COmparison and analysIs of the results of direct-drive targets implosion

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The direct-drive targets used for experiments at the OMEGA laser facility [1] (EL ~ 20 kJ, λL = 0.351 μm) and equivalent targets scaled for NIF [2] (EL ~ 1.8 MJ, λL = 0.351 μm) conditions to realize PDD (polar-direct-drive) approach are considered at this work. The results of comparing the numerical data obtained using various codes between themselves and with available experimental data are discussed. Various negative factors which adversely affect the conditions of the target ignition, as well as reduce the burning efficiency are considered in relation to the two types of the targets listed above, as well as to low-aspect targets proposed for the planned Russian laser facility [3, 4] (EL ~ 2.8 MJ, λL = 0.527 μm). The accordance of the anticipated scales of irradiation non-uniformities and acceptable errors in target positioning inside the chamber is analyzed. Convergence of numerical and experimental results is achieved by using two- and three-dimensional approaches to the description of the processes of compression and burning of thermonuclear fuel. However, still it is necessary to increase the scale of the non-uniformities by several times for their full compliance that may indicate the presence of additional processes that affect the process of implosion, or possible inaccuracies in the used diagnostic data.

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References

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