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High gradient X-band linac as a driver for PWFA user facility

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The EuPRAXIA@SPARC_LAB project aims to develop a compact, high-brightness FEL user facility based on plasma wakefield acceleration (PWFA). To drive the plasma module, a normal-conducting RF linac employing X-band technology is foreseen. The linac features an S-band photoinjector followed by an X-band booster composed of sixteen 1.05 m-long traveling wave accelerating structures operating at 11.994 GHz. These structures are designed to sustain a minimum accelerating gradient of 60 MV/m to achieve the beam energy required for efficient plasma injection.
An extensive R&D program is underway at INFN-LNF to validate the X-band technology and confirm its suitability as a reliable driver for PWFA-based user facilities. This includes the design, fabrication, and testing of various RF components, along with the prototyping and qualification of the accelerating structures. Recently, two RF structure prototypes have been completed, and one has undergone preliminary high-power testing.
This contribution provides an overview of the ongoing and planned activities in X-band technology development, with a particular emphasis on the first high-power test results of the accelerating structure prototypes.

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