

Target Acceleration Stress, Deflection and Free Vibration*

E.Valmianski¹ and R.W. Petzoldt²

¹Consultant to General Atomics, P.O. Box 85608, San Diego, California, 92186-5608

²General Atomics, P.O. Box 85608, San Diego, California, 92186-5608

Target acceleration stress, deformation and free vibration after acceleration are important factors for target survivability and implosion symmetry. They also limit target acceleration and directly affect the required length of the target injector.

Analysis of the stress distribution and deformation dependence on target acceleration, target temperature and support membrane attachment angle is presented for Inertial Fusion Energy (IFE) and Fusion Test Facility (FTF) targets. ANSYS calculations were made in the acceleration range of 1,000 m/s²–10,000 m/s², and temperature range 14–19 K, for various support membrane attachment angles. We calculated target stress and deformation with and without internal DT gas pressure, also with and without an outer capsule shell.

Because mechanical properties data for DT are not available, D₂ data were used, but adjusted for the lower D₂ triple point. New data from experiments planned at LANL will help eliminate resulting uncertainties.

Analytical calculations of the free vibrations of the IFE target were also conducted.

We conclude that for D₂ mechanical material properties, IFE and FTF targets will survive acceleration up to 10,000 m/s² with negligible deformation.

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