

Femtosecond pulse generation

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Femtosecond pulses are now widely used in academic and industrial worlds thanks to their unique properties. They are characterized by a duration of a few femtoseconds to a few picoseconds, a broad spectrum which can also exhibit comb features, and a high peak intensity at moderate pulse energy and average power. They are therefore an invaluable tool in fields as diverse as spectroscopies, imaging, materials processing, metrology and many others.

This lecture will explain how such pulses can be generated thanks (and despite) these extreme characteristics. The physical principles of mode-locking, group-velocity dispersion or self-phase modulation will be explained, as well as their consequences for pulse generation, manipulation, and characteristics.

The main technologies of ultrashort pulse generation will be presented, and the architecture of the most widespread femtosecond oscillators, from Ti:Sapphire crystal-based to fiber-based oscillators, will be described in details.