

Copernicus Webinar and Colloquium Series



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High frequency gravitational waves

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Gravitational waves in the MHz to GHz range are window to the very early Universe, and thus provide a unique way to probe physics around the energy scale of grand unification. The detection of such relic gravitational waves is however extremely challenging. In this talk, I will highlight the fundamental processes generating such high frequency gravitational waves and discuss recent progress in searching for these primordial messengers. I will focus in particular on a natural cosmological gravitational wave detector, based on the conversion of gravitational waves into photons in the presence of cosmic magnetic fields. I demonstrate that this conversion leads to a distortion of the cosmic microwave background (CMB). The measurements of the radio telescopes EDGES and ARCADE can be cast as a bound on the gravitational wave amplitude. For the strongest magnetic fields allowed by astrophysical constraints, these constraints exceed current laboratory constraints by about seven orders of magnitude. Future advances in 21cm astronomy may conceivably push these bounds below the sensitivity of cosmological constraints on the total energy density of gravitational waves.

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