Minicolloque n° MMPS19 ☒ **Oral** ☐ **Poster**

High strain rate laser shock propagation through Aluminium alloys

Mohammad Ayad[a*], Alexandre Rondepierre[a,b] , Uros Trdan[c], et Laurent Berthe[a]

a. PIMM, UMR8006 ENSAM, CNRS, CNAM, 151 bd de l'Hôpital, 75013 Paris, France
b. THALES LAS France, 78990 Elancourt, France
c. University of Ljubljana, Faculty of Mechanical Engineering, LABORATORY FOR HEAT TREATMENT AND MATERIALS TESTING (LATOP), Aškerčeva cesta 6, 1000 Ljubljana

* email : mohammad.ayad@ensam.eu

This work presents the study of the shock wave propagation through Aluminum alloys (pure Aluminium, Aluminium-7075-T6, Aluminium -2017-T4, Friction Stir Welding of 7075-T6 and 2017-T4) produced by laser plasma using experimental and numerical tests. Water confinement regime interaction, pulse duration (7.1 ns) and power density (1-5 GW/cm²) correspond to laser shock peening process configuration and parameters. To that aim, we simulate the shock wave propagation using non-linear explicit code LS-DYNA which validate with experimental results on Pure Aluminium. Thereupon, we present a descriptive analysis which links separately the material model and loading conditions to the dynamic response of pure Aluminium under high strain rate laser shock by coupling Johnson Cook material model with Gruneisen equation of state (MAT-015 and EOS-004 accordingly). What is more, we make use of stress propagation along the target thickness to analyze the origin of different points on the Back Face Velocity (BFV) profile during the shock propagation. For the first time, we make use of the numerical and experimental data to obtain material model parameters for the different studied Aluminium alloys in function of microstructure grain properties [1].

[1] High Strain Rate Laser Shock Propagation through Aluminium Alloys. Ayad, M., Rondepierrea, A., Trdan, U., and Berthe, L. Under preparation.

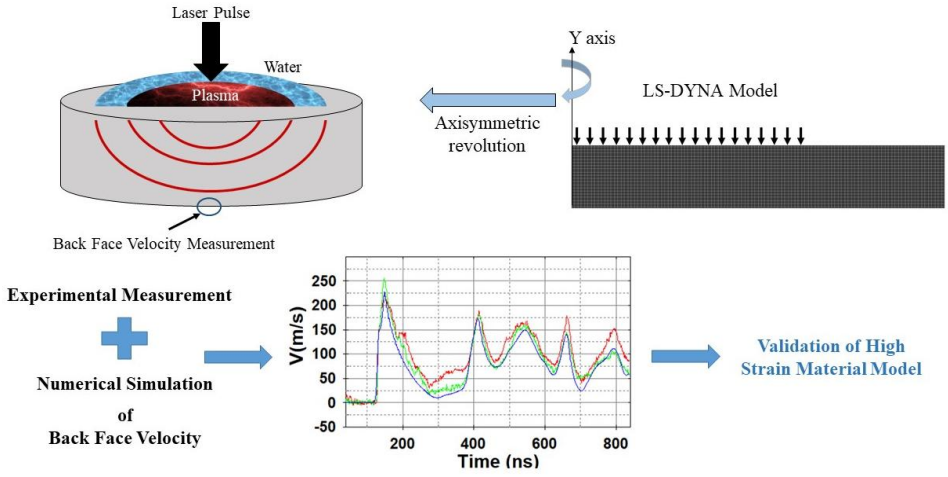

Figure 1 : Experimental and numerical measurement of Back Face Velocity of Aluminium target under high strain laser shock