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Advanced Generation of THz and X-ray Beams Using Compact Electron Accelerator

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A compact accelerator facility designed to generate high-brightness electron beams is of great demand throughout a broad scientific community as it can be used to generate intense, tunable THz and X-ray radiation beams. The “Advanced Generation of THz and X-ray” (AGTaX) collaboration was created to bring together different communities working on the simulation, generation and experimental investigation of radiation beams as well as on accelerator subsystems design and optimization. A technical challenge of compact accelerator projects such as LUCX [1], DLS [2] and MEPHI [3] is the generation of extremely short, pre-bunched beams with hundred femtosecond length and period without external longitudinal phase space compression. This challenge extends to four distinct issues: creating small emittance beams, preserving the emittance during acceleration and transport, utilizing the beams for radiation generation which includes coherent Transition, Smith-Purcell, Cherenkov, Undulator (THz FEL) radiation and Compton X-Rays, and finally to characterizing the radiation properties. Additionally longitudinal beam diagnostics techniques should be adapted for modulated beams. In this report the present collaboration projects will be reviewed and a roadmap for future developments will be discussed.

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