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Development of an ultrafast X-ray laser-plasma source

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We report the development of a fast rotating target system to produce ultrashort incoherent X-ray pulses from Bremsstrahlung. These ultrashort X-ray pulses are produced in the laser-plasma interaction of solid metallic targets with 35fs, 1mJ pulses centered at 800nm of a 1kHz repetition rate Ti:sapphire laser.

We describe the experimental issues of the system such as the stability of the rotatory target or laser focusing with a small Rayleigh length ($<20\mu\text{m}$) which can modify the laser intensity on target and change the characteristics of the X-ray source.

We also report the X-ray spectra analysis of different metallic targets. We observe the X-ray source has a broad Maxwellian-like distribution with temperatures of around 10–120keV. These kind of X-ray sources could be used for advanced X-ray imaging such as absorption or phase contrast tomography.

Primary author(s) : Dr. RUIZ, Camilo (Universidad de Salamanca); Dr. BENLLIURE, Jose (University of Santiago de Compostela); Srta. MARTÍN, Lucía (Universidad de Santiago de Compostela)

Co-author(s) : Dr. CORTINA, Dolores (Universidad Santiago Compostela); Sr. LLERENA CRISTOBO, Juan José (Universidad de Santiago de Compostela)

Presenter(s) : Srta. MARTÍN, Lucía (Universidad de Santiago de Compostela)

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