

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're operating 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 transponders to direct baseband interfaces. It's the versatile backbone for:

- Ground station communications
- Satellite modem verification
- EGSE & SCOE integration
- System-level end-to-end testing

Modern, Open Architecture for Seamless Integration

Integrate Terma SPECTRA into your existing lab infrastructure or operational systems with ease. By leveraging containerized deployment and a virtualization-ready architecture, the system can function as a fully integrated unit or in a distributed configuration with separate RF front-end and baseband processing. In other words, your new TT&C modem is designed for scalable, remote, and automated workflows.

Developed for Your Space Mission

Terma SPECTRA is built with deep domain expertise in satellite EGSE and RF-SCOE and developed in collaboration with ESA. For you, this means a modem that echoes years of hands-on experience, protocol mastery, and practical innovation in satellite operation.

Superior Performance Validation, First-class Testing

With Terma SPECTRA you get a flexible setup, out-of-the-box ready for extending with SLE interface, channel impairment simulation, and future support modules. You'll be able to realistically emulate propagation effects like:

- Doppler shift
- Signal fading (e.g. satellite dynamics)
- Noise and interference

With Terma SPECTRA your setup is ideal for performance validation and system robustness testing.

Why Terma SPECTRA?

- CCSDS-compliant TM/TC processing
- Multi-channel support for TX & RX
- Software-configurable and modular
- Fits both operational and test environments
- Future-proof with clear upgrade paths
- Multi-functional, adaptive and intuitive UI
- Compact and cost-effective, reduced CAPEX and OPEX

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 terma.space@terma.com

TERMA SPECTRA SPECIFICATIONS

TELEMETRY (DOWNLINK)

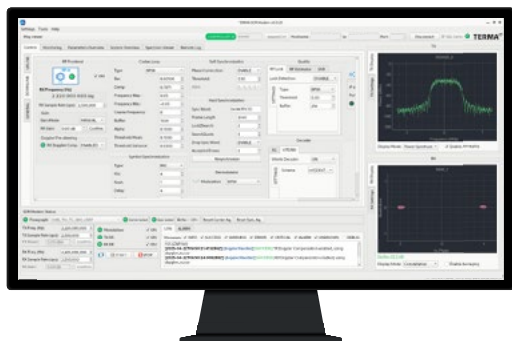
Modulation	(D)BPSK, (D)QPSK, OQPSK, GMSK, PCM/PSK/PM, PCM/PM
Subcarrier Waveform	Sine/Square
Line Coding (PCM Format)	NRZ-L/M/S, SP-L/M/S
Downlink Channels	up to 4
CCSDS Decoding	Reed Solomon: Rate 223/255, 239/255 + Interleaving (l=1,2,3,4,5,8) Turbo: Rate 1/2, 1/3, 1/4, 1/6 Convolutional: Rate 1/2, 2/3, 3/4, 5/6, 7/8 Concatenated (RS+CC)
Randomization	CCSDS Scrambling, Custom
Frame Synchronization	CCSDS CADU, Custom ASM
Symbol Rate	up to 10 Msps
Doppler Compensation	Pre-steering based on TLE or Automatic
Loopback	TM transmission and CADU framing up to 5 Msps

TELECOMMAND (UPLINK)

Modulation	(D)BPSK, (D)QPSK, OQPSK, GMSK, PCM/PSK/PM, PCM/PM
Subcarrier Waveform	Sine/Square
Line Coding (PCM Format)	NRZ-L/M/S, SP-L/M/S
Carrier Sequence Operation	No PLOP, PLOP – 1, PLOP – 2
Uplink Channels	up to 2
Channel Coding	BCH: Rate 56/64 (+ padding functionality)
Randomization	CCSDS Scrambling, Custom
Framing	CCSDS CLTU, Custom Start/Tail sequence
Symbol Rate	up to 5 Msps
Doppler Pre-steering	Pre-steering based on TLE
Carrier Sweeping	3-leg positive/negative
Loopback	TC reception and CLTU deframing

RANGING

Ranging	ESA Tone/Code
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ADDITIONAL FEATURES

Signal Generator	CW Custom digital baseband I-Q signal to RF
Noise Generator	AWGN Source AWGN Adder
Data Generation	Pseudorandom data (PRBS) User-defined patterns
Spectral Analysis	Es/NO, SNR, CNR measurements Spectrum, waveform & constellation display
Performance Metrics	BER tester FER tester
Special Features	Automated phase ambiguity resolution Viterbi node synchronization resolution Bit-slip detection Record & replay functionality Automated gain control (AGC) Distributed architecture Flexible frontend and backend design (COTS) Cybersecurity hardened
Data Interface	TCP/IP, UDP/IP, RS422, SFTP (File)
Monitoring and Control	Terma SDR Remote Interface (JSON based) Terma SDR GUI (remote & local)
Future Implementation (Roadmap Excerpt)	Integration into Terma TGSS Zero Trust Security CCSDS SLE LDPC coding Web-based GUI with RESTful API Higher data rates

MODEM SPECIFICATION

Digitizer	Ettus USRP X300, X310 (other COTS digitizers on request)
Frequency Range	10 MHz – 6 GHz
Bandwidth	TX: 160 MHz RX: 84 – 160 MHz
Max. Input Power	-15 dBm
Max. Output Power	~ 15 dBm below 5 GHz (0.5 dB precision) ~ 8 dBm above 5 GHz (0.5 dB precision)
Noise Figure	8 dB on average
BER Degradation	< 1 dB
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 or external): Accuracy of ± 2.5 ppm, ± 2.5 kHz @ 1 GHz GPSDO: Accuracy of ± 25 ppb, ± 25 Hz @ 1 GHz or better
Physical Dimensions	Backend PC/server: 1U, Frontend: 1U
Operating System	Linux Debian 12