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High-Frequency Gravitational Waves in Electromagnetic Waveguides

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The interaction between a very-high-frequency gravitational wave (VHFGW) and an electromagnetic wave (EMW) in a rectangular waveguide is discussed in the weak field limit. The background EMW is assumed to be initially in the TE10 mode along the waveguide. It is then shown that a VHFGW, having the same frequency and direction of propagation of the EMW, induces through the waveguide a TE mode with a frequency doubled when compared to the original EMW frequency. In that respect, the GW acts similar to a non-linear medium, giving rise to a Second Harmonic Generation (SHG) effect.

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