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Alex A Kazemi

The Boeing Co, Washington

High speed laser based intersatellite link systems for harsh environment of space

This paper will focus on the trends for the space-based lasers, optics and terminals used in the intersatellite networks. Reviewed and evaluate the recent development in the space-based laser technologies and the critical parameters that are employed for successful high-speed inter-satellite communications systems. Fiber optics and photonics technology including lasers increasingly being used in aerospace applications and many challenges are involved, since designing for aerospace is very different for the earth environment. Satellites are much more challenging and for their intersatellite solutions have to contemplate more specific requirements such as space radiation attacks, operation in the harsh environment of space and achieving weight, power requirements and reliability for space are few to consider. Therefore it is important to design a system to defend against the radiation from ionizing, gamma and other attacks. There are numerous methods to protect them from radiation, including shielding, error correction and using radiation resistance shielding and radiation hardening. Building laser for the high-speed communications network for the harsh environment of space using optical links in space has proven to be a complicated task and many such schemes were tried without success in the past. Space-based optical communications using satellites in low earth orbit (LEO) and Geosynchronous orbits (GEO) hold great promise for the proposed Internet in the Sky network of the future. However, in the last few years, there has been impressive progress made to bring the concept of laser-based intersatellite systems to fruition in civilian and government-non classified projects. Laser communications offer a viable alternative to established RF communications for inter-satellite links and other applications where high-performance links are a necessity. The high data rate, small antenna size, narrow beam divergence and a narrow field of view are characteristics of laser-based systems and they are just a few numbers of potential advantages for system design over radio frequency communication.

Biography

Alex A Kazemi a Boeing Associate Technical Fellow and materials scientist has worked for aerospace industry for past 20 years. He is currently focusing on the development of a new generation of optical fibers for Boeing Commercial Airplanes. Alex is a world-recognized Micro Technologist with a focus on fiber optics, miniaturized interconnects, leak detection systems, fiber optic sensors for the cryogenic environment and laser micro packaging. He is regarded as the leading expert in these areas by industry and academia, including US and European aerospace agencies. He is regularly sought as an expert on fiber optics, fiber optic chemical sensors and components, throughout the Boeing Co. At BCA, he is developing a new novel state-of-the-art fiber optic flexible circuits (wall fiber) to replace copper cables for airplanes with projected weight saving of 70% per meter with cost savings of almost an order of magnitude over wire replacement expenses. At BDS, he has performed pioneering work for Boeing EELV by successfully demonstrating the world's 1st fiber optic hydrogen leak detection system during Delta IV rocket engine test at NASA/Stennis. Before beginning his career in industry, he spent several years teaching at USC. Followed by 10 years working for telecommunications and fiber optic sensors/MEMS industry. He has authored/edited 8 books in the area of Photonics and Fiber Optics plus published over 40 papers in international journals. He has received Boeing and worldwide recognition for development of H2 leak detection sensor system for rocket engines. He has received numerous industry prizes and patents.

alex.a.kazemi@boeing.com