Exhibit 6

INDEX OF TEST RESULTS

Exhibit #	Description
6A	800 MHz band / Part 22 / AMPS : RF Power
6B	800 MHz band / Part 22 / AMPS : Modulation Characteristics
6C	800 MHz band / Part 22 / AMPS : Occupied Bandwidth
6D	800 MHz band / Part 22 / AMPS : Spurious Emissions (conducted)
6E	800 MHz band / Part 22 / AMPS : Spurious Emissions (radiated)
6F	800 MHz band / Part 22 / AMPS : Frequency Stability
6G	800 MHz band / Part 22 / DAMPS : RF Power
6H	800 MHz band / Part 22 / DAMPS : Modulation Characteristics
6I	800 MHz band / Part 22 / DAMPS : Occupied Bandwidth
6J	800 MHz band / Part 22 / DAMPS : Spurious Emissions (conducted)
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6L	800 MHz band / Part 22 / DAMPS : Frequency Stability
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6N	1900 MHz band / Part 24 : Modulation Characteristics
6O	1900 MHz band / Part 24 : Occupied Bandwidth
6P	1900 MHz band / Part 24 : Spurious Emissions (conducted)
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6R	1900 MHz band / Part 24 : Frequency Stability

Exhibit 6A1

800 MHz AMPS RF POWER OUTPUT

Para. 2.1046 (a) and 22.913 (a)

The RF power at the band center, measured at the antenna connector using a communications test set as the specified load, are plotted against supply voltage variations and temperature variations at the highest power levels for each modulation type.

Exhibit	Input Voltage	Temperature	P_o	Modulation (Freq)	Power Level
6A2	6.0, 13.6	Varied	3 W	Analog (800)	0 (CLASS 1)
6A3	6.0 Varied ± 15%	+25 C	3 W	Analog (800)	0 (CLASS 1)
6A4	13.6 Varied ± 20%	+25 C	3 W	Analog (800)	0 (CLASS 1)
6A5	6.0	Varied	0.355 W	Analog (800)	0 (CLASS 4)
6A6	6.0 Varied ± 15%	+25 C	0.355 W	Analog (800)	0 (CLASS 4)

Note: The 6V input voltage is varied ± 15%, even though the manufacturer's rated supply voltage is 5.2 VDC to 6.8 VDC; the 13.6V input is varied over its 20% rated range of 10.9 VDC to 16.3 VDC. The 13.6 V supply voltage is only used by the CLASS 1 AMPS mode (not used with CLASS 4 mode). The manufacturer's specified temperature range is –40 ^{o}C to +70 ^{o}C. The output power is calibrated at the center of the band at room temperature.

These measurements were made per EIA/TIA IS-137A using the following equipment:

Anritsu MT8801B	Radio Communication Analyzer
HP E3632A	DC Power Supply (2)
ESPEC Model SH-240	Temperature Chamber

The DM20 Transceiver has been designed as an OEM module for use by various OEM integrators. The transmitter section delivers up to 3 watts (burst) of output power to an RF connector designed for attachment to a customer-supplied cable and antenna. Also, due to the burst mode characteristics of the transmitter in its highest power rating (3W), SAR measurements are not possible. Since an antenna and cable is not provided to the customer, the substitution method per IS-137A of measuring effective radiated power data, and a comparison to SAR measurements, is not available.

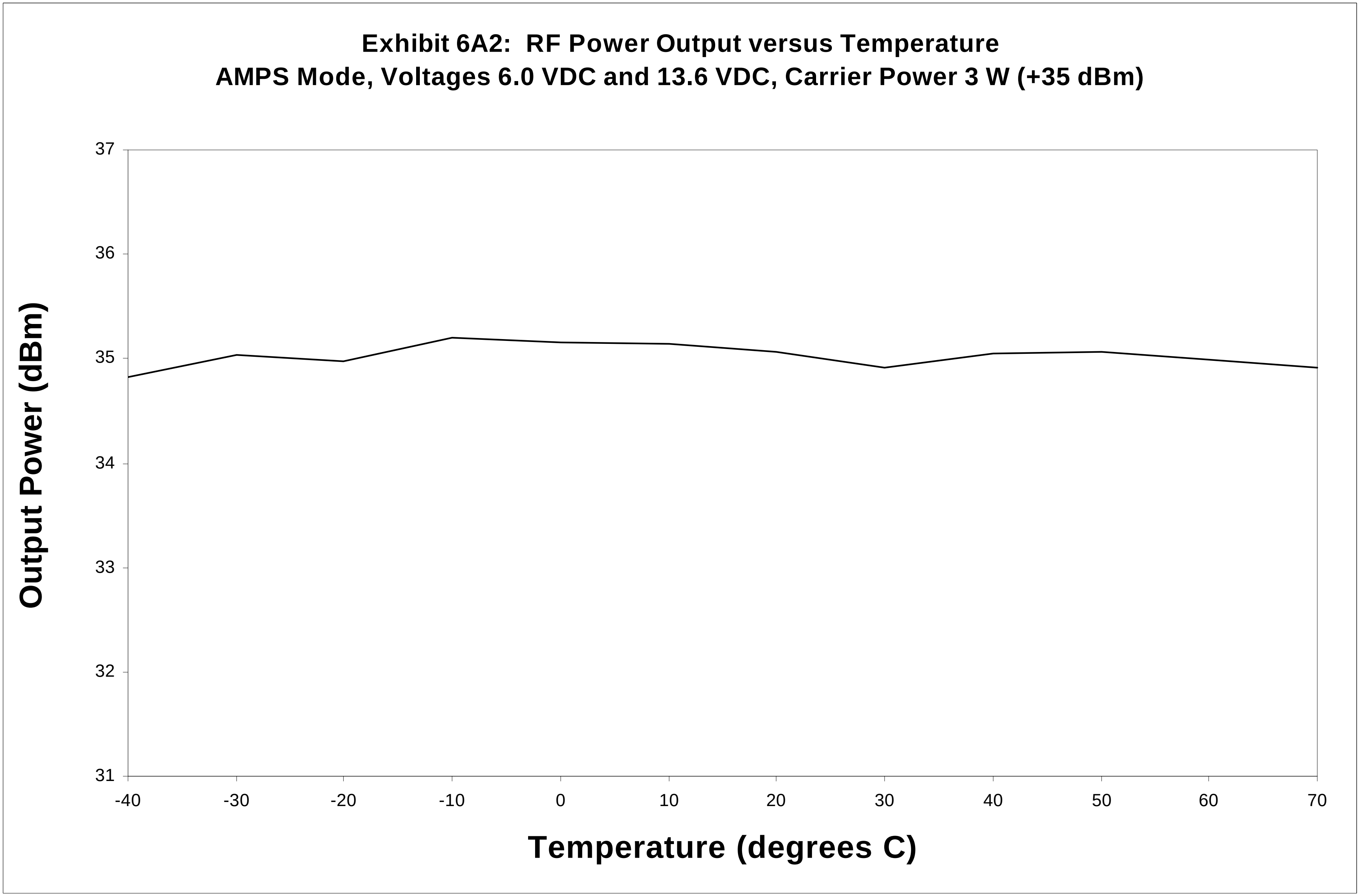


Exhibit 6A2: RF Power Output versus Temperature
AMPS Mode, Voltages 6.0 VDC and 13.6 VDC, Carrier Power 3 W (+35 dBm)
Output Power (dBm)
37
36
35
34
33
32
31
-40
-30
-20
-10
0
10
20
30
40
50
60
70
Temperature (degrees C)

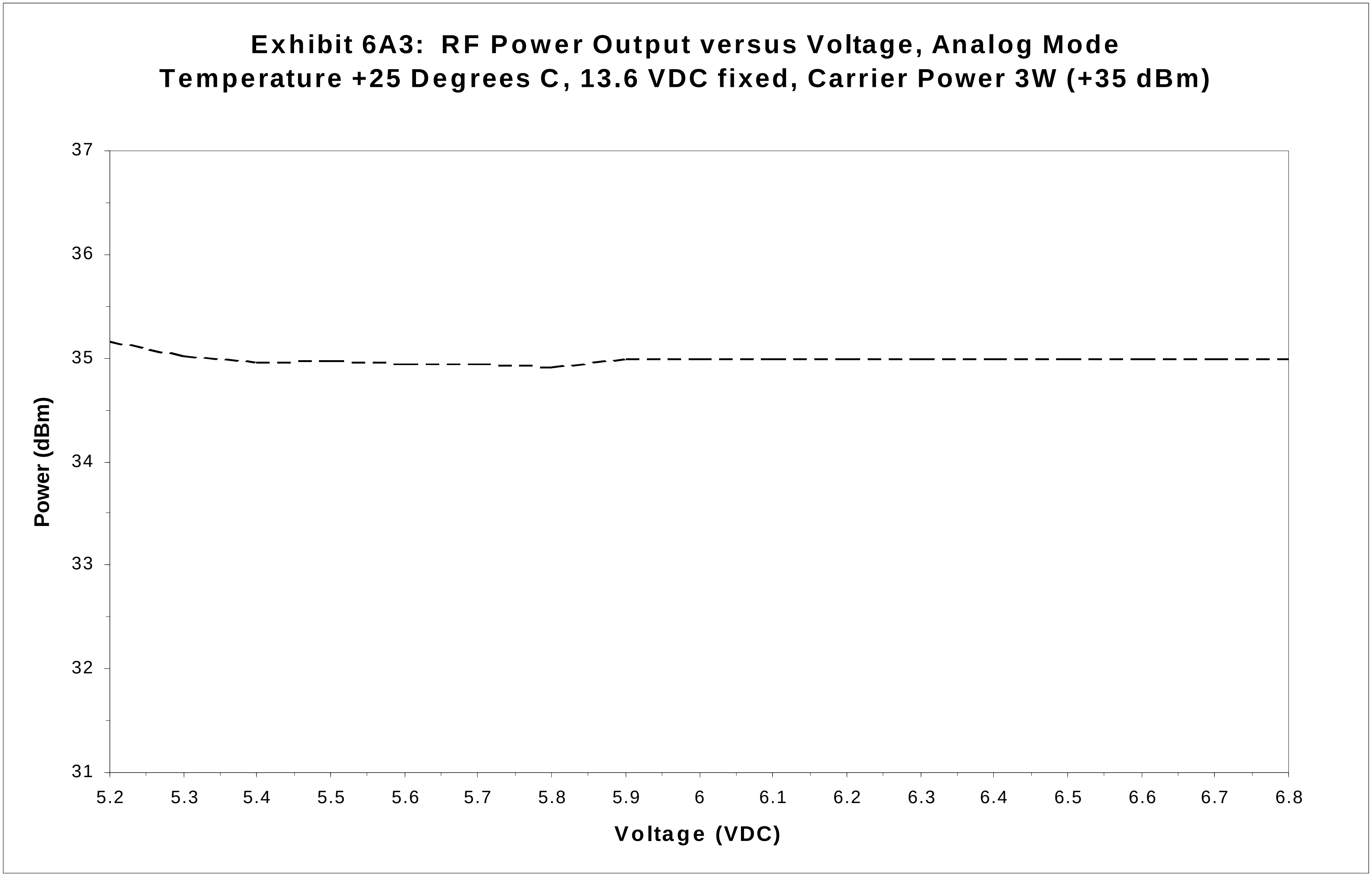


Exhibit 6A3: RF Power Output versus Voltage, Analog Mode
Temperature +25 Degrees C, 13.6 VDC fixed, Carrier Power 3W (+35 dBm)
Power (dBm)
37
36
35
34
33
32
31
5.2
5.3
5.4
5.5
5.6
5.7
5.8
5.9
6
6.1
6.2
6.3
6.4
6.5
6.6
6.7
6.8
Voltage (VDC)

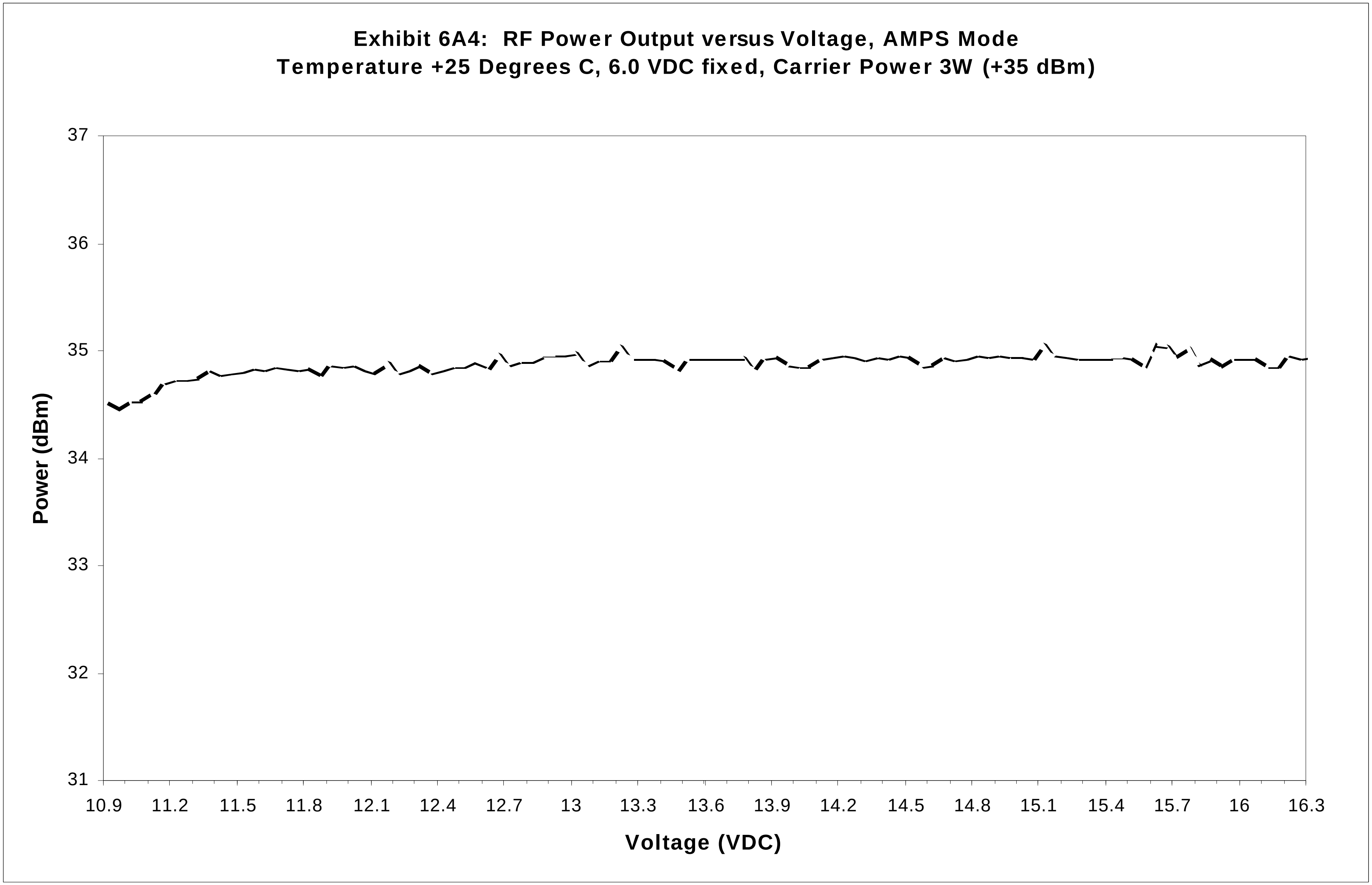


Exhibit 6A4: RF Power Output versus Voltage, AMPS Mode
Temperature +25 Degrees C, 6.0 VDC fixed, Carrier Power 3W (+35 dBm)
Power (dBm)
37
36
35
34
33
32
31
10.9
11.2
11.5
11.8
12.1
12.4
12.7
13
13.3
13.6
13.9
14.2
14.5
14.8
15.1
15.4
15.7
16
16.3
Voltage (VDC)

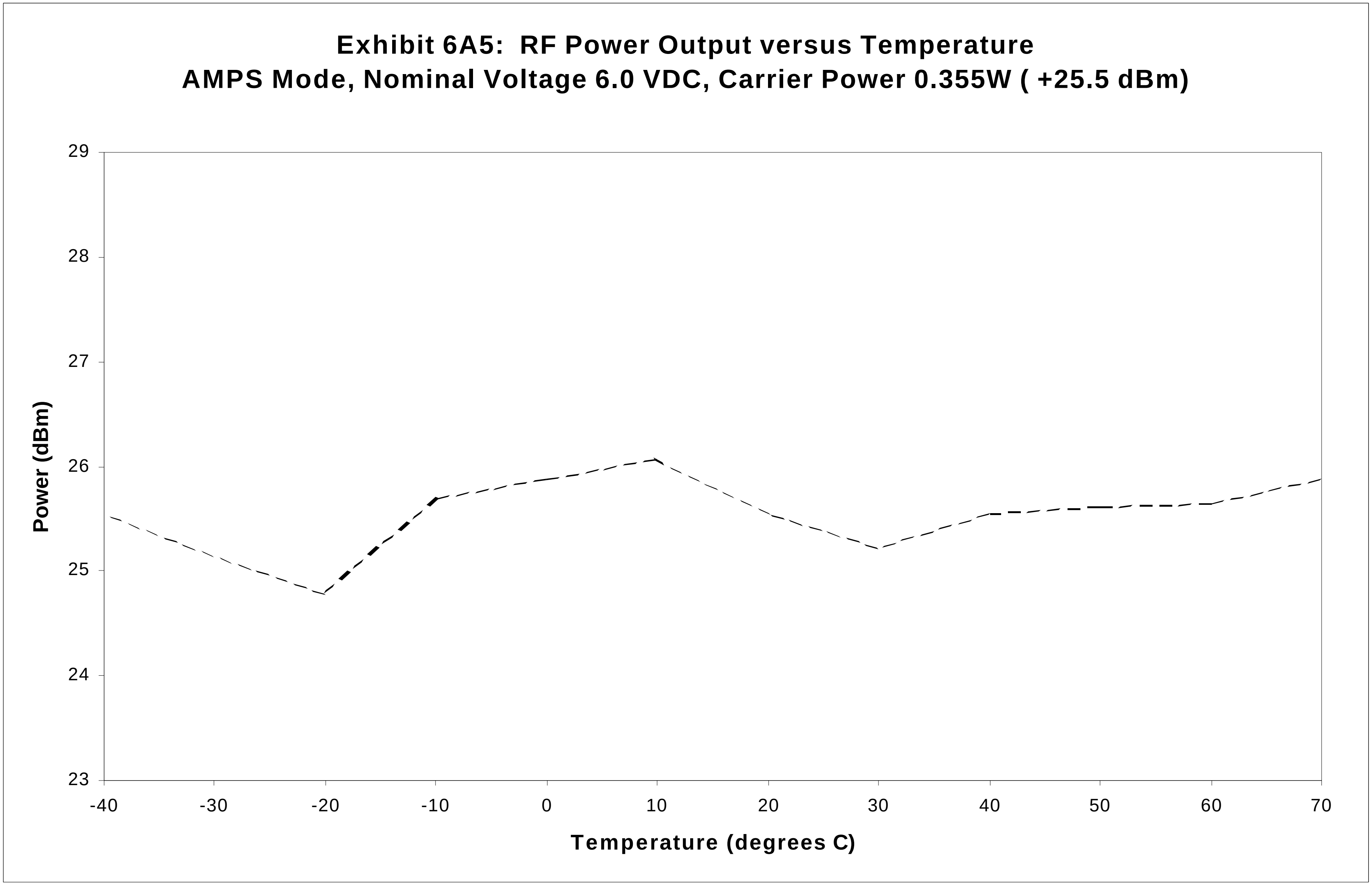


Exhibit 6A5: RF Power Output versus Temperature
AMPS Mode, Nominal Voltage 6.0 VDC, Carrier Power 0.355W (+25.5 dBm)
Power (dBm)
29
28
27
26
25
24
23
-40
-30
-20
-10
0
10
20
30
40
50
60
70
Temperature (degrees C)

Exhibit 6A6: RF Power Output versus 6V Input Voltage, AMPS Mode
Temperature +25 degrees C, Carrier Power 0.355 W (+25.5 dBm)

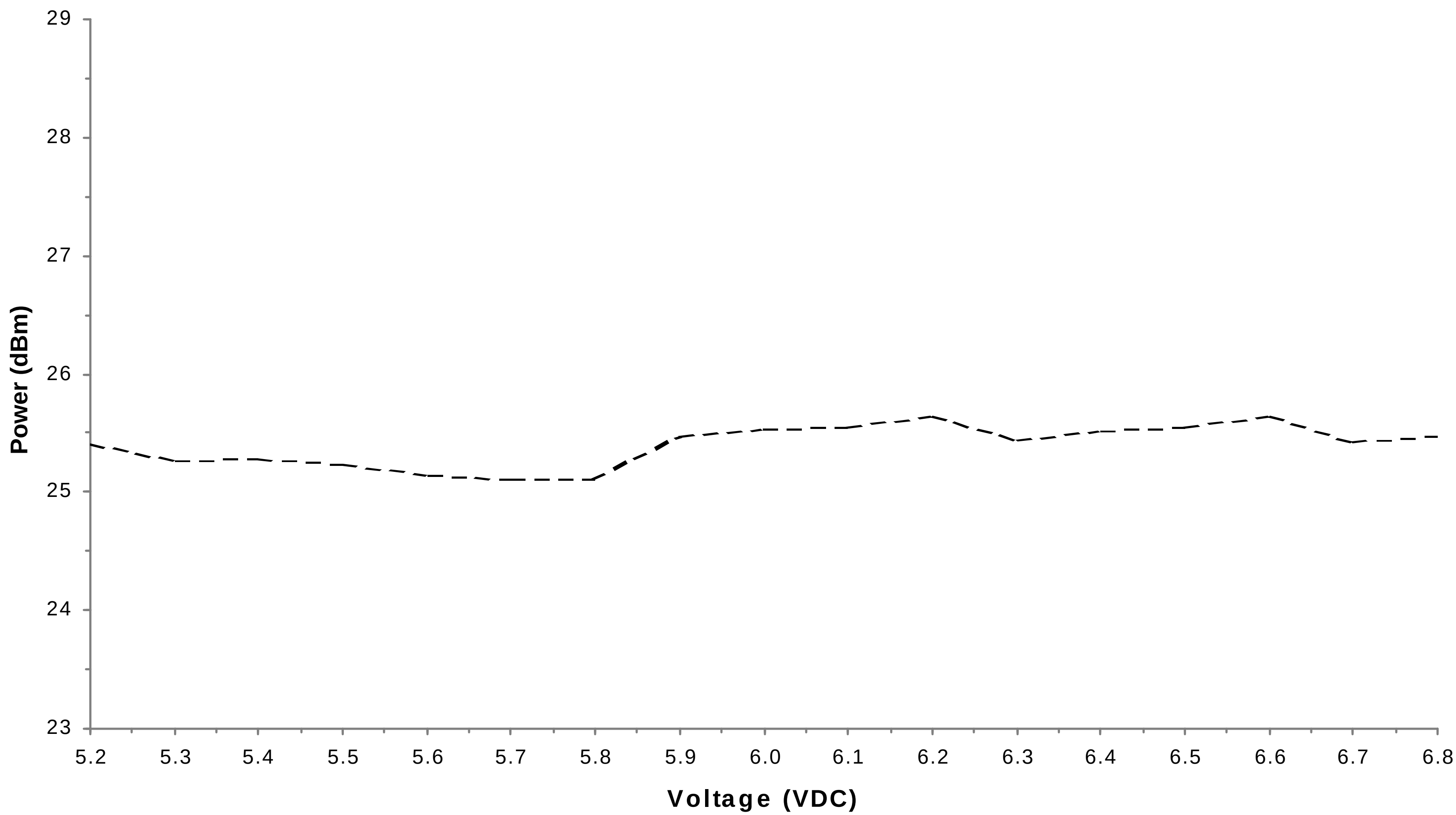


Exhibit 6B1

800 MHz AMPS MODULATION CHARACTERISTICS

Para. 2.1047 (a), (b) and 22.915 (b)(1), (d)(1)

The frequency and amplitude response to audio inputs measured per TIA/EIA IS-137A are shown on the following:

Exhibit #

6B2	Transmit Audio Frequency Response	2.1047 (a)	IS-137A para. 3.3.1.2.2.2
6B3	Post Limiter Filter Attenuation	22.915 (d)(1)	IS-137A para. 3.3.1.2.2.2
6B4	Modulation Limiting vs. Input Voltage	2.1047 (b)	

NOTE: Exhibit 6B4 Modulation Limiting versus Input Signal – the plot includes the audio frequency (1800 Hz) that produced the highest level of deviation.

These measurements were made per TIA/EIA IS-137A using the following equipment:

HP8901B	Modulation Analyzer
HP8903B	Audio Analyzer
HP8904A	Multifunction Synthesizer
HP E3632A	DC Power Supply (2)

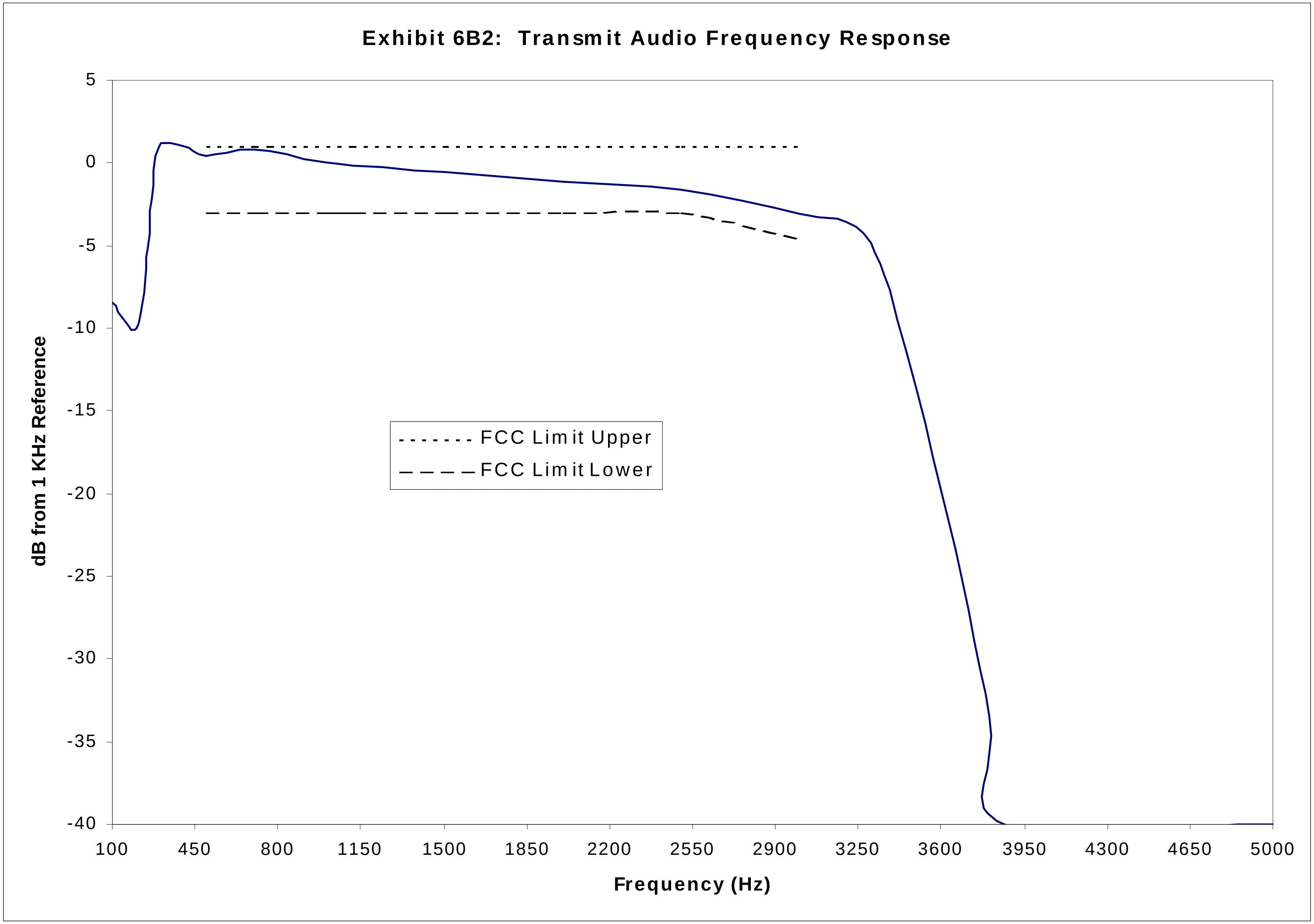


Exhibit 6B2: Transmit Audio Frequency Response
5
0
-5
-10
-15
-20
-25
-30
-35
-40
dB from 1 KHz Reference
FCC Limit Upper
FCC Limit Lower
100
450
800
1150
1500
1850
2200
2550
2900
3250
3600
3950
4300
4650
5000
Frequency (Hz)

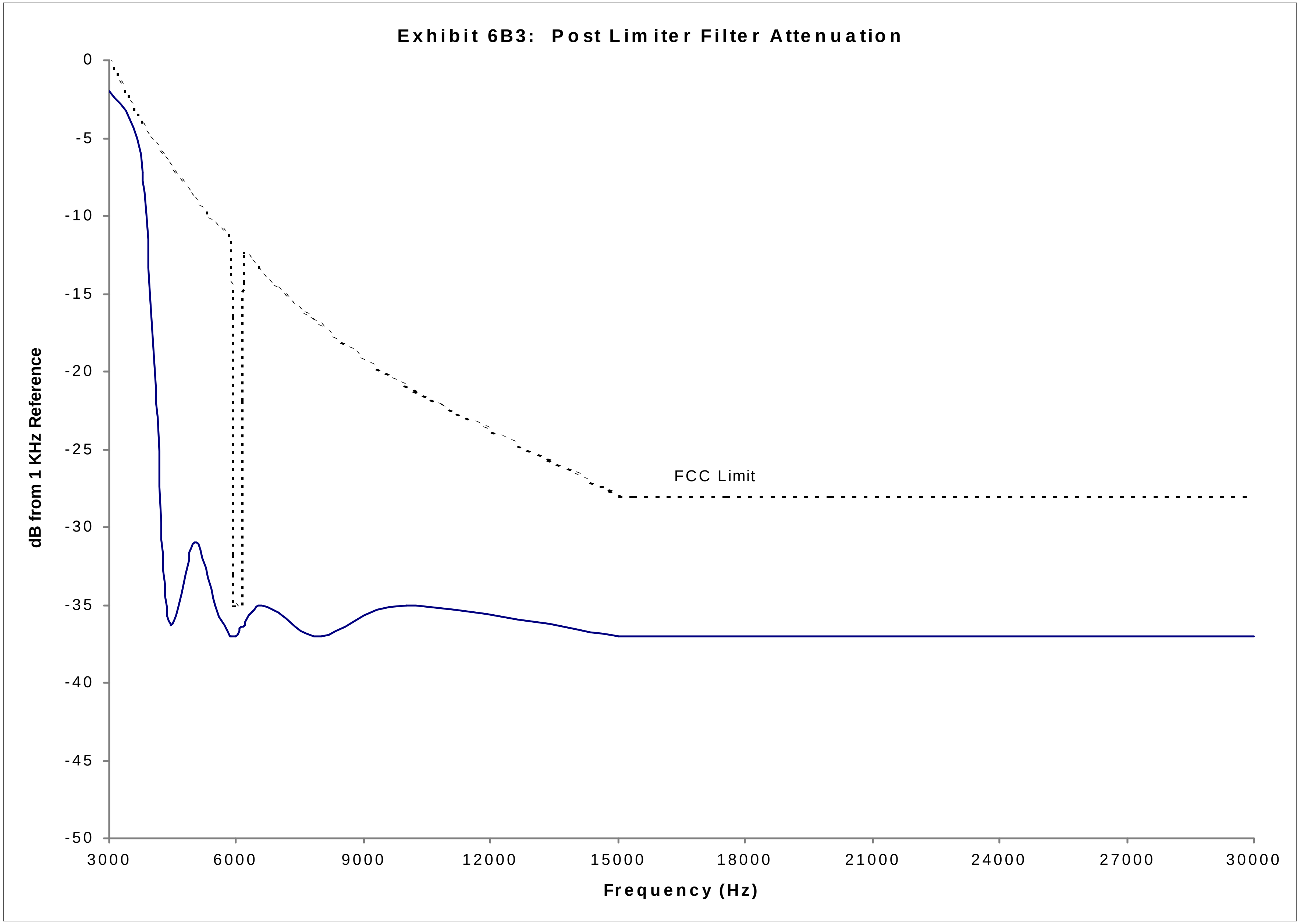


Exhibit 6B3: Post Limiter Filter Attenuation
0
-5
-10
-15
-20
-25
-30
-35
-40
-45
-50
dB from 1 KHz Reference
FCC Limit
3000
6000
9000
12000
15000
18000
21000
24000
27000
30000
Frequency (Hz)

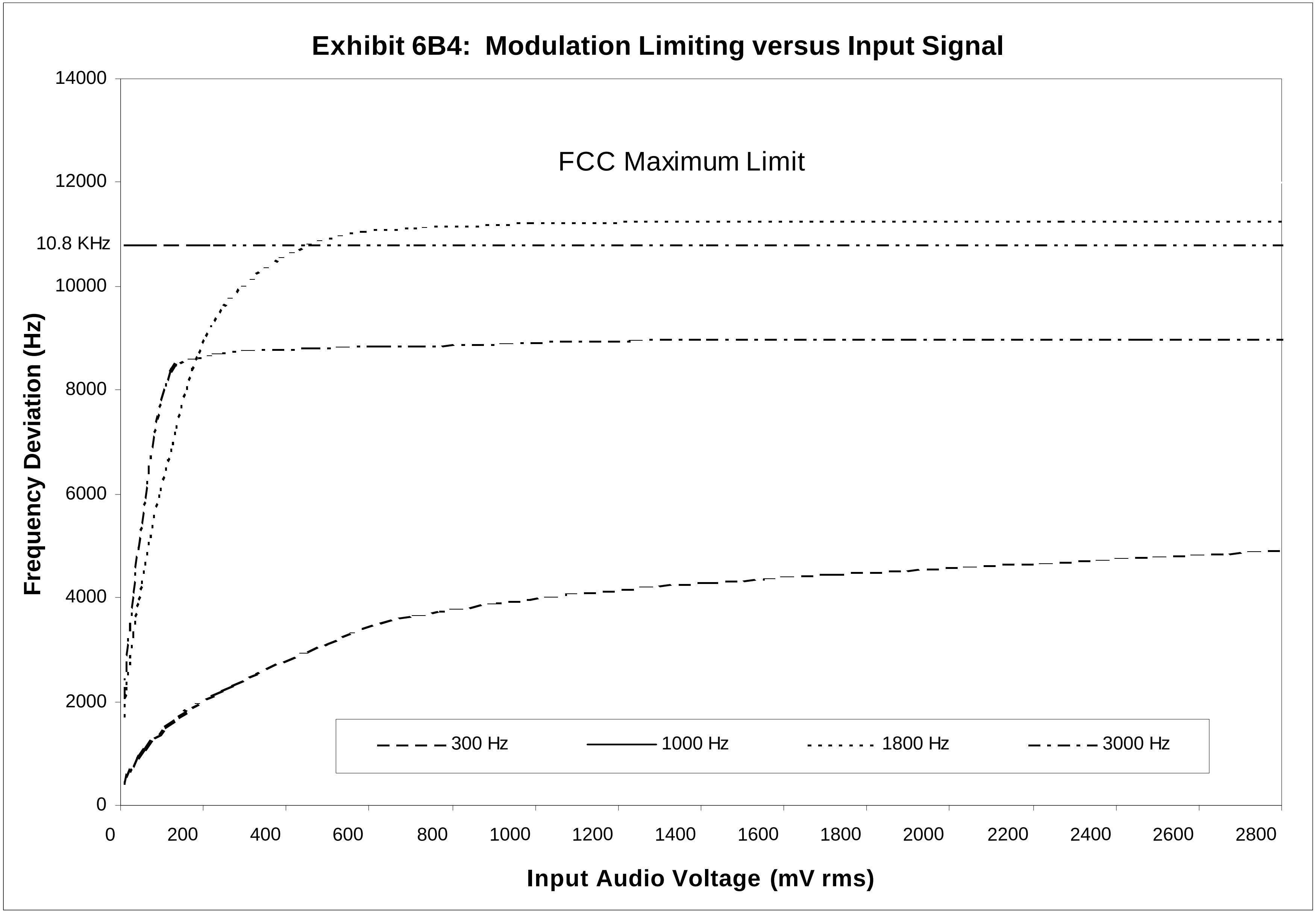


Exhibit 6B4: Modulation Limiting versus Input Signal
FCC Maximum Limit
10.8 KHz
Frequency Deviation (Hz)
14000
12000
10000
8000
6000
4000
2000
0
0
200
400
600
800
1000
1200
1400
1600
1800
2000
2200
2400
2600
2800
Input Audio Voltage (mV rms)
300 Hz
1000 Hz
1800 Hz
3000 Hz

Exhibit 6C1

OCCUPIED BANDWIDTH

Per 2.1049 (c) (1) and 22.917 (d), the exhibits presented show the modulations that co-exist in a cellular system:

Exhibit #	Description	Power Level	Frequency (MHz)
6C2	Unmodulated Carrier	0, CLASS 1	836.52 MHz
6C3	SAT and Signal Tone	0, CLASS 1	836.52 MHz
6C4	SAT and DTMF #3	0, CLASS 1	836.52 MHz
6C5	SAT and 10kb/s Wideband Data	0, CLASS 1	836.52 MHz
6C6	Unmodulated Carrier	0, CLASS 4	836.52 MHz
6C7	SAT and Voice	0, CLASS 4	836.52 MHz
6C8	SAT and Signal Tone	0, CLASS 4	836.52 MHz
6C9	SAT and DTMF #3	0, CLASS 4	836.52 MHz
6C10	SAT and 10kb/s Wideband Data	0, CLASS 4	836.52 MHz

These measurements were made per EIA/TIA IS-137A using the following equipment:

Anritsu MT8801B	Radio Communication Analyzer
HP8593E	Spectrum Analyzer
HP E3632A	DC Power Supply (2)

Exhibit 6C2: Unmodulated Carrier, CLASS 1 Power Level 0
Carrier Frequency 836.52 MHz, Carrier Power 35 dBm

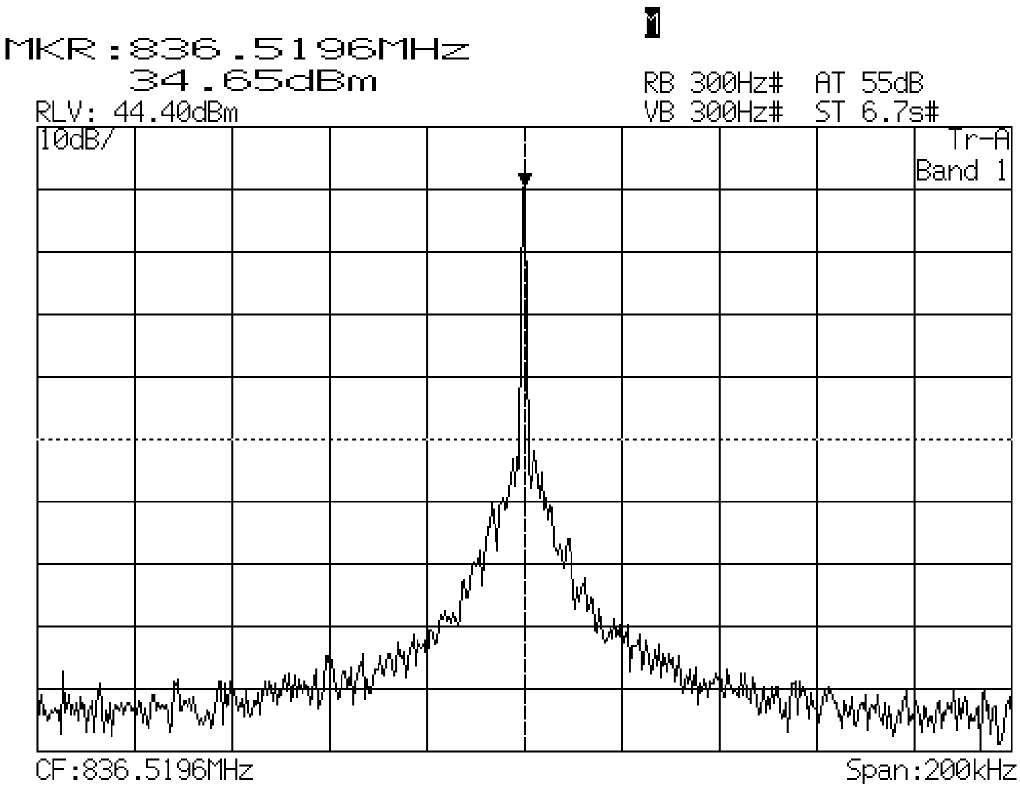


Exhibit 6C3: CLASS 1 Power Level 0, Carrier Power 35dBm
Carrier Frequency 836.52 MHz,
SAT and Signaling Tone, F3E Emission Mask

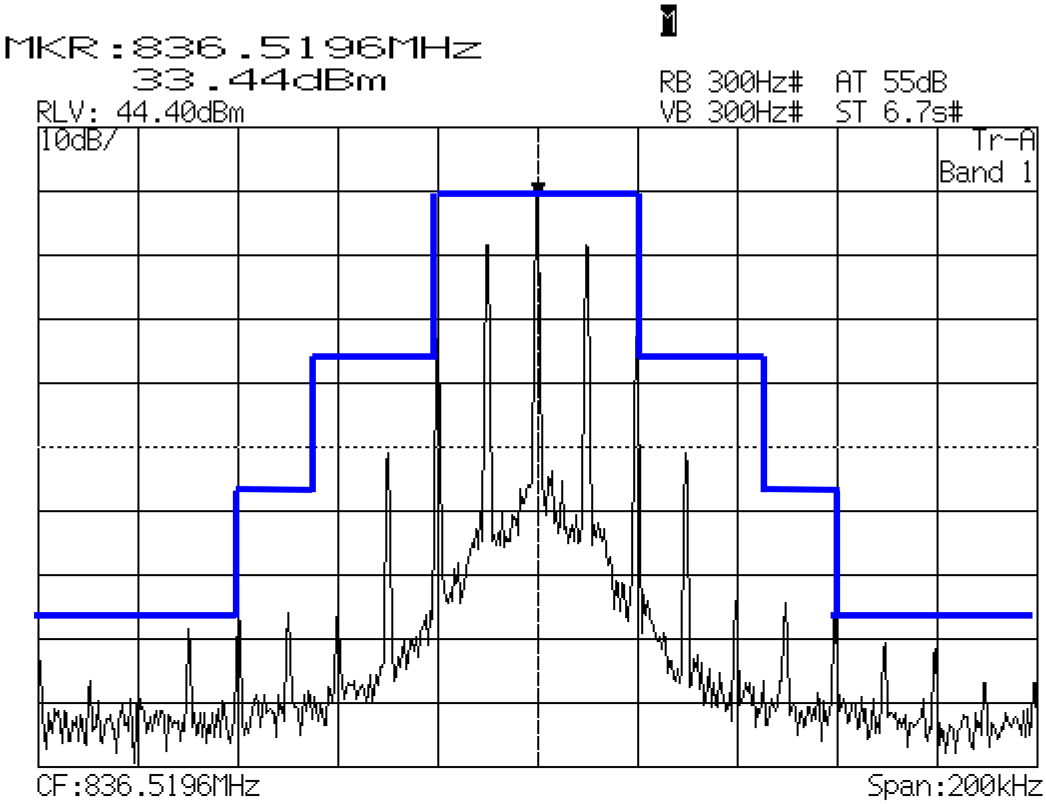


Exhibit 6C4: CLASS 1 Power Level 0, Carrier Power 35 dBm
Carrier Frequency 836.52 MHz,
SAT and DTMF #3, F3E Emission Mask

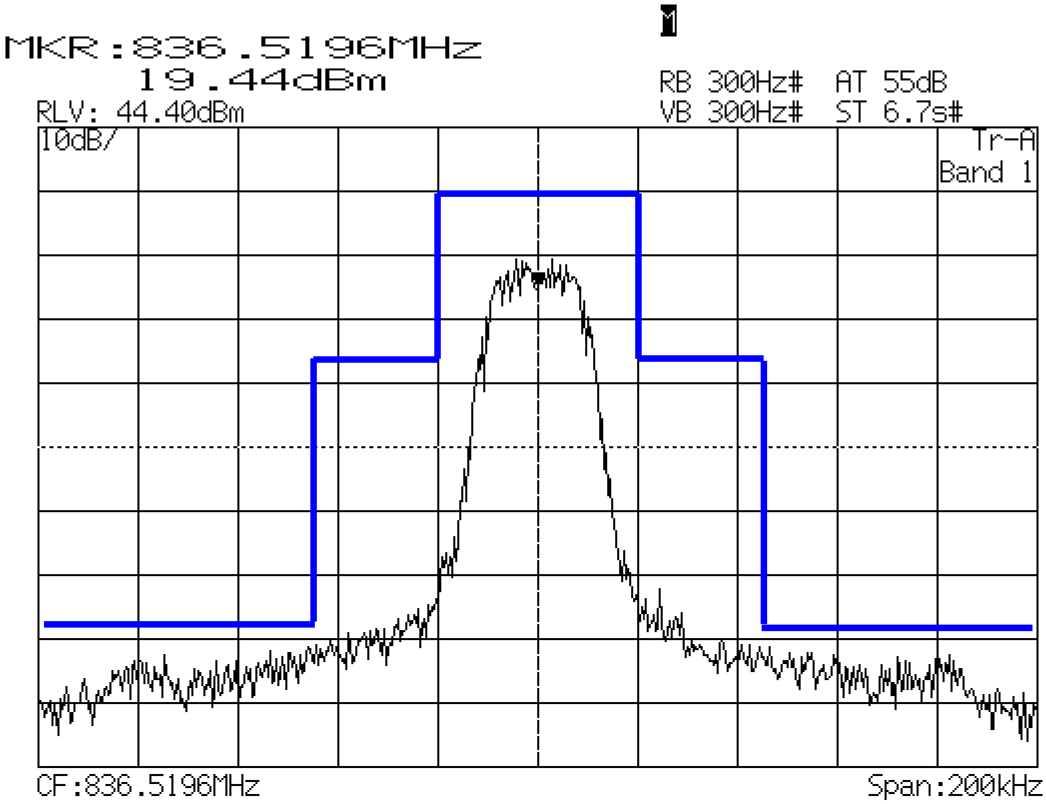


Exhibit 6C5: CLASS 1 Power Level 0, Carrier Power 35 dBm
Carrier Frequency 836.52 MHz,
SAT and Wideband 10kb/s Digital data, F1D Emission Mask

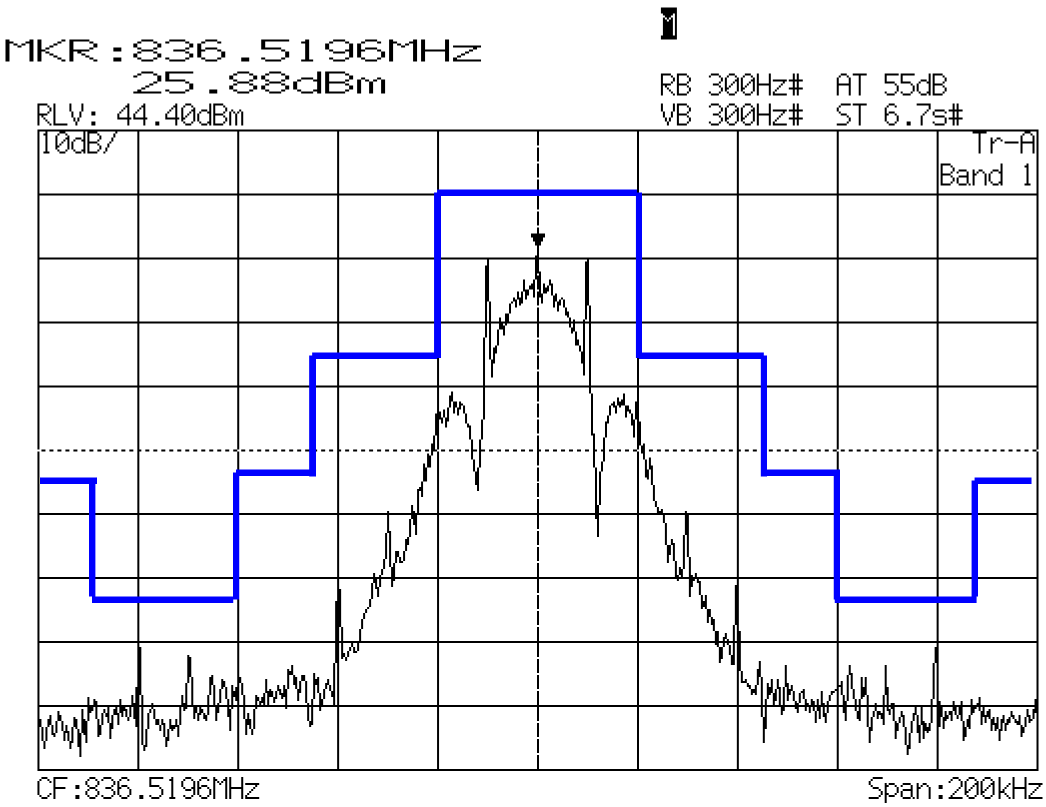


Exhibit 6C6: Unmodulated Carrier. Class 4 Power Level 0 = 0.355 W
Carrier Frequency 836.52

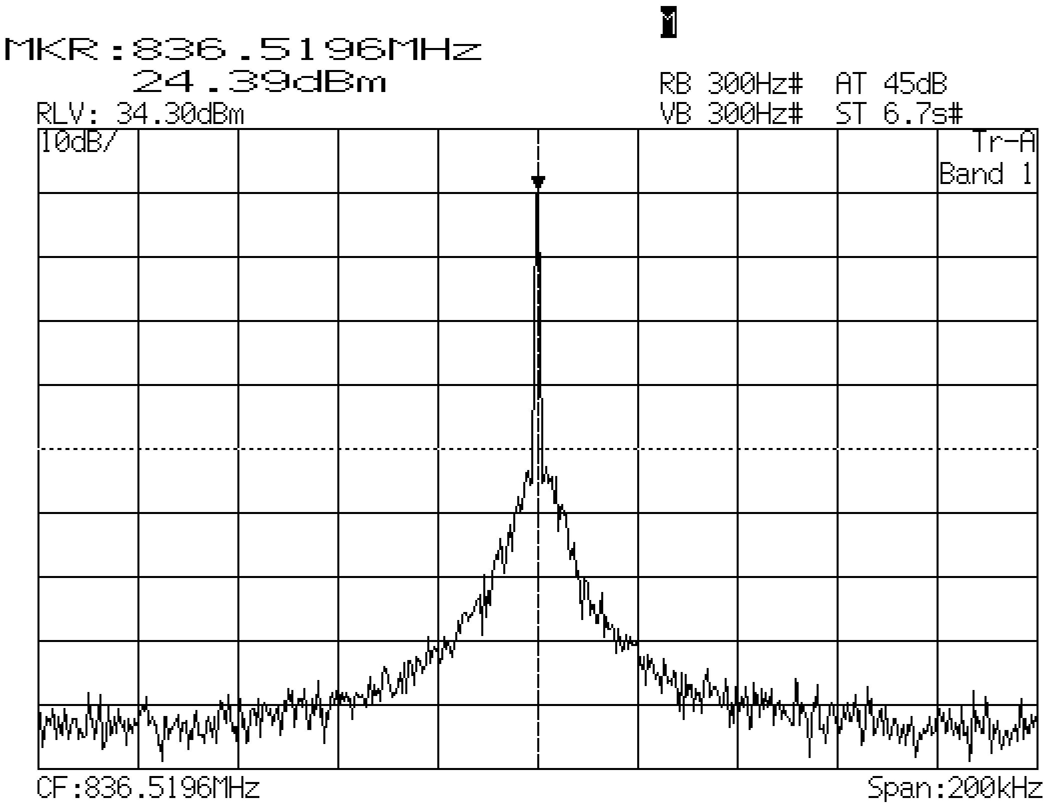


Exhibit 6C7: CLASS 4 Power Level 0 = 0.355 W
Carrier Frequency 836.52 MHz, F3E Emission Mask
Voice Tone 2500Hz, SAT 6000Hz, Total Deviation 11000Hz

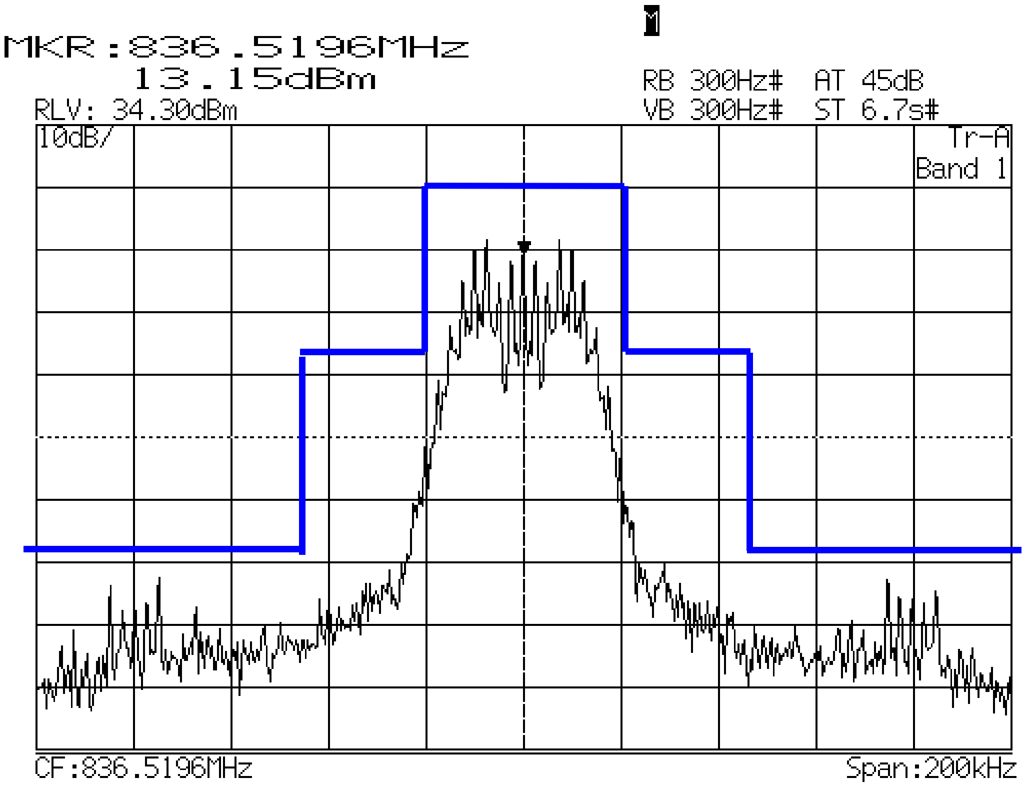


Exhibit 6C8: Class 4 Power Level 0 = 0.355 W
Carrier Frequency 836.52 MHz
SAT and Signaling Tone, F3E Emission Mask

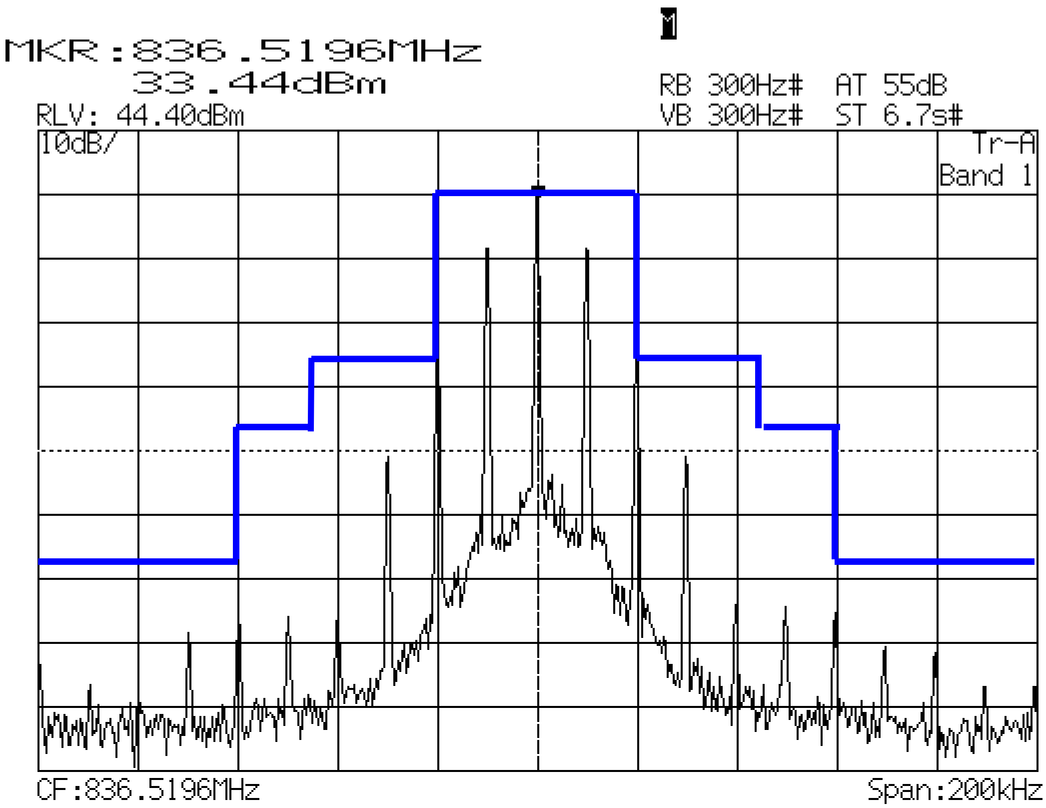


Exhibit 6C9: Class 4 Power Level 0/2 = 0.355 W
Carrier Frequency 836.52 MHz
SAT and DTMF#3, F3E Emission Mask

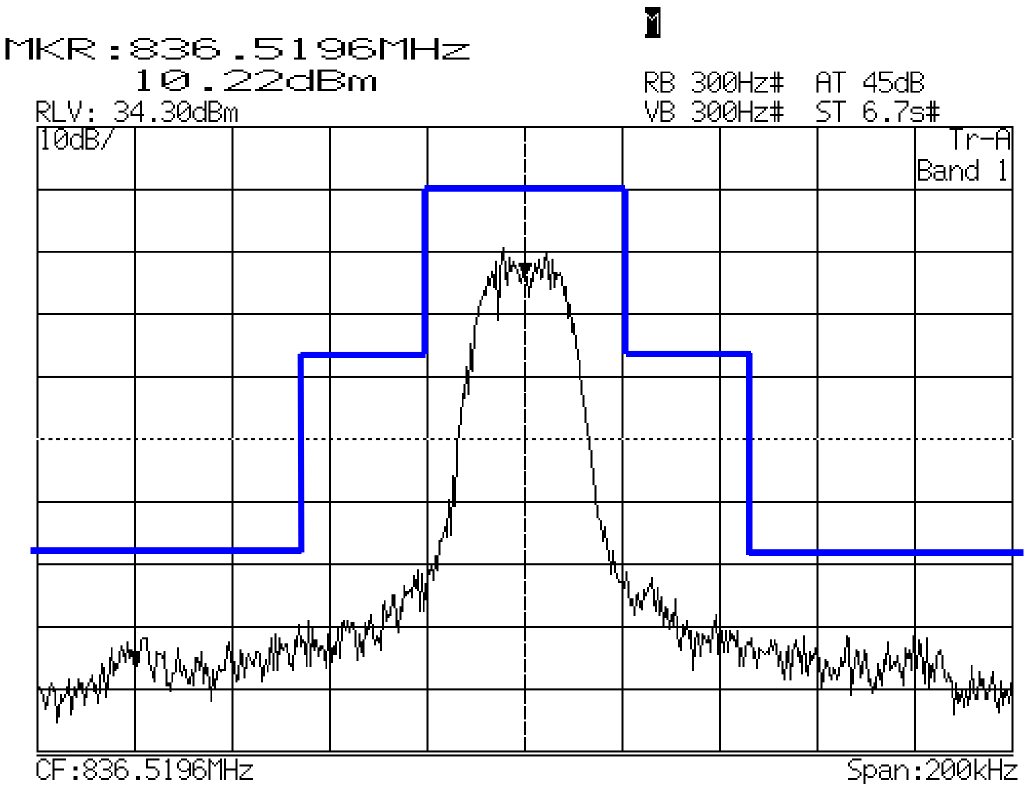


Exhibit 6C10: Class 4 Power Level 0 = 0.355 W
Carrier Frequency 836.52 MHz
SAT and Wideband 10kb/s Digital data, F1D Emission Mask

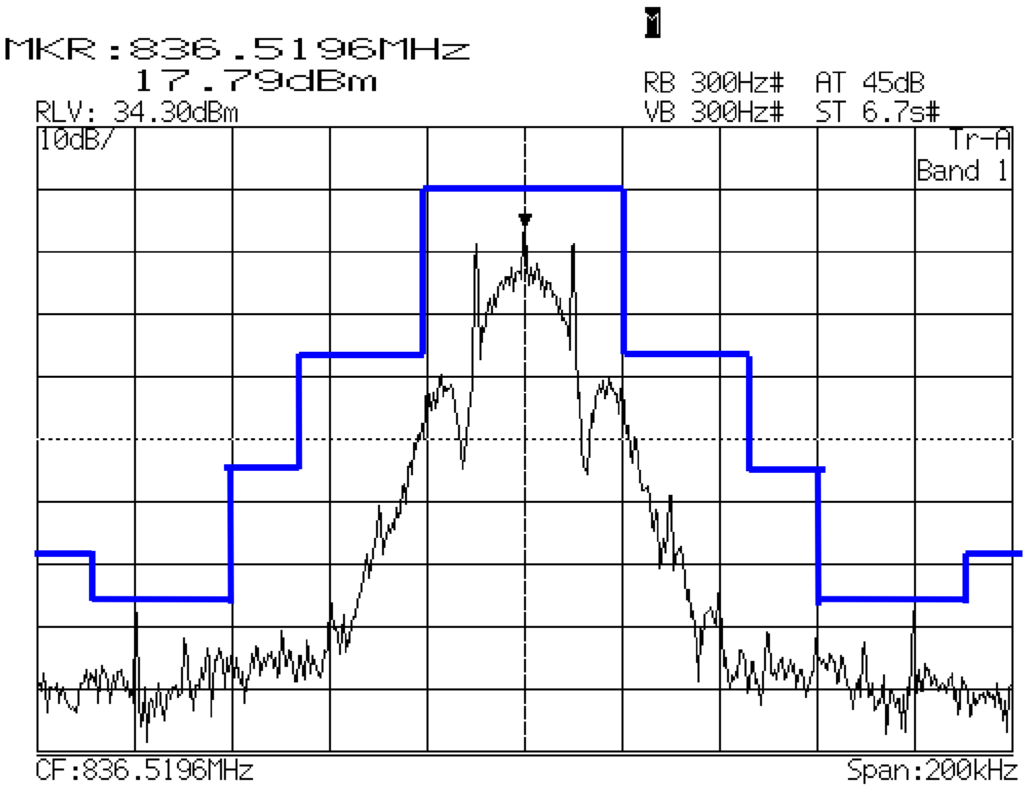


Exhibit 6D1

800 MHz AMPS SPURIOUS EMISSIONS (CONDUCTED)

Per 2.1051 Conducted Spurious emissions were measured at the antenna connector with a spectrum analyzer per EIA/TIA IS-137A.

EXHIBIT #	FREQUENCY	Output Power
6D2	835.02 MHz	3 W (CLASS 1 PL0)
6D3	835.02 MHz	.355 W (CLASS 4 PL0)
6D4	835.02 MHz	.0003 W (CLASS 4 PL10)

Note: The spectrum was examined through the 10^{th} harmonic of the carrier at the highest power level for at low, middle, and high ends of the band. The worst case plots for each power level are shown below. Measurements recorded are peak measurements.

These measurements were made per EIA/TIA IS-137A using the following equipment:

HP8593E	Spectrum Analyzer
HP E3632A	DC Power Supply (2)

Per 22.917 (f), the transmitter emissions in the base station transmit frequency range (869 – 894 MHz) have been verified to be attenuated below –80 dBm.

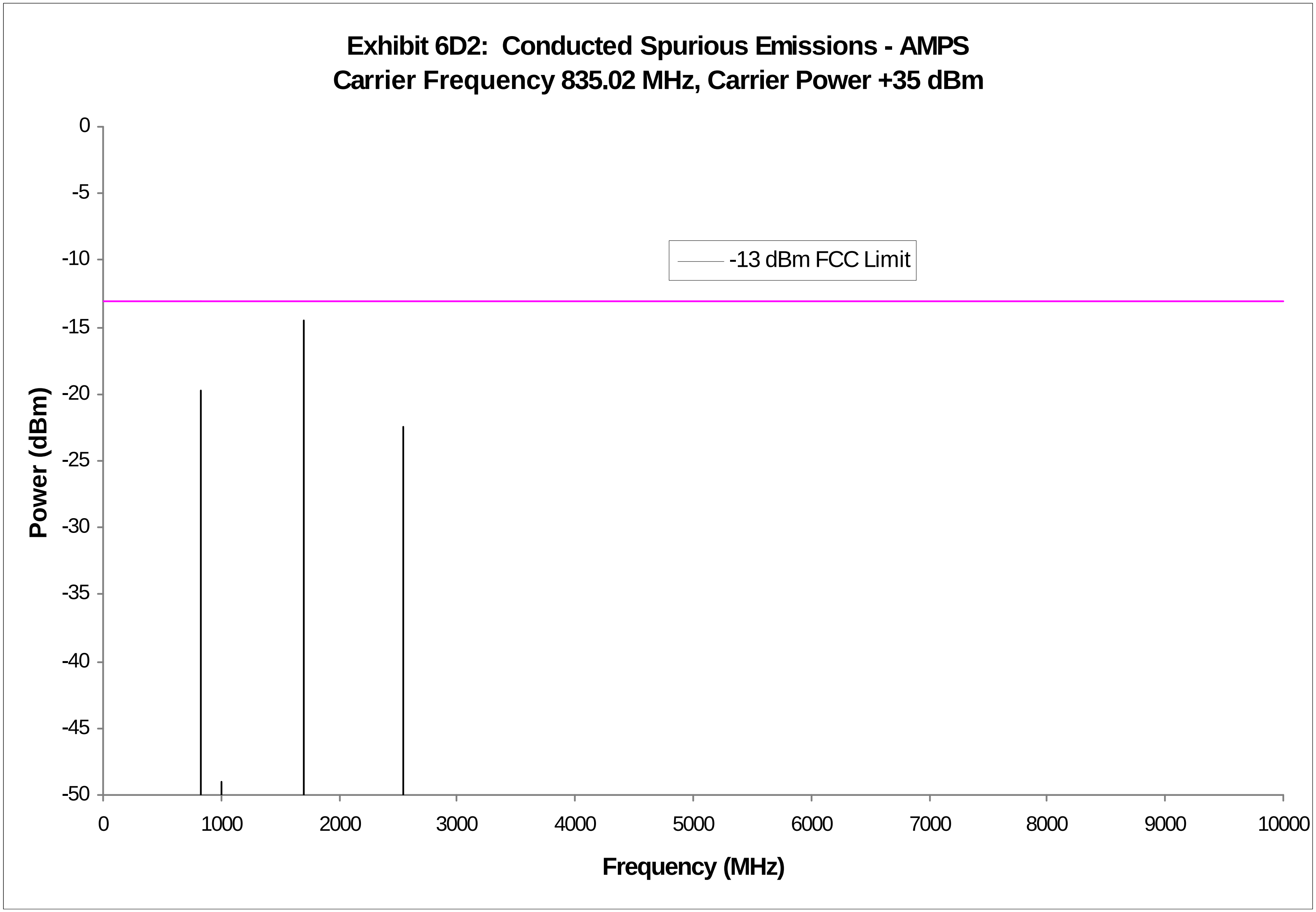


Exhibit 6D2: Conducted Spurious Emissions - AMPS
Carrier Frequency 835.02 MHz, Carrier Power +35 dBm
-13 dBm FCC Limit
Power (dBm)
0
-5
-10
-15
-20
-25
-30
-35
-40
-45
-50
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
10000
Frequency (MHz)

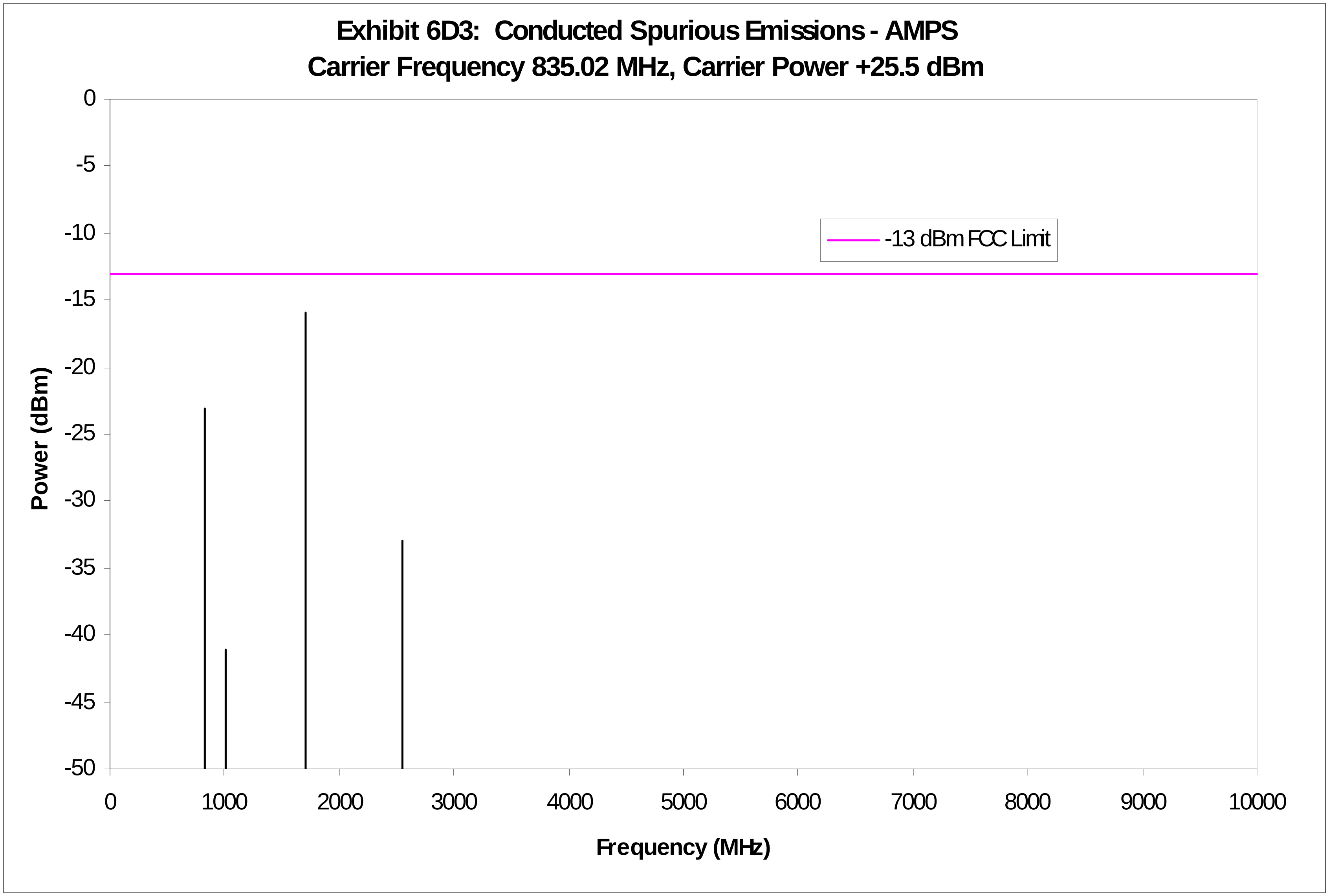


Exhibit 6D3: Conducted Spurious Emissions - AMPS
Carrier Frequency 835.02 MHz, Carrier Power +25.5 dBm
-13 dBm FCC Limit
Power (dBm)
0
-5
-10
-15
-20
-25
-30
-35
-40
-45
-50
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
10000
Frequency (MHz)

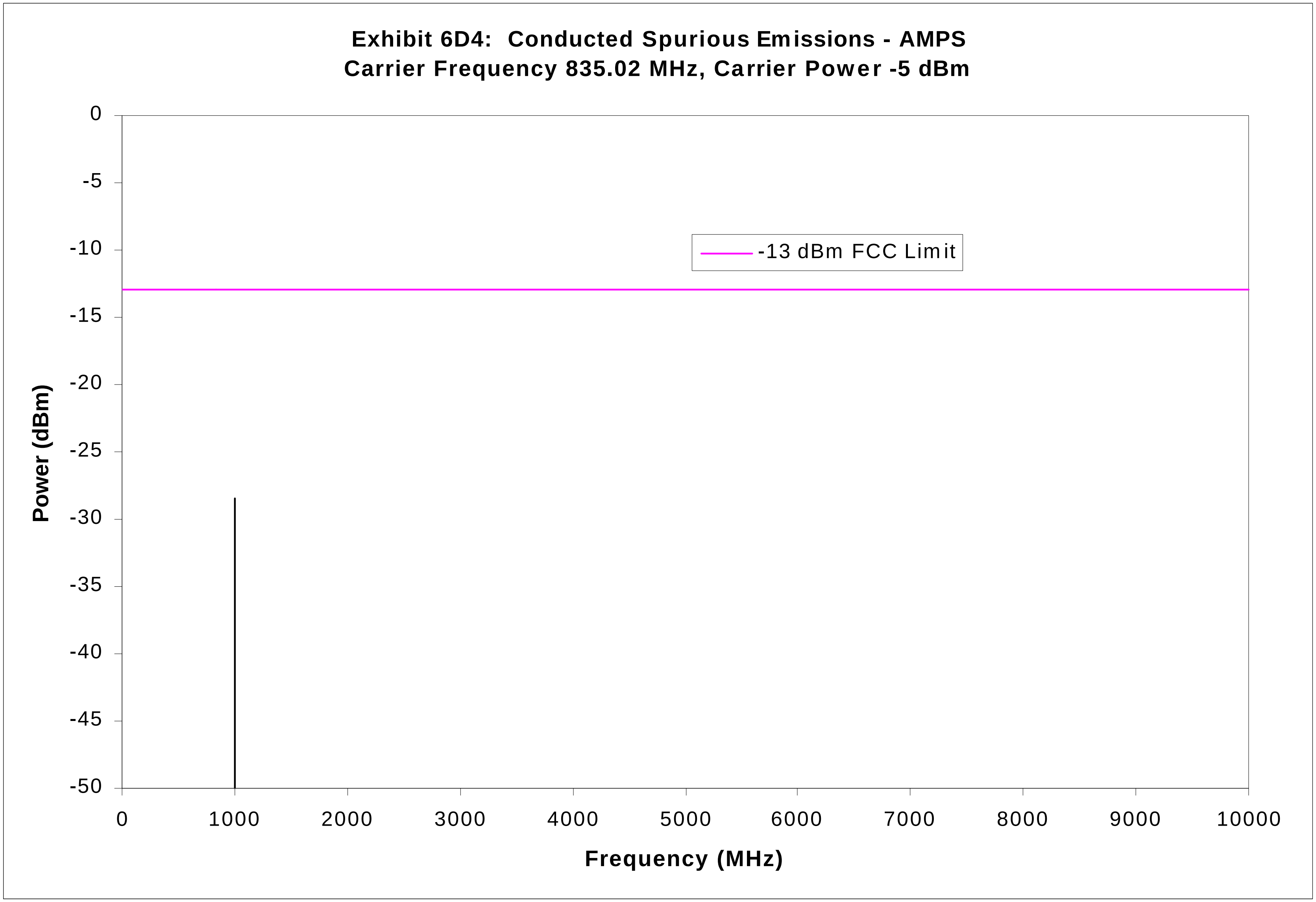


Exhibit 6D4: Conducted Spurious Emissions - AMPS
Carrier Frequency 835.02 MHz, Carrier Power -5 dBm
-13 dBm FCC Limit
Power (dBm)
0
-5
-10
-15
-20
-25
-30
-35
-40
-45
-50
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
10000
Frequency (MHz)

Exhibit 6E1

800 MHz AMPS SPURIOUS EMISSIONS (Radiated)

Per 2.1053 and 22.917 (e), field strength of spurious radiation was measured at Underwriters Laboratories Inc. Research Triangle Park, NC site. Underwriter Laboratories Inc. Research Triangle site is NVLAP and FCC registered. The measurement procedure is per EIA/TIA IS-137A conducted on a 3 meter test site. Results are shown on the following Exhibits.

Note: The spectrum was examined through the 10^{th} harmonic of the carrier at the highest power level for CLASS 1 and CLASS 4, at low, middle, and high ends of the band. The worst case plots for each power level are shown below. Measurements recorded are peak measurements.

EXHIBIT	FREQUENCY	OUTPUT POWER
6E2	824.04 MHz	3 W
6E3	824.04 MHz	0.355 W

The measurements were made per EIA/TIA IS-137A using the following equipment:

Receive Equipment:

Item	Description	Manufacturer
ATA033	52 ft Cable, N-N	UL
ATA034	52 ft Cable, N-N	UL
AT0020	Horn Antenna, 1-18 GHz	Electro-metrics
SAR001	EMI Receiver	Hewlett-Packard

For Substitution Calibration:

Item	Description	Manufacturer
FGR022	Signal Generator	Hewlett-Packard
ATA055	6 ft Cable, N-N	UL
AT0005	Horn Antenna, 1-18 GHz	Electro-metrics

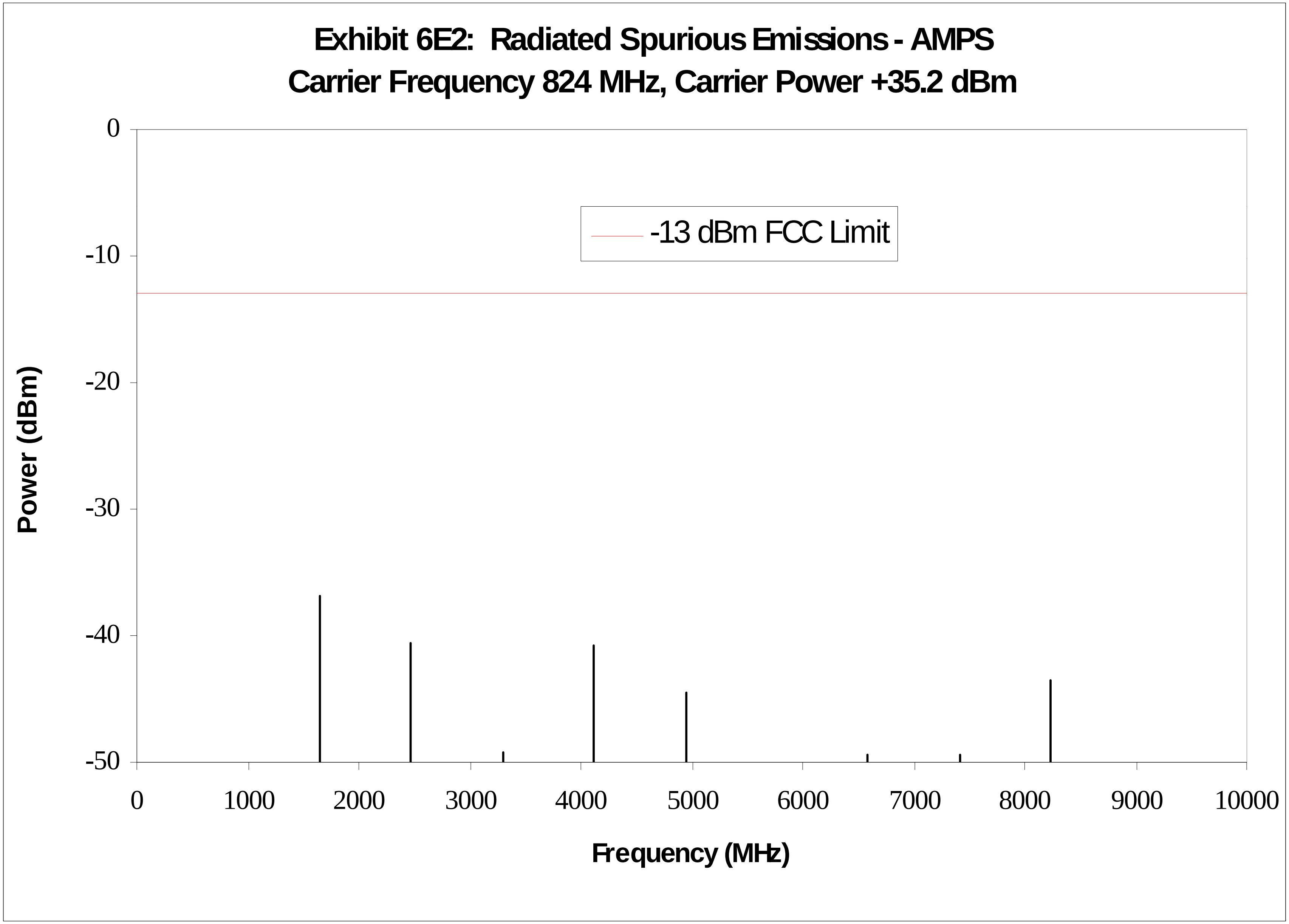


Exhibit 6E2: Radiated Spurious Emissions - AMPS
Carrier Frequency 824 MHz, Carrier Power +35.2 dBm
-13 dBm FCC Limit
Power (dBm)
0
-10
-20
-30
-40
-50
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
10000
Frequency (MHz)

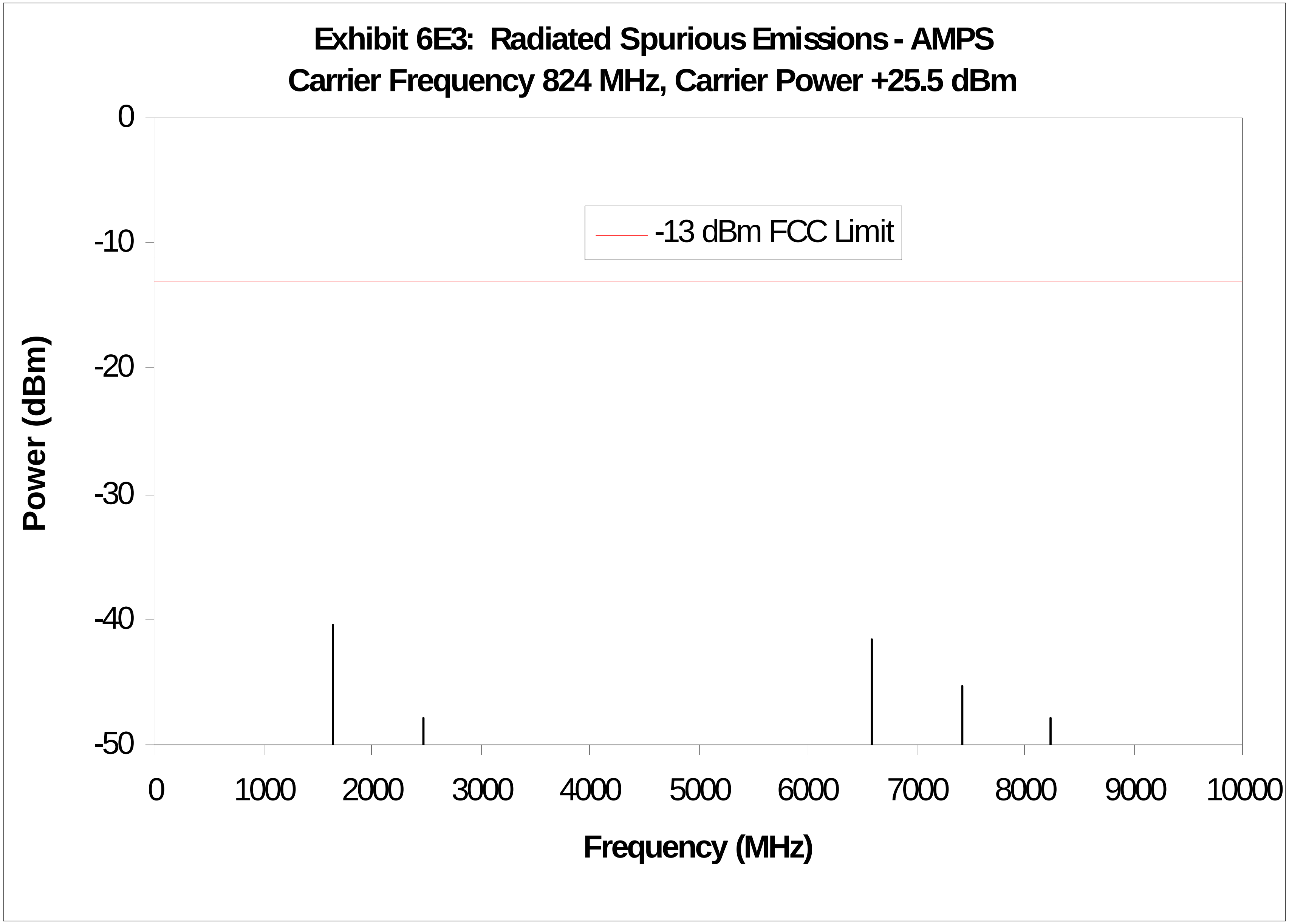


Exhibit 6E3: Radiated Spurious Emissions - AMPS
Carrier Frequency 824 MHz, Carrier Power +25.5 dBm
-13 dBm FCC Limit
Power (dBm)
0
-10
-20
-30
-40
-50
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
10000
Frequency (MHz)

EXHIBIT 6F1 **800 MHz AMPS FREQUENCY STABILITY**

Per 2.1055 (a)(1),(b),(d)(1)

Variation of output frequency as a result of varying either voltage or temperature is shown in Exhibits 6F2 through 6F4.

EXHIBIT #	Input Voltage	Temperature	Mode	Frequency
6F2	6.0 V Varied ± 15%	+25 °C	Analog (CLASS 1)	848.64 MHz
6F3	13.6 V Varied ± 20%	+25 °C	Analog (CLASS 1)	848.64 MHz
6F4	6.0 VDC, 13.6 VDC	Varied	Analog (CLASS 1)	848.64 MHz

Note: The 6V input voltage is varied ± 15%, even though the manufacturer’s rated supply voltage is 5.2 VDC to 6.8 VDC; the 13.6V input is varied over its 20% rated range of 10.9 VDC to 16.3 VDC. The 13.6 V supply voltage is only used by the CLASS 1 AMPS mode (not used with CLASS 4 mode). The manufacturer’s specified temperature range is –40 °C to +70 °C. Data is presented in the worst case CLASS 1 AMPS mode since the Class 4 AMPS mode circuitry is a subset of the CLASS 1 AMPS mode circuitry.

These measurements were made per EIA/TIA IS-137A using the following equipment:

Anritsu MT8801B	Radio Communication Analyzer
HP E3632A	DC Power Supply (2)
ESPEC Model SH-240	Temperature Chamber

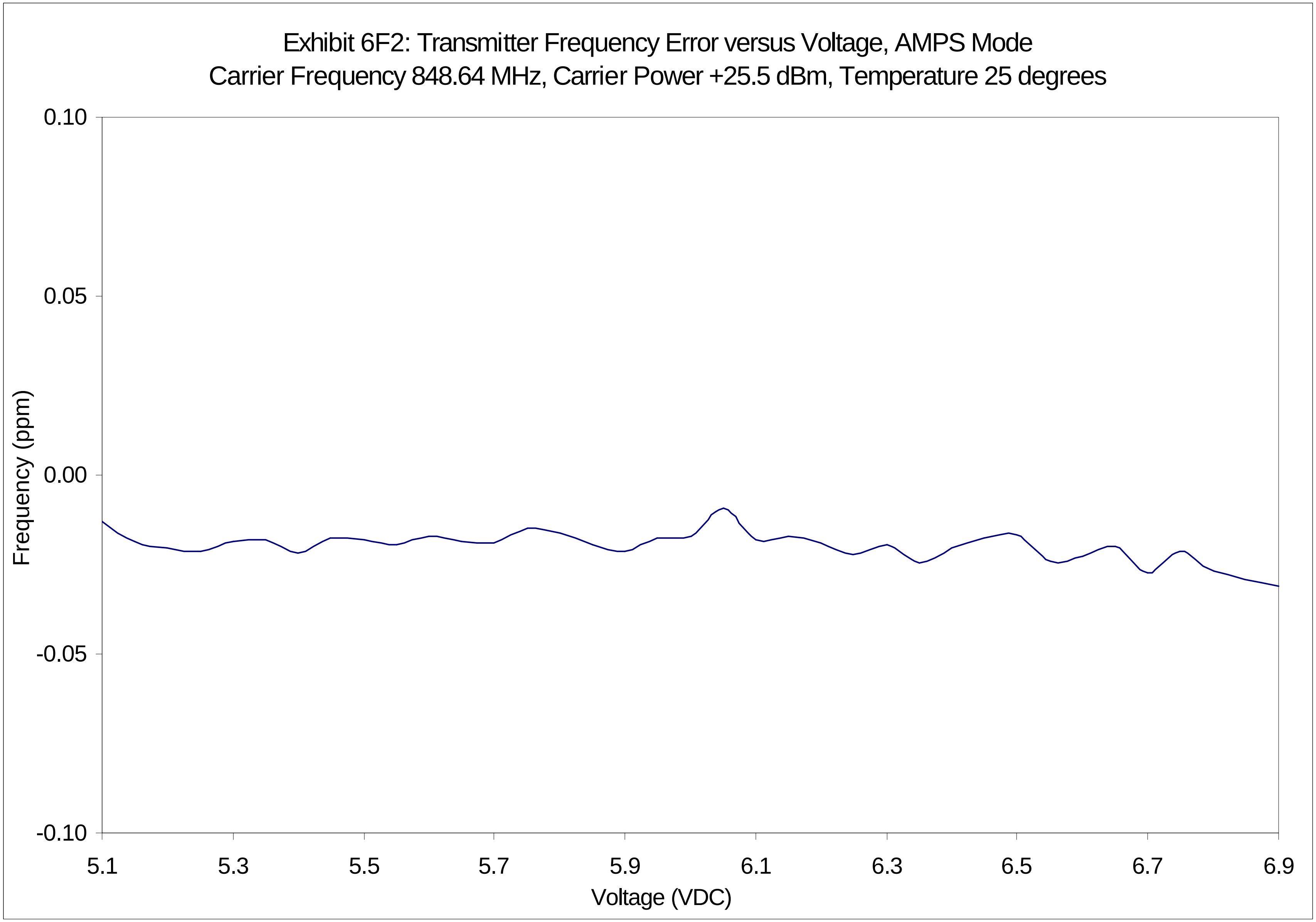


Exhibit 6F2: Transmitter Frequency Error versus Voltage, AMPS Mode
Carrier Frequency 848.64 MHz, Carrier Power +25.5 dBm, Temperature 25 degrees
Frequency (ppm)
0.10
0.05
0.00
-0.05
-0.10
5.1
5.3
5.5
5.7
5.9
6.1
6.3
6.5
6.7
6.9
Voltage (VDC)

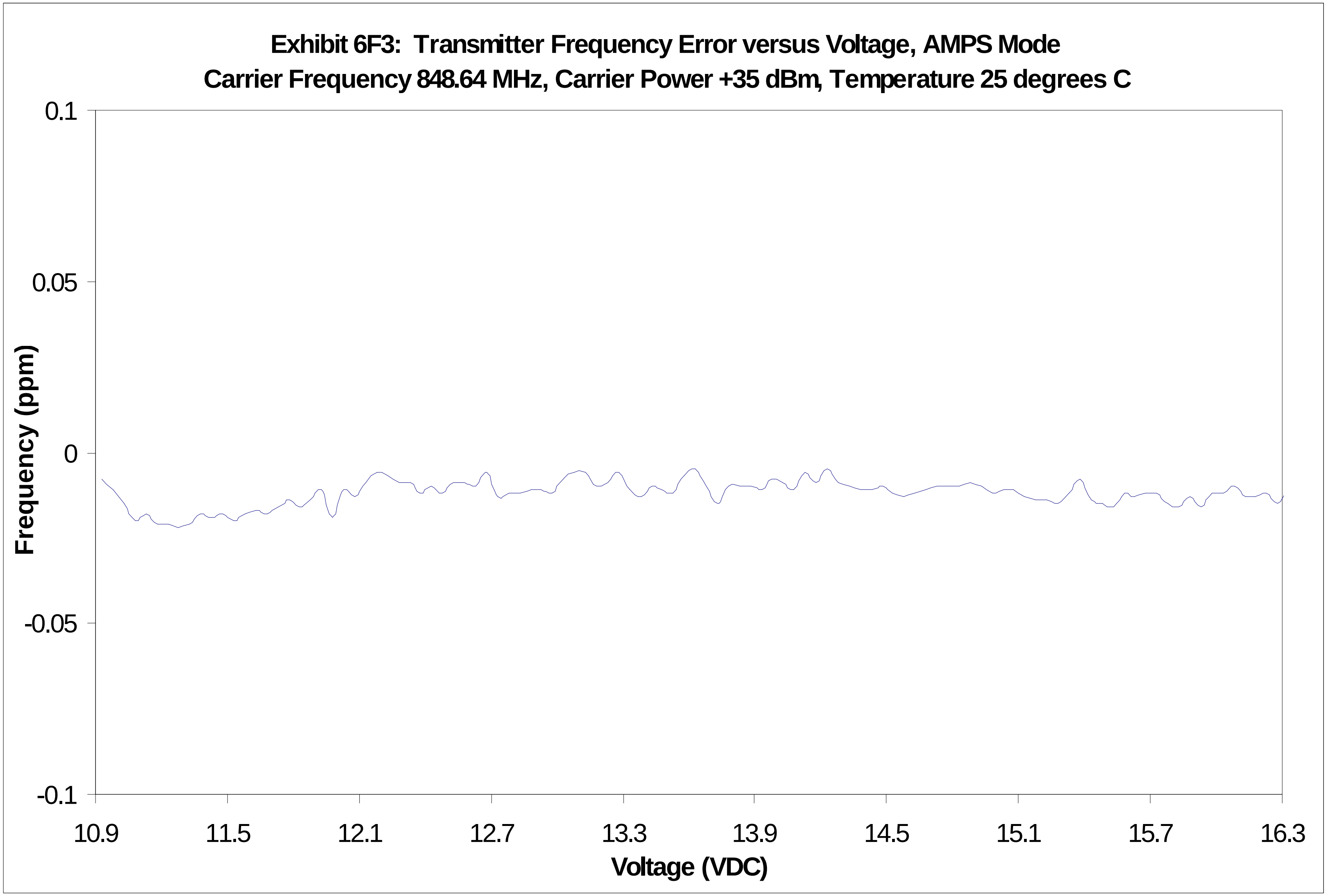


Exhibit 6F3: Transmitter Frequency Error versus Voltage, AMPS Mode
Carrier Frequency 848.64 MHz, Carrier Power +35 dBm, Temperature 25 degrees C
0.1
0.05
0
-0.05
-0.1
Frequency (ppm)
10.9
11.5
12.1
12.7
13.3
13.9
14.5
15.1
15.7
16.3
Voltage (VDC)

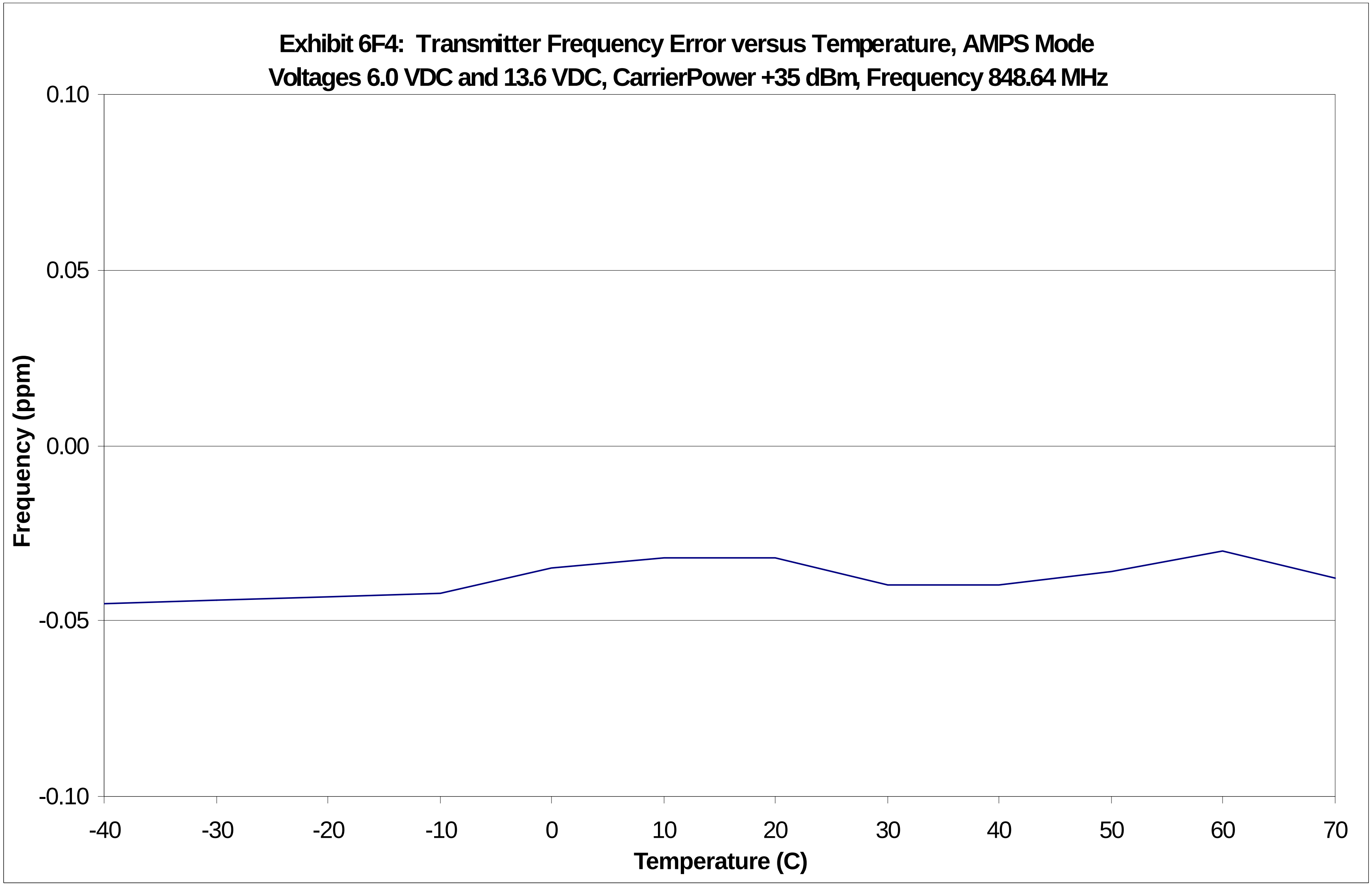


Exhibit 6F4: Transmitter Frequency Error versus Temperature, AMPS Mode
Voltages 6.0 VDC and 13.6 VDC, CarrierPower +35 dBm, Frequency 848.64 MHz
Frequency (ppm)
0.10
0.05
0.00
-0.05
-0.10
-40
-30
-20
-10
0
10
20
30
40
50
60
70
Temperature (C)

Exhibit 6G1

800 MHz DAMPS RF POWER OUTPUT

Para. 2.1046 (a) and 22.913 (a)

The RF power at the band center, measured at the antenna connector using a communications test set as the specified load, are plotted against supply voltage variations and temperature variations at the highest power level.

Exhibit	Input Voltage	Temperature	P_o	Modulation (Freq)	Power Level
6G2	6.0	Varied	0.355 W	Digital (800)	0 (CLASS 4)
6G3	6.0 Varied ± 15%	+25 C	0.355 W	Digital (800)	0 (CLASS 4)

Note: The 6V input voltage is varied ± 15%, even though the manufacturer's rated supply voltage is 5.2 VDC to 6.8 VDC. The manufacturer's specified temperature range is –40 ^{o}C to +70 ^{o}C. The output power is calibrated at the center of the band at room temperature.

These measurements were made per EIA/TIA IS-137A using the following equipment:

Anritsu MT8801B	Radio Communication Analyzer
HP E3632A	DC Power Supply (2)
ESPEC Model SH-240	Temperature Chamber

The DM20 Transceiver has been designed as an OEM module for use by various OEM integrators. Since an antenna and cable is not provided to the customer, the substitution method per IS-137A of measuring effective radiated power data is not available.

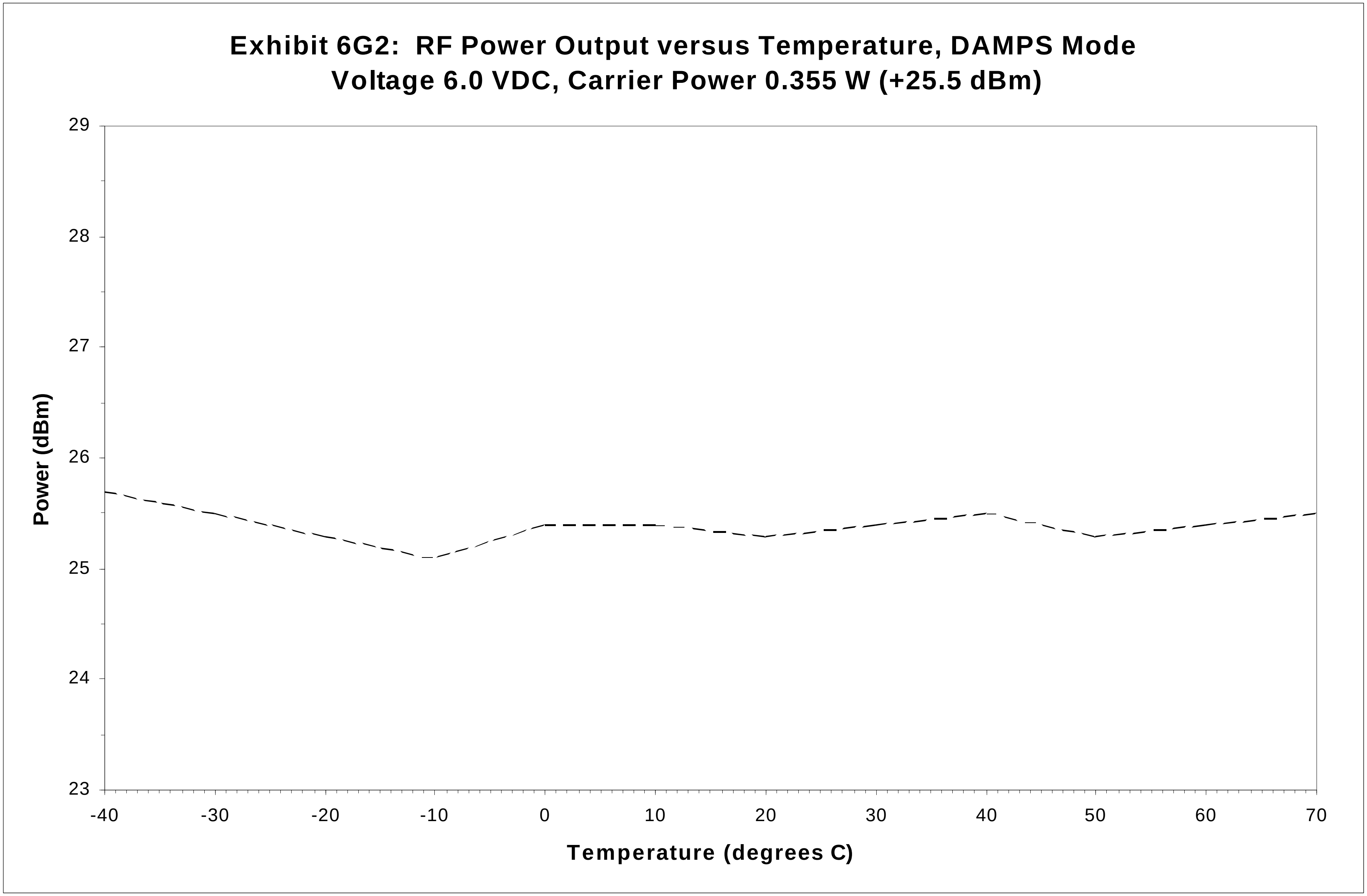


Exhibit 6G2: RF Power Output versus Temperature, DAMPS Mode
Voltage 6.0 VDC, Carrier Power 0.355 W (+25.5 dBm)
Power (dBm)
29
28
27
26
25
24
23
-40
-30
-20
-10
0
10
20
30
40
50
60
70
Temperature (degrees C)

Exhibit 6G3: RF Output Power versus 6 V Input Voltage, DAMPS Mode
Temperature 25 degrees C, Carrier Power 0.355 W (+25.5 dBm)

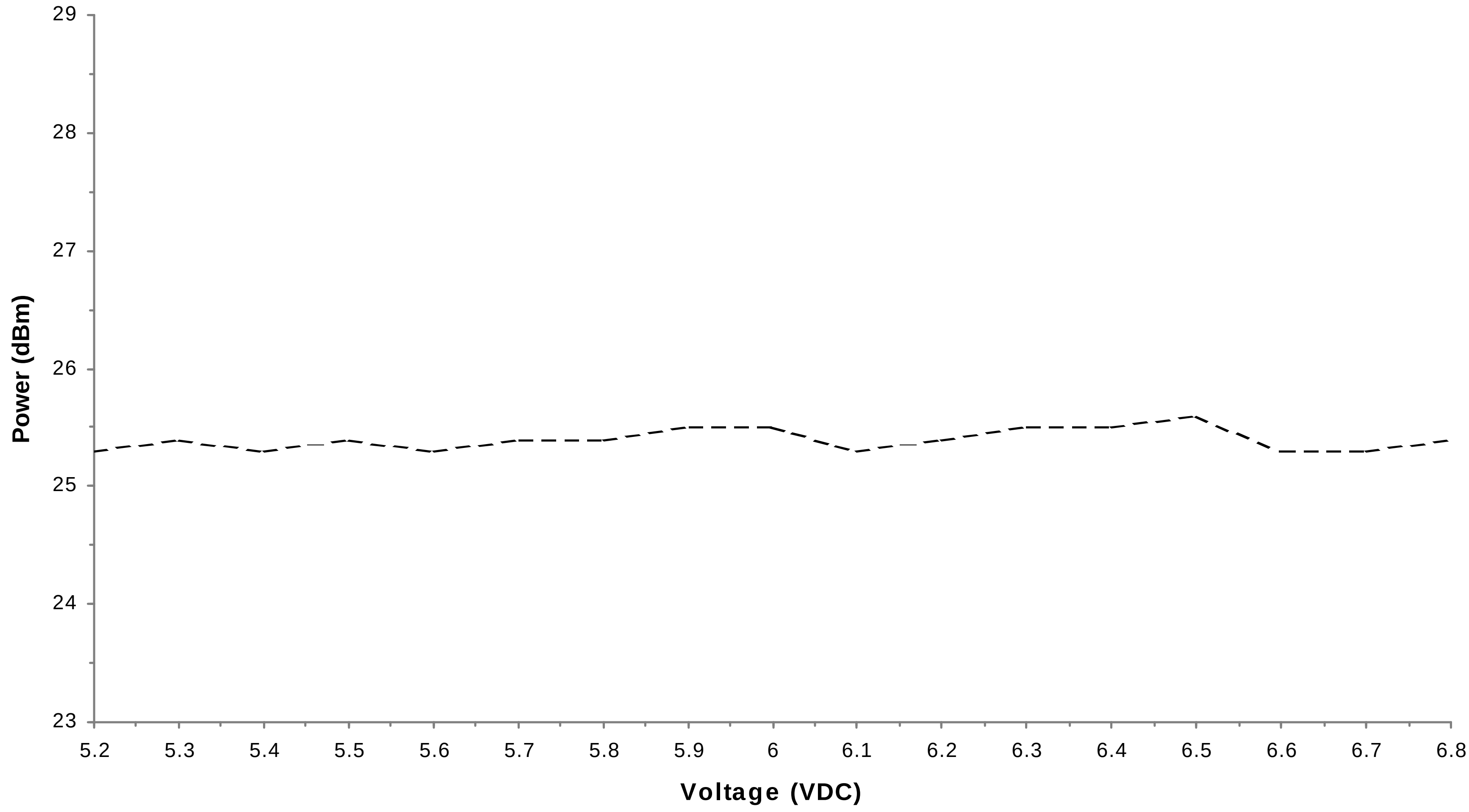


EXHIBIT 6H1

800/1900 MHz: DAMPS MODULATION CHARACTERISTICS

Part 2.1047

Definition

The transceiver shall be capable of generating π/4 shifted differentially encoded quadrature phase shift keying signals. The transmitted signal is given by:

$$S(t) = \sum_n g(t-nT) \cos(\phi n) \cos(\omega ct) - \sum_n g(t-nT) \sin(\phi n) \sin(\omega ct)$$

where g(t) is the pulse shaping function that corresponds to a square root raised cosine baseband filter with roll off factor of 0.35, ωc is the radian carrier frequency, T is the symbol period, and ϕn is the absolute phase corresponding to the nth symbol interval. The symbol rate (1/T) is 24.3 k symbols /sec.

The modulation accuracy requirement is specified by setting limits on the RMS difference between the actual transmitted signal waveform and the ideal signal waveform. The ideal waveform is derived mathematically from the specification of modulation shown above. The specified requirement is error vector magnitude.

For this measurement, frequency accuracy shall meet the requirements of Section 3.1 prior to measurement.

The average carrier frequency error is the difference between the average carrier frequency of the actual transmitted waveform and the average signal waveform carrier frequency.

The ideal modulation is defined above. The definition is such that, observing an ideal transmitter through an ideal root raised-cosine receiver filter at the correct sampling instants one symbol apart would result in the sequence of values given by:

$$S(k)=S(k-1)e^{j\{\pi/4+B(k)*\pi/2\}}$$

where B(k) = 0,1,2,3 according to the following table:

Xk	Yk	B(k)
0	0	0
0	1	1
1	1	2
1	0	3

In the forward channel, S(k) forms part of a continuous data stream. In the reverse channel, the transit bursts from the mobile are truncated by power up and down ramping. In this case, S(6) is the first sample that enters into demodulation, which yields the first two information bits by comparing S(6) with S(7). The last information bits lie in the comparison of S(162) and S(161).

The ideal transmit and receive filters in cascade form a raised cosine Nyquist filter having an impulse response going through zero at symbol period intervals, so there is no inter-symbol interference at the ideal sampling points. The ideal signal sampler therefore, take on one of the eight values defined above, at the output of the receive filter.

This section defines how the output signal from a transmitter is to be evaluated against the ideal signal.

Let Z(k) be the complex vectors produced by observing the real transmitter through an ideal measuring receive filter at instants k, one symbol period apart. With S(k) defined as above, the transmitter is modeled as:

$$Z(k) = [C0 + C1 * [S(k)+E(k)]] * W^{k}$$

where:

k = n/24.3KHz

$W = e^{dr=jda}$ accounts for both a frequency offset giving "da" radians per symbol phase rotation and an amplitude changes of "dr" nepers per symbol:

C0 is a constant origin offset representing quadrature modulator imbalance,
C1 is a complex constant representing the arbitrary phase and output power of the transmitter, and
E(k) is the residual vector error on sample S(k)

The sum square vector error is then:

$$\sum_{k=MIN}^{k=MAX} |E(k)|2 \qquad \sum_{k=MIN}^{k=MAX} |\{[Z(k) * W \quad -C0]/C1\} -S(k)|$$

C0, C1 and W shall be chosen to minimize this expression and are then used to compute the individual vector errors E(k) on each symbol. The symbol timing phase of the receiver output samples used to compute the vector error shall also be chosen to give the lowest value.

The values of MAX and MIN for the reverse channel (mobile station transmitter) are:

MIN = 6
MAX = 162

The RMS vector error is then computed as the square root of the sum-square vector divided by the number of symbols in the slot, (157 in the reverse direction).

Method of Measurement

Connect the mobile station to the Standard Test Source and Modulation Accuracy Equipment. Modulate the Standard Test Source with pseudo-random Data Field bits. The mobile station shall transpond the Data Field bits using the TDMAON command. Use the Modulation Accuracy Measurement Equipment to measure the modulation accuracy of the mobile station.

Minimum Standard

The RMS vector error in any burst shall be less than 12.5%. In addition, the normalized error vector magnitude during the first 10 symbols (20 bits) of a burst following the ramp-up, must have an RMS value of less than 25% when averaged over 10 bursts within a 1 minute interval. The minimum standard for frequency offset is specified in section 3.1.2.2.3 of IS 137. The origin offset in any burst shall be less than -20 dBc.

Exhibit 6I1

800 MHz DAMPS OCCUPIED BANDWIDTH

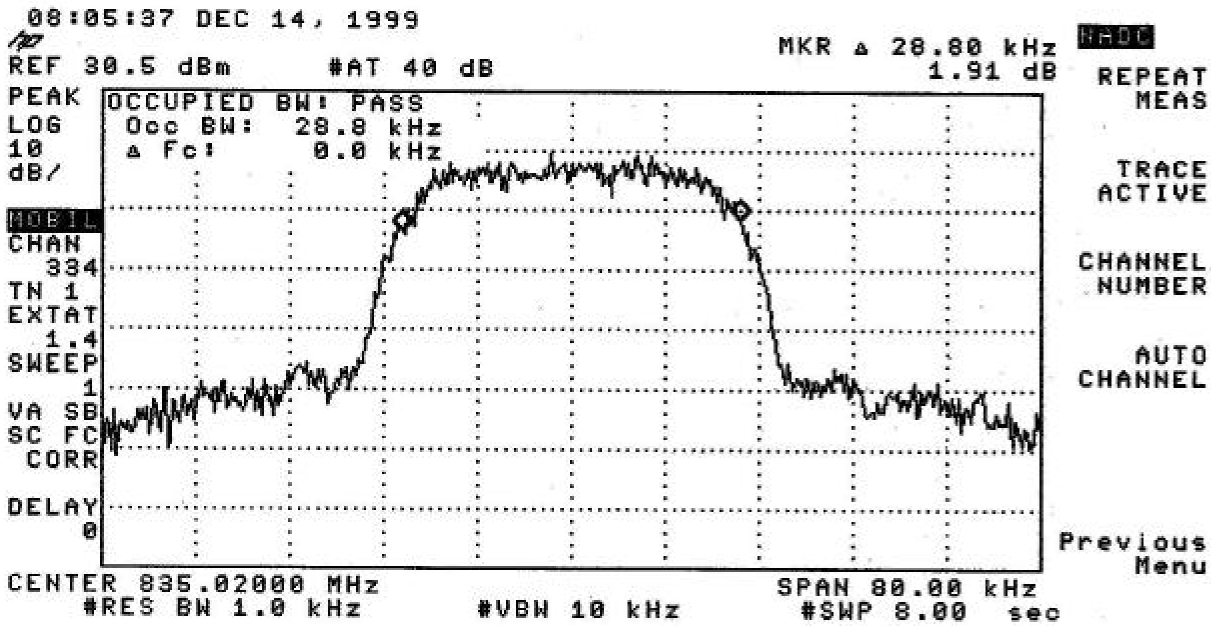
Per 2.1049 (c) (1) and 22.917 (d), the exhibit presented shows the modulation that exists in a DAMPS cellular system:

Exhibit #	Description	Power Level	Frequency (MHz)
6I2	48.6 kb/s Wideband Data	0, CLASS 4	835.02 MHz

These measurements were made per EIA/TIA IS-137A using the following specialized test equipment with a measurement personality specific to this measurement:

HP8593E	Spectrum Analyzer
HP E3632A	DC Power Supply (2)

Exhibit 6I2: Class 4 Power Level 0 = 0.355 W (+25.5 dBm)
Carrier Frequency 835.02MHz, Wideband data 48.6 Kb/s



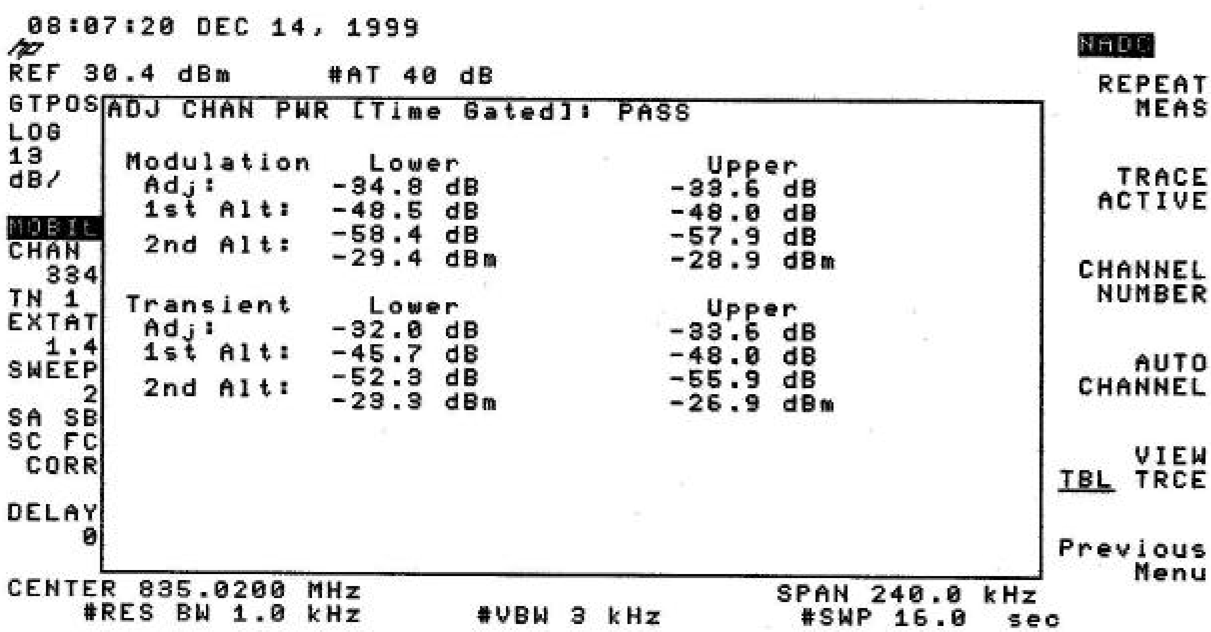


Exhibit 6J1

800 MHz DAMPS SPURIOUS EMISSIONS (CONDUCTED)

Per 2.1051 Conducted Spurious emissions were measured at the antenna connector with a spectrum analyzer per EIA/TIA IS-137A. The conducted spurious has been tested up to the 10th harmonic, reporting all spurious within 20 dB of the FCC limit.

EXHIBIT #	FREQUENCY	Output Power
6J2	835.02	.355 W (CLASS 4 PL0)
6J3	835.02	.0003 W (CLASS 4 PL10)

Note: The spectrum was examined through the 10^{th} harmonic of the carrier at the highest power level for at low, middle, and high ends of the band. The worst case plots for each power level are shown below. Measurements recorded are peak measurements.

These measurements were made per EIA/TIA IS-137A using the following equipment:

HP8593E	Spectrum Analyzer
HP E3632A	DC Power Supply (2)

Per 22.917 (f), the transmitter emissions in the base station transmit frequency range (869 – 894 MHz) have been verified to be attenuated below –80 dBm.

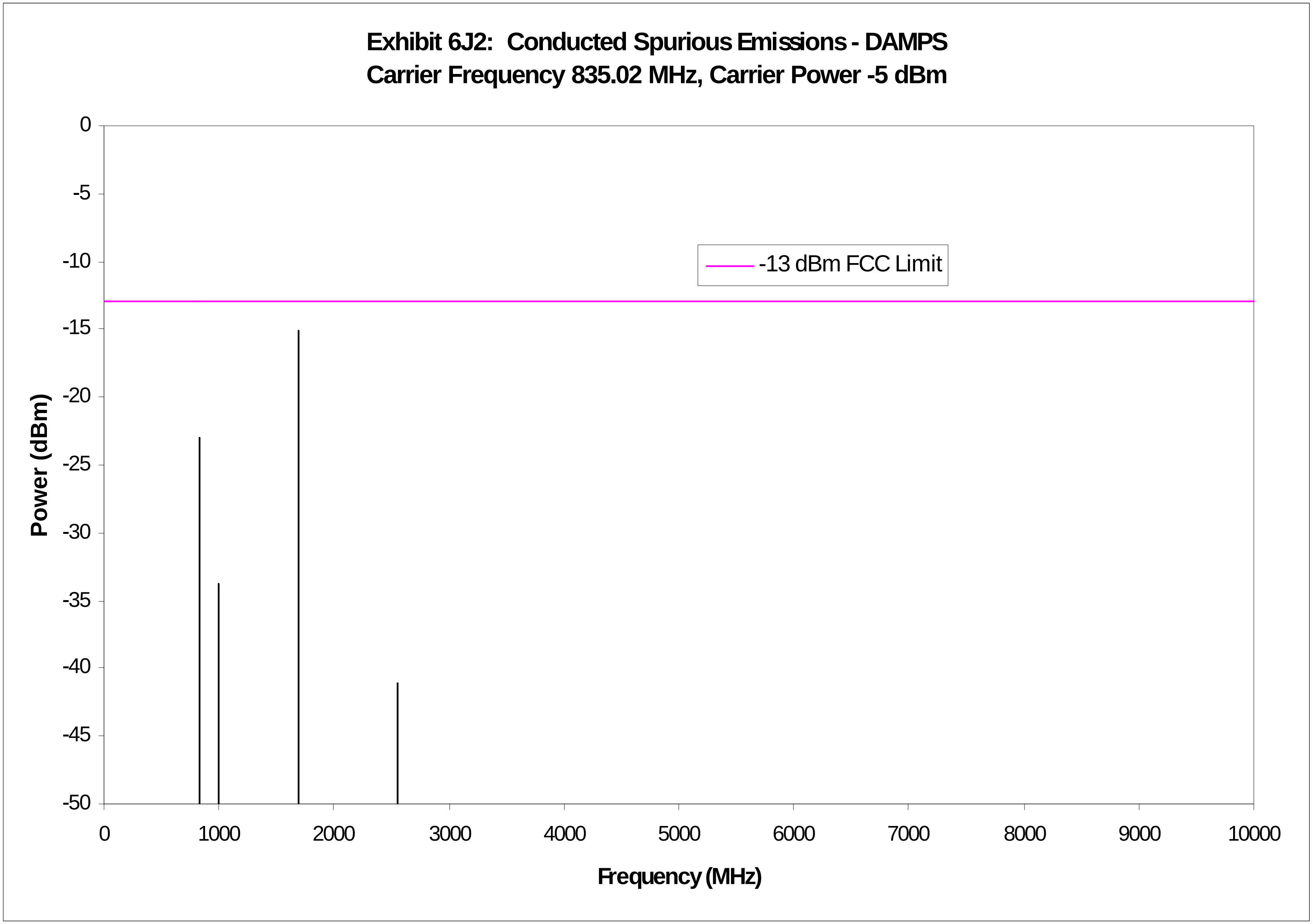


Exhibit 6J2: Conducted Spurious Emissions - DAMPS
Carrier Frequency 835.02 MHz, Carrier Power -5 dBm
-13 dBm FCC Limit
Power (dBm)
0
-5
-10
-15
-20
-25
-30
-35
-40
-45
-50
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
10000
Frequency (MHz)

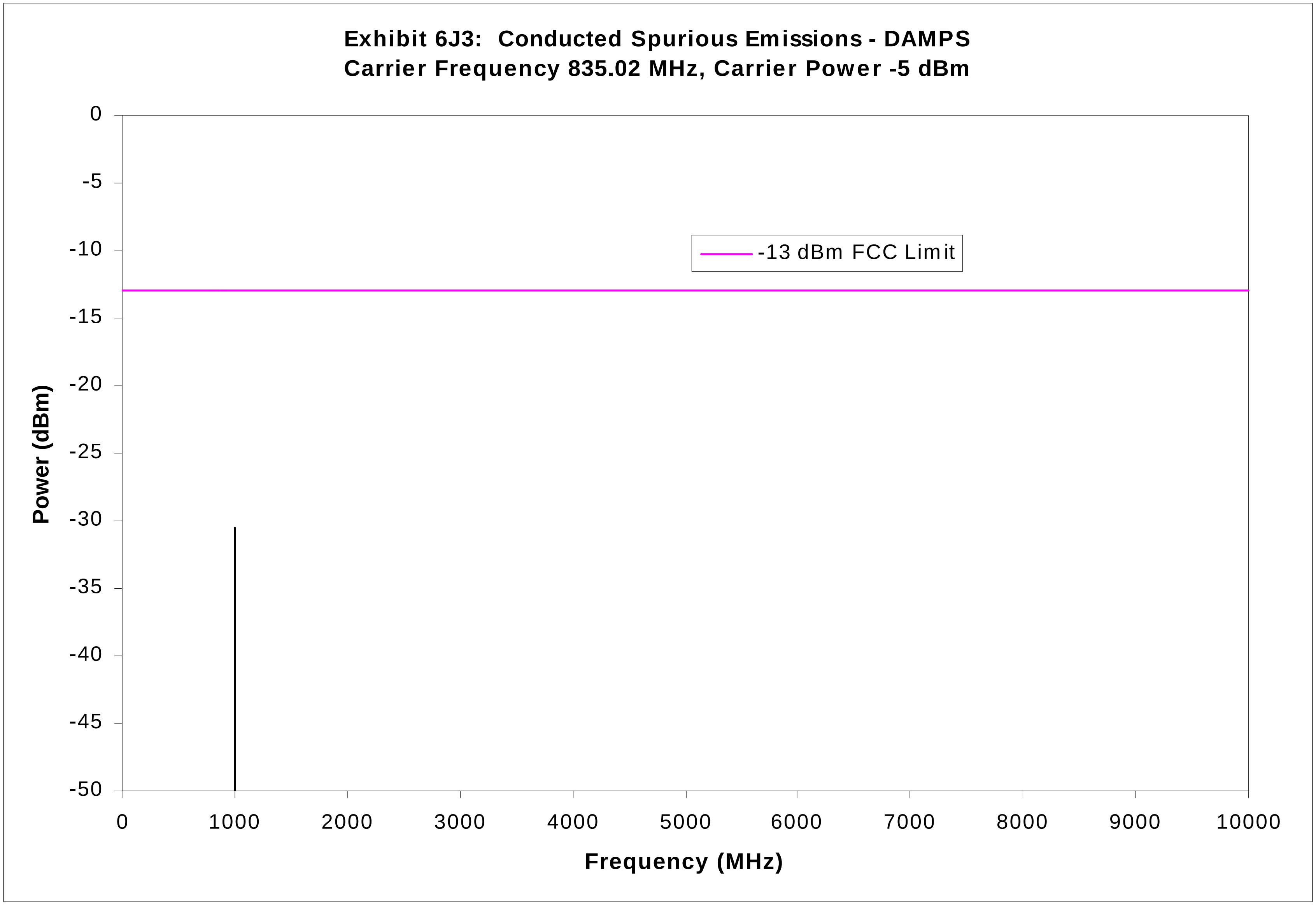


Exhibit 6J3: Conducted Spurious Emissions - DAMPS
Carrier Frequency 835.02 MHz, Carrier Power -5 dBm
Power (dBm)
0
-5
-10
-15
-20
-25
-30
-35
-40
-45
-50
-13 dBm FCC Limit
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
10000
Frequency (MHz)

Exhibit 6K1

800 MHz DAMPS SPURIOUS EMISSIONS (Radiated)

Per 2.1053 and 22.917 (e), field strength of spurious radiation was measured at Underwriters Laboratories Inc. Research Triangle Park, NC site. Underwriter Laboratories Inc. Research Triangle site is NVLAP and FCC registered. The measurement procedure is per EIA/TIA IS-137A conducted on a 3 meter test site. Results are shown on the following Exhibits.

Note: The spectrum was examined through the 10^{th} harmonic of the carrier at the highest power level for CLASS 4, at low, middle, and high ends of the band. The worst case plot is shown below. Measurements recorded are peak measurements.

EXHIBIT	FREQUENCY	OUTPUT POWER
6K2	824.04 MHz	0.355 W

The measurements were made per EIA/TIA IS-137A using the following equipment:

Receive Equipment:

Item	Description	Manufacturer
ATA033	52 ft Cable, N-N	UL
ATA034	52 ft Cable, N-N	UL
AT0020	Horn Antenna, 1-18 GHz	Electro-metrics
SAR001	EMI Receiver	Hewlett-Packard

For Substitution Calibration:

Item	Description	Manufacturer
FGR022	Signal Generator	Hewlett-Packard
ATA055	6 ft Cable, N-N	UL
AT0005	Horn Antenna, 1-18 GHz	Electro-metrics

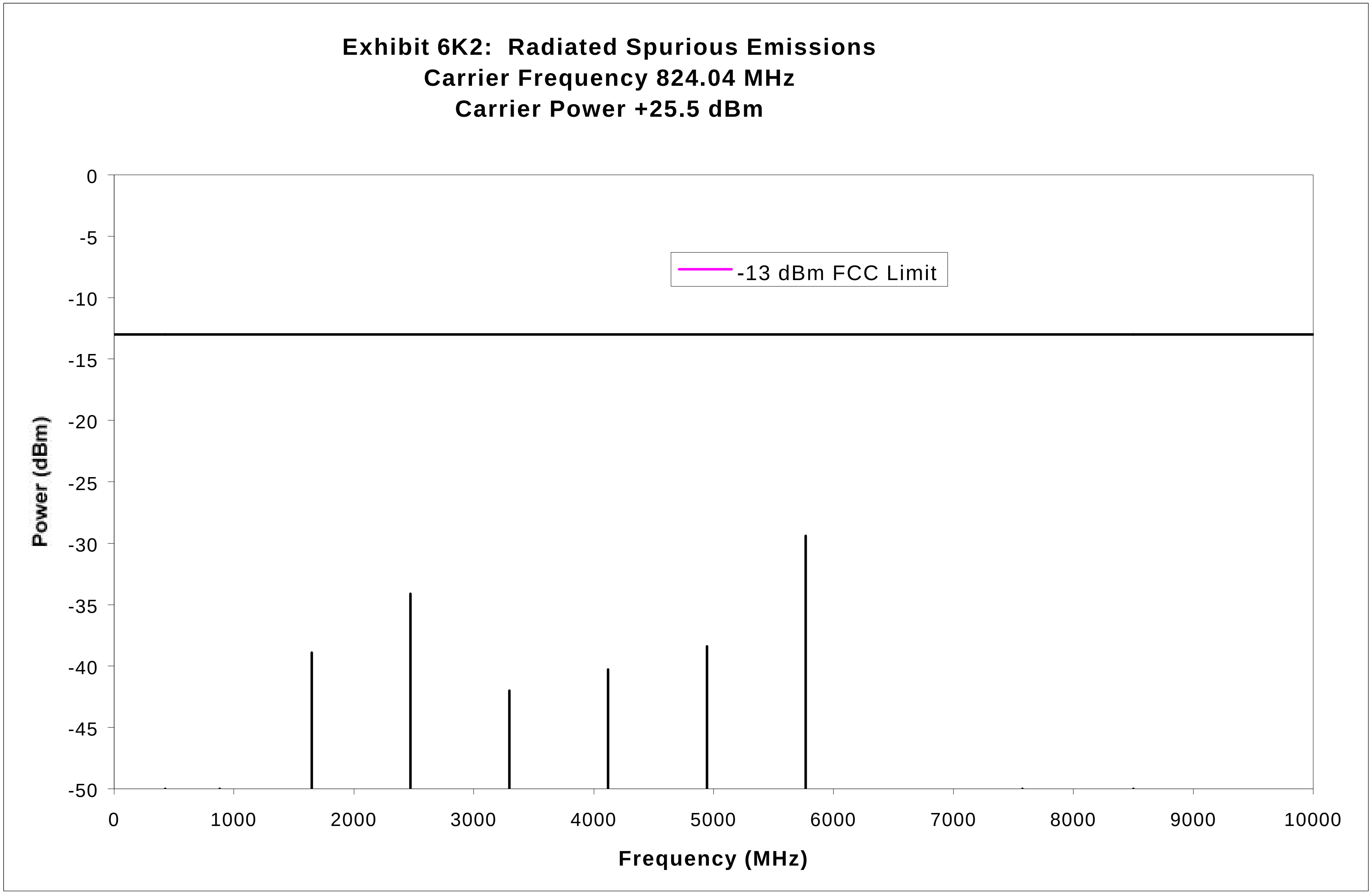


Exhibit 6K2: Radiated Spurious Emissions
Carrier Frequency 824.04 MHz
Carrier Power +25.5 dBm
-13 dBm FCC Limit
Power (dBm)
0
-5
-10
-15
-20
-25
-30
-35
-40
-45
-50
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
10000
Frequency (MHz)

EXHIBIT 6L1 **800 MHz DAMPS FREQUENCY STABILITY**

Per 2.1055 (a)(1),(b),(d)(1)

Variation of output frequency as a result of varying voltage or temperature is shown in Exhibits 6L2 and 6L3.

EXHIBIT #	Input Voltage	Temperature	Mode	Frequency
6L2	6.0 V Varied ± 15%	+25 °C	Digital (CLASS 4)	835.02 MHz
6L3	6.0 VDC	Varied	Digital (CLASS 4)	835.02 MHz

Note: The 6V input voltage is varied ± 15%, even though the manufacturer's rated supply voltage is 5.2 VDC to 6.8 VDC. The manufacturer's specified temperature range is –40 °C to +70 °C.

These measurements were made per EIA/TIA IS-137A using the following equipment:

Anritsu MT8801B	Radio Communication Analyzer
HP E3632A	DC Power Supply (2)
ESPEC Model SH-240	Temperature Chamber

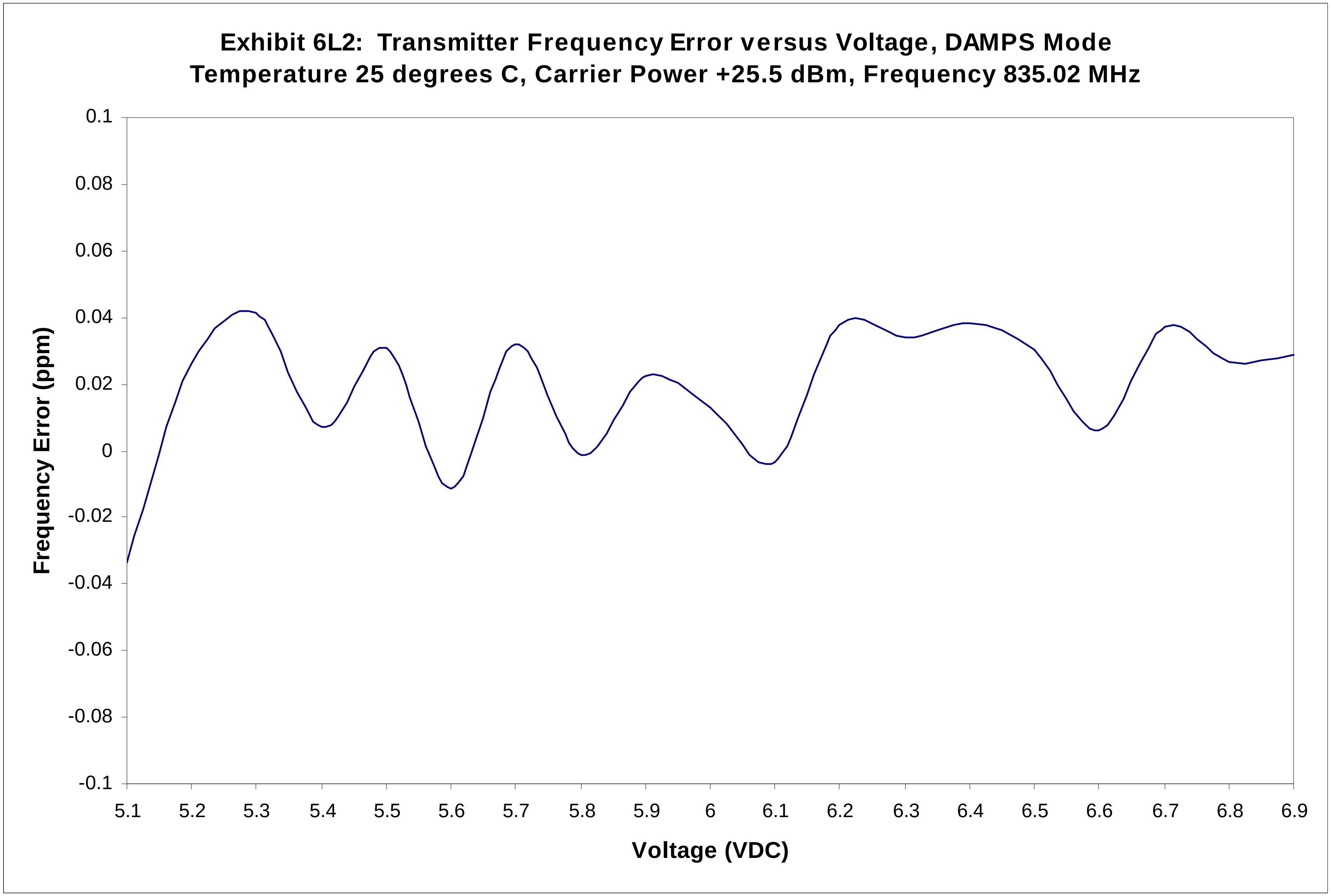


Exhibit 6L2: Transmitter Frequency Error versus Voltage, DAMPS Mode
Temperature 25 degrees C, Carrier Power +25.5 dBm, Frequency 835.02 MHz
Frequency Error (ppm)
0.1
0.08
0.06
0.04
0.02
0
-0.02
-0.04
-0.06
-0.08
-0.1
5.1
5.2
5.3
5.4
5.5
5.6
5.7
5.8
5.9
6
6.1
6.2
6.3
6.4
6.5
6.6
6.7
6.8
6.9
Voltage (VDC)

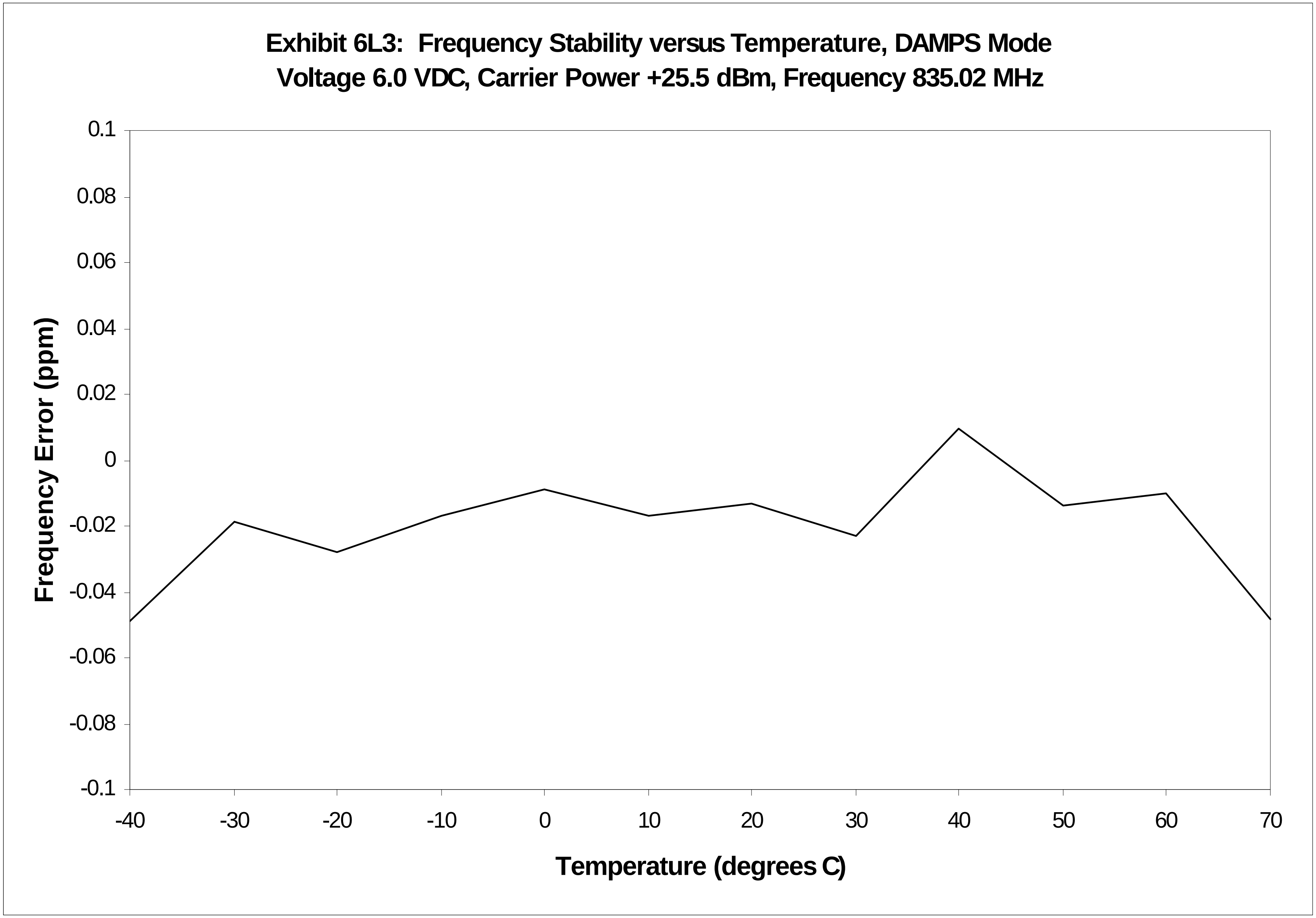


Exhibit 6L3: Frequency Stability versus Temperature, DAMPS Mode
Voltage 6.0 VDC, Carrier Power +25.5 dBm, Frequency 835.02 MHz
Frequency Error (ppm)
0.1
0.08
0.06
0.04
0.02
0
-0.02
-0.04
-0.06
-0.08
-0.1
-40
-30
-20
-10
0
10
20
30
40
50
60
70
Temperature (degrees C)

Exhibit 6M1

1900 MHz: RF POWER OUTPUT

Para. 2.1046 (a) and 22.913 (a)

The RF power at the band ends and band center, measured at the antenna connector using a communications test set as the specified load, are plotted against supply voltage variations and temperature variations at the highest power level.

Exhibit	Input Voltage	Temperature	P_o	Modulation (Freq)	Power Level
6M2	6.0	Varied	0.355 W	Digital (1900)	0 (CLASS 4)
6M3	6.0 Varied ± 15%	+25 C	0.355 W	Digital (1900)	0 (CLASS 4)

Note: The 6V input voltage is varied ± 15%, even though the manufacturer's rated supply voltage is 5.2 VDC to 6.8 VDC. The manufacturer's specified temperature range is –40 ^{o}C to +70 ^{o}C. The output power is calibrated at the center of the band at room temperature.

These measurements were made per EIA/TIA IS-137A using the following equipment:

Anritsu MT8801B	Radio Communication Analyzer
HP E3632A	DC Power Supply (2)
ESPEC Model SH-240	Temperature Chamber

The DM20 Transceiver has been designed as an OEM module for use by various OEM integrators. Since an antenna and cable is not provided to the customer, the substitution method per IS-137A of measuring effective radiated power data is not available.

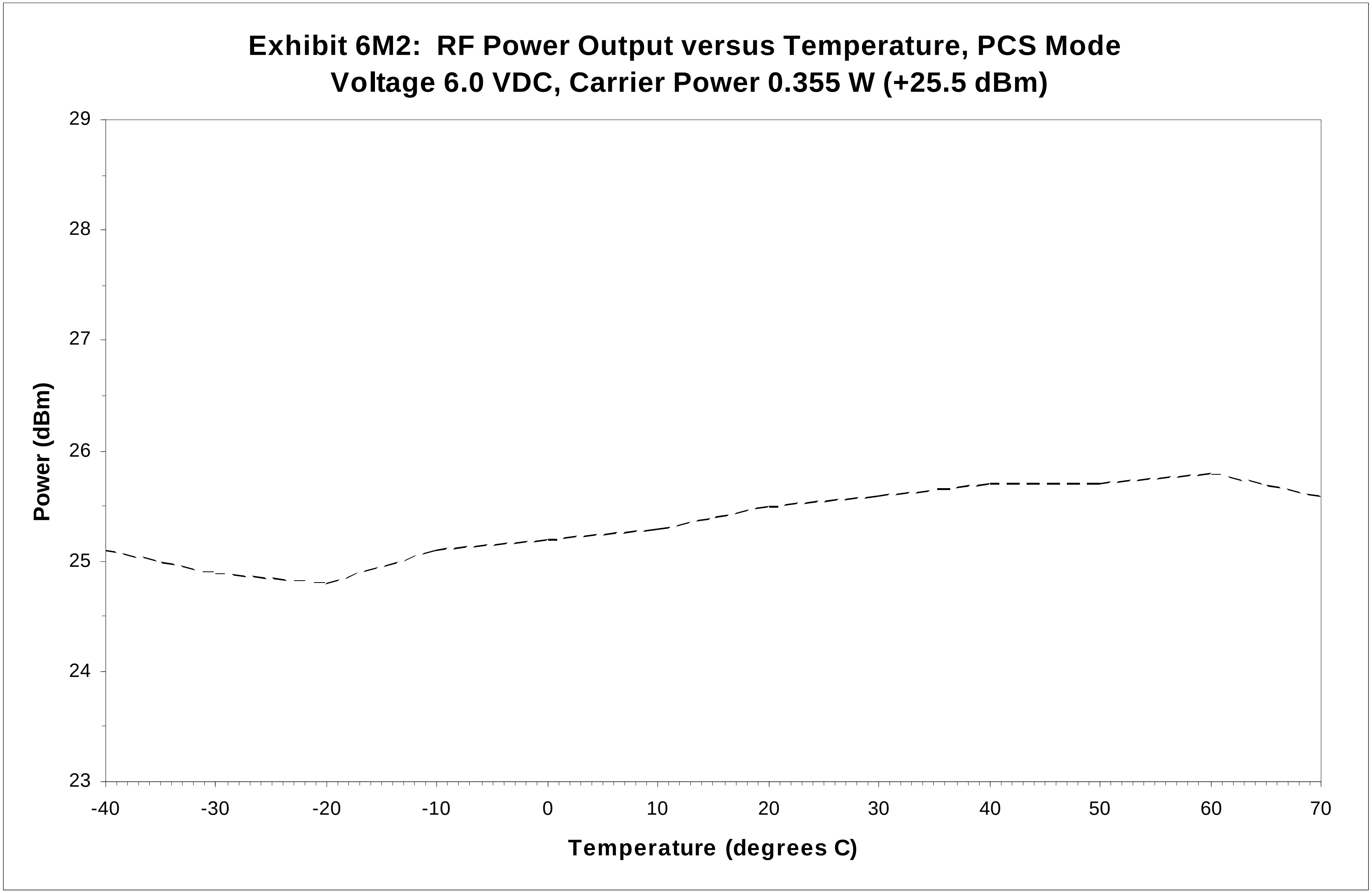


Exhibit 6M2: RF Power Output versus Temperature, PCS Mode
Voltage 6.0 VDC, Carrier Power 0.355 W (+25.5 dBm)
Power (dBm)
29
28
27
26
25
24
23
-40
-30
-20
-10
0
10
20
30
40
50
60
70
Temperature (degrees C)

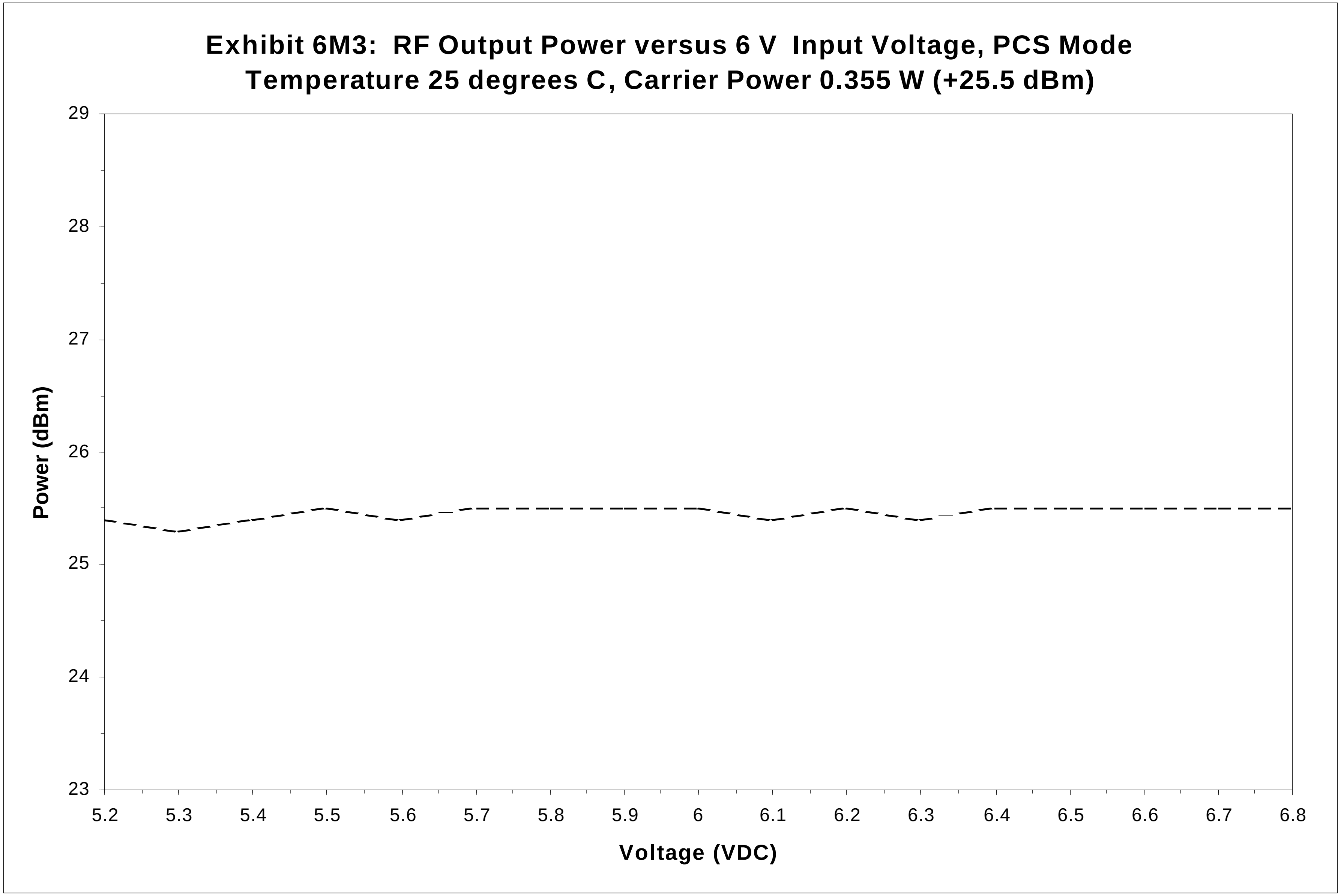


Exhibit 6M3: RF Output Power versus 6 V Input Voltage, PCS Mode
Temperature 25 degrees C, Carrier Power 0.355 W (+25.5 dBm)
Power (dBm)
29
28
27
26
25
24
23
5.2
5.3
5.4
5.5
5.6
5.7
5.8
5.9
6
6.1
6.2
6.3
6.4
6.5
6.6
6.7
6.8
Voltage (VDC)

EXHIBIT 6N1

800/1900 MHz: DAMPS MODULATION CHARACTERISTICS

Part 2.1047

Definition

The transceiver shall be capable of generating π/4 shifted differentially encoded quadrature phase shift keying signals. The transmitted signal is given by:

$$S(t) = \sum_n g(t-nT) \cos(\phi n) \cos(\omega ct) - \sum_n g(t-nT) \sin(\phi n) \sin(\omega ct)$$

where g(t) is the pulse shaping function that corresponds to a square root raised cosine baseband filter with roll off factor of 0.35, ωc is the radian carrier frequency, T is the symbol period, and ϕn is the absolute phase corresponding to the nth symbol interval. The symbol rate (1/T) is 24.3 k symbols /sec.

The modulation accuracy requirement is specified by setting limits on the RMS difference between the actual transmitted signal waveform and the ideal signal waveform. The ideal waveform is derived mathematically from the specification of modulation shown above. The specified requirement is error vector magnitude.

For this measurement, frequency accuracy shall meet the requirements of Section 3.1 prior to measurement.

The average carrier frequency error is the difference between the average carrier frequency of the actual transmitted waveform and the average signal waveform carrier frequency.

The ideal modulation is defined above. The definition is such that, observing an ideal transmitter through an ideal root raised-cosine receiver filter at the correct sampling instants one symbol apart would result in the sequence of values given by:

$$S(k)=S(k-1)e^{j\{\pi/4+B(k)*\pi/2\}}$$

where B(k) = 0,1,2,3 according to the following table:

Xk	Yk	B(k)
0	0	0
0	1	1
1	1	2
1	0	3

In the forward channel, S(k) forms part of a continuous data stream. In the reverse channel, the transit bursts from the mobile are truncated by power up and down ramping. In this case, S(6) is the first sample that enters into demodulation, which yields the first two information bits by comparing S(6) with S(7). The last information bits lie in the comparison of S(162) and S(161).

The ideal transmit and receive filters in cascade form a raised cosine Nyquist filter having an impulse response going through zero at symbol period intervals, so there is no inter-symbol interference at the ideal sampling points. The ideal signal sampler therefore, take on one of the eight values defined above, at the output of the receive filter.

This section defines how the output signal from a transmitter is to be evaluated against the ideal signal.

Let Z(k) be the complex vectors produced by observing the real transmitter through an ideal measuring receive filter at instants k, one symbol period apart. With S(k) defined as above, the transmitter is modeled as:

$$Z(k) = [C0 + C1 * [S(k)+E(k)]] * W^{k}$$

where:

k = n/24.3KHz

$W = e^{dr=jda}$ accounts for both a frequency offset giving “da” radians per symbol phase rotation and an amplitude changes of “dr” nepers per symbol:

C0 is a constant origin offset representing quadrature modulator imbalance,
C1 is a complex constant representing the arbitrary phase and output power of the transmitter, and
E(k) is the residual vector error on sample S(k)

The sum square vector error is then:

$$\sum_{k=MIN}^{k=MAX} |E(k)|2 \qquad \sum_{k=MIN}^{k=MAX} |\{[Z(k) * W \quad -C0]/C1\} -S(k)|$$

C0, C1 and W shall be chosen to minimize this expression and are then used to compute the individual vector errors E(k) on each symbol. The symbol timing phase of the receiver output samples used to compute the vector error shall also be chosen to give the lowest value.

The values of MAX and MIN for the reverse channel (mobile station transmitter) are:

MIN = 6
MAX = 162

The RMS vector error is then computed as the square root of the sum-square vector divided by the number of symbols in the slot, (157 in the reverse direction).

Method of Measurement

Connect the mobile station to the Standard Test Source and Modulation Accuracy Equipment. Modulate the Standard Test Source with pseudo-random Data Field bits. The mobile station shall transpond the Data Field bits using the TDMAON command. Use the Modulation Accuracy Measurement Equipment to measure the modulation accuracy of the mobile station.

Minimum Standard

The RMS vector error in any burst shall be less than 12.5%. In addition, the normalized error vector magnitude during the first 10 symbols (20 bits) of a burst following the ramp-up, must have an RMS value of less than 25% when averaged over 10 bursts within a 1 minute interval. The minimum standard for frequency offset is specified in section 3.1.2.2.3 of IS 137. The origin offset in any burst shall be less than -20 dBc.

Exhibit 6O1

1900 MH: OCCUPIED BANDWIDTH

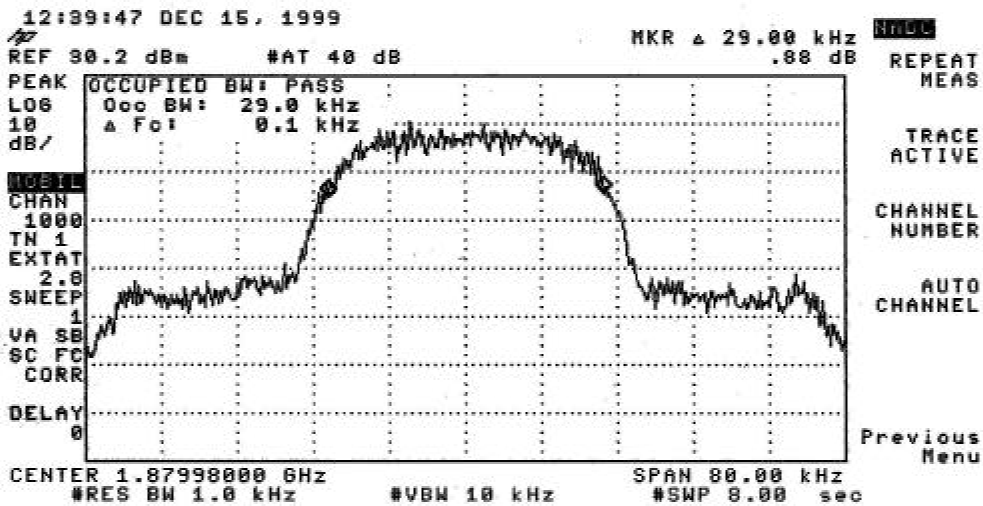
Per 2.1049 (c) (1) and 22.917 (d), the exhibit presented shows the modulation that exists in a DAMPS cellular system:

Exhibit #	Description	Power Level	Frequency (MHz)
6O2	48.6 kb/s Wideband Data	0, CLASS 4	1879.98 MHz

These measurements were made per EIA/TIA IS-137A using the following equipment:

HP8920B	Radio Communication Analyzer
HP8593E	Spectrum Analyzer
HP E3632A	DC Power Supply (2)

Exhibit 6O2: Class 4 Power Level 0 = 0.355 W (+25.5 dBm)
Carrier Frequency 1879.98 MHz, Wideband data 48.6 Kb/s



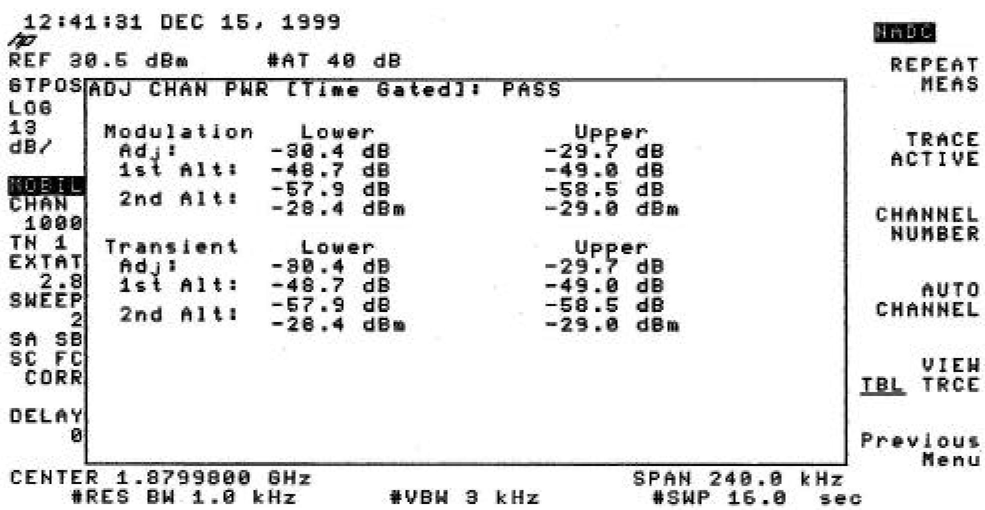


Exhibit 6P1

1900 MHz: SPURIOUS EMISSIONS (CONDUCTED)

Per 2.1051 Conducted Spurious emissions were measured at the antenna connector with a spectrum analyzer per EIA/TIA IS-137A.

EXHIBIT #	FREQUENCY	Output Power
6P2	1879.98 MHz	.355 W (CLASS 4 PL0)
6P3	1879.98 MHz	.0003 W (CLASS 4 PL10)

Note: The spectrum was examined through the 10th harmonic of the carrier at the highest power level for at low, middle, and high ends of the band. The worst case plots for each power level are shown below. Measurements recorded are peak measurements.

These measurements were made per EIA/TIA IS-137A using the following equipment:

HP8593E	Spectrum Analyzer
HP E3632A	DC Power Supply (2)

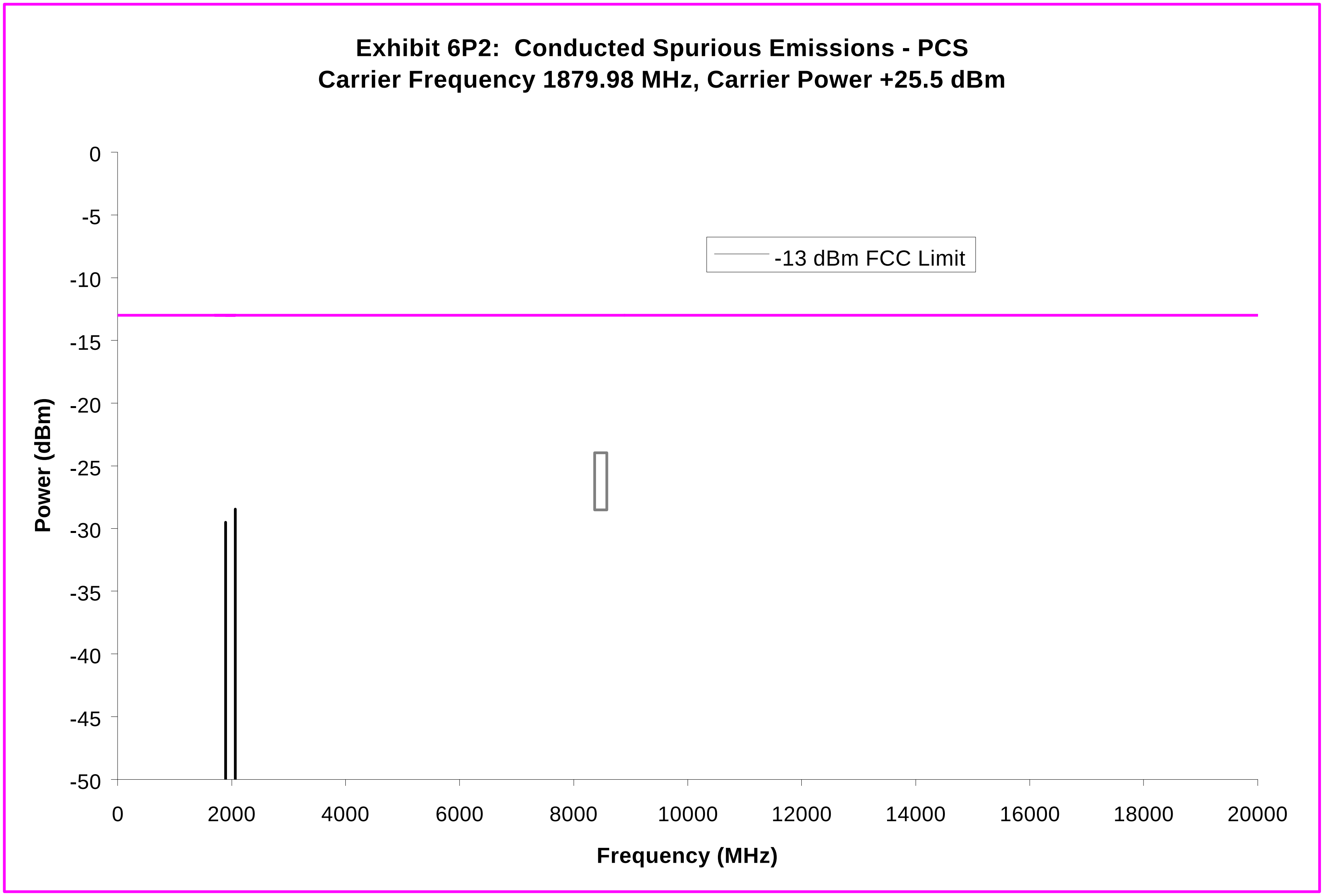


Exhibit 6P2: Conducted Spurious Emissions - PCS
Carrier Frequency 1879.98 MHz, Carrier Power +25.5 dBm
-13 dBm FCC Limit
Power (dBm)
0
-5
-10
-15
-20
-25
-30
-35
-40
-45
-50
0
2000
4000
6000
8000
10000
12000
14000
16000
18000
20000
Frequency (MHz)

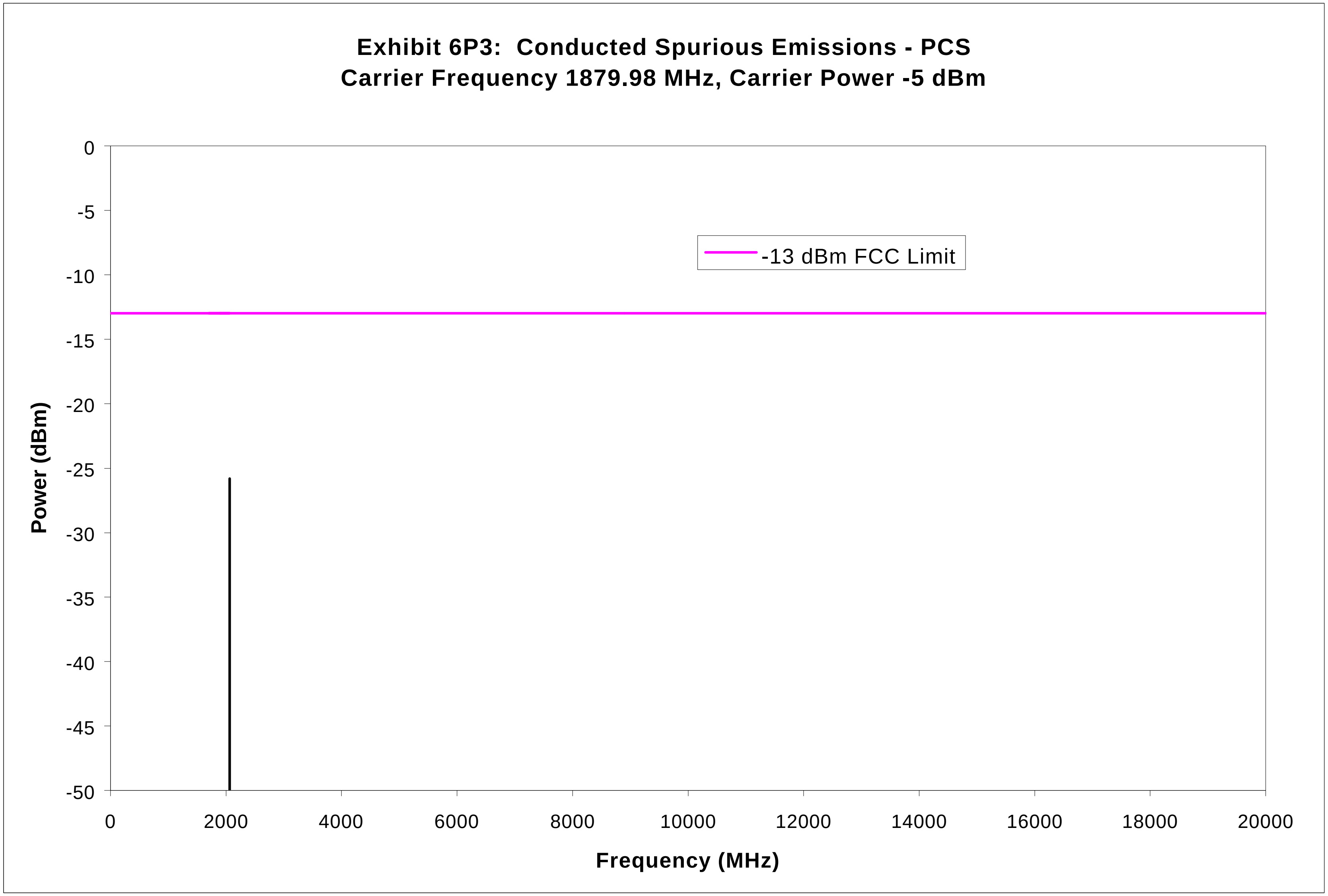


Exhibit 6P3: Conducted Spurious Emissions - PCS
Carrier Frequency 1879.98 MHz, Carrier Power -5 dBm
-13 dBm FCC Limit
Power (dBm)
0
-5
-10
-15
-20
-25
-30
-35
-40
-45
-50
0
2000
4000
6000
8000
10000
12000
14000
16000
18000
20000
Frequency (MHz)

Exhibit 6Q1

1900 MHz: SPURIOUS EMISSIONS (Radiated)

Per 2.1053 and 22.917 (e), field strength of spurious radiation was measured at Underwriters Laboratories Inc. Research Triangle Park, NC site. Underwriter Laboratories Inc. Research Triangle site is NVLAP and FCC registered. The measurement procedure is per EIA/TIA IS-137A conducted on a 3 meter test site. Results are shown on the following Exhibits.

Note: The spectrum was examined through the 10^{th} harmonic of the carrier at the highest power level for CLASS 4, at low, middle, and high ends of the band. The worst case plots for each power level are shown below. Measurements recorded are peak measurements.

EXHIBIT	FREQUENCY	OUTPUT POWER
6Q2	1880 MHz	0.355 W

The measurements were made per EIA/TIA IS-137A using the following equipment:

Receive Equipment:

Item	Description	Manufacturer
ATA033	52 ft Cable, N-N	UL
ATA034	52 ft Cable, N-N	UL
AT0020	Horn Antenna, 1-18 GHz	Electro-metrics
SAR001	EMI Receiver	Hewlett-Packard

For Substitution Calibration:

Item	Description	Manufacturer
FGR022	Signal Generator	Hewlett-Packard
ATA055	6 ft Cable, N-N	UL
AT0005	Horn Antenna, 1-18 GHz	Electro-metrics

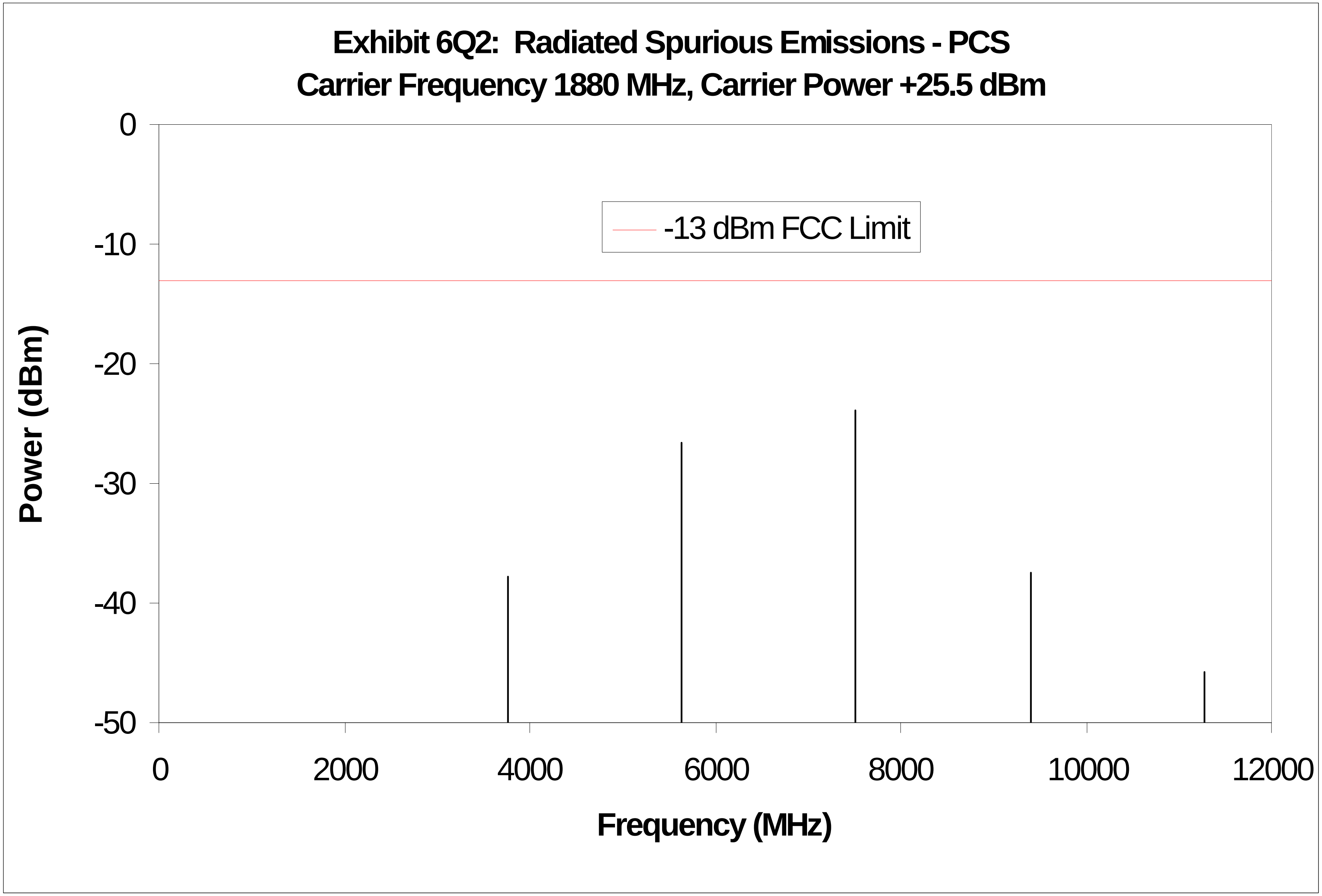


Exhibit 6Q2: Radiated Spurious Emissions - PCS
Carrier Frequency 1880 MHz, Carrier Power +25.5 dBm
-13 dBm FCC Limit
Power (dBm)
0
-10
-20
-30
-40
-50
0
2000
4000
6000
8000
10000
12000
Frequency (MHz)

EXHIBIT 6R1 **1900 MHz: FREQUENCY STABILITY**

Per 2.1055 (a)(1),(b),(d)(1)

Variation of output frequency as a result of varying voltage or temperature is shown in Exhibits 6L2 and 6L3.

EXHIBIT #	Input Voltage	Temperature	Mode	Frequency
6R2	6.0 V Varied ± 15%	+25 °C	Digital (CLASS 4)	1979.98 MHz
6R3	6.0 VDC	Varied	Digital (CLASS 4)	1979.98 MHz

Note: The 6V input voltage is varied ± 15%, even though the manufacturer's rated supply voltage is 5.2 VDC to 6.8 VDC. The manufacturer's specified temperature range is –40 °C to +70 °C.

These measurements were made per EIA/TIA IS-137A using the following equipment:

Anritsu MT8801B	Radio Communication Analyzer
HP E3632A	DC Power Supply (2)
ESPEC Model SH-240	Temperature Chamber

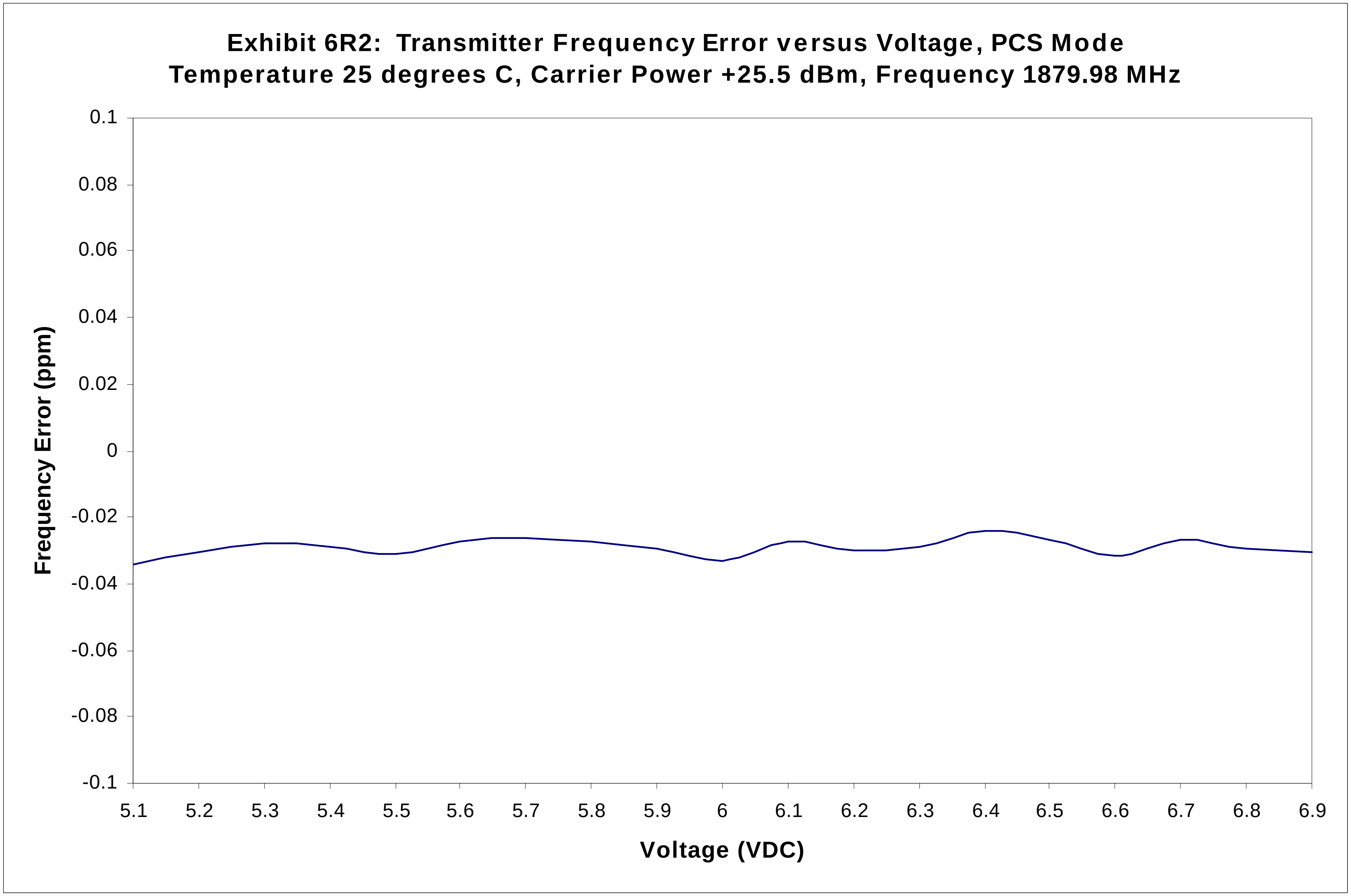


Exhibit 6R2: Transmitter Frequency Error versus Voltage, PCS Mode
Temperature 25 degrees C, Carrier Power +25.5 dBm, Frequency 1879.98 MHz
Frequency Error (ppm)
0.1
0.08
0.06
0.04
0.02
0
-0.02
-0.04
-0.06
-0.08
-0.1
5.1
5.2
5.3
5.4
5.5
5.6
5.7
5.8
5.9
6
6.1
6.2
6.3
6.4
6.5
6.6
6.7
6.8
6.9
Voltage (VDC)

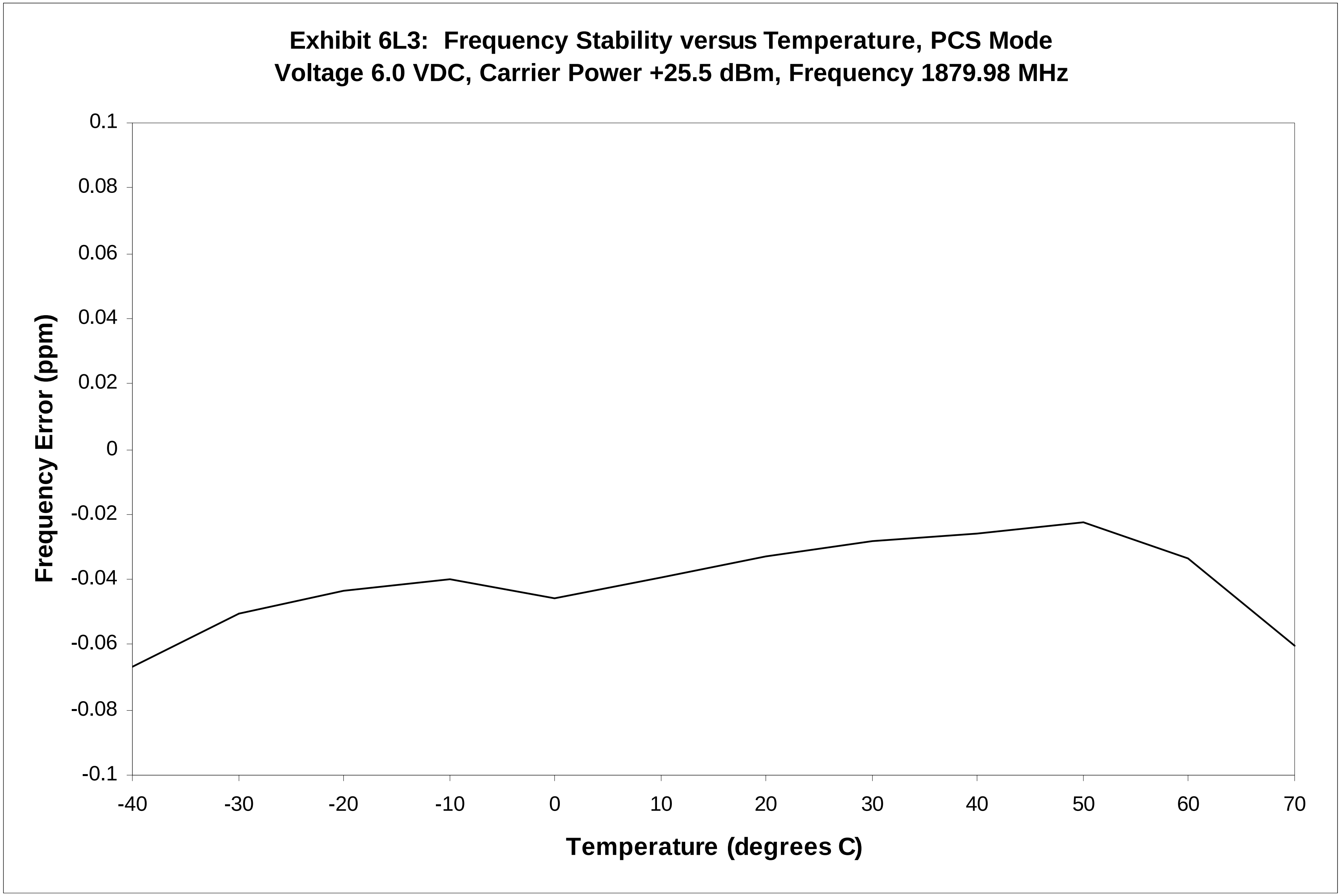


Exhibit 6L3: Frequency Stability versus Temperature, PCS Mode
Voltage 6.0 VDC, Carrier Power +25.5 dBm, Frequency 1879.98 MHz
Frequency Error (ppm)
0.1
0.08
0.06
0.04
0.02
0
-0.02
-0.04
-0.06
-0.08
-0.1
-40
-30
-20
-10
0
10
20
30
40
50
60
70
Temperature (degrees C)