



Contribution ID: 30

Type: poster

Study of Spontaneous Radiation during Axial Channeling of Relativistic Positrons in Hexagonal Crystals

Monday, 5 June 2023 18:20 (1 minute)

Using the energy levels and corresponding wave functions found for hexagonal crystals of Be, Sc, Ti, Co, Zn, Y, Zr, Ts, Ru, Cd, and La, the spectra of channeled spontaneous radiation are calculated in the dipole approximation for nondispersive relativistic positron beams moving at zero angles with respect to the c -axes. Analysis of the dependencies shows that the intensity maxima of spectral lines correlate with the depths of potential wells. Based on the fact that in wide hexagonal channels it is possible to achieve channeled motion of relativistic positron beams with high density, and taking into account that their dechanneling lengths significantly exceed the channeling lengths for electrons, it is possible to obtain intense short-wavelength spontaneous radiation.

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Session Classification: PS: Poster Session