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About thermal and non-thermal ignition of nuclear fusion reactions

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The fact that nuclear reactions are about ten million times more energetic than chemical reactions as e.g. the burning of carbon, requires the same difference of thermal equilibrium pressures with similar elevated fusion temperatures: not hundred oC but hundred million degrees. This was changed by the advent of the laser offering the addition of a non-thermal pressure as a nonlinear phenomenon, initially discovered by Thomson-Kelvin as ponderomotion in electrostatics and generalized by Maxwell's stress tensor for plasmas. This was visible from measurements after 1963 at sufficiently high laser intensities, theoretically predicted and experimentally confirmed as ultrahigh plasma acceleration by Sauebrey using CPA picosecond laser pulses of extremely high power. The measurements reached now parameters for non-thermal conditions of nuclear fusion even for the environmentally clean, but in contrast to thermal-classically very low energy-gain reaction of hydrogen and the boron-11 isotope. The increase was measured [1] showing many orders of magnitudes higher energy gains with CPA pulses for a radically new design of generators (Fig. 16 of [1], and [2][3]) for electricity.

[1] H. Hora, G. Korn, L. Giuffrida, D. Margarone, A. Picciotto, J.Krasa, K. Jungwirth, J. Ullschmied, P. Lalousis, S. Eliezer, G.H. Miley, S. Moustaizis and G. Mourou, Fusion energy using avalanche increased boron reactions for block ignition by ultrahigh power picosecond laser pulses. Laser and Particle Beams. 33, No. 4 (2015) 607
[2] Hora, H., Eliezer, S. Kirchhoff G.J., Nissim, N, Wang, J.X., Lalousis, P., Xu, Y.X., Miley, G.H., Martinez-Val, J..M, McKenzie, W., Kirchhoff, J., Road Map to clean energy using laser beam ignition of boron-fusion. Laser and Part. Beams, 35 (2017) 730-740
[3] US-Patent 10,410,752

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