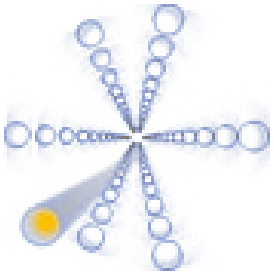

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Unknown Preconditions and Abnormal Features of Cherenkov Radiation and X-ray Laser Amplification in Realistic Media

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The influence of the spatial distribution of electrons, atoms and nuclei in condensed media on medium's susceptibility and on the conditions of both X-ray Cherenkov radiation and laser X-ray (gamma-ray) generation are considered.
It was shown that the "traditional"condition of Cherenkov radiation is incorrect and takes place only in idealized case of a completely homogenous medium without atomic structure. It is shown that taking into account the inhomogeneous (on atomic level) structure of material media leads to very essential change in the effective susceptibility and permittivity as compared with cases of model homogeneous media with the same average concentration of electrons. It is seen that the effective susceptibility of a periodically inhomogeneous medium (including crystal) differs from the average susceptibility not only at Bragg diffraction but in all cases!
It follows from these results that the threshold energy of fast charged particles, which is required to generate Cherenkov radiation, increases by the essential value.
It is shown also that the function of the spatial distribution of electrons and nuclei in a target affects the conditions for laser generation in X- and gamma-ray ranges (on the problem of X- and gamma-ray lasers): in some cases the coefficient of stimulated (laser) amplification exceeds the analogous coefficient in the case of a model homogeneous medium.

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