**General Relativity and Quantum Cosmology**

# Propagation of Gravitational Waves in Generalized TeVeS

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Efforts are underway to improve the design and sensitivity of gravitational waves detectors, with the hope that the next generation of these detectors will observe a gravitational wave signal. Such a signal will not only provide information on dynamics in the strong gravity regime that characterizes potential sources of gravitational waves, but will also serve as a decisive test for alternative theories of gravitation that are consistent with all other current experimental observations. We study the linearized theory of the tensor-vector-scalar theory of gravity (TeVeS) with generalized vector action, an alternative theory of gravitation designed to explain the apparent deficit of visible matter in galaxies and clusters of galaxies without postulating yet undetected dark matter. We find the polarization states and propagation speeds for gravitational waves in vacuum, and show that in addition to the usual transverse-traceless propagation modes, there are two more transverse modes and two trace modes. Additionally, the propagation speeds are different from c.

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