

# QUANTIZED MASSIVE SPIN $\frac{1}{2}$ FIELDS ON STATIC SPHERICALLY SYMMETRIC WORMHOLE SPACETIMES

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## ABSTRACT

Traversable wormholes have become a subject of intensive studies since 1988 when Morris and Thorne published their paper which put forward the energy conditions for traversable wormholes. A number of researchers have calculated the stress-energy tensors of different fields but failed to find one that meets the requirement of the wormhole geometry. Some others find different schemes to sustain traversable wormholes but either on the Planck scale or hypothetically on a macroscopic scale.

Groves has developed a method to compute the renormalized stress-energy tensor for a quantized massive spin  $\frac{1}{2}$  field in a general static spherically symmetric spacetime. Using this method, I have computed the renormalized stress-energy tensors of two quantized massive spin  $\frac{1}{2}$  fields in four static spherically symmetric wormhole spacetimes. The results of my calculation suggest that these two fields can be considered exotic. However, due to the technical difficulties in implementing this method, a series of approximations are used in the computation in order to make the problem mathematically tractable; but it is not clear under what physical circumstances these approximations could hold. Besides, the cases that I investigated turned out to involve unphysically large energy densities. Because of these reasons, no firm physical conclusions can be drawn.