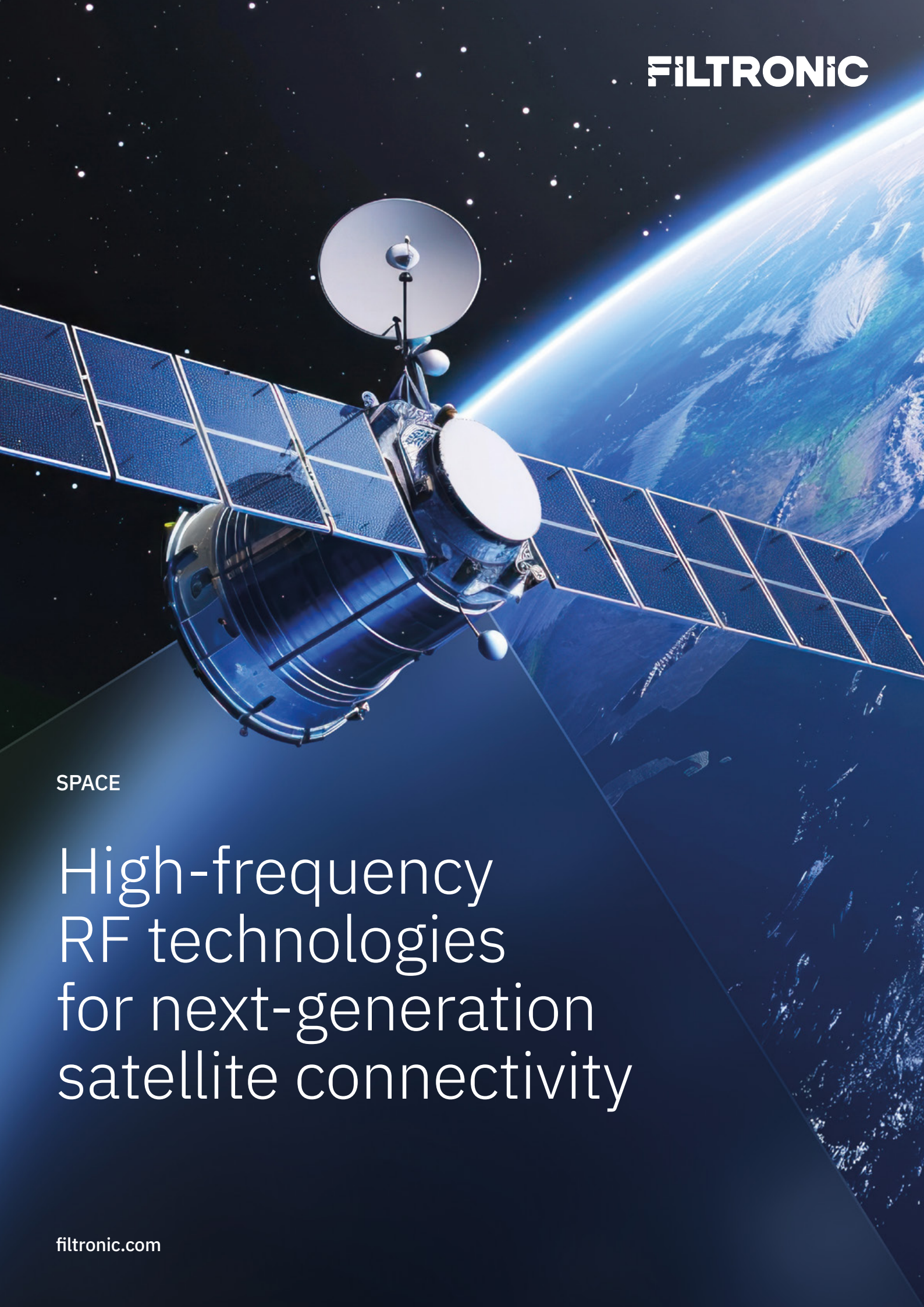
FILTRONIC



SPACE

High-frequency RF technologies for next-generation satellite connectivity

filtronic.com

Extending communications beyond the Earth

Filtronic RF technologies are critical to the high-performance communication systems deployed throughout satellite networks to transform global connectivity, Earth observation and space exploration.

MAKING EVERY CONNECTION COUNT

Space communications rely on seamless connectivity across widely dispersed ground infrastructure, airborne platforms and orbiting satellites. Filtronic RF-to-mmWave subsystems enable high-volume, low-latency connections between all space domains. Our powerful space-qualified payload systems sustain high-bandwidth inter-satellite, direct-to-device and satellite-to-Earth communications.

Through constant collaboration and innovation, we are enhancing data links across HAPs, VLEO, LEO, MEO and GEO satellites, advancing global communications and space exploration, while building the capabilities to support future deep space missions and lunar networks.

PARTNERS IN SPACE INNOVATION

Our expertise and technical capabilities have positioned Filtronic as a trusted long-term supplier to the space sector. We have supported some of the world's most ambitious satellite programmes with our advanced mmWave technologies, enabling new levels of connectivity. We partner with space primes to optimise RF performance throughout the communications chain, unleashing ever-more resilient and efficient satellite networks.

To support this continuous innovation, we work with commercial operators, academia and national space agencies, including the UK Space Agency (UKSA), European Space Agency (ESA) and Defence Science and Technology Laboratory (DSTL), to extend the possibilities for communications beyond Earth.

UNLOCKING NEW CAPABILITIES AT mmWave

To help fast-growing satellite networks handle exponential data growth, we have developed technologies to operate in under-utilised mmWave frequency bands (Ka, Q, V, E, W and D), avoiding congestion and limited bandwidth at lower frequencies. These mmWave systems provide the high data rates, low latency and superior spectral efficiency needed to support ultra-fast, high-capacity, interference-free data transmission throughout satellite networks.

SYSTEMS DESIGNED FOR NEW FRONTIERS

In space, every component must operate flawlessly in environments where maintenance is impossible. Our in-house design and manufacturing capability allows us to develop high-performance systems designed for the specific demands of every space ecosystem, extending global connectivity and supporting emerging technologies.




Making
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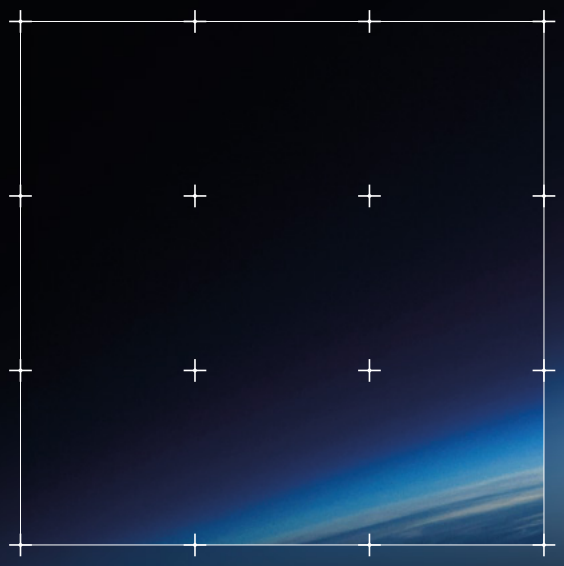
Our impact in space

Our technology has far-reaching impacts. By delivering reliable connectivity across the expanses of space, it supports high-performance data communications, sensing, tracking, monitoring, broadband, command and control applications around the world.

SATELLITES: BUILDING LONG-RANGE, MULTI-ORBIT CONNECTIONS

Our technologies are engineered to optimise power, speed and capacity at every connection for airborne and orbiting satellite systems.

- **Payload** – satellite-mounted systems enable high-bandwidth communication between satellites, and between space and ground operations. Payload components are designed to minimise size and weight, while maximising power.
- **Phased-array antennas** – phased-array technologies are transforming the way satellites communicate, track and adapt to changing operational requirements. Our technologies enable high-performance electronically steerable antenna systems boost flexibility and capacity for direct-to-device and broadband applications.
- **Software-defined radios** – our technology intelligently manages connectivity across feeder, optical inter-satellite and user links, enabling efficient use of radio resources. On-orbit software upgrades allow capabilities to be adapted throughout mission lifecycles.
- **High-throughput feeder links** – our feeder link technology supports high-capacity connectivity between satellites and the ground, providing efficient, high-volume data transmission, while enabling more flexible, scalable ground infrastructure.
- **Synthetic Aperture Radar (SAR)** – SAR provides detailed, all-weather imaging for Earth observation, environmental monitoring and scientific research. Our subsystems support precision, stability and signal integrity in these advanced radars.
- **High Altitude Pseudo Satellite (HAPS)** links – bridging the gap between terrestrial and orbiting assets, HAPS operate in the stratosphere to bring connectivity to areas beyond the reach of traditional infrastructure. Our front-end systems maintain reliable links over vast distances and in challenging environments.
- **Lunar terminals** – as missions extend beyond Earth's orbit, Filtronic is supporting the next era of lunar exploration by developing the technologies to enable future communication networks on the moon.



Powering signals across space networks



GROUND SEGMENT: ENABLING CRITICAL LINKS BETWEEN SPACE AND EARTH

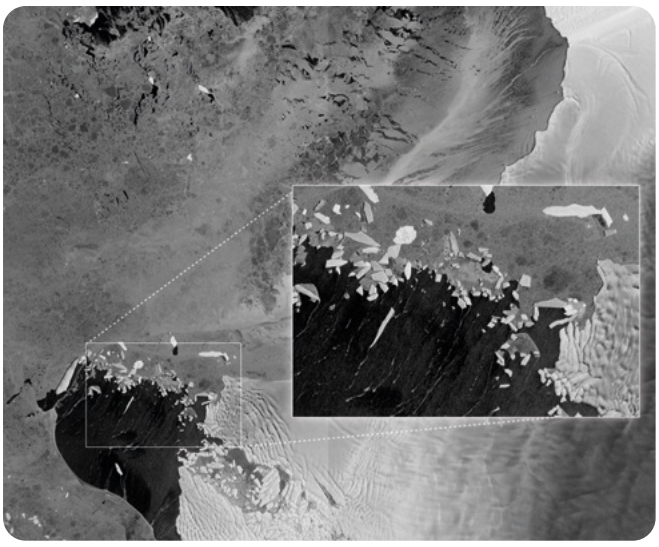
Space missions depend on sophisticated ground infrastructure to transmit data, maintain communications and deliver services to users on Earth. Filtronic technologies underpin the resilient and scalable ground systems needed to support today's ever-expanding satellite networks.

- **Ground stations and gateways** – providing the vital connection between satellites and terrestrial communications infrastructure, our high-frequency RF subsystems support high-speed, high-throughput data links on the ground.
- **Satellite user terminals** – Filtronic manufactures the RF front-end for compact, high-capacity satellite user terminals, delivering dependable links for users in a wide range of environments where traditional networks cannot reach.

Our space technologies



Operating in space demands precision-manufactured RF technologies capable of delivering maintenance-free power, performance and reliability over the long-term.



SOLID STATE POWER AMPLIFIERS (SSPAs) – POWERING LONG-RANGE COMMUNICATIONS

Amplifiers boost input signals for long-distance transmission. Our ground-breaking mmWave SSPAs are designed to operate efficiently at high power densities for satellite uplinks and downlinks. Our Cerus SSPA range provides industry-leading performance at V, E and W-band, meeting growing demand for high-data-rate transmission across all satellite infrastructure.

FREQUENCY CONVERTERS – ENABLING SEAMLESS SIGNAL TRANSLATION

Proven to perform, our block upconverters (BUCs) and low-noise block downconverters (LNBs) offer rugged, reliable performance in high-throughput satellite (HTS) systems. They support Ka, Q, V, E and W-bands to enable high-volume, multi-band satellite operation.

TxRx – SECURING RELIABLE COMMUNICATION LINKS

Our integrated transmit and receive (TxRx) technologies support reliable signal handling throughout satellite communications networks. Our fully packaged mmWave transceivers combine TxRx functions alongside amplifiers, frequency converters and filters to provide a ready-to-deploy solution.

Filtronic designs and manufactures RF systems specifically engineered for space applications, whether deployed in the extreme conditions of deep space or the high-throughput environment of a satellite ground station.





FILTERS – MAINTAINING SIGNAL INTEGRITY IN SPACE

Our filters play a crucial role in satellite communication systems. We use advanced materials and manufacturing techniques to create lightweight, compact filters with high reliability and durability. They are designed to withstand the extreme temperatures and environments of space, while effectively attenuating unwanted signals and noise.

DIGITAL ADVANCES – SCALING UP FOR NEXT-GENERATION SPACE COMMUNICATIONS

As space missions, architectures and connectivity requirements become more complex, Filtronic is developing digital RF-over-IP capabilities to support simplified, adaptive, future-ready satellite ground networks. Digitising RF signals and transporting them securely over ethernet connections enables more secure, flexible and cost-effective signal transmission, using more agile and scalable infrastructure. It also simplifies hardware requirements, reducing the capital and operating costs associated with satellite ground stations.

Filtronic digital RF innovations are paving the way for the high-throughput, software-defined satellite communication systems needed to support future high-speed connectivity.

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