**Submission to
IEEE P802.11
Wireless LANs**

QPSK,OQPSK, and MSK Spectral Regrowth and PA Efficiency

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- QPSK, OQPSK, and MSK were evaluated for spectral regrowth and power amplifier efficiency.
- Each waveform was synthesized at baseband using a dual channel arbitrary waveform generator and then upconverted using a quadrature modulator to the ISM band.
- The resulting signal was passed through a Class AB solid state power amplifier (SSPA).
- The power consumption of the SSPA was measured at various input drive levels and efficiency computed.
- Power spectrum for each waveform was then plotted at the 1 dB compression point and with the output saturated.
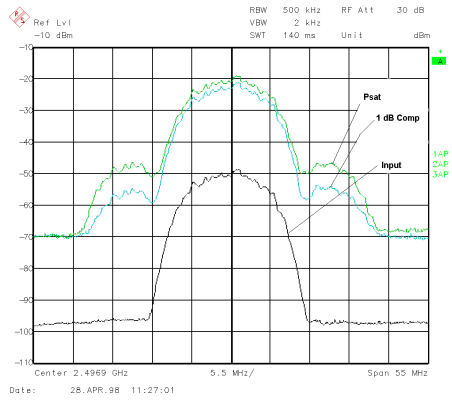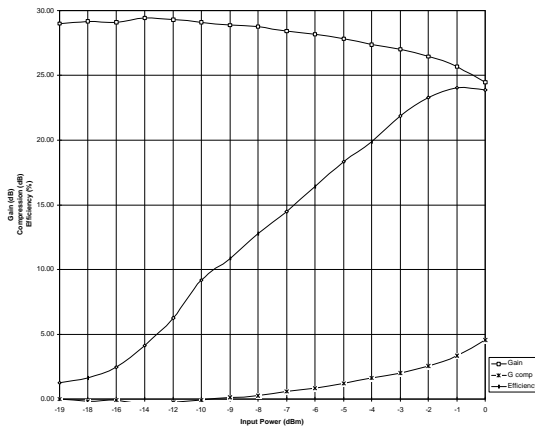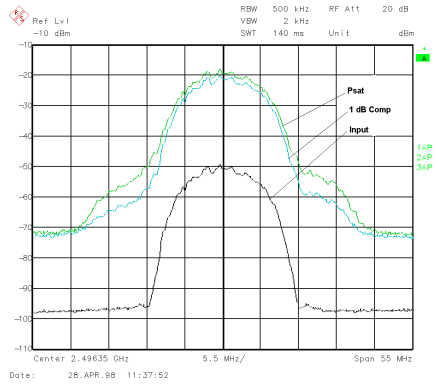
SSPA Characterization
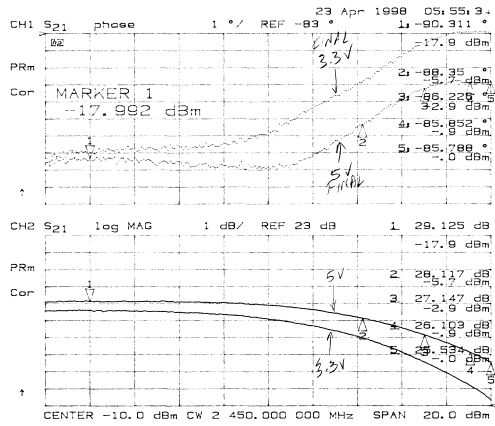
QPSK Compression / Efficiency
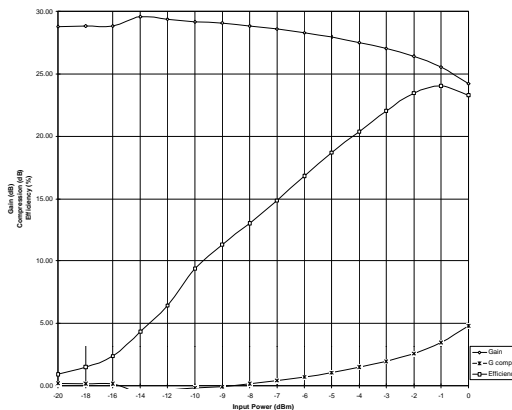
QPSK Spectrum (11 Mchips/s)

OQPSK Compression / Efficiency

OQPSK Spectrum (11 Mchips/s)

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MSK Compression / Efficiency

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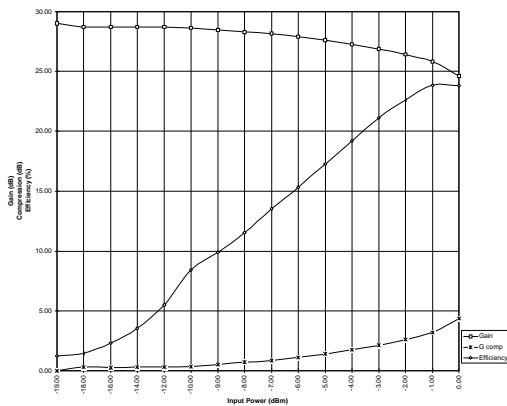
MSK Spectrum (11 Mchips/s)
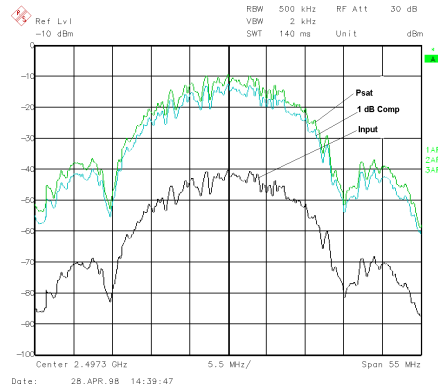
Summary

Waveform	Psat (dBm)	Eff @ Psat (%)	Pwr @ 1 dB Gc (dBm)	OBO @ 1 dB Gc (dB)	Eff @ 1 dB Gc (%)
QPSK	24.5	24.0	22.9	1.6	18.0
OQPSK	24.7	24.0	22.4	2.3	17.0
MSK	24.8	24.0	21.7	3.1	15.0

•Based on lab data, QPSK must be operated at 1.5 - 2.0 dB more OBO than OQPSK.

•For an output power of 24.5 dBm, OQPSK requires about 1.2 W (24% eff) and QPSK would require about 1.6 W (18% eff).

•This is a 33% increase in power required for the PA. Or about 80 ma at 5VDC.

Conclusions

• **OQPSK is slightly more power efficient than QPSK**

• **The increase in power efficiency must be traded against a added complexity in the DFE and slightly degraded performance due to more complex equalizer training.**

•**The power advantage of OQPSK is not substantial enough to warrant adoption without further study of receiver issues.**