

IAF SPACE COMMUNICATIONS AND NAVIGATION SYMPOSIUM (B2)
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ON THE EXPLOITATION OF LIGHT DEGREES OF FREEDOM FOR THE STARSHOT SAIL
TRANSMITTERS

Abstract

The launching of probes to the Alpha Centauri planetary system is studied regarding the function of communicating data to ground stations on the Earth.

The essential features are to match the information content to send with the channel constraints and the very limited and lightweight hardware available. The optimized coding, leveraging the different degrees of freedom of light, is investigated by our team from the point of view of modulation format and synchronisation, and will be described.

The concept and design of the optical transducers for light pulses that shall encode different light polarization states will be studied in terms of nano-optic devices that will respect photonics and weight constraints. The optimization of a single emitter, or light-leaf, will be investigated and then scaled up in order to cover a portion of the sail surface.

Finally, by leveraging our experimental studies on fundamental principles that use quantum communication in space [1], we contribute to the modeling of the communication channel and the transmission schemes for the unprecedented scale of this Project.

[1] F. Vedovato et al. "Extending Wheeler's Delayed-Choice Experiment to Space." *Science Advances* 3 (2017)