FCC Test report

Test report no.: WIREL_010_06002_MBS2_LP_G24E_FCC-25

FCC Part 25 / RSS 170
Model: MBS2-LP EDGE
FCC ID: P5IMBS2LPE
IC-ID: 1478A-MBS2LPE

Certificate # 2135.01

Bluetooth Qualification Test Facility (BQTF)

FCC listed # 101450

IC recognized # 3925

***CETECOM* Inc.**
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Board of Directors: Dr. Harald Ansorge, Dr. Klaus Matkey, Hans Peter May

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1 General information

1.1 Notes

The test results of this test report relate exclusively to the test item specified in 1.5. The CETECOM Inc. does not assume responsibility for any conclusions and generalisations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item. The test report may only be reproduced or published in full. Reproduction or publication of extracts from the report requires the prior written approval of the CETECOM Inc.

TEST REPORT PREPARED BY:
EMC Engineer: Satya Radhakrishna

1.2 Testing laboratory

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1.3 Details of applicant

Name	**:**	**Wireless Matrix Corporation**
Street	**:**	**12369-B Sunrise Valley Drive**
City / Zip Code	**:**	**Reston, VA 20191**
Country	**:**	**USA**
Contact	**:**	**Darryl Strucko**
Telephone	**:**	**703.262.4021**
Tele-fax	**:**	**703.262.0380**
e-mail	**:**	**Darrvl.strucko@wrx-us.com**

1.4 Application details

Date of receipt test item	:	**2004-10-04**
Date of test	:	**2006-10-18 - 2006-11-02**

1.5 Test item

Manufacturer	:	**Wireless Matrix Corporation**
Marketing Name	:	**Mobile Base Station 2 Low Profile with EDGE(MBS2-LP EDGE)**
Model No.	:	**MBS2-LP EDGE**
Description	:	**Satellite, EDGE, 802.11,GPS in one unit with RS-232 and Ethernet capabilities**.
FCC-ID	**:**	**P5IMBS2LPE**
IC-ID	**:**	**1478A-MBS2LPE**

Additional information

Frequency	:	**824.2MHz – 848.8MHz for GSM 850** **1850.2MHz – 1909.8MHz for PCS 1900**
Type of modulation	:	**GFSK**
Number of channels	:	**GSM**
Antenna	:	**GSM:Monopole @ 6-7 dBi max, Satellite: Spiral @ 4.5 dBi max,802.11: Elevated Dipole @ 6.5 dBi max**
Power supply	:	**13.6VDC Nominal voltage**
Output power	:	**0.6W @ 850 MHz, 1W @ 1900 MHz**
Extreme temp. Tolerance	:	**Lower: -20°C Upper: +70°C**

1.6 Test standards: FCC Part 25 / CANADA RSS-170

Note: All radiated measurements were made in all three orthogonal planes. The values reported are the maximum values.

2 Technical test

2.1 Summary of test results

No deviations from the technical specification(s) were ascertained in the course of the tests Performed	
Final Verdict: (only “passed” if all single measurements are “passed”)	**Passed**

Technical responsibility for area of testing:

Date	Section	Name	Signature
2006-11-06	EMC & Radio	Lothar Schmidt (Technical Manager)	

2.2 Test report

TEST REPORT

Test report no.: WIREL_010_06002_MBS2_LP_G24E_FCC-25
(Model: MBS2-LP EDGE)

TEST REPORT REFERENCE

POWER OUTPUT § 25.204

Summary:
During the process of testing, the EUT was controlled via HyperTerminal.

This paragraph contains peak conducted output power and EIRP measurements for the EUT.
In all cases, output power is within the specified limits.

Method of Measurements:
The EUT was set up for the max. Output power with pseudo-random data modulation.
The power was measured with R&S Spectrum Analyzer ESIB 40 (peak)
These measurements were done at 3 frequencies, 1626.5 MHz, 1643.5 MHz and 1660.5 MHz (bottom, middle and top of operational frequency range)

Conducted:

Frequency (MHz)	Conducted Peak Power (dBm)
1626.5	34.37
1643.5	34.35
1660.5	34.05

ANALYZER SETTINGS: RBW = VBW = 1MHz

Radiated:

EIRP Measurements

Measured with the substitution method.

1626.5 MHz: 28.11dBm + 8.15dBi gain = 36.26 dBm EIRP

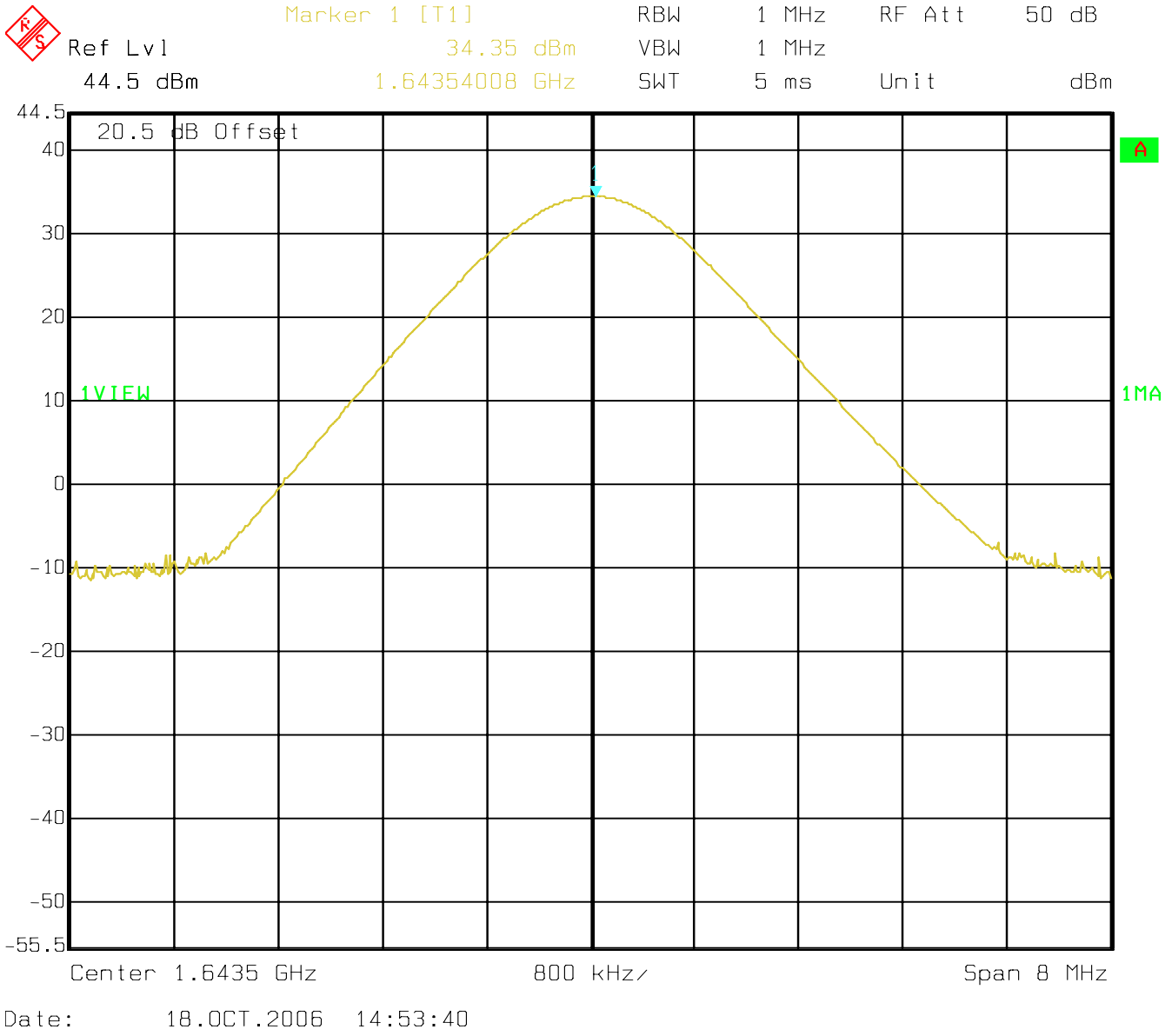
1643.5 MHz: 27.60dBm + 8.15dBi gain = 35.75 dBm EIRP

1660.5 MHz: 26.83dBm + 8.15dBi gain = 34.98 dBm EIRP

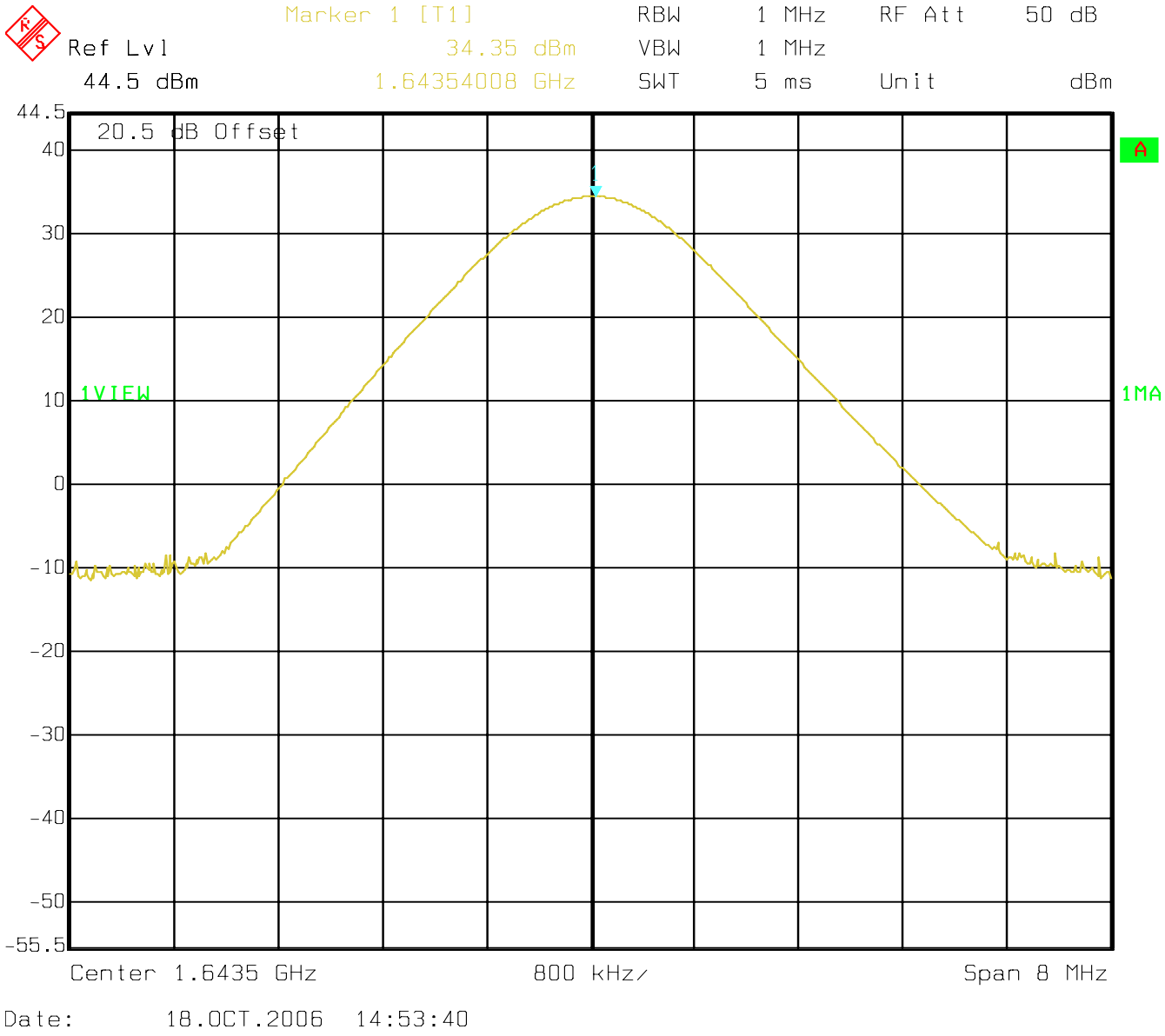
Frequency (MHz)	EIRP (dBm)
1626.5	36.26
1643.5	35.75
1660.5	34.98

ANALYZER SETTINGS: RBW = VBW = 1MHz

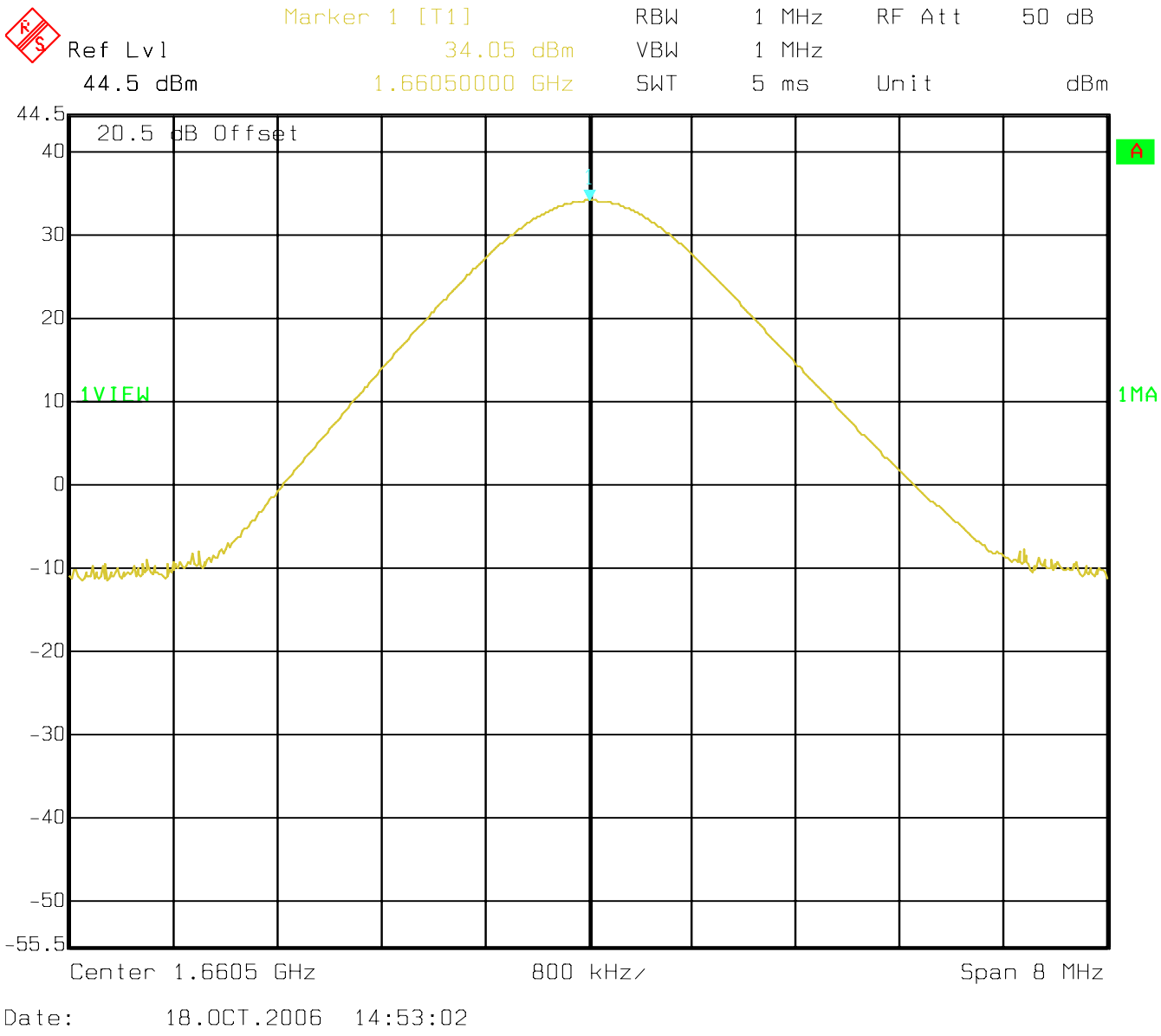
Conducted Peak Power
Lowest Channel: 1626.5MHz



Conducted Peak Power
Mid Channel: 1643.5MHz



Conducted Peak Power
Highest Channel: 1660.5MHz



FREQUENCY STABILITY § 25.202 (e)

Frequency Stability measurements were performed by Wireless Matrix. See Appendix-1 to this test report.

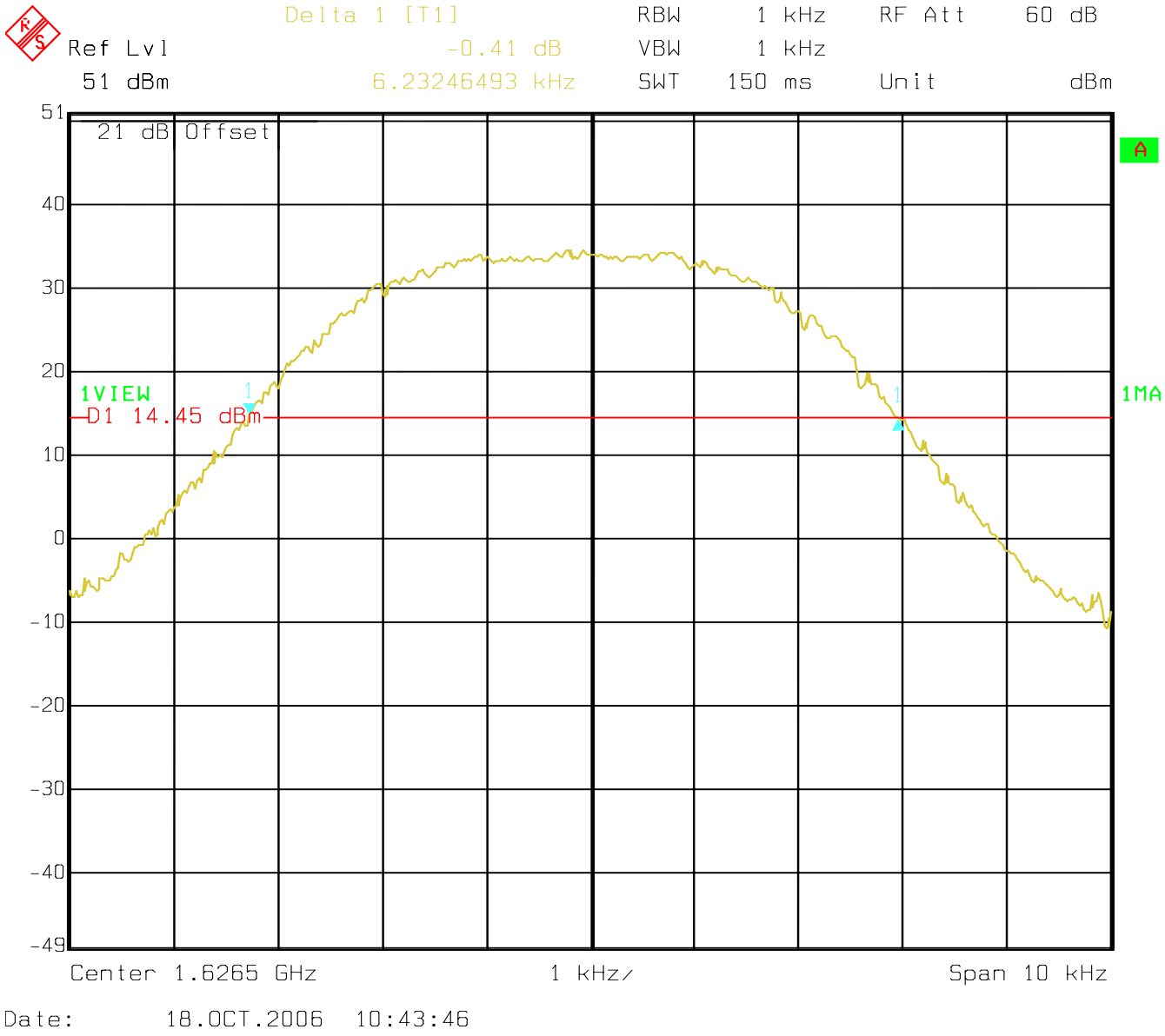
OCCUPIED BANDWIDTH §2.1049

Occupied Bandwidth Results

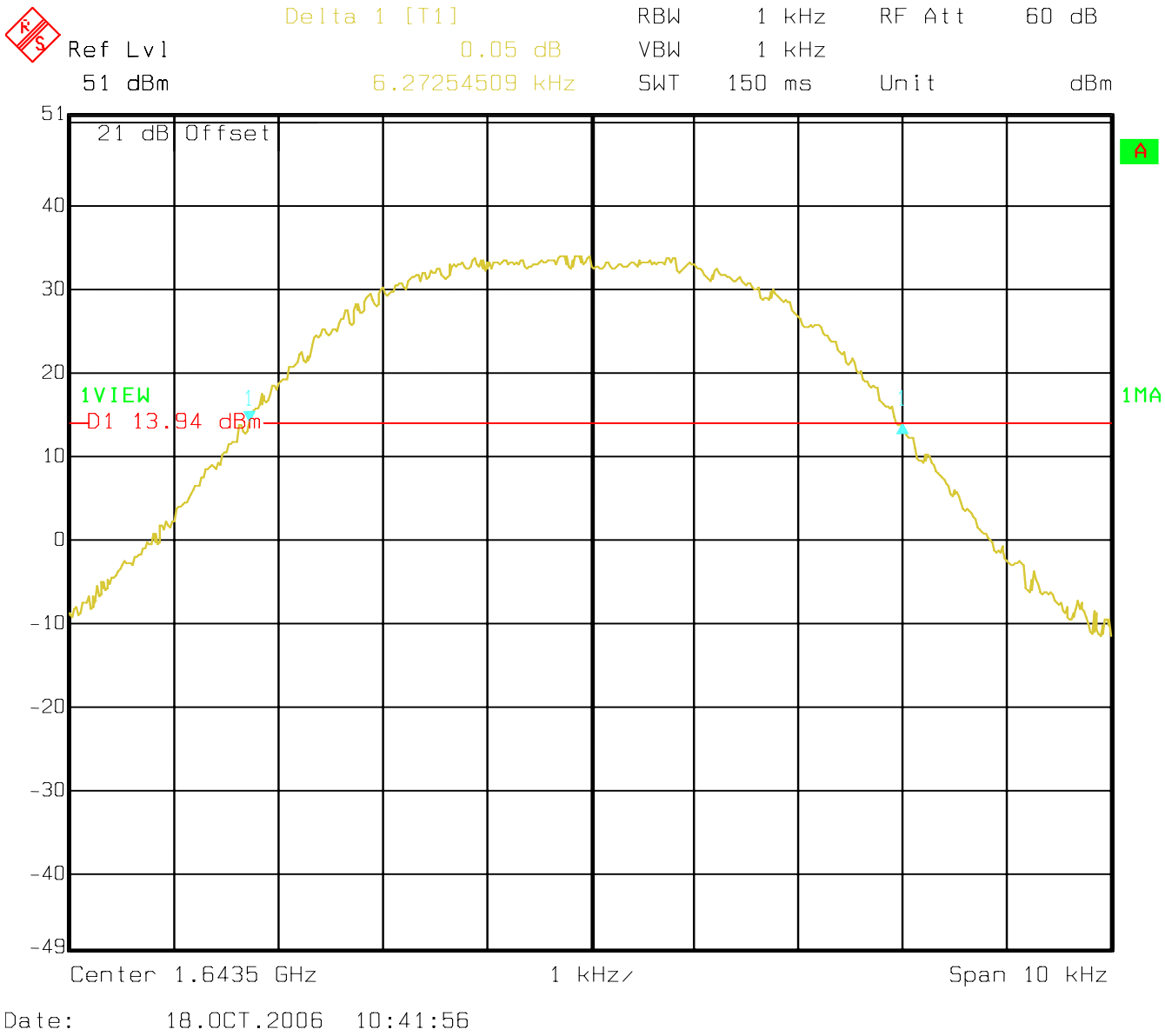
Table below lists the measured -20dBc BW (99%). Spectrum analyzer plots are included on the following pages.

Frequency	Occupied Bandwidth (–20dBc BW) kHz
1626.5	6.2325
1643.5	6.2725
1660.5	6.2926

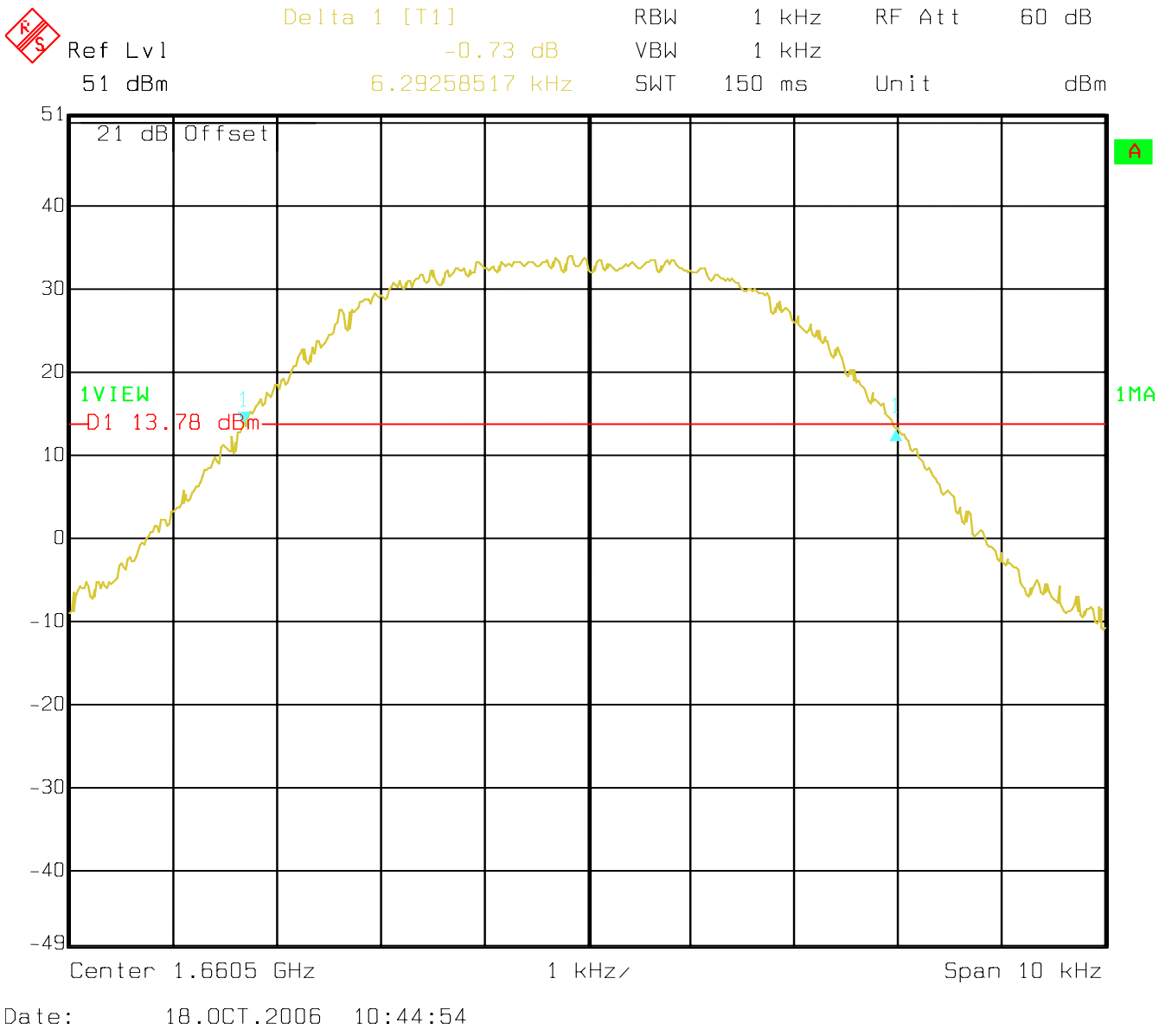
Lowest Channel: 1626.5MHz
Occupied Bandwidth (-20dBc BW)



Mid Channel: 1643.5MHz
Occupied Bandwidth (-20dBc BW)



Highest Channel: 1660.5MHz
Occupied Bandwidth (-20dBc BW)



EMISSIONS LIMITS §25.202(f)

Measurement Procedure:

The following steps outline the procedure used to measure the radiated emissions from the EUT. The site is constructed in accordance with ANSI C63.4 – 1992 requirements and is recognised by the FCC. The spectrum was scanned from 30 MHz to the 10th harmonic of the highest frequency generated within the equipment, which is the transmitted carrier that can be as high as 1660.5 MHz. The resolution bandwidth is set as outlined in Part 25. The spectrum was scanned with the mobile station transmitting at carrier frequencies that pertain to low, mid and high channels.

The final Radiated emission test procedure is as follows:
a) The test item was placed on a 0. 8 meter high non-conductive stand at a 3 meter test distance from the receive antenna.
b) A double-ridged wave-guide antenna was placed on an adjustable height antenna mast 3 meters from the test item for emission measurements.
c) Detected emissions were maximized at each frequency by rotating the test item and adjusting the receive antenna height and polarization. The maximum meter reading was recorded. The radiated emission measurements of all non-harmonic and harmonics of the transmit frequency through the 10th harmonic were measured with peak detector and 1MHz bandwidth. If the harmonic could not be detected above the noise floor, the ambient level was recorded.

Channel	Frequency
Low	1626.5 MHz
Mid	1643.5 MHz
High	1660.5 MHz

Measurement Limit:
Sec. 25.202(f) Emission Limits.

Measurement Results:

NOTE: The spurious emissions were done with different settings, using the relevant pre-amplifiers for the relevant frequency ranges. This is the reason that the graphs show different noise levels. In the range between 3GHz and 18 GHz very short cable connections to the antenna was used to minimize the noise level.

RESULTS OF RADIATED TESTS FOR FCC-25:

Harmonic	Tx Freq.: 1626.5(MHz)	Level (dBm)	Tx Freq.: 1643.5(MHz)	Level (dBm)	Tx Freq.: 1660.5(MHz)	Level (dBm)
2	**3253**	NF	**3287**	NF	**3321**	NF
3	**4879.5**	NF	**4930.5**	NF	**4981.5**	NF
4	**6506**	NF	**6574**	NF	**6642**	NF
5	**8132.5**	NF	**8217.5**	NF	**8302.5**	NF
6	**9759**	NF	**9861**	NF	**9963**	NF
7	**11385.5**	NF	**11504.5**	NF	**11623.5**	NF
8	**13012**	NF	**13148**	NF	**13284**	NF
9	**14638.5**	NF	**14791.5**	NF	**13944.5**	NF
10	**1626.5**	NF	**1643.5**	NF	**1660.5**	NF

nf: noise floor

RADIATED SPURIOUS EMISSIONS

Lowest Channel (1626.5MHz):30MHz - 1GHz

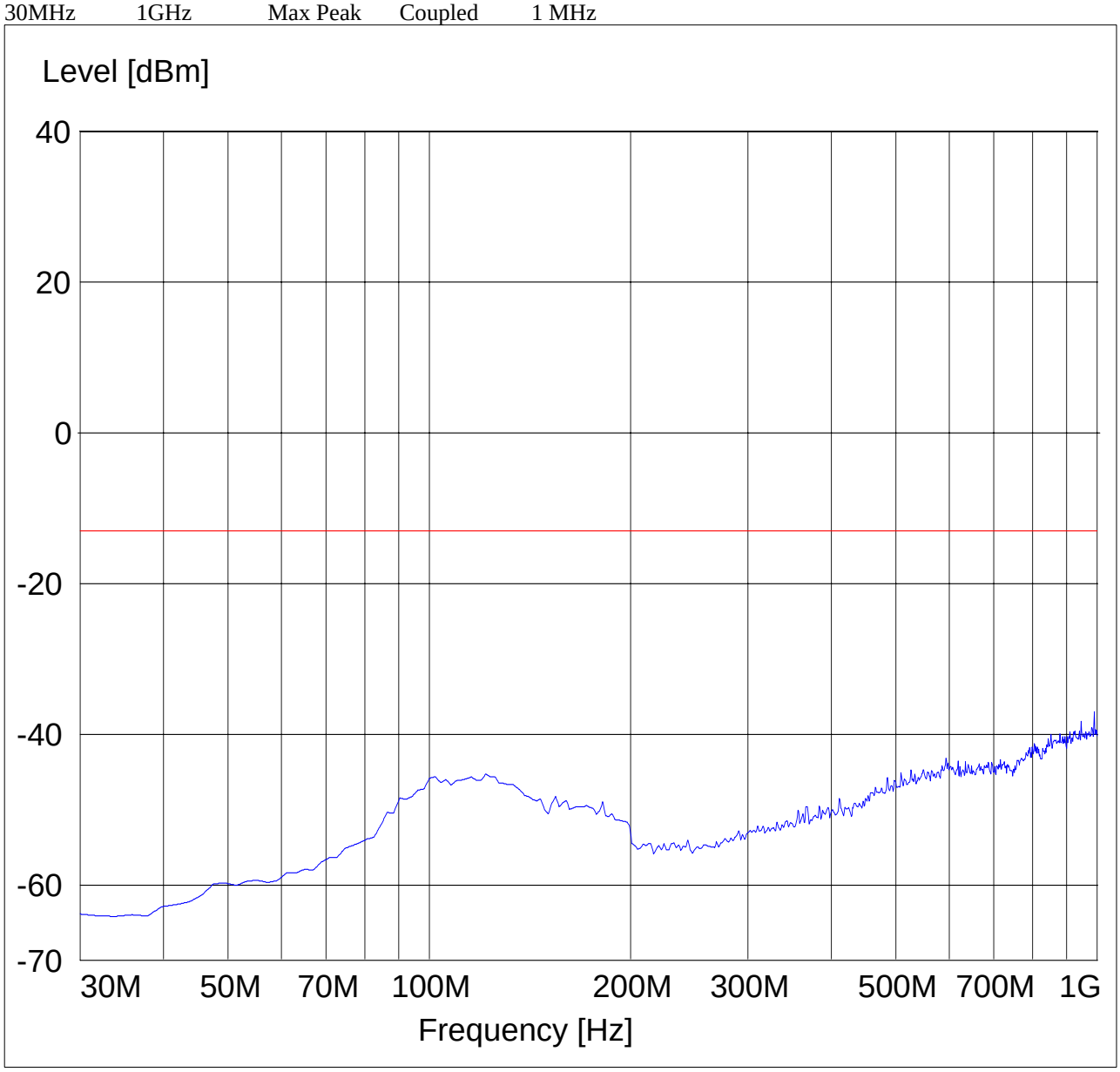
Spurious emission limit –13dBm

Antenna: vertical

Note: This plot is valid for low, mid & high channels (worst-case plot).

SWEEP TABLE: "FCC 25 Spur 30M-1G"

Start Frequency	*Stop Frequency*	*Detector*	*Meas. Time*	*RBW/VBW*
30MHz	1GHz	Max Peak	Coupled	1 MHz



RADIATED SPURIOUS EMISSIONS

Lowest Channel (1626.5MHz):30MHz - 1GHz

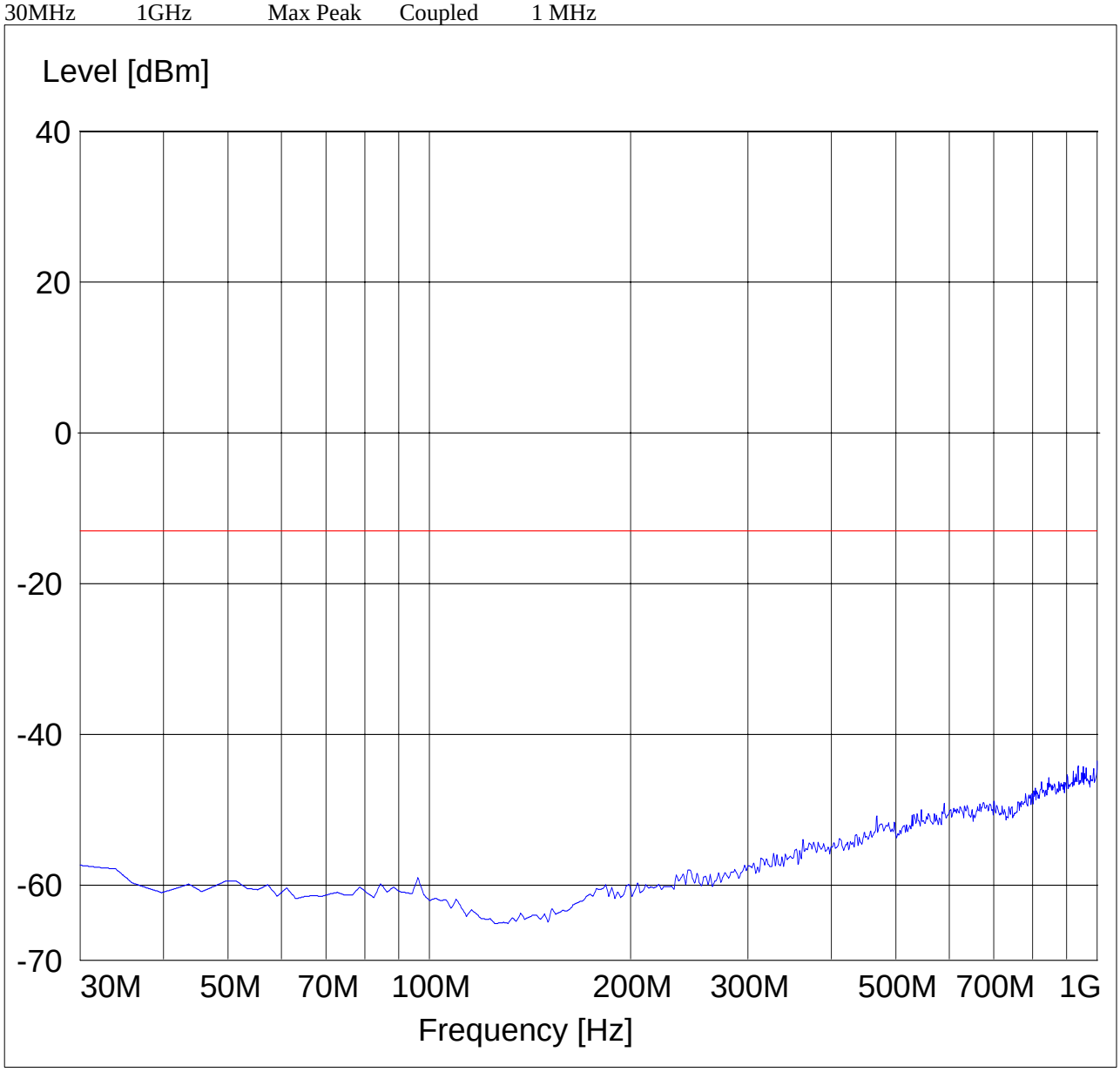
Spurious emission limit –13dBm

Antenna: horizontal

Note: This plot is valid for low, mid & high channels (worst-case plot).

SWEEP TABLE: "FCC 25 Spur 30M-1G"

Start Frequency	*Stop Frequency*	*Detector*	*Meas. Time*	*RBW/VBW*
30MHz	1GHz	Max Peak	Coupled	1 MHz



RADIATED SPURIOUS EMISSIONS

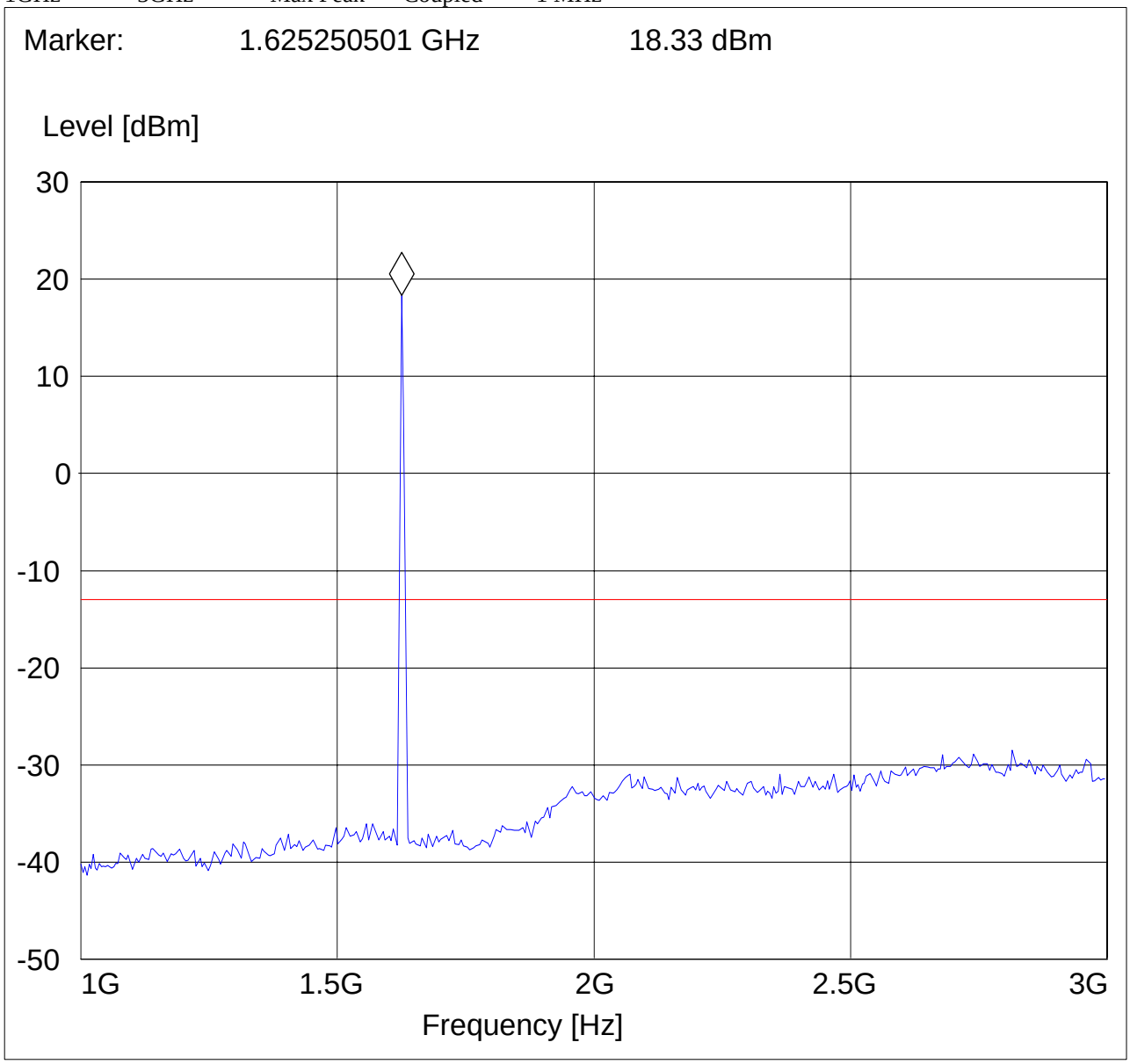
Lowest Channel (1626.5MHz):1GHz - 3GHz

Spurious emission limit –13dBm

NOTE: peak above the limit line is the Carrier frequency @ low channel

SWEEP TABLE: "FCC Spuri 1-3G"

Start Frequency	*Stop Frequency*	*Detector*	*Meas. Time*	*RBW/VBW*
1GHz	3GHz	Max Peak	Coupled	1 MHz



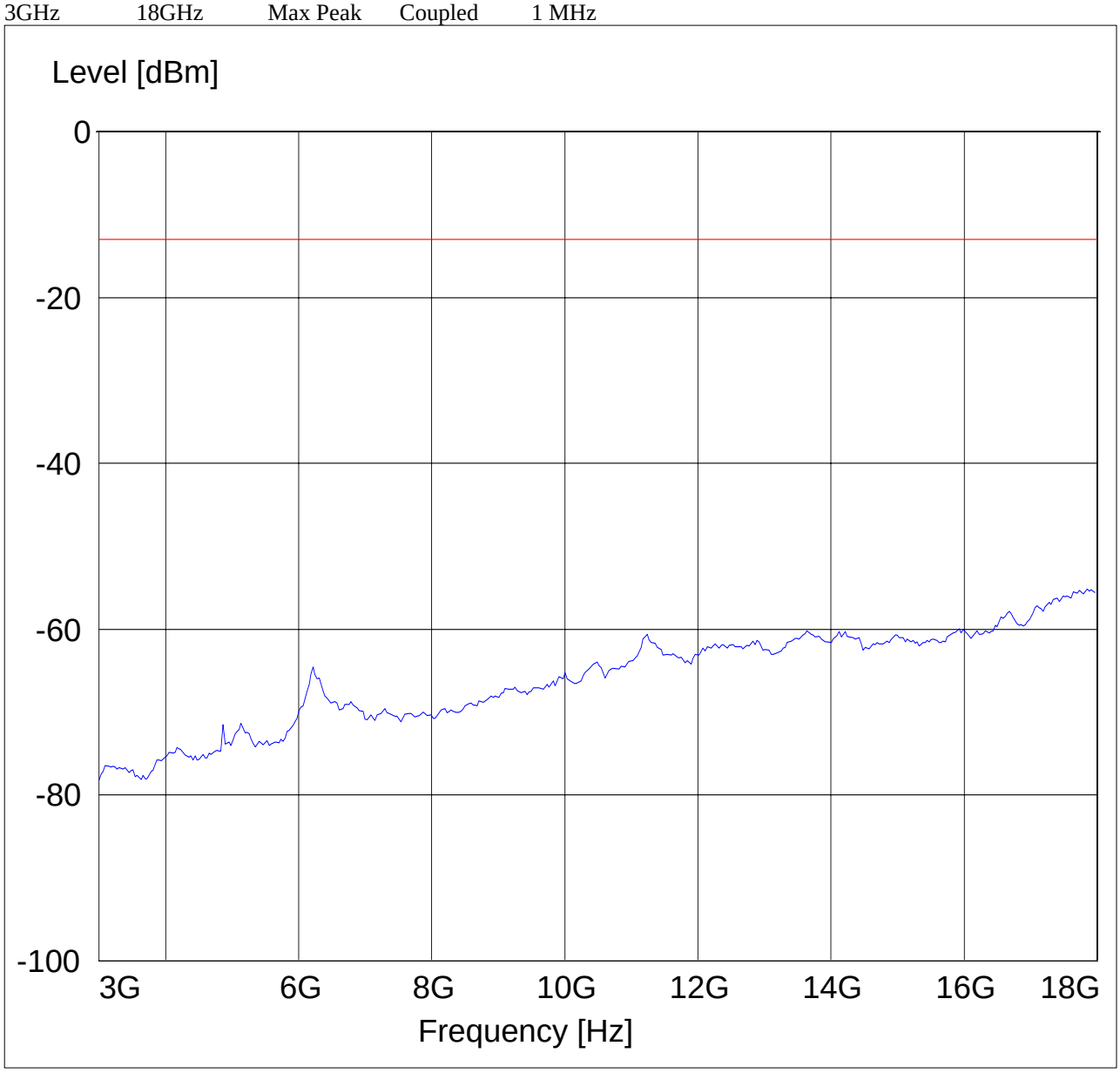
RADIATED SPURIOUS EMISSIONS

Lowest Channel (1626.5MHz):3GHz - 18GHz

Spurious emission limit –13dBm

SWEEP TABLE: "FCC Spuri 3-18G"

Start Frequency	*Stop Frequency*	*Detector*	*Meas. Time*	*RBW/VBW*
3GHz	18GHz	Max Peak	Coupled	1 MHz



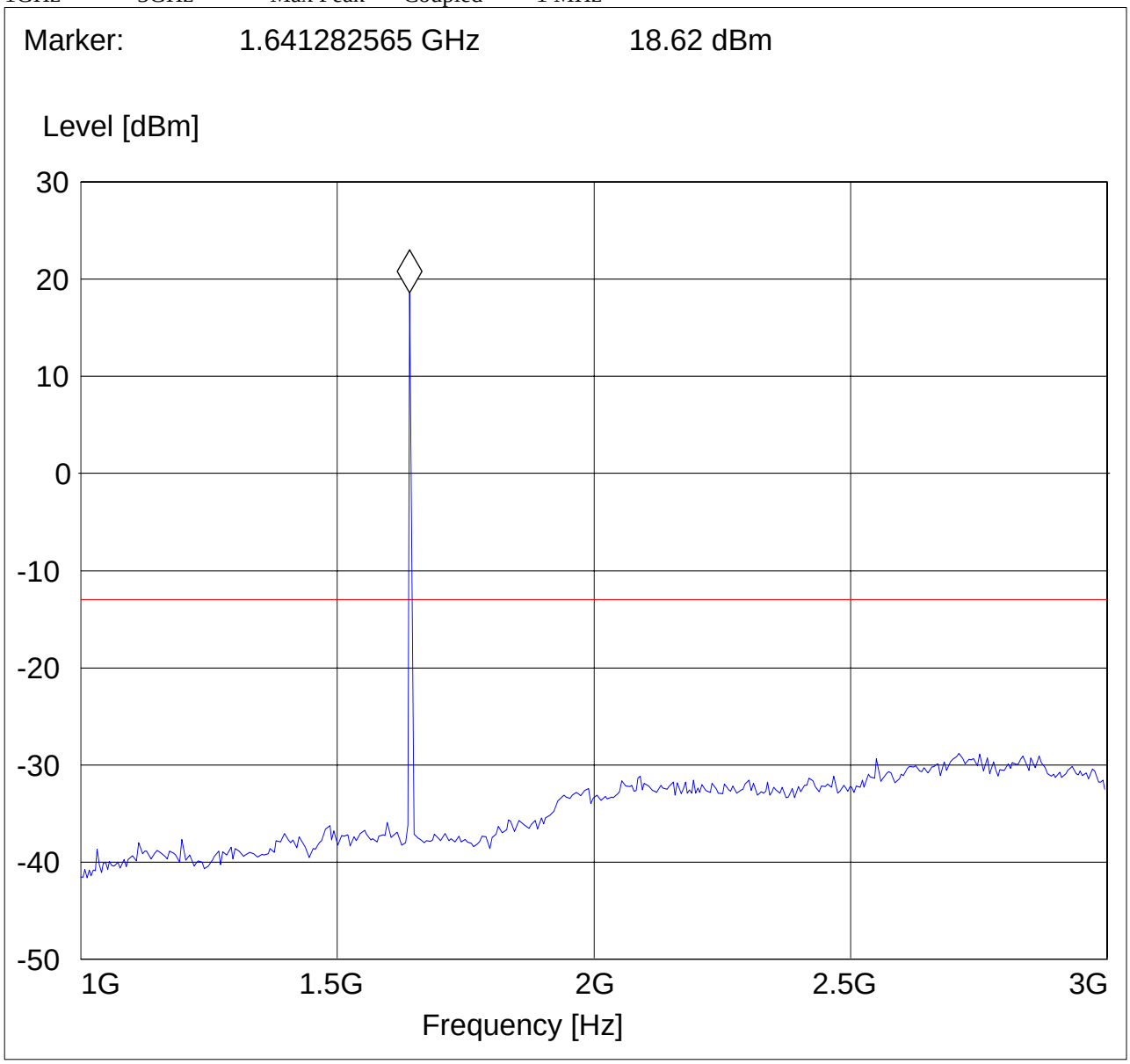
RADIATED SPURIOUS EMISSIONS
Mid Channel (1643.5MHz):1GHz - 3GHz

Spurious emission limit –13dBm

NOTE: peak above the limit line is the Carrier frequency @ mid channel

SWEEP TABLE: "FCC Spuri 1-3G"

Start Frequency	*Stop Frequency*	*Detector*	*Meas. Time*	*RBW/VBW*
1GHz	3GHz	Max Peak	Coupled	1 MHz

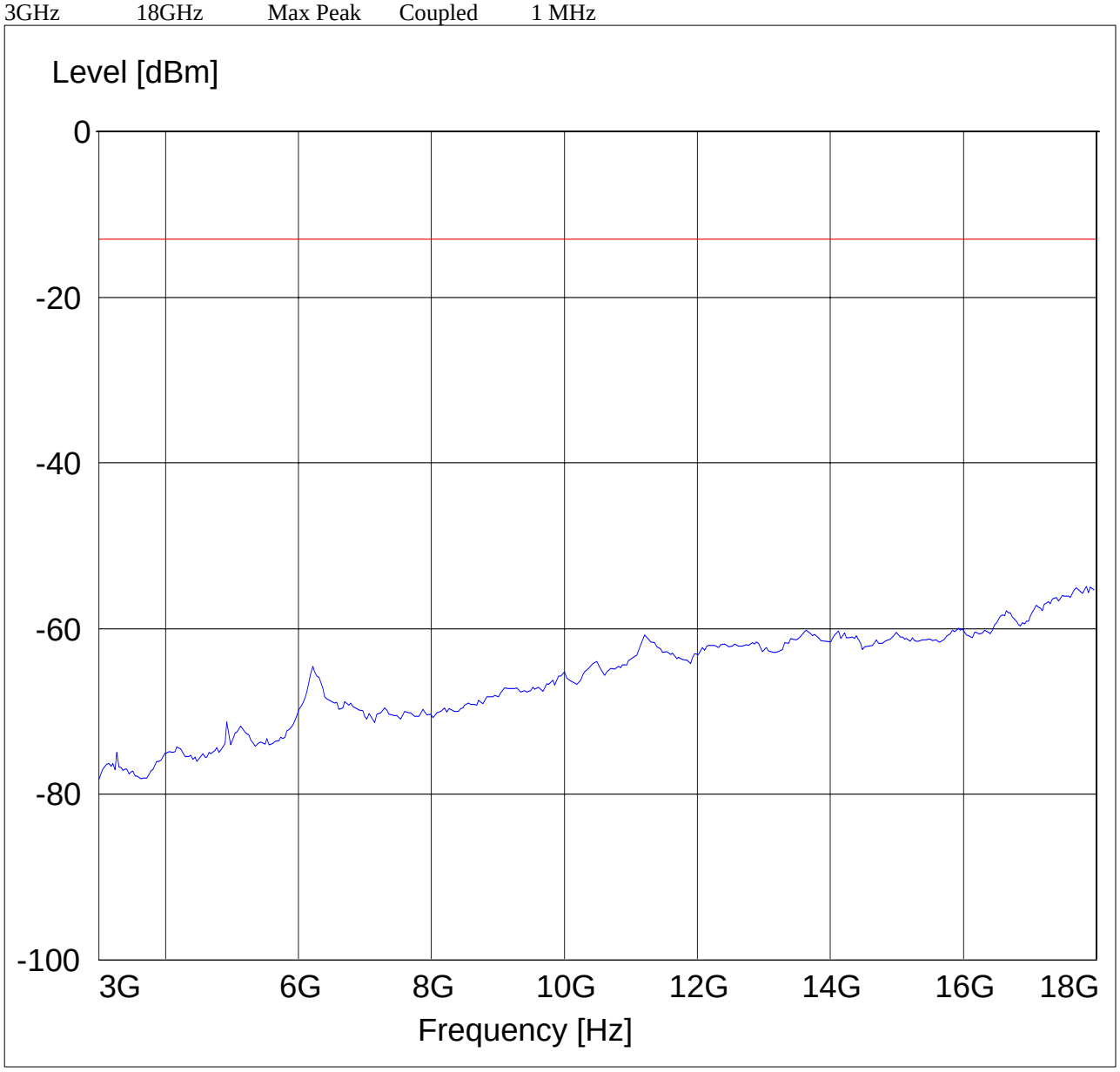


RADIATED SPURIOUS EMISSIONS
Mid Channel (1643.5MHz):3GHz - 18GHz

Spurious emission limit –13dBm

SWEEP TABLE: "FCC Spuri 3-18G"

Start Frequency	*Stop Frequency*	*Detector*	*Meas. Time*	*RBW/VBW*
3GHz	18GHz	Max Peak	Coupled	1 MHz



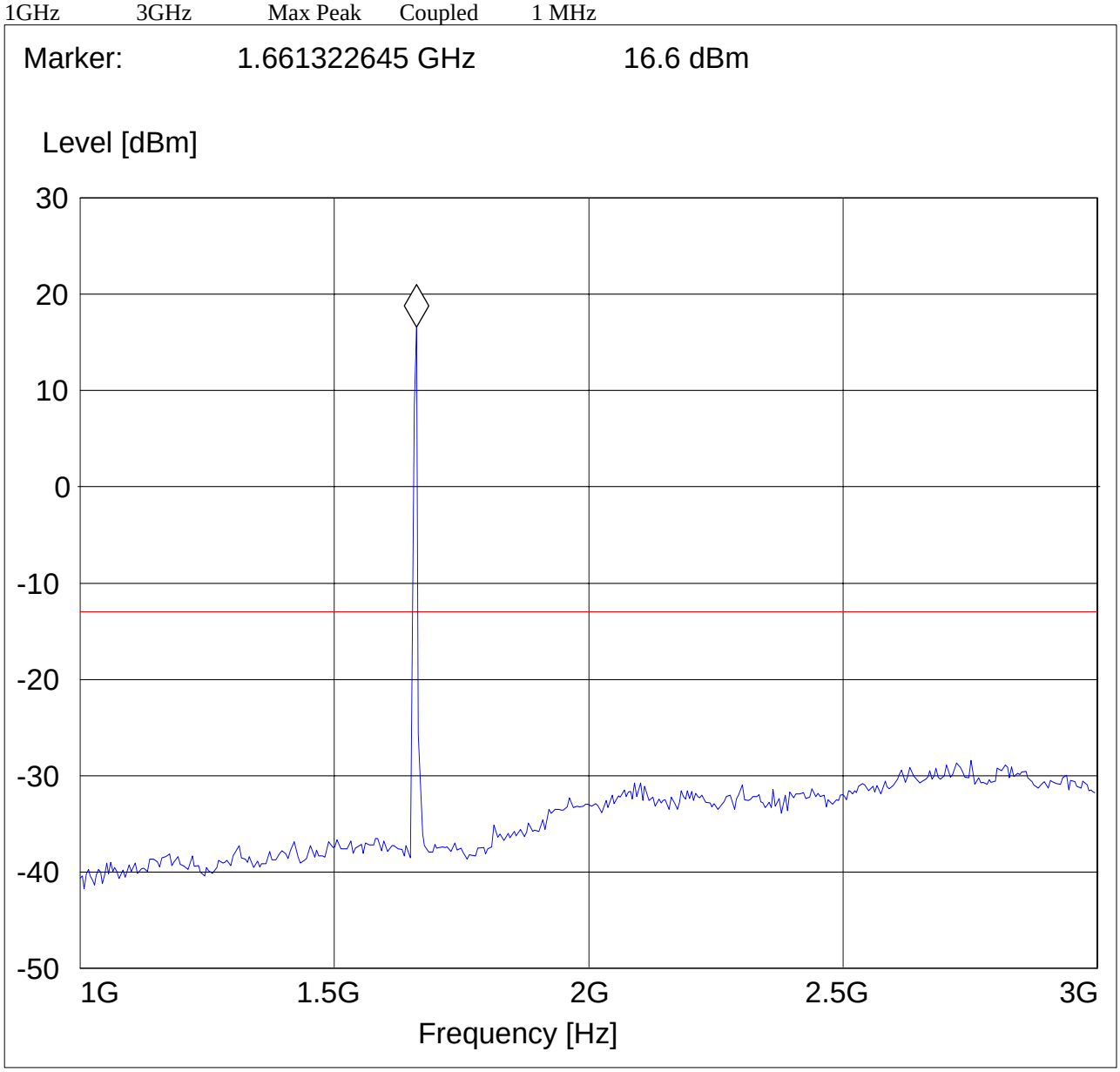
RADIATED SPURIOUS EMISSIONS
Highest Channel (1660.5MHz):1GHz - 3GHz

Spurious emission limit –13dBm

NOTE: marked peak above the limit line is the Carrier frequency @ high channel

SWEEP TABLE: "FCC Spuri 1-3G"

Start Frequency	*Stop Frequency*	*Detector*	*Meas. Time*	*RBW/VBW*
1GHz	3GHz	Max Peak	Coupled	1 MHz

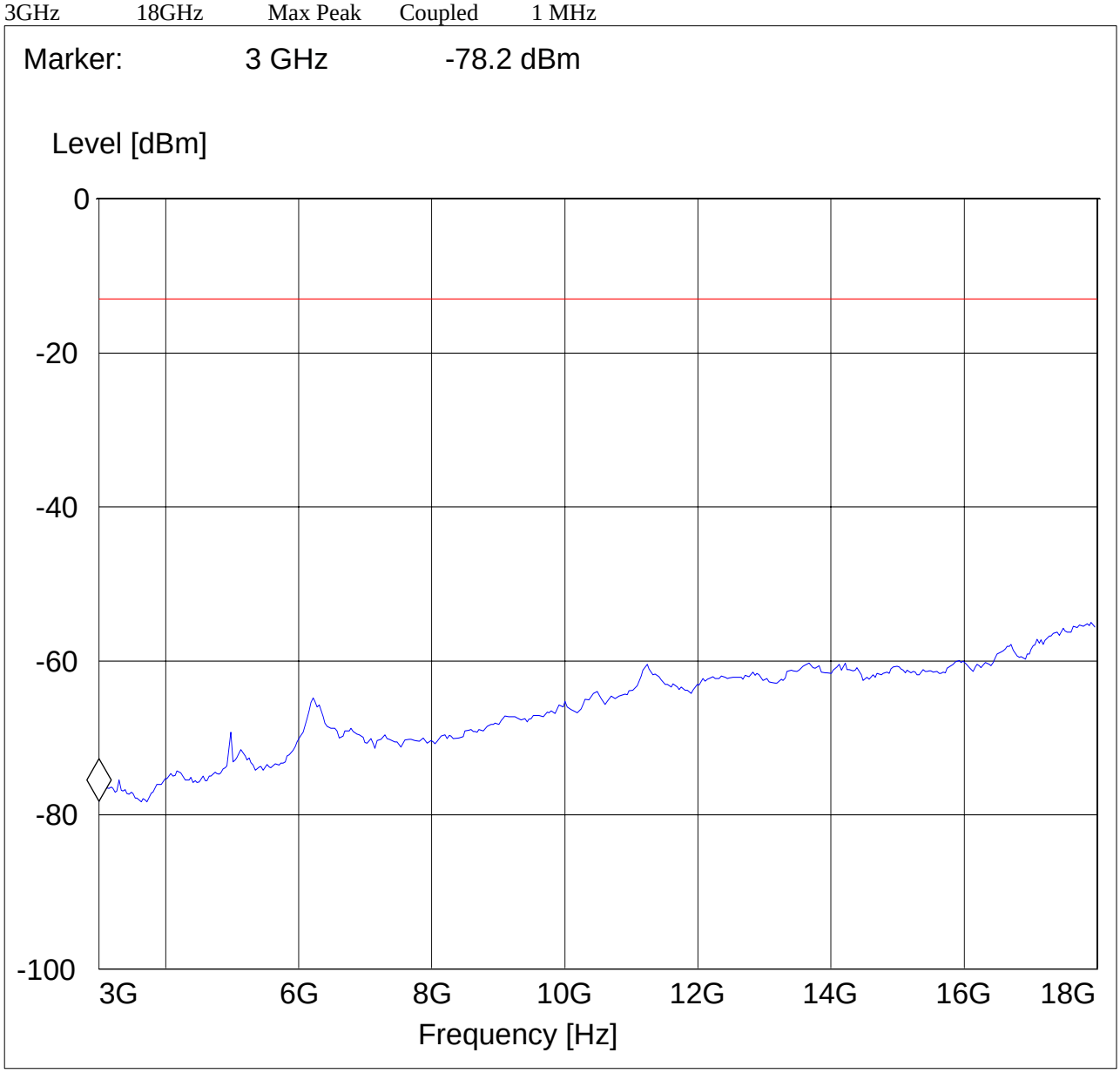


RADIATED SPURIOUS EMISSIONS
Highest Channel (1660.5MHz):3GHz - 18GHz

Spurious emission limit –13dBm

SWEEP TABLE: "FCC Spuri 3-18G"

Start Frequency	*Stop Frequency*	*Detector*	*Meas. Time*	*RBW/VBW*
3GHz	18GHz	Max Peak	Coupled	1 MHz



RADIATED SPURIOUS EMISSIONS

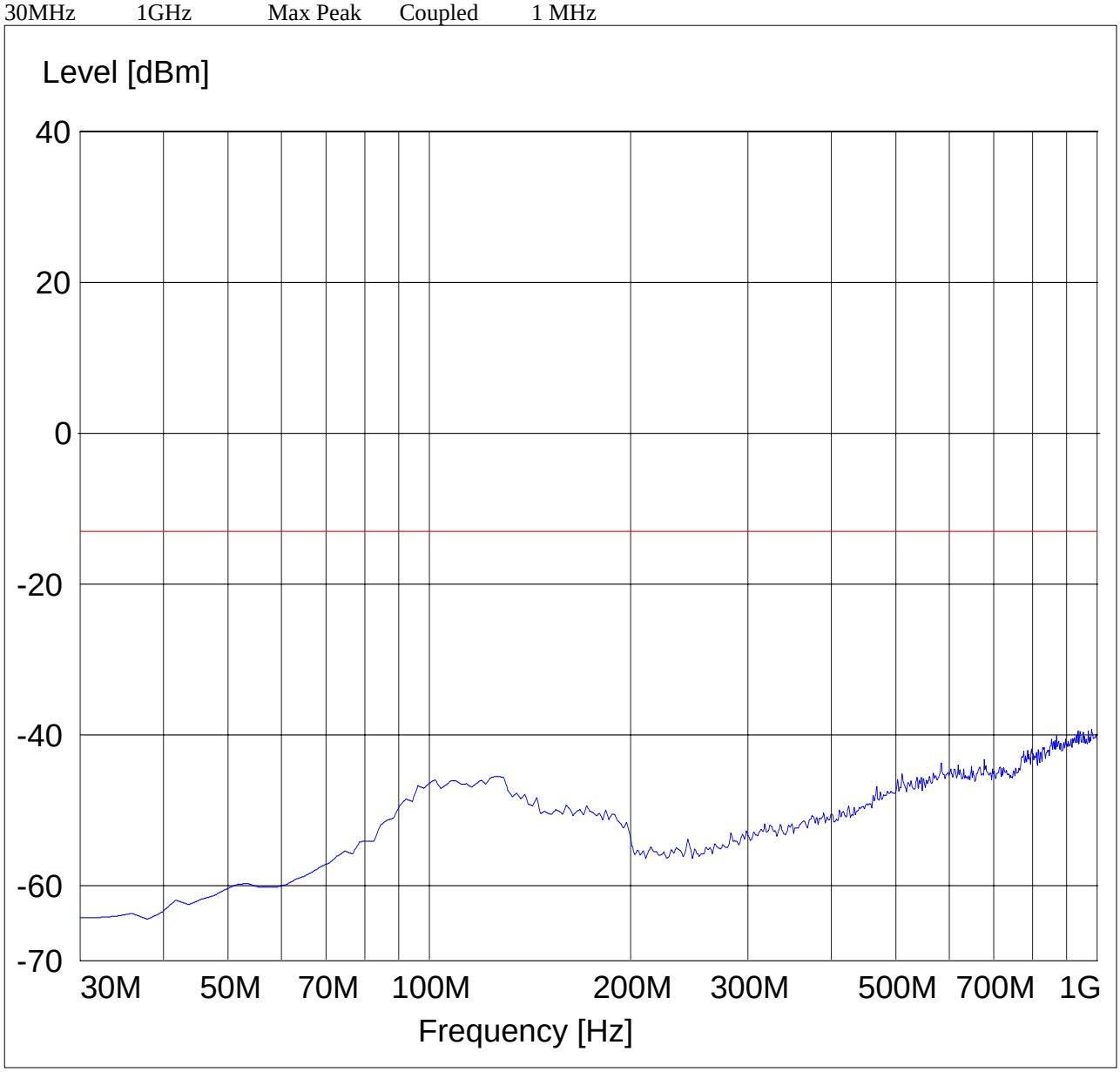
EUT in Idle Mode: 30MHz – 1GHz

Spurious emission limit –13dBm

Antenna: vertical

SWEEP TABLE: "FCC 25 Spur 30M-1G"

Start Frequency	*Stop Frequency*	*Detector*	*Meas. Time*	*RBW/VBW*
30MHz	1GHz	Max Peak	Coupled	1 MHz



RADIATED SPURIOUS EMISSIONS

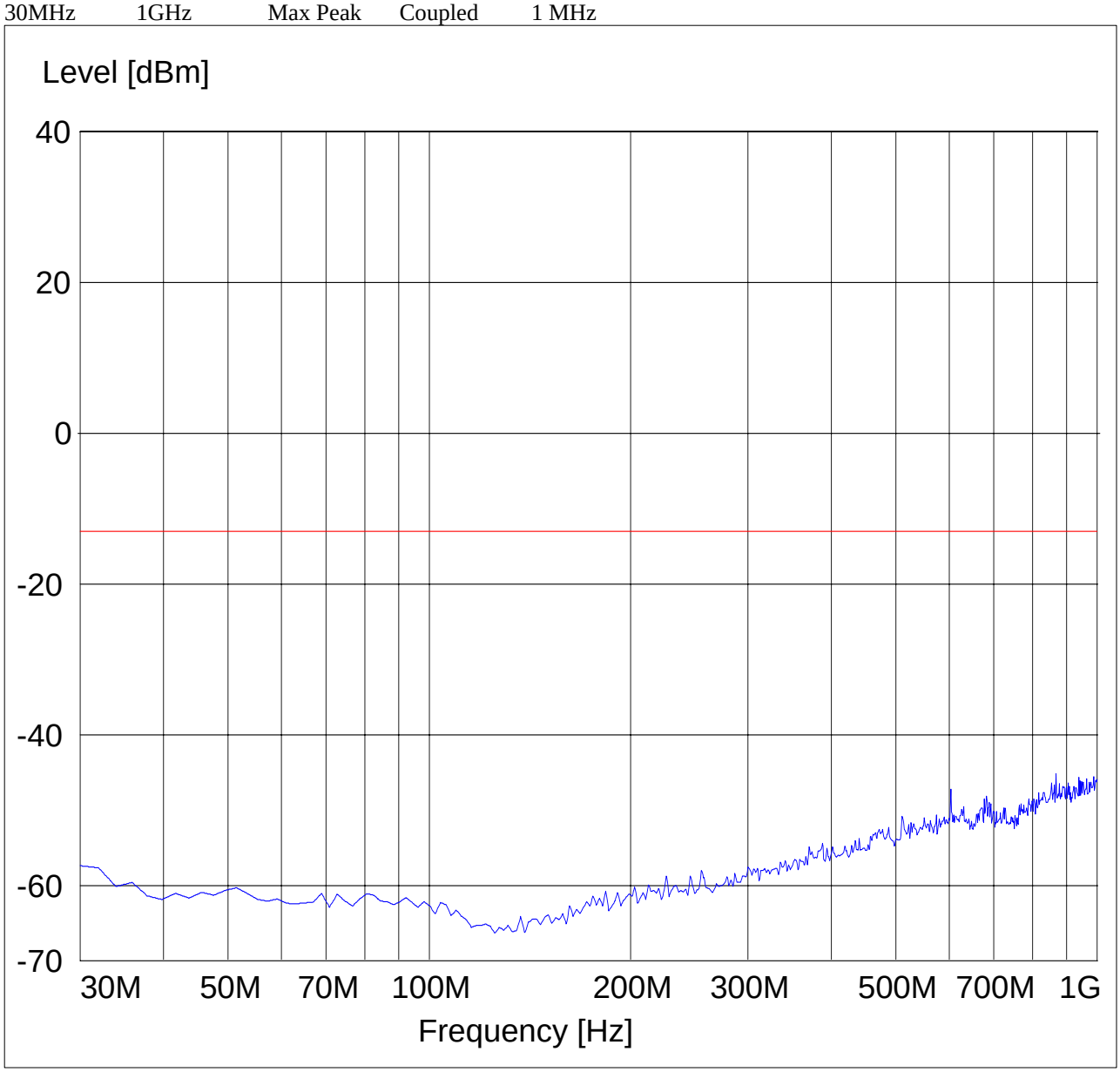
EUT in Idle Mode: 30MHz – 1GHz

Spurious emission limit –13dBm

Antenna: horizontal

SWEEP TABLE: "FCC 25 Spur 30M-1G"

Start Frequency	*Stop Frequency*	*Detector*	*Meas. Time*	*RBW/VBW*
30MHz	1GHz	Max Peak	Coupled	1 MHz

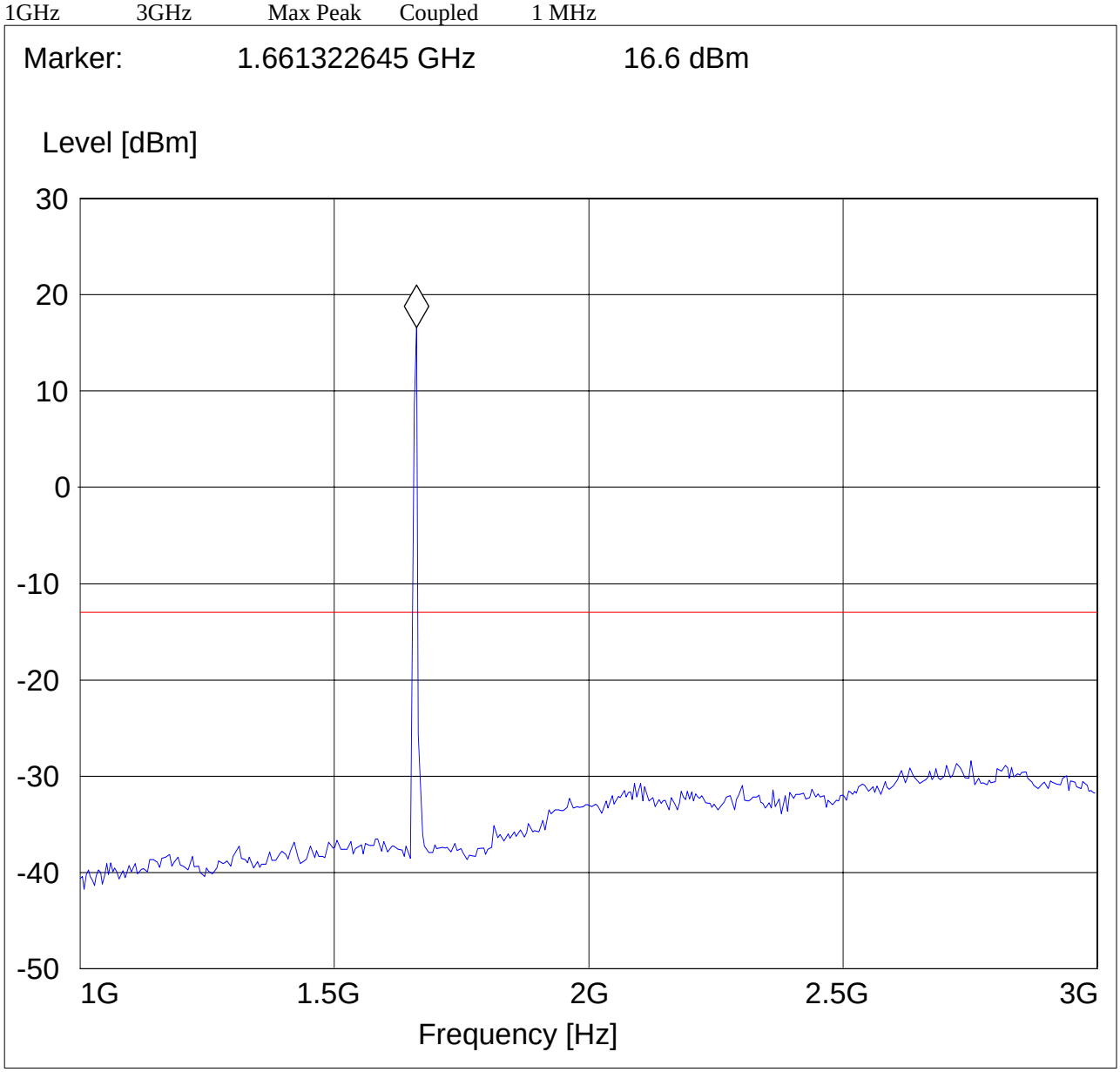


RADIATED SPURIOUS EMISSIONS
EUT in Idle Mode: 1GHz – 3GHz

Spurious emission limit –13dBm

SWEEP TABLE: "FCC Spuri 1-3G"

Start Frequency	*Stop Frequency*	*Detector*	*Meas. Time*	*RBW/VBW*
1GHz	3GHz	Max Peak	Coupled	1 MHz

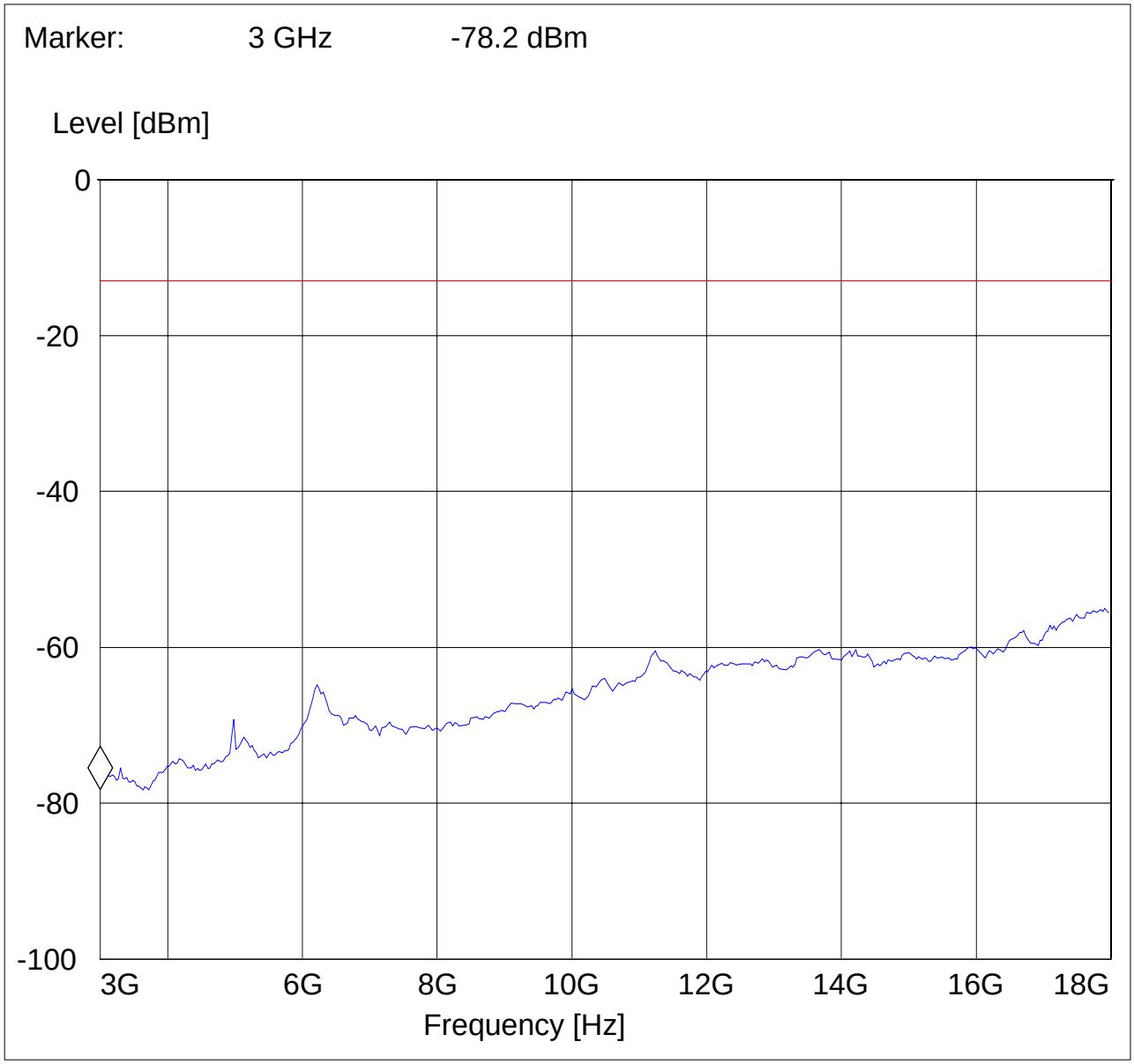


RADIATED SPURIOUS EMISSIONS
EUT in Idle Mode: 3GHz – 18GHz

Spurious emission limit –13dBm

SWEEP TABLE: "FCC spuri 3-18G"

Start Frequency	*Stop Frequency*	*Detector*	*Meas. Time*	*RBW/VBW*
3GHz	18GHz	Max Peak	Coupled	1 MHz



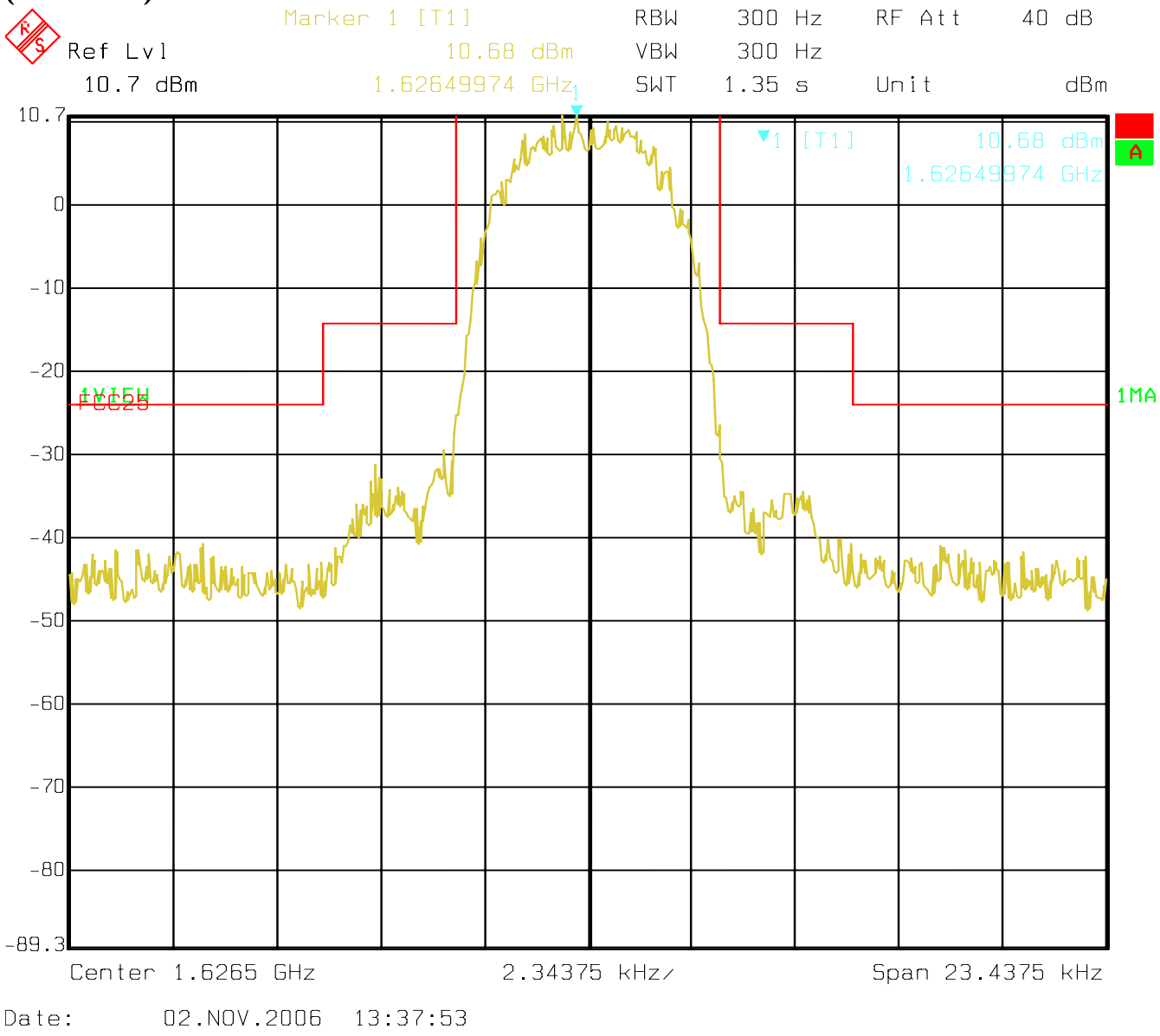
EMISSION MASK §25.202 (f)
(Conducted)

Emission mask table based on 25.202(f)

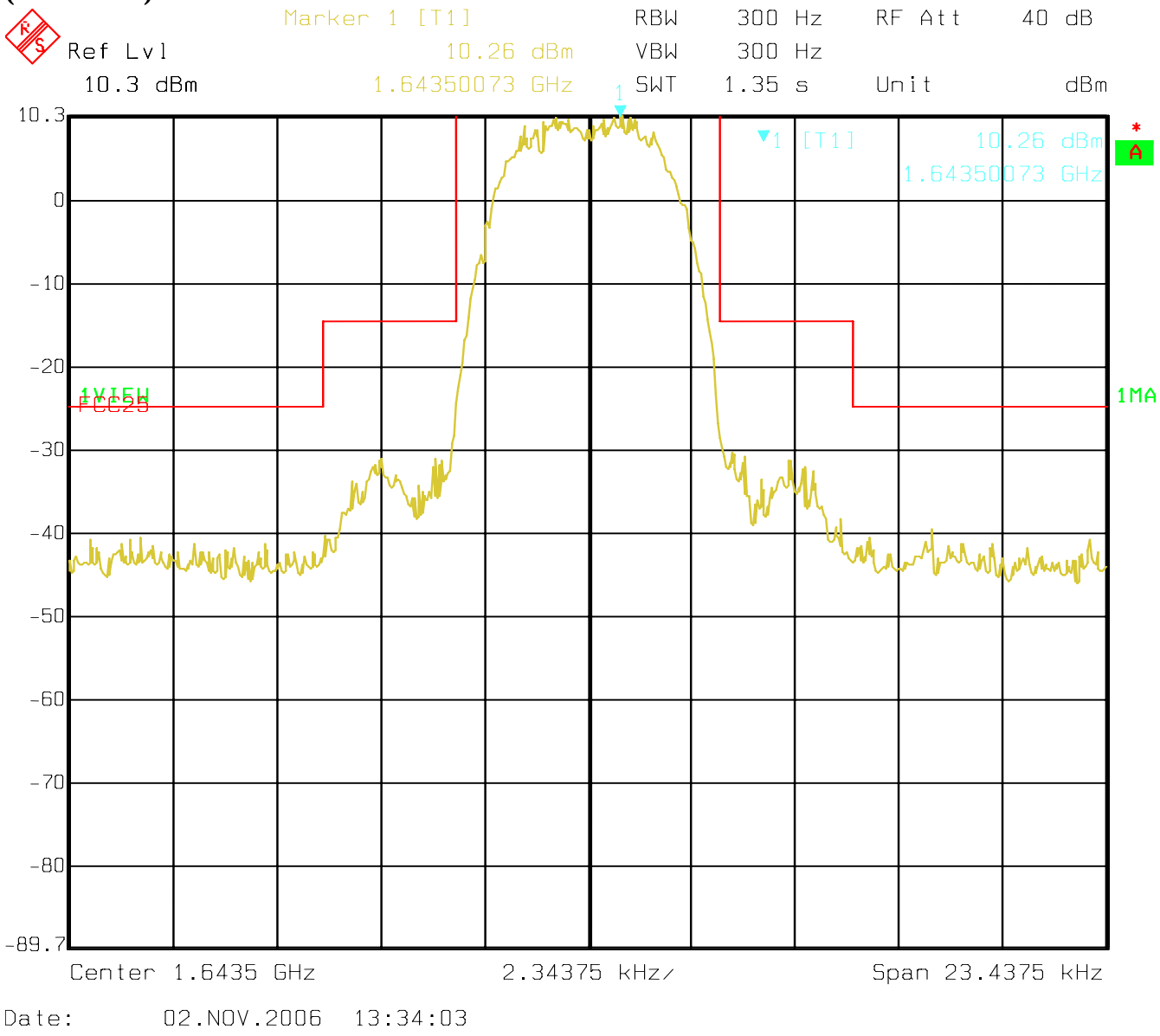
Frequency offset from centre freq (kHz)	Mean power of emissions below the mean output power of transmitter
0 to 3kHz	0 dBc
3kHz to 6kHz	-25 dBc in any 4kHz
6kHz to 15kHz	-35 dBc in any 4kHz
> 15kHz	-43 dBW in any 4kHz

Analyzer settings: RBW = VBW = 300 Hz
(Note: due to authorized BW of 6 kHz 300 Hz RBW was used for measurements.)

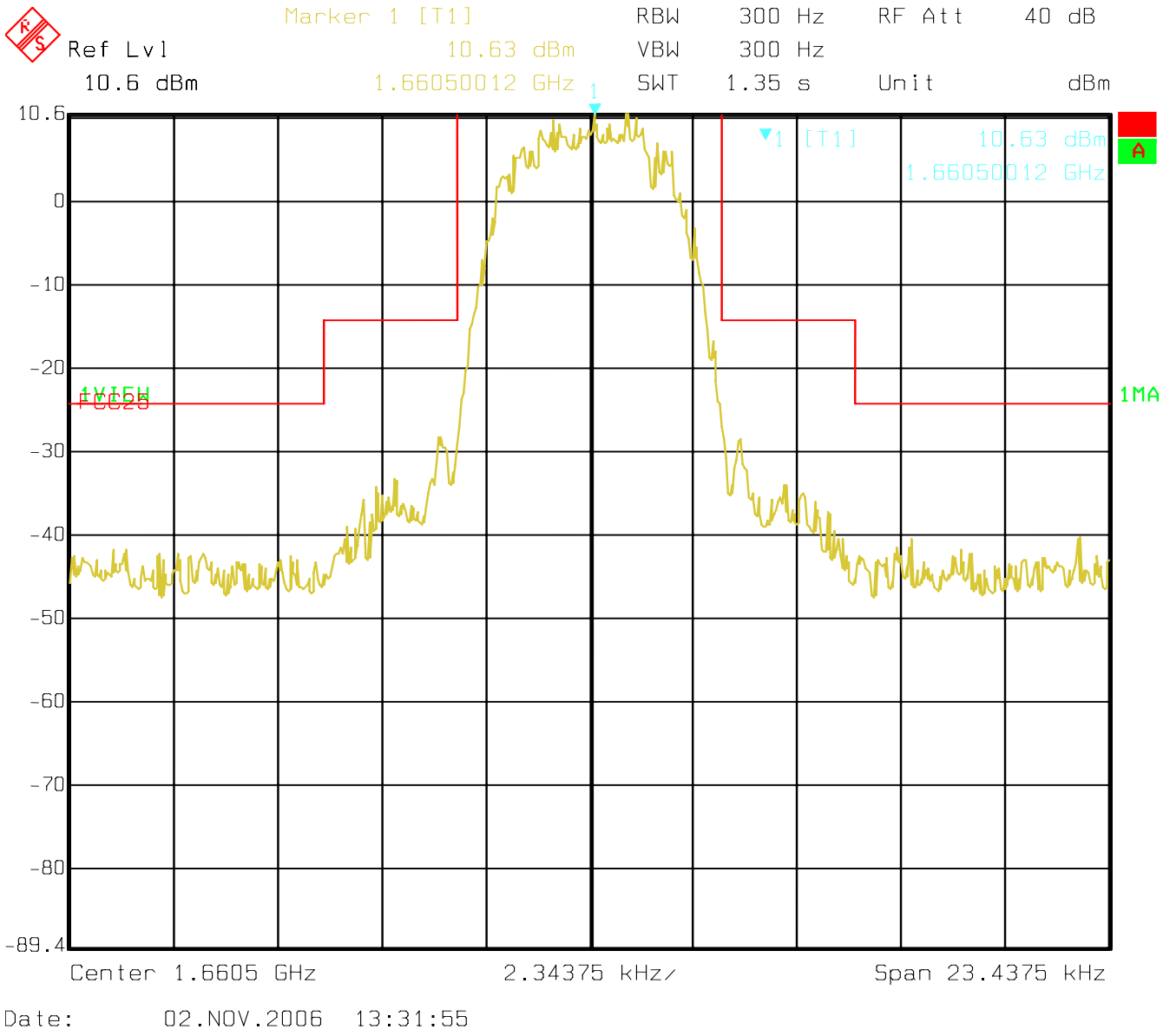
EMISSION MASK
Lowest Channel (1626.5MHz)
(Conducted)



EMISSION MASK
Mid Channel (1643.5MHz)
(Conducted)



EMISSION MASK
Highest Channel (1660.5MHz)
(Conducted)



RECEIVER RADIATED EMISSIONS § 15.209

NOTE: The radiated emissions were done with different settings, using the relevant pre-amplifiers for the relevant frequency ranges. This is the reason that the graphs show different noise levels. In the range between 3GHz and 18GHz very short cable connections to the antenna was used to minimize the noise level.

Limits **SUBCLAUSE § 15.209**

Frequency (MHz)	Field strength (µV/m)	Measurement distance (m)
0.009 - 0.490	2400/F(kHz)	300
0.490 - 1.705	24000/F(kHz)	30
1.705 - 30.0	30	30
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
Above 960	500	3

RECEIVER RADIATED EMISSIONS

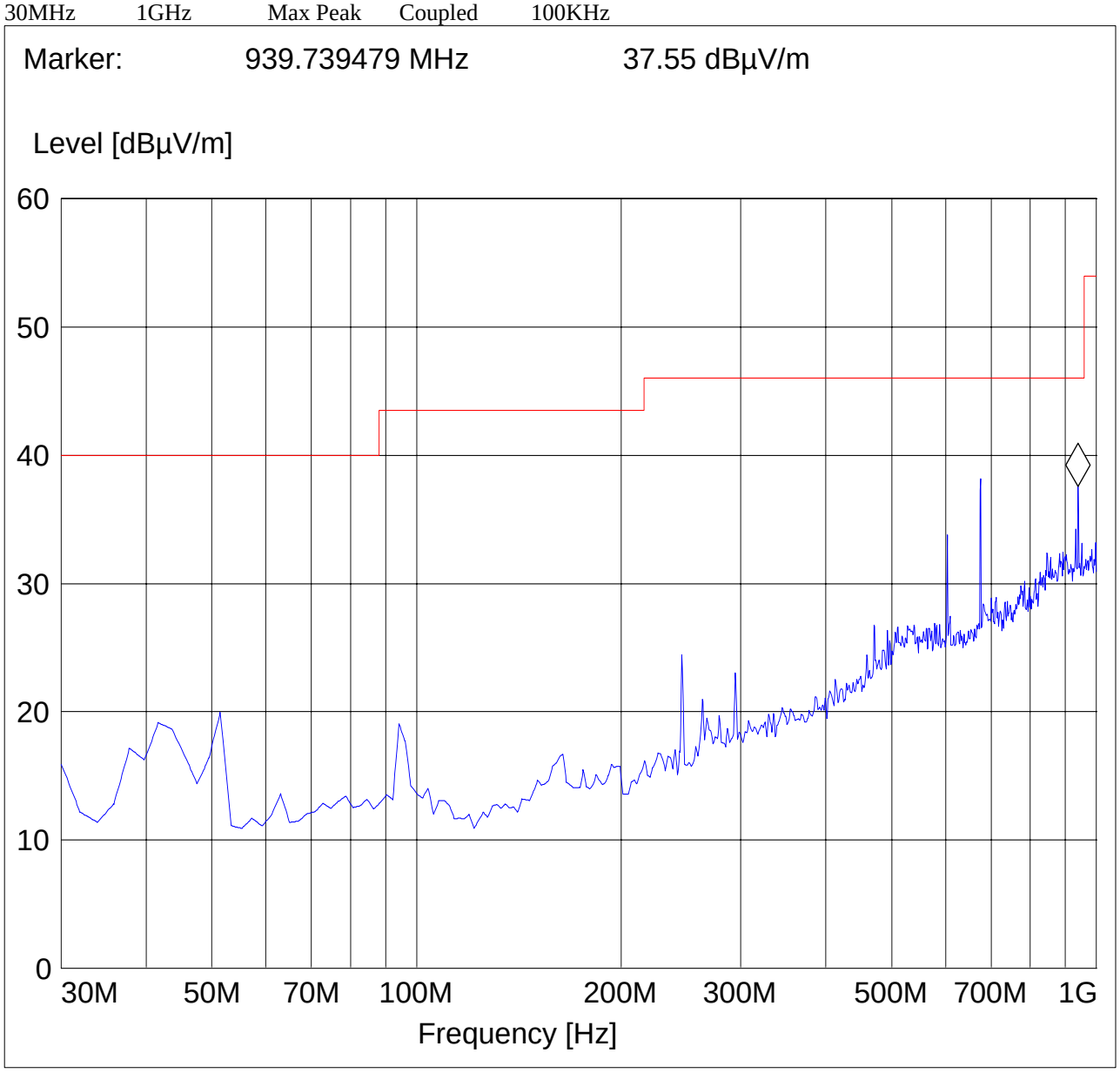
EUT in Rx Mode: 30MHz – 1GHz

Antenna: vertical

Note: This plot is valid for both polarities (worst-case plot)

SWEEP TABLE: "FCC 15 Spur 30M-1G"

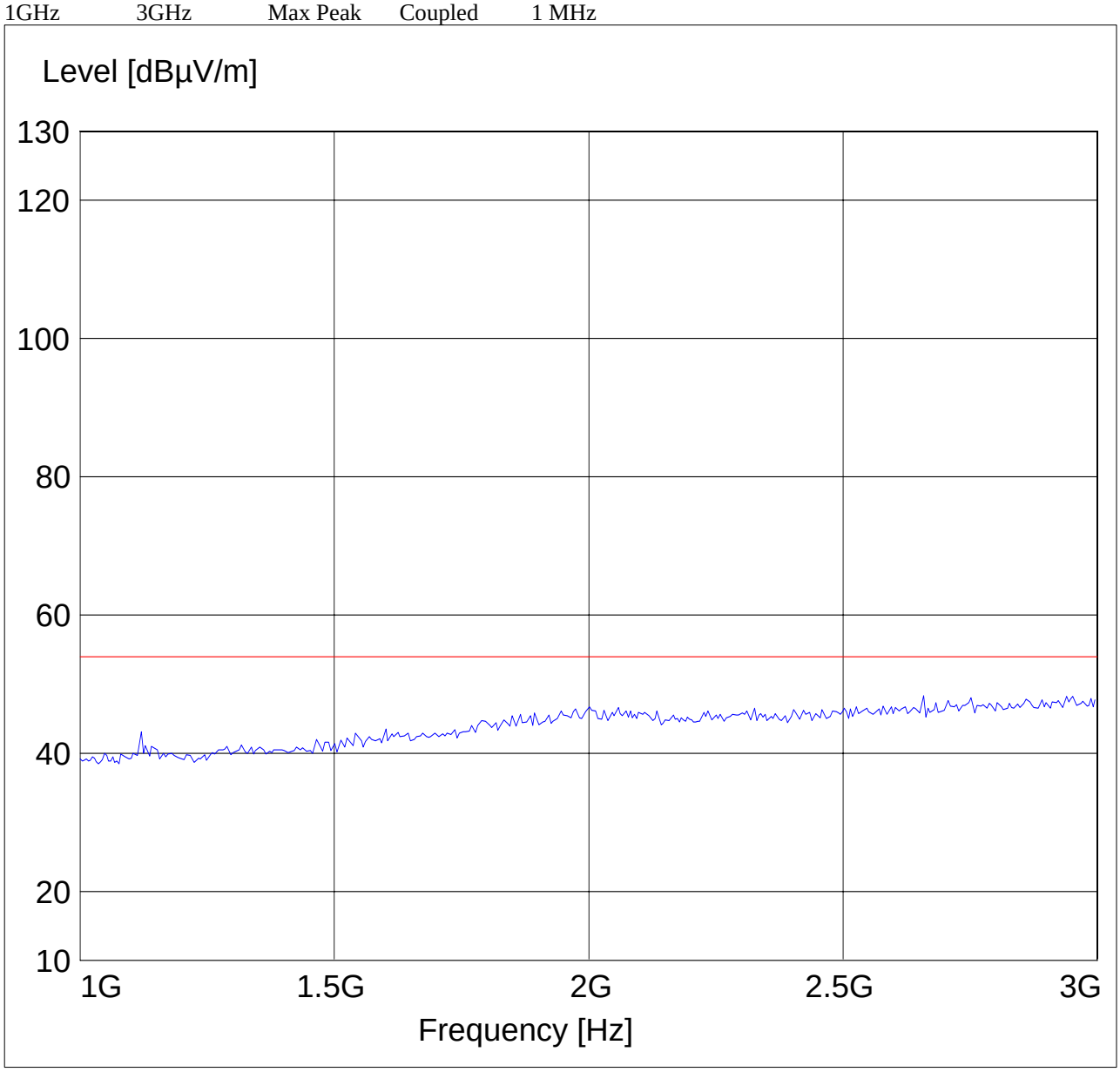
Start Frequency	*Stop Frequency*	*Detector*	*Meas. Time*	*RBW/VBW*
30MHz	1GHz	Max Peak	Coupled	100KHz



RECEIVER RADIATED EMISSIONS
EUT in Rx Mode: 1GHz – 3GHz

SWEEP TABLE: "FCC 15 Spuri 1-3G"

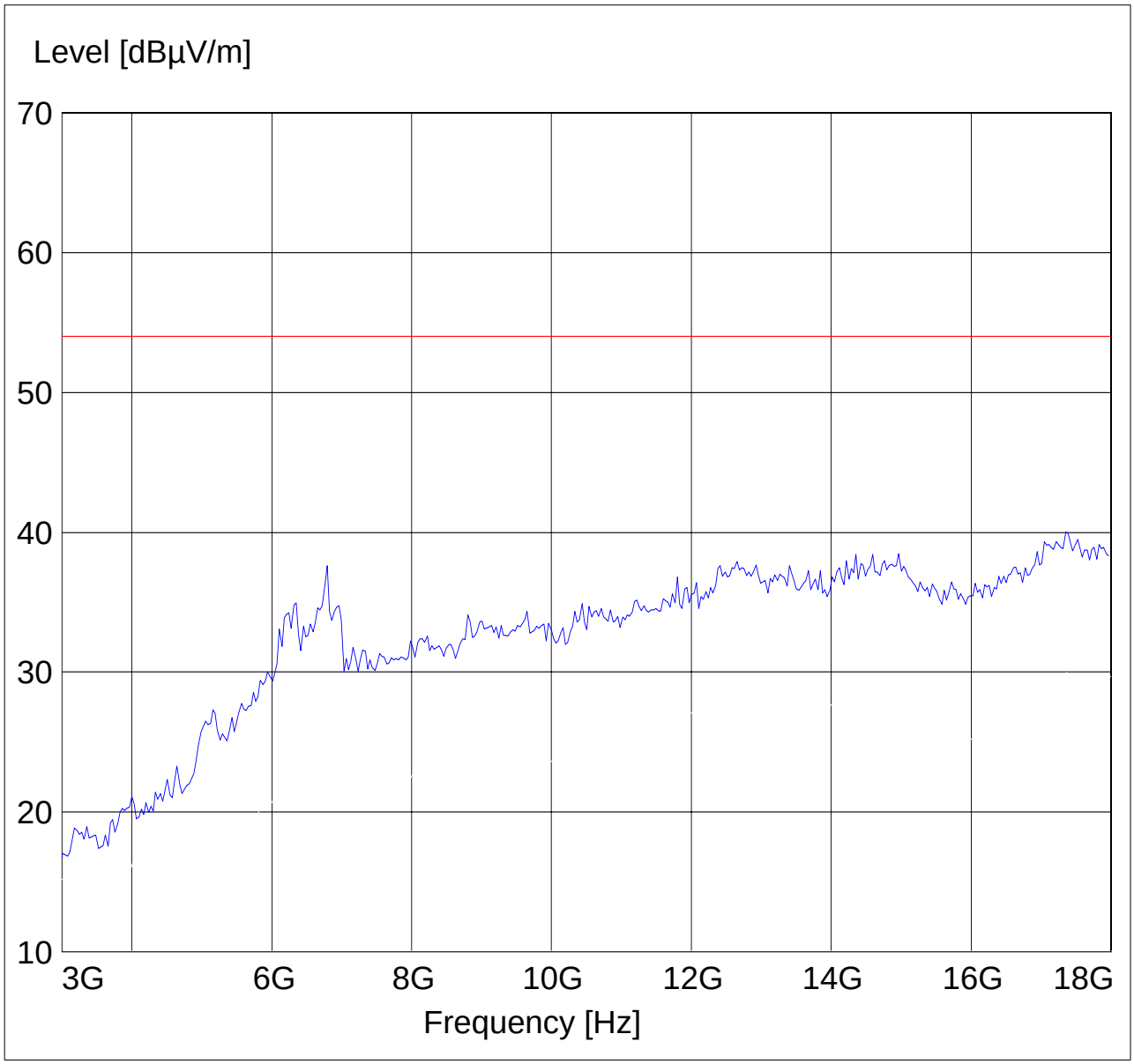
Start Frequency	*Stop Frequency*	*Detector*	*Meas. Time*	*RBW/VBW*
1GHz	3GHz	Max Peak	Coupled	1 MHz



RECEIVER RADIATED EMISSIONS
EUT in Rx Mode: 3GHz – 18GHz

SWEEP TABLE: "FCC 15 spuri 3-18G"

Start Frequency	*Stop Frequency*	*Detector*	*Meas. Time*	*RBW/VBW*
3GHz	18GHz	Max Peak	Coupled	1 MHz



CONDUCTED SPURIOUS EMISSIONS

Measurement Procedure:
The following steps outline the procedure used to measure the conducted emissions from the EUT.
1. Determine frequency range for measurements: From CFR 2.1057 the spectrum should be investigated from the lowest radio frequency generated in the equipment up to at least the 10th harmonic of the carrier frequency.
For the equipment under test, this equates to a frequency range of 30 MHz to 16.065 GHz, data taken from 30 MHz to 18 GHz.
2. Determine EUT transmit frequencies: below outlines the band edge frequencies pertinent to conducted emissions testing.

Channel	Frequency
Low	1626.5 MHz
Mid	1643.5 MHz
High	1660.5 MHz

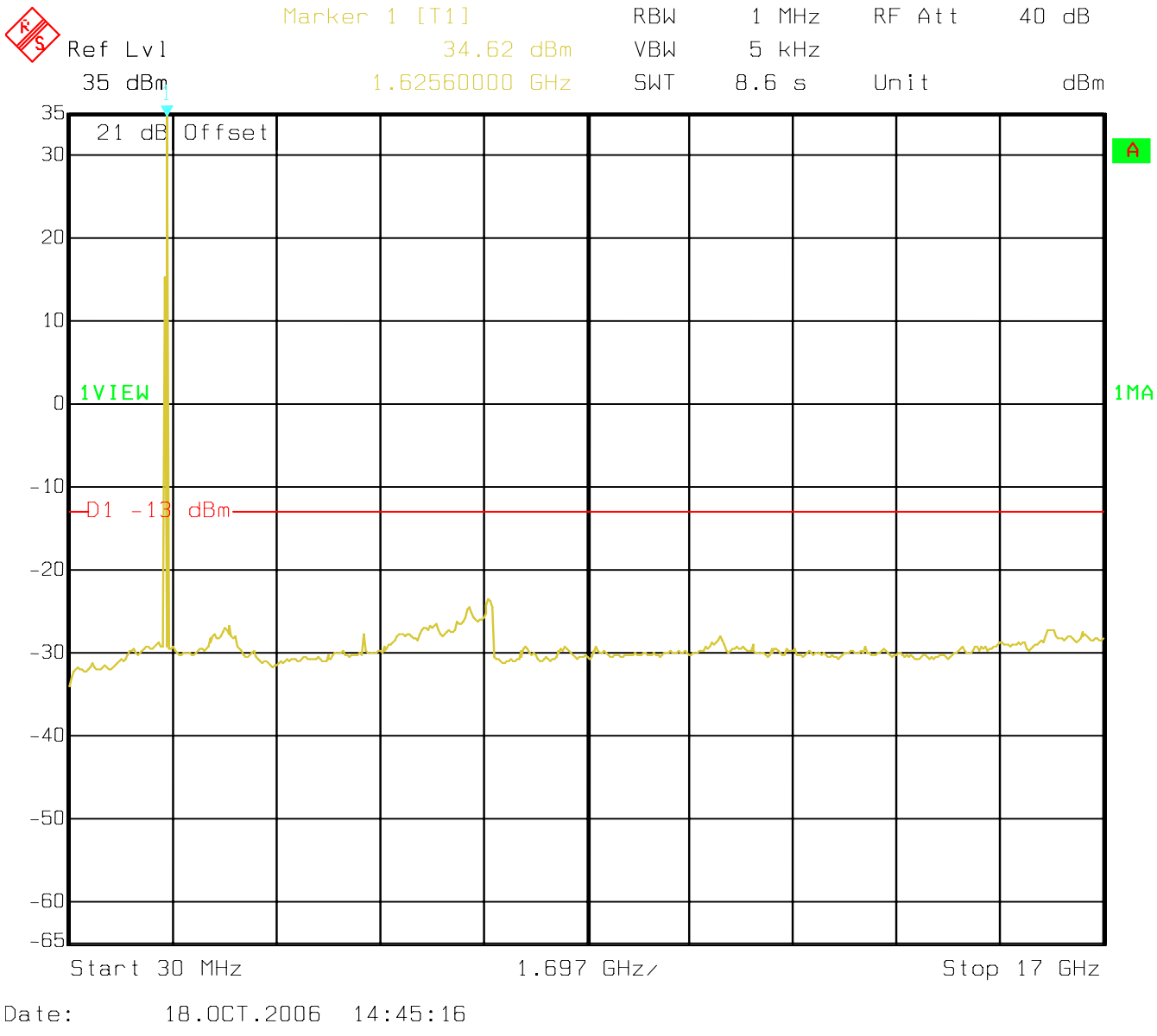
Measurement Limit:
Sec. 25.202(f) Emission Limits.

Test data
See plots on next pages

CONDUCTED SPURIOUS EMISSIONS
Lowest Channel (1626.5MHz):30MHz - 18GHz

Spurious emission limit –13dBm

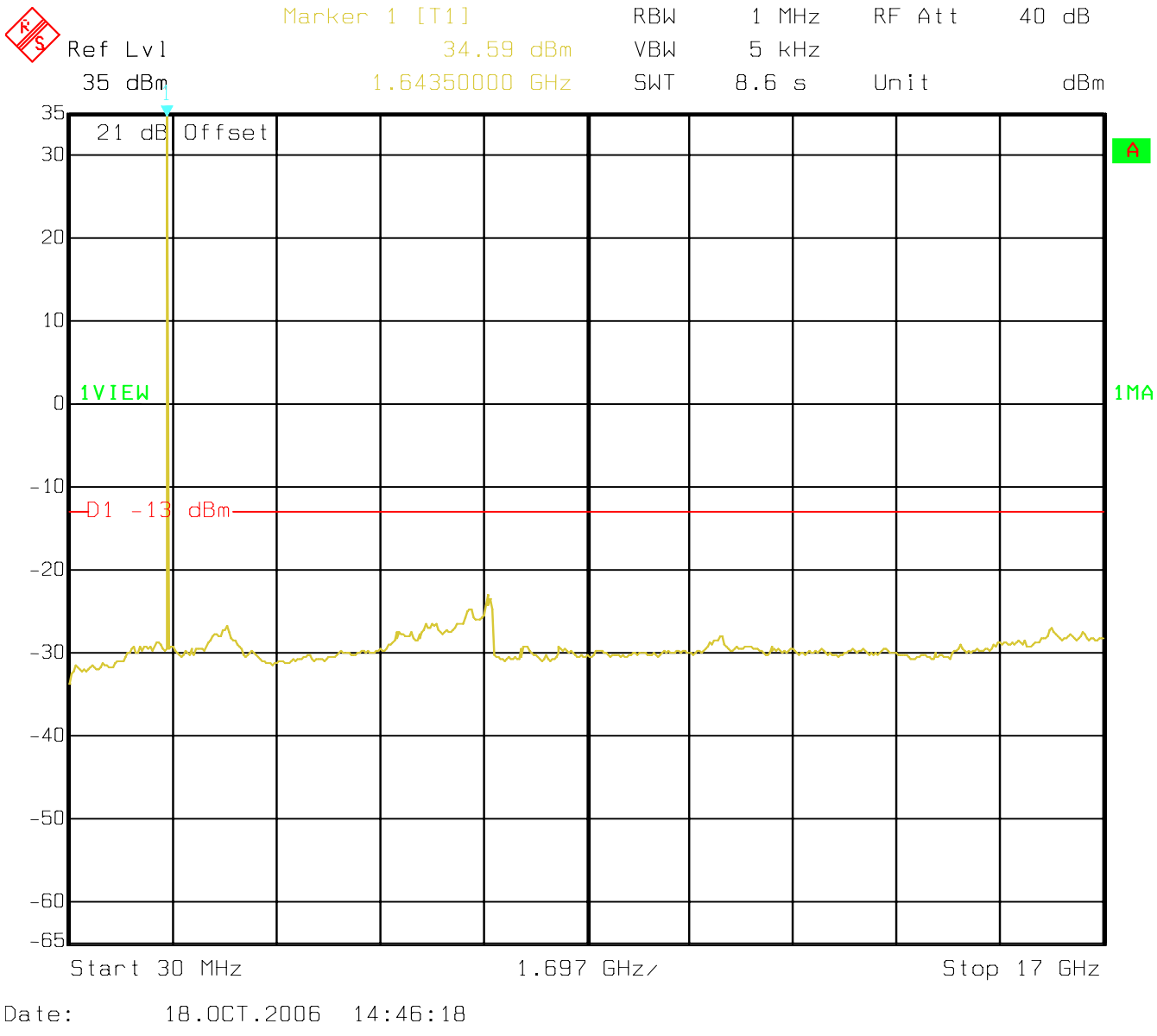
NOTE: peak above the limit line is the carrier frequency.



CONDUCTED SPURIOUS EMISSIONS
Mid Channel (1643.5MHz):30MHz - 18GHz

Spurious emission limit –13dBm

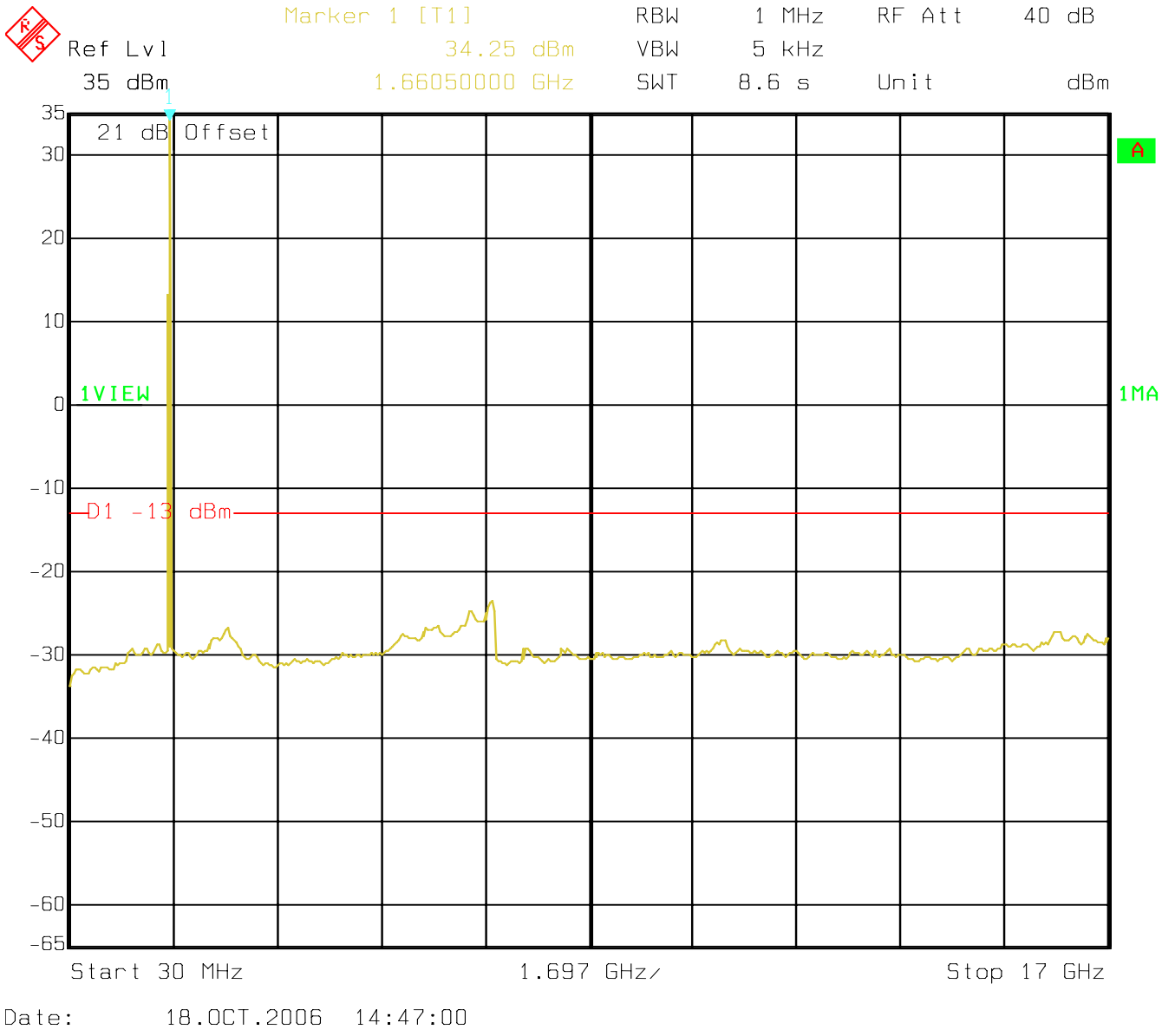
NOTE: peak above the limit line is the carrier frequency.



CONDUCTED SPURIOUS EMISSIONS
Highest Channel (1660.5MHz):30MHz - 18GHz

Spurious emission limit –13dBm

NOTE: peak above the limit line is the carrier frequency.



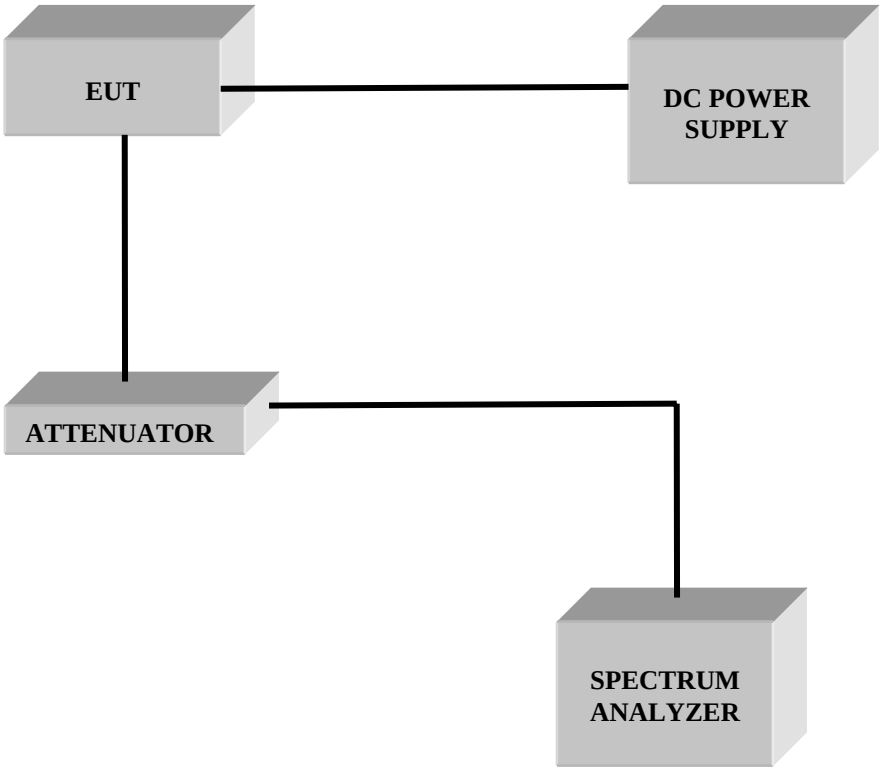
CONDUCTED EMISSIONS **§ 15.107/207**

This measurement is not applicable for EUT

TEST EQUIPMENT AND ANCILLARIES USED FOR TESTS

No	Instrument/Ancillary	Type	Manufacturer	Serial No.	Cal Due	Interval
01	Spectrum Analyzer	ESIB 40	Rohde & Schwarz	100107	May 2007	1 year
02	Spectrum Analyzer	FSEM 30	Rohde & Schwarz	100017	August 2007	1 year
03	Signal Generator	SMY02	Rohde & Schwarz	836878/011	May 2007	1 year
04	Power-Meter	NRVD	Rohde & Schwarz	0857.8008.02	May 2007	1 year
05	Biconilog Antenna	3141	EMCO	0005-1186	June 2007	1 year
06	Horn Antenna (1-18GHz)	SAS-200/571	AH Systems	325	June 2007	1 year
07	Horn Antenna (18-26.5GHz)	3160-09	EMCO	1240	June 2007	1 year
08	Power Splitter	11667B	Hewlett Packard	645348	n/a	n/a
09	Climatic Chamber	VT4004	Voltsch	G1115	May 2007	1 year
10	High Pass Filter	5HC2700	Trilithic Inc.	9926013	n/a	n/a
11	High Pass Filter	4HC1600	Trilithic Inc.	9922307	n/a	n/a
12	Pre-Amplifier	JS4-00102600	Miteq	00616	May 2007	1 year
13	Power Sensor	URV5-Z2	Rohde & Schwarz	DE30807	May 2007	1 year
14	Digital Radio Comm. Tester	CMD-55	Rohde & Schwarz	847958/008	May 2007	1 year
15	Universal Radio Comm. Tester	CMU 200	Rohde & Schwarz	832221/06	May 2007	1 year

BLOCK DIAGRAMS
Conducted Testing



Radiated Testing