RLS-2100 Radio Link Simulator

Overview

The Square Peg Communications Inc. RLS-2100 Radio Link Simulator supports hardware-in-the-loop physical layer and end-to-end network performance testing of wideband satellite, aeronautical and terrestrial radio communications systems. 5G NTN channel models and hybrid satellite/terrestrial systems are supported.

The simulated signal paths include the RF characteristics of the transmitter, uplink, satellite/relay, downlink, and receiver, with realistic modelling of characteristics such as path delay, Doppler, and fading. A touch-screen or keyboard/mouse user interface allows real-world scenarios to be mapped directly to the applicable elements in the signal paths.

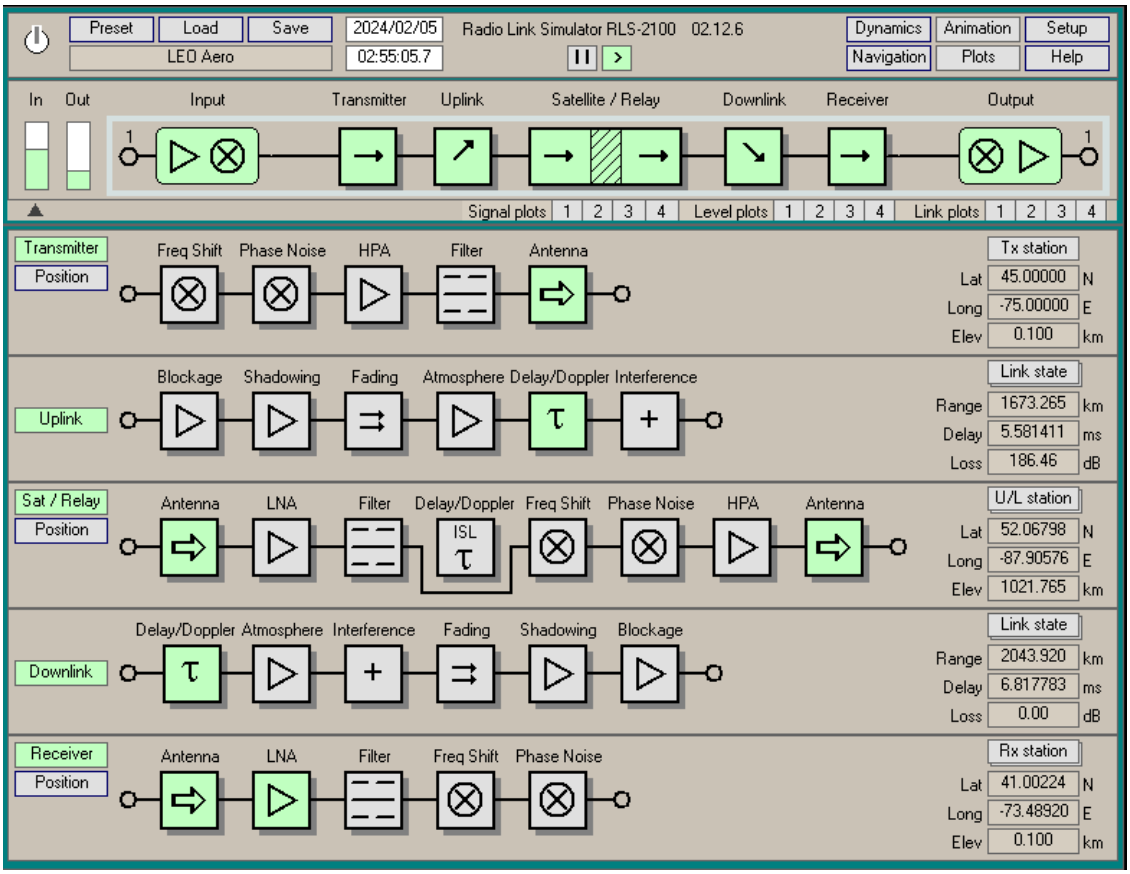
All stations (Transmitter, Satellite/Relay, Receiver) can be in motion, with the affected simulation parameters updated dynamically. The RLS-2100 includes integrated real-time multi-satellite orbit calculation and display for modelling LEO, MEO, HEO, GEO, and mixed satellite constellations. Routes can be specified for mobile platforms such as vehicles, ships, aircraft, UAVs, HAPs or rockets. Dual independent integrated GNSS simulators can provide station position to user equipment.

Graphical displays of signal spectrum, signal power profile, station positions, and link parameters facilitate verification of test setups and allow simple visualization of the effects of the applied impairments.

Specifications

FUNCTIONAL CAPABILITIES

Channels	**2 x 1200 or 1000 MHz, or 4 x 600, 500, 400, 300, 200, 150 or 100 MHz**
Frequency (independent input/output)	**140 to 2450 MHz Opt: 5G FR1 (400 to 7125 MHz) Opt: 5G FR2 (10.7 to 31 GHz), with ext. converter**
Input level	**–40 dBm rms min, +16 dBm max total peak**
Output level	**–40 dBm rms min, +3 dBm max total peak**
Models	**Satellite, Terrestrial, Aero and hybrids**
Impairments	▪ **Path loss, delay and Doppler (fixed, position-based or user file)** ▪ **Additive wideband noise** ▪ **Phase noise density (spectrum, level)** ▪ **Phase noise discrete (level, frequency offset)** ▪ **Interference (type, level, frequency)** ▪ **Multipath fading (model, bandwidth, C/M ratio, differential delay/Doppler)** ▪ **Blockage, shadowing** ▪ **Antenna gain pattern** ▪ **Antenna phase and amplitude jumps (probability distribution, interval)** ▪ **HPA non-linearity** ▪ **Phase and amplitude frequency response** ▪ **Atmospheric effects including ITU rain fading** ▪ **5G fading and path loss models**
Other capabilities	▪ **Orbital dynamics (LEO/MEO/HEO/GEO)** ▪ **Terrestrial/aeronautical station dynamics** ▪ **Dual independent GNSS simulators**



SYSTEM VIEW OF RADIO LINK SIMULATOR (SINGLE CHANNEL)

GPS SIMULATOR

Channels	**2, derived from station positions**
Connector	**SMA(F)**
Impedance	**50 ohms nominal**
Frequency	**1575.42 MHz (GPS L1)**
Level	**–90 to –50 dBm**

ADDITIONAL CAPABILITIES

Cooperative units	**4 (up to 16 channels total)**
Remote control	**Ethernet, via Python API**
Station position output	**Ethernet, ARINC 429**
Ephemeris output	**Ethernet**
Antenna emulation	**OpenAMIP or custom**
Visualization	**Orbit and route animation**
Spectral display	**4 independent plots, at input or output**
Power profile display	**4 independent plots, at input or output**
Link parameter display	**4 independent plots of range, loss, delay, delay rate, Doppler or Doppler rate, for uplink, downlink, ISL or composite path**

MONITOR & CONTROL INTERFACES

Sync and 1 pps	**TTL, configurable as input or output**
Reference	**100 MHz internal, external or disciplined**
Ethernet	**10/100/1000 Base T**
Serial	**RS-232/422/485**
USB	**USB 2.0, USB 3.0**
Video	**DisplayPort, HDMI, VGA**

MECHANICAL/ENVIRONMENTAL

Form factor	**19" / 2.5U rack mount**
Size (with bumpers)	**L 51 cm x W 51.75 cm x H 12.07 cm L 20 in x W 20.38 in x H 4.75 in**
Weight	**≈ 7 kg (15 lb)**
Power connector	**IEC 320 male**
Voltage	**100-240 VAC, 50/60 Hz**
Current (typical)	**≈ 1.8 A rms at 115 VAC**
Operating temperature	**10°C to 35°C**
Operating humidity	**20% to 75% relative humidity, non-condensing**
Regulatory	**FCC, CE and RoHS compliant Safety: EN61010-1 Emissions & immunity: EN61326-1 Class A**

CONTACT US

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