

SPACE COMMUNICATIONS AND NAVIGATION SYMPOSIUM (B2)
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ADAPTIVE ANTENNA FOR HIGH BAND COMMUNICATIONS

Abstract

The global market for telecommunications is expanding rapidly. Telecommunications is one of the leading growing sectors in the world economy; it is one of the most important components of our today's social, cultural, economic and political lives. Applications such as Satellite Radio, HDTV, ULTRA HDTV(4K), Mobile TV, In-flight Internet, fast Internet, bi-directional satellite for cellular communication and satellite imagery download, are driving insatiable demand for satellite communications bandwidth. This demand pushes satellite manufacturers to build satellites with bigger Antenna sizes, higher transmitting power and higher receiver sensitivity. Volume in launcher canopies and satellites limits the maximum diameter of communication antennas. Sophisticated, costly mechanisms are needed to deploy folded structures; these mechanisms are not able to provide large Antennas, have many fail points and have a large mass. An innovative technology is needed to both address the technical challenge and enable further expansion of satellite services for both the traditional GEO satellites and the new space LEO small satellite constellations. NSLComm offers a solution to this problem by using Expandable Shape Memory Polymer (SMP) Reflector combined with an Adaptive Feed System Surface Correction Technology. The adaptive system is in the form of an adaptable sub reflector. The sub-reflector is able to change shape in multiple points on the surface and thus change the gain of the Antenna at that point. This technology enables us to correct errors in the main expandable antenna due to deployment challenges of high surface accuracy (for KU and KA bands for example). Not Error correction is possible, but changing the shaping and thus the ground coverage of the antenna system while in orbit. The achievable bandwidth of our proposed sized Antenna System is 10-20 times that of today's best performing small satellites. Using our technology a Nano-Satellite can achieve more than one Gigabit per second communication rate with modest energy and ground station requirements. Expandable technology has many benefits over existing solutions. It enable the deployment of large structures, has a low mass, low packing volume during launch, flexible stowing configuration, high reliability and mission life span. The system is in an advanced testing phase and has already demonstrated the ability to correct for deployment residual errors as well as thermal expansion in space. The Article will demonstrate the technology and present the results of the tested system.