# MILSATCOM Atmospheric Scintillation Simulator (MASS)

Hardware-in-the-Loop Fading Channel Simulator

The MILSATCOM Atmospheric Scintillation Simulator is a proven, wideband, hardware in-the-loop, flat fading channel simulator that faithfully replicates the scintillation characteristics imparted by a high altitude nuclear detonation or natural scintillation. The MASS provides dual channel capability with independent, user-defined fading characteristics on the uplink and downlink signals. The modular architecture eases integration with intermediate frequency (IF) interfaces of ground, airborne, and sea-based MILSATCOM terminals. MASS has been field tested with several operational terminals as well as satellite simulators and on-orbit military satellites.

Features & Benefits

- Flat fading based upon statistical parameters or scripted scenarios
- Configurable IF or radio frequency (RF) interfaces from L-band through Ku-band
- Up to 2 GHz instantaneous bandwidth
- Two independent channels enable combined uplink and downlink testing
- Fading with stationary or non-stationary statistics
- Modular architecture eases interfacing with different SATCOM terminals
- Automated calibration ensures accuracy and repeatability, and eases the burden on the operator
- Comprehensive software tools for test planning, real-time data logging, and post test data analysis
- Uses Defense Threat Reduction Agency models for nuclear scintillation

- First unit independently certified by the Defense Threat Reduction Agency for nuclear scintillation
- Pre-certification test results provided with each unit
- Includes operator training, User's Manual, test data, and three-year warranty
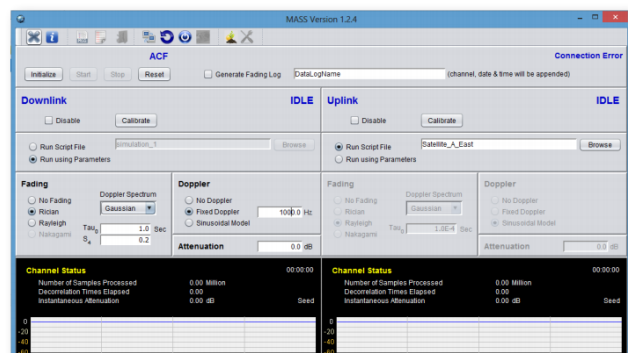
MASS Connections to SATCOM Terminal
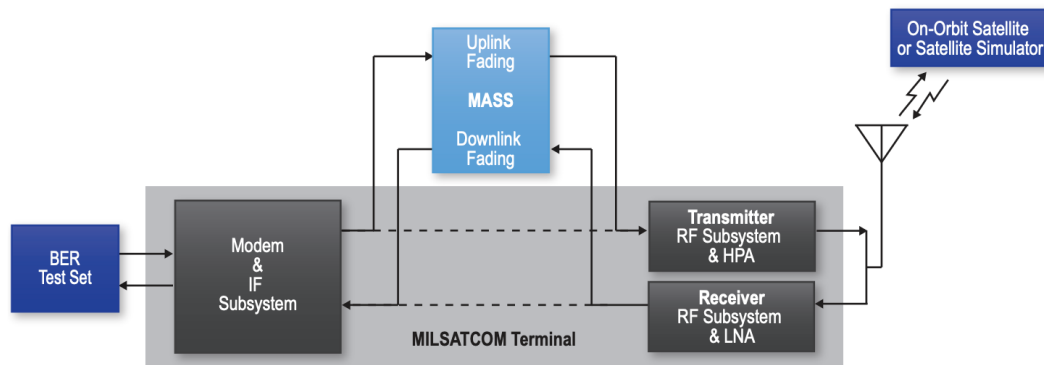
The MASS connects into the transmit and receive paths of terminals for uplink and downlink testing, respectively. MASS interface electronics provide benign connections to the terminal. MASS pre-distortion capabilities compensate for the detrimental non-linearities of the terminal's transmitter to ensure the correct fading statistics of the transmitted signal at the output of the antenna. The MASS also provides additive white Gaussian noise (AWGN) into the downlink path to compensate for the faded noise from the terminal receiver's low noise amplifier (LNA).

The MASS operator selects from Rayleigh, Rician, and Nakagami-m amplitude fading statistics and f-4, f-6, or Gaussian Doppler spectrums. Total electron content (TEC) Doppler, AWGN, and static/slow amplitude attenuation are available. Both stationary and non-stationary fading capabilities are included. Script building allows the user to define specific scenarios with non-stationary fading statistics.

Specifications

Channels	Two with independent scintillation
S4	0.0 to 1.0
Interfaces	L-band through Ku-band
Doppler spectrum	Gaussian, f - 4 power law, f - 6 power law
Bandwidth	Up to 2 GHz
Modes	Benign, parametric, scripted
Signal & noise levels	Compatible with terminal under test
Attenuation	0 to 52 dB (static or slowly varying)
Distributions	Rayleigh, Rician, Nakagami-m
TEC Doppler	-1.0 to 1.0 MHz
Amplitude scintillation	-52 dB to +8 dB
Spurious	45 dBc
Phase scintillation	Yes, phase continuous
Uplink pre-distortion	Linearizes AM-AM & AM-PM distortion
τ0	100 μsec to 30 sec
Downlink noise	Broadband AWGN with user-defined amplitude

**For further information on our products,
contact us at info@welkinsciences.com.**