

AN-60-042

**TD-SCDMA Base Station MMIC Amplifier**

Mini-Circuits PHA-1+ Ultra High Dynamic Range MMIC Amplifier is designed specifically for applications which require extremely linear performance, particularly wideband, advanced digital communications systems such as TD-SCDMA which require excellent ACLR suppression and low EVM.

The E-PHEMT based PHA-1+ provides typically +42 dBm OIP3 which translates to extremely linear performance in multi-carrier and complex signal environments such as TD-SCDMA supporting ACLR\_1 Measurements of better than -60 dBc at +10 dBm output and EVM of 0.57% (rms) and 2.95% (pk) at the same power.



Figure 1 (PHA-1+ Test Board)

**DUT Configuration:**

**Device:** PHA-1+ Test board

**Supply Voltage:** 5.0V, 150 mA

**Temperature:** 25°C

**Note:** All data is referenced to the PCB connectors

**Test Signal:**

TD-SCDMA

Fc = 2000 MHz

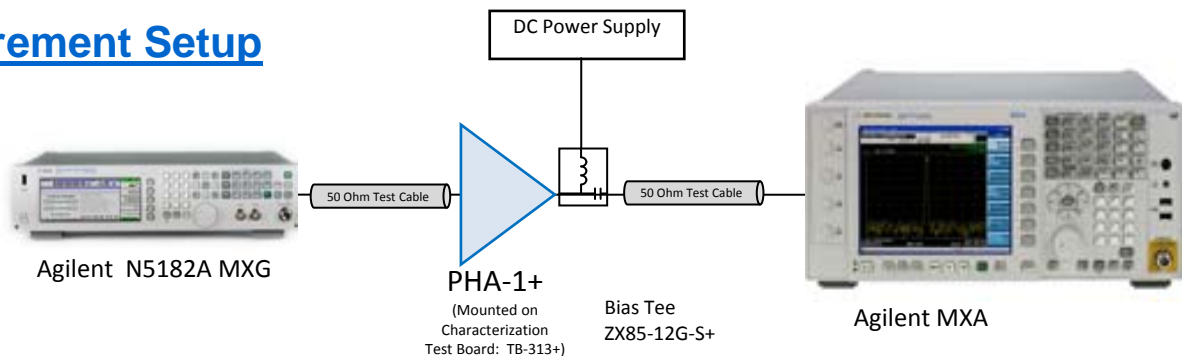
Single Channel

Channel bandwidth: 1.6 MHz

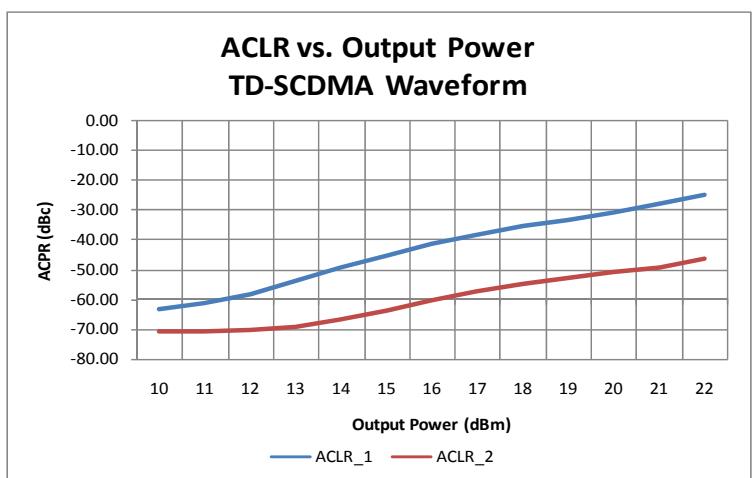
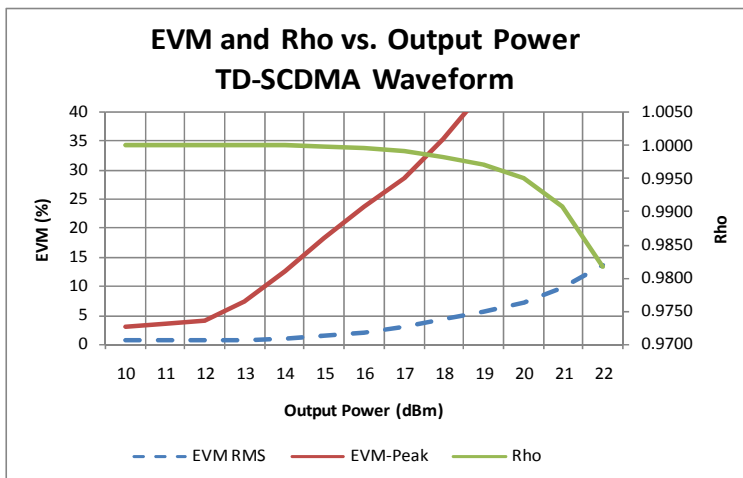
**CCDF**

10%	3.21 dB
1.0%	6.09 dB
0.1%	7.95 dB
0.01%	8.53 dB
0.001%	8.56 dB
0.0001%	8.56 dB

**Measurement Setup**



**Summary Data**



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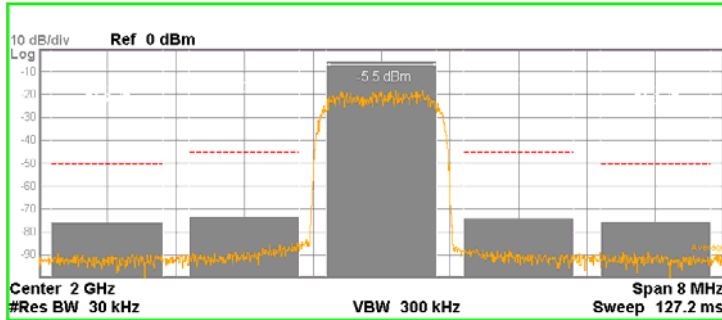
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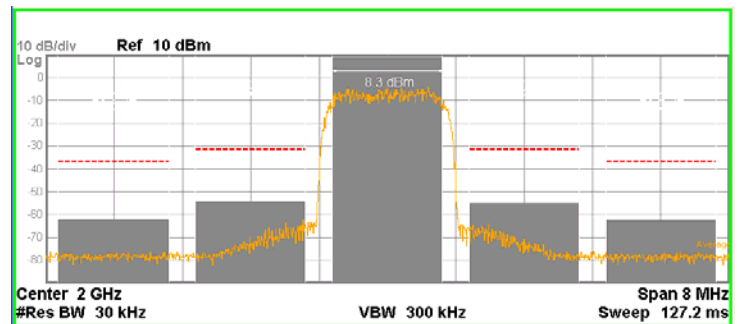
# ACLR\_1 Plots vs. Output power

## System Reference



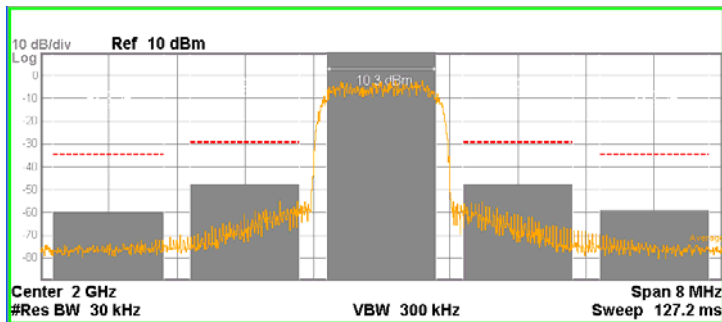
Offset Freq	Integ BW	Lower		Upper	
		dBc	dBm	dBc	dBm
1.600 MHz	1.280 MHz	-68.03	-73.57	-69.08	-74.63
3.200 MHz	1.280 MHz	-70.66	-76.21	-70.46	-76.01

## + 10 dBm



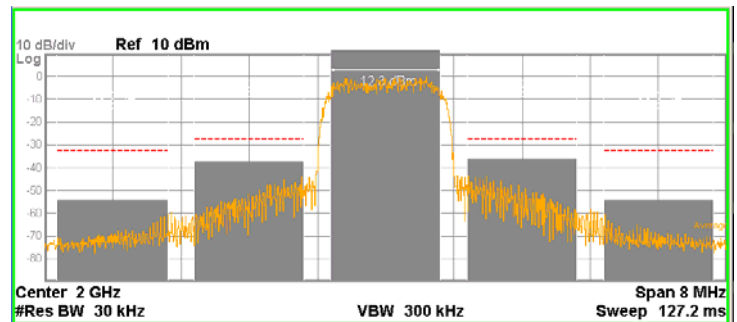
Offset Freq	Integ BW	Lower		Upper	
		dBc	dBm	dBc	dBm
1.600 MHz	1.280 MHz	-62.75	-54.48	-63.38	-55.11
3.200 MHz	1.280 MHz	-70.62	-62.35	-70.70	-62.43

## + 12 dBm



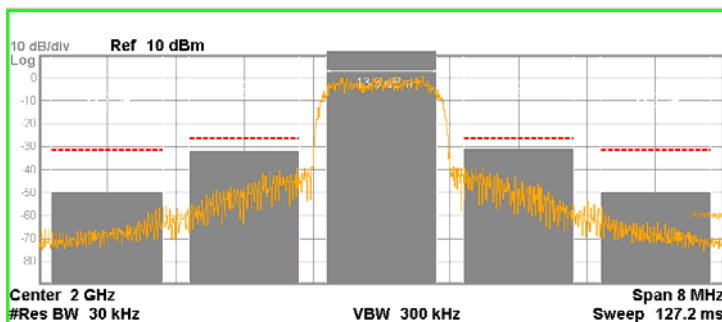
Offset Freq	Integ BW	Lower		Upper	
		dBc	dBm	dBc	dBm
1.600 MHz	1.280 MHz	-58.27	-47.97	-58.24	-47.94
3.200 MHz	1.280 MHz	-70.20	-59.90	-69.76	-59.47

## + 14 dBm



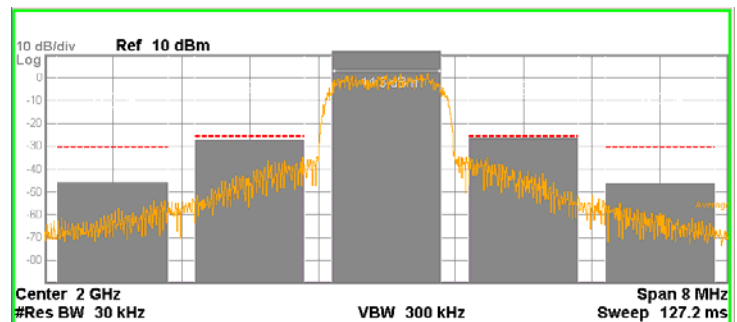
Offset Freq	Integ BW	Lower		Upper	
		dBc	dBm	dBc	dBm
1.600 MHz	1.280 MHz	-49.78	-37.51	-48.81	-36.54
3.200 MHz	1.280 MHz	-66.78	-54.50	-66.84	-54.56

## + 15 dBm



Offset Freq	Integ BW	Lower		Upper	
		dBc	dBm	dBc	dBm
1.600 MHz	1.280 MHz	-45.46	-32.17	-44.63	-31.35
3.200 MHz	1.280 MHz	-63.75	-50.47	-63.92	-50.64

## + 16 dBm



Offset Freq	Integ BW	Lower		Upper	
		dBc	dBm	dBc	dBm
1.600 MHz	1.280 MHz	-41.60	-27.33	-40.94	-26.67
3.200 MHz	1.280 MHz	-60.17	-45.90	-60.53	-46.26



ISO 9001 ISO 14001 CERTIFIED

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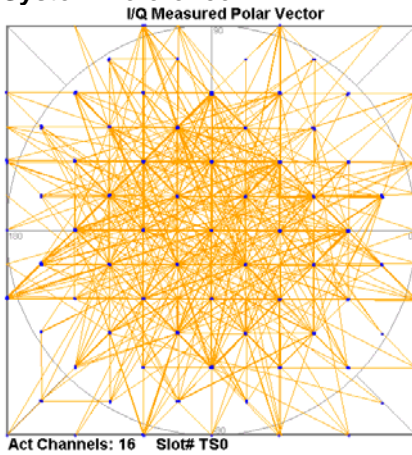
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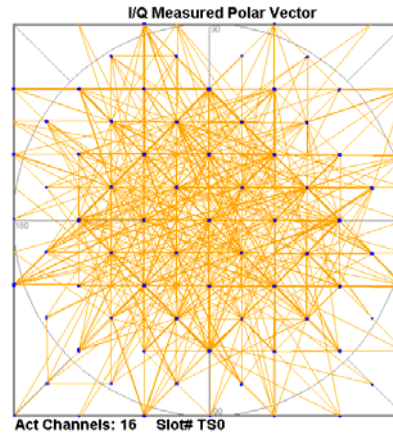
# IQ Polar Plots vs. Output Power (EVM, Rho and PCDE)

**System Reference:**



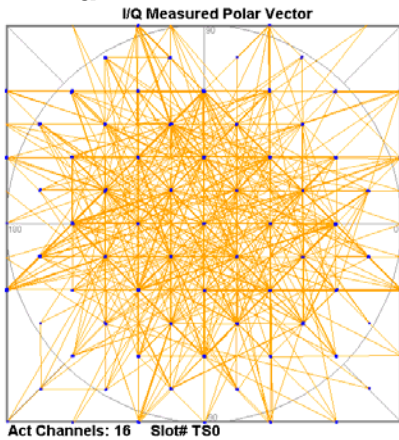
Slot# TS0  
 Rho: 0.99997  
 EVM: 0.57 % rms  
 3.25 % pk  
 Pk CDE: -54.03 dB  
 at S16(10)

**+10 dBm**



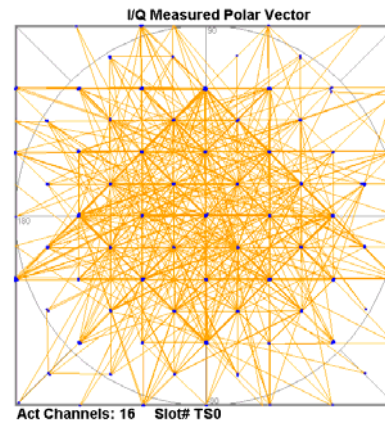
Slot# TS0  
 Rho: 0.99997  
 EVM: 0.57 % rms  
 2.95 % pk  
 Pk CDE: -54.39 dB  
 at S16(0)

**+12 dBm**



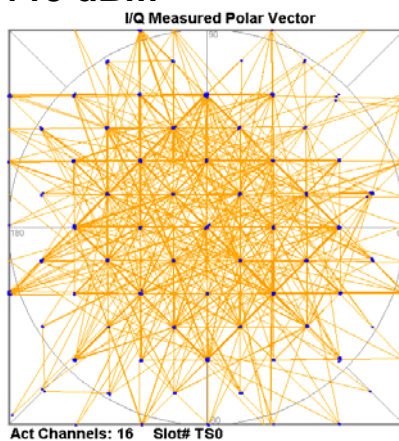
Slot# TS0  
 Rho: 0.99996  
 EVM: 0.60 % rms  
 3.87 % pk  
 Pk CDE: -53.92 dB  
 at S16(2)

**+14 dBm**



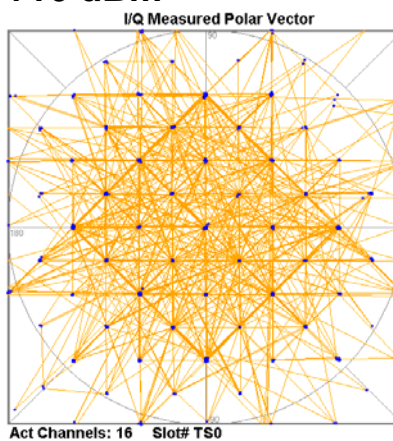
Slot# TS0  
 Rho: 0.99992  
 EVM: 0.89 % rms  
 12.45 % pk  
 Pk CDE: -50.30 dB  
 at S16(7)

**+15 dBm**



Slot# TS0  
 Rho: 0.99983  
 EVM: 1.32 % rms  
 18.25 % pk  
 Pk CDE: -47.51 dB  
 at S16(0)

**+16 dBm**



Slot# TS0  
 Rho: 0.99960  
 EVM: 2.00 % rms  
 23.75 % pk  
 Pk CDE: -44.10 dB  
 at S16(7)

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