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Laser driven accelerating structures: from photonic bandgap to surface waves[1]

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As the frontier of particle physics moves towards higher energies, there is a mounting pressure on the accelerator physics community to develop new accelerating concepts resulting in more compact accelerators. This requires higher accelerating gradients and, owing to the trapping criterion, higher radiation frequencies. In order for structure-based laser driven accelerators to become a reality, three major challenges must be addressed: (a) development of highly efficient laser sources, (b) overcoming laser damage by using advanced materials, and (c) efficient coupling of radiation to particle beams by the appropriate structure design. In this talk I will address the last two issues. Several structure designs such as photonic bandgap, surface wave, and Bragg waveguide accelerators will be reviewed and compared. Micro-fabrication techniques enabling such accelerators will be examined. First experimental demonstration of grating-assisted excitation of accelerating surface waves in a Surface Wave Accelerator Based on Silicon Carbide (SWABSiC) will be reported.

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