PointRed MMDS CPE Transmitter
Class 2 Permissive Change Request

FCC ID: QDU-MCRD-CPE-2R5
Original Grant: 25 June 2002

The following changes have been made to the original equipment:

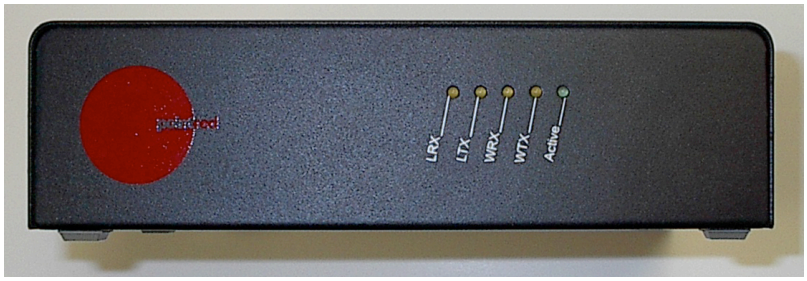
a) A new case has been designed for the outdoor radio transceiver unit.
b) Different type and manufacturer for TX output filters
c) Additional absorbing material installed on pcb and case lid

Antenna conducted and radiated emissions testing was performed. Radiated emissions were performed in the CCS five meter anechoic chamber. Conducted emissions were performed at the Pointred facility laboratory.

PointRed MMDS CPE Transmitter

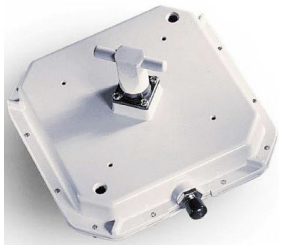
General Overview

The CPE Modem



The Customer Premise Equipment (CPE) Modem IF Unit functions as the endpoint users interface to the Internet or other media types. The CPE is an easily configurable subscriber Modem unit. That provides a 10BASET connection type for multiple applications such as Data, Voice, or Video. The CPE is partnered with a Power supply that operates at 110vdc or 220vdc. The CPE modem is connected via coaxial cable to the transceiver unit mounted outdoors.

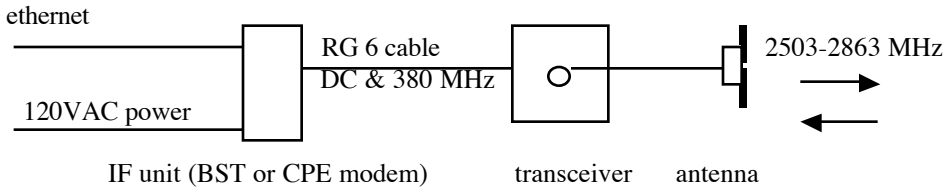
The Transceiver Unit



The Transceiver unit functions as the RF interface. The Transceiver can be configured with various antenna gain combinations and models and is powered with DC provided from the indoor unit.

The transceiver (radio unit) can be configured as either customer premises equipment (CPE) or as a base station unit (BST). The transceiver is identical for both applications. The BST and subscriber (CPE) modem have different housings and power supplies,, but the IF output signals are the same and the transceiver used with them is identical.

Fig.1



Test Equipment:

Spectrum analyzer:	Agilent PSA E4460 3Hz – 26.5 GHz (radiated emissions above 1 GH)
EMI Receiver:	HP 8524E 20 Hz – 2.9 GHz
Spectrum analyzer:	HP 8563 20 Hz – 26.5 GHz (antenna output conducted)
Pre-amplifier:	Miteq NSP2600-SP 1- 26.5 GHz
Bilog antenna:	ARA LPB 2520/A
RX Horn Antenna	EMCO 3115 1-18 GHz
RX Horn Antenna	ARA 18 – 26.5 GHz horn
Signal Generator	Rohde&Schwarz SMP04
TX Horn Antenna;	EMC 3115

Section 2.1047 Modulation Characteristics
Requirement/Limit: 21.908(a)

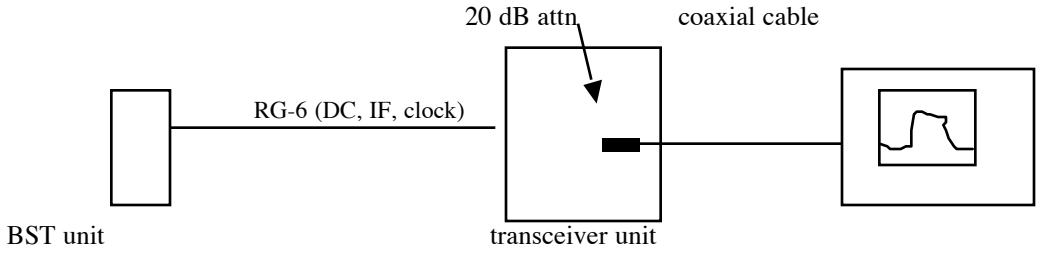
Maximum out of band emission:
At 6 MHz channel bandedge: -25 dB relative to average 6 MHz channel power level
Then linear slope of -40 dB for next 250 kHz
Then linear slope of -60 dB to 3MHz removed from highest or lowest 6 MHz channel edge
Then -60 dB beyond that

Measurement equipment used:

HP 8563E Spectrum Analyzer
Coaxial attenuator1.5 ft (0.5 dB loss at 2.5 GHz)

Test set-up:

Figure 2



Test Procedures

Software was run to produce a continuous pseudo random bit stream (prbs).

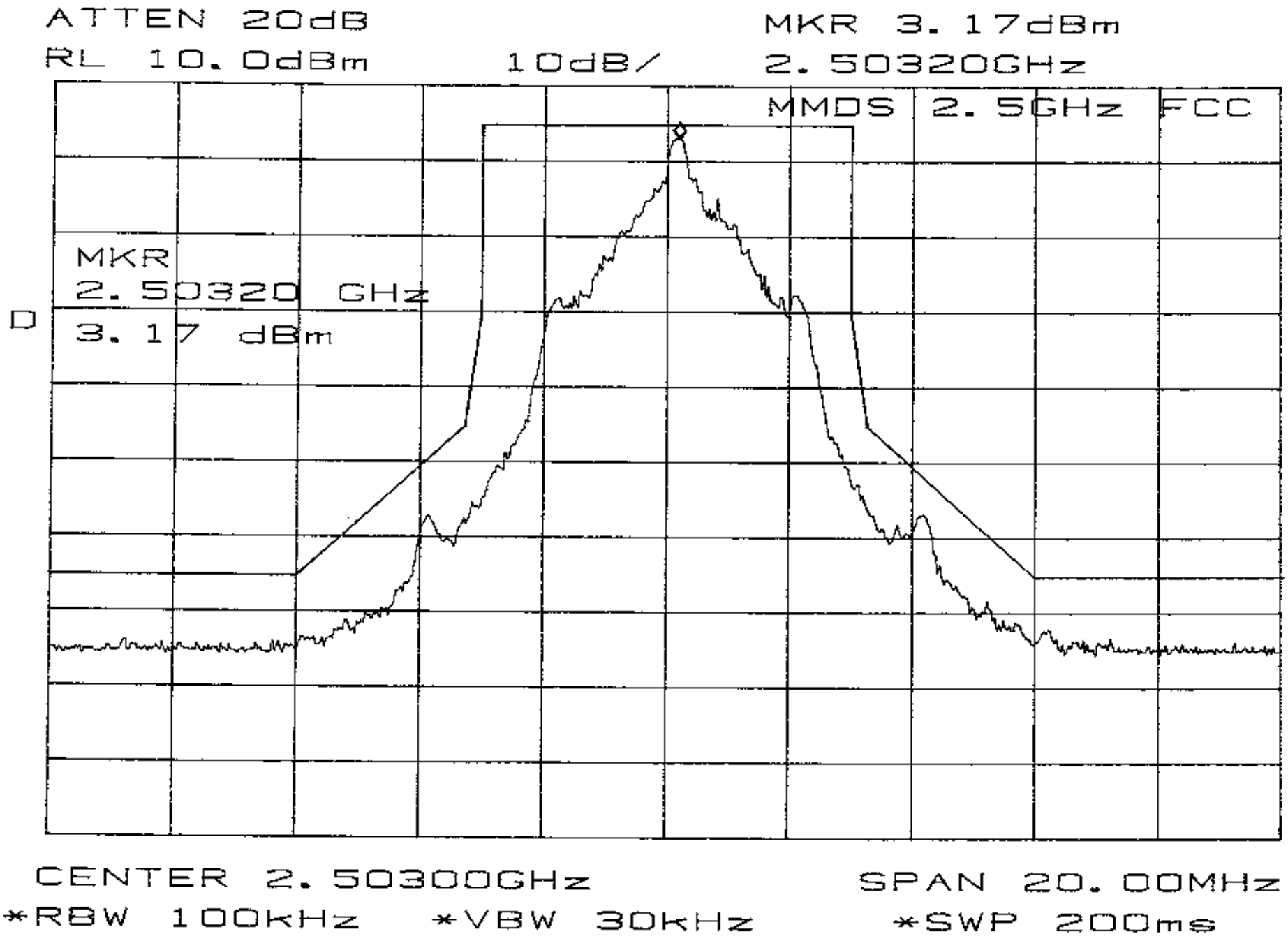
Test Results

PASS. Refer to attached spectrum analyzer charts for two channels:

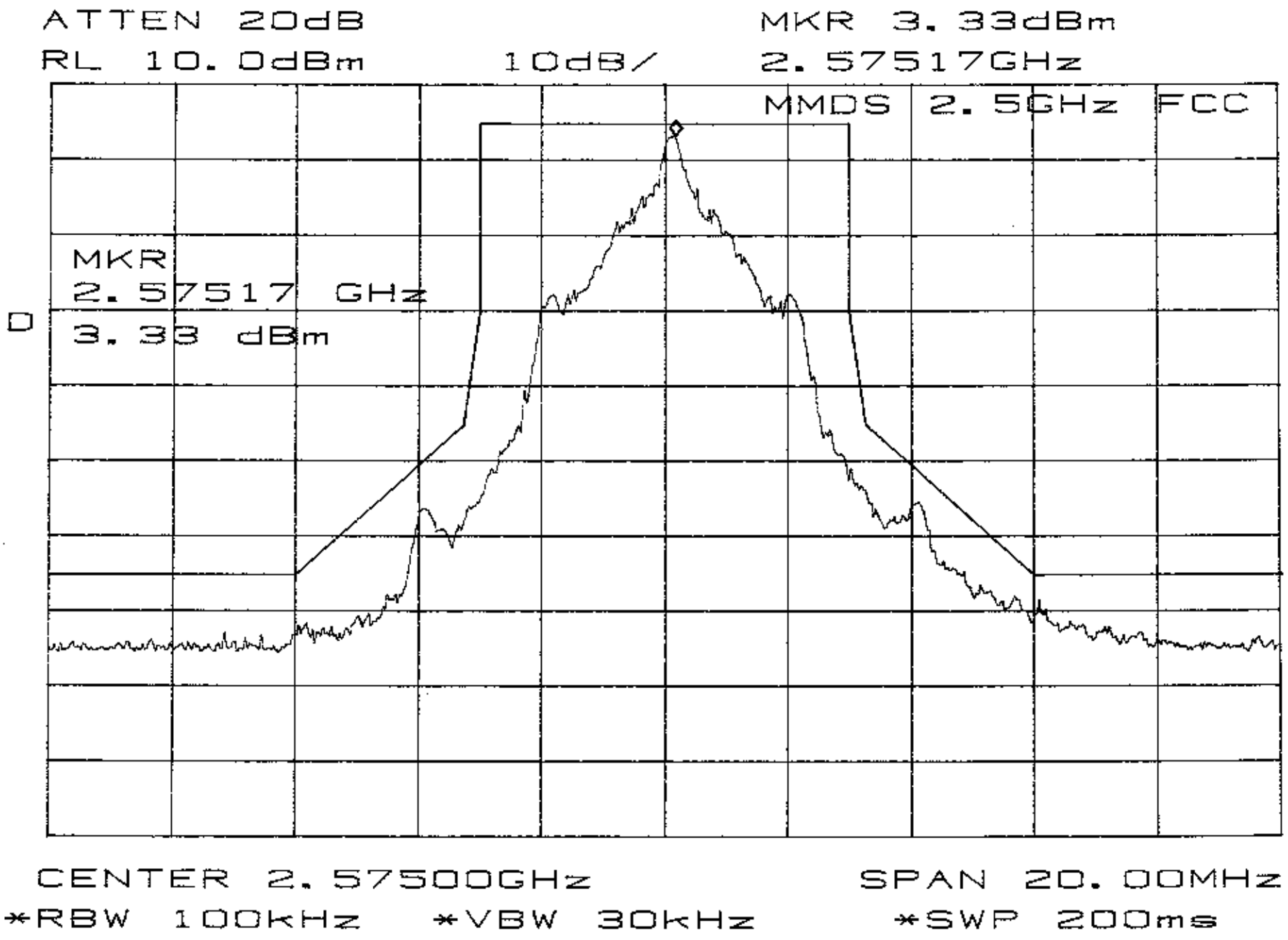
Lowest: 2503 MHz
Highest: 2683 MHz

Emissions masks at Lowest and Highest channels are shown with mask lines superimposed on spectrum analyzer charts.

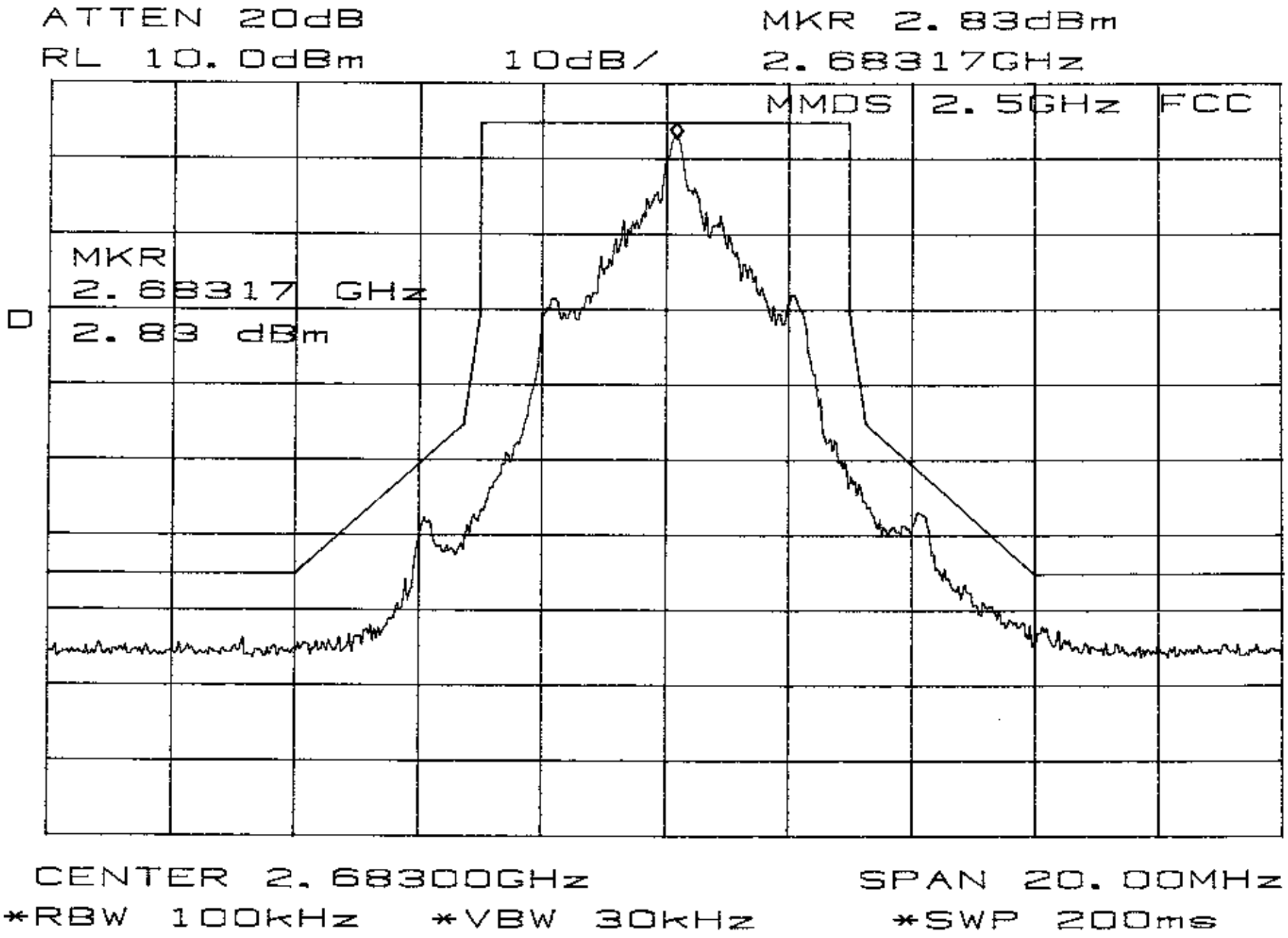
7/15/03


ATTEN 20dB
RL 10.0dBm
10dB/
MKR 3.17dBm
2.50320GHz
MMDS 2.5GHz FCC
MKR
2.50320 GHz
3.17 dBm
D
CENTER 2.50300GHz
SPAN 20.00MHz
*RBW 100kHz
*VBW 30kHz
*SWP 200ms

7/15/03


ATTEN 20dB
RL 10.0dBm
10dB/
MKR 3.33dBm
2.57517GHz
MMDS 2.5GHz FCC
MKR
2.57517 GHz
3.33 dBm
D
CENTER 2.57500GHz
SPAN 20.00MHz
*RBW 100kHz
*VBW 30kHz
*SWP 200ms

7/15/03


ATTEN 20dB
RL 10.0dBm
10dB/
MKR 2.83dBm
2.68317GHz
MMDS 2.5GHz FCC
MKR
2.68317 GHz
2.83 dBm
D
CENTER 2.68300GHz
SPAN 20.00MHz
*RBW 100kHz
*VBW 30kHz
*SWP 200ms

Section 2.1046 RF Output Power

Measurement Equipment Used

HP 8563E Spectrum Analyzer
Coaxial attenuator, 20 dB
Coaxial cable, 1.5ft

Test Set-up

Refer to Figure 2.

Test Procedure

The EUT was set to set to produce maximum output power in CW mode, which is maximum output power since the EUT used FM modulation (FSK) which has constant envelope output power.

Test Results

Maximum power = 3.83 dBm + 20 dB attn + 0.5 CL = 24.33 dBm. This is within 1 dB or less of previously reported value.

Section 2.1051 Spurious and Harmonic Emissions at Antenna Terminals
Requirement/Limit: 21.908(a)

All emissions -60 dBc.

Measurement equipment used:

HP 8563E Spectrum Analyzer
Coaxial attenuator, 20 dB
Coaxial cable, 1.5 ft

Test set-up:

Refer to Figure 2 above

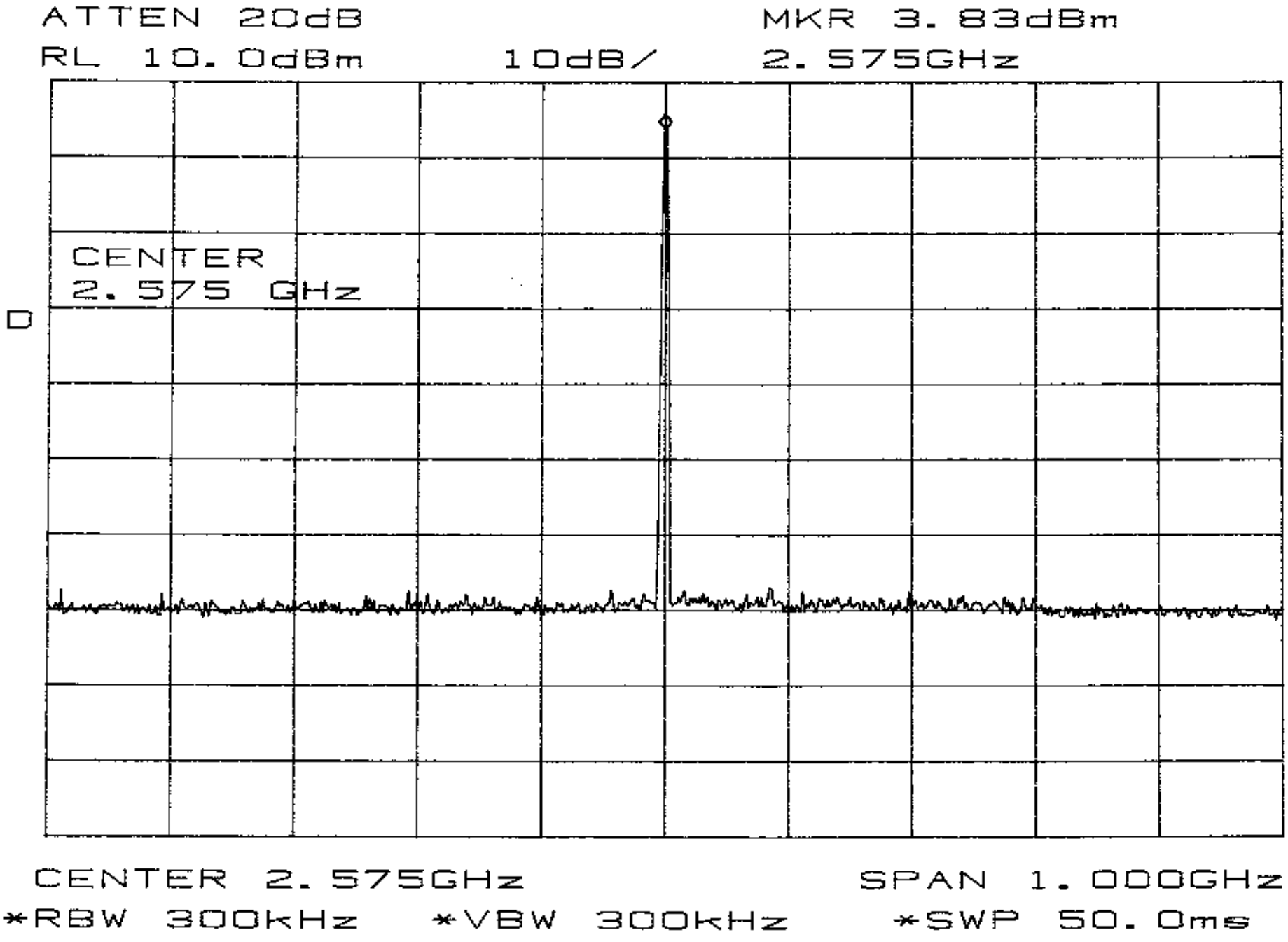
Test Procedures

Section 21.908(e) requires that for a minimum 100 kHz measurement bandwidth, all emissions removed from the channel edge by more than 3 MHz must be attenuated at least 60 dB below the channel emission flat top.

1. Set spectrum analyzer to TX output center frequency, RES BW ≥ 100 kHz
2. Set DISPLAY LINE to a level 60 dB below flat top peak
3. Record transmitter output spectrum from 1 MHz to 10^{th} harmonic of TX output frequency
4. Plot spectrum analyzer output traces.
5. Perform 1-4 for LOW, MID, and HIGH channels

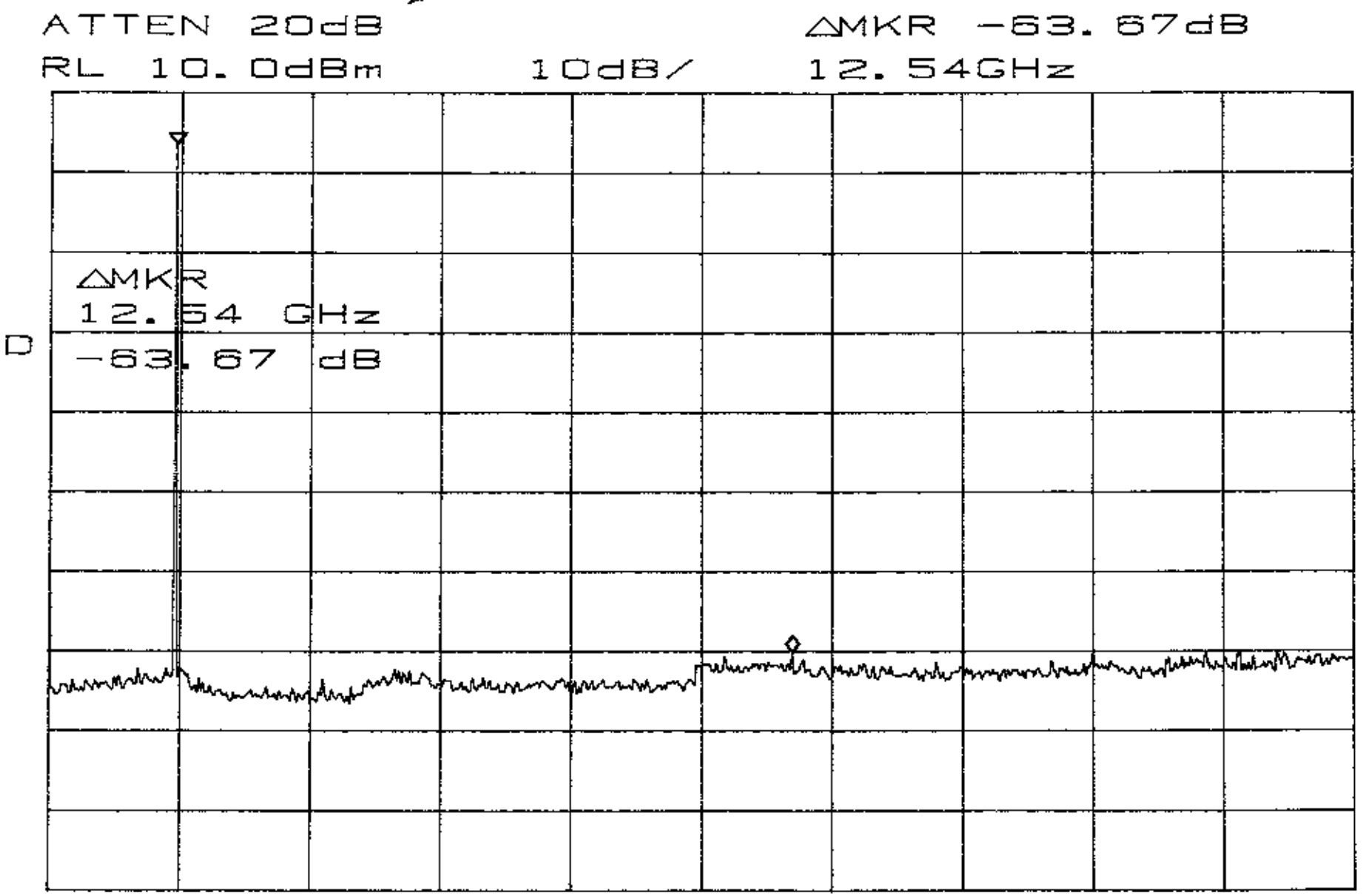
Test Results

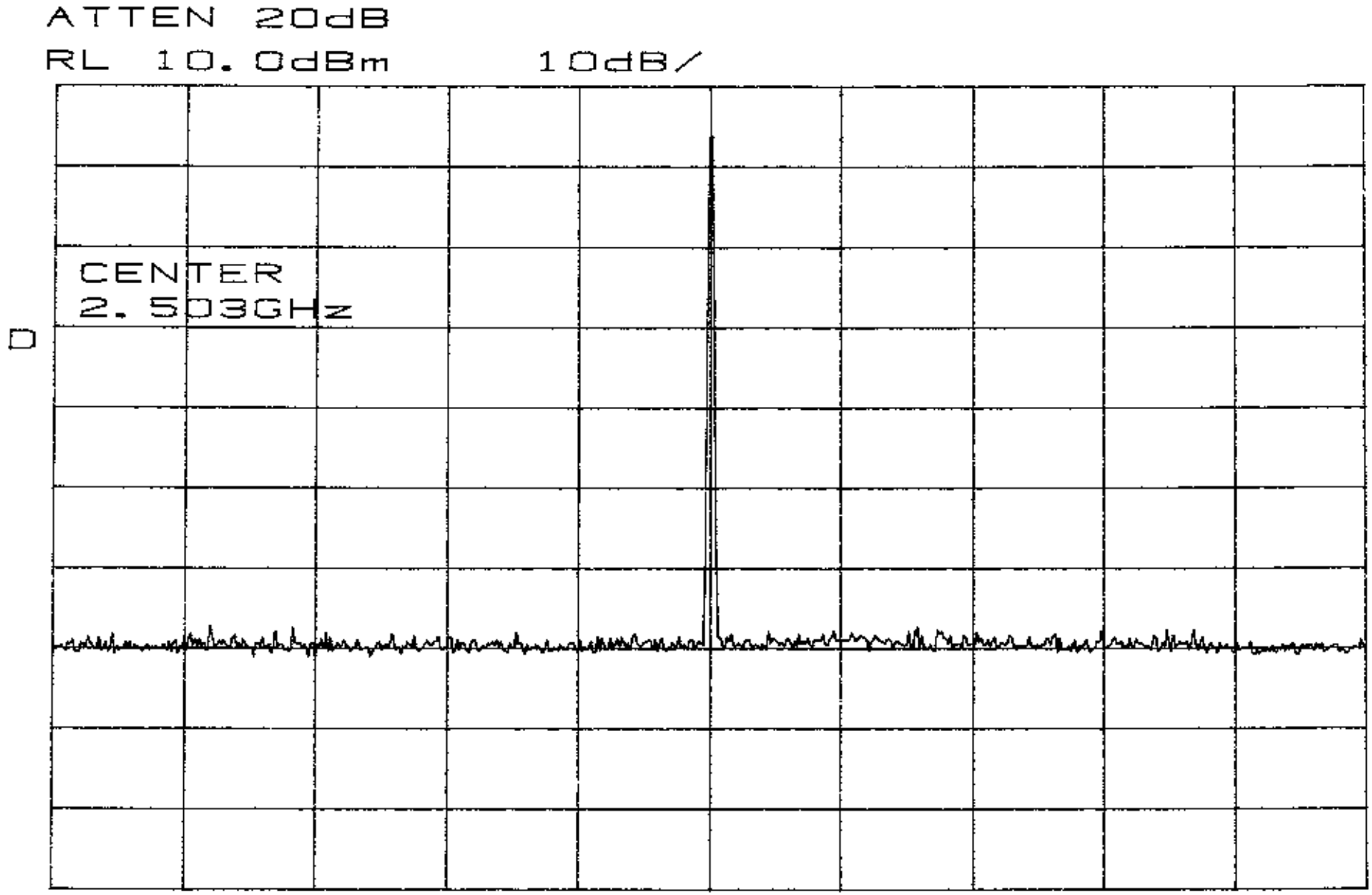
PASS. Refer to attached data plots.


ATTEN 20dB
RL 10.0dBm
10dB/
MKR 3.83dBm
2.575GHz
CENTER
2.575 GHz
D
CENTER 2.575GHz
SPAN 1.000GHz
*RBW 300kHz
*VBW 300kHz
*SWP 50.0ms

Output Freq @ 2575 MHz

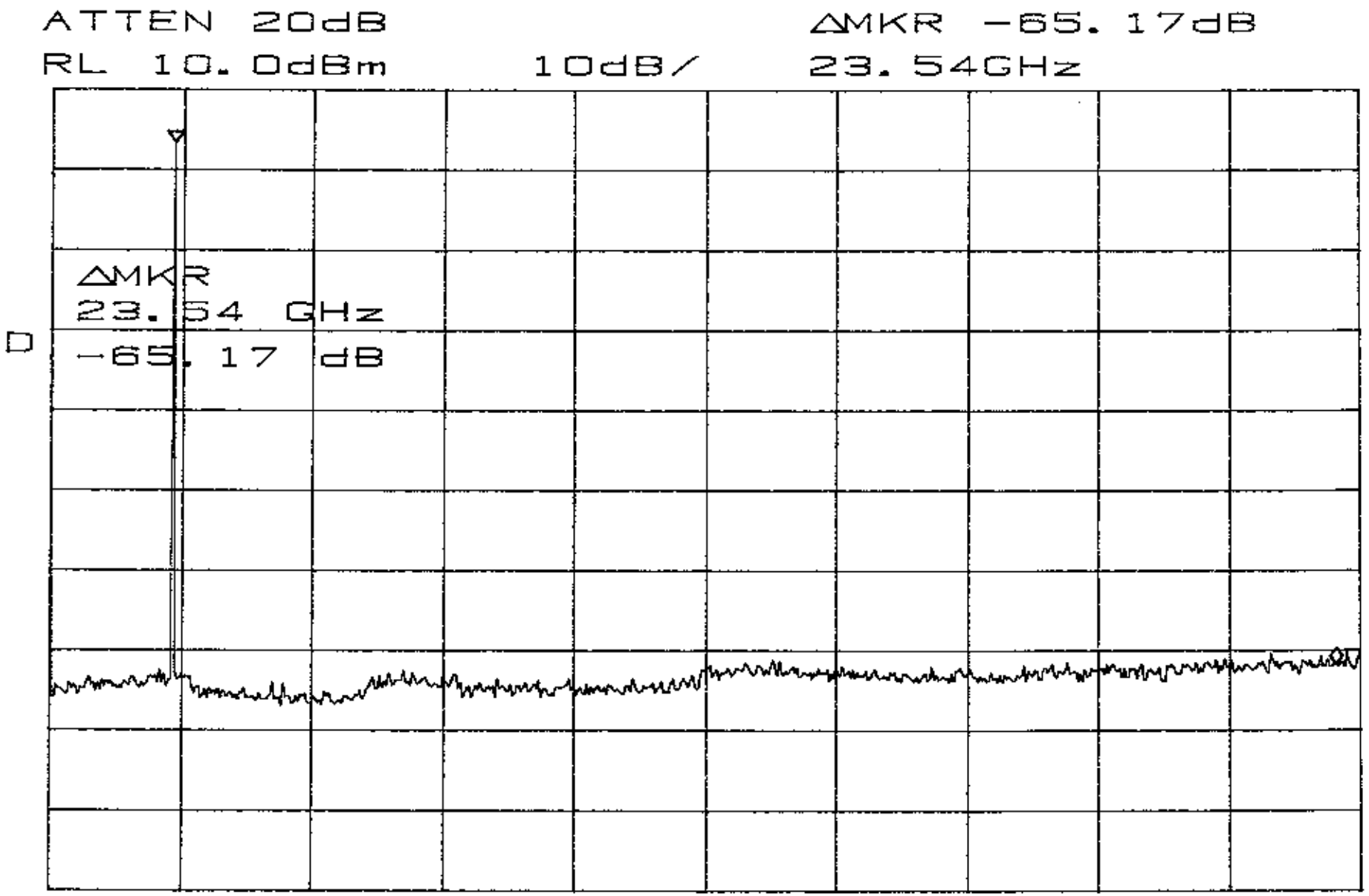
7/15/03




ATTEN 20dB
RL 10.0dBm
10dB/
CENTER
2.503GHz
D
CENTER 2.503GHz
SPAN 1.000GHz
*RBW 300kHz
*VBW 300kHz
*SWP 50.0ms

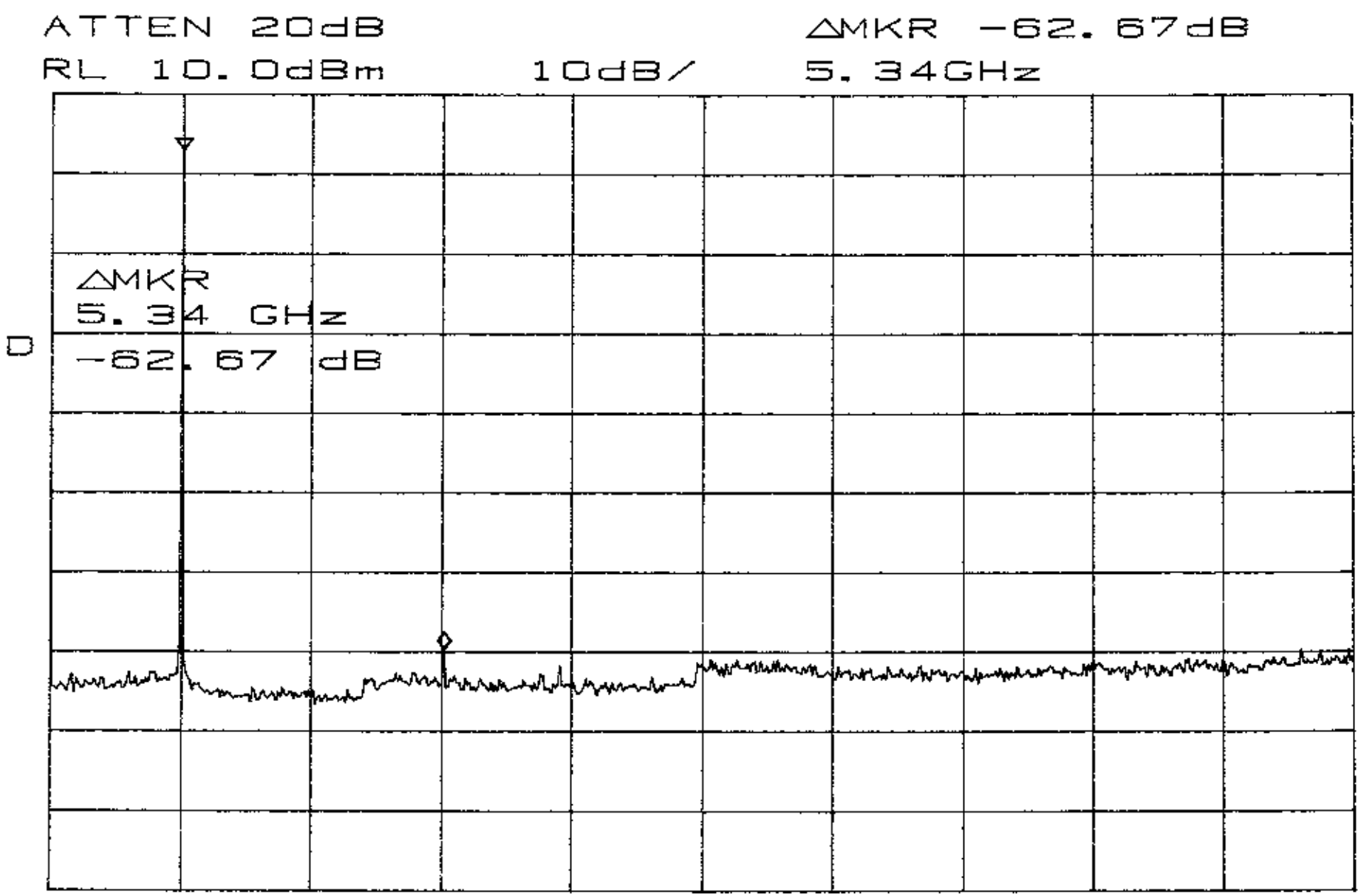
7/15/03

Output Freq @ 2503 MHz



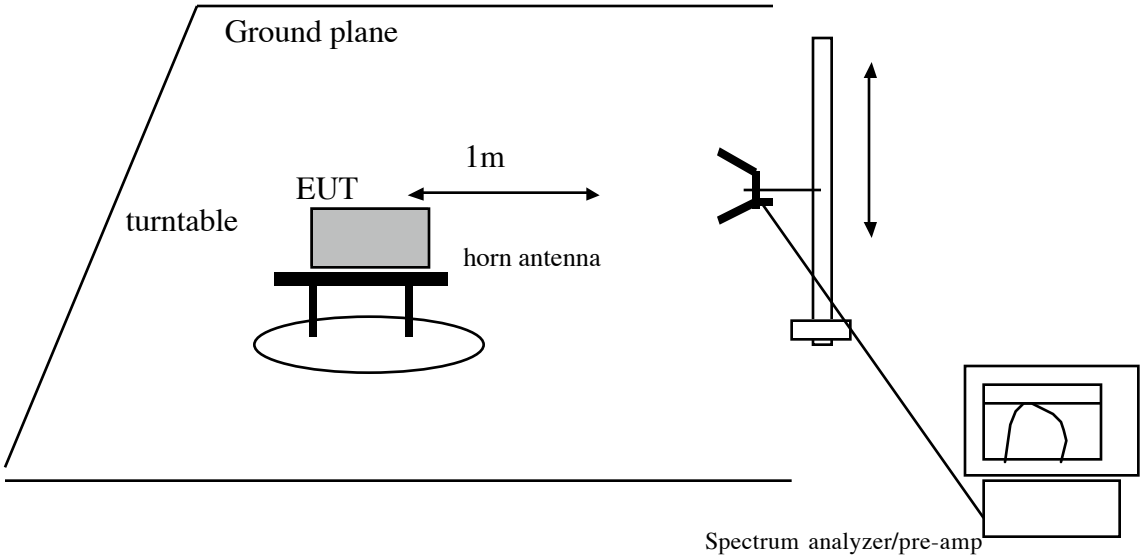
Output Freq @ 2683 MHz

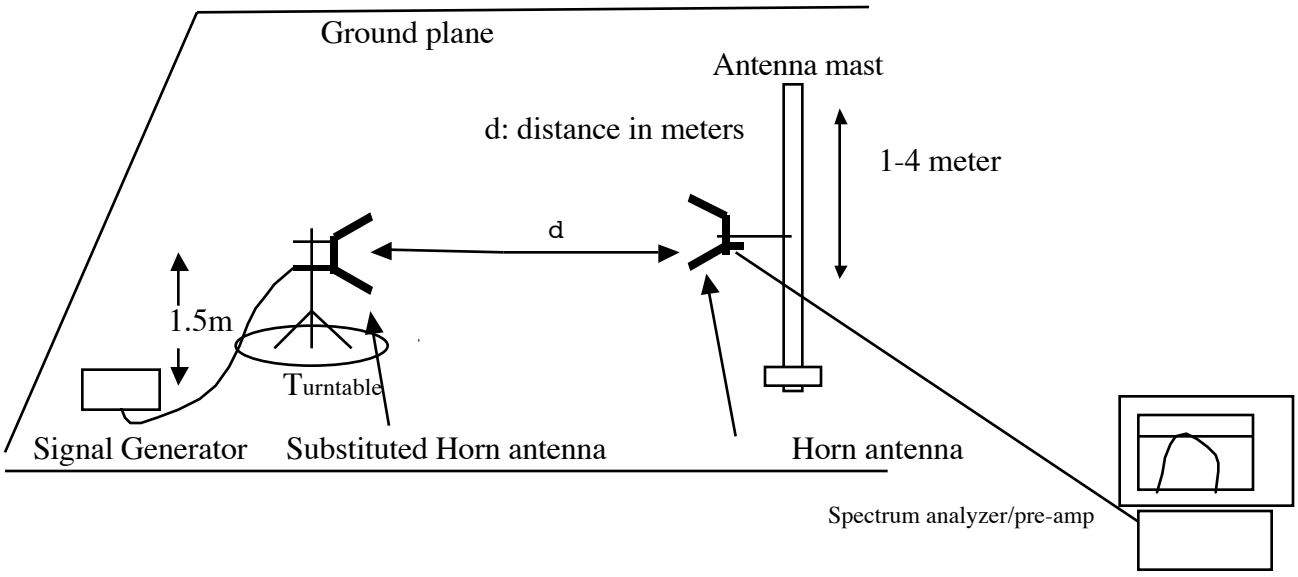
7/15/03



Section 2.1053 Field Strength of Spurious and Harmonic Radiation
Requirement/Limit: 21.909(e)

Test Set-Up





Minimum Requirement

The magnitude of each spurious and harmonic emission detected as being radiated from the EUT must be at a level more than 60 dB below channel output power.

Output power: 24.3 dBm
Limit: (24.3 - 60) dBm = -35.7 dBm ERP

Test Method

The antenna output port of the EUT was terminated with a 50 ohm load. With the transmitter operating at full power, the EUT was rotated 360° and the search antenna was raised and lowered in both polarities, all in an attempt to maximize the levels of the received emission for each harmonic and spurious emission up to 10 fo.

Test Results

Pass.

Below 1 GHz: no emissions detected from EUT
Above 1 GHz: Refer to attached spread sheet. Worst case margin –3.1 dBm.

07/22/03 **High Frequency Substitution Measurement**
Compliance Certification Services, Morgan Hill Open Field Site

Test Engr:William Zhuang
Project #:03U2141
Company:Pointred
EUT Descrip.:Pointred outdoor 2.5 GHz MMDS radio unit (ODU)
EUT M/N:QDU-MCRD-CPE-2R5 & QDU-MCRD-BASE-2R5 (C2PC)
Test Target:
Mode Oper:

Test Equipment:

EMCO Horn 1-18GHz	Pre-amplifier 1-26GHz	Spectrum Analyzer	Horn > 18GHz	Limit
T60; S/N: 2238 @1m	T87 Miteq 924342	Agilent E4446A Analyzer		ERP

Hi Frequency Cables

(2 ft) | (2 ~ 3 ft) | (4 ~ 6 ft) | (12 ft)

Peak Measurements:

Fundamental:
RBW>99% or 26dB Emissions BW
VBW=RBW

Bandedge:
RBW=>1% Emissions BW
VBW=> 3*RBW

Spurious
RBW=1MHz
VBW=1MHz

f GHz	SA reading (dBm)	SG reading (dBm)	CL (dB)	Gain (dBi)	Gain (dBd)	ERP (dBm)	Limit (dBm)	Margin (dB)	Notes
2.660	-53.3	-62.5	2.9	8.0	5.8	-59.6	-35.7	-23.9	Low Ch, V
2.660	-50.3	-63.2	2.9	8.0	5.8	-60.2	-35.7	-24.5	Low Ch, H
3.040	-53.1	-60.2	3.1	8.5	6.3	-56.9	-35.7	-21.2	Low Ch, V
3.040	-52.5	-58.9	3.1	8.5	6.3	-55.6	-35.7	-19.9	Low Ch, H
4.246	-36.3	-42.4	3.6	9.4	7.2	-38.8	-35.7	-3.1	Low Ch, V
4.246	-42.2	-49.3	3.6	9.4	7.2	-45.7	-35.7	-10.0	Low Ch, H
2.660	-51.4	-60.6	2.9	8.0	5.8	-57.7	-35.7	-22.0	Mid Ch, V
2.660	-48.9	-58.8	2.9	8.0	5.8	-55.8	-35.7	-20.1	Mid Ch, H
3.040	-51.6	-58.7	3.1	8.5	6.3	-55.4	-35.7	-19.7	Mid Ch, V
3.040	-51.9	-58.3	3.1	8.5	6.3	-55.0	-35.7	-19.3	Mid Ch, H
4.390	-44.8	-50.3	3.7	9.5	7.4	-46.6	-35.7	-10.9	Mid Ch, V
4.390	-48.2	-56.1	3.7	9.5	7.4	-52.3	-35.7	-16.6	Mid Ch, H
5.150	-52.6	-58.8	4.0	10.4	8.2	-54.6	-35.7	-18.9	Mid Ch, V
5.150	-54.0	-59.1	4.0	10.4	8.2	-54.9	-35.7	-19.2	Mid Ch, H
6.585	-53.4	-58.1	4.6	10.3	8.2	-54.5	-35.7	-18.8	Mid Ch, V
6.585	-56.0	-59.8	4.6	10.3	8.2	-56.2	-35.7	-20.5	Mid Ch, H
7.725	-50.1	-51.0	5.1	10.3	8.2	-47.9	-35.7	-12.2	Mid Ch, V
7.725	-52.4	-53.4	5.1	10.3	8.2	-50.4	-35.7	-14.7	Mid Ch, H
3.040	-53.6	-60.7	3.1	8.5	6.3	-57.4	-35.7	-21.7	High Ch, V
3.040	-52.2	-58.6	3.1	8.5	6.3	-55.3	-35.7	-19.6	High Ch, H
4.605	-40.6	-46.3	3.8	9.8	7.7	-42.4	-35.7	-6.7	High Ch, V
4.605	-47.6	-54.2	3.8	9.8	7.7	-50.3	-35.7	-14.6	High Ch, H
4.986	-53.0	-57.7	3.9	10.3	8.2	-53.4	-35.7	-17.7	High Ch, V
4.986	-57.2	-62.5	3.9	10.3	8.2	-58.3	-35.7	-22.6	High Ch, H
8.049	-52.1	-52.6	5.2	10.4	8.2	-49.6	-35.7	-13.9	High Ch, V
8.049	-53.9	-54.4	5.2	10.4	8.2	-51.4	-35.7	-15.7	High Ch, H
						0.0			
						0.0			
						0.0			
						0.0			
						0.0			
						0.0			
						0.0			
						0.0			
						0.0			
						0.0			
						0.0			
						0.0			
						0.0			
						0.0			
						0.0			
						0.0			
						0.0			
						0.0			
						0.0			
						0.0			
						0.0			
						0.0			

Test Site

All testing was performed at PointRed Technologies (antenna conducted measurement) and at Compliance Certification Services (radiated emissions) either by me or under my supervision. Conducted and radiated emissions were performed using test equipment with calibration traceable to NIST, and following test procedures accepted by the industry.

THOMAS N. COKENIAS
Consultant, EMC&Radio Type Approvals
Agent for PointRed Technologies