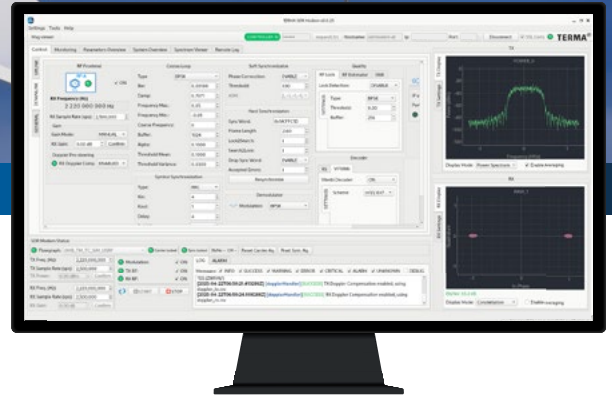




TERMA SPECTRA

**NEXT-GEN SDR TT&C MODEM.
FLEXIBLE. FUTURE-READY. EXTENDABLE.**

Built for Space – On the Ground

Terma SPECTRA (Software-defined Platform for Enhanced Communication, Telemetry, and Ranging Applications) delivers the performance, flexibility, and reliability you need – today and tomorrow, whether you operate a ground station or validating satellite hardware in a test environment.

One Modem. Multiple Missions.

Terma SPECTRA supports a wide range of operational and testing scenarios. From ground stations and satellite modems to direct baseband interfaces. It's the versatile backbone for:

- LEO/MEO/GEO ground station communication & ranging
 - From a single satellite up to a mega constellation
- EGSE, TT&C SCOE and ATE integration
 - Satellite communication platform verification

From Testing to Actual Operation

With Terma SPECTRA you get a flexible setup, out-of-the-box ready for testing and operation. It can be easily extended with the Terma Ground Segment Suite (TGSS), mission control software. You'll be able to operate your spacecraft with the combined advantages of Terma SPECTRA and TGSS.

Modern, Secured Architecture for Seamless Integration

Integrate Terma SPECTRA seamlessly into your existing lab infrastructure or operational systems. Deploy it as a fully integrated unit or in a distributed configuration with separate RF front-end and baseband processing. Built-in security features include SSL encryption and authentication for all control interfaces.

Developed for Your Space Mission

Terma SPECTRA leverages decades of proven expertise in satellite EGSE and RF-SCOE, developed in close collaboration with ESA to meet the evolving demands of modern space missions. For you, this means a modem that embodies years of hands-on experience, protocol mastery, and practical innovation in satellite operation.

Terma SPECTRA supports you from the very early stages of TT&C testing up to the actual communication and ranging with your spacecraft.

Why Terma SPECTRA?

- CCSDS-compliant TM/TC processing
- Multi-channel support with scaling options
- Compact and cost-effective, reduced CAPEX and OPEX
 - Native 70 MHz, L- and S-band output
 - No need for up- and downconverters
 - Configurable and modular software
 - "Pay what you need" flexible licensing
- Full configurable acquisition behaviour
- Multi-functional, adaptive, and intuitive UI
- Future-proof with clear upgrade paths
- Adaptations and extensions on customer request

Bolster Your Satellite Communication Today

From ground stations to test benches, we help you build and validate the communication link that connects space to Earth.

Get in touch for a live demo or integration consultation.
Please contact our team spectra.support@terma.com

TERMA SPECTRA SPECIFICATIONS

TELEMETRY (DOWNLINK)

Modulation	(D)BPSK, (D)QPSK, OQPSK, GMSK (Non-Coherent), GMSK (Coherent), PCM/PSK/PM, PCM/PM
Subcarrier Waveform	Sine/Square
PCM Line Coding	NRZ-L/M/S, SP-L/M/S
Matched Filter	RRC, RC, Gaussian, Rectangular
Downlink Channels	Up to 4 (higher numbers on request)
CCSDS Decoding	Reed Solomon: RS(255,223), RS(255,239) with Interleaving (l=1,2,3,4,5,8) Viterbi/Convolutional (K=7): r=1/2, 2/3, 3/4, 5/6, 7/8 Concatenated (RS+CC) Turbo: r=1/2, 1/3, 1/4, 1/6
Derandomization	CCSDS descrambling, Custom polynomials
Frame Synchronization	CCSDS CADU, Custom sync words
Symbol Rate	64 sps up to 5 Msps (depending on coding; higher rates on request)
Doppler Compensation	Pre-steering (TLE-based), Automatic
Loopback (Simulation)	CCSDS encoding, CADU framing, TM transmission

TELECOMMAND (UPLINK)

Modulation	(D)BPSK, (D)QPSK, OQPSK, GMSK (Non-Coherent), GMSK (Coherent), PCM/PSK/PM, PCM/PM
Subcarrier Waveform	Sine/Square
PCM Line Coding	NRZ-L/M/S, SP-L/M/S
Pulse-Shaping Filter	RRC, RC, Gaussian, Rectangular
Carrier Sequence Operation	CCSDS PLOP-2, CCSDS PLOP-1
Uplink Channels	Up to 2 (higher numbers on request)
Encoding	CCSDS BCH(63,56) Reed Solomon: RS(255,223), RS(255,239) with Interleaving (l=1,2,3,4,5,8) Convolutional (K=7): r=1/2, 2/3, 3/4, 5/6, 7/8 Concatenated (RS+CC) Turbo: r=1/2, 1/3, 1/4, 1/6
Randomization	CCSDS scrambling, Custom polynomials
Framing	CCSDS CLTU, Custom Start/Tail sequences
Symbol Rate	64 sps up to 2 Msps (depending on coding; higher rates on request)
Doppler Compensation	Pre-steering (TLE-based)
Sweeping	3-leg pos./neg., 1-leg linear, 2-leg linear
Loopback (Simulation)	TC reception, CLTU deframing, CCSDS decoding

RANGING

Mode	ESA Code/Tone Ranging (ECSS-E-50-02C, ECSS-E-50-05C)
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ADDITIONAL FEATURES

Signal Generator	CW carrier, Custom digital baseband IQ signal to RF
Noise Generator	AWGN source/adder
Data Generation	Pseudorandom (PRBS) data, User-defined patterns
Spectral Analysis	Es/NO, SNR, CNR, C/NO measurements Spectrum, waveform & constellation display
Performance Metrics	BER/FER tester
Special Features	Automated phase ambiguity resolution Viterbi node synchronization resolution Bit-slip detection Automated Gain Control (AGC) Distributed architecture Flexible frontend and backend design Cybersecurity hardening
Data Interfaces	TCP/IP and File for exchange of TM and TC data RS422 for exchange of TM and TC data (optional) Adaptation to proprietary interface (optional)
Monitoring and Control	Terma SPECTRA Remote Interface (JSON-based, SSL-secured) Terma SPECTRA GUI (remote & local)
Future Extensions	Industry standard data interface DIFI / VITA 49 Digital-RF data interface CCSDS SLE interface (RAF, RCF, F-CLTU) CCSDS LDPC coding "Zero Trust" cybersecurity hardening (using NATS API) Spread spectrum

MODEM SPECIFICATION

Digitizer (Frontend Sampler)	Ettus USRP X300, X310 (additional digitizer support on request)
Frequency Range	10 MHz – 6 GHz
Bandwidth	TX: 160 MHz, RX: 84 – 160 MHz
Max. RF Input Power	-15 dBm
Max. RF Output Power	~15 dBm < 5 GHz (0.1 dB precision) ~8 dBm > 5 GHz (0.1 dB precision)
Noise Figure	8 dB (on average)
BER Degradation	<1 dB (typical)
Spurious Suppression	>60 dBc up to 2.2 GHz >45 dBc above 2.2 GHz
Subcarrier Phase Deviation	<2%
Temperature Range	10 - 35 °C
Humidity Range	10 - 80% non-condensing
Frequency Reference	10 MHz (internal/external): Accuracy of ± 2.5 ppm, ± 2.5 kHz at 1 GHz GPSDO (optional): Accuracy of ± 25 ppb, ± 25 Hz at 1 GHz or better
Time Reference	PPS (internal/external)
Physical Dimensions	Backend: 1U, Frontend: 1U (19-inch rack mountable)
Operating System	Linux Debian 12