Investigation of the effect of transverse pulse shape on the Cherenkov radiation generation in plasma

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When propagation of high intensity laser pulse in different media many of phenomenon are occurred. One of these phenomenon is radiation generation in THZ rang that is called Cherenkov radiation. Cherenkov radiation is occurred when pulse laser propagated through environments with velocity faster than phase velocity in media. This condition is presented in magnetized plasma in this work propagation of laser pulse with different transverse distribution of pulse intensity has been investigated. First the system of equations governing on propagation of light in magnetized plasma using motion and Maxwell s equation have been obtained. Using Laplace transforms the mentioned equations have been solved and the amplitude of magnetic field related to Cherenkov radiation has been calculated analytically. Results show that Cherenkov radiation generated in conical zone. Here Gaussian and dark hollow distribution of intensity for incident laser pulse is considered. Also effect of magnitude of the external on magnetic field and plasma density Cherenkov radiation generation for both distributions is investigated. The studies show that by increasing plasma density for both distributions, the intensity of the produced magnetic field related to Cherenkov radiation increased. It can be seen that the increasing of the external magnetic field also has the same and $\omega_c$ effect. In addition, the frequency of the generated Cherenkov radiation depends on the $\omega_c$ and $\omega_p$ parameters.