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Future Applications of the Dielectric Wakefield Accelerators in the SINBAD Project at DESY

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Short, high-brightness relativistic electron bunches can drive ultra-high wakefields in the dielectric wakefield accelerators (DWFAs). Such effect can be used to generate high power THz coherent Cherenkov radiation, accelerate trailing particles in a witness bunch with gradient two orders of magnitude larger than that in the conventional RF linear accelerators, and produce energy modulation or reduce the correlated energy spread within the driving bunch itself, etc. The paper will study potential applications of the DWFAs in the SINBAD facility at DESY. The simulations show that the 100 MeV ultra-short bunches from the SINBAD injector ARES can excite accelerating wakefield with peak amplitudes of a few GV/m at frequencies higher than 10 THz in proper DWFA structures. In addition, we also present that the DWFA structure can serve as a de-chirper to reduce the correlated energy spread of the bunches accelerated by the laser plasma wakefield accelerator where the 100 MeV ARES ultra-short bunches are injected externally.

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