



Contribution ID: 657 Contribution code: **WEPG16**

Type: **Poster Presentation**

Magnetron diagnostics with a novel optical fibre-Cherenkov detector

Wednesday, 22 May 2024 16:00 (2 hours)

Development of an optical fiber-based beam loss monitor (OBLM) is in progress at the Cockcroft Institute (CI), UK. The novel sensor utilizes the Cherenkov radiation (CR) emitted in optical fibers by relativistic particle showers generated in beam loss or RF breakdown events.

RF breakdowns are a problem for high-power magnetrons, such as those in medical accelerator facilities, as damage to the magnetron cathode reduces the device efficiency and lifetime. These events can be detected by emitted CR channeled along the fibers to photomultiplier detectors, and a time-of-flight method can be used to calculate the RF breakdown location from the CR arrival time. This has previously been demonstrated with the OBLM system on RF cavities (at CLARA, Daresbury Laboratory, and CTF3, CERN); and allows for rapid and reliable breakdown detection which is important for damage mitigation.

This contribution presents proof-of-concept measurements from OBLM studies into magnetrons at Teledyne e2v, Chelmsford. It also discusses design adjustments made to improve the detector sensitivity and how the performance can be enhanced using the sensor (or similar).

Footnotes

Funding Agency

This work is supported by STFC under grant ST/X000540/1), the Cockcroft Institute Core Grant (STFC ST/V001612/1) and the University of Liverpool Impact Acceleration Account.

Paper preparation format

LaTeX

Region represented

Europe

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Session Classification: Wednesday Poster Session

Track Classification: MC6: Beam Instrumentation, Controls, Feedback, and Operational Aspects:
MC6.T03 Beam Diagnostics and Instrumentation