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Author: Prof. Shigeru Aso
Kyushu University, Japan, aso@aero.kyushu-u.ac.jp

Prof. Kiyotaka Fujisaki
Japan, fujisaki@ait.kyushu-u.ac.jp
Mr. Tsutomu Tokifuji
Japan, mlab2@cube.ocn.ne.jp
Ms. Naomi Kurahara
Japan, kurahara@nsat.t.u-tokyo.ac.jp

DEVELOPMENT OF NEW GROUND STATION AT KYUSHU UNIVERSITY FOR NANO
SATELLITE OPERATION WITH EFFICIENT AND LOW-COST NET WORK SYSTEM

Abstract

In Japan, since 2002, 17 Japanese university and/or regional satellites have been launched (in November 2010). Furthermore, aiming to be launched in the future, various satellite missions are under development now. Generally speaking, university and/or regional satellites often use amateur radio frequency for telecommunication because amateur radio instruments or facilities are low-cost. However, the higher advanced mission requirements are defined, the higher communication rates are required. Recently, S-band to X-band or Ku-band telecommunication is increasing in university and/or regional satellites. In this context, we have started a new ground station system development through the governmental first program “New Space Development and Utilization Paradigm by Nano-satellites Introducing Japan-oriented Reasonable Reliable Systems Engineering” since April 2010. In this project, we aim to establish a reasonable and cost-effective ground station system for nano-satellite operation. This paper introduces system characteristics, testing results, development progress, and the example of experimental operation. In 2010 two parabola antennas have been set at Ito campus of Kyushu University, Japan. To operate various satellites effectively, we have developed two different antenna types for multi-band radio frequency. One is established for C/X/Ku-band (No.1), the other is established for S-band or lower frequency bands (No.2). The diameter of two antenna is 2.4 m. Now they begin to receive signals from satellite. Also, the collaboration of university ground stations has great advantages for advanced satellite operation. To realize the collaboration of university ground stations, the remote operation technology of ground station is important issue. For this purpose, Ground Station Network (GSN) was proposed for nano-satellite operation. GSN is a network of ground stations of universities and colleges and member stations are controlled remotely via the Internet. The received data at each station is transported to the operator in real time via the Internet. Instead of using dedicated lines, use of the Internet for communication between the remote station and the operator reduces the development and operation cost of the network. In addition because the Internet spread all over the world, many ground stations can easily join the network and the large network is expectable. The paper also includes the new network systems for efficient and low cost ground station operation.