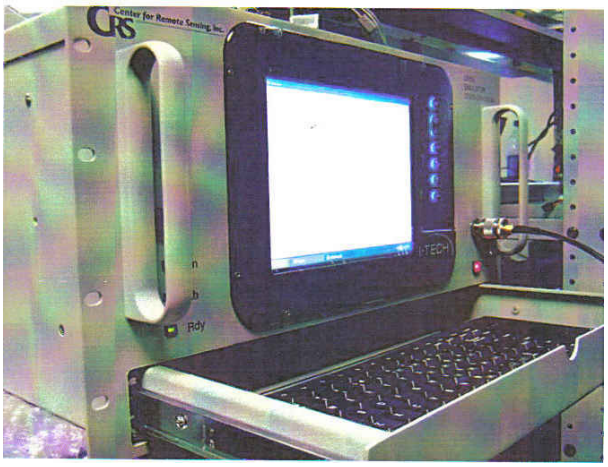
CENTER FOR REMOTE SENSING, INC.

Satellite Link Emulator

(SLE-01-09)

The Satellite Link Emulator (SLE-01-09) accepts RF/IF or digital signals from a suitable waveform/signal generator and outputs RF/IF (or digital) signals for receiver input. The output signals are commensurate with satellite and receiver platform motions, environmental conditions, and effects of receiver and transmitter antennas and their orientations, group and phase delays, and other artifacts. Transmitter and receiver non-linearities can be introduced if desired. Multipath effects due to reflection or scattering and several other artifacts can be emulated if desired.



The Link Emulator can be used as a stand alone unit or with one element of the integrated satellite channel simulator consisting of the signal source, the link emulator, and the receiver model. The more conventional approach involves the use of independent signal source and receiver under test. Independent signal sources as well as independent models can also be provided.

Typical applications for the link emulator include testing of modems, Earth terminal, satellite payload, mobile transceiver, and network. It emulates both combined uplink-downlink or individual uplink or downlink channels. The satellite orbits can be defined by the user or selected and LEO, MEO, GEO (stationary and Geosynchronous) orbits models are provided.

The basic link emulator operates 140 MHz or L-band as IF and RF. Additional modules can be used for other bands, C, Ku, Ka both for uplink and downlink frequencies.

The Link Emulator and the Satellite Channel Simulators are developed to meet the growing current and future demands on satellite based signals used for both communication and navigation. These products utilize the most topical electronics and provide performances that were impossible with technologies a few years earlier. They are the only system that meet the challenges of precision imposed by navigational systems (group and phase delays, waveform distortion, Doppler, etc.) as well as communication systems (dynamic range, Doppler, SNR, Satellite hand over, fading, etc.).

- Independent RF, IF (or digital) signal source
- Emulates satellite, environment, and receiver input and platform models
- Generates precise digital and RF signals at the receiver antenna ports
- Dynamic delay control with phase continuity
- Built in noise generator
- Can integrate receiver model and provide performance estimate (optional)
- Multiple independent satellites with handover
- Remote operation through Ethernet
- Complex and dynamic environmental models
- Hardware in the loop (HWIL) with large update rates
- Versatile Windows® based GUI

Center for Remote Sensing, Inc.
Advancing Technology

3702 Pender Drive, Suite 170
Fairfax, VA 22030
www.cfrsi.com
Phone: 703.385.7717
Fax: 703.385.7719
E-mail: gps@cfrsi.com

Satellite Link Emulator

SPECIALITY:

- Large delay range with smooth phase changes
- Large dynamic range to accommodate GPS type signals
- Group delay, phase, and other parameters commensurate with GPS and other GNSS signals (with suitable source generators can be used as GPS/GNSSS simulator)
- Versatile environmental models: emulating various fading models, rain models, ionospheric models, tropospheric models, scintillation models – provides appropriate signal strength, group, and phase delay, Independent fading and scintillation models can be independently controlled to provide amplitude, phase fluctuations, and their spectral distribution.
- Transmitter and Receiver Antenna Models
  - 3-D amplitude, phase, and group delays
  - Independent lever arm
- Satellite Orbital Parameters: independent orientation, revolution
- Platform motion
  - 6DOF
  - Independent lever arm specifying independent antenna motions w.v. to center of platform motion
- Noise: Gaussian, White Arbitrary Colored Noise
- Interference: Co-channel, out-of band, pulsed (dynamic range to 130 dB)
- Ionosphere: Group delay, phase advance, scintillation
- Troposphere: fading
- Transmitter Non linearities (optional)
- Multipath signals – models scattered or reflected signal due to any satellite channel (optional)

SPECIFICATIONS:

Number of channels:	1 to 6
Frequencies RF:	VHF to Ku band in multiple bands (user selectable modules)
Frequencies IF:	to L band
Bandwidth:	45 MHz / 150 MHz
RF/IF input power:	0 dBm to -60 dBm
RF output power:	-10 dBm to -140 dBm
In Band Spurious Suppression:	> -60 dBc
Noise Floor:	< -145 dBc (to L-band)
Group Delay:	< 60 ns
Emulated Delay:	0.1 to 600 ms
Accuracy:	< 10 ps
Resolution:	Slew rate Ins 0.5 ps/s to 20 ms/s
Phase Shift:	0 to 180°
Accuracy:	1°
Resolution:	0.1°
Slew Rate:	0 to 180 /ms
Attenuation:	0 to 140 dB (in 4, 40 dB bands)
Resolution:	0.1 dB
Slew Rate:	> 140 dB/ms
Accuracy (relative):	±0.1 dB in each 40 dB band
Accuracy (absolute):	±0.5 dB
Doppler:	±3.0 MHz, ±5.0 MHz
Resolution:	0.01 Hz
Accuracy (relative):	± 0.01 Hz
Accuracy (absolute):	1 part in 10^{10} oven stabilized 10 MHz 1 part in 10^{12} Rubidium 10 MHz (option)
Control	Front Panel
Remote	RJ45
Real time update	1 ms to 1 sec

NOISE GENERATOR:

Noise Floor Density Range:	-100 dBm/Hz
Noise Accuracy:	±1 dB
Noise Bandwidth	575 MHz
Attenuation Range:	40 dB
Attenuation Step:	1 dB