

IAF SPACE COMMUNICATIONS AND NAVIGATION SYMPOSIUM (B2)
Space Communications and Navigation Global Technical Session (8-GTS.3)

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RECEIVING TESTS OF NEW THREE DIMENSIONAL PHASED ARRAY ANTENNA

Abstract

Many satellites are being launched to the low Earth orbit, for example, the SpaceX Starlink satellites. All the satellites must be communicated with the ground stations for the control and data acquisition. The ground stations are required to communicate simultaneously with so many satellites. The purpose of this study is to develop the 3 dimensional phased array antenna for the various applications including the ground antennas and the onboard ones. We have already built a few pilot models of the receiving antenna at the frequency of X and S-band.

The 3 dimensional phased array antenna has many pole antennas, each of which can work as a linear phased array antenna with a lot of the isotropic antenna elements. The pole antennas are two-dimensionally arranged just like a forest, that can scan the main beam toward the whole directions. The 3 dimensional phased array antenna can simultaneously communicate with several satellites using the Digital Beam Forming.

The small satellite OPTIMAL-1 was ejected from the International Space Station on 6 January, 2023. The functions of the satellite were examined as the initial operation for one month. We tried to receive the signals from the OPTIMAL-1 using our new 3 dimensional phased array antenna. The signals could be received with the one pole antenna observed with the spectrum analyzer. The spectra indicate the signals can be radiated from the small satellite OPTIMAL-1 by receiving along the anticipated orbit, showing the expected bandwidth and Doppler Shift. We are examining our new 3 dimensional phased array antenna by receiving the signals from the OPTIMAL-1 satellite increasing the number of the pole antennas to measure the azimuths of the signals with the Digital Beam Forming. We will present the results of the receiving tests with our new 3 dimensional phased array antenna in my presentation.