

Abstract Submitted
for the DPP09 Meeting of
The American Physical Society

The relativistic virial theorem in plasma EOS calculations¹

JOSEPH OREG, Artep Inc. Ellicott City MD 21042 , AVRAHAM BARSHALOM, NRCN, P.O. Box 9001 Beer-Sheva, Israel — A method for enhancing EOS calculations is presented. Our model combines the two pressure representations: the basic definition - as the volume derivative of the free energy F , and the “virial pressure” $P_v = [E - c^2 B] / 3V$ derived from the relativistic virial theorem, where B is the lower component contribution to the electronic density. The model takes into account the deviation δ between the two representations and presents an exact differential equation for F that provides analytic expressions for both F and P , in terms of $M = \delta + c^2 B - TS$. Using the LDA approximation for M in these exact expressions, together with a boundary condition at the normal density, improves the EOS LDA results significantly. We present a survey of comparisons with experiments showing excellent agreements with the calculations.

¹We acknowledge the encouragement of S. Obenschain, Head of the Laser Plasma Branch of the Naval Research Laboratory, and his support funded by the USDOE.

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Date submitted: 31 Aug 2009

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