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Strain measurements of the Apple X SABINA undulator with fiber Bragg grating

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The SABINA project will add a user facility to SPARC_LAB at INFN in Frascati (Rome). For the THz line, an electron beam is transported to the APPLE-X undulators to produce photon pulses in the ps range, with energy of tens of μJ , with linear or elliptical polarization. Each undulator has four magnetic arrays that can be moved radially simultaneously to set the operating gap. Two arrays can also move longitudinally for phase displacement. A structural analysis of this unique mechanical structure has been performed by the production company (KYMA S.p.a) to ensure good field quality and beam trajectory. To support those, a set of tests has been performed with FBG acting as strain sensors in Frascati. An FBG is a phase grating inscribed in the core of a single-mode fiber, whose Bragg-diffracted light propagates back along the fiber. Any deformation of the grating affects its pitch, which changes the diffracted Bragg wavelength thus giving information about the occurred deformation. Application of the technique at the state-of-the-art level allows to perform strain measurements with $1 \mu\text{Strain}$ resolution. Such analysis and results will be presented in this contribution.

Footnotes

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