EXPERIMENTATION OF Q/V-BAND GROUND SEGMENT TECHNOLOGIES IN THE FRAMEWORK OF THE H2020 PROJECT Q/V-LIFT

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Abstract

In order to reach the terabit connectivity target, future generations of High Throughput Satellites (HTS) will exploit the “beyond Ka band” frequencies. In this framework, the short-term scenarios foresee the use of Q/V (40/50 GHz) frequency bands. The QV-LIFT project aimed at developing the foundation of the Ground Segment Technology for the future Q/V band SatCom systems focusing on two mission scenarios, namely using Q/V-band in the feeder link of next generation high throughput satellites as well as in the user link for aeronautical terminals in aviation scenarios.

This paper presents the experimental activities conducted during final phase of the project. A smart gateways management system (SGMS) was deployed, having the capacity to counteract the propagation impairments, which presents one of the main obstacles in the operability of the Q/V band feeder systems.

During the test campaign of the project, the end-to-end connectivity at system level allowed to validate of the aeronautical satellite system developed in QV-LIFT exploiting the Alphasat “Aldo Paraboni” Payload as the space segment and the existing Ground Stations for the feeder link. The aeronautical terminal is composed by a Q/V band Antenna (0.6 mt) and tracking pedestal, Q/V RF frontend, including a LNB (Low Noise Block) operating at 38 GHz and BUC (Block Up Converter) operating at 48 GHz. The BUC was realized by developing a solid-state power amplifier (SPA) based on Gallium Nitride. In particular, the implemented SPA benefits of a novel high frequency GaN/Si 0.1μmMMIC technology process developed in Europe. The developed RF technology was also used to integrate an Earth station, based on a larger Antenna (1.5 mt), which was also integrated and tested in the QV-LIFT Ground segment.

The design, implementation and testing of the QV-LIFT overall system provided key indicators on operational capabilities at component and equipment level. For the first time to our knowledge, it was demonstrated operability of the entire Q/V band communication system infrastructure including both the ground and space segment.