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## **A novel fibre optic monitor for VHEE UHDR beam monitoring: first tests at CLEAR**

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Beam monitoring for Ultra High Dose Rate (UHDR) radiation therapy using pulsed beams, i.e. Very High Energy Electrons (VHEE), is a major challenge. The lower pulse repetition of VHEE beams means a larger dose-per-pulse is necessary to achieve the mean dose rates required for UHDR therapy (so-called FLASH). The currently used transmission ion chambers suffer drastic recombination effects under these conditions. A proposed detector consisting of a 2D array of silica optical fibres connected to a photodetector which measures the Cherenkov radiation emitted by the VHEE beam as it passes through the fibres could be a promising alternative due to its high spatial and temporal resolution and its low material budget. First measurements with such a detector, consisting of silica optical fibres with a diameter of 200  $\mu\text{m}$ , have been conducted at the CLEAR facility at CERN using 200 MeV electrons up to the UHDR required for FLASH. Measurements on the dynamic range of the fibre detector showed that it had a linear response at mean dose rates of over 300 Gy/s. Such results show that this fibre-optic based beam monitor is able to provide fast direct real-time measurements of the VHEE beam dose and profile up to the UHDR. This makes them an excellent candidate for online dosimetry and beam diagnostics in future clinical FLASH machines with VHEE and other beam types.

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### **Footnotes**

### **I have read and accept the Privacy Policy Statement**

Yes

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