

Single-shot measurement of electron bunch duration in laser wakefield acceleration

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Laser-wakefield accelerators (LWFA) feature electron bunches with duration ranging from several fs to tens of fs. Precise knowledge of the longitudinal profile of such ultrashort electron bunches is essential for the design of the next generation of light-sources and still remains a big challenge due to the resolution limit of existing diagnostic techniques. Here we present measurement of electron bunch duration by recoding incoherent and coherent transition radiation emitted as LWFA electron bunches passing through a metal foil. For this purpose, a broadband spectrometer covering the spectral range from UV to MID-IR at very high dynamic range was deployed in a single shot mode. We discuss the longitudinal structure of LWFA bunches from different injection mechanism and possible path for generation of high peak current electron beam with a good beam quality.