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Electron bunch length in laser-plasma acceleration.

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Many experiments have been conducted in recent years in which electron bunches have been accelerated during the interaction of ultra-short and ultra-intense laser pulses with thin solid targets. Several causes can be taken into consideration which contribute to the determination of the measured bunch length at the exit of the targets. These include the velocity distribution of the electrons accelerated at the plasma critical surface and, eventually, the extension of the pre-plasma in which other acceleration processes can develop as well. The understanding of these mechanisms will allow, in the future, for controlling the duration of an electron bunch generated with these techniques, which is necessary for several applications as, for example, multi-stage laser-plasma acceleration systems.

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