Precision tests of the strong gravity regime through direct observations of gravitational
wave events, will provide new crucial insights on the nature of gravity. In this regard,
a long lasting questions that has survived one century of investigation, is wether the
graviton is massive or not.

In this talk we present new results obtained by studying gravitational perturbations of non-spinning black holes, when the underlying theory of gravity features gravitons with
a non-vanishing mass term. We provide a detailed study of the gravitational signals produced when a small particle plunges or inspirals into a large black hole. Our results
should also describe the gravitational collapse to black holes and explosive events such
as supernovae. We show how merging objects up to 1Gpc away or collapsing stars in the
nearby galaxy can be used to constrain the mass of the graviton to be smaller than ~
10^(-23) eV, with low-frequency detectors. We also present a detailed investigation of new
modes, that suggest how the absence of dipolar gravitational waves from black hole
binaries may be used to rule out entirely such theories. These results are particularly
relevant for next generation of space interferometers like LISA, which has extreme-mass-
ratio mergers among its primary targets.