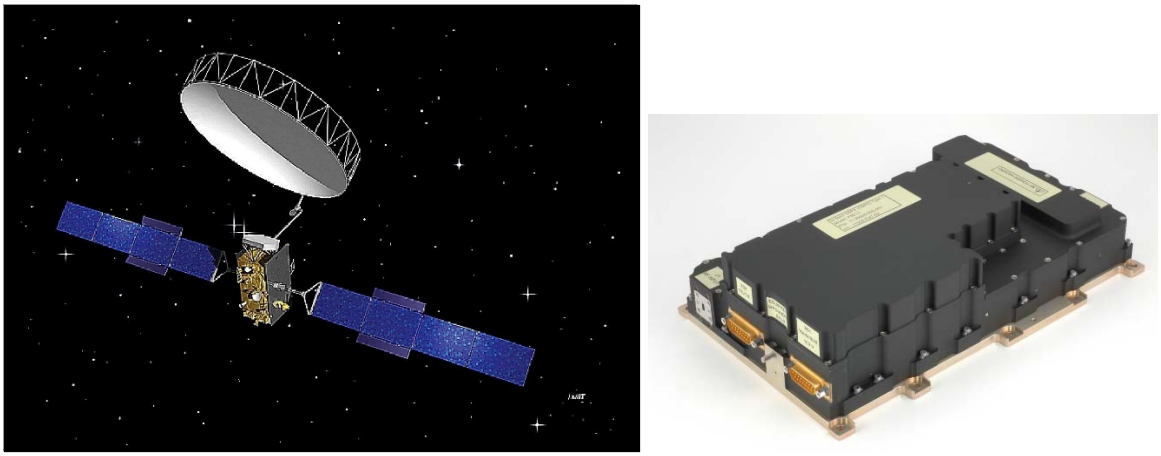
Alphasat TDP5 Q-band Solid-State Power Amplifiers reach a new milestone!

November 1, 2022: QuinStar Technology designed, manufactured, and tested a set of four Q-band (33-50 GHz) Solid-State Power Amplifiers (SSPA) during 2008-2011 as transmitters and beacons for Alphasat Technology Demonstration Payload # 5 (TDP5), named The Aldo Paraboni Q/V Communications and Propagation Experiment. This equipment is part of a Q-V Band communications experiment to assess the feasibility of using these new frequency bands for future commercial applications. The equipment for conducting propagation studies and communication technology experiment was launched on July 25, 2013 on an Ariane-5 ECA vehicle from Kourou, French Guiana. On January 21, 2014, it was fully operational and the experiments and measurements were started.

QuinStar's four SSPA have operated continuously for almost 9 years now without any problems or failures. There are over 25 ground stations* located throughout Europe that have been measuring propagation characteristics of the Q-and beacon while three locations conduct communication experiments using the Q/V band transceivers on board.
After completing 9 years in operation in space, the experimenters are seeking to renew the contract for another 3 years of operation. It should be noted that the SSPAs were required to operate for a minimum of 3 years in space environment. They are approaching three times that in operation.

*Italian ground stations of the experiment are using QuinStar-built frequency converter sets. In the near future, these ground stations will also use QuinStar-built V-band (47-52 GHz) Solid State Power Amplifiers (SSPA) for which QuinStar is currently under contract.
A very significant body of highly critical information and data has been obtained during this period by dozens of experimenters and academicians that will be vital for designing and planning future broadband satellites in these bands.

Key words- Alphasat TDP5, Q/V band, Aldo Paraboni Experiment, Propagation, Communications Technology



Alphasat Satellite and QuinStar-produced Q-band Solid-State Power Amplifier

FACT SHEET

Aldo Paraboni Q/V Band Payload

Technology Demonstration Payload

The Aldo Paraboni Q/V Band Payload explores new frequencies for future telecom applications. In parallel, Ka- and Q-band beacon transmitters will measure how Earth's atmosphere affects communications in these bands.

Exploring new frontiers

The frequencies in which broadband satellite communications operate are becoming crowded, and industry is now looking at technologies capable of utilising higher frequencies. These are represented by the Q-band for downlink (around 40 GHz) and V-band for uplink (around 50GHz). TDP 5 is named after the Italian scientist Aldo Paraboni, who dedicated his life to researching the higher frequency bands.

Italian national space agency ASI commissioned the payload (under ESA's ARTES programme) with Italian companies Thales Alenia Space and Space Engineering to explore these possibilities by developing technology that could adapt to poor atmospheric conditions while minimising the effect it has on performance in clear skies.

These frequencies are now becoming real commercial possibilities, as technological advancements have eradicated the previous need for oversized transponders to accommodate for the fading that occurs due to Earth's atmosphere. The wide bandwidth provided by these frequencies can result in lower service fees, higher-capacity systems and improved satellite positioning.

Two independent systems in harmony

TDP 5 is designed to perform two experiments while in GEO: Communication and Propagation. Its communication experiment tests methods of adapting the beam to atmospheric conditions and its propagation functions monitor the influence of weather and provide figures for the upgrade from current Ka-band to Q/V-band. It is the first time the advanced satellite standard DVB-S2 will be tested in Q/V-band, which must happen in real conditions. These experiments will provide the knowledge for future advancements in the necessary infrastructure.

Composition

COMEX Subsystem: Communication experiment

- In Q/V-band
- V-band uplink (48 GHz), Q-band downlink (38 GHz)
- 2 transponders with cross-strapping capability
- 3 beams (2 simultaneously active)
- No redundancy

SCIEX Subsystem: Propagation experiment

- In Q-Band and Ka-Band
- 2 beacons (19.7 GHz – 39.4 GHz)
- Fully redundant configuration

ASI, Space Engineering and Thales Alenia Space

Italian industry's heritage with high frequency ranges in space services hails from the 1970s, when it pioneered the use of Ka-band in commercial applications. ASI continues to support further development in this area. ASI assigned the Space Engineering Group with the TDP 5 ground segment responsibilities, as well as the antenna and passive units design. Thales Alenia Space was responsible for the payload design and development of the active units and antenna assembly.

Facts and figures

Nominal lifetime	3 years, possible 2 year extension
Total weight	37.7kg
Max power consumption	274W
Max thermal dissipation	245W
Launch	25 July 2013, on Alphasat
Control Centres	• Tito, Italy • Spino d'Adda, Italy • Graz, Austria • London, UK (Inmarsat)
Co- contractors	• Thales Alenia Space, Italy • Space Engineering, Italy

ESA Media Relations Office
Tel: +33 1 53 69 71 55
Fax: +33 1 53 69 76 90
Email: media@esa.int