8.0. TECHNICAL SPECIFICATIONS

The following specifications describe warranted performance over the temperature range 0-50 degrees C and include a 30 minute warm-up time from ambient conditions. Supplemental characteristics are in italics and provide useful information by giving non-warranteed performance parameters.

The specifications are measured under the following channel conditions unless otherwise indicated:

- RF Input Signal = 900 or 1800 MHz sinewave
- RF Input Level = -10 dBm (Input Reference Level set 3.0 dB less then input overload)
- Output Attenuator = 0 dB
- LO Input Level = +13 dBm
- LO Input Frequency = RF Input Frequency -140 MHz
- One Path On, Path Modulation = none, Path Loss = 0 dB, Path Delay = 0 μs
- Channel Configuration = Dual Channel

RF Channel Specifications

RF Input Signal Frequency Range	25 to 4000 MHz
RF Bandwidth	26 MHz
Number of Independent RF Channels	1 or 2
RF Input Signal Level	
Range	+5 to -30 dBm
Nominal	-10 dBm
Damage Level	+20 dBm
Automatic Reference Level Range	*0 to -25 dBm*
RF Bandwidth Peak to Peak Amplitude Variation	*1dB typical* 2dB maximum
Channel Insertion Loss	*12 dB typical* 16 dB maximum

Spurious Emission Levels on RF Out (without EFX option)

Within Channel Pass Band	-45 dBc maximum
($f_c \leq 200$ MHz)	*-15 dBc*
RF Image Feedthrough	*= RF OUT level typical*
RF LO Feedthrough	0 dBm maximum

Group Delay Distortion   ±30 ns

Path Insertion Delay
RF In to RF Out   *4.0 µs maximum*

Physical Interface Characteristics

Impedance	*50 ohms*
Input SWR	*< 1.5*
Connector Type	*Type N Female*

RF Channel Options

RF Image and LO Feedthrough Suppression (EFX Option)

Frequency Range	800 to 3000 MHz
RF Image Feedthrough on RF Out	-50 dBc maximum
RF LO Feedthrough on RF Out	-75dBm maximum
Additional Channel Insertion Loss	*6 dB typical* 8 dB maximum
Additional Channel Amplitude vs. Freq. Variation	*1 dB typical* 2 dB maximum

RF Output Attenuator

ATT1:

Attenuation Range	0 to 80 dB
Resolution	0.1 dB
Frequency Range	800 to 2500 MHz
Accuracy	
0 to 10 dB attenuation	*±0.75 dB*
>10 to 20 dB attenuation	*±1.5 dB*
>20 to 30 dB attenuation	*±2.0 dB*
>30 to 60 dB attenuation	*±3.0 dB*
>60 to 80 dB attenuation	*±5.0 dB*
Additional Channel Insertion Loss	2.5 dB maximum

ATT3:

Attenuation Range	0 to 90.0 dB
Resolution	0.1 dB
Frequency Range	25 to 3000 MHz
Accuracy (25 to 3000 MHz)	
0 to 49.9 dB attenuation	*±1.0 dB*
50.0 to 85.0 dB attenuation	*±2.0 dB*
85.0 to 90.0 dB attenuation	*±2.5 dB*
Additional Channel Insertion Loss	1.5 dB maximum

RF Filter Bypass (FBP Option) and RF Channel Bypass (CBP Option)

Additional Insertion Loss	*1 dB typical*
	2 dB maximum

Local Oscillator (LO) Characteristics

Internal Local Oscillator (LO 4 option)
(All specs refer to LO OUT unless noted)

LO Frequency Range	940-2860 MHz
Carrier Frequency Range (RF IN)	800-3000 MHz
Frequency Resolution	100 kHz
Frequency Accuracy	*2 kHz*
Phase Noise (1 kHz offset)	*-75 dBc/Hz*
Level	*+13 dBm typical*
	+10 dBm minimum

External Local Oscillators
(All specs refer to LO IN unless noted)

LO Frequency Range	165-3860 MHz
LO Offset from Carrier Frequency (F_c)	
$F_c \geq 800$ MHz	F_c - 140 MHz
$F_c < 800$ MHz	F_c + 140 MHz
Level Range	+12 to +15 dBm
Nominal Level	
$F_c < 3.6$ GHz	+13 dBm
$F_c \geq 3.6$ GHz	+15 dBm
Damage	+23 dBm
LO Impedance	50Ω

Technical Specifications are subject to change without notice.

Channel Emulation Characteristics

Number of Independent Paths per Channel   3 or 6

Path Modulation   None, Rayleigh, Frequency Shift, Phase Shift, Rician, Rayleigh with Freq. Shift, Rician with Frequency Shift, Nakagami

Fading Emulation Method

Programmable with 2 modes: Jakes, Filtered Noise

Fading (Rayleigh) Amplitude Distribution

Deviation from Theoretical CPDF exceeds the following requirements (exceeds IS-137/138 and IS-97/98 requirements):

From +10 to -30 dB of mean power level   *± 0.5 dB*

Level Crossing Rate (LCR) Accuracy exceed the following requirements (exceeds IS-137/138 and IS-97/98 requirements):

From +3 to -30 dB of mean power level   *< ± 2.5% deviation theoretical LCR curve of the simulated vehicle velocity*

Fading Power Spectrum

Emulation Method = Jakes
Programmable with 2 shapes: Classical 6 dB, Flat

Emulation Method = Filtered Noise
Programmable with 4 shapes: Classical 6 dB, Flat, Classical 3 dB, Rounded

Fading Repetition Interval

Emulation Method = Jakes
Simulated Doppler frequency ≤ 500 Hz   *> 20 minutes*
Simulated Doppler frequency > 500 Hz   *> 10 minutes*

Emulation Method = Filtered Noise
Programmable with 3 modes: *27 seconds, 20 minutes, 24 hours*

Correlation Coefficient
(Between Channel 1 and Channel 2 Paths)

Range	0 to 1
Resolution	0.01

Velocity

Range (f_c = 900 MHz)	± 0.1 to ± 1199.2 km/hr (± 0.1 to ± 745.1 mph)
Resolution	0.1 units
Units	m/s, km/hr, feet/sec, mph

Fading Doppler Frequency

Range	
Jakes Mode	± 1 to ± 1000 Hz
Filtered Noise Mode	± 0.1 to ± 1000 Hz
Resolution	0.1 Hz

Doppler Shift Frequency (Frequency Shift)

Range	± 0.01 to ± 1000.00 Hz
Resolution	0.01 Hz

Line of Site (LOS) Arrival Angle
(Modulation = Rician or Nakagami)

Range	0 to 360 degrees
Resolution	0.1 degrees

Relative Phase Between Paths
(Modulation = Phase)

Range	0 to 360 degrees
Resolution	0.1 degrees

Rician K Factor
(Modulation = Rician)

Range	-30 to +30 dB
Resolution	0.1 dB

Nakagami M Value
(Modulation = Nakagami)

M Values	1, 3, 5, 10, 15, 25, 100

Technical Specifications are subject to change without notice.

Fading Shift Frequency
(Modulation = Rayleigh with Frequency Shift, Rician with Frequency Shift)

Range	-999.0 to +999.0 Hz
Resolution	0.1 Hz

Relative Path Delay

Range

Standard System	0 to 125 μsec
Extended Delay Option	0 to 2000 μsec
Resolution	0.5 nsec
Accuracy	*± 10 nsec*

Relative Path Loss
(measurement performed with Modulation = Rayleigh)

Range	0 to 50 dB
Resolution	0.1 dB

Accuracy

0 to 30 dB attenuation	±0.3 dB
>30 to 40 dB attenuation	±1.0 dB
>40 to 50 dB attenuation	±3.0 dB

Log Normal Fading Standard Deviation
(Relative Path Loss = 25 dB)

Range	0 to 12 dB
Resolution	1 dB

Log Normal Fading Rate

Range	0 to 20 Hz
Resolution	0.001 Hz

Dynamic Environment Emulation

NOTE: Dynamic Environment Emulation is available via remote operation only. The front panel interface is disabled while in Dynamic Environment Emulation mode.

Number of States:	> 2 billion
Minimum State Duration	5 msec[4]
State Duration Resolution	1 msec
State Transition Trigger	internal, external
Programmable Parameters **For Standard State Durations (≥ 10msec)**	Delay Path Loss RF Attenuation (ATT1 only) Modulation Type Velocity LOS Component Spectrum Offset Rician K / Nakagami M Phase Shift Fading Power Spectrum
Programmable Parameters **For Accelerated State Durations(5 - 9 msec)**	Delay Path Loss RF Attenuation (ATT1 only)

All other specifications in Section 8.0. apply except the following:

Relative Path Delay Resolution	15 nsec
Fading Emulation Method:	Filtered Noise Only
Fading Doppler Tracking Mode:	Path Mode
Channel Maximum Doppler:	1 kHz
Line of Site Reference:	Channel Maximum Doppler
Log Normal Fading:	Not Available
Channel Configuration	Dual Channel, Diversity, or Interference

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[4] A Minimum State Duration in the range from 5 msec to 9 msec is only supported with a subset of programmable parameter changes. For test cases that require other Path Parameters to be modified, a state duration of 10 msec or greater is required.

3GPDP Specifications

Test Profiles:	Moving Propagation
	Birth-Death
Minimum State Duration	1 msec
State Duration Resolution	1 msec
State Transition Trigger	internal, external
Parameter Modified During Test	Path Delay
Moving Propagation	
Frequency of Oscillation(units E-3 rads/sec)	1 to 32767
Number of Moving Paths:	1 to 6
Birth-Death	
Number of Delay Bins	1 to 64
Number of Active Paths:	1 to 6

Interface and Environmental Characteristics

Power Requirements

Voltage	85-265 VAC (auto sensing)
Frequency	47-440 Hz
Power	265 Watt (maximum)
Fuse Type	8.0 Amp, 250 Volt slow-blow fuse
Number of Fuses	2
Fuse Location	Hot conductor, Neutral conductor

Operating Environment

Temperature	*0 to 50 degrees C (32 to 122 degrees F)*
Humidity	*10% to 90%, noncondensing*

Dimensions and Weight

Height	*6.9 inches*
Width	*17.7 inches*
Depth	*19.9 inches*
Weight	*45 pounds*

Control Interfaces

Interfaces Provided	RS-232 (DCE) and IEEE-488 (GPIB)

Serial Control Port Parameters

Bit Rates	300, 1200, 2400, 4800, 9600
Format	asynchronous
Bits/Char.	7 or 8
Parity	none, odd, even
Stop Bits	1, 1.5, 2

External 10 MHz Reference Requirements

Input Frequency	10.000 MHz
Input Power Level	2.5 dBm ± 1 dB

Technical Specifications are subject to change without notice.

External Trigger Requirements

V_{IH}	3.0 to 5.0 Volts
V_{IL}	0 to 0.4 Volts
I_{IH}	1 mA maximum
I_{IL}	1 mA maximum
Trigger Pulse Width	1 μs minimum
Trigger rise time	10 ns to 1 μs
Trigger fall time	10 ns to 1 μs

Technical Specifications are subject to change without notice.