



*Antenna image above is WS1 at WSC

LEGS Locations (Site, Lat., Long.)

White Sands, USA: 32.544863, -106.612504
Matjiesfontein, South Africa: -33.231224, 20.58163 (TBD)
Pacific Region TBD

Additional Information

FUNCTION	PERFORMANCE
Antenna Diameter (D)	D > 18m
Services	TT&C, CCSDS Forward and Return data, Radiometric tracking and antenna auto tracking angles
Transmit and Receive Polarizations	Tx: RHC or LHC Rcv: RHC & LHC
Antenna Travel Range	>360 deg Azimuth Continuous (TBR) 0-90 deg Elevation
Antenna axis Tracking rate	0.5 deg/s velocity (TBR)
Radiometric Tracking	Per CCSDS 414.1-B-2, Pseudo-Noise (PN) Ranging Systems
Radiometric Accuracy	Equivalent to DSN adjusted to C/No
Autotrack Accuracy	+/- 0.2 dB of beam peak (TBR)
Multiple Spacecraft Per Antenna (MSPA)	Up to 4 simultaneous return services per aperture (Max 3 Ka)
Timing Reference	short term stability better than 10 ⁻¹⁴ (TBR)

Lunar Exploration Ground Sites (LEGS)

The LEGS mission is to provide direct-to earth communication and navigation services for missions operating from 36,000 kilometers (km) in the GEO to cis Lunar and other orbits out to 2 Million km. To fully support distant orbits there will be three LEGS sites equally spaced around the Earth. The Ground sites utilize CCSDS Modulation and coding schemes for forward and return data. Specialized/unique Mod-Cods are optional. User Local Equipment on site is optional. Ground system performance characteristics are provided below:

Antenna System Radio Frequency Operating Regimes

Radio Frequency (RF) Band	Operating Frequency	
	Lower limit	Upper limit
S-Band (Forward)	2025 MHz	2120MHz
S-Band (Return)	2200 MHz	2300 MHz
X-Band (Forward)	7145 MHz	7235 MHz
X-Band (Return)	8400 MHz	8500 MHz
Ka-Band (Forward)	22.55 GHz	23.15 GHz
Ka-Band (Return)	25.50 GHz	27.0 GHz

RF Performance Criterion	Radio Frequency Performance (Forward)		
	S-Band	X-Band	Ka-Band
EIRP (minimum) ³	81 dBW	86 dBW	89 dBW
Approx 3 dB Beamwidth ³	0.5°	0.1°	0.04°
Forward Distortions ²	1 dB max	1 dB max	1 dB max
Carrier Modulation	Direct PCM/PM PCM/PM/PSK, OQPSK, BPSK ¹	Direct PCM/PM PCM/PM/PSK, OQPSK, BPSK ¹	BPSK, OQPSK Filtered OQPSK ¹
Max Data Rate	10 Msps	10 Msps	40 Msps

RF Performance Criterion	Radio Frequency Performance (Return)		
	S-Band	X-Band	Ka-Band
G/T (minimum) ³	28 dB/K	39 dB/K	47.5 dB/K
Approx 3 dB Beamwidth ³	0.5°	0.1°	0.04°
Implementation loss ²	2 dB max	2 dB max	2 dB max
Demodulation	Direct PCM/PM, PCM/PM/PSK, OQPSK, BPSK ¹	Direct PCM/PM, PCM/PM/PSK, OQPSK, BPSK ¹	OQPSK, Filtered OQPSK ¹
Max Data Rate	20 Msps	150 Msps	500 Msps

¹Additional modulation schemes or data service types are optional

²GSFC CLASS link calculations use a 3dB implementation loss of which, the receive system is allocated 2dB and the transmit system distortions are allocated 1dB

³TBR pending finalization of antenna system requirements