Superconducting undulator with a variable configuration of the magnetic field.

Budker Institute of Nuclear Physics, Novosibirsk

Superconducting undulator design.

Based on coils developed at the Budker Institute of nuclear physics for a superconducting undulator with a period of 15.6 mm, a model of a superconducting undulator with variable polarization (SCUVP) with a period of ~40 mm is proposed. The undulator consists of two superconducting undulators placed mutually perpendicular and powered by currents independently. Depending on the different currents values in the windings of the undulator, there is a possibility to create both an elliptical undulator with different elliptic coefficients, and planar undulators with linear radiation polarization at a zero angle both horizontally and vertically. The paper presents numerical calculations of the undulator fields and its spectra.

Modeling undulator and spectral properties of photons.

To calculate the spectral properties of photons, a program was written in Mathcad to simulate the real conditions of an undulator. The simulation is based on the analytical formula of the magnetic field from a current conductor of finite length. The coil in this case is represented as the sum of the turns. One turn is represented as the sum of conductors with a current of finite length. The result was an undulator 2m long, 44 periods, with a gap of 20 mm, and a magnetic field, 0.5 Tesla. The program used a current of 480 amperes, limited by the critical characteristics of the superconducting wire. The length of 2 meters was chosen on the basis of the fact that this is the standard size of manufactured undulators at the Institute of Nuclear Physics.

The Spectra program version 10.02 was used to calculate the photon spectra. The supposed photon stream was viewed at a distance of 30 meters, at a solid angle of 10 microradians.
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