PD-TX-5000-A-2.4 TEST DATA

RF Power Output 2

Modulation Characteristics-Deviation Frequency Response . . 3

Modulation Characteristics-Modulation Sensitivity . . . 4

Occupied Bandwidth/Spurious Emissions 6

Frequency Stability-Temperature Stability 11

Frequency Stability-Power Supply Stability. 13

Pd-TX-5000-A-2.4 RF Power Output:

Relevant FCC Chapter:

"§ 2.1046 Measurements required: RF power output.

(a) For transmitters other than single sideband, independent sideband and controlled carrier radiotelephone, power output shall be measured at the RF output terminals when the transmitter is adjusted in accordance with the tune-up procedure to give the values of current and voltage on the circuit elements specified in § 2.1033(c)(8). The electrical characteristics of the radio frequency load attached to the output terminals when this test is made shall be stated.

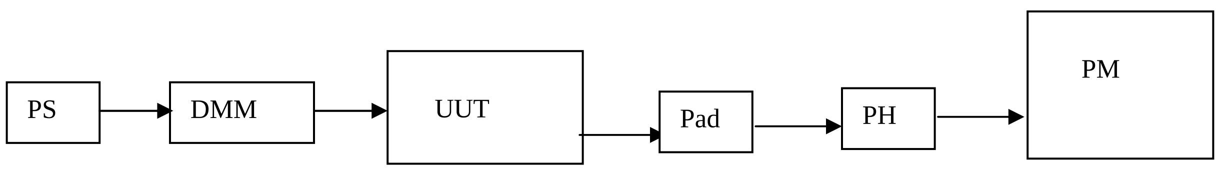
§ 2.1033 Application for certification.

(c) Applications for equipment other than that operating under parts 15 and 18 of the rules shall be accompanied by a technical report containing the following information:

(8) The dc voltages applied to and dc currents into the several elements of the final radio frequency amplifying device for normal operation over the power range."

Test Setup:

The setup for this test is shown below.



PS – Power Supply – HP 3633A S/N KR81500001
DMM – Digital Multi-Meter
UUT – Pd-TX-5000-A-2.4
Pad – 30 dB Pad – Mini Circuits CAT30
PH – Power Head – HP 8481A – SN 2702A53289
PM – Power Meter - HP 437B - SN 2912A01689

Test Method:

The Calibration Software allows for the each channel to have the attenuation set in 1 db steps. The unit under test is set to drive the output amplifier to 4.95 watts at any selected frequency with a regulated supply voltage of 12.0 VDC as required in the user manual. For all intents and purposes, the output of the unit is flat with respect to frequency. The total current consumption and amplifier currents are also flat, at 6.1 and 5.4 amps respectively.

Pd-TX-5000-A-2.4 Modulation Characteristics

Deviation Frequency Response

Relevant FCC Chapter:
"§ 2.1047 Measurements required: Modulation characteristics.

(d) *Other types of equipment.* A curve or equivalent data which shows that the equipment will meet the modulation requirements of the rules under which the equipment is to be licensed.

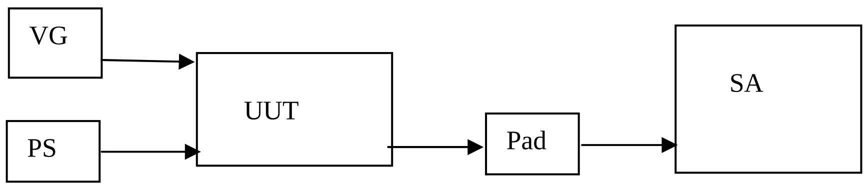
Test Method: See below

Test Results:
Whereas this is a pure video system (no audio subcarriers), and the Code of Federal Regulations Title 47 Part 90 has no definition for COFDM video signals, a test was not performed.

Pd-TX-5000-A-2.4 Modulation Characteristics
Modulation Sensitivity

Relevant FCC Chapter:
"§ 2.1047 Measurements required: Modulation characteristics.
(d) *Other types of equipment.* A curve or equivalent data which shows that the equipment will meet the modulation requirements of the rules under which the equipment is to be licensed.

Test Setup:
The setup for this test is shown below.



VG – Video Generator – Tektronix TSG195 – SN B032558
Power Supply –Hewlett Packard E3633A- S/N KR81500001
UUT – Pd-TX-5000-A-2.4
Pad – 30 dB Pad – Weinschel WA33-30
SA – Spectrum Analyzer – Advantest R3131 – SN 121000872

Test Method:
The unit under test was modulated with a 75% color bar signal, and then the video input port was loaded with a 75 ohm pure resistive load.

Test Results:
Since the nature of digital modulation is such that the input signal has no effect on the modulated carrier(s), the results are presented in figure 1 without modulation and figure 2 with modulation show that a typical video signal will produce the same modulation characteristic as no input signal at all. Therefore, the modulation sensitivity is essentially flat with respect to the frequency and amplitude of the modulating signal.

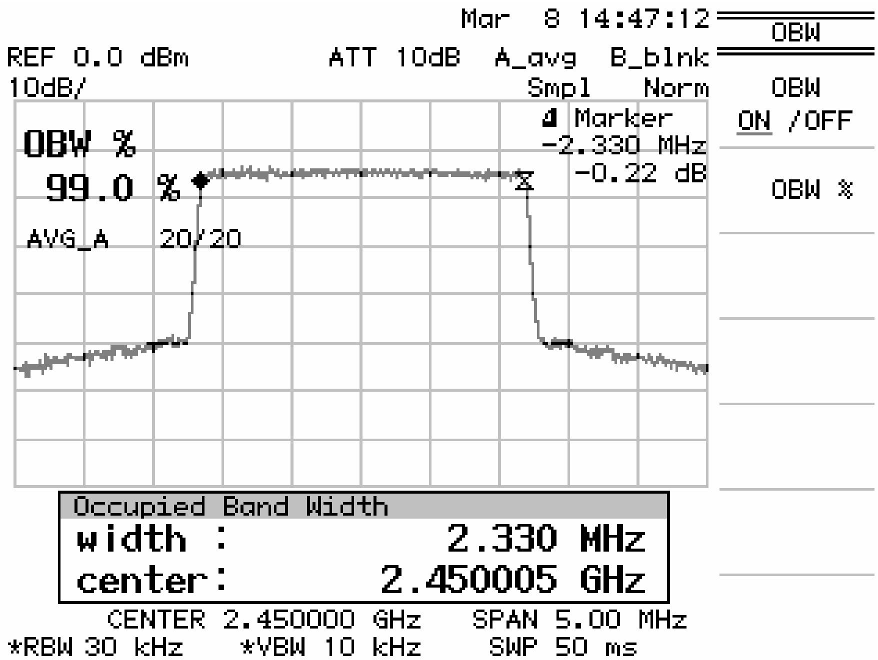


Figure 1

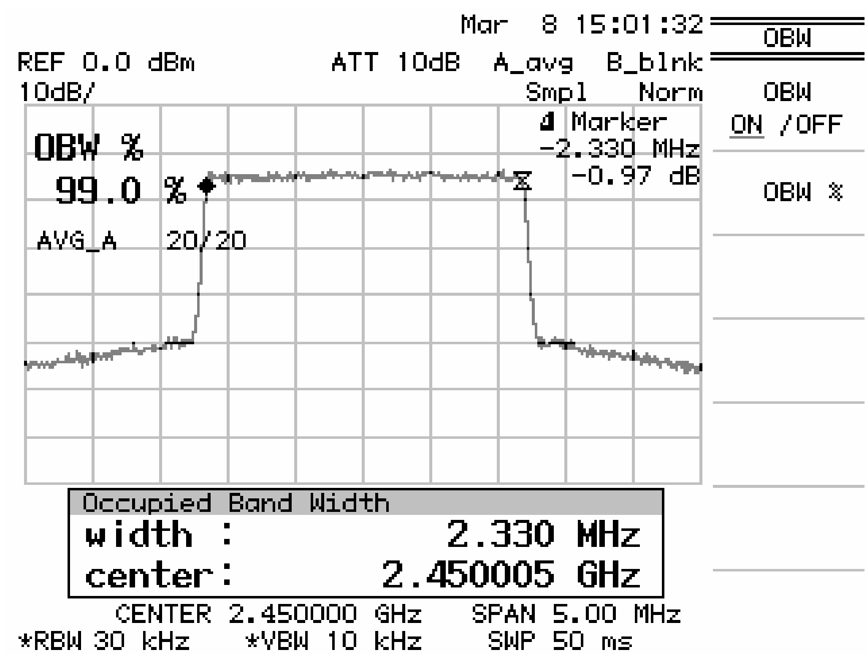


Figure 2

Pd-TX-5000-A-2.4 Occupied Bandwidth/Spurious Emissions

Relevant FCC Chapters:

§ 2.1049 Measurements required: Occupied bandwidth.

The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured under the following conditions as applicable:

(h) Transmitters employing digital modulation techniques—when modulated by an input signal such that its amplitude and symbol rate represent the maximum rated conditions under which the equipment will be operated. The signal shall be applied through any filter networks, pseudo-random generators or other devices required in normal service. Additionally, the occupied bandwidth shall be shown for operation with any devices used for modifying the spectrum when such devices are optional at the discretion of the user.

§ 2.1051 Measurements required: Spurious emissions at antenna terminals.

The radio frequency voltage or powers generated within the equipment and appearing on a spurious frequency shall be checked at the equipment output terminals when properly loaded with a suitable artificial antenna. Curves or equivalent data shall show the magnitude of each harmonic and other spurious emission that can be detected when the equipment is operated under the conditions specified in § 2.1049 as appropriate. The magnitude of spurious emissions which are attenuated more than 20 dB below the permissible value need not be specified.

§ 90.210 Emission masks.

(Under Part 90 section 210, the masks for equipment designated to operate in the 2.38 to 2.48 MHz band are not specified in the Applicable Emission Masks Chart. Therefore, while the Pd-TX-5000-A-2.4 has no provision to inject an audio sub carrier into the transmitted RF signal, we have applied Mask B as noted for “All other bands”. Although Mask B generally pertains to equipment with an audio low pass filter, Mask C is completely in appropriate in that it does not allow for spread spectrum carriers within the designated bandwidth.)

(b) *Emission Mask B* - For transmitters that are equipped with an audio lowpass filter pursuant to § 90.211(a), the power of any emission must be below the unmodulated carrier power (P) as follows:

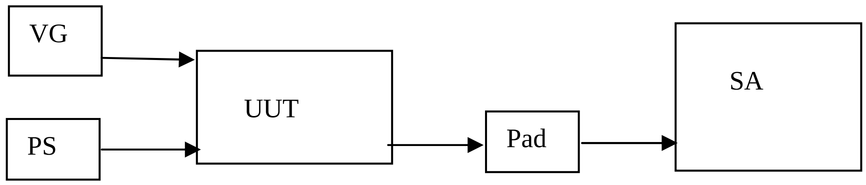
(1) On any frequency removed from the assigned frequency by more than 50 percent, but not more than 100 percent of the authorized bandwidth: At least 25 dB.

(2) On any frequency removed from the assigned frequency by more than 100 percent, but not more than 250 percent of the authorized bandwidth: At least 35 dB.

(3) On any frequency removed from the assigned frequency by more than 250 percent of the authorized bandwidth: At least 43 + 10 log (P) dB.

Test Setup:

The setup for this test is shown below.



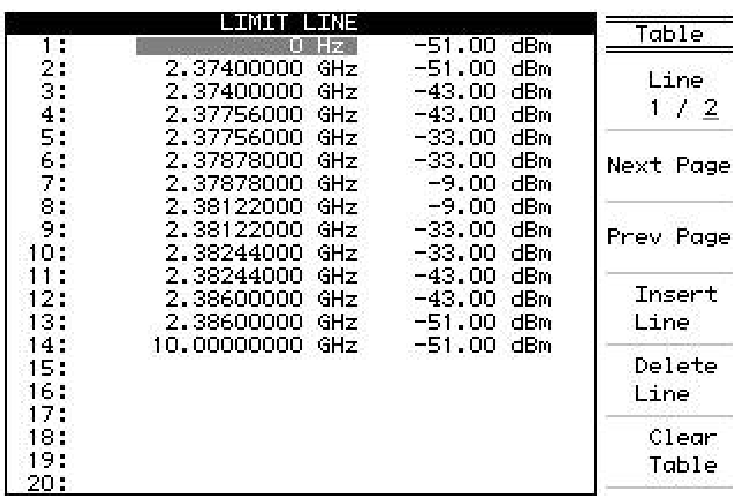
VG – Video Generator – Tektronix TSG195 – S/N BO32558
Power Supply HP 3633A- S/N KR81500001
UUT – Pd-TX-5000-A-2.4
Pad – 30 dB Pad – Weinschel WA33-30
SA – Spectrum Analyzer – Advantest R3131 – S/ 121000872
SA- Spectrum Analyzer- HP E4405B- S/N US39050101- Conducted Emissions

Test Method:

The unit under test was modulated with a 75% color bar signal tested at low, mid and high band frequencies.

For the purpose of calculating mask segments, the power of the unmodulated carrier was 5 Watts, therefore the value calculated per 90.210 (b) (3): 43 + 10log(5.000) = 49.9 dB

The mask was applied to the spectrum analyzer using the low band frequency of the Unit Under Test as the base point. The segment values are shown in Figure 3. The Advantest R3131 allows the X and Y offsets of the entire mask. For pragmatic and consistency purposes, the same mask was used for all three measurement points with the frequency offset of the mask adjusted to recenter over each of the three measurement points.



LIMIT LINE

1:	0 Hz	-51.00 dBm
2:	2.37400000 GHz	-51.00 dBm
3:	2.37400000 GHz	-43.00 dBm
4:	2.37756000 GHz	-43.00 dBm
5:	2.37756000 GHz	-33.00 dBm
6:	2.37878000 GHz	-33.00 dBm
7:	2.37878000 GHz	-9.00 dBm
8:	2.38122000 GHz	-9.00 dBm
9:	2.38122000 GHz	-33.00 dBm
10:	2.38244000 GHz	-33.00 dBm
11:	2.38244000 GHz	-43.00 dBm
12:	2.38600000 GHz	-43.00 dBm
13:	2.38600000 GHz	-51.00 dBm
14:	10.00000000 GHz	-51.00 dBm
15:		
16:		
17:		
18:		
19:		
20:		

Table
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Next Page
Prev Page
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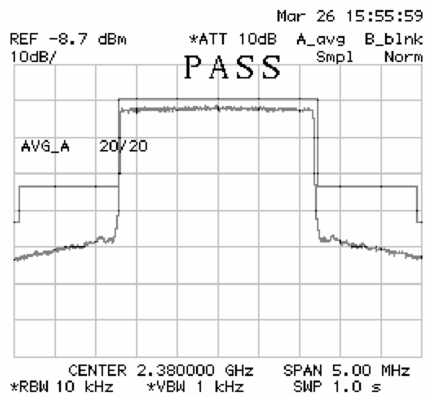
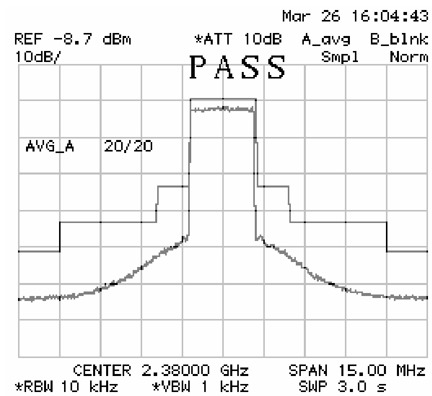
Figure 3

Test Results:

The results of the test are shown in Figures 4 - 12. Figures 6, 9, and 12 are presented to show the mask with no signal present. Figures 13 - 19 show the results of conducted emissions. The frequency range from 1 MHz to 13 GHz was examined. A 30 dB pad was used between the UUT and the spectrum analyzer. The analyzer Ref. was set to 10 dBm with 10 dB of input attenuation. All spurious emissions are at least -50 dB below the fundamental frequency.





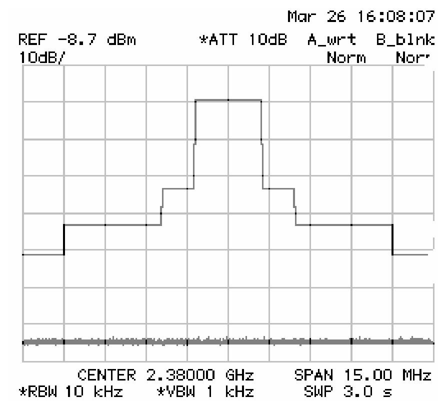
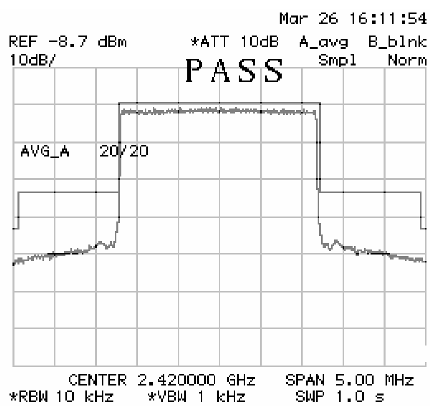
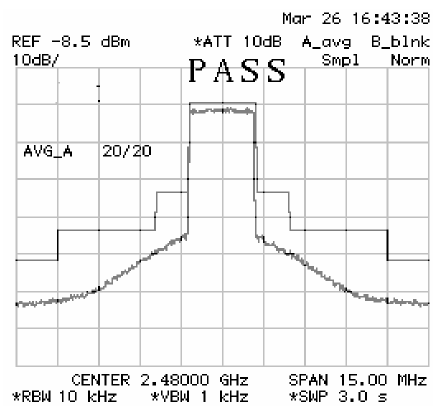


Figure 4 **Figure 5** **Figure 6**





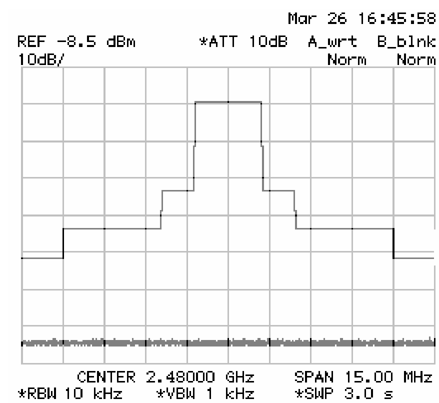
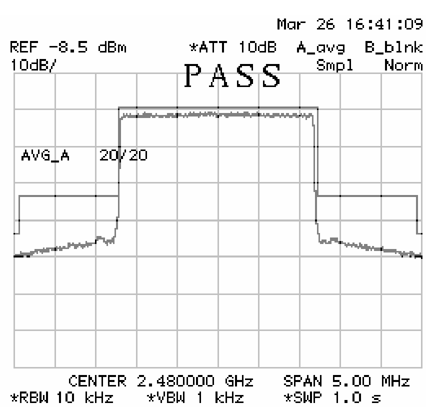
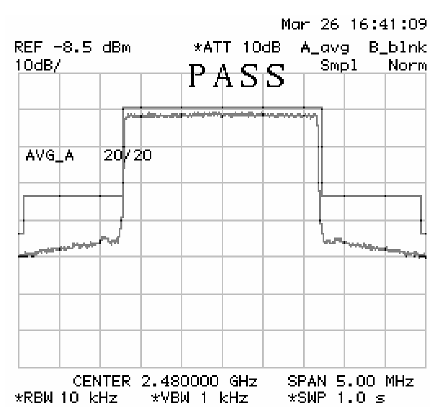


Figure 7 **Figure 8** **Figure 9**





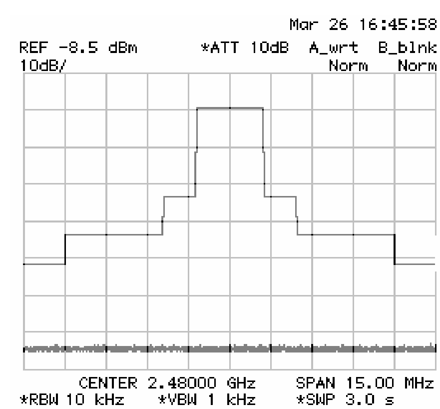


Figure 10 **Figure 11** **Figure 12**

Conducted Spurious Emissions:

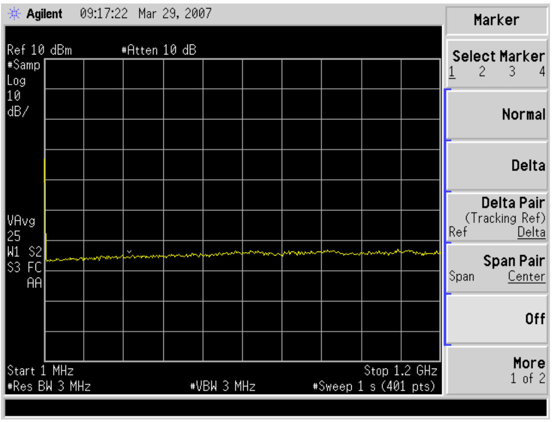


Figure 13

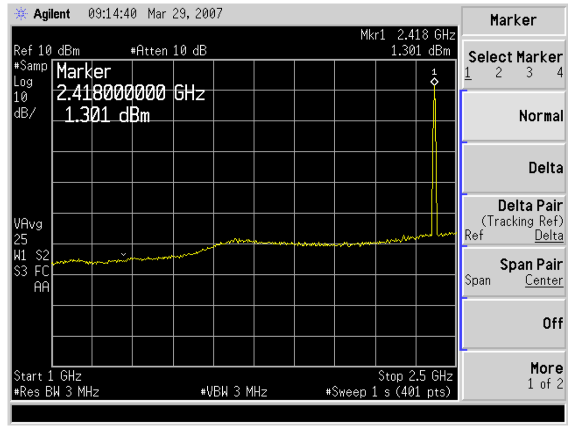


Figure 14

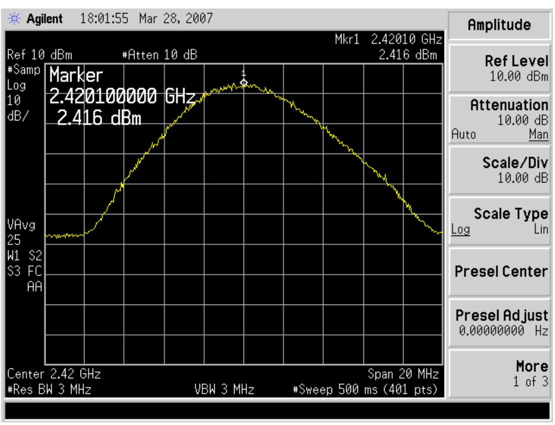


Figure 15

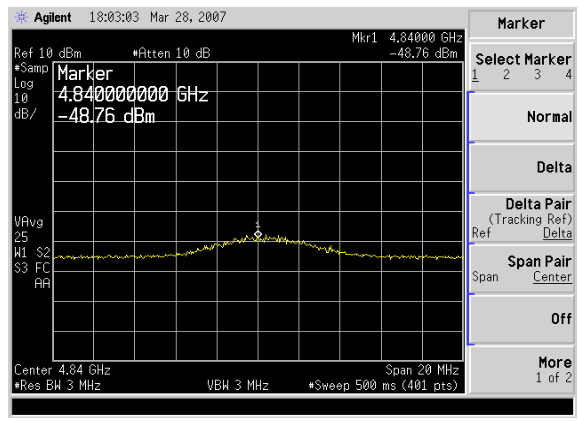


Figure 16

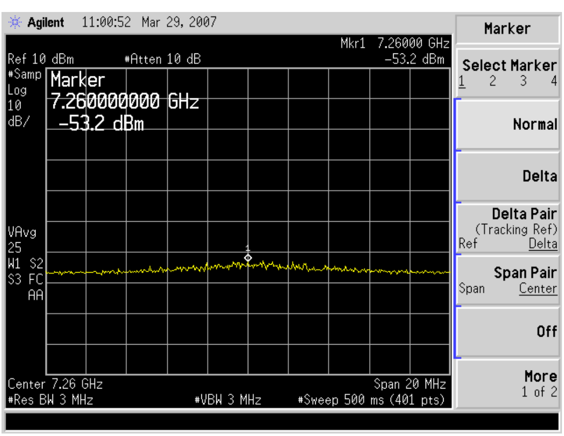


Figure 17

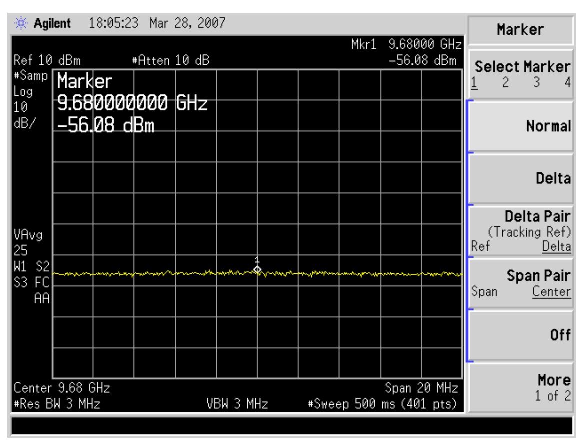


Figure 18

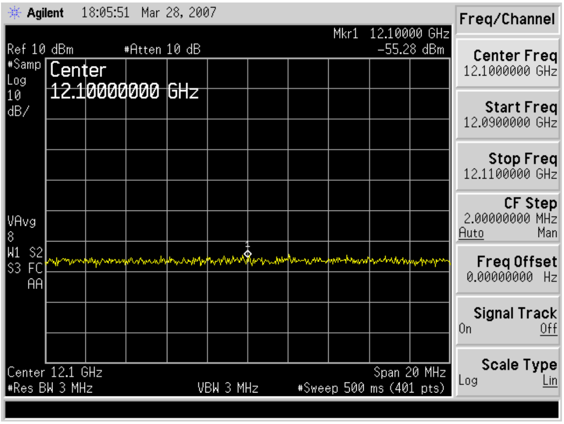

Agilent 18:05:51 Mar 28, 2007
Mkr1 12.10000 GHz
-55.28 dBm
Ref 10 dBm
#Atten 10 dB
#Samp
Log
10
dB/
Center
12.10000000 GHz
VAvg
8
W1 S2
S3 FC
AA
Center 12.1 GHz
#Res BW 3 MHz
VBW 3 MHz
Span 20 MHz
#Sweep 500 ms (401 pts)
Freq/Channel
Center Freq
12.1000000 GHz
Start Freq
12.0900000 GHz
Stop Freq
12.1100000 GHz
CF Step
2.00000000 MHz
Auto Man
Freq Offset
0.00000000 Hz
Signal Track
On Off
Scale Type
Log Lin

Figure 19

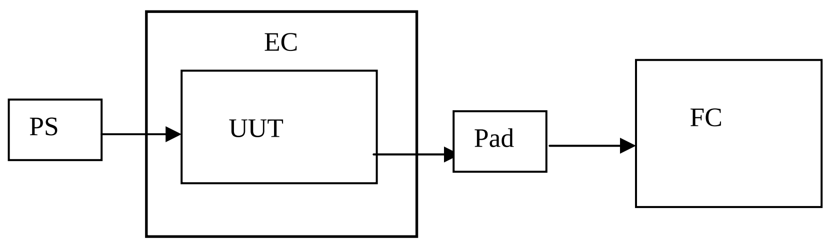
PDTX-5000-A-2.4 Frequency Stability
Temperature Stability

Relevant FCC Chapter:
"§ 2.1055 Measurements required: Frequency Stability.
(a) The frequency stability shall be measured with variation of ambient temperature as follows:
(1) From -30° to +50° centigrade for all equipment except that specified in paragraphs (a) (2) and (3) of this section.

[The Pd-TX-5000-A-2.4 does not qualify under part 90, chapter 2.1055 (a) (2) or (a) (3)]

(b) Frequency measurements shall be made at the extremes of the specified temperature range and at intervals of not more than 10° centigrade through the range. A period of time sufficient to stabilize all of the components of the oscillator circuit at each temperature level shall be allowed prior to frequency measurement. The short term transient effects on the frequency of the transmitter due to keying (except for broadcast transmitters) and any heating element cycling normally occurring at each ambient temperature level also shall be shown. Only the portion or portions of the transmitter containing the frequency determining and stabilizing circuitry need be subjected to the temperature variation test.

Test Setup:
The setup for this test is shown below.



PS – Power Supply – Agilent E3633A – S/N KR81500001
EC – Environmental Chamber – Applied Systems BK-1101 – SN 8665
UUT – Pd-TX-5000A-M-2.4
Pad – 30 dB Pad – Weinschel WA33-30
FC – Frequency Counter – HP 5351B – SN 3049A01214

Test Method:
The unit under test was powered at 12.0 VDC and set to a carrier frequency of 2.45 GHz. The modulation source was disabled in order to allow the unit to transmit a single CW center frequency carrier. The Environmental Chamber was set to –30° C and swept to +70° C in 10° steps. Due to the small size of the chamber and the UUT, the unit was left at each temperature for 30 minutes before the measurement was made. Since there is no method of keying the transmitter or any form of heating element in the UUT, those results are not required.

Test Results:
The results of the test are shown in Figures 20 and 21.

Frequency Deviation (PPM) as a function of temperature

Temp (°C)	Fr Dev. (PPM)
-30	-1.88
-20	-1.257
-10	-1.25
0	-.750
10	+.121
20	0
30	-.759
40	-.523
50	-.562

Figure 20 – Frequency Stability (Pursuant to FCC Requirement 2.1055a) – Raw Data

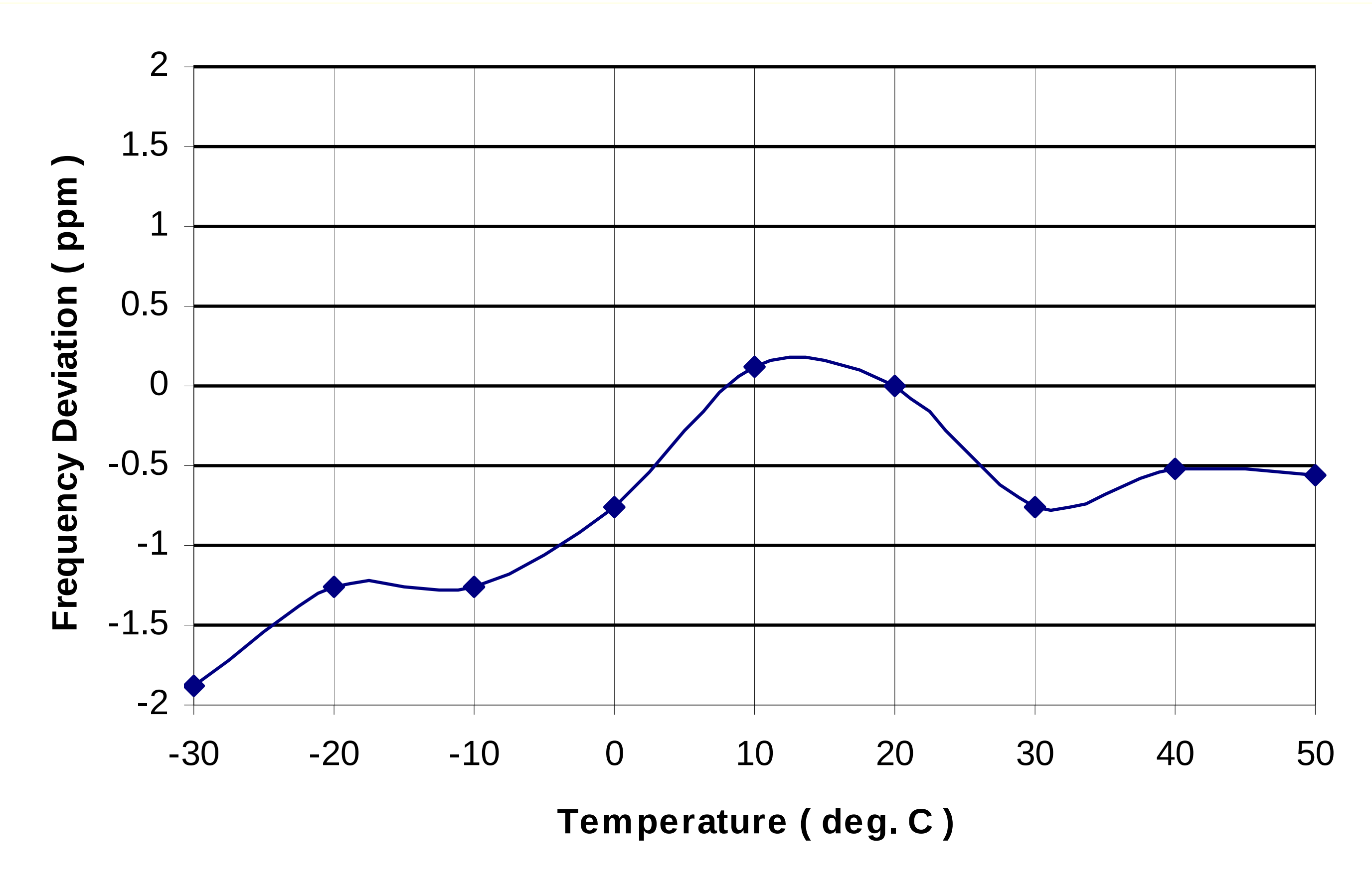
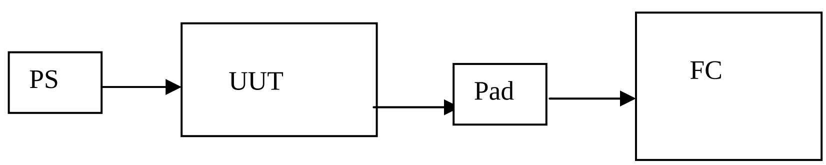


Figure 21 - Frequency Deviation (PPM) as a Function of Temperature (Pursuant to FCC Requirement 2.1055a)

Pd-TX-5000-A-2.4 Frequency Stability
Power Supply Stability

Relevant FCC Chapter:
"§ 2.1055 Measurements required: Frequency Stability.
(d) The frequency stability shall be measured with variation of primary supply voltage as follows:
(1) Vary primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment.

Test Setup:
The setup for this test is shown below.



PS – Power Supply – Hewlett-Packard E3633A – S/N KR81500001
UUT – Pd-TX-5000-A-2.4
Pad – 30 dB Pad – Weinschel WA33-30
FC – Frequency Counter – HP 5351B – SN 3049A01214

Test Method:
The Frequency output of the unit under test was measured at supply voltages in 5 increments from 85% to 115% of the nominal 12 VDC.

Test Results: The results of the test are shown in Figures 22 and 23.

Frequency Deviation (PPM) as a function of supply voltage

Voltage (VDC)	Fr Dev. (PPM)
10.2	+.0020
11.1	0
12.0	0
12.9	.0028
13.8	.0024

Figure 22 – Frequency Stability (Pursuant to FCC Requirement 2.1055d) – Raw Data

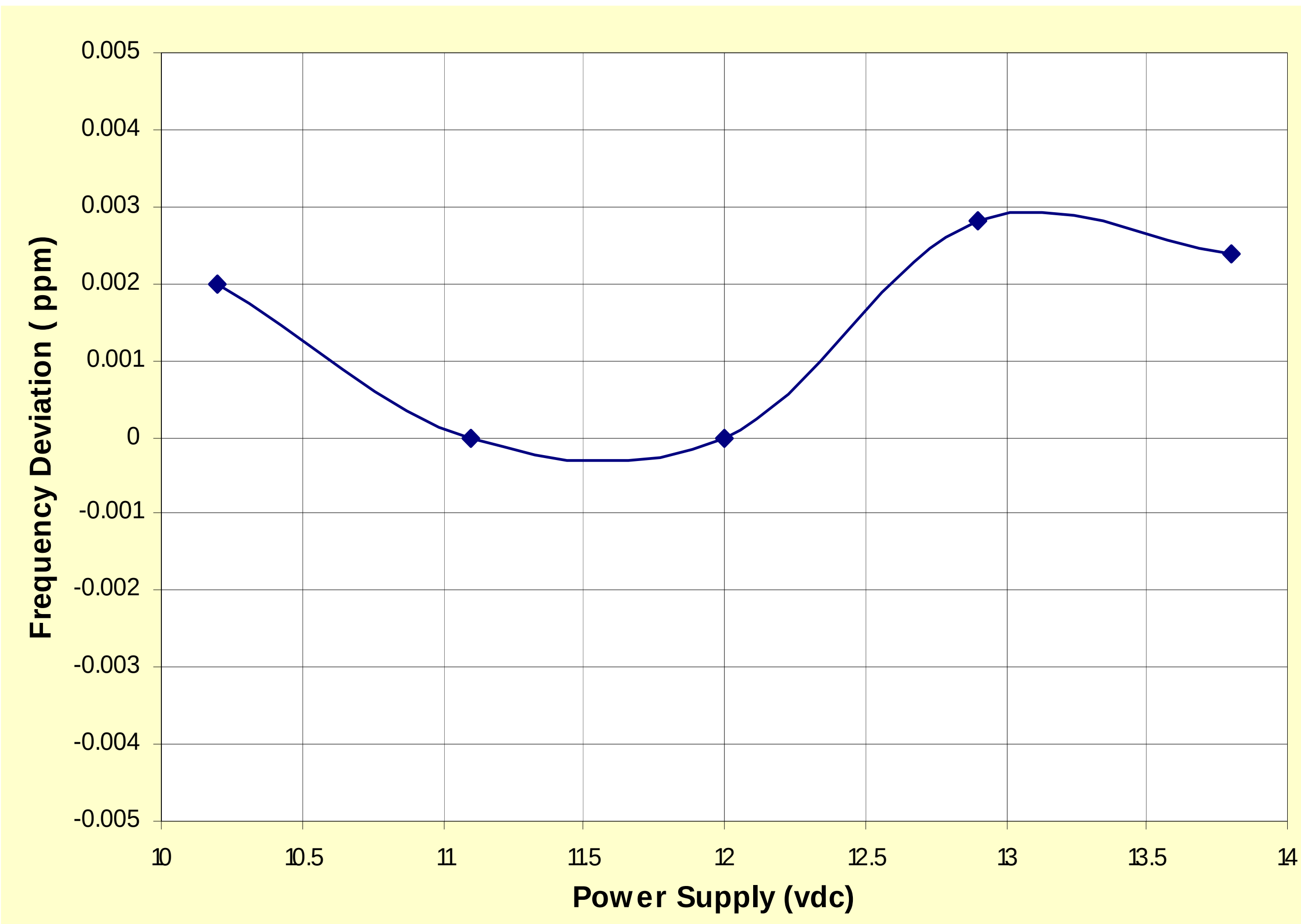


Figure 23 - Frequency Deviation (PPM) as a Function of Supply Voltage (Pursuant to FCC Requirement 2.1055d)