

FAR FUTURE (D4)
Human Exploration Beyond Mars/Interstellar Precursors Missions (1.-D4.3)

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INTERSTELLAR RADIO LINKS ENHANCED
BY EXPLOITING THE SUN AS A GRAVITATIONAL LENS

Abstract

The gravitational lens of the Sun is an astrophysical phenomenon predicted by Einstein's general theory of relativity. It implies that, if we can send a probe along any radial direction away from the Sun up to the minimal distance of 550 AU and beyond, the Sun's mass will act as a huge magnifying lens, letting us "see" detailed radio maps of whatever may lie on the other side of the Sun even at very large distances. The recent book by this author [1] studies such future FOCAL space missions to 550 AU and beyond.

In this paper, however, we want to study another possibility yet: how to INCREASE the future interstellar radio links between the solar system and any future interstellar probe by utilizing the gravitational lens of the Sun as a huge antenna.

In particular, we study the Bit Error Rate (BER) across interstellar distances with and without using the gravitational lens effect of the Sun.

The conclusion is that only when we will exploit the Sun as a gravitational lens we will be able to communicate with our own probes (or with nearby Aliens) across the distances of even the nearest stars to us in the Galaxy, and that at a reasonable Bit Error Rate.

[1] Reference book: Claudio Maccone, Deep Space Flight and Communications, 414 pages, Praxis-Springer, 2009.