LASER-INDUCED BREAKDOWN SPECTROMETRY WITH LASER PULSES IN FEMTOSECONDS TO PICOSECONDS REGIME AND THEIR INFLUENCE ON ABLATION QUALITY

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For an efficient laser processing of a material, the selection of laser parameters that couple with the sample holds great importance [1,2]. With respect to pulse width, femtosecond laser ablation in comparison to the nanosecond one, is characterized by a significantly different behavior in the laser-matter interaction resulting in minimum thermal damage and therefore a better spatial resolution. The most significant feature is the lack of laser - plasma interaction, which has been demonstrated in pump-probe phase-change experiments [3]. Such experiments demonstrate that surface alteration occurs in the several hundred picosecond scale, while phase-change starts at around 1 ns after the reaching of the laser pulse. From the spectroscopic point of view, signal emission does not occur before 5 ns.

Our communication is focused on the influence of the pulse width, ranging from femtosecond to picosecond, on the laser – matter interaction during laser ablation of solid materials. Modifications in the stretcher-compressor do allow the continuous selection of amplified pulses in the range between 35 fs to 4 ps. The pulses are characterized in the autocorrelation, spectral bandwidth and energy per pulse. A 0.5 m focal-length spectrograph fitted with an intensified CCD or fast single-channel detectors are used to determine the time constants, to establish the fluence threshold, and to record multi-channel spectra from the generated plasmas.

References

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