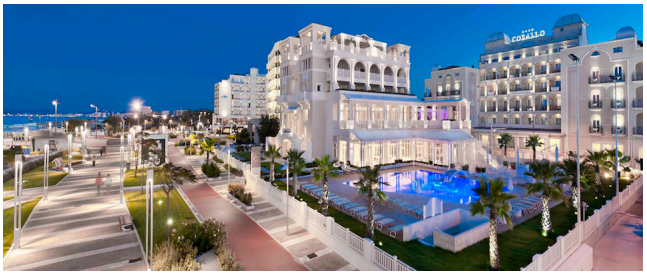

Contribution ID: **72** Type: **invited**

Diamond-based detection systems for tomorrow's precision dosimetry

Thursday, 8 June 2023 11:10 (30 minutes)

Radiation dosimetry for Radiotherapy (RT) is a key element in ensuring treatments efficacy as well as both the safety and the proper management of patients. Accurate dosimeters able to perform precise dose measurements is of pivotal importance for the calibration of the radiation beams, aimed at evaluating their characteristics and validating the treatment plan performed during the therapy.
Over the years, the evolution and spread of modern dynamic and conformal techniques in RT has imposed a number of challenges from the dosimetric point of view. The radiation beams typically used in RT are either high-energy (6-18 MeV) or low-energy (50 keV) photon beams, for external or intraoperative treatments, respectively. Very recently, the emerging FLASH RT technique is posing additional and new challenges in the field of dosimetry. The FLASH technique is a modern solution for the cancer treatments of the future, which employs high-energy pulsed electron beams with ultra-high dose-per-pulse values allowing for a differentiated response between healthy and diseased tissue, thus sparing radiation damage to healthy tissue.
A unique multi-purpose dosimeter able to offer a good performance with radiations of different nature and energy range would be highly desirable, especially in the RT field. Diamond detectors, which represent an established and mature technology for conventional RT, may also be the optimal solution for the FLASH RT. Due to the unique physico-chemical characteristics of the material, diamond detectors exhibits an excellent linearity of the response with both the dose and the dose-rate, a high sensitivity, a high spatial resolution, and a response time in the nanosecond range, regardless of the nature and/or energy of the radiation. For these reasons, diamond is a highly versatile and particularly appealing material for applications in ionising radiation dosimetry. In addition, diamond dosimeters coupled to a tailored signal readout system easily enables pulse-by-pulse monitoring of the radiation beam in terms of: dose and dose-rate delivery, pulse duration, and pulse repetition rate. Therefore, diamond-based dosimeters allow performing a real-time full-diagnostics of the beam, thus assuring accurate single-pulse measurements fundamental in improving the quality of the treatments in the RT field.

Primary author: PETTINATO, Sara

Presenter: PETTINATO, Sara

Session Classification: S3 & S4: Acceleration Techniques & New Concepts