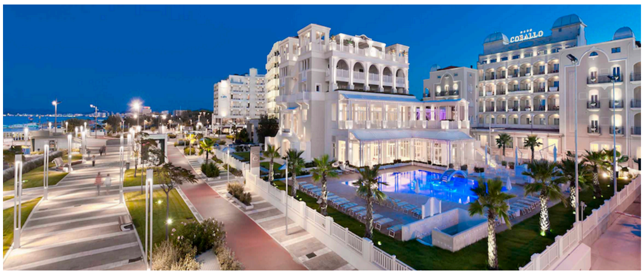

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Excitation of a giant dipole resonance by radiation of channeled electrons in a Si (110) crystal

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The study of giant dipole resonance (GDR) as a collective nuclear excitation [1] is a relevant area of theoretical and experimental research. GDR was first observed in the experiments on the braking γ-beam (bremsstrahlung - BS) [2]. Interest in this fundamental phenomenon does not weaken in our days [3].
Channeling radiation (CR) of electrons in crystals has been studied in detail [4] and till now is of interest in terms of generation of high-energy photons.
As known, the spectrum of CR electrons of sub-GeV and GeV energies is characterized by an optimal width maximum and photon energies up to several tens of MeV, which is sufficient to overcome the threshold in photonuclear reactions of light nuclei [5]. On the other hand, at an equal thickness of the primary target, the CR yield is more than an order of magnitude higher than the braking yield that suggest the use of the orientation dependence of the CR spectrum in studying the giant dipole resonance of heavy nuclei.
This work aims in investigating the total yield of GDR (for heavy nuclei Au, Pb, and U) by electron channeling radiation in a Si crystal target at various electron energies and angles of incidence respect to the channeling planes.
The efficiency of the proposed method in comparison to the use of the braking gamma photons is growing up to 3 GeV and higher. For example, increasing the electron beam energy from 2 to 3 GeV with zero angle of incidence leads to approximately 6-fold (Au target) and 9-fold (Au target) increase in GDR yield in the case of CR compared to that of BS.
There is also an additional effect for fine-tuning: the possibility of slightly changing the GDR yield at a fixed electron energy combined with an orientation effect to tune the CR spectrum.
Since the number of CR photons could be more than an order of magnitude greater than the number of BS photons for equal radiator thickness, the use of CR instead of traditional BS in studying photonuclear reactions might be preferrable.

LITERATURE

[1] A. B Migdal. Quadrupole and dipole -radiation of nuclei // Phys. J. Phys (USSR). –1944.-Vol.8. –P. 331.

[2] G.C. Baldwin, G.S. Klaiber // Phys. Rev., 1947, 71 3

[3] Wang R. et al. Constraining the in-medium nucleon-nucleon cross section from the width of nuclear giant dipole resonance // Physics Letters B. –2020. –Vol. 807. –P. 14-19.

[4] Bayer V.N., Katkov V.M., Strakhovenko V.M. Electromagnetic processes at high energy in oriented single crystals. - Moscow: Nauka, 1989. - P. 400.

[5] Bogdanov O.V., Dabagov S.B., Pivovarov Yu. L. Photonuclear reactions by relativistic electrion channeling radiation // NIM B.–2020. –Vol.465. –P. 67–72.

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