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Nature of Singularities in Vector-Tensor Theories of Gravity

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The Vector-Tensor theories are a class of alternative theories of gravity that differ from the standard General Relativity (GR) with the presence of a vector field besides the metric. They are studied in attempts to understand spontaneous Lorentz violation, to generate massive gravitons, and as models of dark matter and dark energy. In this talk, I outline how the nature of singularities and horizons in VT theories differ greatly from GR even under ordinary conditions. This is illustrated with Einstein-aether theory where vacuum black hole solutions have naked singularities and vacuum cosmological solutions have new singularities that are otherwise absent in GR. I also summarize the results on other vector-tensor theories where multiple horizons and multiple singularities exist. I end with offering ways to explore these deviations using gravitational waves.

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