6.2 Modulation Characteristics and Necessary Bandwidth -- Pursuant 47 CFR 2.1033(c)13, 2.1047(d) & 2.202

Digitally encoded speech or digital data is transmitted in four sub-channels at a 4 kHz rate using M-ary symbols mapped to predetermined fixed magnitude and phase components within 1 of 3 constellations associated with a particular modulation scheme. Figure 6-2 illustrates symbol mapping to one of the four QPSK sub-channels constellations. Figure 6-3 illustrates symbol mapping to one of the four16QAM sub-channels constellation. Figure 6-4 illustrates symbol mapping to one of the four 64QAM sub-channels constellation. For Quad-QPSK modulation, this mapping adjusts the amplitude and phase variations of the baseband signal to one of 4 points on the constellation. For Quad-16QAM modulation, this mapping adjusts the amplitude and phase variations of the baseband signal to one of 16 points on the constellation. For Quad-64 modulation, this mapping adjusts the amplitude and phase variations of the baseband signal to one of 64 points on the constellation. The bandwidth of the modulating signals is limited by the pair of modulation limiting low pass filters within the modem block function of U801 (see Figure 4-2 in Exhibit 4.3). These filters serve to limit out-of-band and spurious emissions due to modulation. The necessary bandwidth of the sub-channels is limited to 4.8 kHz by the pair of modulation limiting low pass filters. The transfer response of these filters is depicted in Figure 6-1 where the filter excess bandwidth coefficient of 0.2 is shown. This excess bandwidth leads to the necessary bandwidth calculation of (1 + 0.2) x (4 kHz) = 4.8 kHz. Since the sub-channels are spaced 4.5 kHz apart, the necessary bandwidth of the composite 4 sub-channel symbol streams is 4.8 + (3 x 4.5) = 18.3 kHz.

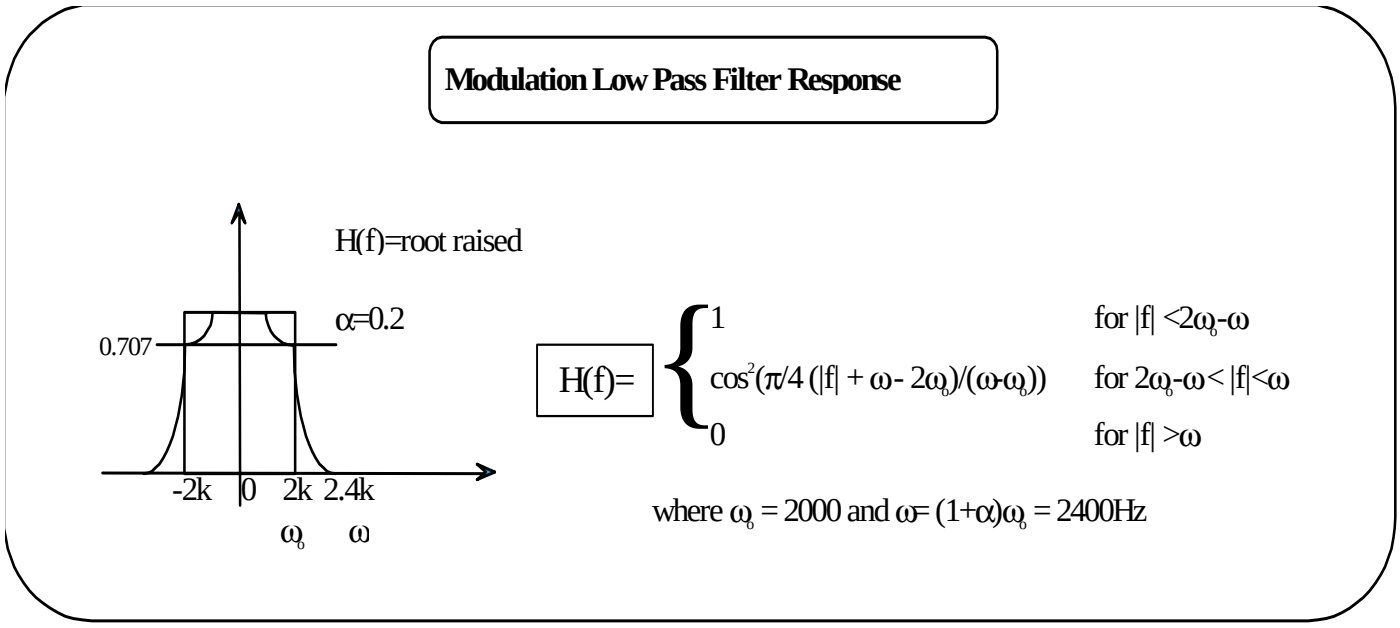

Figure 6-1: Modulation Low Pass Filter Response

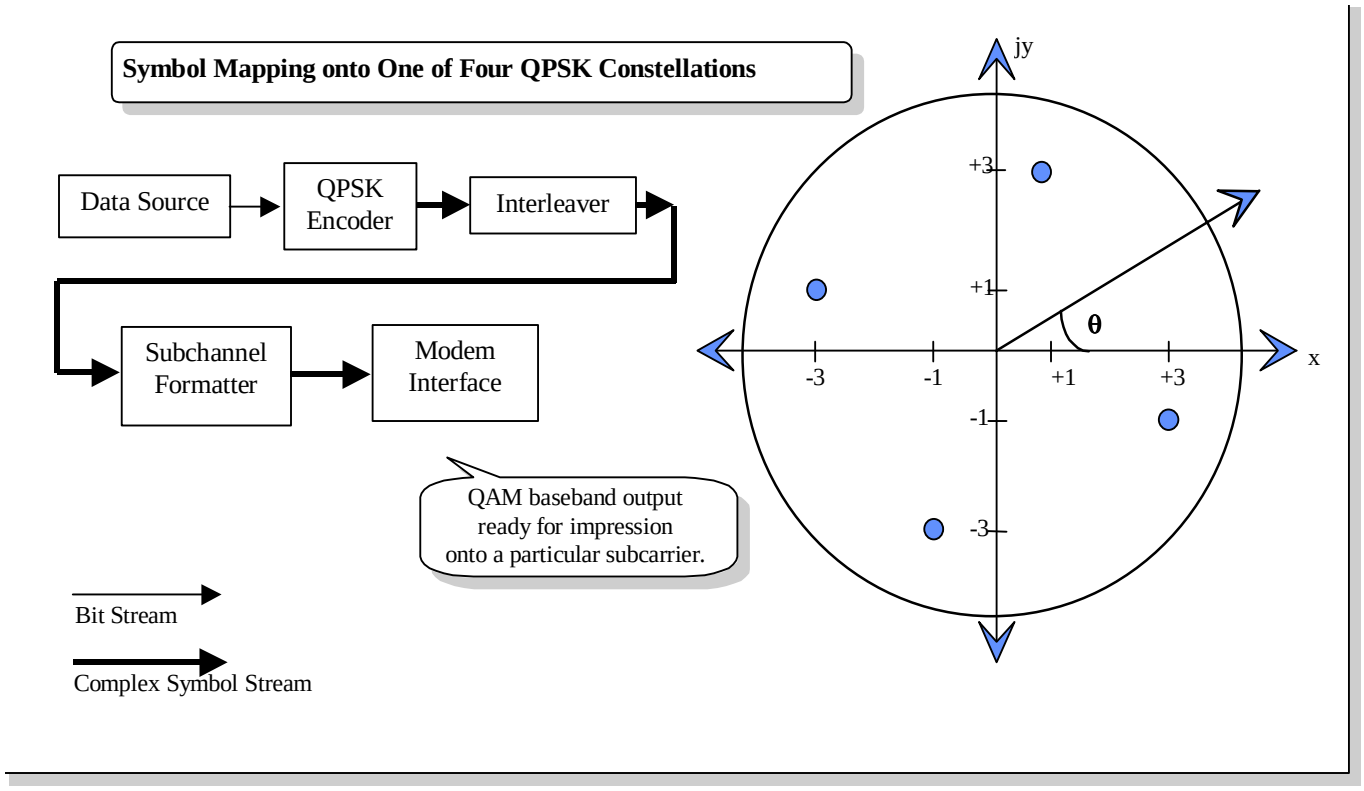

Figure 6-2: Symbol Mapping onto One of Four QPSK Constellations

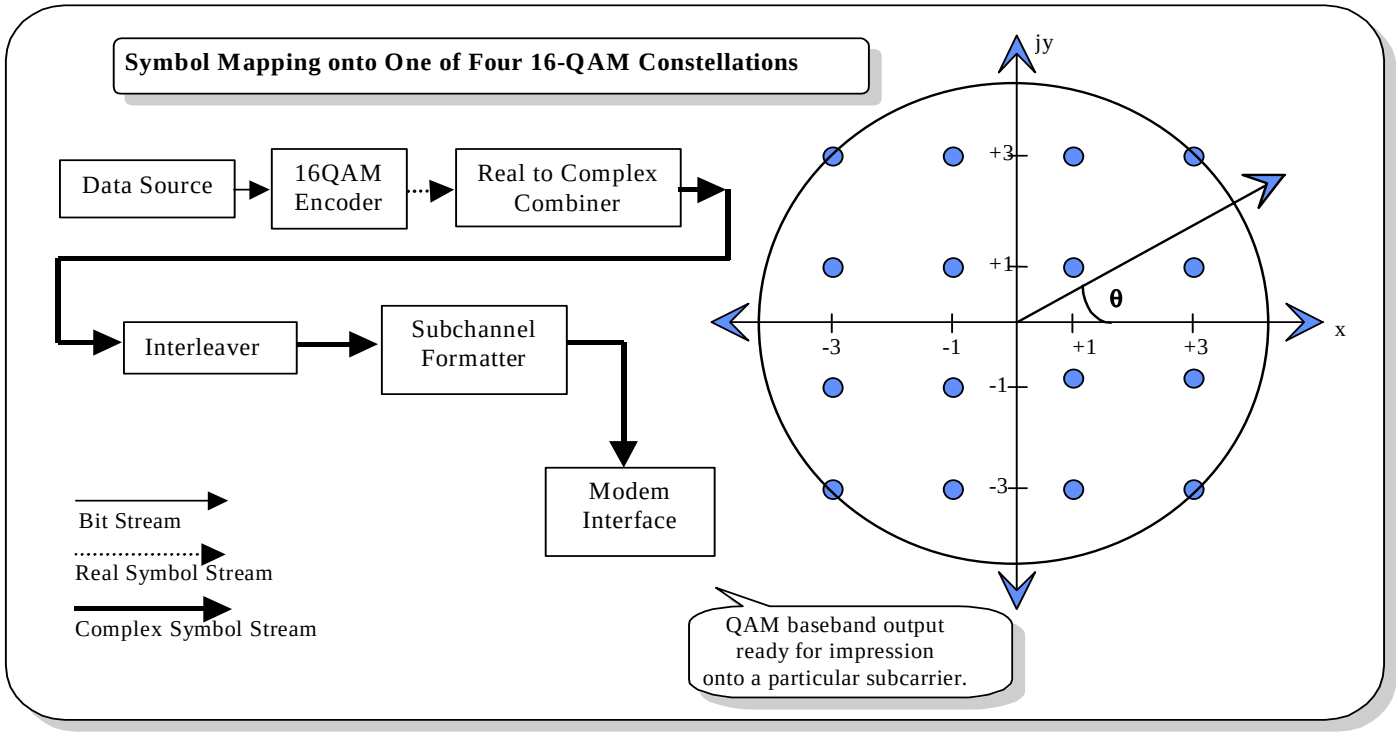

Figure 6-3: Symbol Mapping onto One of Four 16-QAM Constellations

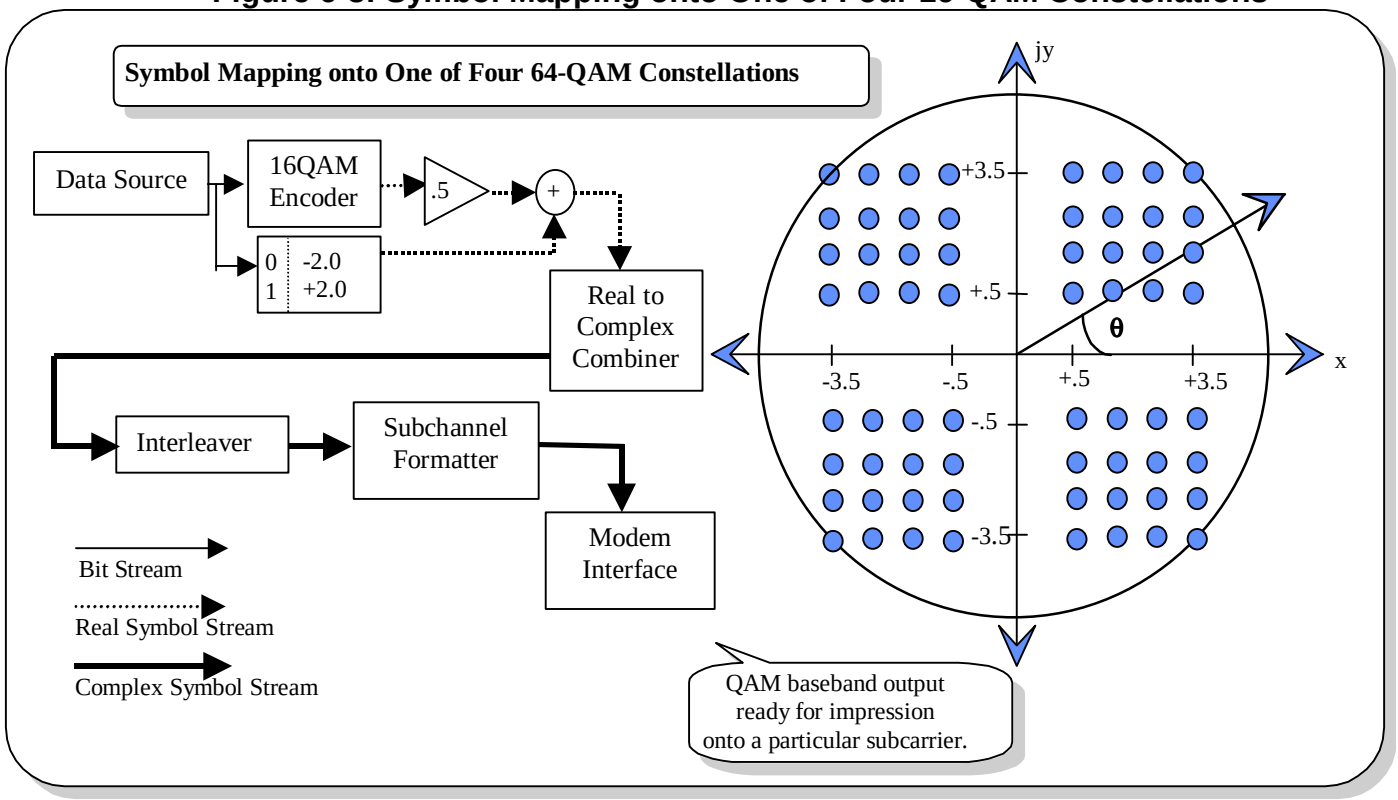

Figure 6-4: Symbol Mapping onto One of Four 64-QAM Constellations

6.3 Emission Mask -- Pursuant 47 CFR 2.1049(h) & 90.210(m)

The method described in paragraph 7.2 was employed with the following conditions:

For Quad-QPSK Modulation:
32K Bits Per Second Pseudo-Random Digital Modulation.
Vertical division: 10 dB/div.
Carrier Reference: Carrier Reference 0 dB corresponds to maximum and minimum peak output power settings, respectively.

For Quad-16QAM Modulation:
64K Bits Per Second Pseudo-Random Digital Modulation
Vertical: 10 dB/div
Carrier Reference: Carrier Reference 0 dB corresponds to maximum and minimum peak output power settings, respectively.

For Quad-64QAM Modulation:
96K Bits Per Second Pseudo-Random Digital Modulation
Vertical: 10 dB/div
Carrier Reference: Carrier Reference 0 dB corresponds to maximum and minimum peak output power settings, respectively.

In Figures 6-5 through Figure 6-22, one trace was used to capture transmitter performance, measured using a resolution bandwidth of 300 Hz, while the reference level was obtained by another trace, using a resolution bandwidth of 30 kHz. A third trace shows the applicable emission mask.

6.3.1 800 MHz Band Operation Measured Data

FCC Limits

- Per 47CFR90.210(g)
- Per EA SMR Emission Mask, 47CFR90.691(a)

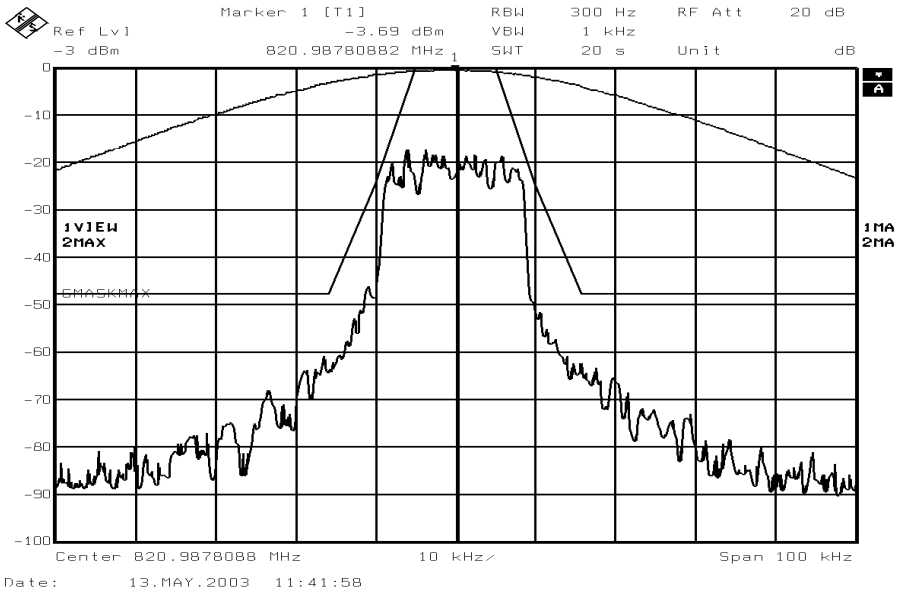

Figure 6-5: Quad-QPSK Modulation performance relative to mask 47 CFR 90.210(g) (MAXIMUM POWER SETTING)

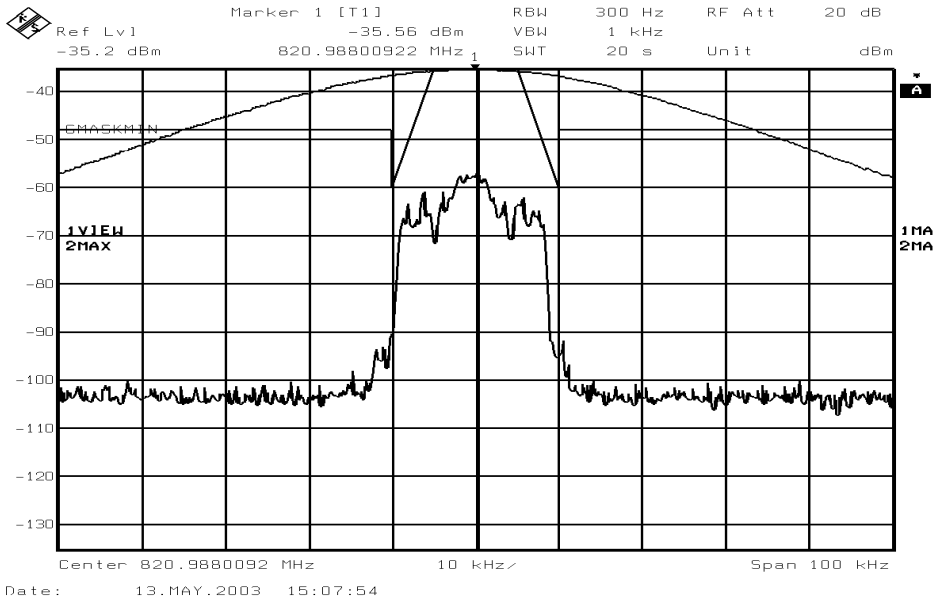

Figure 6-6: Quad-QPSK Modulation performance relative to mask 47 CFR 90.210(g) (MINIMUM POWER SETTING)

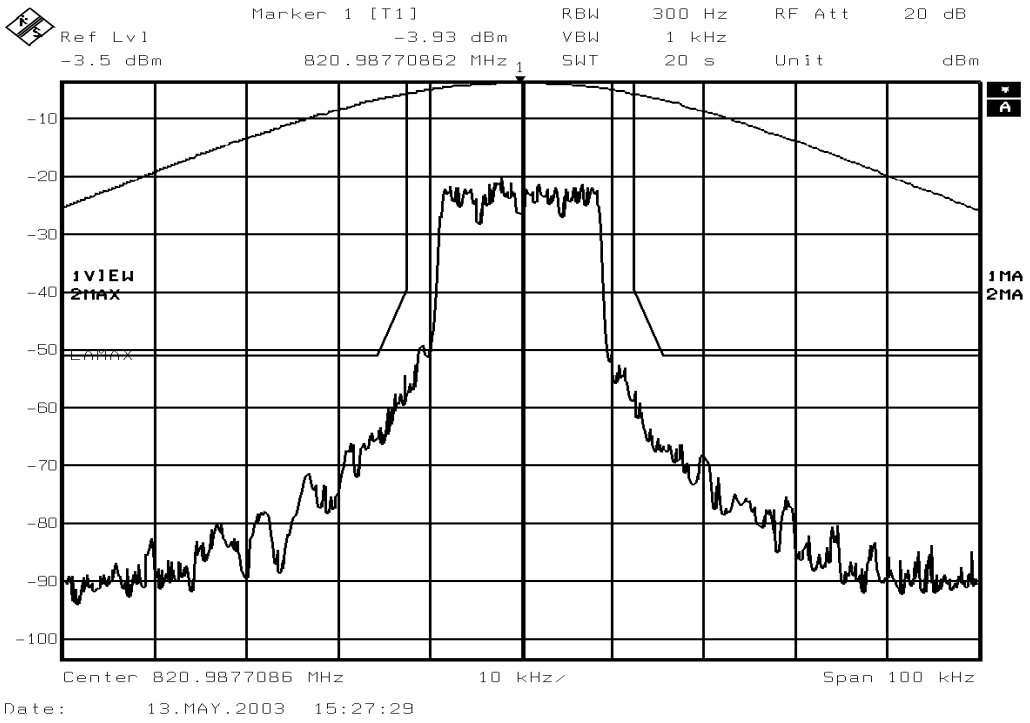

Figure 6-7: Quad-QPSK Modulation performance relative to mask 47 CFR 90.691. (MAXIMUM POWER SETTING)

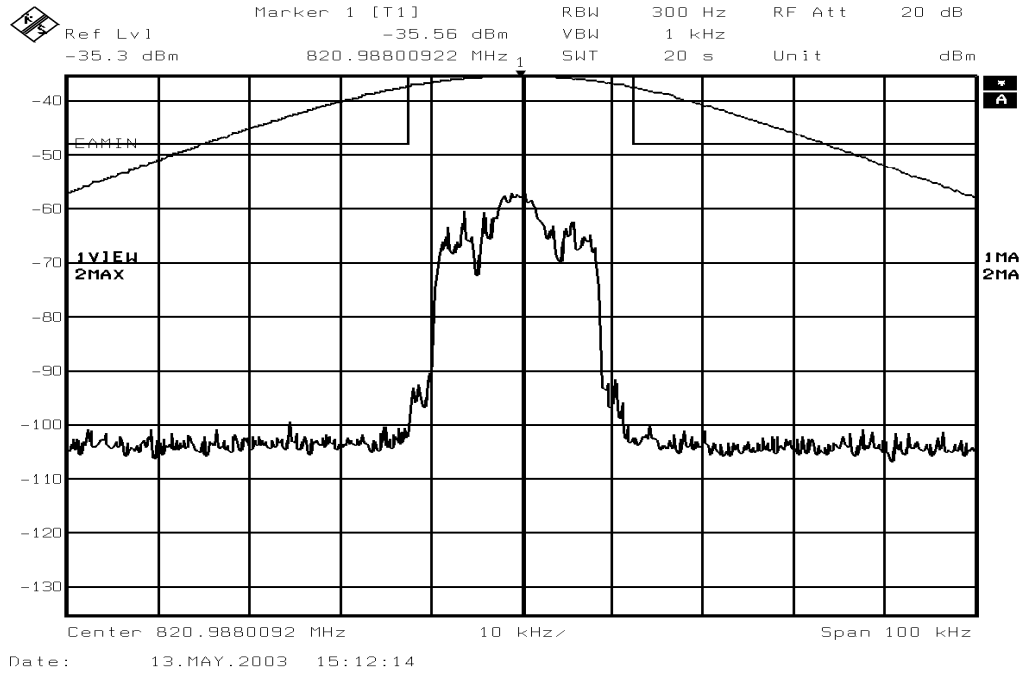

Figure 6-8: Quad-QPSK Modulation performance relative to mask 47 CFR 90.691. (MINIMUM POWER SETTING)

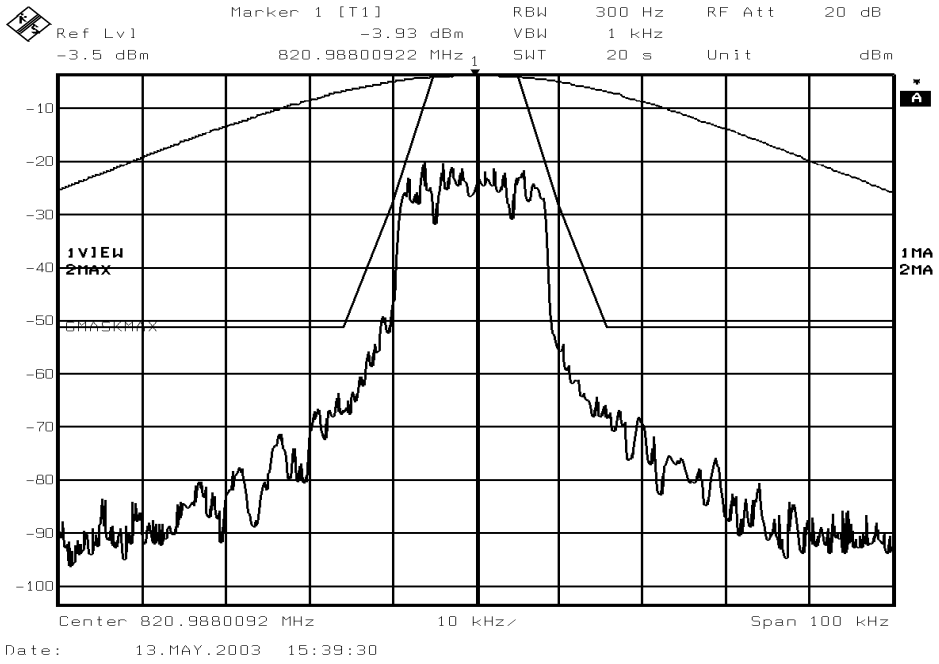

Figure 6-9a: Quad-16QAM Modulation performance relative to mask 47 CFR 90.210(g)
(MAXIMUM POWER SETTING)

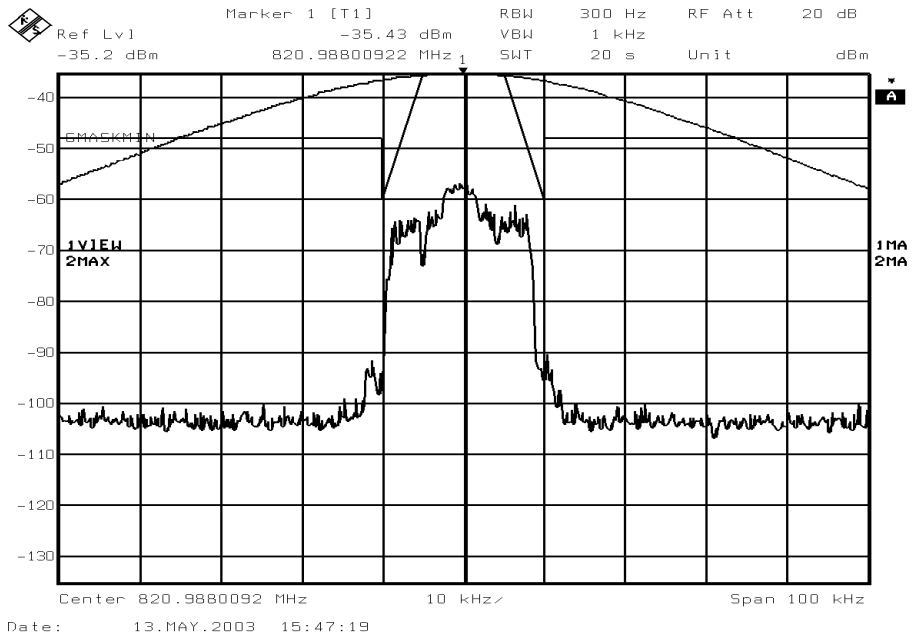

Figure 6-10a: Quad-16QAM Modulation performance relative to mask 47 CFR 90.210(g)
(MINIMUM POWER SETTING)

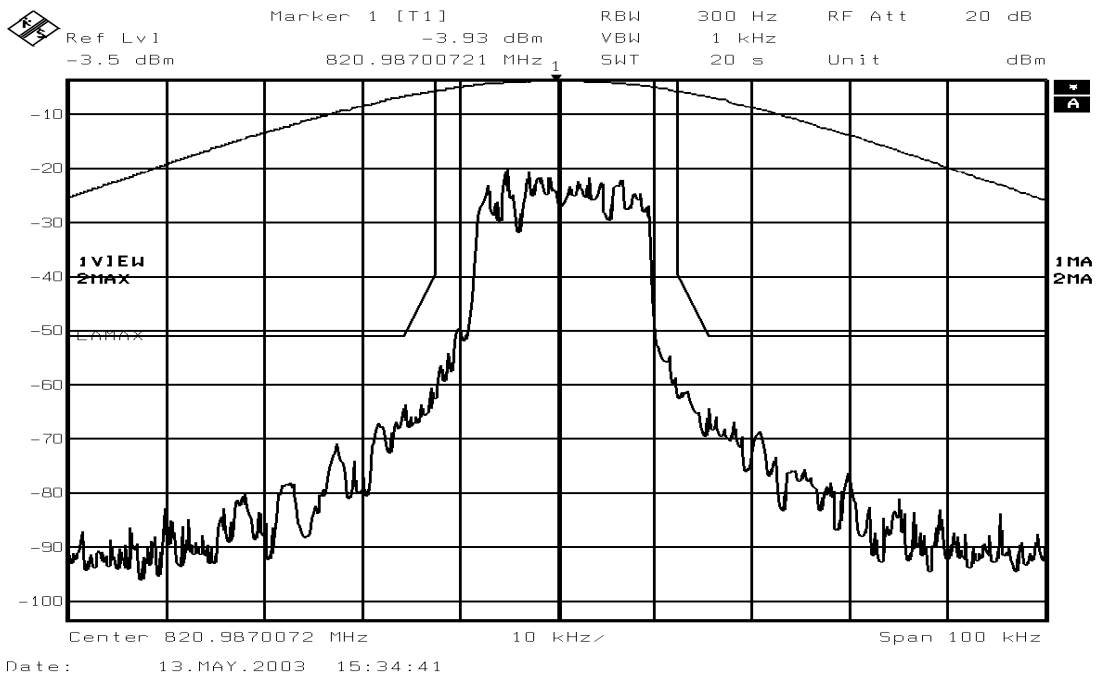

Figure 6-11a: Quad-16QAM Modulation performance relative to mask 47 CFR 90.691.
(MAXIMUM POWER SETTING)

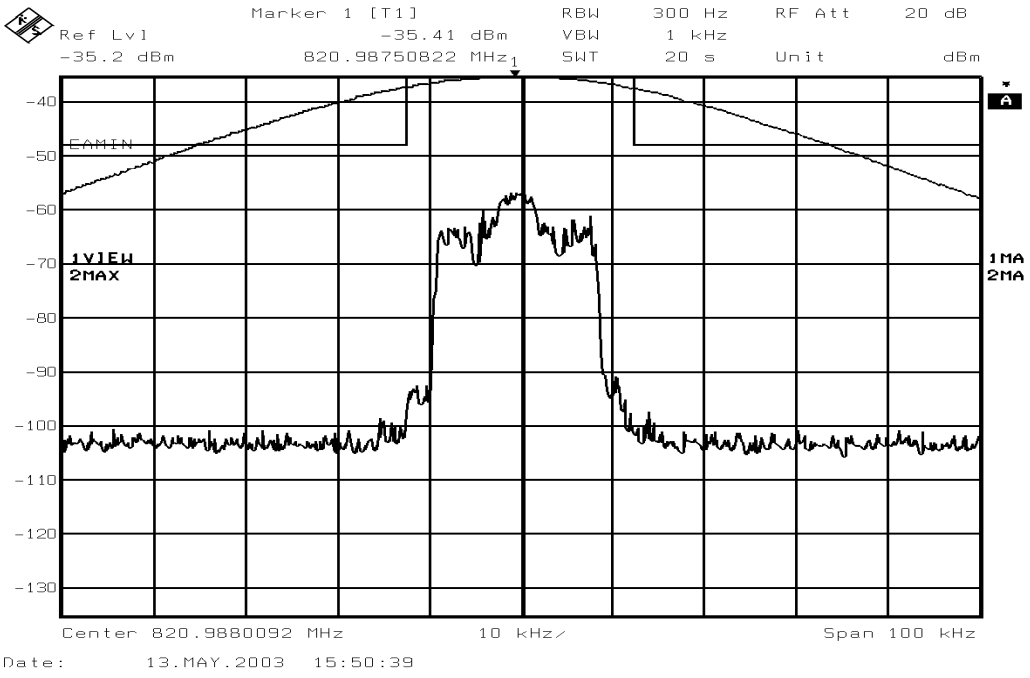

Figure 6-12a: Quad-16QAM Modulation performance relative to mask 47 CFR 90.691.

(MINIMUM POWER SETTING)

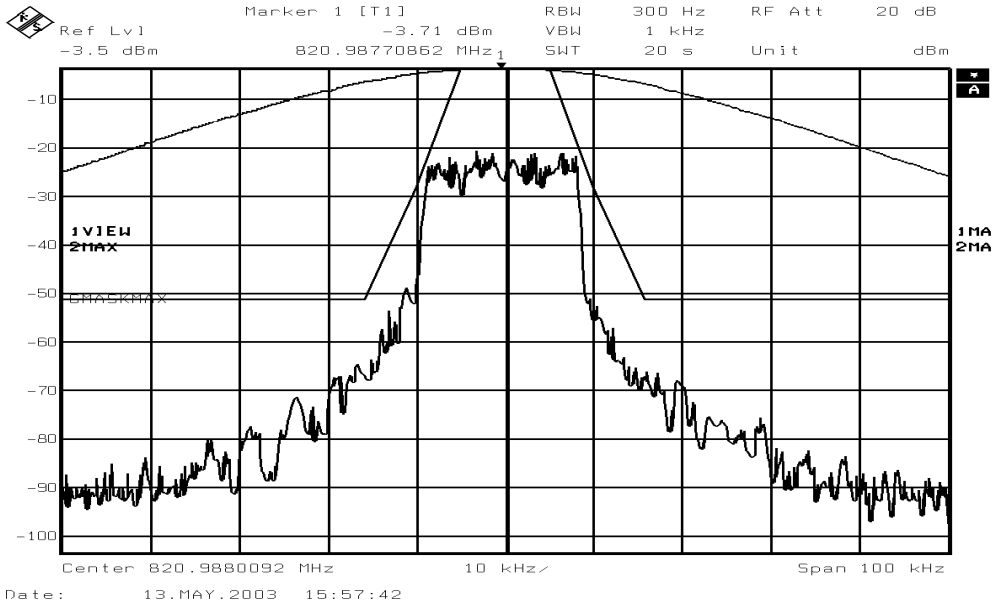

Figure 6-13: Quad-64QAM Modulation performance relative to mask 47 CFR 90.210(g)
(MAXIMUM POWER SETTING)

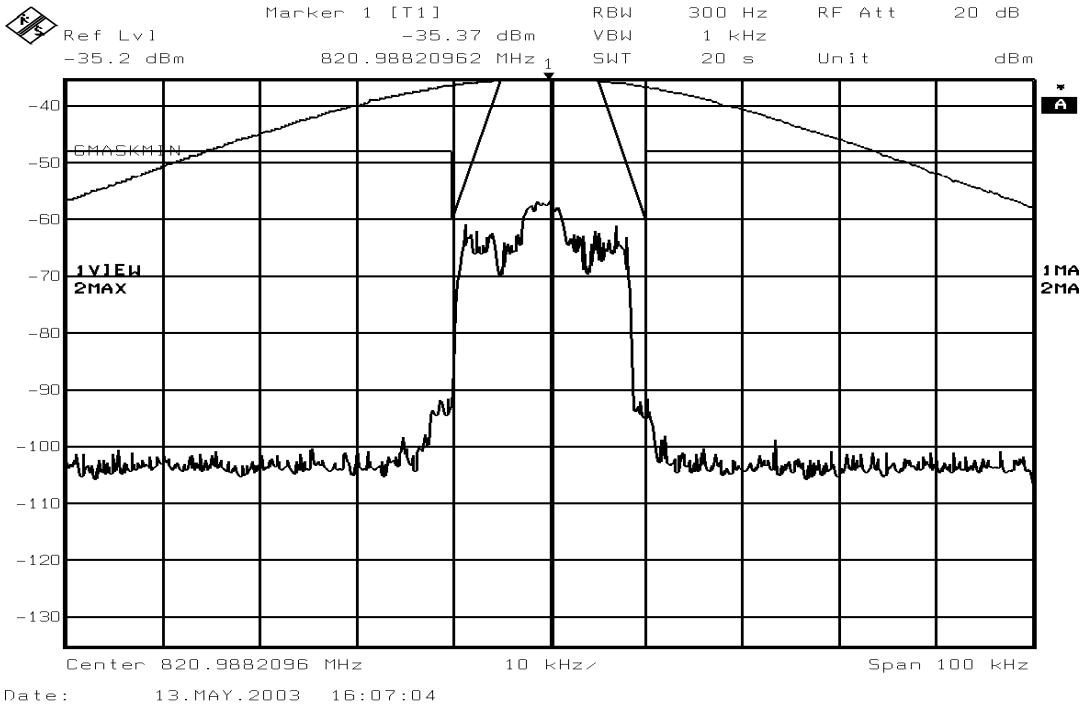

Figure 6-14: Quad-64QAM Modulation performance relative to mask 47 CFR 90.210(g)
(MINIMUM POWER SETTING)

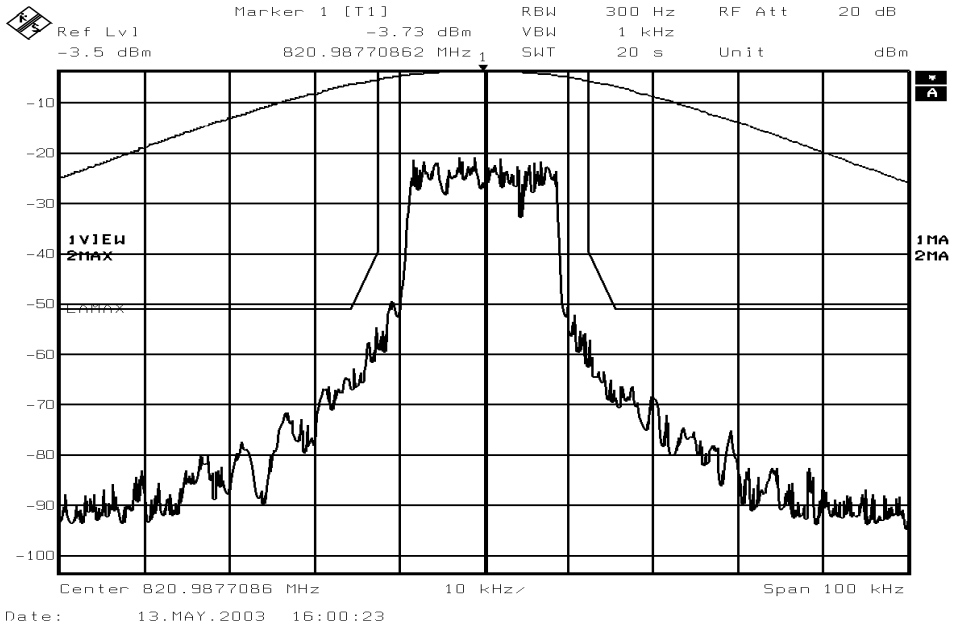

Figure 6-15: Quad-64QAM Modulation performance relative to mask 47 CFR 90.691. (MAXIMUM POWER SETTING)

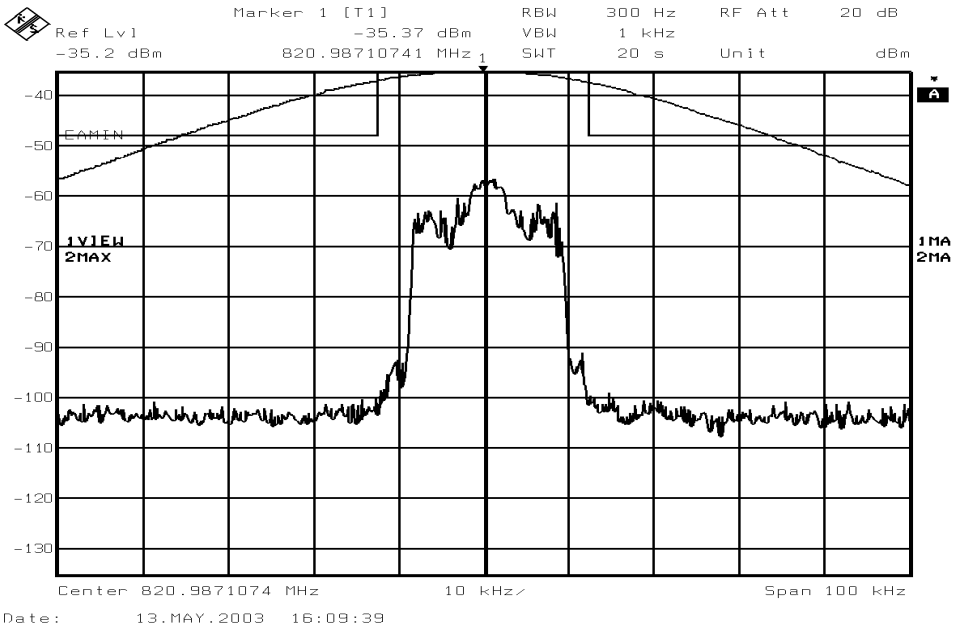

Figure 6-16: Quad-64QAM Modulation performance relative to mask 47 CFR 90.691. (MINIMUM POWER SETTING)

6.3.2. 900 MHz Band Operation Measured Data

FCC Limits

- Per 47 CFR 90.669(a)

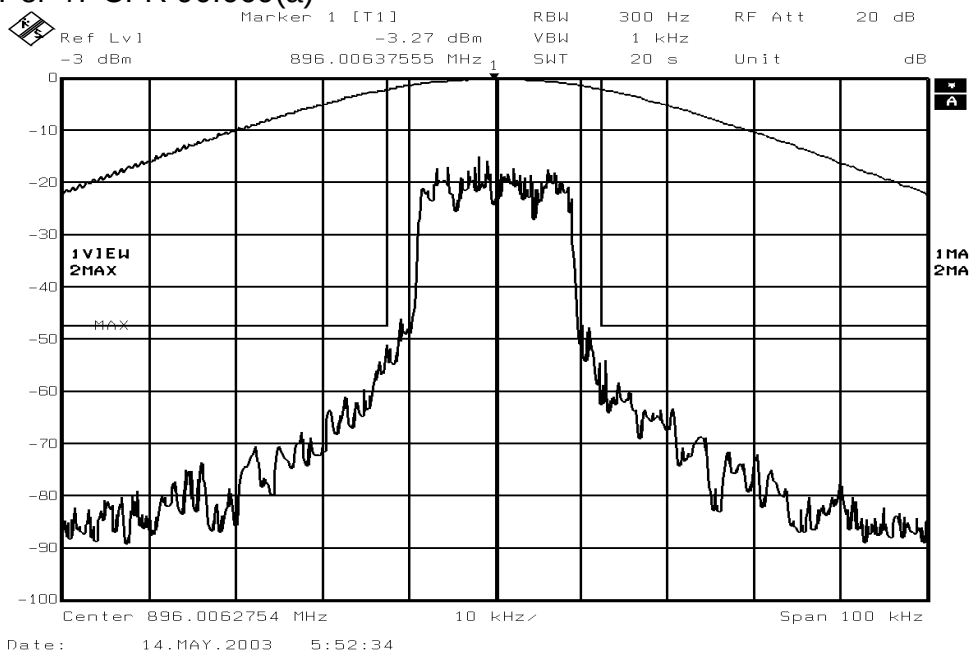

Figure 6-17: Quad-QPSK Modulation performance relative to mask 47 CFR 90.669(a)
(MAXIMUM POWER SETTING)

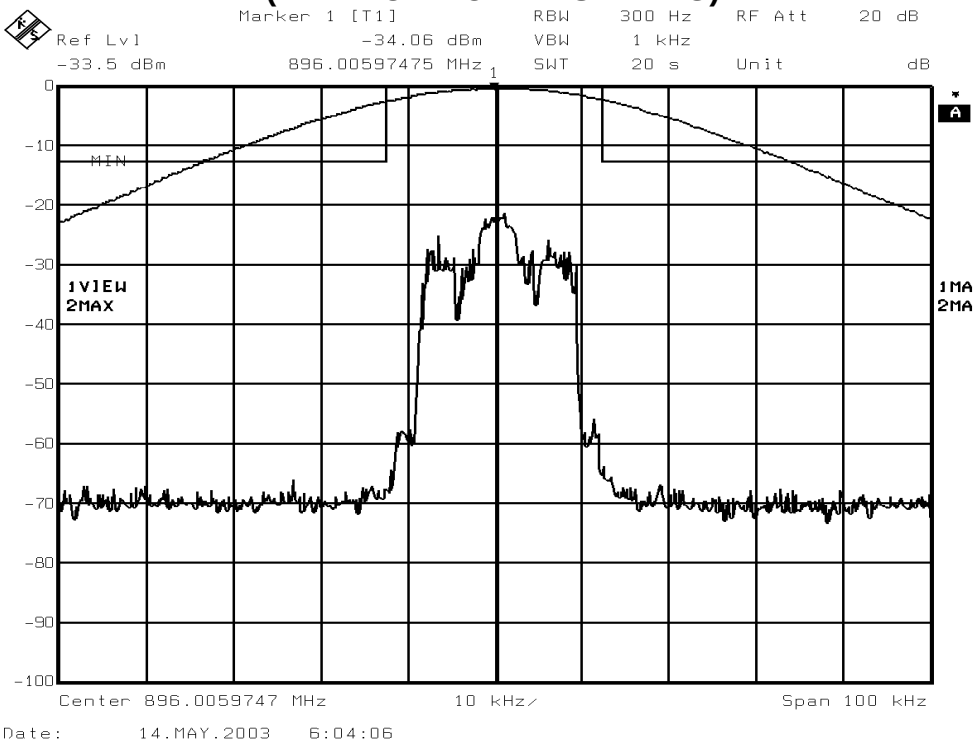

Figure 6-18: Quad-QPSK Modulation performance relative to mask 47 CFR 90.669(a)
(MINIMUM POWER SETTING)

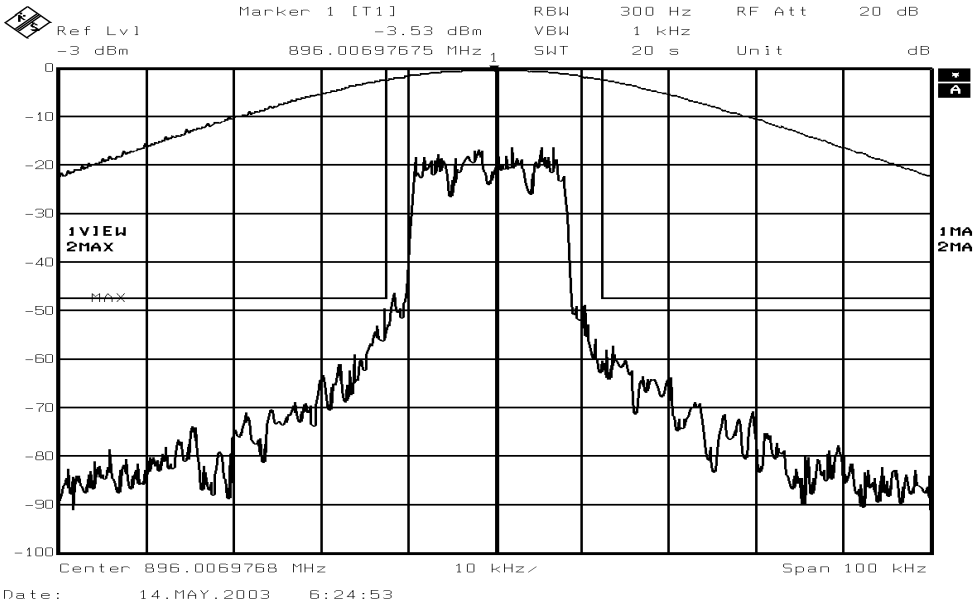

Figure 6-19a: Quad-16QAM Modulation performance relative to mask 47 CFR 90.669(a)
(MAXIMUM POWER SETTING)

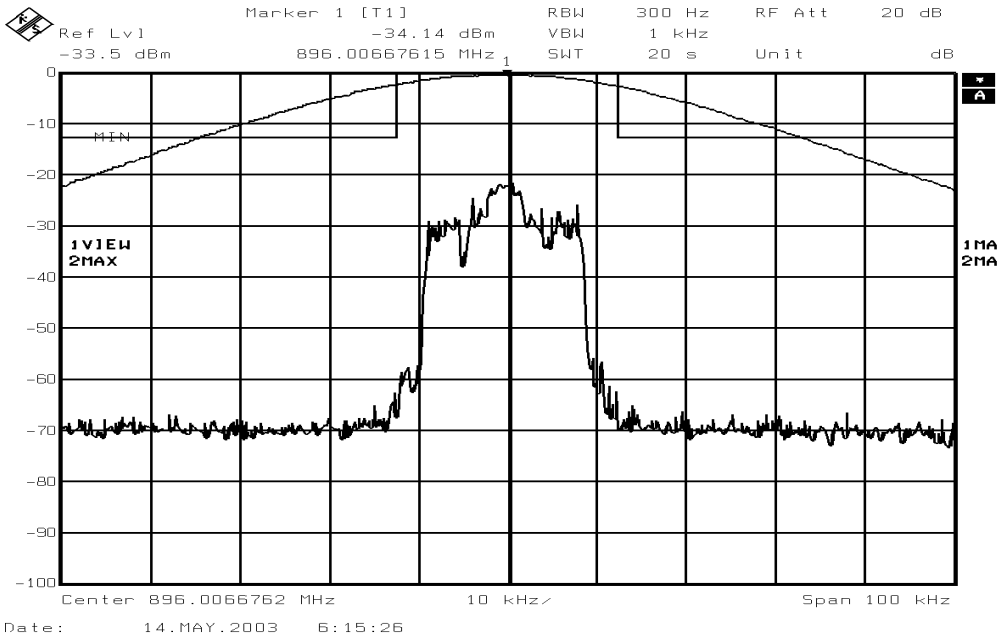

Figure 6-20a: Quad-16QAM Modulation performance relative to mask 47 CFR 90.669(a)
(MINIMUM POWER SETTING)

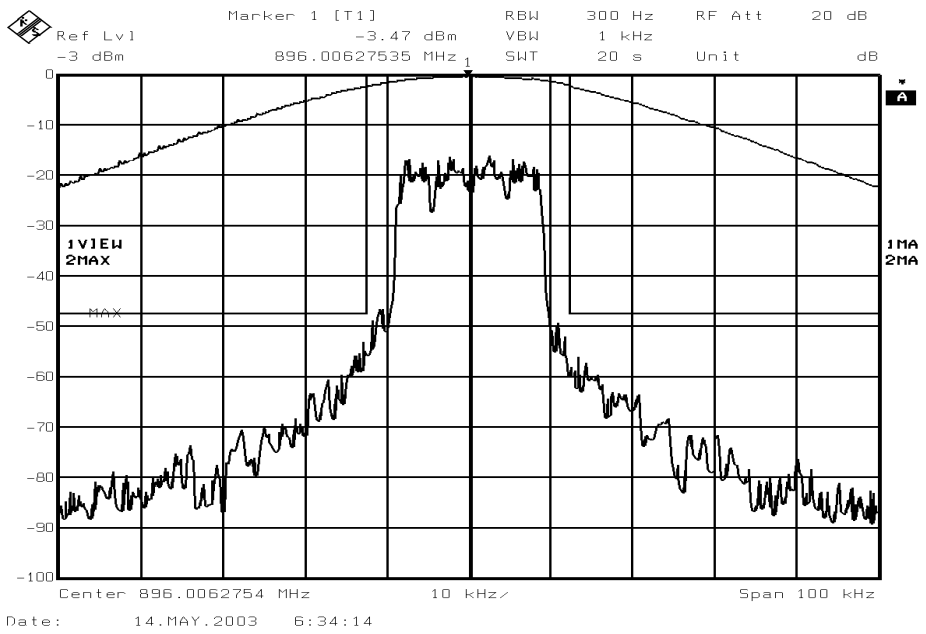

Figure 6-21: Quad-64QAM Modulation performance relative to mask 47 CFR 90.669(a)
(MAXIMUM POWER SETTING)

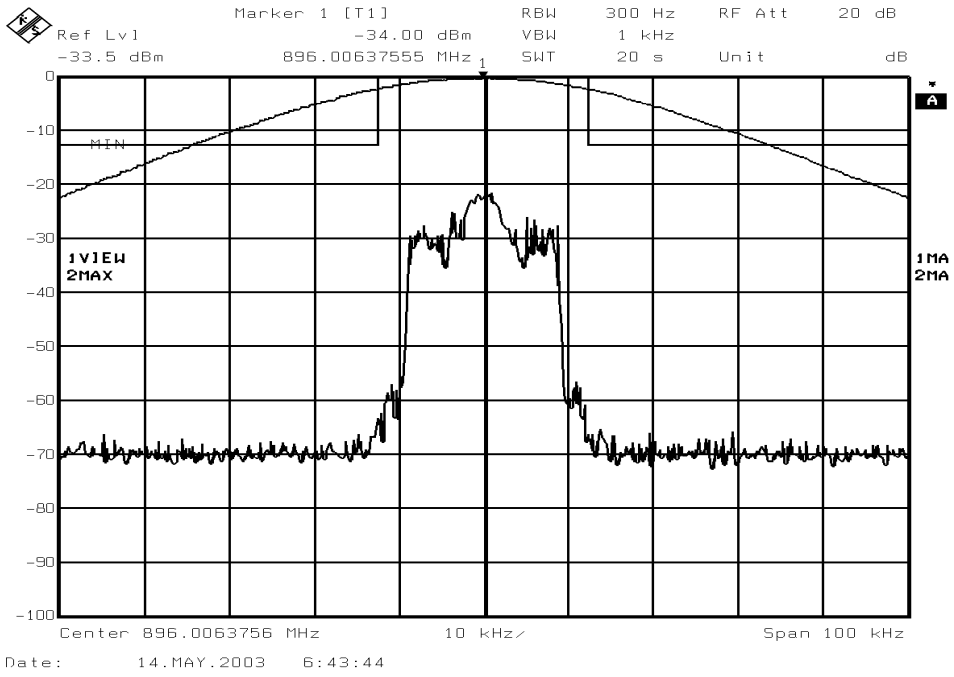

Figure 6-22: Quad-64QAM Modulation performance relative to mask 47 CFR 90.669(a)
(MINIMUM POWER SETTING)