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A Subluminal Warp Drive Solution Satisfying Energy Conditions

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Warp drives offer intriguing possibilities for novel transportation methods. This study presents a groundbreaking solution for a constant velocity subluminal warp drive that satisfies all energy conditions. Our approach combines a stable matter shell with a shift vector distribution resembling established warp drive solutions, such as the Alcubierre metric. We numerically generate the spacetime metric and rigorously evaluate the energy conditions. Importantly, we demonstrate that the shift vector distribution cannot be reduced to a mere coordinate transformation, confirming the physical significance of our solution. This research marks a significant advancement in warp drive theory by showing that classic warp drive spacetimes can be modified to satisfy energy conditions through the addition of a regular matter shell with a positive ADM mass. Our findings open new avenues for theoretical explorations of faster-than-light travel within the constraints of general relativity and provide a foundation for future studies in this exciting field.

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