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Optical Diagnostics For High Power Pulsed Underwater Electrical Discharge Characterization JULIEN DEROY, GILLES AVRILLAUD, Bmax, 30 bd de Thibaud, 31104, Toulouse, France, MICHEL BOUSTIE, ALAIN CLAVERIE, EKATERINA MAZANCHENKO, Institut PPRIME, CNRS-ENSMA-Université de Poitiers, B.P.40109, 86960, Futuroscope, France, DAVID ASSOUS, IDIL, Rue Claude Chappe, 22300, Lannion, France, ALEXANDER CHUVATIN, LPP, CNRS-Ecole Polytechnique, Route de Saclay, 91128, Palaiseau CEDEX, France
— In order to evaluate the behavior of a high power pulsed underwater electrical discharge, and especially characterize the pressure generated by such a discharge, we implemented several optical diagnostics. We first observed directly the expansion of the plasma produced by the dielectric breakdown of the water between the electrodes and the resulting gaseous pulsating bubble. This observation led to an estimate of the pressure inside the bubble with respect to time. We then visualized the propagation of the pressure wave generated by the discharge with shadowgraphy and Schlieren set-up. The obtained velocity was then used to evaluate the theoretical maximum pressure at the pressure front. Finally, we measured the velocity induced by the pressure wave on a thin aluminum disk with a heterodyne velocimeter and used numerical simulation to obtain a temporal form of pressure. These methods and results can be used to develop and assess performances of processes using underwater electrical discharges to generate pressure waves such as electrohydraulic forming.

Julien Deroy
Bmax, 30 bd de Thibaud, 31104, Toulouse, France

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