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Polarization of the diffraction radiation on the metal sphere: possibilities for the beam diagnostics

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The description of the diffraction radiation on the conductive sphere based on the method of images known from electrostatics has been proposed in [1, 2]. The developed approach was successfully used to calculate the polarization of the radiation [2, 3]. The method for determining the azimuth of a trajectory of the moving particle relatively the center of the sphere using a single polarization-sensitive detector for the radiation emitted in some pre-selected direction was offered there. Here we describe another approach to the same problem using three detectors without registration of the radiation polarization.

The second problem considered in the report is the coherent diffraction radiation on the sphere from the pancake-bunch. It is demonstrated that the polarization of the radiation in this case permits to estimate the position of the bunch edges in relation to the center of the sphere. This feature could be used for the non-destructive measurement of the characteristic dimensions of the bunch.

[1] Shul'ga N.F., Syshchenko V.V., Larikova E.A. // Nuclear Instrum. Methods B 402 (2017) 167.
[2] Shul'ga N.F., Syshchenko V.V. // Nuclear Instrum. Methods B 452 (2019) 55.
[3] Syshchenko V.V., Larikova E.A. // Journal of Surface Investigation: X-ray, Synchrotron and Neutron Techniques 13 (2019) 990.

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