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Large-Scale Quantization in Plasmas GEORGE LIVADIOTIS, DAVID MCCOMAS, Southwest Research Institute, USA — In our recent paper [Livadiotis and McComas, Entropy, 15, 1118; Nature, doi:10.1038/nature.2013.13159], we showed that plasmas are systems characterized by a large-scale phase space quantization, caused by the Debye shielding that structures local correlations between particles. While there is no a priori reason to expect a single value of this phase space minimum across different plasmas, we find a surprisingly constant value of $h* \approx 2\pi(1.2 +/- 2.4)10^{-22}$Js, using four independent methods: (1) Ulysses solar wind measurements, (2) a variety of space plasmas spanning a broad range of physical properties, (3) the entropic limit emerging from statistical mechanics, (4) waiting-time distributions of explosive events in space plasmas. Having a phase space minimum $h*$ of 12 orders of magnitude larger than the Planck constant h, plasmas are consistent with a larger scale quantization that opens a new areas in theoretical and experimental physics.

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