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FEL performance and tolerance studies of the EuPRAXIA@SPARC_LAB AQUA beamline

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The AQUA beamline of the EuPRAXIA@SPARC_LAB free-electron laser facility is a SASE FEL designed to operate in the water window, in the 3-4 nm wavelength range. The electron beam driving this source is accelerated up to 1-1.2 GeV by an X-band normal conducting linear accelerator followed by a plasma wakefield acceleration stage.

The main radiator consists of an array of ten APPLE-X permanent magnet undulator modules, each 2 m long and with a period length of 18 mm.

An analysis of resistive wall wakefields and tolerances to magnetic field errors and misalignments is discussed, and their impact on the FEL performance is evaluated.

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