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New self-similar Solution for Multi-stacked Converging Shocks and High Compression of Matter

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Since Guderley [1] found the self-similar solution of a single spherical shock wave converging to the center in uniform matter in 1942, it has been applied to a number of different problems. The maximum compressed density of the reflected shock at the center reaches 32 times the initial density, when the specific heats ration $\gamma = 5/3$. Now we have found new self-similar solutions for multi-stacked converging and diverging shocks. By increasing the number of stacked shocks, the maximum compression rate has turned out to dramatically increases; for instance, it goes beyond 1000's with four stacked shocks propagating in a uniform spherical target. Unlike the orthodox shell-structured ICF targets, the use of spherical solid targets is expected to release us from the Rayleigh-Taylor instability. This study then gives an insight for a new and simple ignition approach to ICF. The detail of the study is provided in the talk.

[1] G. Guderley, Luftfahrtforschung 19, 302 (1942).