Abstract Submitted
for the DPP16 Meeting of
The American Physical Society

Cherenkov radiation in a surface wave accelerator based on silicon carbide TIANHONG WANG, VLADIMIR KHUDIK, GENNADY SHVETS, Cornell University — We report on our theoretical investigations of Cherenkov-type emission of surface phonon polaritons (SPPs) by relativistic electron bunches. The polaritons are confined by a planar waveguide comprised of two SiC slabs separated by an air gap [1]. The SPPs are generated in the spectral range known as the reststrahlen band, where the dielectric permittivity of SiC is negative. Two surface modes of the radiation are analyzed: the longitudinal (accelerating) and the transverse (deflecting) ones. Both form Cherenkov cones that are different in the magnitude of the cone angle and the central frequency. However, both exhibits rapid spatial oscillations and beats behind the moving charge. Moreover, the longitudinal mode forms a reversed Cherenkov radiation cone due the negative group velocity for sufficiently small air gaps, but the transverse mode does not. The wakefield acceleration of electron beam inside the structure is also studied. Transverse instabilities and BBU effects can be suppressed by flat driver beam, meanwhile the longitudinal mode can support accelerating fields >1 GeV.
[1] B. Neuner III, D. Korobkin, G. Ferro, and G. Shvets, "Prism-coupled surface wave accelerator based on silicon carbide", Phys. Rev. Sp. Top. - Accelerators and Beams, 15, 031302 (2012).

Tianhong Wang
Cornell University

Date submitted: 13 Jul 2016 Electronic form version 1.4