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Z-dependence of PXR for light and heavy ions

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As it was shown in [1], the radiation intensity of Parametric X-ray Radiation (PXR) for the different types of accelerated nuclei is proportional to Z2.

I our work the same problem is solved for ions. However, in contrast to [1] to calculate PXR radiation intensity, we have used the formula, obtained from the dynamical theory [2] within the framework of multipath approach developed by Ohtsuki (see, for example, [3]).

It had allowed us to show that for ions not only PXR-photon frequency, but in addition the shape of PXR angular distribution will change with three parameters: Z, N (number of neutrons in nucleus) and Ze (number of ion's electrons). Consequently, the Fourier components of the dielectric susceptibility of the crystal will be changed as well.

However, all of these features should formally be observed also for nuclei. But these changes are insignificant. The factor causing measurable changes of PXR radiation intensity for ions is the electron screening effect of nuclear charge.

On the basis of Thomas-Fermi-Dirac theory we have received by numerical analysis that PXR radiation intensity for ions is proportional to Zo2+1/2Zo, where Zo = Z –Ze is the ion charge.

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