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Resonant laser plasma channel undulator[1] BIFENG LEI, JINGWEI WANG, VASILY KHARIN, SERGEY RYKOVANOV, Helmholtz Institute Jena — Laser-plasma based undulators/wigglers attract a lot of attention because of their potential for the next generation of compact (˜cm scales) radiation sources. The undulator wavelength of plasma-based devices can theoretically reach ˜1mm or less while keeping the undulator strength on the order of unity - values so far unachievable by conventional magnetic undulators. Recently, a novel type of the plasma channel undulator/wiggler (PIGGLER) based on the wakefields generated in a parabolic plasma channel by a laser pulse undergoing centroid oscillations was proposed [PRL. , 145003 (2015)]. It was demonstrated analytically and with the help of numerical simulations that narrow-bandwidth, flexible polarization and bright UV-soft X-ray source can be obtained for the case when the laser pulse centroid oscillation frequency, proportional to the Rayleigh length of the laser pulse, is tuned to be much larger than the betatron frequency. In the current contribution, the case of the resonance, when the laser pulse centroid oscillation frequency is equal to the betatron frequency is discussed. It is shown that significant photon yield enhancement can be. Both linear and nonlinear regimes are studied.

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