

AN-60-041

LTE 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 LTE 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 LTE supporting ACLR_1 Measurements of better than -60 dBc at +10 dBm output and -26 dBc at +20dBm (near the 1 dB compression point).

The PHA-1+ is characterized using a high peak-to-average ratio OFDM signal used for next generation LTE within the AWS-1 Downlink Band.

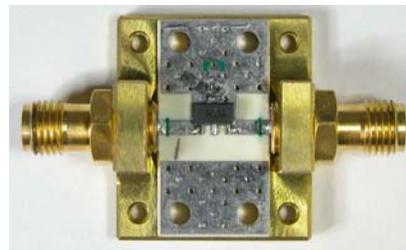


Figure 1 (PHA-1+ Test Board)

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:

AWS_1 Downlink

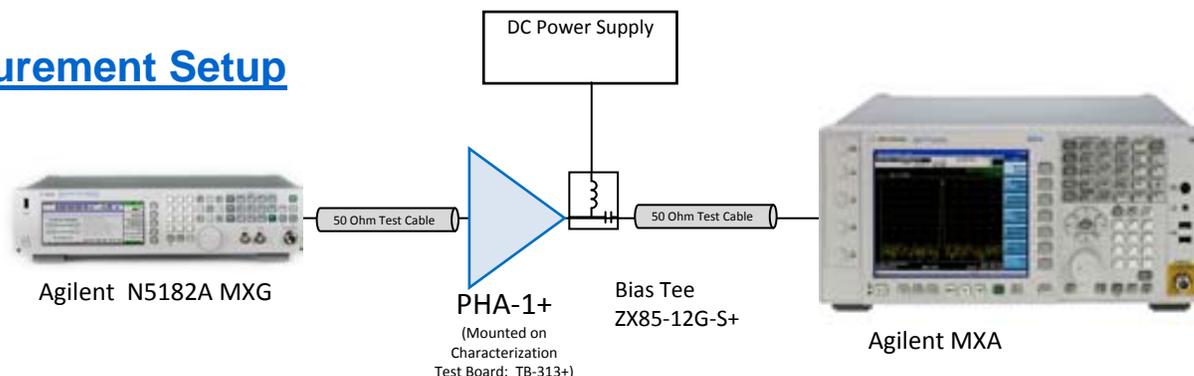
Fc = 2130 MHz

OFDM, 10 MHz Channel width

CCDF

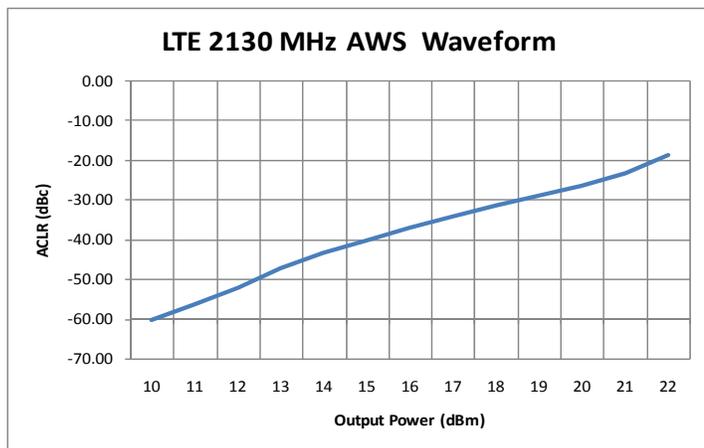
10%	4.05 dB
1.0%	7.27 dB
0.1%	9.12 dB
0.01%	10.32 dB
0.001%	11.40 dB
0.0001%	11.98 dB

Measurement Setup

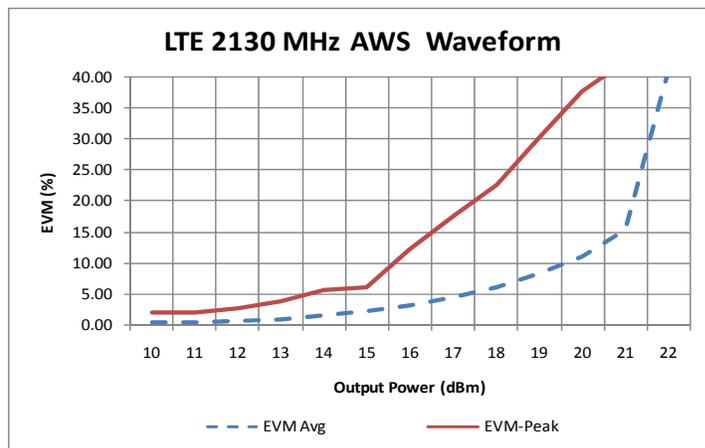


Summary Data

ACLR 1 vs. Output Power



EVM vs. Output Power



P.O. Box 350166, Brooklyn, New York 11235-0003 (718) 934-4500 Fax (718) 332-4661 For detailed performance specs & shopping online see Mini-Circuits web site



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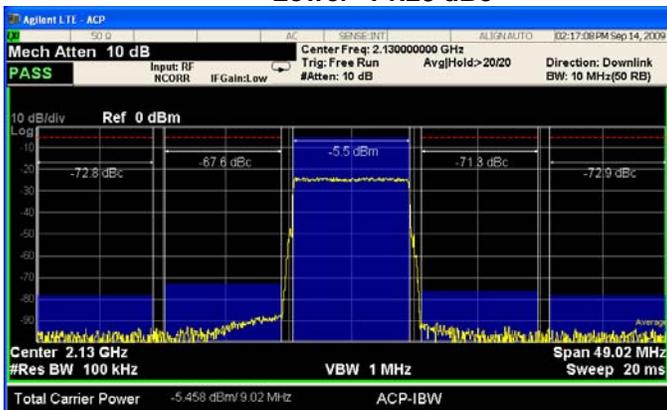
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ACLR_1 Plots vs. Output power

System Reference

Upper: -67.6 dBc
Lower: -71.28 dBc



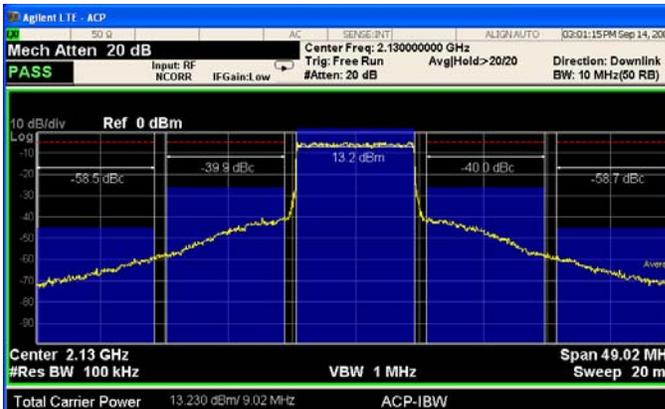
+ 10 dBm Upper: -60.1 dBc
Lower: -60.3 dBc



+ 12 dBm Upper: -51.8 dBc
Lower: -52.0 dBc



+ 15 dBm Upper: -39.9 dBc
Lower: -40.0 dBc



+ 18 dBm Upper: -31.0 dBc
Lower: -31.2 dBc



+ 20 dBm Upper: -26.1 dBc
Lower: -26.3 dBc



EVM Constellation Plots vs. Output power

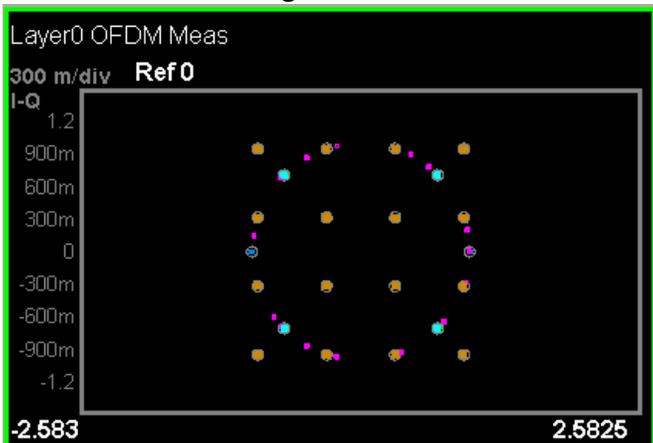
System Reference: Avg: 0.05% / Pk: 1.73%



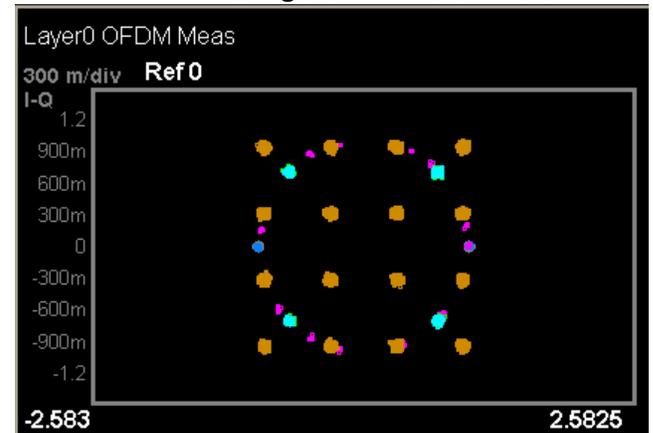
+10 dBm 0.54% Avg. / 2.02% Pk



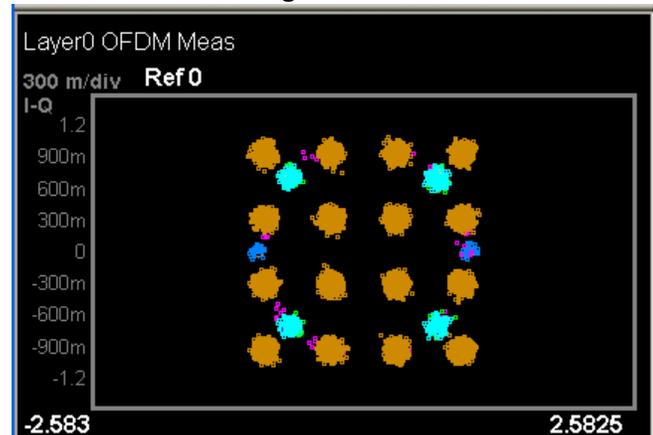
+12 dBm 0.75% Avg. / 2.72% Pk



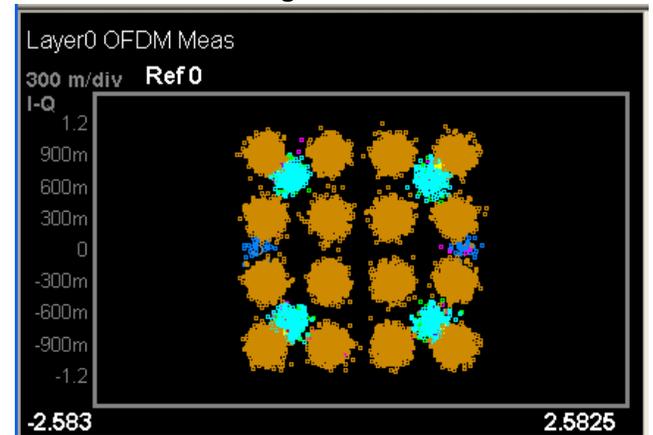
+15 dBm 2.31% Avg. / 8.12% Pk



+18 dBm 6.19% Avg. / 22.6% Pk



+20 dBm 11.2% Avg. / 37.7% Pk



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