

Fostering fast telecommunications developments trough the use of Q/V band satellite links

**Giuseppe Codispoti
Telecommunication and Integrated Application Unit
Italian Space Agency**

Vienna, Feb. 16th, 2012

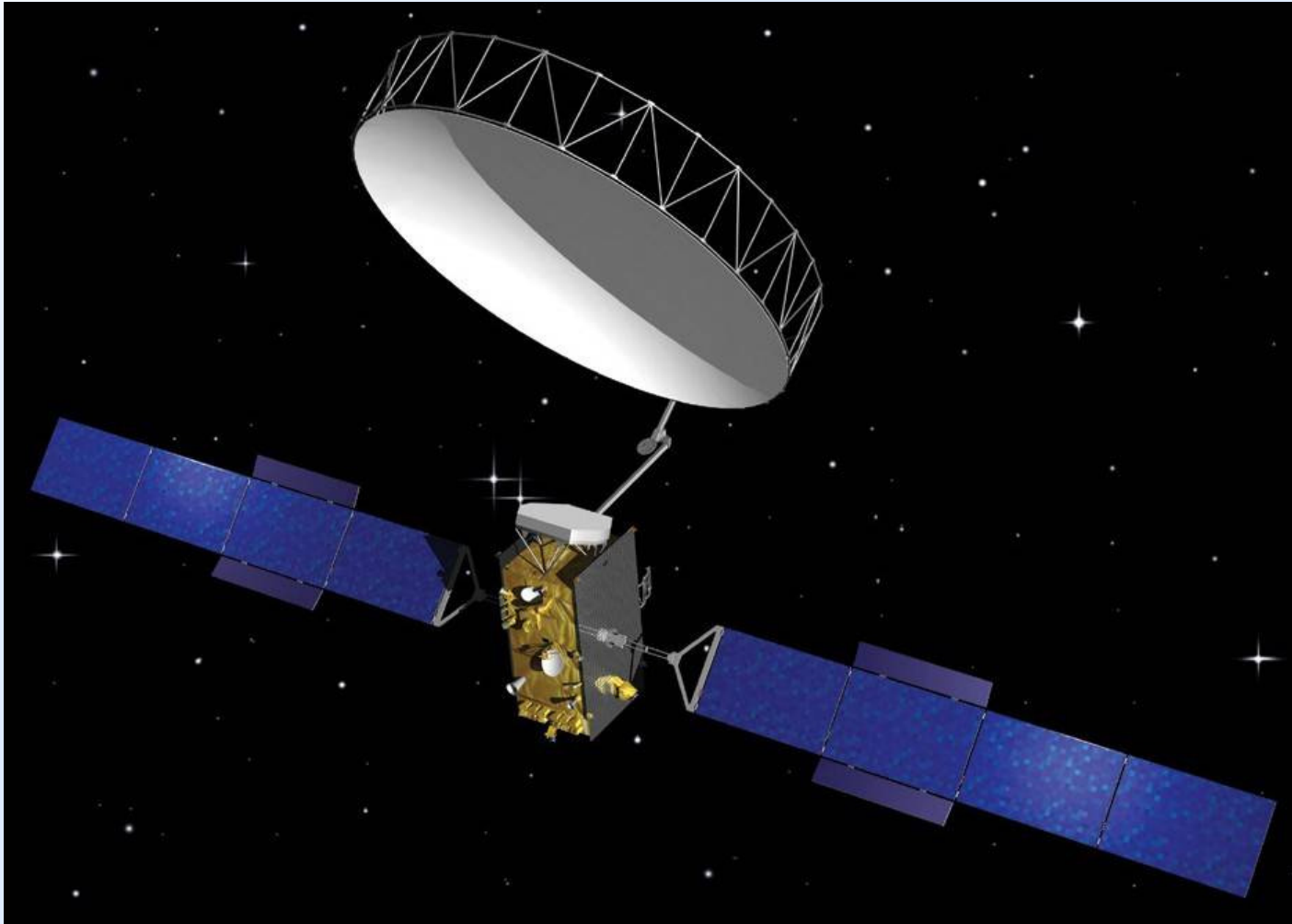
The use of large band telecommunications technologies is a fundamental step for the solution of the “Digital Divide” problem and for the creation of telecommunication infrastructures in developing countries.

One of the institutional task of the Italian Space Agency, ASI, is the promotion of research for high frequency-large band space telecommunications.

In 2003 ASI started experimental activities concerning telecommunication frequency bands not yet used for commercial purposes: Q/V Band (40/50 GHz), W Band (70/90 GHz) and Optical Band.

In 2007 a Geostationary space flight opportunity urged to concentrate on Q/V Band technologies.

The Flight opportunity: Alphasat



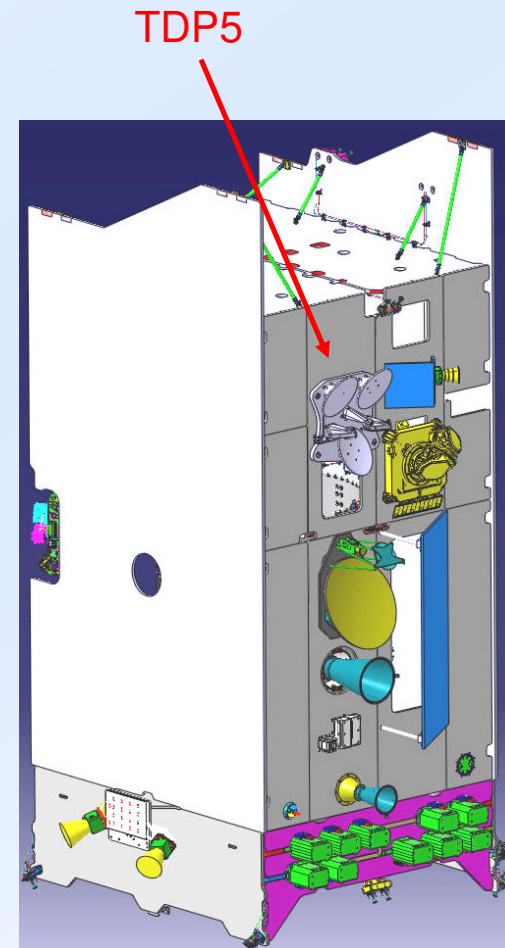
Alphasat

is a large geostationary satellite (6,000 kg at launch) for telecommunications to be launched the 1st quarter of 2013.

It uses a very large platform, Alphabus, developed by the European Space Agency, ESA and will embark a principal commercial telecom payload developed by INMARSAT.

Besides the main payload smaller Technology Development Payloads, TDPs, are embarked.

A Q/V Band Telecommunication payload has been financed by ASI and developed in Italy: TDP5



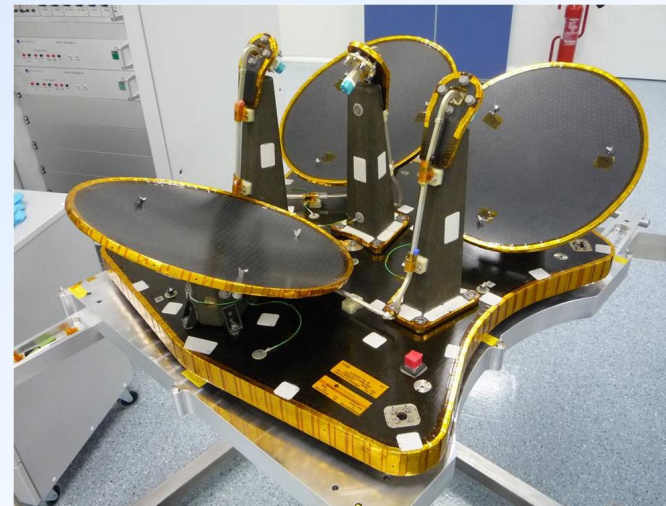
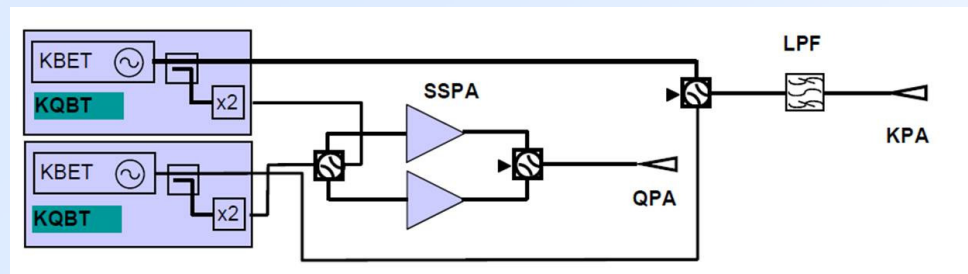
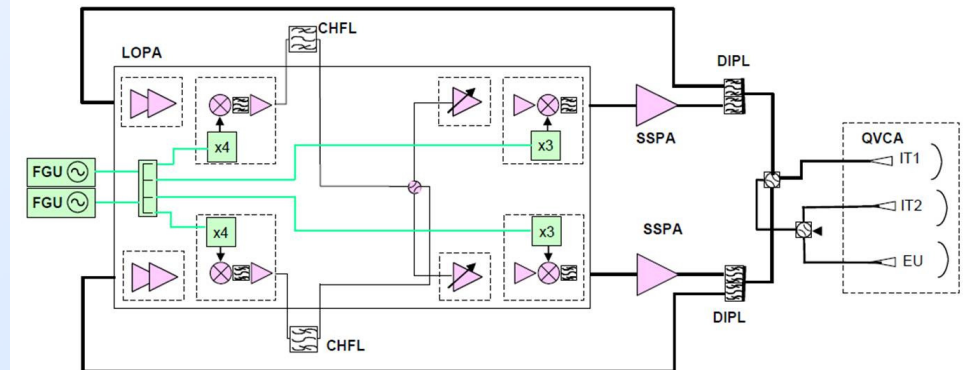
TDP5

is a Q/V Band (40/50 GHz) telecom payload.

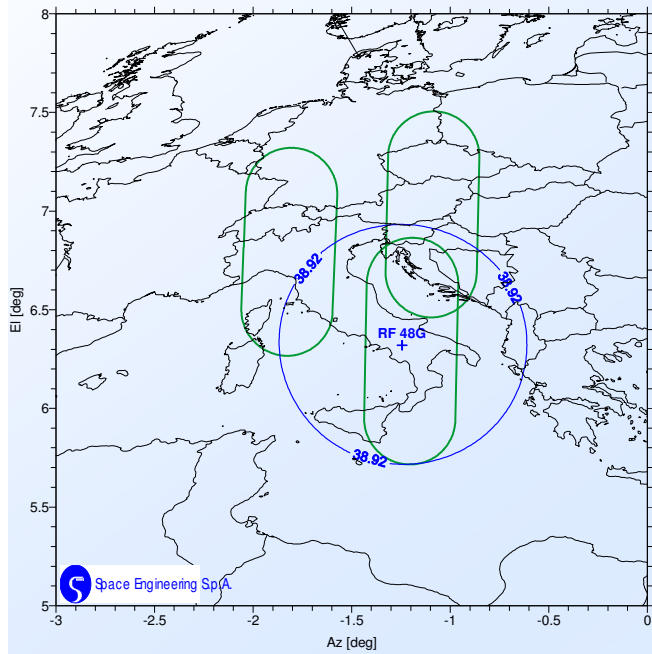
It has been manufactured by Italian industries on scientific requirements of scientific investigators in order to perform channel and propagation communication experiments.

The payload antennas provide three communication beams above Italy and Austria and two propagation beacons at 40 and 20 GHz for a large continental coverage.

The telecommunication experiment will be carried out by Italian and Austrian scientists. The propagation research is open to any interested investigator.

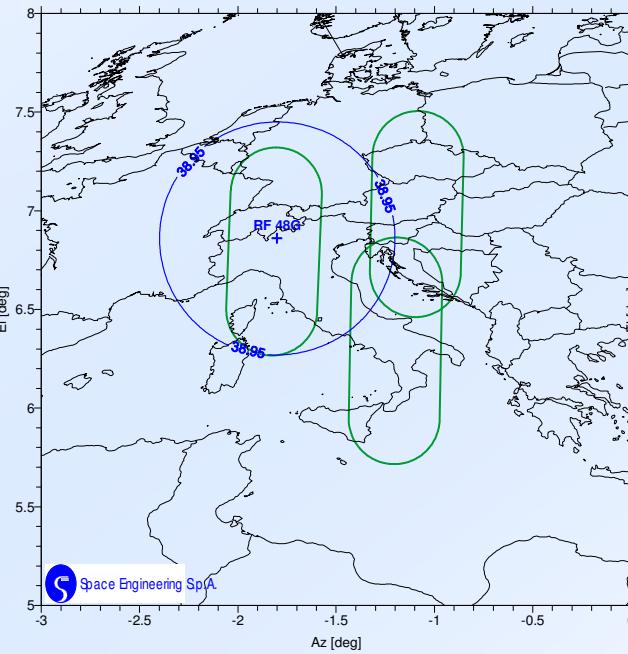


IT1 Beam Measured Gain @ 48 GHz



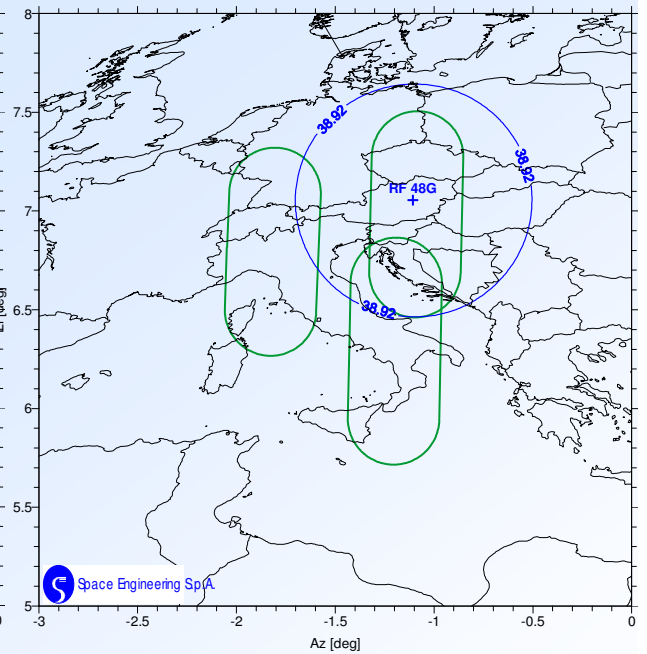
Up-link (V-Band) Beam Contour over Tito, Italy

IT2 Beam Measured Gain @ 48 GHz



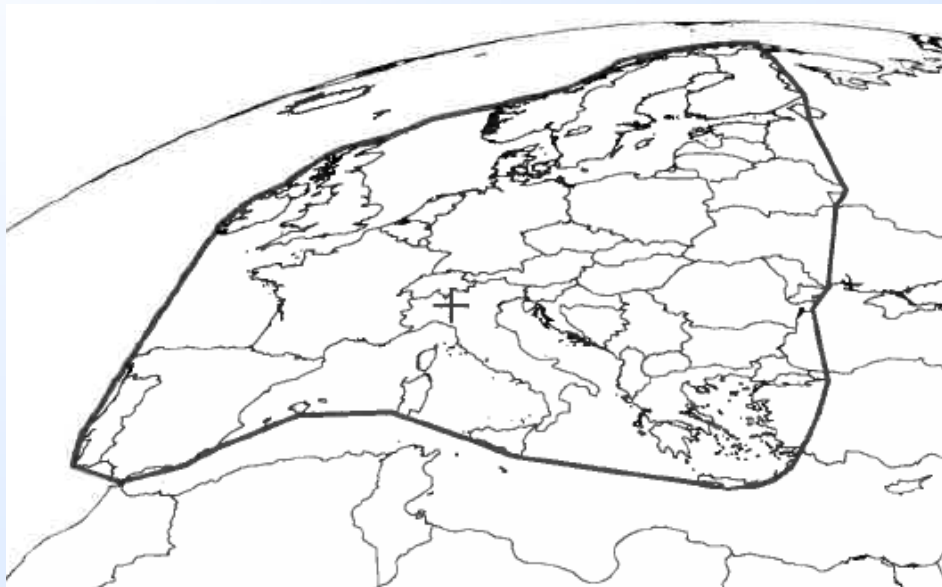
Up-link (V-Band) Beam Contour over Spino d'Adda, Italy

EU1 Beam Measured Gain @ 48 GHz



Up-link (V-Band) Beam Contour over Graz, Austria

40 GHz (Q-Band) Beacon Coverage



20 GHz (Ka-Band) Beacon Coverage



The Q/V Band experimentation program, is composed by a “space segment” and a “ground segment”, either for communication and for propagation.

ASI, in collaboration with the Austrian Space Agency, is developing the first civil ground station network for space telecommunications at 40/50 GHz.

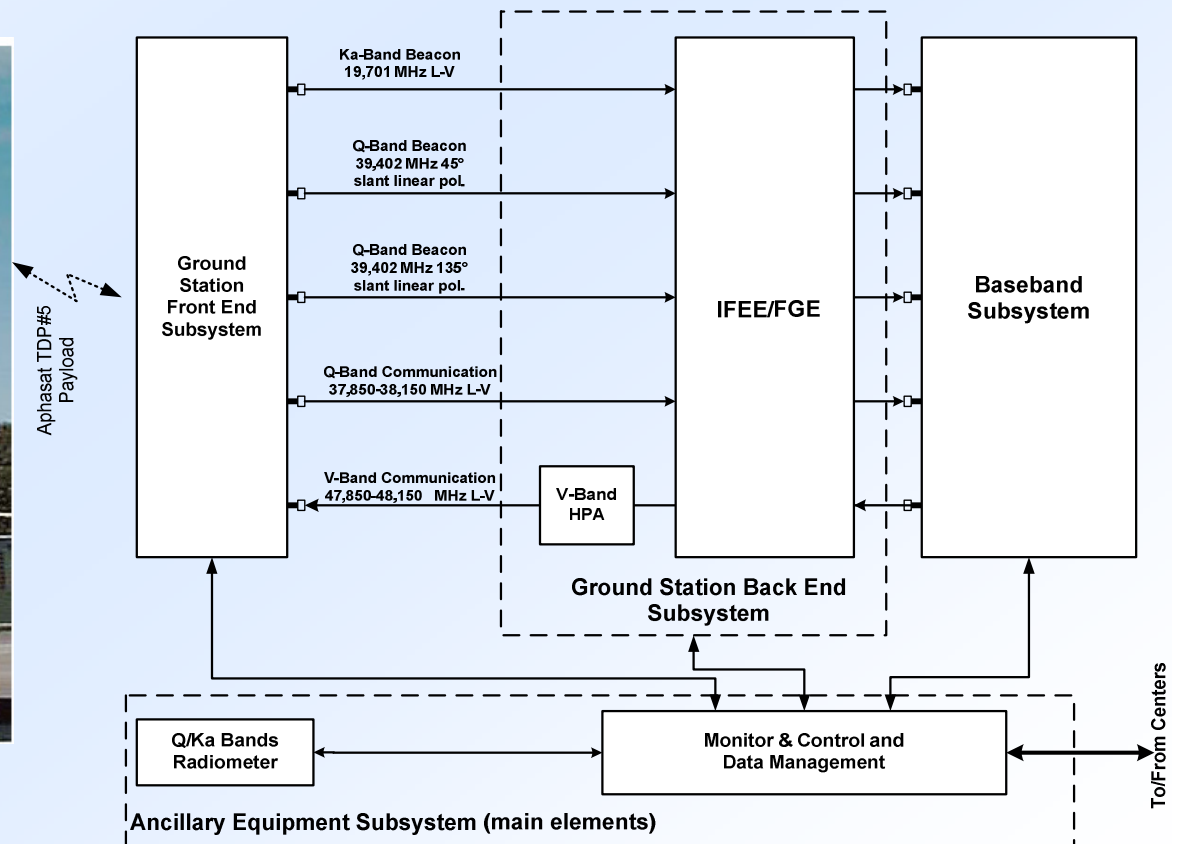
This ground infrastructure will allow the scientific investigators to test the communication channels provided by the TDP5 payload.

By means of adaptive transmission schemes, the researchers final goal is to prove the use of the Q/V band for broadband communications.

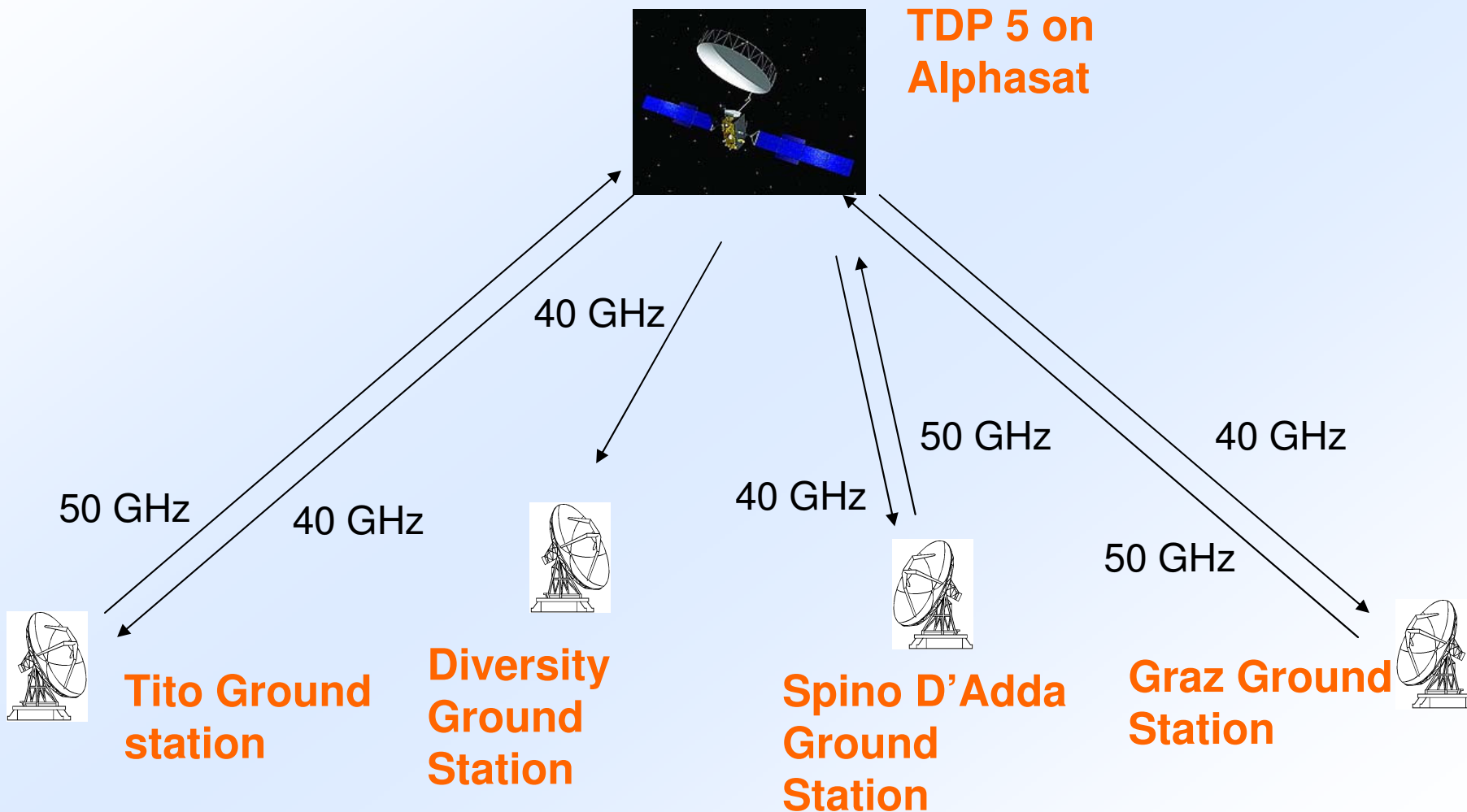
Ground Station Antenna



Ground Station block scheme



Q/V Band Communication Network



Q/V Band Propagation Experimental Network



- **The future applications in Q/V Band will exploit the two main characteristics in using these frequencies:**
 - Large bandwidth availability
 - Reduced dimension for the user terminal

- **This leads to identify the following possible future applications:**
 - Fixed Service
 - Mobile Service
 - Space Services (Data Relay)

Fixed Service

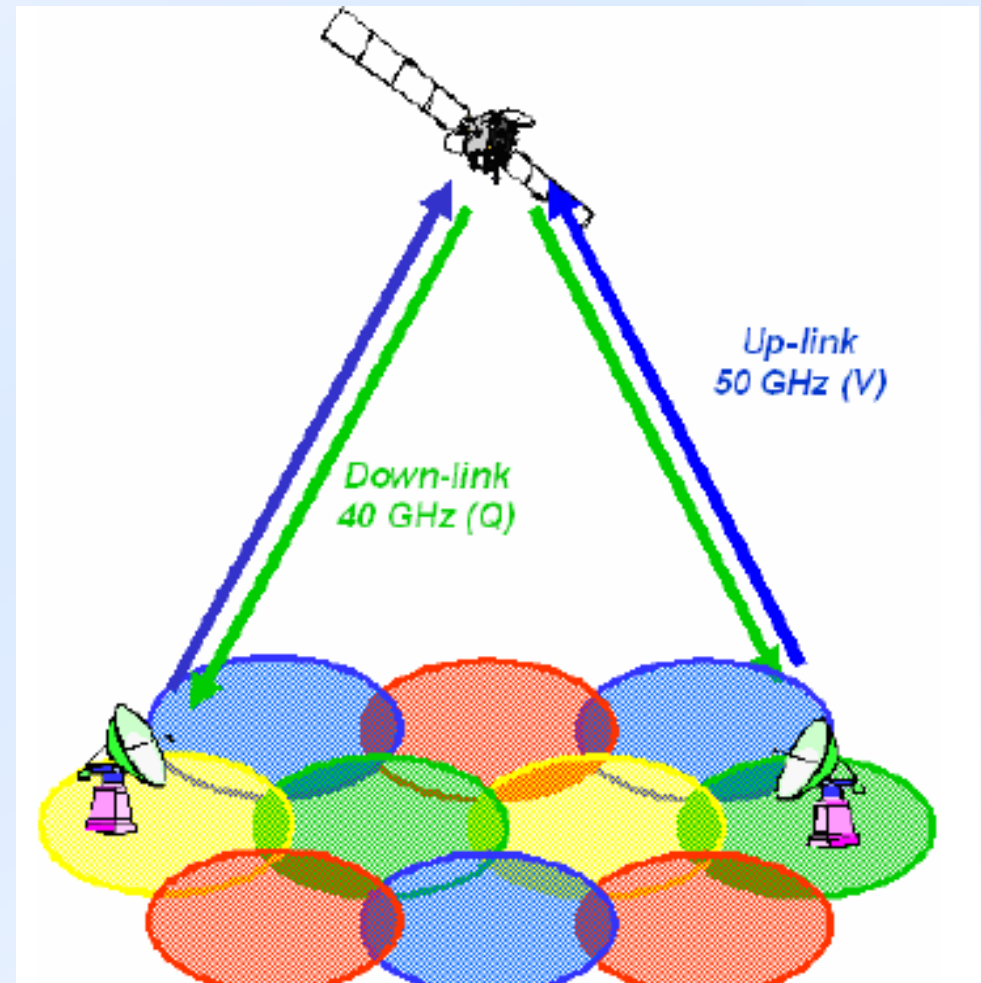
- **Two different future applications:**
 - Broadband Multimedia Satellite Systems (BMSS)
 - Backbone Connectivity Network (BCN)
- **The BMSS mission is in principle associated to the multi-play services, in general, and to the 3-play in particular (Internet Access, Video on-demand, Voice over IP)**

Backbone Connectivity Network (BCN)

- **Backbone connectivity is an operative mission to provide the Internet Backbone guaranteeing:**
 - High data rate
 - High availability
 - Service reconfiguration capability
- **Links in Q/V band are a really good solution for the bandwidth requirements of high data rate services when compared to other frequency bands such as the Ka band and trade-off analysis could demonstrate the high value of data rate figure also in worst case conditions**

BCN Possible Mission

- The satellite could be seen as a drop-in replacement for terrestrial fiber-optic link
- Every earth station:
 - transmits up to four 155 Mbit/s channels on the up-link
 - receives one 620 Mbit/s channel on the down-link



Thank You!