

### LTE Base Station MMIC Amplifier

Mini-Circuits PMA-545+ High Dynamic Range and Super Low Noise MMIC Amplifier is designed specifically for applications which require high linear performance, particularly wideband, advanced digital communications systems such as LTE which require excellent ACLR suppression and low EVM.

The E-PHEMT based PMA-545+ provides typically +36 dBm OIP3 which translates to high linear performance in multi-carrier and complex signal environments such as LTE supporting ACLR<sub>1</sub> Measurements of better than -60 dBc at +6 dBm output.

The PMA-545+ is characterized using a high peak-to-average ratio OFDM signal used for next generation LTE within the 700MHz Downlink Band.



Figure 1 PMA-545+ Test Board

#### DUT Configuration:

**Device:** PMA-545+ Test board

**Supply Voltage:** 3V, 77 mA

**Temperature:** 25C

**Note:** All data is referenced to the test board connectors

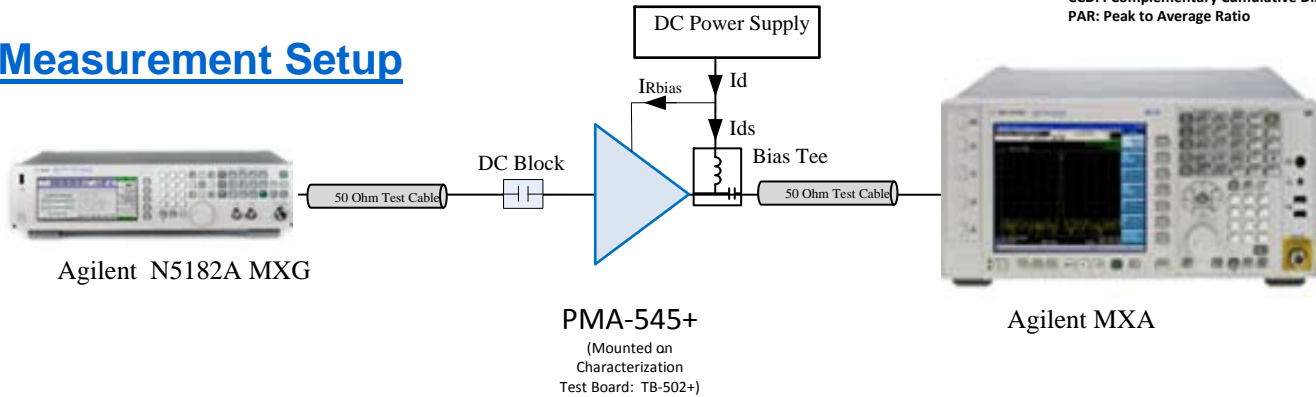
#### Test Signal:

LTE FDD Downlink (2009-3), Full filled 64 QAM, 10MHz (50 RB) Fc = 700 MHz

CCDF	PAR
10%	3.63 dB
1.0%	6.67 dB
0.1%	8.48 dB
0.01%	10.06 dB
0.001%	10.90 dB
0.0001%	11.05 dB

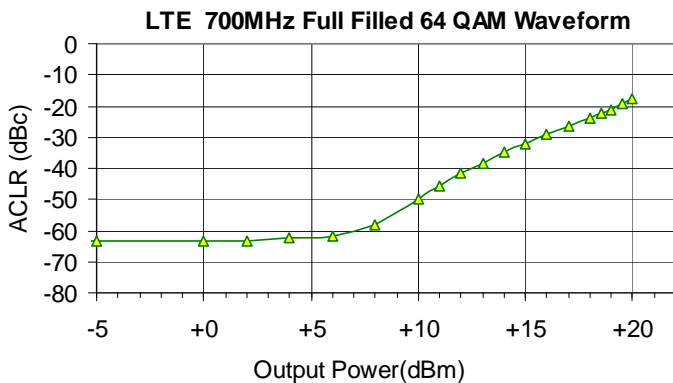
CCDF: Complementary Cumulative Distribution Function  
PAR: Peak to Average Ratio

### Measurement Setup

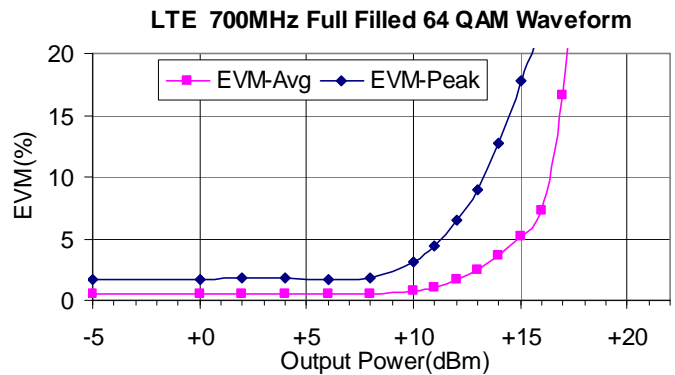


### Summary Data

#### ACLR 1 vs. Output Power



#### EVM vs. Output Power



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Table 1 Data of ACLR and EVM vs. Output Power

Output Power (carrier) dBm	ACLR (dBc)				EVM (%)	
	ACLR2 LOW 20MHz	ACLR1 LOW 10MHz	ACLR1 HIGH 10MHz	ACLR2 HIGH 20MHz	RMS	Peak
+20	-34.5	-17.7	-17.7	-34.4	47.640	134.33
+19.5	-38.8	-19.3	-19.3	-38.8	47.416	121.42
+19	-42.9	-21.2	-21.1	-43.0	46.093	112.76
+18.5	-45.3	-22.3	-22.3	-45.4	44.760	106.34
+18	-47.3	-23.8	-23.9	-47.5	40.280	99.73
+17	-49.7	-26.5	-26.6	-50.0	16.664	94.75
+16	-51.5	-29.2	-29.3	-51.7	7.323	24.38
+15	-53.3	-32.2	-32.2	-53.6	5.235	17.80
+14	-55.2	-35.0	-35.2	-55.6	3.673	12.76
+13	-57.4	-38.3	-38.5	-57.7	2.496	8.90
+12	-59.4	-41.7	-42.0	-59.8	1.665	6.48
+11.33	-60.7	-44.4	-44.6	-61.2	1.244	5.17
+11	-61.3	-45.8	-46.2	-61.8	1.081	4.47
+10	-62.6	-50.0	-50.3	-63.1	0.734	3.10
+8	-63.8	-58.3	-58.9	-64.0	0.525	1.82
+6	-63.8	-61.7	-62.2	-64.1	0.497	1.67
+4	-63.8	-62.5	-63.3	-64.1	0.479	1.78
+2	-63.9	-63.2	-63.6	-64.2	0.483	1.79
+0	-63.7	-63.5	-63.7	-64.1	0.472	1.72
-5	-63.7	-63.4	-63.7	-64.0	0.483	1.69

**Note:**

For output powers less than -5dBm, ACLR measurement accuracy is limited by the dynamic range of the test equipment.

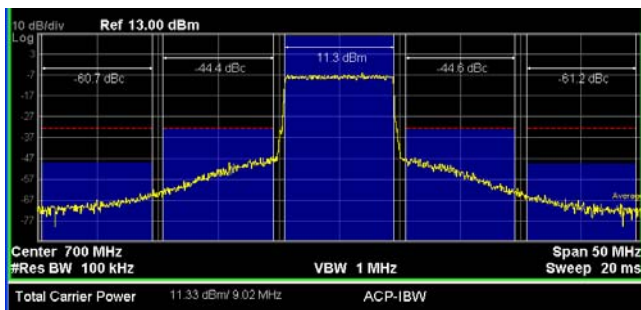


Figure 2 ACLR Plot at Output Power of +10.84 dBm

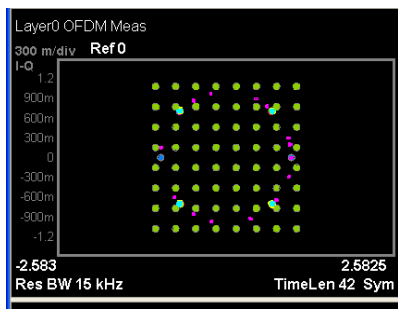


Figure 3 EVM Plot at Output Power of +10.84 dBm

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