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Magnetron diagnostics with a novel optical fibre-Cherenkov detector

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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

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