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Wormholes geometries in f(R,T^2) gravity satisfying the energy conditions

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In this work we analyze traversable wormhole spacetimes in the framework of a covariant generalization of Einstein's General Relativity known as energy-momentum squared gravity. Here, we show that a wide variety of wormhole solutions for which the matter fields satisfy all the energy conditions, namely the null, weak, strong and dominant energy conditions, exist in this framework, without the necessity for a fine-tuning of the free parameters that describe the model. For that purpose, we derive the junction conditions for the theory, and we prove that a matching between two spacetimes must always be smooth, i.e., no thin-shells are allowed at the boundary. Finally, we use these junction conditions to match the interior wormhole spacetime to an exterior vacuum described by the Schwarzschild solution, thus obtaining traversable localized static and spherically symmetric wormhole solutions satisfying all energy conditions for the whole spacetime range.

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