IRIS RADIO VERSION 3.0

Multi-Band Deep Space Communication



Iris Radio, version 3.0.

HERITAGE OF HIGH SUCCESS TRUSTED MISSION PARTNER QUALITY, COST-EFFECTIVE SOLUTION CUSTOM CONFIGURATIONS RESPONSIVE, RELIABLE SUPPORT WINNING TEAM CONTRIBUTOR

The new Iris Radio version 3.0 is a multi-band softwaredefined telecommunications subsystem designed specifically for orbits beyond LEO, such as MEO, GEO, lunar, and interplanetary missions. The revolutionary design enables Iris to operate on two simultaneous channels in full duplex mode on multiple bands including UHF, S-, X-, and Ka-band. Iris uses an environmentally robust architecture, including radiation-tolerant parts for deep space, multi-year missions.

The Space Dynamics Laboratory (SDL) develops, fabricates, and tests Iris Radio technology in our NASA-certified facilities and provides mission support. SDL routinely customizes features and delivers mission-specific configurations.

For more information about Iris Radio, please contact the team: iris.support@sdl.usu.edu



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IRIS RADIO VERSION 3.0 Multi-Band Deep Space Communication

GENERAL SPECIFICATIONS

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Network Compatibility	All CCSDS networks: DSN, NEN ^[1] , SN ^[1] , LEGS ^[1] , etc.		
Design Lifetime	3 years		
Frequency Bands	 1 or 2 simultaneous, full-duplex channels with any combination of the following bands: UHF, S-band, X-band, Ka-band Forward or reverse channels supported 		
Operating Temperature	-20°C to +60°C		
CPU	Gaisler LEON3-FT		
Memory	1 to 8 Gb MRAM (radiation tolerant)		
Interface	Port 1: SpaceWire or other IVDS protocols		
	Port 2: Ethernet, RS-422, SpaceWire, or other LVDS protocols Both ports can be used for commanding and/or		
	data transfer		
Solid-State Power Amplifier (SSPA)	1–3 RF paths, dedicated to individual antennas; configuration band dependent		
Low Noise Amplifier (LNA)	1–2 RF paths, dedicated to individual antennas; configuration band dependent		
Reference Oscillator	 Internal Temperature Compensated Crystal Oscillator (TCXO): ± 2 ppm Clock disciplinable to other time standards 		
Ranging Modes	 DDOR and PNDDOR Coherent sequential Coherent regenerative PN One-way ranging Spacecraft-to-spacecraft ranging 		
Command/Telemetry Interface	 Uplink: CCSDS TC, USLP, SDLS protocols Downlink: CCSDS AOS, USLP, SDLS protocols 		
Telemetry Symbol Rates	7 sps to 12.5 Msps		
Telemetry Modulation	 PCM/PSK/PM (subcarrier) PCM/PM(/Bi-Φ) (direct carrier) BPSK, QPSK, OQPSK, GMSK Optional pulse shaping or spectral filter 		
Telemetry Encoding	 Uncoded Convolutional: 7-1/2 Reed-Solomon (255, 223) Turbo rates: 1/2, 1/3, 1/4, 1/6 Turbo block sizes: 1784, 3568, 7136, or 8920 bits LDPC rates: 1/2, 2/3, 4/5, 7/8 LDPC block sizes: 1024, 4096, or 7136 bits Additional encoding as required 		
Carrier Acquisition	 Acquisition range: ±1 MHz Tracking range: ±5 MHz Configurable acquisition/tracking bandwidths (100 Hz acq, 40 Hz trk typical) FFT-assisted acquisition Spacecraft-initiated frequency sweep 		
Command Symbol Rates	7 sps to 3 Msps		
Command Modulation	 PCM/PSK/PM (subcarrier) PCM/PM(/Bi-Φ) (direct carrier) BPSK 		
Command Decoding	Uncoded LDPC 1/2 BCH (SEC/TED) Additional decoding as required		
Miscellaneous	 Over-the-air updates IQ recorder for diagnostics Beacon mode 		

TRANSPONDER SPECIFICATIONS

Frequency Range	Supports all standard deep space and near-Earth frequencies	
Coherent Turnaround Ratio	Standard or arbitrary ratiosNoncoherent mode also supported	

RECEIVER SPECIFICATIONS (X-BAND EXAMPLE)				
Noise Figure	<1.8 dB			
Carrier Tracking Signal Range	-70 to -150 dBm			
Command Threshold	-134 dBm @ 60 bits/s			
Eb/N0 Implementation Loss	<0.5 dB			

TRANSMITTER SPECIFICATIONS (X-BAND EXAMPLE)			
SSPA Output Power	4.0 W		
Phase Noise	 1 Hz: <-20 dBc/Hz 10 Hz: <-40 dBc/Hz 100 Hz-100 kHz: <-60 dBc/Hz 		
Spurious & Harmonic Outputs	<-60 dBc		

MASS & POWER SPECIFICATIONS				
Transponder Stack Mass	≤500 g (TBC)			
LNA Mass	≤150 g (TBC)			
SSPA Mass	≤300 g (TBC)			
Transponder Envelope	101 x 101 x 30 mm (TBC)			
LNA Envelope	125 x 62 x 25 mm (TBC)			
SSPA Envelope	140 x 75 x 25 mm (TBC)			
Input Supply Voltage	12-38 VDC			
Input Supply Power	5–32 W (TBC, X-band example)			
	Mode	DC Input (W)		
	Battery Connect	<0.04		
	X-Receive Only	9 (TBC)		
	X-Transmit Only	29 (TBC)		
	X-Transmit/Receive	32 (TBC)		

 DSN compatibility has been verified at DTF-21; meets specifications of other CCSDS networks but has not been formally verified.



