

Abstract Submitted
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Plasma Constraints on the Cosmological Abundance of Magnetic Monopoles and the Origin of Cosmic Magnetic Fields¹ MIKHAIL V. MEDVEDEV, KU, MIT, ABRAHAM LOEB, Harvard — 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, $\Omega_M \leq 3 \times 10^{-4}$, 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 $\mathbf{k} \cdot \mathbf{B} \neq 0$. 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.

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Mikhail Medvedev
Univ of Kansas

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