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ISENTROPIC COMPRESSION FOR TATB BASED HE SAMPLES, NUMERICAL SIMULATIONS AND COMPARISON WITH EXPERIMENTS

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Isentropic compression experiments and numerical simulations on TATB based HE were performed respectively at Z accelerator facility from Sandia National Laboratory and at Lawrence Livermore National Laboratory in order to study the isentrope and associated Hugoniot of this HE [1].

3D configurations have been calculated here to test the new beta version of the electromagnetism package coupled with the dynamics in Ls-Dyna and compared with the ICE Z shot 1967.

1.1 CONFIGURATION OF THE NUMERICAL SIMULATIONS

The experimental configuration of the shot 1967 is presented Figure 2.

A 3D configuration has been used with a lagrangian description and a coarse mesh resolution.

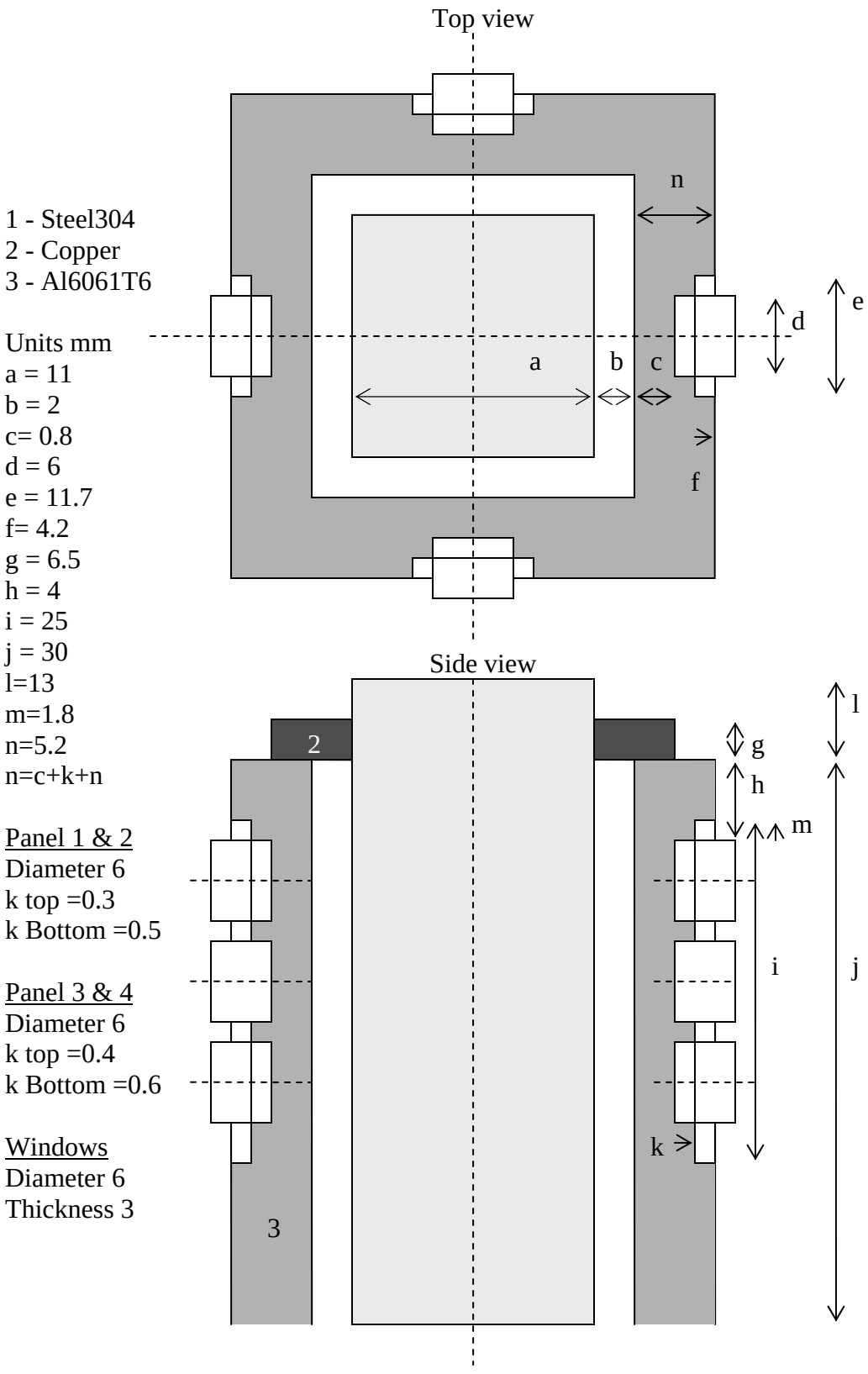

Figure 1 : Experimental set-up of the square high pressure configuration

1.2 MODEL DESCRIPTIONS

Steinberg constitutive law has been used for the metals [2]. Classical Gruneisen equations of state have been applied for the metals, the HE samples and the LiF windows. The heat capacity and the thermal conductivity have been used for the thermal solver.

The main assumptions are no phase change, no plasma, conductivity constant for the anode and cathode. The diffusion of the current could be taken into account, but has not been tested yet here. It is possible to take into account the conductivity change versus the temperature (resistivity equation of state), but has not been tested yet here.

1.3 NUMERICAL SIMULATION RESULTS

The numerical results are presented Figure 2 and Figure 3.

The experimental velocity maximum of the “drive” (middle sample, interface panel / LiF windows) are retrieved within 100 m/s. The numerical release is faster than the experimental one.

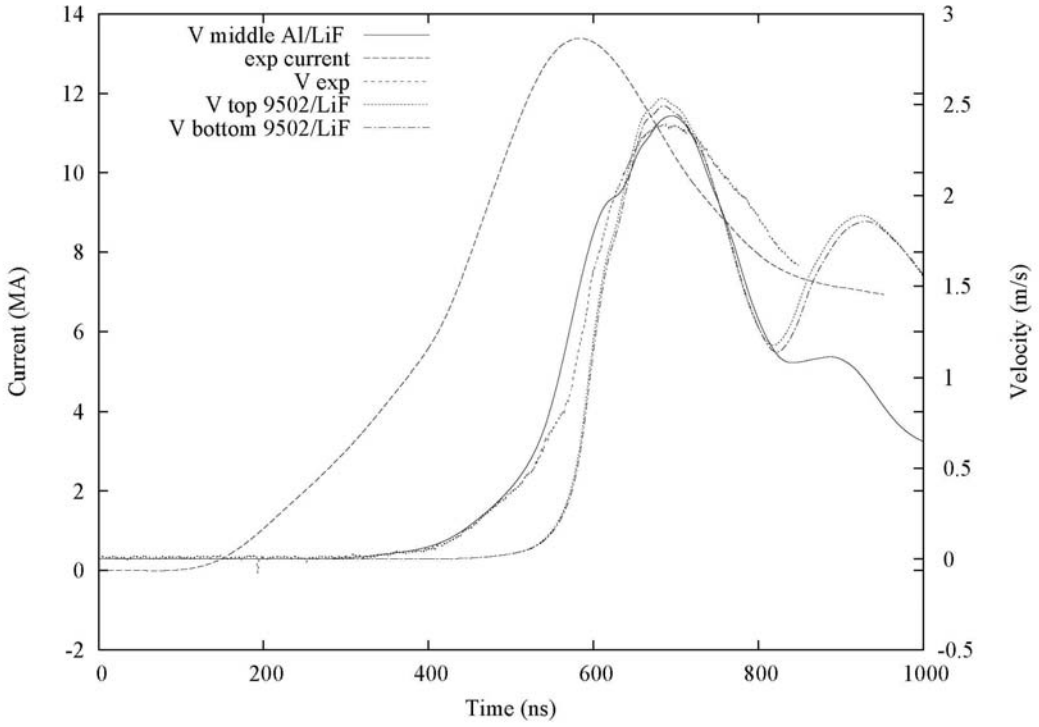

Figure 2 : Current and Interface Velocities versus time, Z shot 1967 and calculations

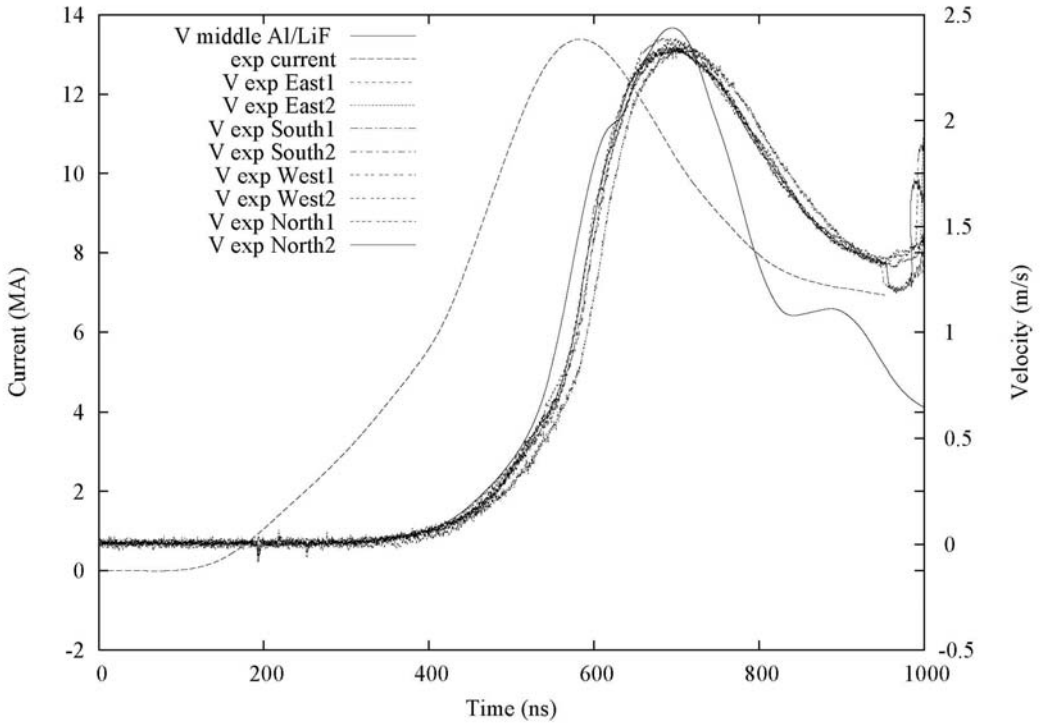

Figure 3 : Current and Interface Velocities versus time, Z shot 1967 and calculations

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References

[1] D.B.Reisman, J.W.Forbes, C.M.Tarver, F.Garcia, D.B.Hayes, M.D.Furnish, J.J.Dick, Isentropic Compression of High Explosives with the Z Accelerator, 12th International Detonation Symposium, pp.343-348

[2] D.J.Steinberg,S.G.Cochran, M.W.Guinan, A Constitutive Model for Metals Applicable at High-Strain Rate, J.Appl.Phys.51,1498 (1980)