



Contribution ID: 99

Type: talk

The Future of Warp Drive Research

Tuesday 24 September 2024 18:20 (25 minutes)

Warp drives are exotic solutions in general relativity that allow inertial observers to accelerate and reach subluminal or superluminal speeds relative to other inertial observers. The field of warp drives was defined three decades ago with the famous Alcubierre metric and its generalization, the Natário metric. Both classes of warp drives feature propulsion-less acceleration, zero ADM mass, and shift-only metrics. Moreover, both these classes violate all the energy conditions, which made these solutions perceived as historically quirky and unphysical. Recently, a new wave of warp drive research has emerged, with several new metrics proposed by us and other groups. It has become clear that there are many more warp drive spacetimes than initially conceived, not necessarily limited to the earlier constraints. To explore these spacetimes, we have introduced a new software tool called Warp Factory (which can also be turned into a Time Machine Factory), capable of rapidly numerically evaluating the physicality of arbitrarily complex metrics and visualizing warp drives. With it, we have already found an unambiguously physical constant velocity solution and an accelerating hovering solution. Remarkably, the field seems to be invigorated, with novel ideas proposed by many groups around the world. These include collapsing warp drives, their gravitational wave signatures, and the first explorations into mechanisms of physical acceleration. What does the future of warp drive research look like? It appears remarkably bright as the field is still in its infancy.

Primary authors: BOBRICK, Alexey (Applied Physics); Dr MELCHER, Brandon (Applied Physics); Dr HELMERICH, Christopher (Applied Physics); Mr MARTIRE, Gianni (Applied Physics); FUCHS, Jared (Applied Physics); Mr SELLERS, Luke (Applied Physics)

Presenter: BOBRICK, Alexey (Applied Physics)

Session Classification: Session IV. Faster than light, warp drive