

Abstract Submitted
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Quantum Plasmas in Neutron Stars B.J. KELLETT, R. BINGHAM, Rutherford Appleton Laboratory, J.T. MENDONCA, GOLP, Lisboa, Portugal, A. CAIRNS, University of St Andrews, St Andrews, Scotland, P.K. SHUKLA, Institut für Theoretische Physik IV, Bochum, Germany, C.H.T. WANG, University of Aberdeen, Aberdeen, Scotland — Observations of X-rays from 1E1207.4-5209 (an isolated hot neutron star/pulsar in the supernova remnant KS1209-52) reveal that its X-ray spectrum contains absorption features that display quantization in their energy. We show that such features can be explained by quantizing the Larmor orbits in the extremely strong magnetic field of the neutron star. However, the magnetic field strength necessary to explain the quantized absorption features (8×10^{10} G) is a factor 40 too small to explain the known rotational spin-down rate of the pulsar ($2-3 \times 10^{12}$ G). We provide a solution to this dilemma by showing that X-ray emission arises from confined toroidal plasma surrounding the equator of the neutron star/pulsar (a “pulsarsphere”). This emission is then situated well above the surface of the neutron star and hence reveals a much lower apparent magnetic field strength.

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