

# S-Band Downlink Transmitter

## Applications

- LEO High Speed Payload Downlink
- Earth Observation Missions
- Space Science Missions

The S-band downlink supports high-speed data return for Earth Observation and space science missions. Data and clock inputs are fed from either an on-board computer, data storage device or receiver. Data processing, NRZ-L to NRZ-M differential encoding and  $\frac{1}{2}$  Rate  $k=7$  convolution encoding are implemented within a FPGA. Baseband Root-Raised-Cosine matched filtering is also implemented.

## Features

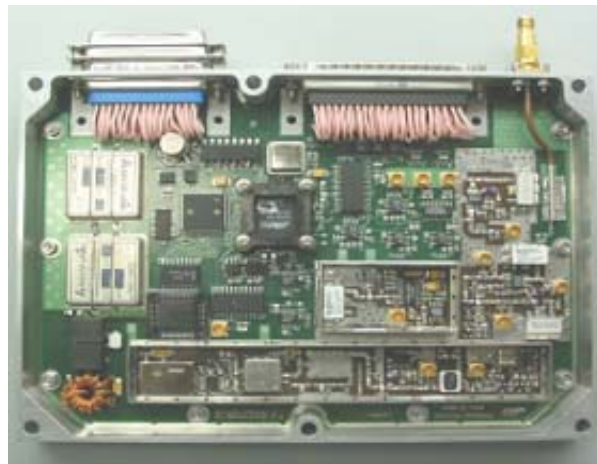
- Flight heritage
- Manufactured to ECSS standards
- Data rates 9.6 Kbps – 8.0 Mbps
- Data rate switchable
- BPSK/QPSK modulation
- Convolutional encoding
- 7.5 year design life

## Key Specifications

- Up to 4 W RF power using additional Power Amplifier
- 28 V unregulated supply, < 38 W
- 190 x 135 x 80 mm (4W, 8Mbps)
- < 2 kg

## Heritage (launch date)

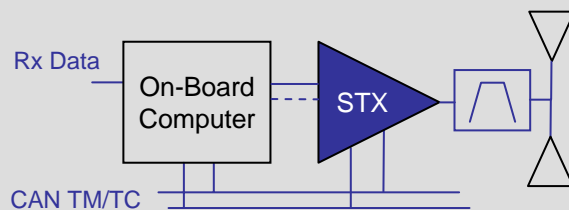
- AISAT (2003)
- UK-DMC (2003)
- NigeriaSat-1 (2003)
- GIOVE-A (2005)
- DMC+4 (2005)
- RapidEye constellation (2008)
- Deimos-1, UK-DMC2 (2009)
- NigeriaSat-2



S-band Downlink Transmitter

### Typical Use (1)

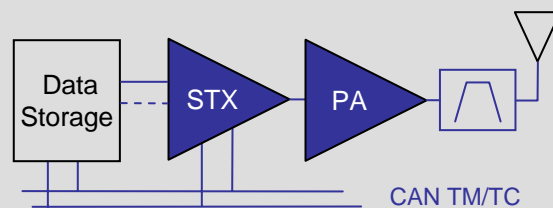
Omni Antenna System



S-band Telemetry Transmitter

### Typical Use (2)

Nadir Pointing Antenna



S-band Payload Downlink Transmitter

## Interfaces

- LVDS I/Q – 8 channels
- TTL – 3 channels
- 50 ohm antenna interface (SMA)
- Dual-redundant CAN TM/TC Interface

## Options

- Encryption and encoding
- Various surface finishes

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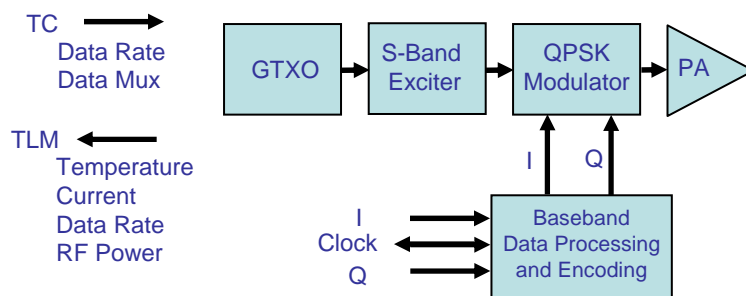
**SSTL is ISO9001:2008 certified**

Subsystems are manufactured to:

- ECSS Q-ST-70-08C
- ECSS Q-ST-70-38C
- All work overseen by ESA-trained assembly staff

**Standard delivery service includes:**

- compliance testing
- vibration test
- thermal cycling
- user manual
- test results
- export license and shipping
- thermal vacuum testing available
- unit can be supplied prior to environmental testing



S-band Downlink Transmitter Block Diagram

Frequency range	2.2 to 2.3 GHz $< \pm 20$ ppm
RF Output power	Up to 4 W at SMA connector (With additional amplifier)
Modulation	BPSK, QPSK
Mass	< 2 kg
Dimensions	200 x 191 x 80 mm (4 W, 8 Mbps version is a 3 tray design)
Power	15 to 50 V, < 38 W
Operating Temperature	-20 to +50 °C operating -30 to +60 °C non-operating
Random Vibration	15 $G_{rms}$ in all axis
Radiation tolerance	10 kRad (Si)

## Surrey Satellite Technology Limited

SSTL has launched over 34 satellites gaining almost 200 years in-orbit experience. SSTL draws on its world-class expertise in both small satellite platform technology and high and medium resolution optical instruments. SSTL provides complete turn-key system solutions; spacecraft, ground station, launch, operations and image processing.

SSTL is unique in the space industry; able to design, manufacture and integrate multiple satellites in-house.

*Changing the economics of space*  
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## Slide 2

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**SM1**

Changes:

- Date/revision/SmarTeam #
- Disclaimer
- ECSS paragraph + reformat/alignment

Simon Meik, 24/11/2010