World Academy of Science, Engineering and Technology
International Journal of Electronics and Communication Engineering
Vol:18, No:01, 2024

# Next-Generation Laser-Based Transponder and 3D Switch for Free Space Optics in Nanosatellite

**Authors :** Nadir Atayev, Mehman Hasanov

**Abstract :** Future spacecraft will require a structural change in the way data is transmitted due to the increase in the volume of data required for space communication. Current radio frequency communication systems are already facing a bottleneck in the volume of data sent to the ground segment due to their technological and regulatory characteristics. To overcome these issues, free space optics communication plays an important role in the integrated terrestrial space network due to its advantages such as significantly improved data rate compared to traditional RF technology, low cost, improved security, and inter-satellite free space communication, as well as uses a laser beam, which is an optical signal carrier to establish satellite-ground & ground-to-satellite links. In this approach, there is a need for high-speed and energy-efficient systems as a base platform for sending high-volume video & audio data. Nano Satellite and its branch CubeSat platforms have more technical functionality than large satellites, wheres cover an important part of the space sector, with their Low-Earth-Orbit application area with low-cost design and technical functionality for building networks using different communication topologies. Along the research theme developed in this regard, the output parameter indicators for the FSO of the optical communication transceiver subsystem on the existing CubeSat platforms, and in the direction of improving the mentioned parameters of this communication methodology, 3D optical switch and laser beam controlled optical transponder with 2U CubeSat structural subsystems and application in the Low Earth Orbit satellite network topology, as well as its functional performance and structural parameters, has been studied accordingly.

**Keywords :** cubesat, free space optics, nano satellite, optical laser communication.
**Conference Title :** ICOCECE 2024 : International Conference on Optical Communication Electronics and Communication Engineering
**Conference Location :** Paris, France
**Conference Dates :** January 18-19, 2024