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PIC Simulations and Analysis of CTR from Electron Bunches Exiting a Plasma[1] PAUL MULLOWNEY, DAVID BRUHWILER, CHRISTINE ROARK, Tech-X Corporation, BILL PETER, Consultant, CAMERON GEDDES, ERIC ESAREY, WIM LEEMANS, GUILLERME PLATEAU, LOASIS Group, Lawrence Berkeley National Lab — Laser wakefield accelerator (LWFA) concepts are characterized by ultra-high gradients and ultra-short bunch lengths. These short, nano-Coulomb charge bunches can radiate strongly at THz frequencies via coherent transition radiation (CTR) as they exit the plasma. Accurate modeling of the CTR in simulations is challenging even for moderately energetic bunches of 5 MeV due to constraints imposed by the formation length, L, which scales as the inverse fourth power of the angle from the bunch propagation direction to the observer's position. If the EM fields on a virtual surface near to the plasma are used to calculate the far CTR radiation field, complications arise from the self-fields of the high-charge bunch. We present results and analysis of PIC simulations of characteristic electron bunches exiting a plasma. We show that by treating the surface currents as dipole-radiators, we can compute the CTR in the far-field. These techniques are being used to study the effect of plasma density ramps and other complicating factors.

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