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Modified gravitational waves across galaxies from Macroscopic Gravity

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We analyze the propagation of gravitational
waves in a medium containing bounded
subsystems (”molecules”), able to induce significant Macroscopic Gravity effects. We establish a precise constitutive relation between the
average quadrupole and the amplitudes of a vacuum gravitational wave, via the geodesic deviation equation. Then we determine
the modified equation for the wave inside the medium and the associated dispersion relation. A phenomenological analysis shows that
anomalous polarizations of the wave emerge
with an appreciable experimental detectability
if the medium is identified with a typical galaxy. Both the modified dispersion relation
(wave velocity less than the speed of light)
and anomalous oscillations modes could be detectable by the incoming LISA or pulsar timing arrays experiments, having the appropriate size to see the concerned wavelengths
(larger than the molecular size) and
the appropriate sensitivity to detect the
expected deviation from vacuum General Relativity.

Summary

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