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New Graviton Mass Bound from Binary Pulsars

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In Einstein's general relativity, gravity is mediated by a massless metric field. The extension of general relativity to consistently include a mass for the graviton has profound implications for gravitation and cosmology. Salient features of various massive gravity theories can be captured by Galileon models, the simplest of which is the cubic Galileon. The presence of the Galileon field leads to additional gravitational radiation in binary pulsars where the Vainshtein mechanism is less suppressed than its fifth-force counterpart, which deserves a detailed confrontation with observations. We choose a set of well-timed binary pulsars, and from their intrinsic orbital decay rates we put a new bound on the graviton mass. Furthermore, we extensively simulate times of arrival for pulsars in orbit around stellar-mass black holes and the supermassive black hole at the Galactic center, and investigate their prospects in probing the cubic Galileon theory in the near future.

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