Involvement of Digital Divide affected countries in Q/V Band experimentation and use

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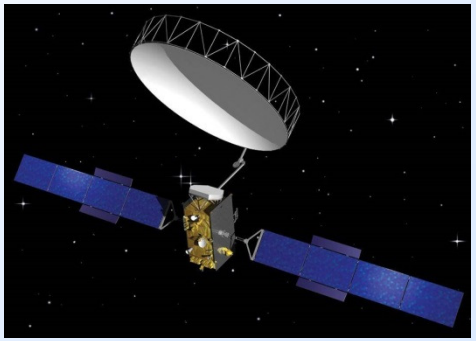
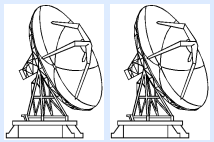
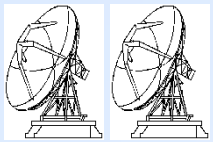
Italy, through its national body the Italian Space Agency, ASI, has proposed to use the experimental Q/V band frequency system, part of the payload on-board Alphasat satellite scheduled for launch on July 2013. The Q/V payload has been developed by ESA based on an Italian proposal and funded by ASI



On board segment

Ka/Q/V bands payload, TDP5, on board Alphasat ESA/INMARSAT satellite, consists of 3 40/50 GHz telecom beams and 2 propagation beacons at Ka and Q bands



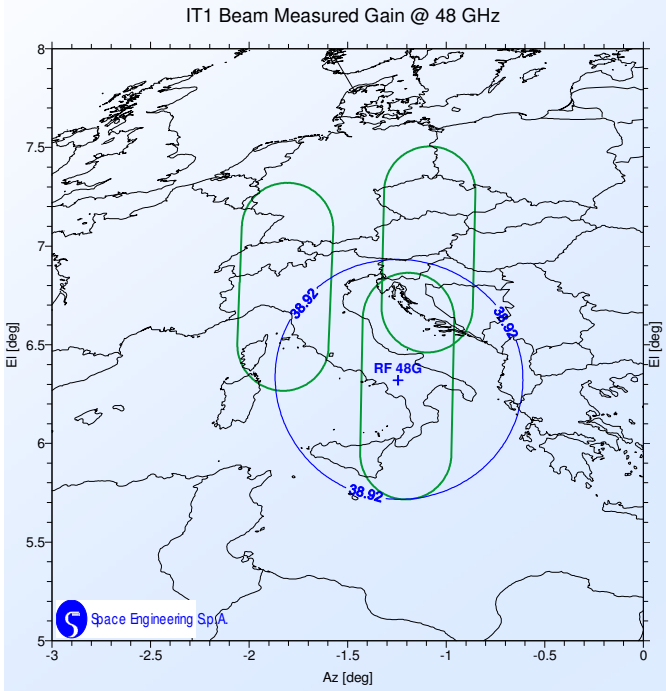


On Ground Segment

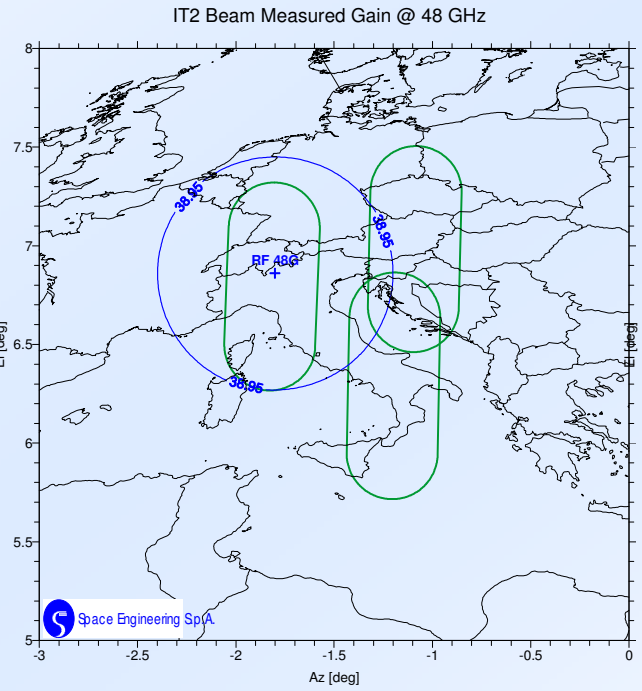
Three main ground stations at Tito, Spino d'Adda (Italy) and Graz (Austria) for both propagation and telecommunication experimentation and a series of ground stations for propagation only research.

Fixed Beams

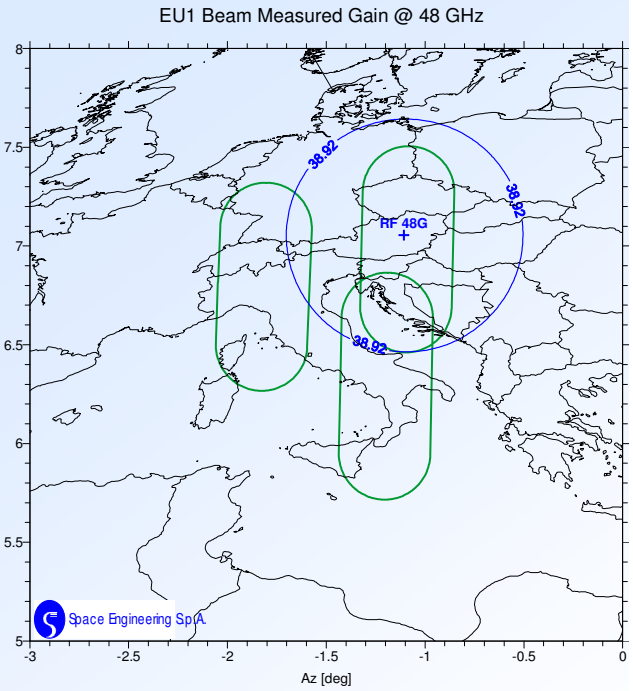
40/50 GHz telecom fixed beams over Tito and Spino d'Adda, Italy, and Graz, Austria



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



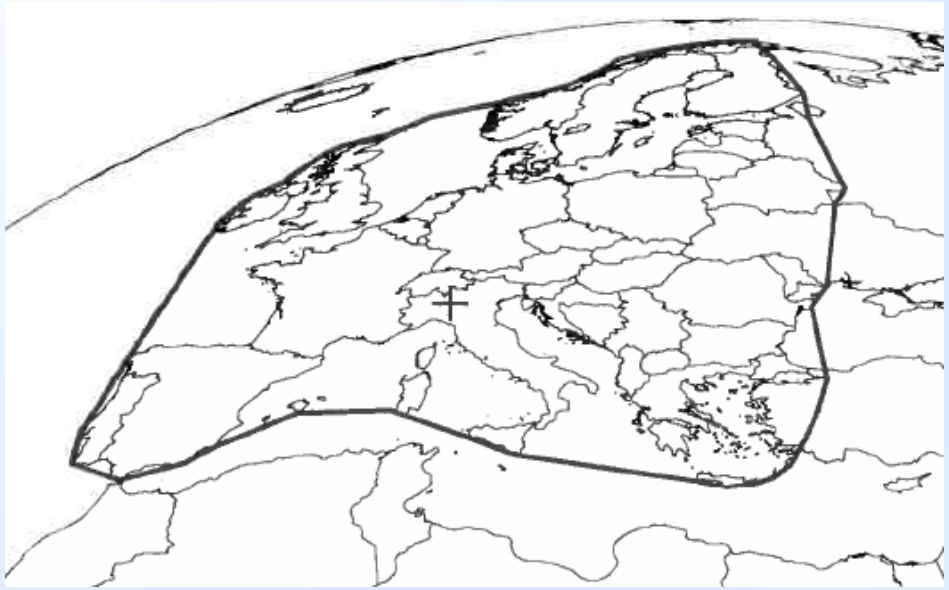
Up-link (V-Band) Beam Contour over Spino d'Adda, Italy



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

Open beams

40 GHz (Q-Band) Open Beacon Coverage



20 GHz (Ka-Band) Open Beacon Coverage

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Why to experiment the use of higher frequency band?

" . . These bands are essentially undeveloped and available for use in a broad range of new products and services, including high-speed, point-to-point wireless local area networks and broadband Internet access. Highly directional, 'pencil-beam' signal characteristics permit systems in these bands to be engineered in close proximity to one another without causing interference"

Federal Communications Commission (FCC) of the U.S.A.

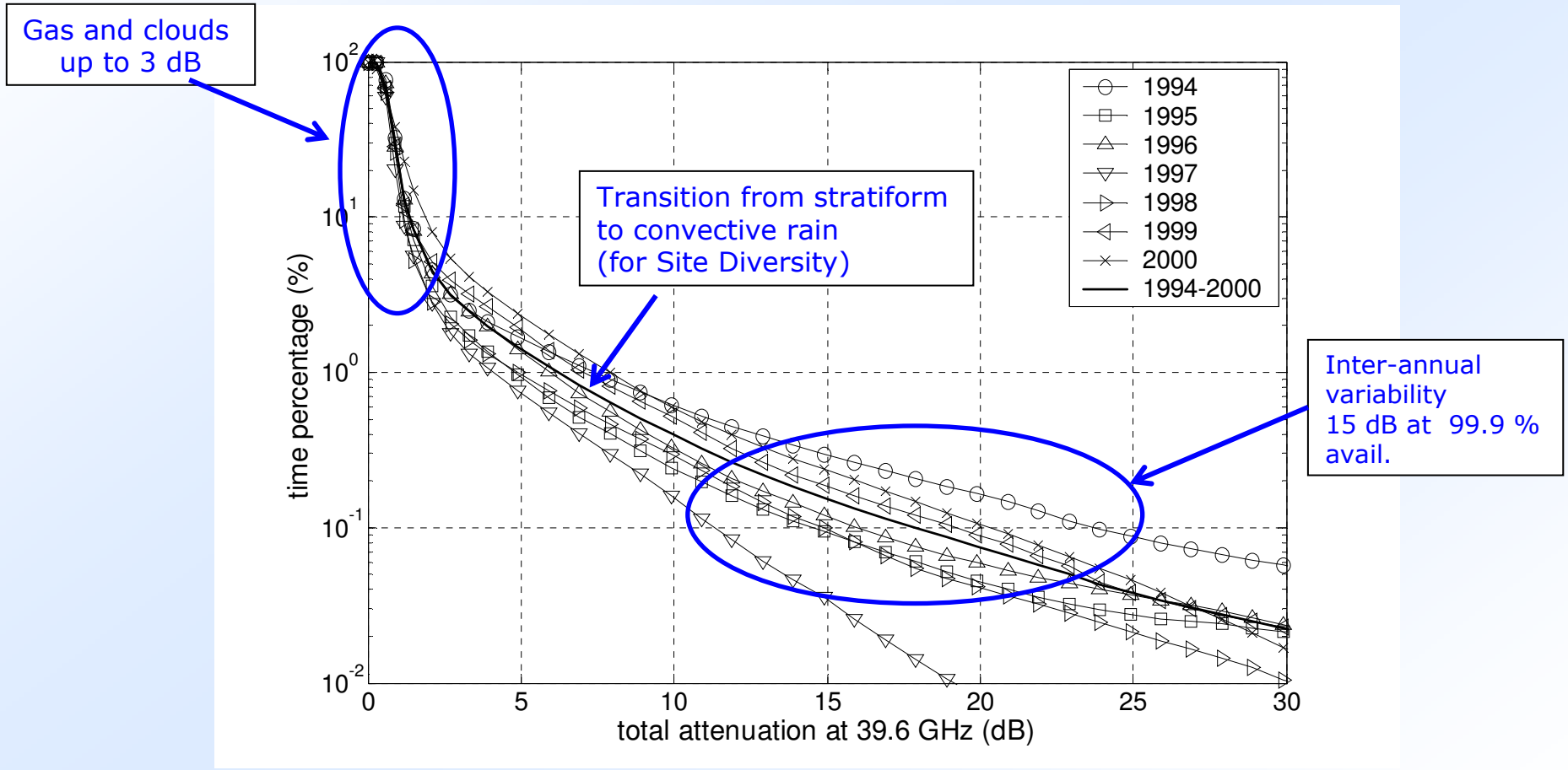
TLC systems at Q/V bands

Advantages & today limitations

- Larger bandwidth
- Smaller antenna for fixed gain
- Higher gain for fixed antenna
- Enhanced directivity for spot beams systems

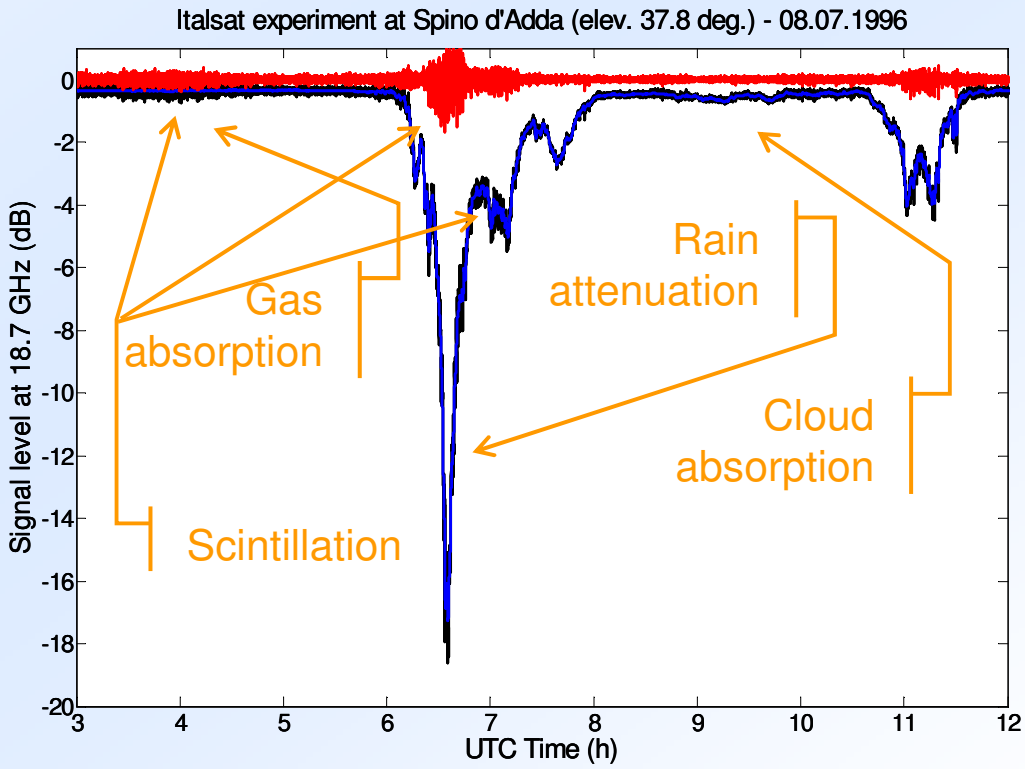
- Increase of atmospheric impairments
- Research activities needed
- Different design approach:
  - FMT
  - Lower QoS

Distribution of Attenuation at Q Band (ITALSAT Measurements at Spino d'Adda)



Atmospheric Propagation

- Impairments
  - Gas
    - Oxygen
    - Water vapour
  - Clouds
  - Rain
  - Turbulence
- Effects
  - Absorption
  - Scattering
  - Attenuation
  - Scintillation
  - Depolarization



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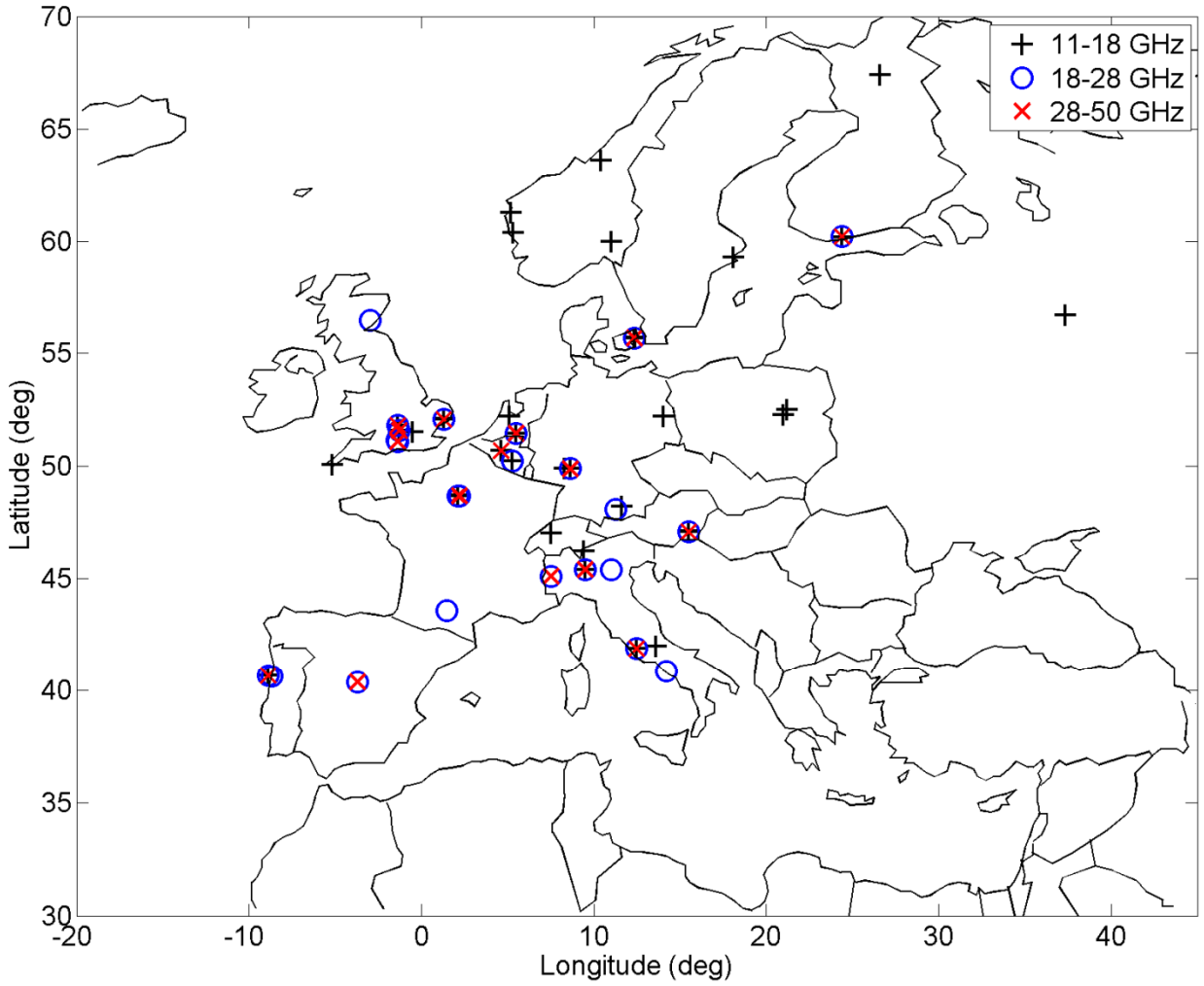
Prediction in the Q/V band

- Gas and clouds models:
  - satisfactory accuracy (versus radiosoundings)
  - Few beacon measurements
- Rain attenuation, depolarization and scintillation models: needed much further research efforts
- Urgent need of appropriate satellite long-term propagation campaign in Q/V band:
  - Attenuation at multiple frequencies and sites
  - Depolarization and scintillation measurements

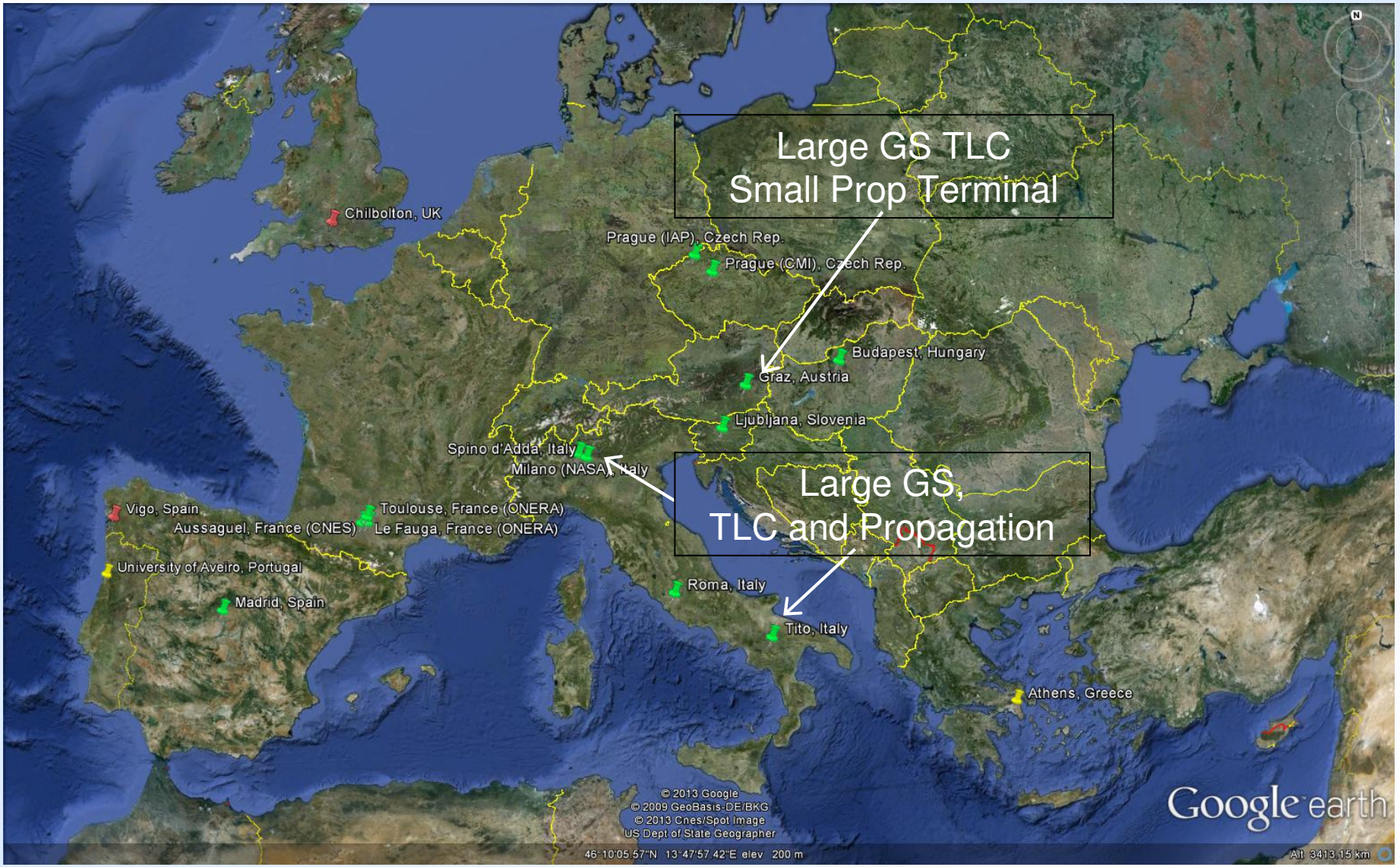
Aldo Paraboni Alphasat Experiment

- Long-term scientific objectives
  - New data to design future Fade Mitigation Technique, FMT, systems such as:
    - On-board antenna reconfigurability
    - Variable power partitioning among beams
    - Adaptive Code Modulation, ACM
    - Up- and down-link power control
    - …
  - First and second order statistics of propagation impairments
  - Coordination of measurements from European Earth terminals
  - Plan for a synergic use of Weather Forecast (ECMWF) and of Earth Observation products (MSG, TRMM, Cloudsat, etc.)
  - Concurrent communication and propagation measurements

Past European Beacon Experiment (ITU-R database)

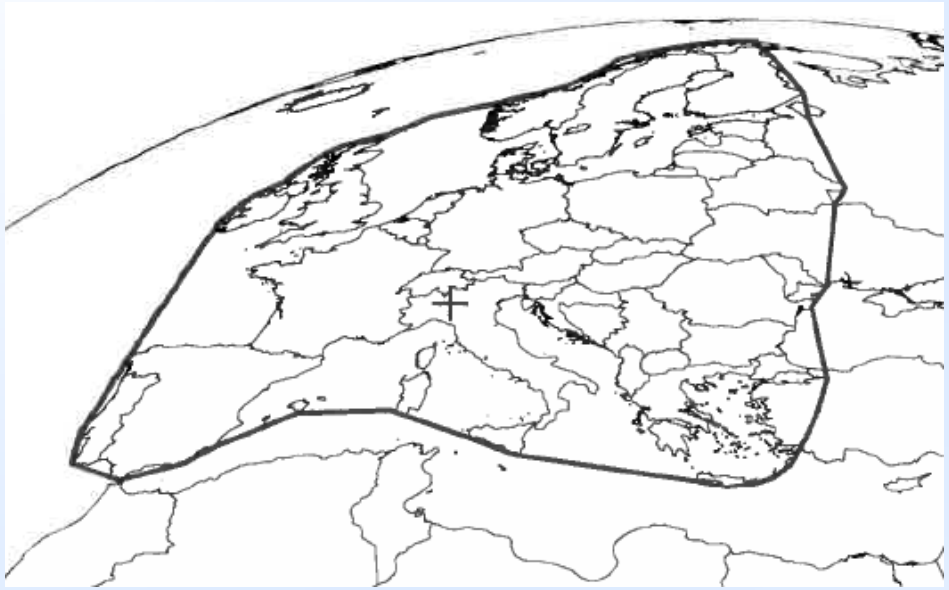


Network of Alpahasat Propagation Terminals



Potential involvement of other Nations

40 GHz (Q-Band) Beacon Coverage



20 GHz (Ka-Band) Beacon Coverage

- Data of propagation characterization coming from other countries are needed in order to prepare the use of Q/V band frequencies for coming application.

- Cost of the investment to join the experiment is extremely low when compared with the possible benefits.

- The advantage gained is not only for the scientific community but has mainly to be viewed as an general opportunity for technological improvement.

- The use of the proposed frequency bands in areas other than those already involved will allow the use of new technologies for countries where a fast telecommunication development is needed. Larger bandwidth availability will help to spread fast telecom services channels such as voice, television, internet etc.

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Thank you for your attention.

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