M Medvedev et al., J Astrophys Aerospace Technol 2017, 5:3 (Suppl)
DOI: 10.4172/2329-6542-C1-011

Plasma constraints on the cosmological abundance of magnetic monopoles and the origin of cosmic magnetic fields

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Existing theoretical and observational constraints on the abundance of magnetic monopoles are limited. Here we demonstrate that an ensemble of monopoles forms a plasma whose properties are well determined and whose collective effects place new tight constraints on the cosmological abundance of monopoles. In particular, the existence of micro-Gauss magnetic fields in galaxy clusters and radio relics implies that the scales of these structures are below the Debye screening length, thus setting an upper limit on the cosmological density parameter of monopoles, Omega_M<~3x10^-4, which precludes them from being the dark matter. Future detection of Gpc-scale coherent magnetic fields could improve this limit by a few orders of magnitude. In addition, we predict the existence of magnetic Langmuir waves and turbulence which may appear on the sky as "zebra patterns" of an alternating magnetic field with the non-zero dot-product k.B. We also show that magnetic monopole Langmuir turbulence excited near the accretion shock of galaxy clusters may be an efficient mechanism for generating the observed intracluster magnetic fields.

Biography

M Medvedev has completed his PhD in 1996 from University of California, San Diego and Post-doctoral studies from Harvard University Astronomy Department and Canadian Institute for Theoretical Astrophysics, Toronto. He is Professor at the University of Kansas and is affiliated with the Massachusetts Institute of Technology. He has published over a 100 papers in reputed journals, gave over 50 invited/review talks at international conferences, in 2013-16 has been the Chair of the Topical Group in Plasma Astrophysics (GPAP) of the American Physical Society (APS), has been serving as a Member on several editorial boards.

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