

Title:

Interstellar Mission Optical Downlink for Scientific Data: Issues and Challenges

David Messerschmitt

UC Berkeley, EECS Department

Abstract:

Current attention on near-term exploration of nearby star systems is focused on low-mass probes that can be accelerated to relativistic speed using propulsion based on a ground-based directed-energy beam. Such a probe has to have a low mass (gram-scale) and transmit with low power (mW-scale). Such a mission is worthwhile only if the collected scientific observations can be successfully downlinked to Earth. We describe a preliminary design for such a downlink from the vicinity of Proxima Centauri, undertaken in collaboration with Philip Lubin and Ian Morrison. We chose short wavelengths with a ground-based (km-scale) receive aperture. This might be the most challenging and ambitious communications link design attempted to date, and here we emphasize some “pain points” that may require new technologies. This talk emphasizes the optics and photonics aspects (as opposed to modulation and coding/decoding), in hopes of stimulating interest and activity in invention and development of needed new photonics capabilities. Further detail can be found in our preprint, which is available at <https://arxiv.org/abs/1801.07778>.

Biography:



David G Messerschmitt is the Roger A. Strauch Professor Emeritus of Electrical Engineering and Computer Sciences (EECS) at the University of California at Berkeley. The first ten years of his career was spent at Bell Laboratories, where he participated in the exploratory development of early digital communication and switching systems for telephony. At Berkeley he has done research in digital communications, audio and video encoding, and software for signal processing, and has served as the Chair of EECS and the Interim Dean of the School of Information. He is the co- author of five books, including *Digital Communication* (Kluwer Academic Publishers, Third Edition, 2004). His doctorate in Computer, Information, and Control Engineering is from the University of Michigan, and he is a Life Fellow of the IEEE, a Member of the National Academy of Engineering, and a recipient of the IEEE Alexander Graham Bell Medal recognizing “exceptional contributions to the advancement of communication sciences and engineering”.