Modeling of Electro-Magnetic Pulses generated by high intensity lasers

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The inertial confinement fusion use high intensity laser for diagnostics and ignition scenario. Those high intensity lasers produce EMP (Electro-Magnetic Pulse) [1] which can destroy the electronic devices in the laser room. Indeed, the pulse frequency is resonant with the eigen frequency of the electronics devices and the amplitude is high enough to generate high tension and irreversible damages.

The first studies made at CELIA with the laser ECLIPSE and in collaboration with the CESTA enable us to detail the important elements of the EMP generation mechanisms. We confirmed that the EMP amplitude is linked with the quantity of electrons ejected by the laser heating [2]. After the shot, the target is charged. The charge is relative to the laser intensity : 100 nC for an intensity about 10^{18} W/cm^2 up to 100 μC for an intensity of 5.10^{19} W/cm^2. The target is settle on a support which become an antenna during the charge relaxation toward the mass. The EMP is emitted all along this relaxation.

The poster present a simple model which predicts the charge after the shot with the laser and the target parameters. The model is successfully compared to the numerical simulation and to the experience. The results have been published [3].

References

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