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Binary neutron star mergers in massive scalar-tensor theory: an adiabatic look

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In massive scalar-tenor theories, a Compton length-scale will be introduced by the scalar mass. In the context of binary systems, the influences of such length-scale include the suppressions in the scalar interaction between the two members when the orbital separation well exceeds the scale, and in the emissivity of scalar radiation with wavelength longer than that. We focus here on coalescing binary neutron stars, where we investigate the scalar effect on the late-inspiral dynamics. It has been found that the scalar activity becomes dynamically important only when the orbital separation shrinks within a few times of the Compton length-scale. Therefore, certain constraints may be placed on the theory by scrutinising the late-inspiral waveforms. Here we adopt quasi-equilibrium states to approximate the leading order evolution of binaries, whereby we find that a lower bound on the scalar mass of m_ϕ
$gtrsim 10^{-11}$ eV is suggested by the event GW170817 if the progenitors were spontaneously scalarized.

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