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GRAVITATIONAL WAVE COMMUNICATIONS: THE FUTURE OF INTERSTELLAR MESSAGING?

Abstract

Traditional interstellar communication relies on electromagnetic waves, which are limited by interference, signal degradation, and speed-of-light constraints. Gravitational waves are ripples in spacetime caused by massive cosmic events. This could offer a potential breakthrough in a new form of deep-space communication. By potentially enabling information transfer across large cosmic distances with minimal loss of data or information. This paper will look into seeing the feasibility of recreating this phenomenon or utilising detected gravitational waves to see if information can be sent through them. Be it to keep communications going with a very far away space craft, or to look for ET life, the applications are many and will be explored in this paper.

The paper will start off with studying theoretical models of encoding information within artificially generated gravitational waves, as well as potential transmission methods, such as controlled mass displacements or high energy laser induced spacetime oscillations. Then the paper will discuss the several technological challenges of detecting and decoding such signals, considering advancements in gravitational wave observatories like LIGO, Virgo, and LISA.

Beyond human applications, the paper will investigate whether advanced ET civilizations could already be utilizing gravitational waves for interstellar communication. If so, SETI (Search for Extraterrestrial Intelligence) efforts may need to shift their focus from the electromagnetic spectrum to gravitational wave detections. This could be valuable information for future SETI work.

The paper will define the technological, theoretical, and observational challenges, how they can be addressed. This research hopes to provide a roadmap for developing gravitational wave-based communication and its potential to revolutionize our understanding of deep-space communication.