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Strong shock-phenomena at petawatt-picosecond laser side-on ignition fusion of uncompressed hydrogen-boron11

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An extreme anomaly of laser-plasma interaction with petawatt-picoseoncd (PW-ps) pulses of very high contrast ratio for suppression of relativistic self-focusing [1] permitted a come-back of the Bobin-Chu side-on ignition of uncompressed deuterium-tritium (DT) fusion fuel [2] based on measured ion beam densities above 10^{11} Amps/cm^2. This ignition mechanism needed numerical and theoretical studies of extremely strong shock phenomena and flow of bremsstrahlung radiation. When extending these results to the side-on ignition of uncompressed hydrogen-boron11 (HB11), surprisingly, the ignition by this shock mechanism was only about 10times more difficult than for DT [3] in contrast to ignition by spherical laser driven compression where HB11 ignition is 100,000 times more difficult than DT. Fusion gains up to 10,000 may be possible similar to side-on ignition by electron beam driven DT using chemically modest compression following the Nuckolls-Wood scheme. Differences between the ion and the electron beam side-on driving were elaborated and next steps for studying energy losses by thermal conduction and stability of the reaction flame at ion drive are formulated.
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[3] H. Hora, G.H. Miley at al, Optics Communications 282, 4124 (2009)