Towards laser plasma accelerators for future light sources and colliders

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Electron acceleration of electrons using intense laser pulses that excite tens of gigavolt per meter fields in plasmas will be discussed and the path forward to practical machines. The potential impact of compact laser plasma accelerators (LPA) ranges from providing the capability of producing high energy, ultra-short electron bunches and associated radiation pulses for forefront science in a small laboratory setting, to medical and security applications, to the development of high energy particle colliders for fundamental science into the origin of matter and energy.

Progress on addressing key challenges for the development of high energy electron accelerators with beam quality sufficiently good to drive free electron lasers and gamma ray sources, or serve as building blocks for a future laser plasma accelerator based colliders will be presented. This includes experiments that uses the high repetition rate (1Hz) Petawatt BELLA laser aimed at reaching 10 GeV in less than a meter long accelerator, staging two laser plasma accelerator modules and progress towards an extreme ultra-violet FEL and a gamma ray source.