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Potential applications of Plasma-Modulated Plasma Accelerators.

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Plasma-Modulated Plasma Accelerator (P-MoPA) can be driven by existing, efficient thin-disk lasers, accelerating electrons to GeV level energies at kHz-repetition-rate. Some aspects of the P-MoPA scheme have already been tested experimentally. Work to demonstrate in the lab the remaining key steps is being undertaken by the kHz Plasma Accelerator Collaboration (kPAC). Assuming that P-MoPA would operate as expected, we are assessing potential applications of P-MoPA. The long-term goal would be P-MoPA driven water window FEL. As a milestone would be a development of a Compton radiation source covering large range of photon energies from about 100 keV to few MeV. Such a source could be used for phase-contrast imaging over the whole range of photon energies covering micron level space resolution for biological objects as well as for high Z metals. On the other hand, transportable source of photons for absorption imaging would have applications for non-destructive inspection in many areas, such as security, manufacturing of critical machine parts and mining to identify rare-earth elements in ores. A separate direction would be to develop a THz radiation source which would only require a train of laser pulses obtained using the plasma modulator; no electron acceleration would be needed.

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