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## Socio-Economics for Energy: Extreme Laser Pulses for Boron Fusion Power Reactors

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### ABSTRACT

Application of extreme laser pulses of less than picoseconds duration but with powers between Peta- and Exawatt is an example for direct use against the climatic changes by generating fusion energy from boron without nuclear radiation problem. Fusion of hydrogen nuclei (protons) with the boron-11 isotope (HB11) was known as extremely difficult or impossible. But this was of high interest being environmentally clean with less radioactivity per generated energy than from burning coal. This changed radically when it was discovered in 2008, that a non-thermal ignition of fusion in uncompressed fuel was converting the energy of extremely powerful very short laser pulses directly into the ultrahigh acceleration of macroscopic plasma blocks. This kind of ignition was similar to heavy ion fusion [1], but now the extreme laser pulses offer the necessary sufficient non-thermal conditions of plasma acceleration techniques. This is related to the science based results on a unique avalanche multiplication of HB11 reactions in the presentation by Moustazis et al. with the discovery with many orders of magnitudes increased reaction gains measured [2] and explained by theory [3]. This paper presents details for designing a fusion reactor using the combination of the accelerated plasma blocks with ultrahigh laser generated magnetic fields [4]. An advantage for the technology consists in the fact that the cylindrical geometry for the trapping of the reaction volume permits the application of plane wave interaction of the >petawatt laser pulses as a direct drive ignition process. This avoids the complications known from indirect drive and more general geometries [5][6]. The HB11 reaction energy in the alpha particles (helium) is converted by electrostatic fields with nearly no heat losses into electric power with standard Million-Volt technology. Economically profitable power generation without nuclear radiation problem appears to be possible including socio-economic aspects.

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[1] Rubbia Carlo, Laser and Particle Beams 11, 391 (1993)

[2] Hora Heinrich, Korn G. et al., Laser and Particle Beams 33, 607 (2015)

[3] Eliezer Shalom, Hora H., Korn G. et al. Physics of Plasmas 23, 050704 (2016)

[4] Hora H. and Kirchhoff G.J. PCT world patent WO 2015/144190 A1 (23 March 2014)

[5] Hora H. Chapter 10 of Laser Plasma Physics, Second Edition, SPIE Press, Bellingham WA, 2016

[6] Hora H. et al Conference Abstract 3rd ICHDP 23-25 SEP 2016, ShenZhen/China

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