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**Round Table on the Future of EU Space Research -
Satellite Operator Perspective**

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Who are Europe's Satellite Operators?

ESOA Full Members



Supporting industry members



Satellite communications are a vital part of today's society:

- **Direct services**

- ⇒ TV broadcasting to around 80 million households in the EU
- ⇒ Closing the digital divide, connecting remote / isolated users to broadband Internet
- ⇒ Government services / secure communications
- ⇒ Mobile communications (e.g. ship-to-shore, air-to-ground)
- ⇒ Emergency communications

- **Hybrid services**

- ⇒ Backhaul (e.g. for mobile telephony)
- ⇒ Innovative broadcast / broadband services

The world's leading satellite operators contribute to the EU's economic and industrial competitiveness

Satcoms: a “bridge over troubled water”?

Satellite communications are somewhat in between space and telecoms ...



Ensuring visibility and relevance of satcoms in the future telecoms eco-system

- **Satcoms must evolve to respond to a changing telecoms environment, e.g.**
 - ⇒ Converged service scenario with hi-quality video content on multiple devices, anytime, anywhere, blurring distinction between linear / non-linear content
 - ⇒ Increasing security concerns, with cyber threats and geo-politically driven attempts to block certain transmissions / content
- **R&D, essential to assume its rightful place in the evolving digital world**
- **This starts in space and ends at the user premises, including:**
 - ⇒ Safety of satellites
 - ⇒ Systems with higher capacity and more flexibility
 - ⇒ Integrity and security of signals
 - ⇒ Optimising networks (e.g. to manage broadband and broadcast links)
 - ⇒ CPE with intelligent caching and access

The necessary R&D goes beyond space

Requires coherent, mutually beneficial approach between space and telecoms

Relevance of EU space research to **safety of satellites in space**

Areas of useful research include:

- **Space Surveillance and Tracking**

- ⇒ Radars and sensors to track space debris that could potentially harm satellites
- ⇒ Automated tracking systems to auto-detect maneuvers of controlled objects to prevent collisions

- **Space Weather**

- ⇒ Development of global governance system to enable space weather instruments to be put on board commercial satellites in a context of international cooperation
- ⇒ Sensors to detect energetic particle levels onboard and to measure radiation levels to help preserve electronics

Relevance of EU space research to systems with higher capacity and more flexibility

High Throughput Satellites (HTS) and innovation allow a more cost-effective response to growing capacity demand for broadband communications, including consumer and professional, fixed and mobile applications

Areas of useful research include

- ◆ **Payload Flexibility**

- ⇒ Development of reconfigurable on-board equipment enabling market agility in orbit and better meeting customer requirements all along the satellite lifetime
- ⇒ Includes development of: active transmit antennas, agile converters, Multi Port Amplifier (MPA) to allow more optimised usage of the limited spacecraft resources

- ◆ **Payload data processing**

- ⇒ Development of disruptive technologies for on-board high-speed, high-data processing
- ⇒ Drastic reduction in the cost of on-board processors to provide cost effective solutions

- ◆ **Large Reflectors**

- ⇒ Development of large reflectors (over 5 meter antennas) to provide more focused user beam and consequently increase the spectrum re-use

Relevance of EU space research to integrity and security of satellite signals

In recent years intentional interference with satellite signals has increased representing a deliberate attempt to curb the human right to freedom of opinion and expression

Areas of useful research include

- **Secure communications protocols**
- **Anti-jamming techniques:** further investigation into technologies and techniques to ensure the security and liability of communications:
 - ⇒ Active receive antennas
 - ⇒ Agile repeater components
 - ⇒ More resilient transmission standards (modulation, coding and access modes).

Relevance of EU space research to optimising networks and development of CPE [1]

Convergence, interoperability & seamless interaction between devices will be key characteristics of the future telecoms ecosystem that satellite must adapt to.

Areas of useful research include

- **Universal caching equipment and protocol:** Memory becoming less expensive every year, future devices with large memory. A universal protocol for managing caching is needed
- **Flexible chipsets:** Satellite applications require dedicated chipsets, often costly to develop and bring to market. Flexible chipsets could serve many applications: terrestrial and satellite networks, with different protocols.
- **High-rate modulators:** Development and industrialization of low-cost components such as MMIC-based modulators for satellite terminals to work at higher data rates could dramatically reduce the cost of satellite terminals so ensuring greater take-up.

Relevance of EU space research to optimising networks and development of CPE [2]

Convergence, interoperability and seamless interaction between devices will be key characteristics of the future telecoms ecosystem that satellite must adapt to.

Areas of useful research include

- **M2M satellite applications:** Satellite applications must be ready for this market through Development of specific new terminals, the procurement of large quantities of these terminals, the deployment of M2M pilot networks and large-scale applications based on satellite technology will allow satellite to be ready for the Machine-to-machine (M2M) and the Internet of Things (IoT) markets, which risk radically changing telecoms in years to come.
- **Q/V-band feeders:** HTS satellites will increasingly demand the development of novel feeder link access techniques and the use of higher bands such as exploitation of Q/V band and optical Ground-to-Space communications
- **Laser communications:** merit further study for ground-to-space and space-to-ground systems as well as Inter-Satellite Links (ISL)