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High-power, high-repetition-rate X-band power source at X-LAB, the X-band laboratory for accelerators and beams at the University of Melbourne

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The X-LAB has been commissioned at the University of Melbourne. A key project within this laboratory involves rehoming half of the CERN high-gradient X-band test stand, XBOX3, now known as Mel-BOX. This initiative aims to validate the performance of high-gradient traveling wave accelerating structures operating at a frequency of 12 GHz. Mel-BOX is employed to evaluate the performance of these accelerating structures under high-power pulsed RF conditions.

Two TD24 high-gradient structures, previously conditioned at CERN, were reconditioned at X-LAB after being shipped and stored for five years. Additional components have also been tested, including a compact pillbox-type RF window with traveling waves in ceramic, SLED-I type pulse compressors with a novel piston design, and high-power loads fabricated via 3D titanium printing and 1-meter-long stainless steel.

As with XBOX3, Mel-BOX utilizes the combined power of two high-average-power klystron units to feed two test slots at a repetition rate of up to 400 Hz. Additionally, there are plans to leverage this technology as a foundation for developing compact accelerators for medical and university applications.

Footnotes

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