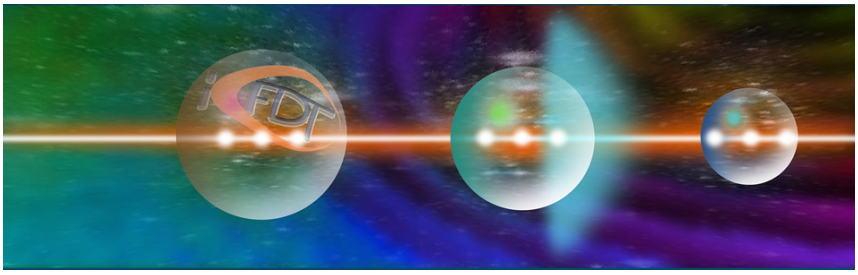

Contribution ID: **16** Type: **Poster**

Sensitivity improvement by optically-absorbent plastics of electro-optical probes for high-intensity electromagnetic-fields generated by laser-matter interaction

Thursday, 4 October 2018 14:30 (1h 30m)

Radiofrequency-microwave electromagnetic pulses (EMPs) of high intensity generated by powerful pulsed laser-matter interaction are a very hot topic of research. They are often detrimental for active diagnostics placed around the interaction region, but could be used for diagnostic purposes or for application to studies on materials and devices in these extreme conditions. This is a common and important issue in facilities for Inertial Confinement Fusion and Laser-Plasma Acceleration using solid-state near-infrared lasers of high energy and intensity. The reliable measurement of these intense fields by classical conductive probes is a well-known hard task because of the high level of electromagnetic background noise affecting the measurement setups. Fully electro-optical probes proved to be a very interesting solution to this problem even at petawatt laser pulse regimes, leading to the accurate measurement of fields up to hundreds of kV/m. A CW laser is commonly used to monitor the properties of the dielectric permittivity tensor of a crystal; because of Pockels effect, it changes according to an externally-applied electromagnetic field. In some experiments we found that part of the diffused main laser-pulse may occasionally be coupled to the optical path of the probing CW laser within the crystal. Due to the high intensity of the main pulse, we found experimentally that even slight couplings may lead to important reductions of the measurement field sensitivity on the first nanoseconds. A solution to this problem could be the use of thick plastic shields for the crystal, highly absorbing for the main laser wavelength, but at the same time highly transparent to the wide radiofrequency-microwave range of the EMP fields to be measured. For this reason we performed two experimental campaigns for the electromagnetic absorption characterization of several plastic materials in both the two frequency ranges. A spectrophotometer operating in the visible and near-infrared spectral interval was used for the characterization of the optical absorption and a Dual TEM Cell for the radiofrequency-microwave transmission. Results of experimental measurements for several materials will be described and discussed for the effective improvement of the EMP electro-optical probe sensitivity (a)

(a) This work has been partially carried out within the framework of the EUROfusion Consortium and has received funding from the Euratom research and training programme 2014-2018 under grant agreement No 633053. The views and opinions expressed herein do not necessarily reflect those of the European Commission

Summary

Primary author: Dr CONSOLI, Fabrizio (ENEA - Centro Ricerche Frascati)

Co-authors: Dr ZAMBOTTI, Alessandro (ENEA); Dr BONFIGLI, Francesca (ENEA C.R. Frascati); Mr DI GIORGIO, Giorgio (ENEA); Mr CRISTOFARI, Giuseppe (ENEA); Dr CIPRIANI, Mattia (ENEA - CR Frascati); Dr

D'ATANASIO, Paolo (ENEA); Mr ANDREOLI, Pierluigi (ENEA); Dr DE ANGELIS, Riccardo De Angelis (ENEA); Dr MONTEREALI, Rosa Maria (ENEA C.R.Frascati); Dr PINTO, Rosanna (ENEA); Dr LO PRESTO, Vanni (ENEA)

Presenter: Dr CONSOLI, Fabrizio (ENEA - Centro Ricerche Frascati)

Session Classification: POSTER SESSION