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Author: Mr. Jan Schulte
Kongsberg Satellite Services AS, Norway, jans@ksat.no

Dr. Martin Krynitz
Kongsberg Satellite Services AS, Norway, martin.krynitz@ksat.no

COMPARISON BETWEEN OPTICAL AND RF SYSTEMS FOR LUNAR COMMUNICATION

Abstract

This year 50 years have passed since the last humans landed on the Moon. The Moon is back in the spotlight for human space exploration in the context of eventually going to Mars. While microelectronics has developed in a breath-taking speed during the last five decades the basic physics remain the same. Rockets need the same thrust to reach lunar orbits and ground station antennas need the same size for closing the communication links as before. Given that few unmanned missions have been conducted to the Moon, usually supported by expensive Deep Space Antenna Networks (DSN), few antennas exist that can support lunar communication links today. The present manifest contains at least 140 planned missions to the Moon before the end of the decade and all of them need to communicate with Earth, in some cases via Relay Satellites. In summary, the communication link between Moon and Earth is heavily underserved. The question discussed in this paper is which investments are best suited to resolve this issue. The cost for RF-systems compliant to the NASA LEGS (Lunar Exploration Ground Sites) requirements are compared to using optical telescopes for similar communication links. Apart from the price comparison the operational aspects and the risks involved are analyzed. Finally, recommendations for a future proof communication solution are provided.