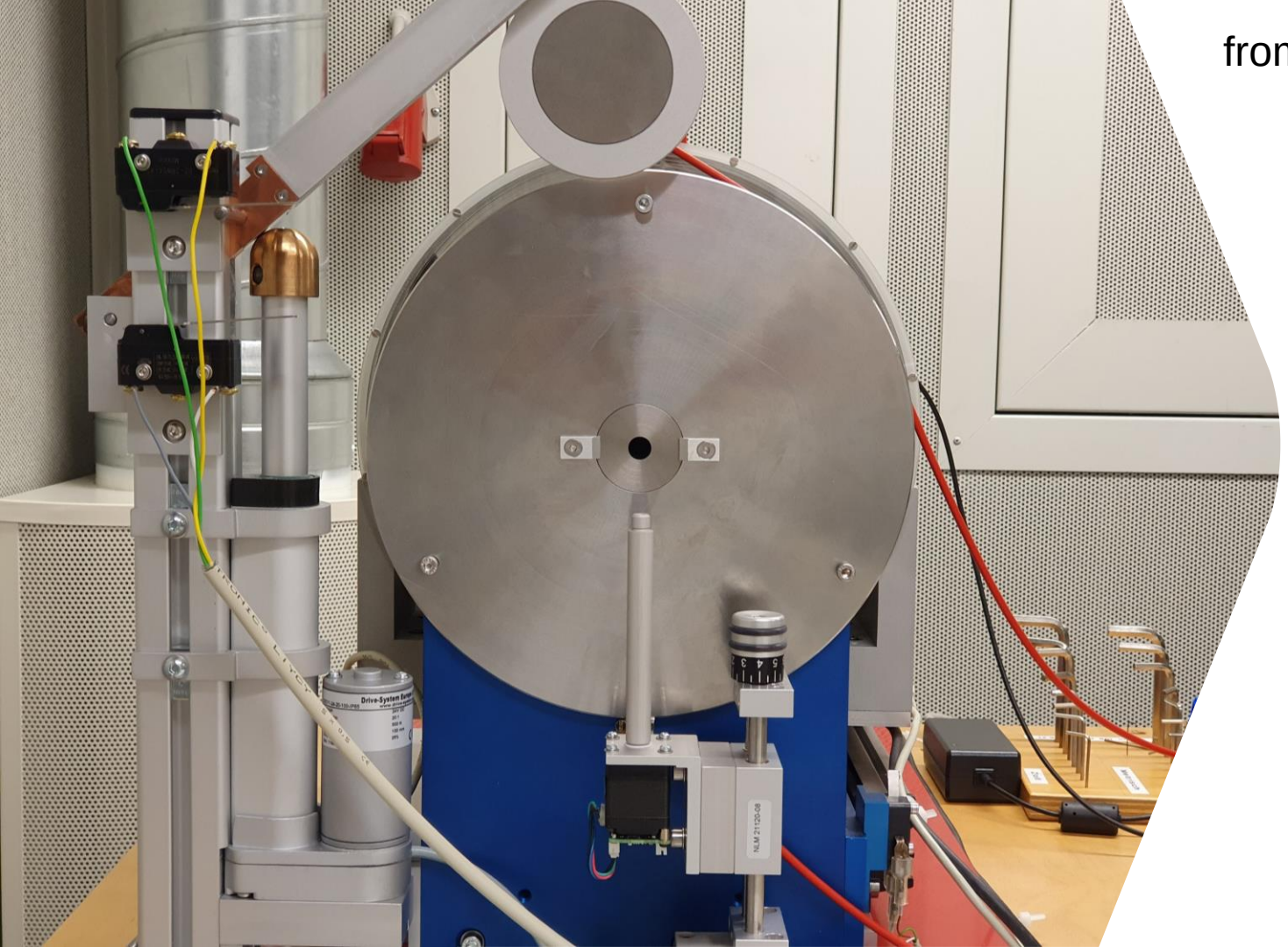
Task 1.1: Establishment of primary standards for $D_{w,1\,\mathrm{cm}}$ (due Aug 2022) – from T. Schneider







ipFAC: Realisation of $D_{w,1\,\mathrm{cm}}$ in water



from T. Schneider, PTB

ipFAC:

- New faceplate
- New shutter
- New aperture
- New phantom material
- New more sensitive electronic
- New Software
- New characterization

Task 1.1 A1.1.3 Formalism for „equivalent eBT“ spectra

CMI and **ENEA** agreed in October 2021 to join at ENEA in 2022 Q1-Q2 and carry out spectrometry of ENEA’s equivalent eBT spectra using CMI’s portable CdTe AmpTek 1-2-3 spectrometer

Task 1.2: Establishment of a calibration procedure for the absorbed dose rate to water using I.C.

The aim of this task is to establish a **calibration procedure**, based on **ionisation chambers** as secondary transfer standards, for eBT sources in terms of absorbed dose to water at 1 cm depth, This will include the characterisation of the commercially available ionisation chambers, the development of an appropriate calibration procedure for the selected chambers and the estimate of the correction to be applied. The possibility of using well-type chambers as secondary transfer standards will be tested. **A Good Practice Guide (GPG) will be written** at the end of this task.

Task 1.2: Establishment of a calibration procedure for the absorbed dose rate to water using I.C.

Energy dependence of RadCal RC6M vs PTW 23344 **(CMI, ENEA)**

ENEA added more data points at ISO N10,15,25,30,40 for their RadCal. See update data on SharePoint WP1 area.