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Unveiling the mysteries of the early universe

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Particle physics is at a crossroads: new physics is there, but we do not know where to search for it. Astrophysics and cosmology offer many opportunities to reduce the parameter space for new physics. In this talk, I will focus on a potential relic that could bring us invaluable information about processes in the early universe and, thus, about new physics. Strong hints from gamma-ray astronomy suggest that a large-scale intergalactic magnetic field (IGMF) exists in the voids and occupies most of the volume of our universe. Intergalactic magnetic fields likely have a primordial origin and could become a new pillar of cosmology. To achieve this ambitious goal, the properties of the IGMF should be robustly measured and studied in detail. I will review dedicated efforts in gamma-ray (CTA) and radio (SKA) astronomy, as well as the progress in understanding galaxy formation and active galactic nuclei to differentiate the primordial component of the IGMF.

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