



FCC Test report

Test report no.: EMC_624FCC-25_2004_SAT

FCC Part 25 / RSS 170

Model: MBS1000-2

FCC ID: P5IMBS2A

IC ID: 1478A-MBS2A



TTI-P-G 081/94-A0

Accredited according to **ISO/IEC 17025**



**Bluetooth Qualification
Test Facility
(BQTF)**



FCC listed # 101450

IC recognized # 3925

CETECOM Inc.

411 Dixon Landing Road • Milpitas, CA 95035 • U.S.A.

Phone: + 1 (408) 586 6200 • Fax: + 1 (408) 586 6299 • E-mail: info@cetecomusa.com • <http://www.cetecom.com>

CETECOM Inc. is a Delaware Corporation with Corporation number: 2113686
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: Harpreet Sidhu

1.2 Testing laboratory**CETECOM Inc.**

411 Dixon Landing Road, Milpitas, CA-95035, USA

Phone: +1 408 586 6200 Fax: +1 408 586 6299

E-mail: lothar.schmidt@cetecomusa.comInternet: www.cetecom.com

1.3 Details of applicant

Name : Wireless Matrix Corporation
Street : 12369-B Sunrise Valley Drive
City / Zip Code : Reston, VA 20164
Country : USA
Contact : Darryl Strucko
Telephone : 703 262 4021
Tele-fax : 703 262 3085
e-mail : darryl.strucko@wrx-us.com

1.4 Application details

Date of receipt test item : 2004-03-01
Date of test : 2004-03-01/02/03

1.5 Test item

Manufacturer : Applicant
Marketing Name : Mobile Base Station 2
Model No. : MBS1000-2
Description : [Mobile base station with GSM 850/1900, WLAN 802.11b & Satellite Transmitters.](#)
FCC-ID : **P5IMBS2A**
IC-ID : **1478A-MBS2A**

Additional information

Frequency : Tx 1626.5MHz – 1660.5MHz
Rx 1525MHz – 1559MHz
Type of modulation : QPSK
Number of channels : 5666
Antenna : Cross Dipole for Satellite
Power supply : 13.6VDC Nominal voltage
Output power : 34.47dBm (2.8W) max. EIRP measured
Extreme temp. Tolerance : Lower: -20°C Upper: +60°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:

2004-03-12	EMC & Radio	Lothar Schmidt (Technical Manager)	
Date	Section	Name	Signature

Responsible for test report and project leader:

2004-03-12	EMC & Radio	Harpreet Sidhu (EMC Engineer)	
Date	Section	Name	Signature

2.2 Test report

TEST REPORT

**Test report no.: EMC_624FCC-25_2004_SAT
(Model: MBS1000-2)**

TEST REPORT REFERENCE

PARAMETER TO BE MEASURED	PARAGRAPH	PAGE
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ANNEX-1: FREQUENCY STABILITY

ANNEX-2: GLONASS BAND NOISE AND SPURIOUS TESTS

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	34.12
1643.5	34.32
1660.5	34.33

Radiated:**EIRP Measurements**

Frequency (MHz)	EIRP (dBm)
1626.5	34.47
1643.5	34.17
1660.5	34.43

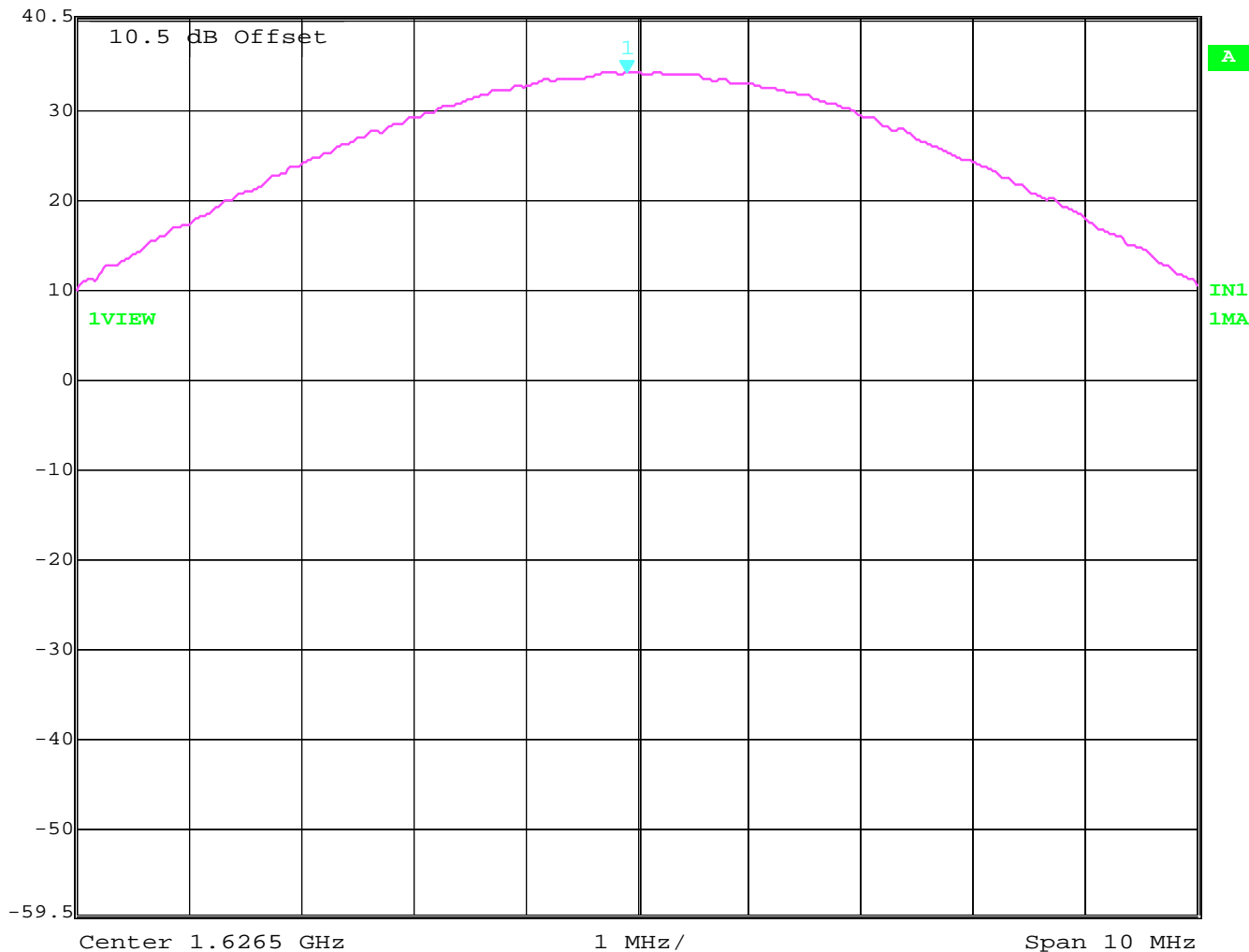
ANALYZER SETTINGS: RBW = VBW = 3MHz

Conducted Peak Power

Lowest Channel: 1626.5MHz



Ref Lvl	Marker 1 [T1]	RBW	3 MHz	RF Att	40 dB
40.5 dBm	34.12 dBm	VBW	3 MHz		
	1.62640982 GHz	SWT	5 ms	Unit	dBm

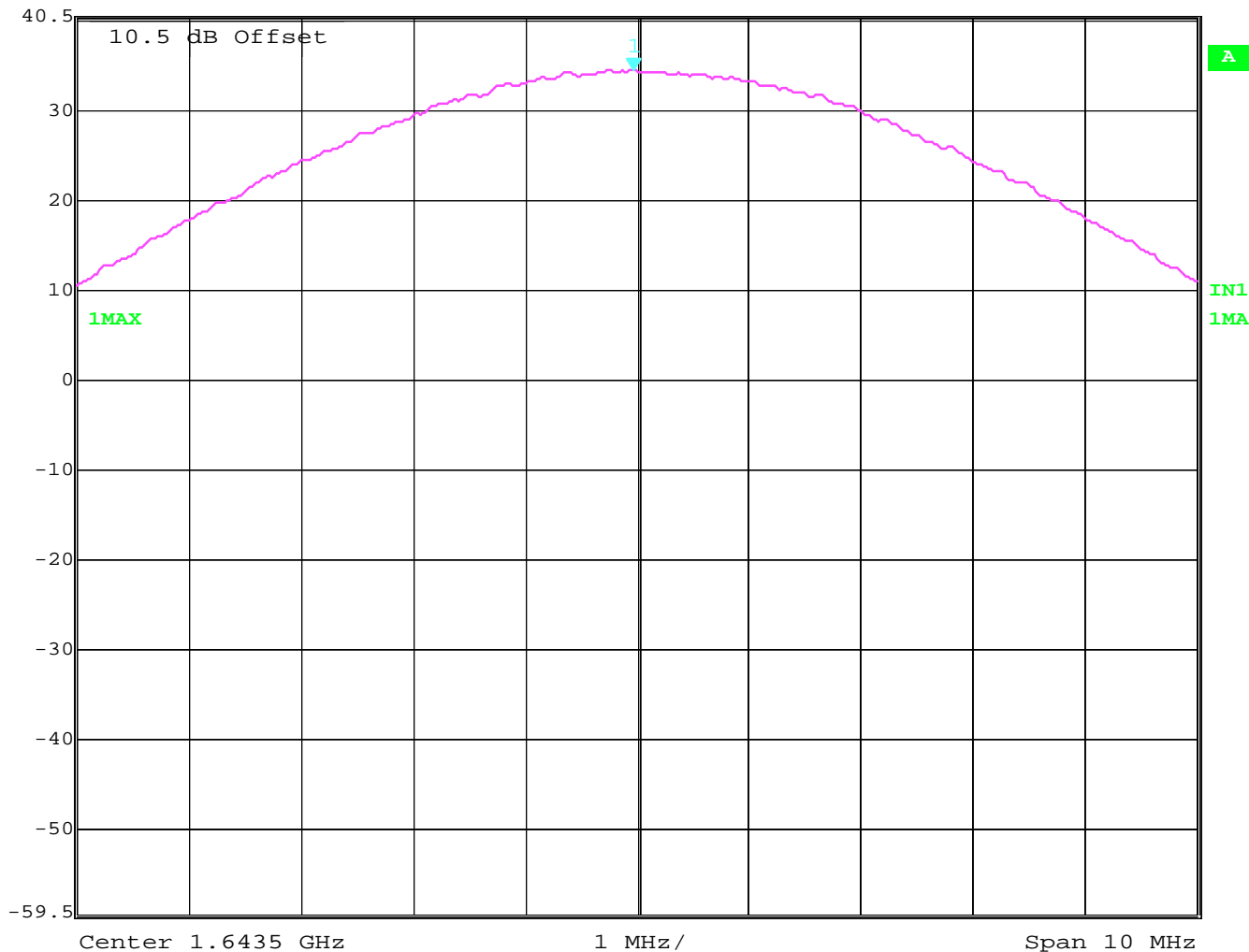


Date: 1.MAR.2004 11:56:01

Conducted Peak Power
Mid Channel: 1643.5MHz



Ref Lvl	Marker 1 [T1]	RBW	3 MHz	RF Att	40 dB
40.5 dBm	34.38 dBm	VBW	3 MHz		
	1.64346994 GHz	SWT	5 ms	Unit	dBm

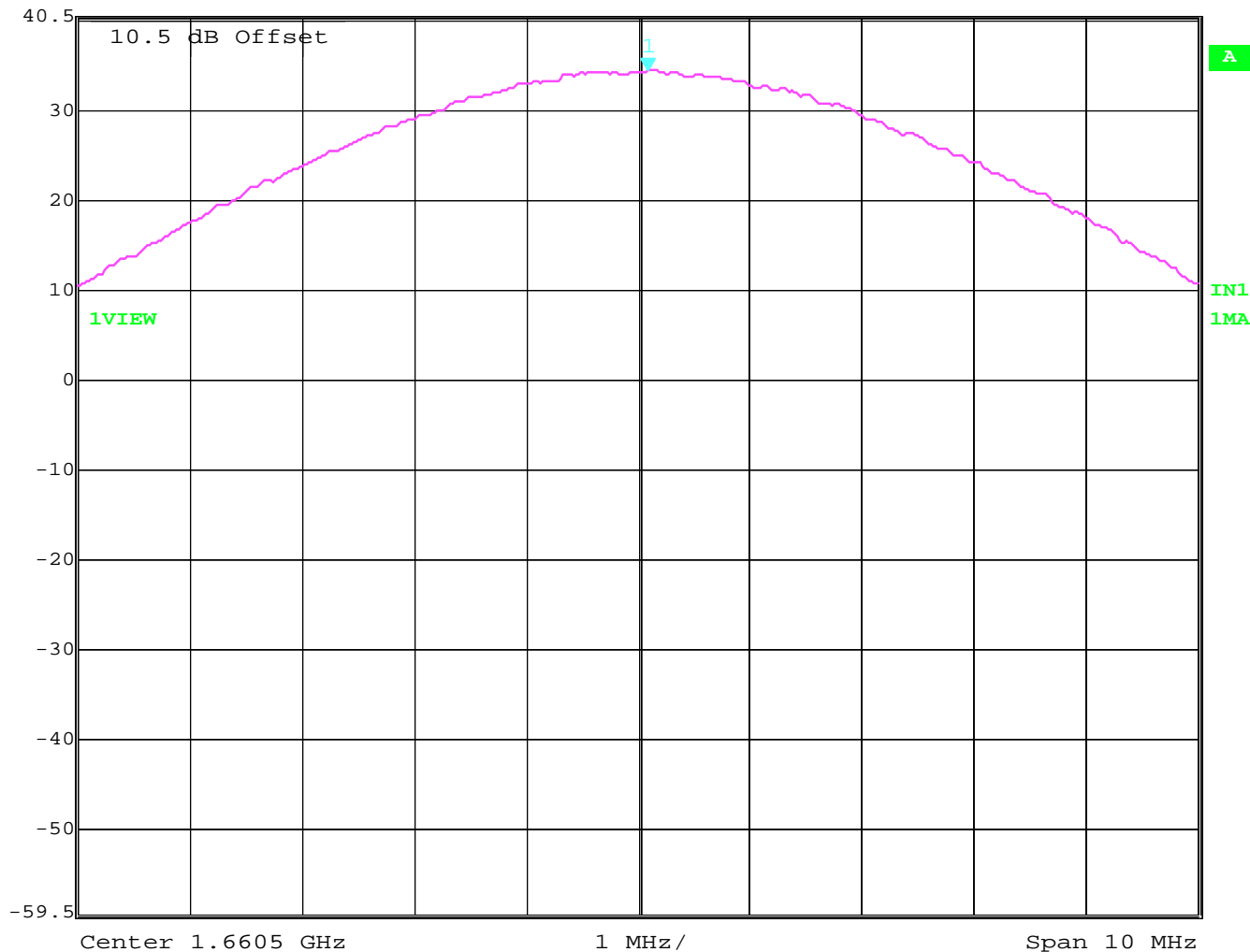


Date: 1.MAR.2004 11:58:50

Conducted Peak Power
Highest Channel: 1660.5MHz



Ref Lvl	Marker 1 [T1]	RBW	3 MHz	RF Att	40 dB
40.5 dBm	34.33 dBm	VBW	3 MHz		
	1.66059018 GHz	SWT	5 ms	Unit	dBm



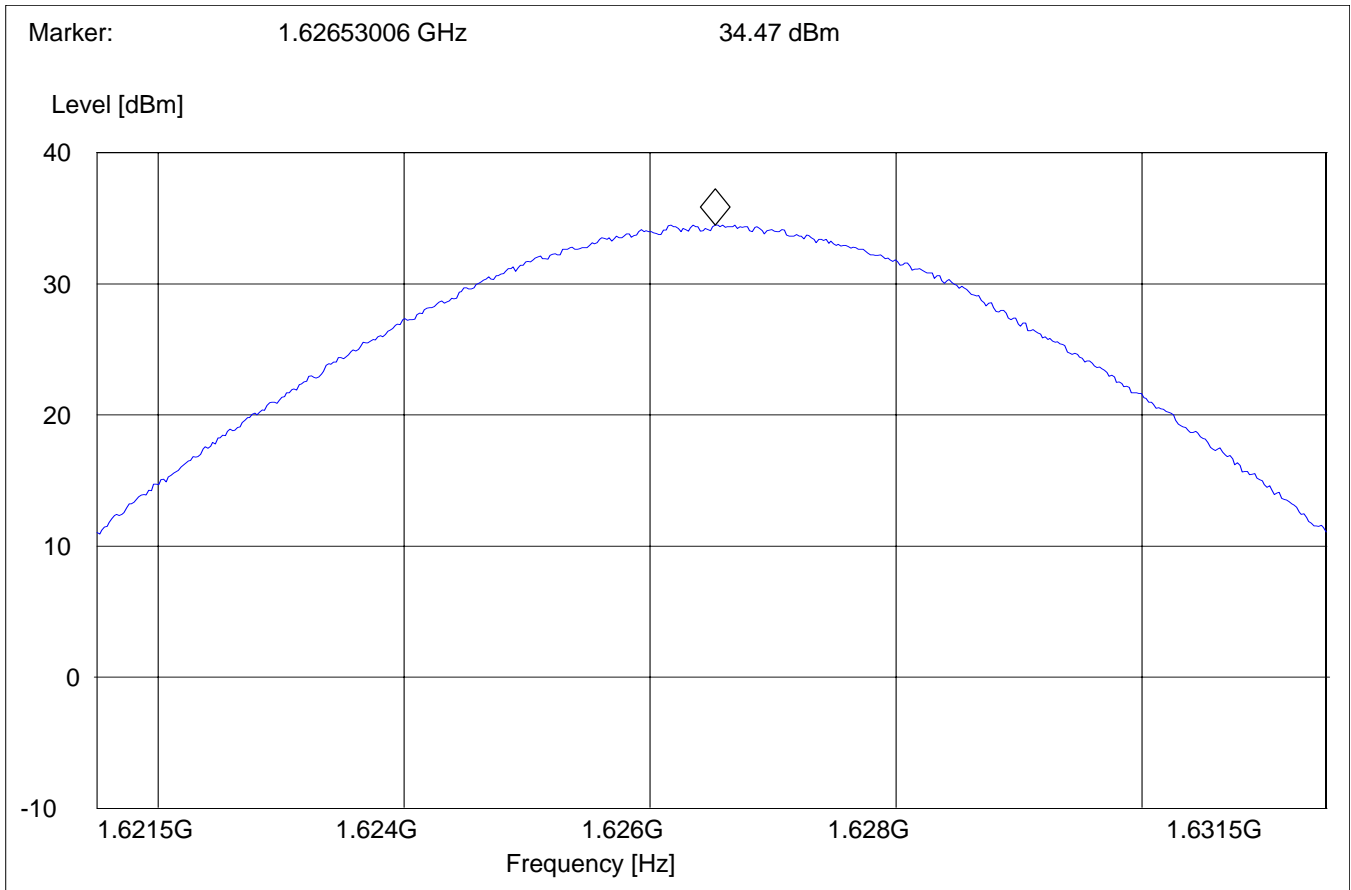
Date: 1.MAR.2004 12:00:20

EIRP

Lowest Channel: 1626.5MHz

SWEEP TABLE: "EIRP SAT CH-LOW"

Start Frequency	Stop Frequency	Detector	Meas. Time	RBW/VBW
1.6215 GHz	1.6315 GHz	Max Peak	Coupled	3 MHz

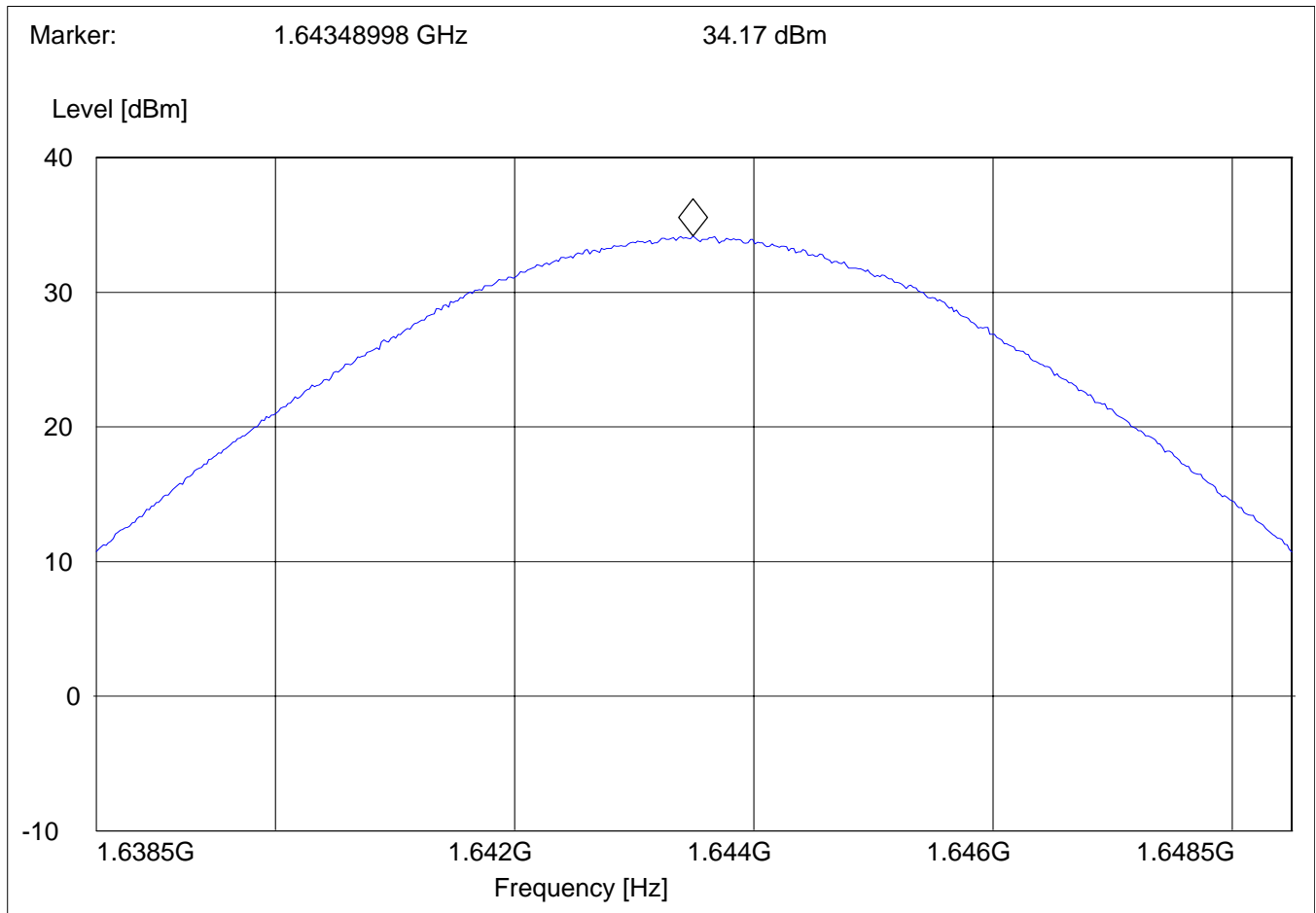


EIRP

Mid Channel: 1643.5MHz

SWEEP TABLE: "EIRP SAT CH-MID"

Start Frequency	Stop Frequency	Detector	Meas. Time	RBW/VBW
1.6385 GHz	1.6485 GHz	Max Peak	Coupled	3 MHz

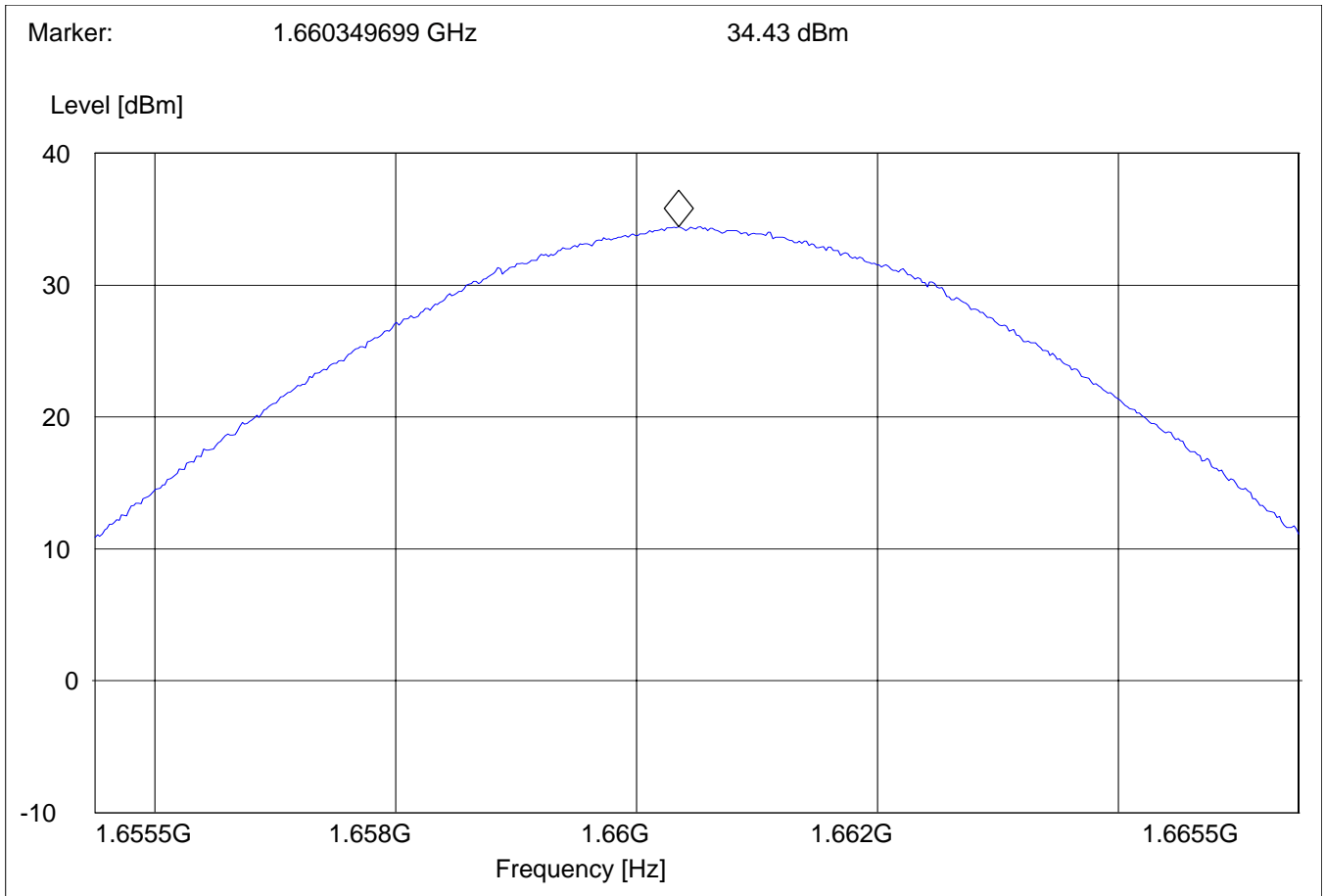


EIRP

Highest Channel: 1660.5MHz

SWEEP TABLE: "EIRP SAT CH-HIGH"

Start Frequency	Stop Frequency	Detector	Meas. Time	RBW/VBW
1.6555 GHz	1.6655 GHz	Max Peak	Coupled	3 MHz



FREQUENCY STABILITY

§ 25.202 (e)

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

OCCUPIED BANDWIDTH**§2.1049****Occupied Bandwidth Results**

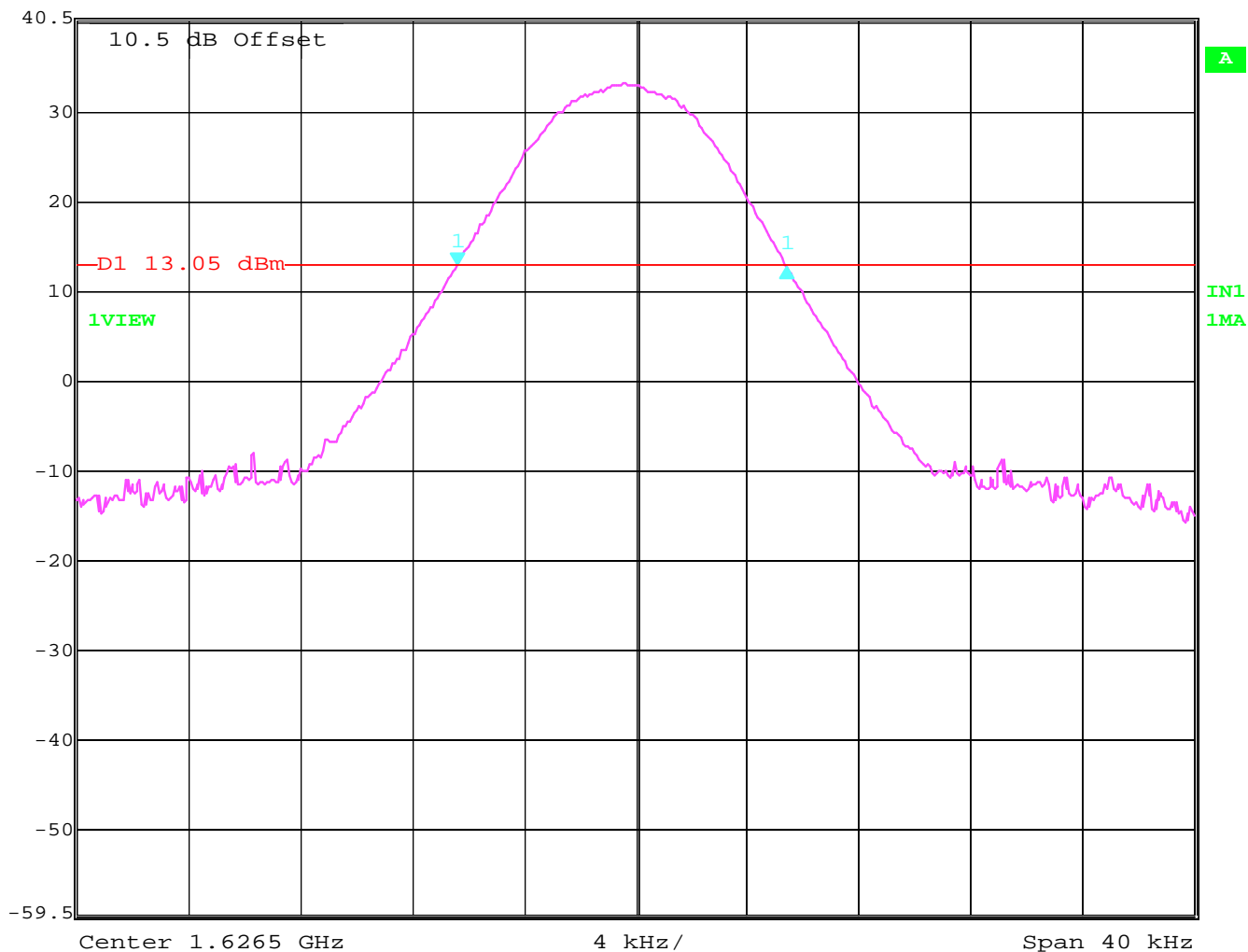
Table below lists the measured -20dBc BW (99%). Spectrum analyzer plots are included on the following pages.

Frequency	Occupied Bandwidth (-20dBc BW) kHz
1626.5	11.78
1643.5	11.94
1660.5	11.70

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



	Delta 1 [T1]	RBW	3 kHz	RF Att	40 dB
Ref Lvl	-0.15 dB	VBW	3 kHz		
40.5 dBm	11.78356714 kHz	SWT	50 ms	Unit	dBm



Date: 11.MAR.2004 09:14:58

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



Delta 1 [T1]

RBW 3 kHz RF Att 40 dB

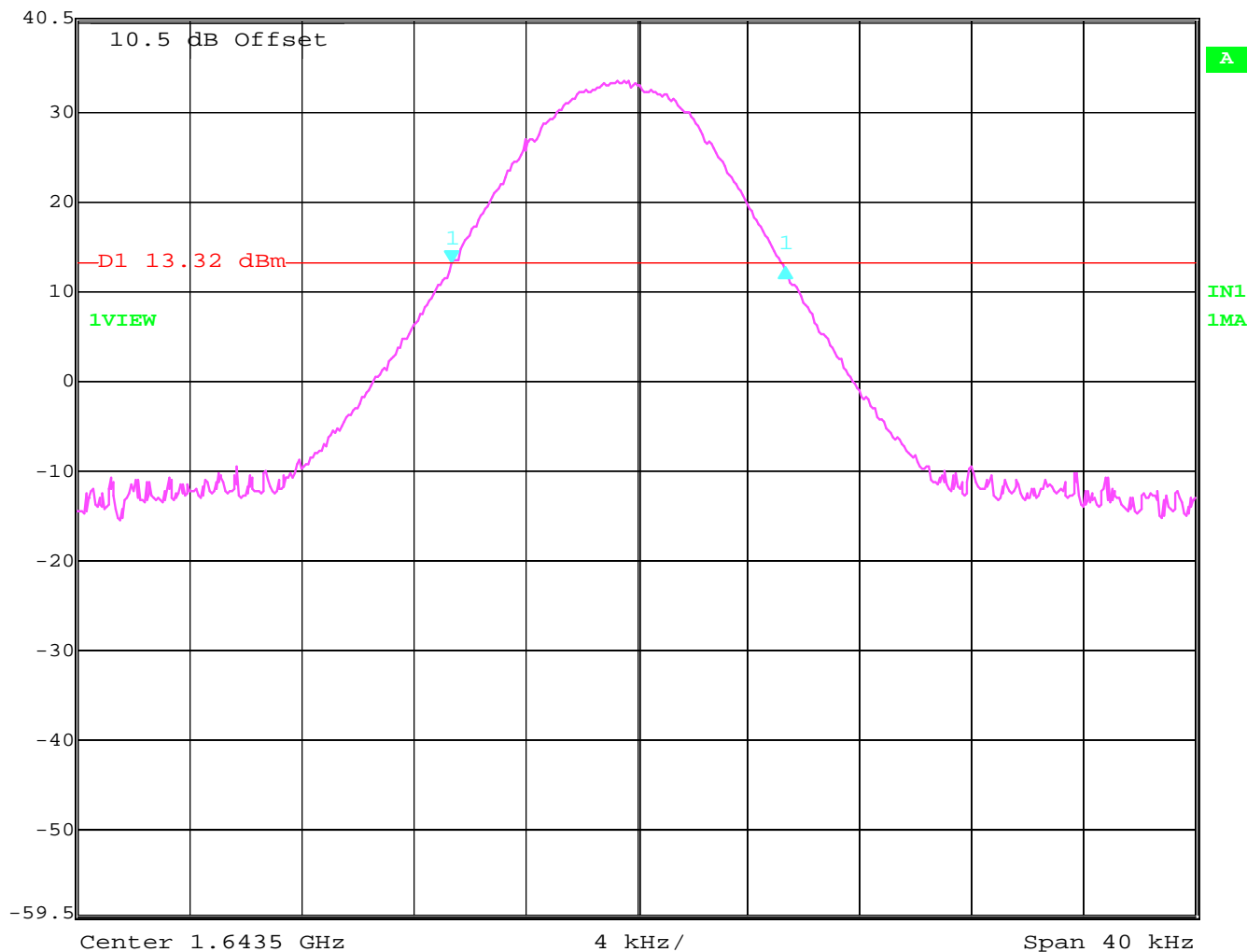
Ref Lvl -0.48 dB

VBW 3 kHz

40.5 dBm 11.94388778 kHz

SWT 50 ms

Unit dBm

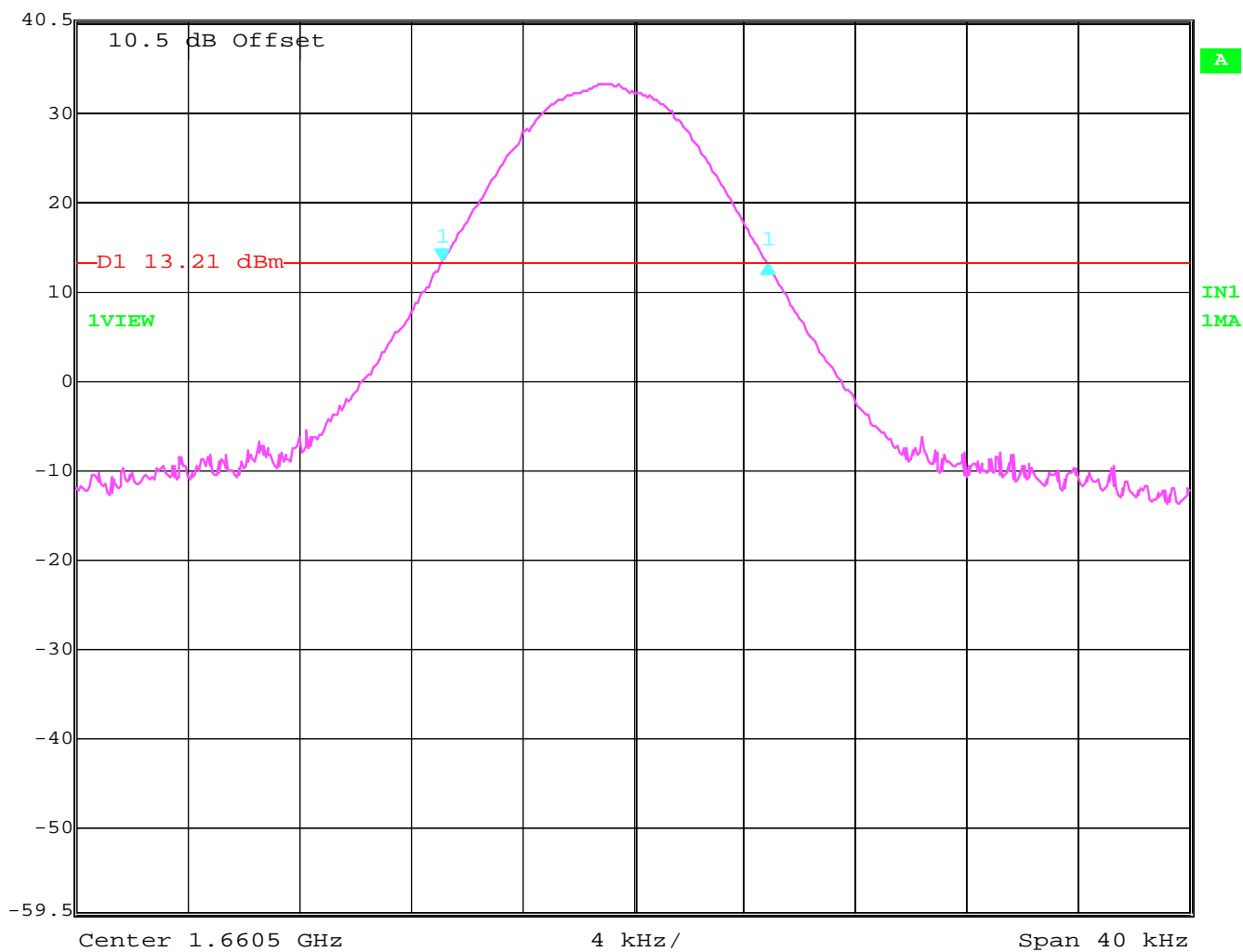


Date: 11.MAR.2004 09:19:00

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



Ref Lvl	Delta 1 [T1]	RBW	3 kHz	RF Att	40 dB
40.5 dBm	-0.39 dB	VBW	3 kHz		
	11.70340681 kHz	SWT	50 ms	Unit	dBm



Date: 11.MAR.2004 09:26:07

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	-33.18	3287	-35.59	3321	-38.56
3	4879.5	-43.86	4930.5	-48.55	4981.5	nf
4	6506	-31.46	6574	-41.37	6642	nf
5	8132.5	nf	8217.5	-46.63	8302.5	-47.08
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	16265	nf	16435	nf	16605	nf

nf: noise floor

RADIATED SPURIOUS EMISSIONS

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

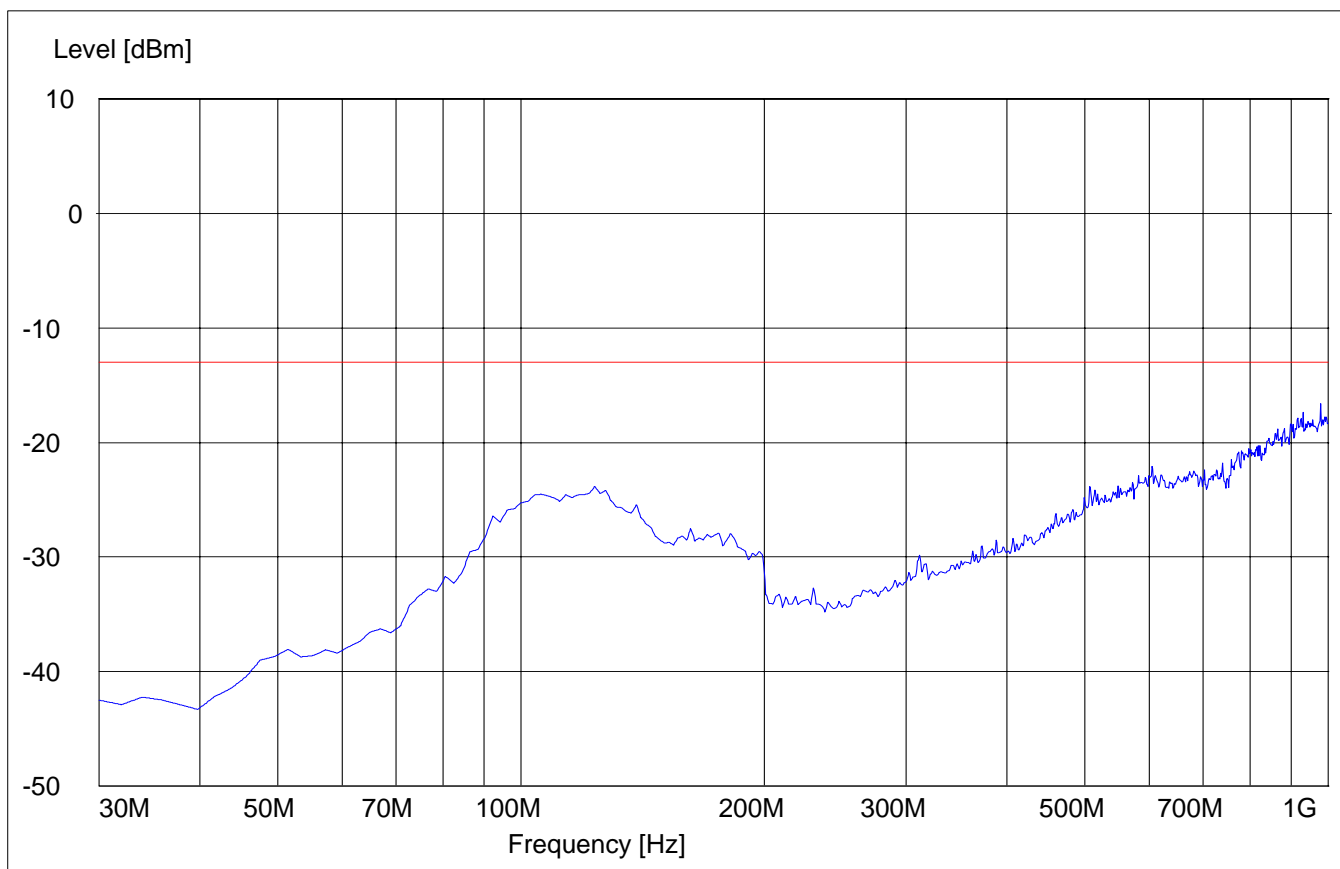
Spurious emission limit -13dBm

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

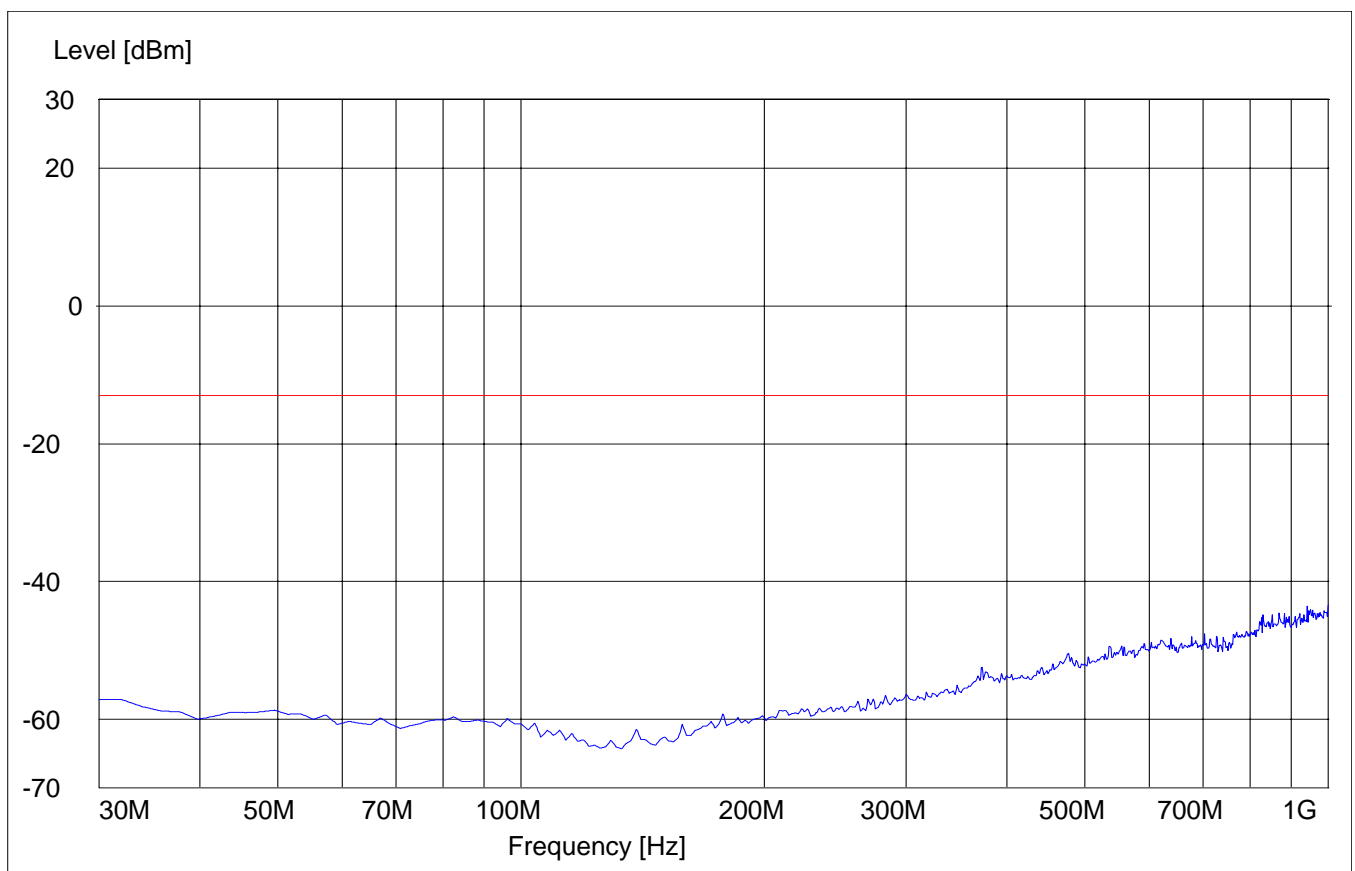
Spurious emission limit -13dBm

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

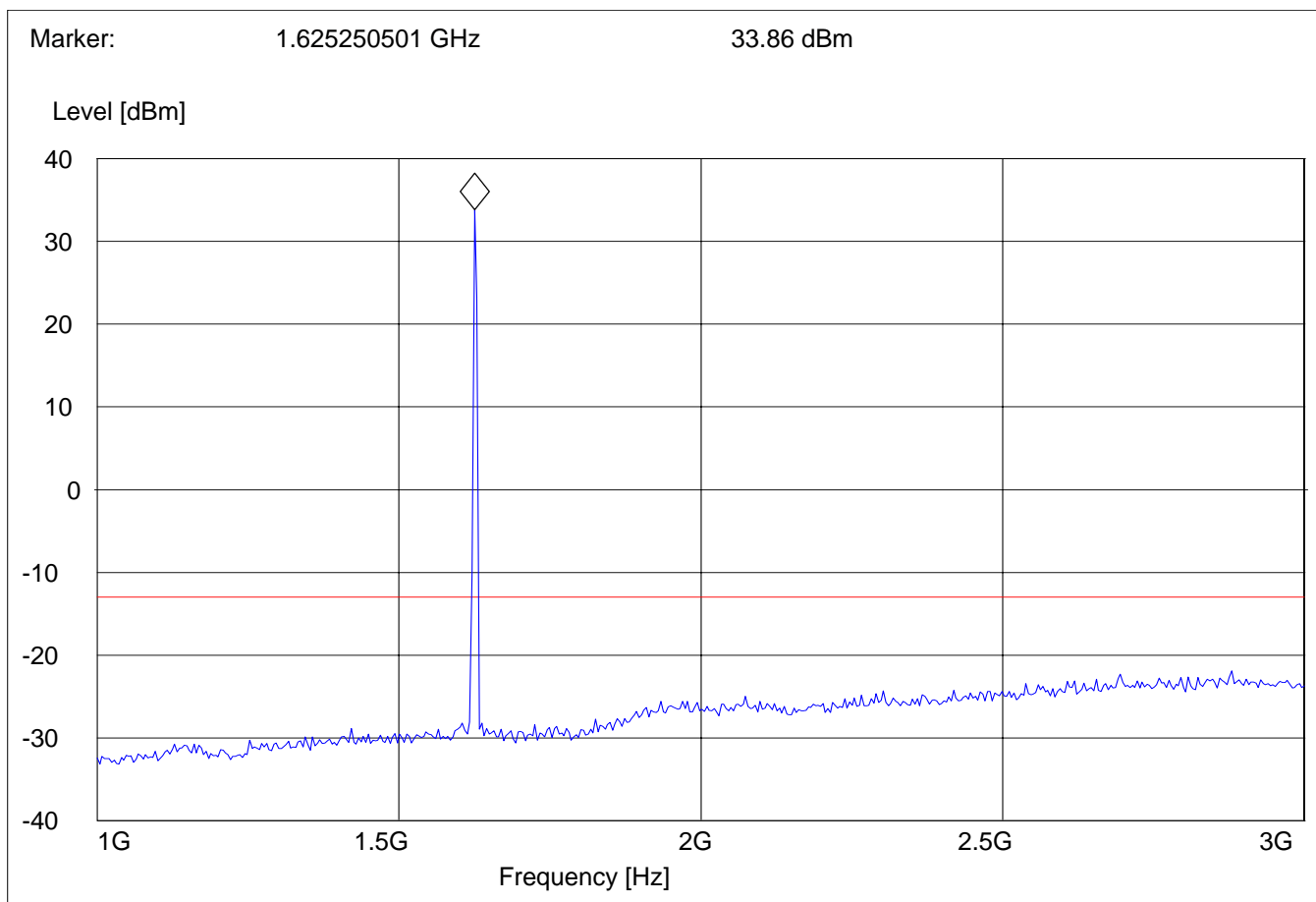
Lowest Channel (1626.5MHz):1GHz - 3GHz

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



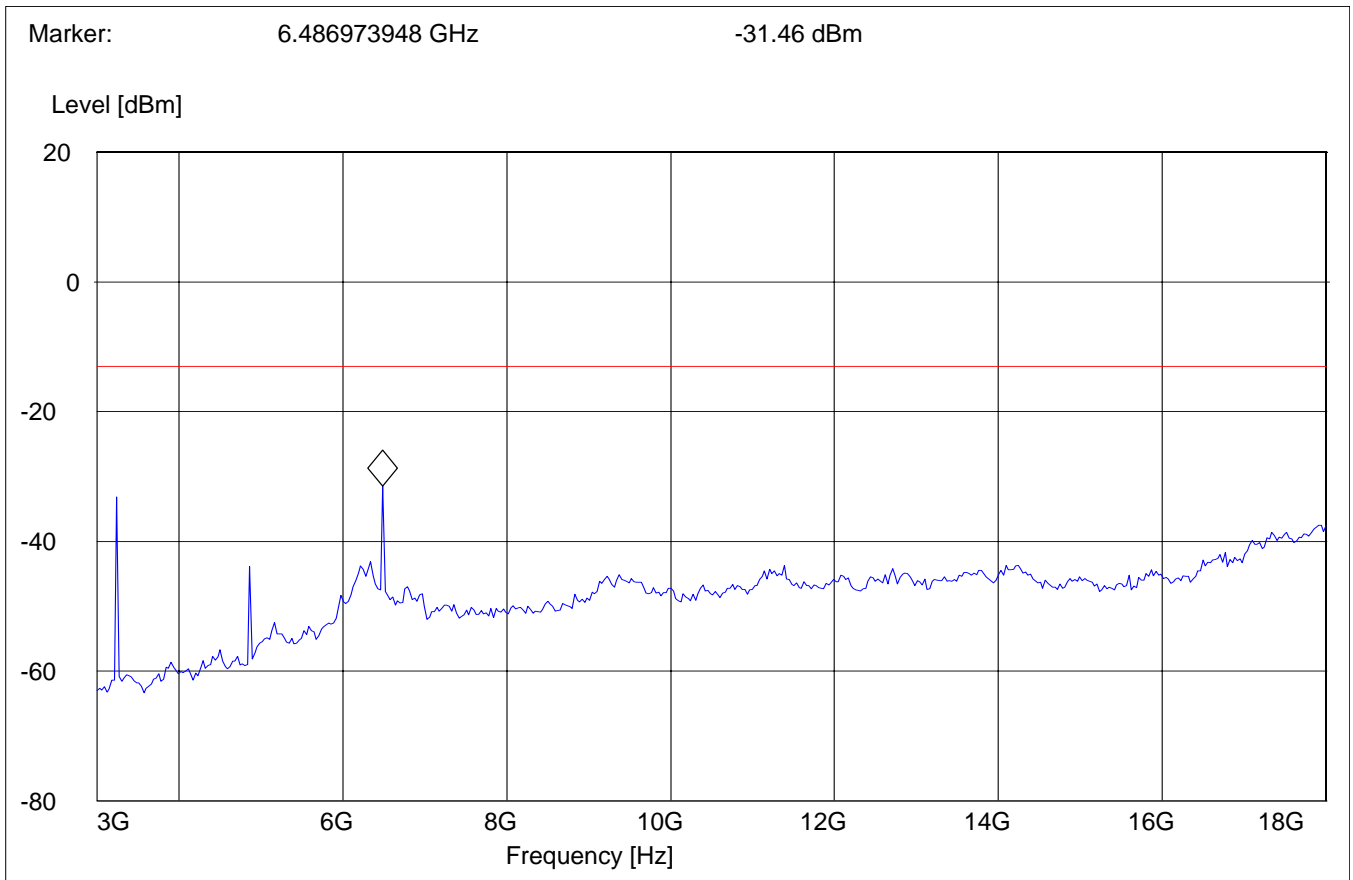
RADIATED SPURIOUS EMISSIONS

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

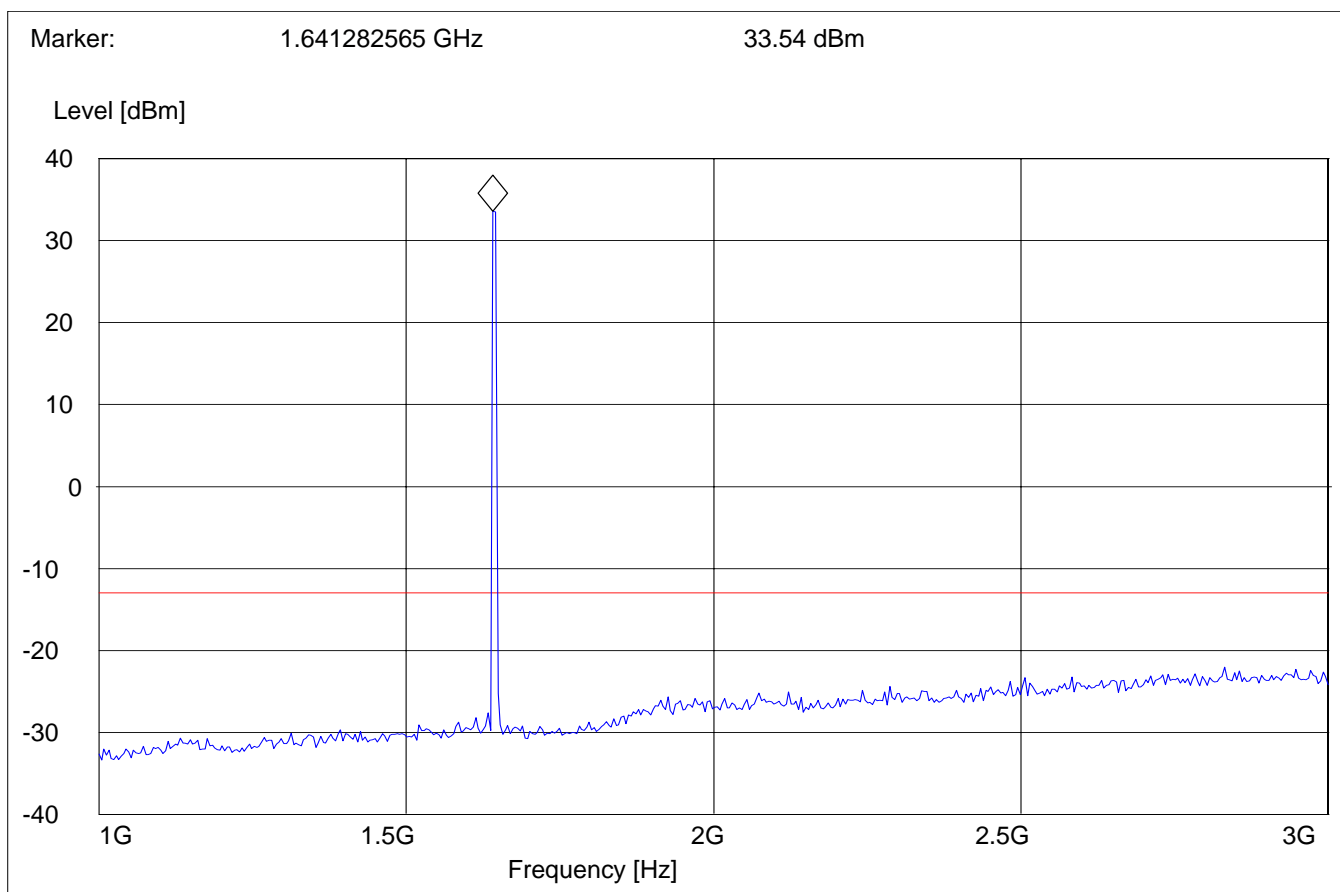
Mid Channel (1643.5MHz):1GHz - 3GHz

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



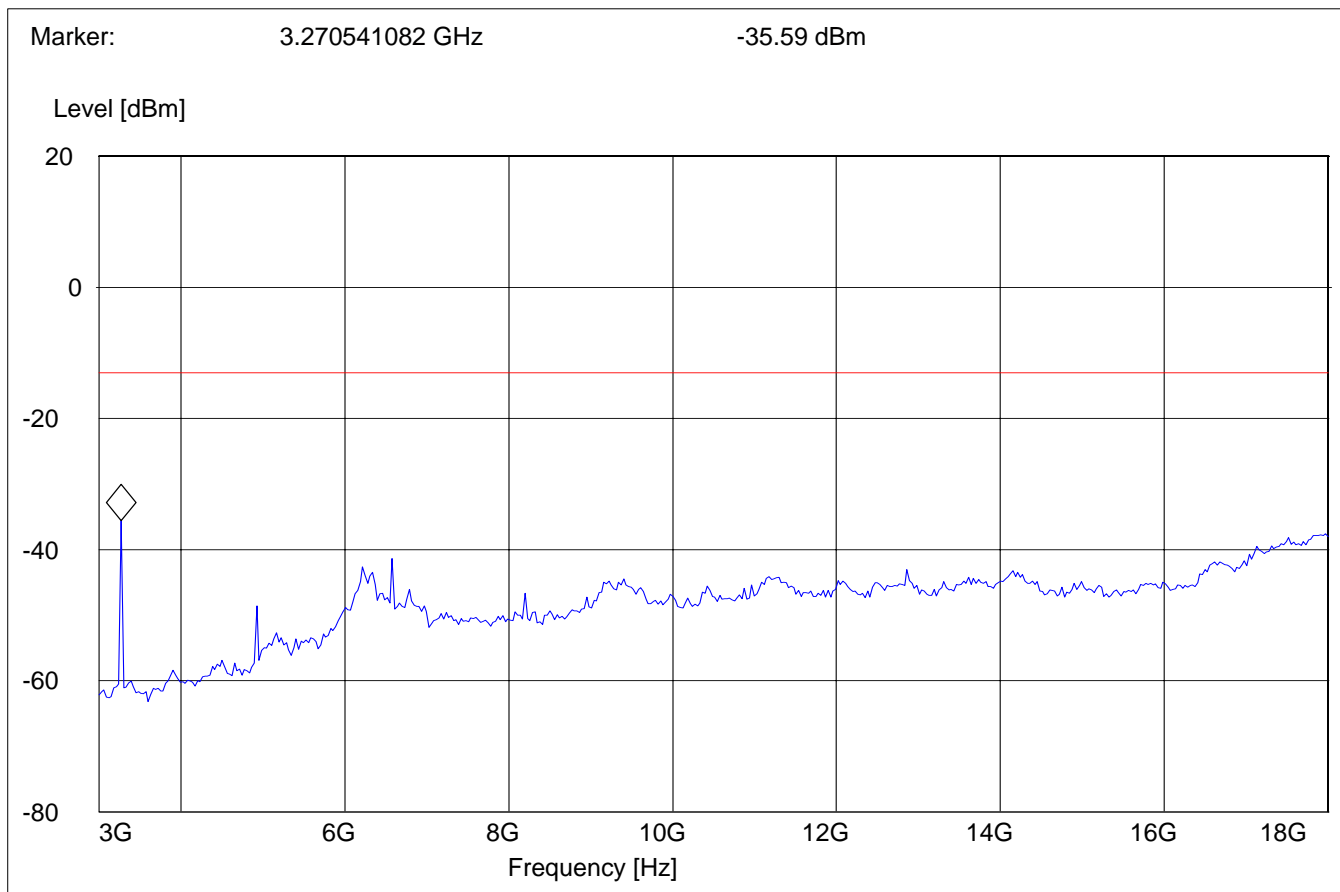
RADIATED SPURIOUS EMISSIONS

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

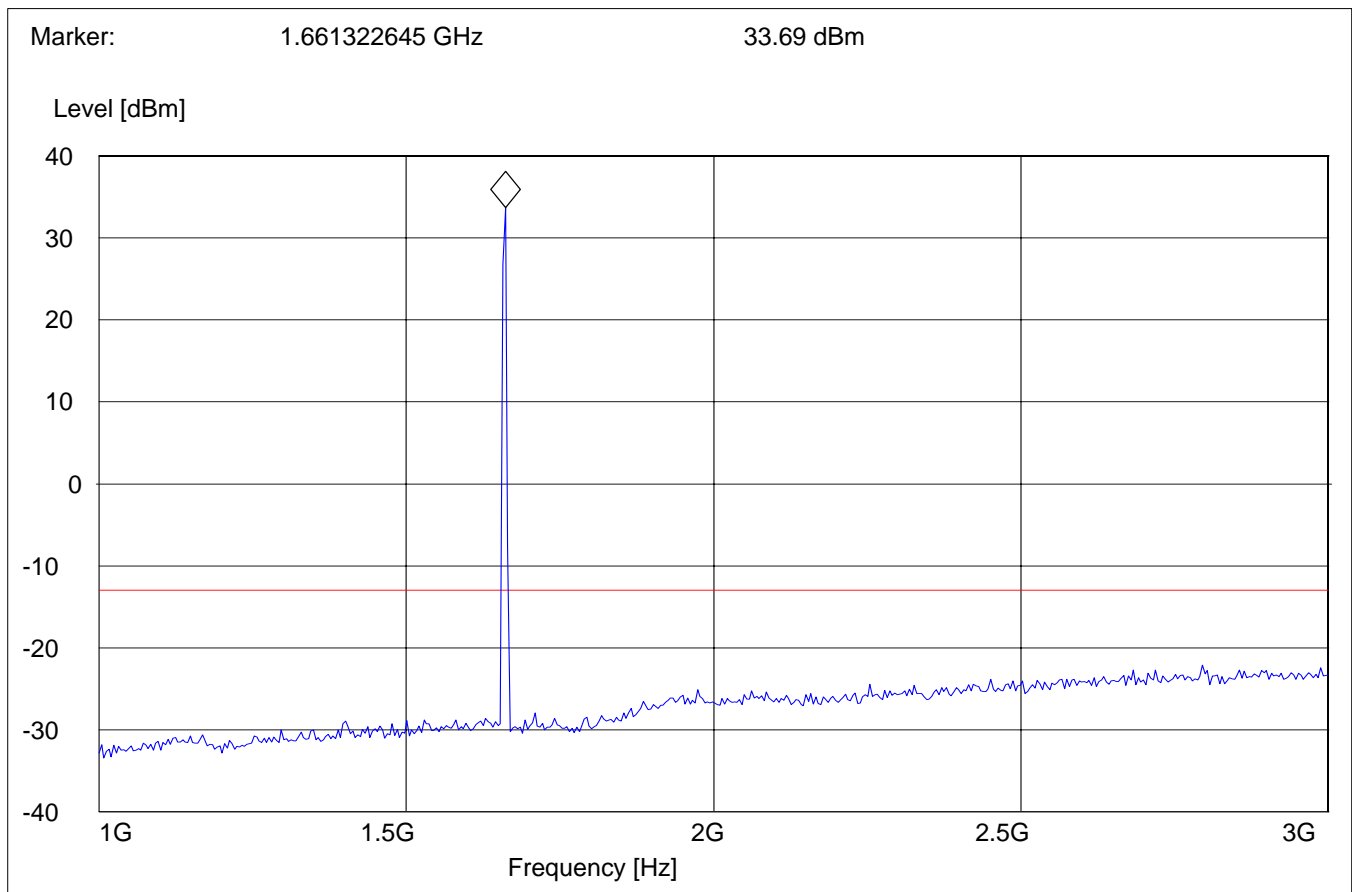
Highest Channel (1660.5MHz):1GHz - 3GHz

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



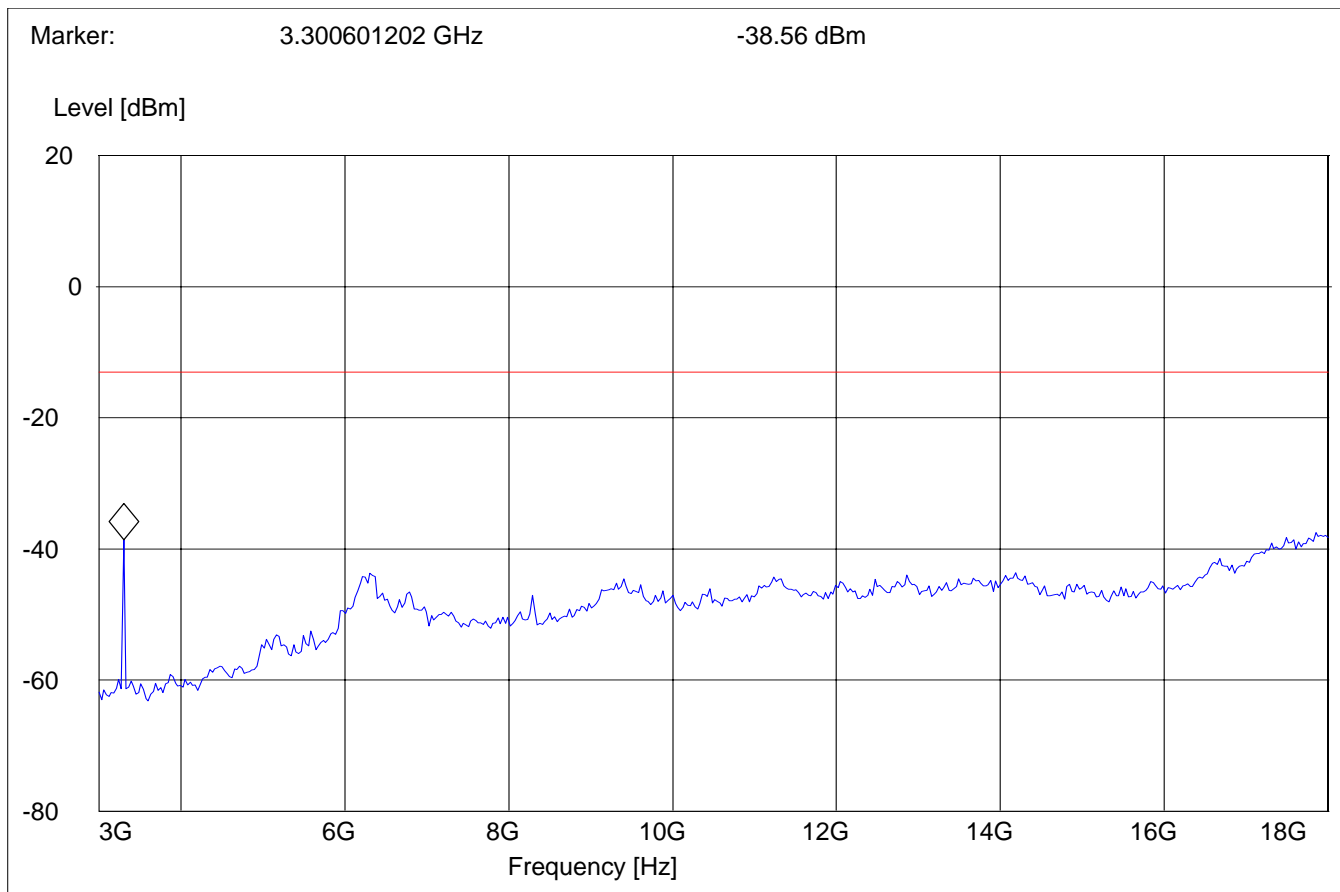
RADIATED SPURIOUS EMISSIONS

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

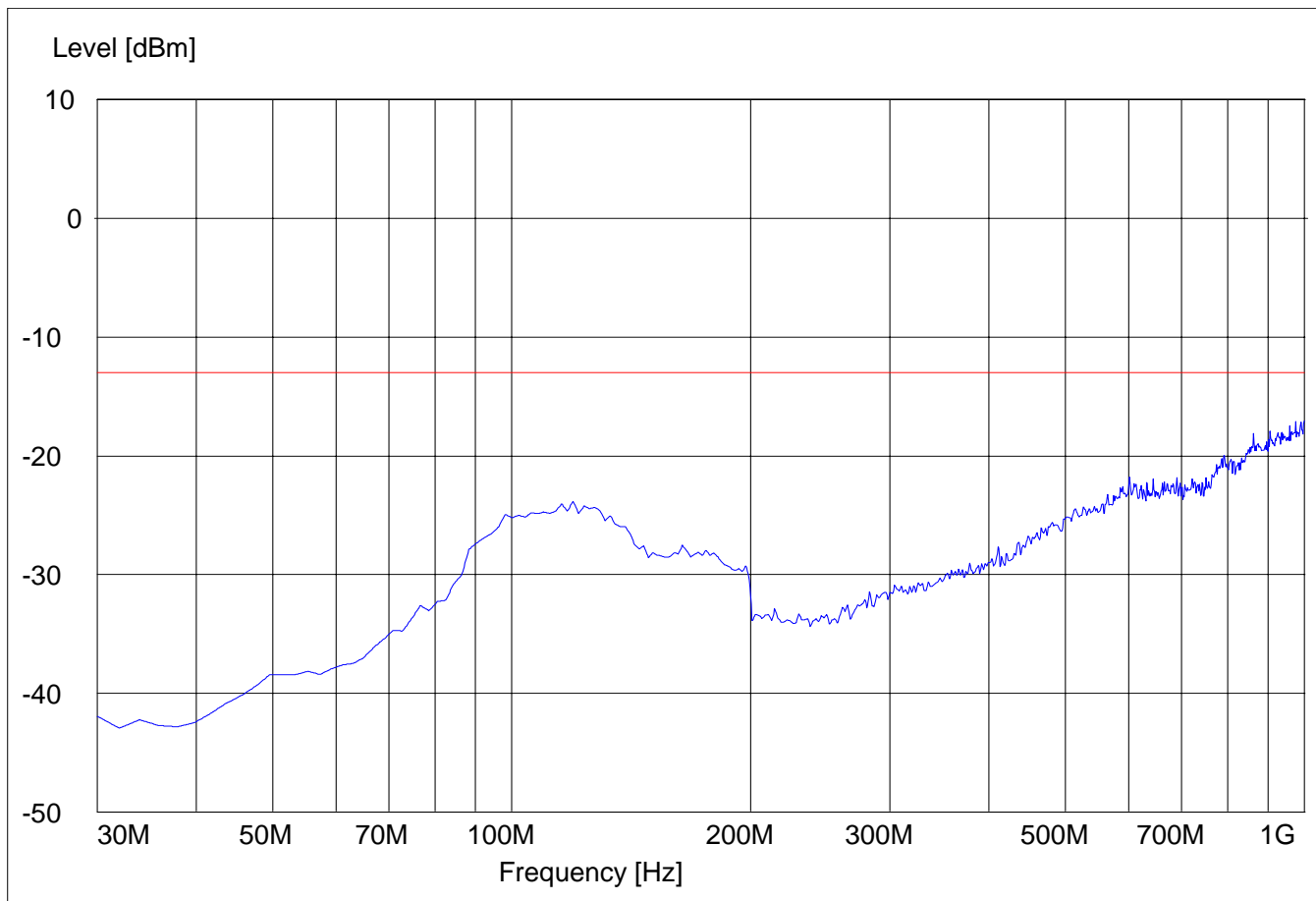
EUT in Idle Mode: 30MHz – 1GHz

Spurious emission limit -13dBm

Antenna: vertical

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

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



RADIATED SPURIOUS EMISSIONS

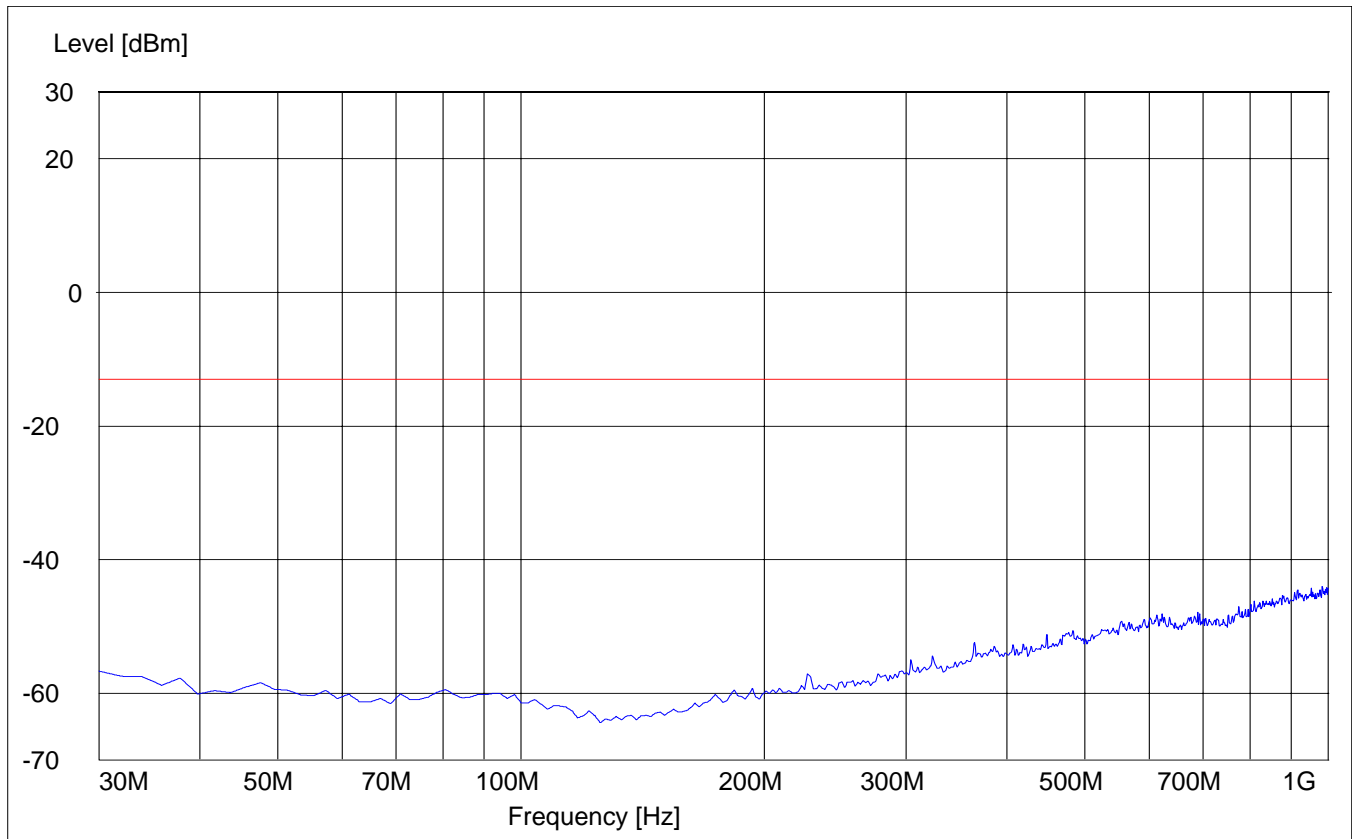
EUT in Idle Mode: 30MHz – 1GHz

Spurious emission limit -13dBm

Antenna: horizontal

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

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



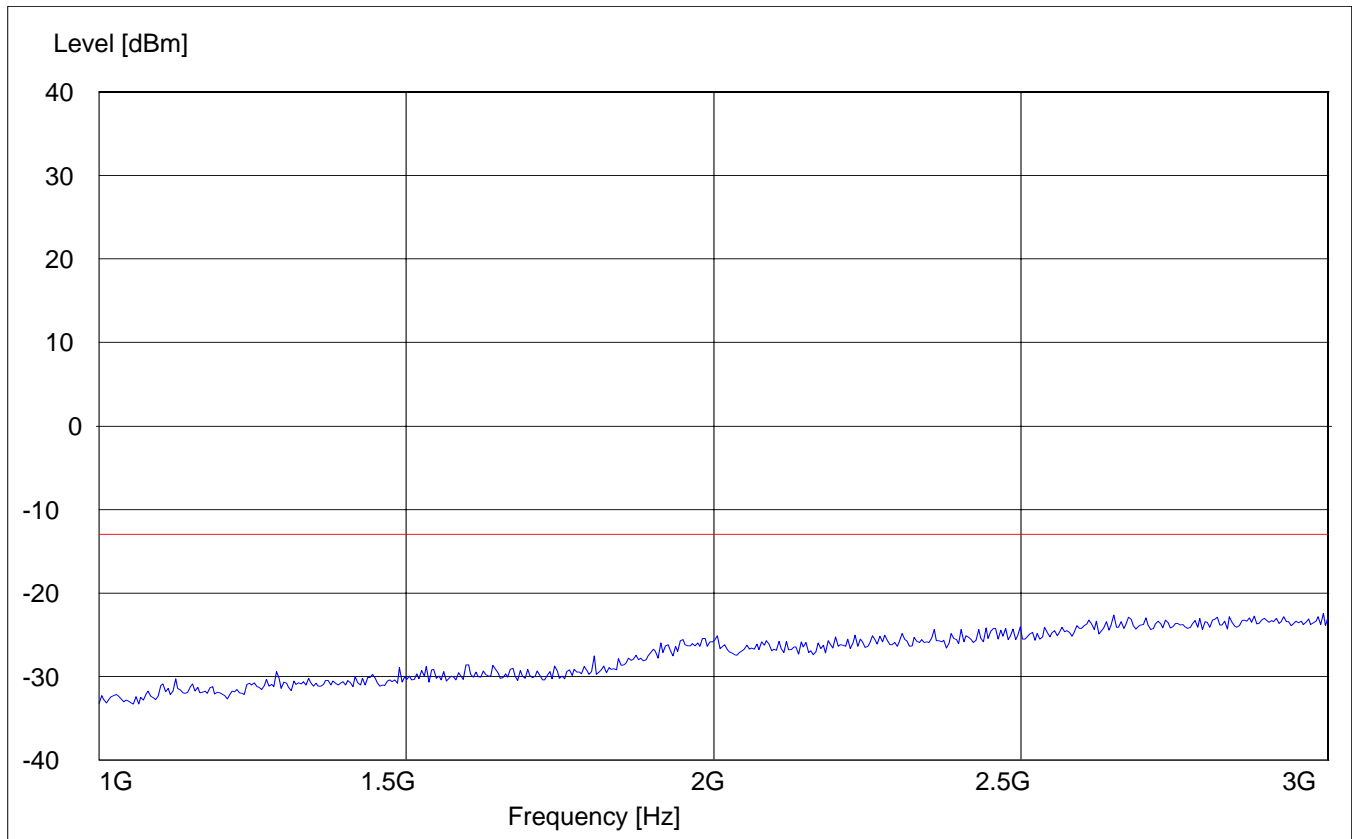
RADIATED SPURIOUS EMISSIONS

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



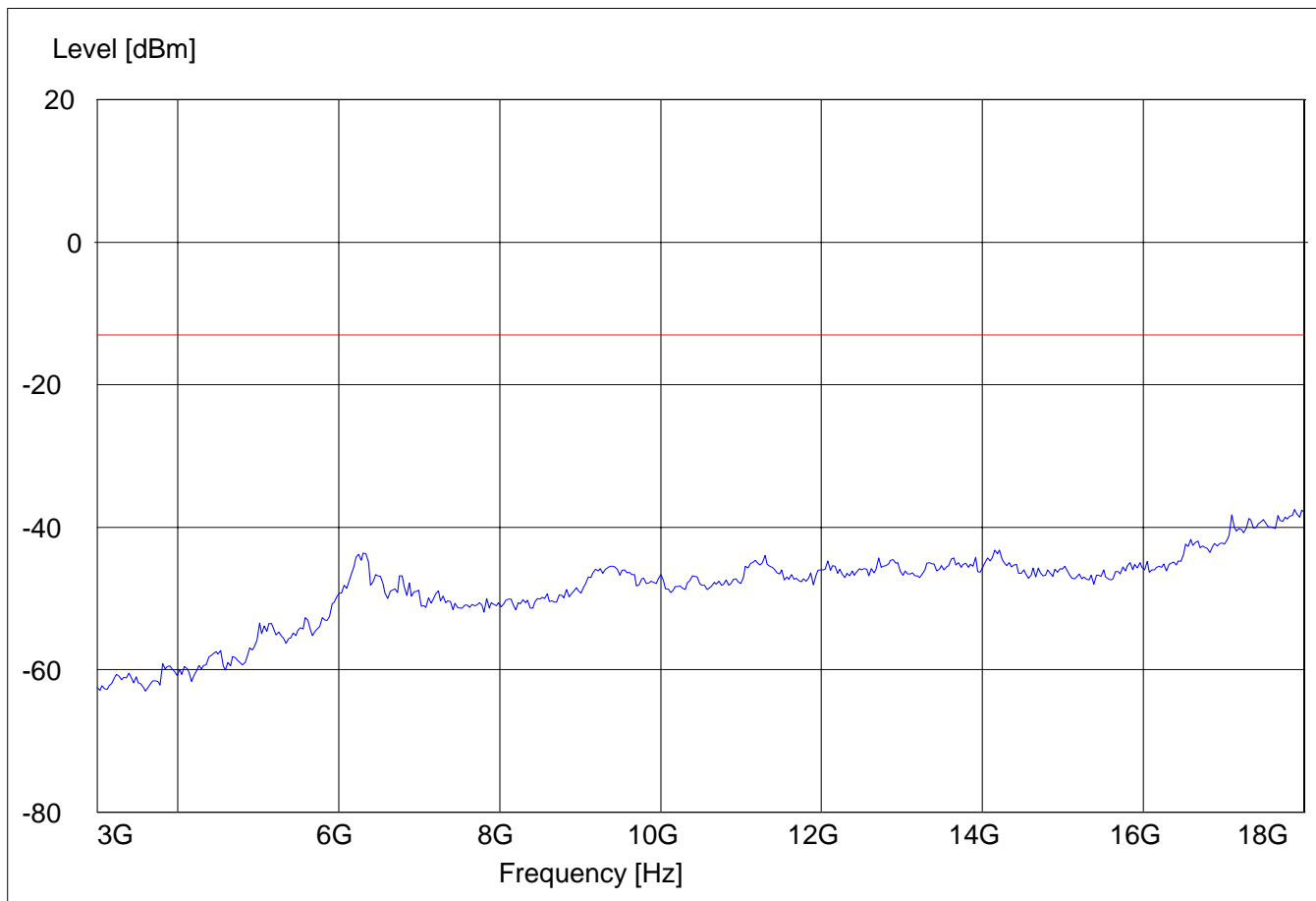
RADIATED SPURIOUS EMISSIONS

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
(Conducted)**

§25.202 (f)

Emission mask table based on 25.202(f)

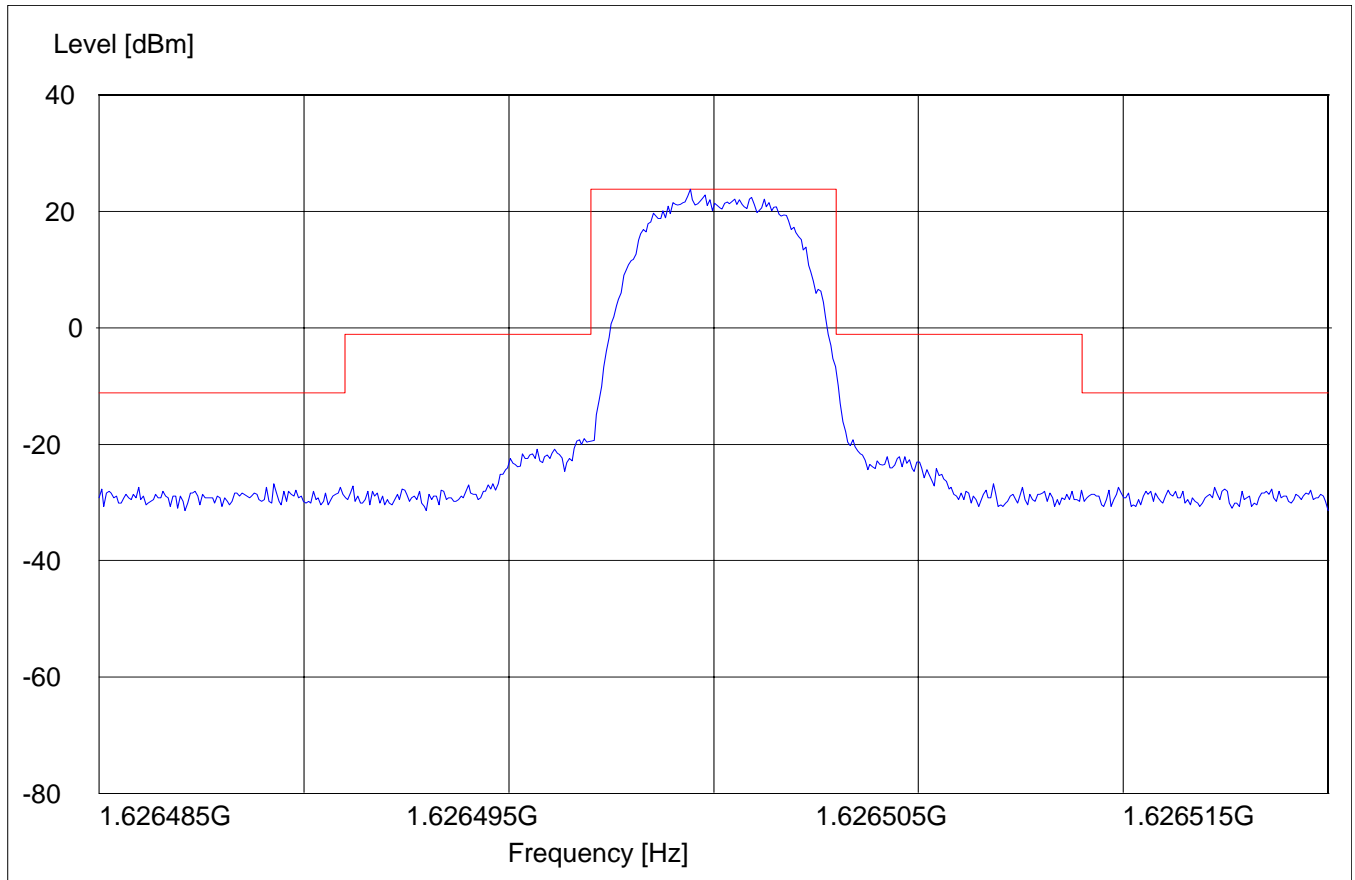
Frequency offset from centre freq (kHz)	Mean power of emissions below the mean output power of transmitter
0 to 3kHz	0 dBc
3kHz to 9kHz	-25 dBc in any 4kHz
9kHz to 15kHz	-35 dBc in any 4kHz
> 15kHz	-43 dBW in any 4kHz

Analyzer settings: RBW = VBW = 4 kHz

EMISSION MASK

Lowest Channel (1626.5MHz)

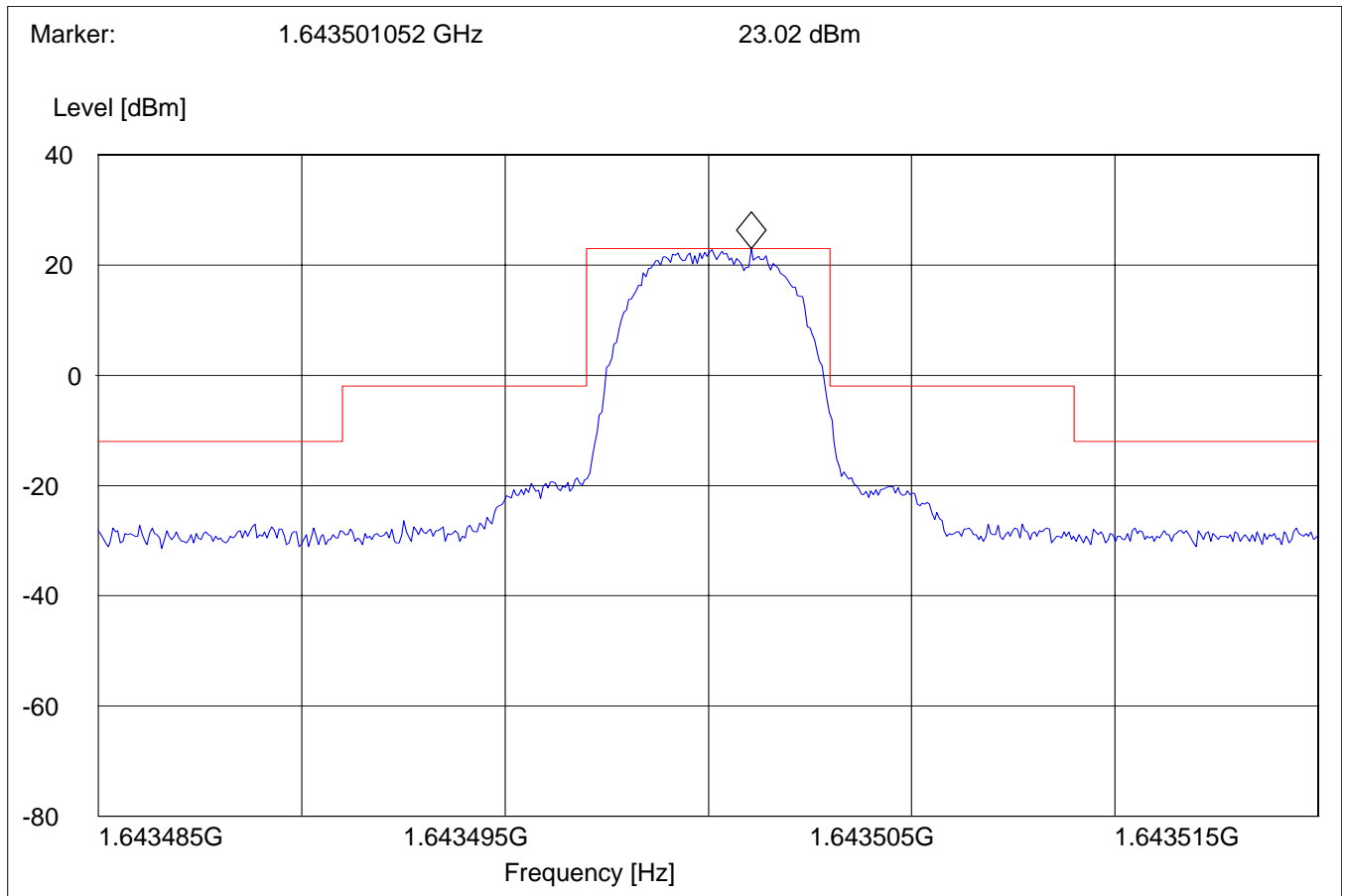
(Conducted)



EMISSION MASK

Mid Channel (1643.5MHz)

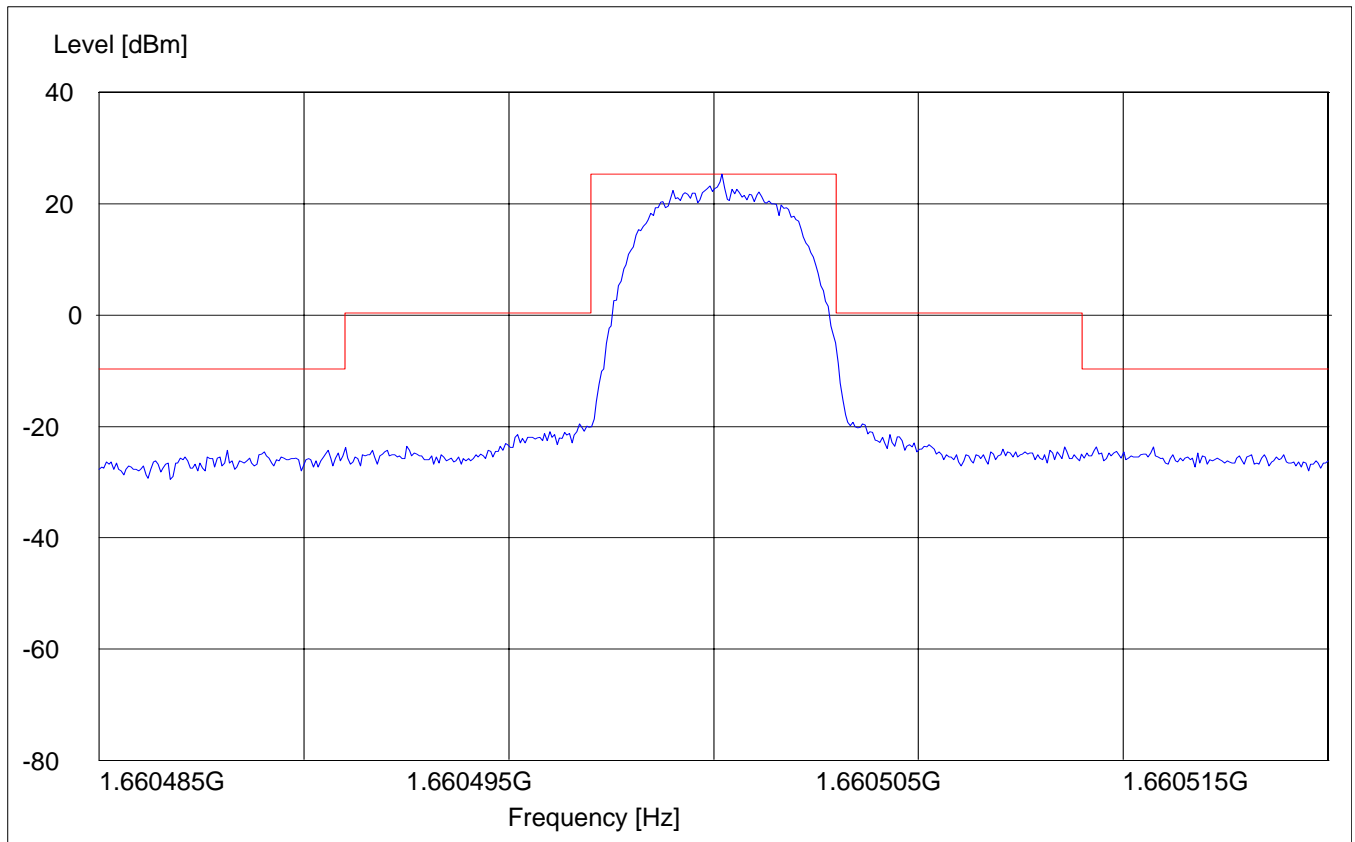
(Conducted)



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

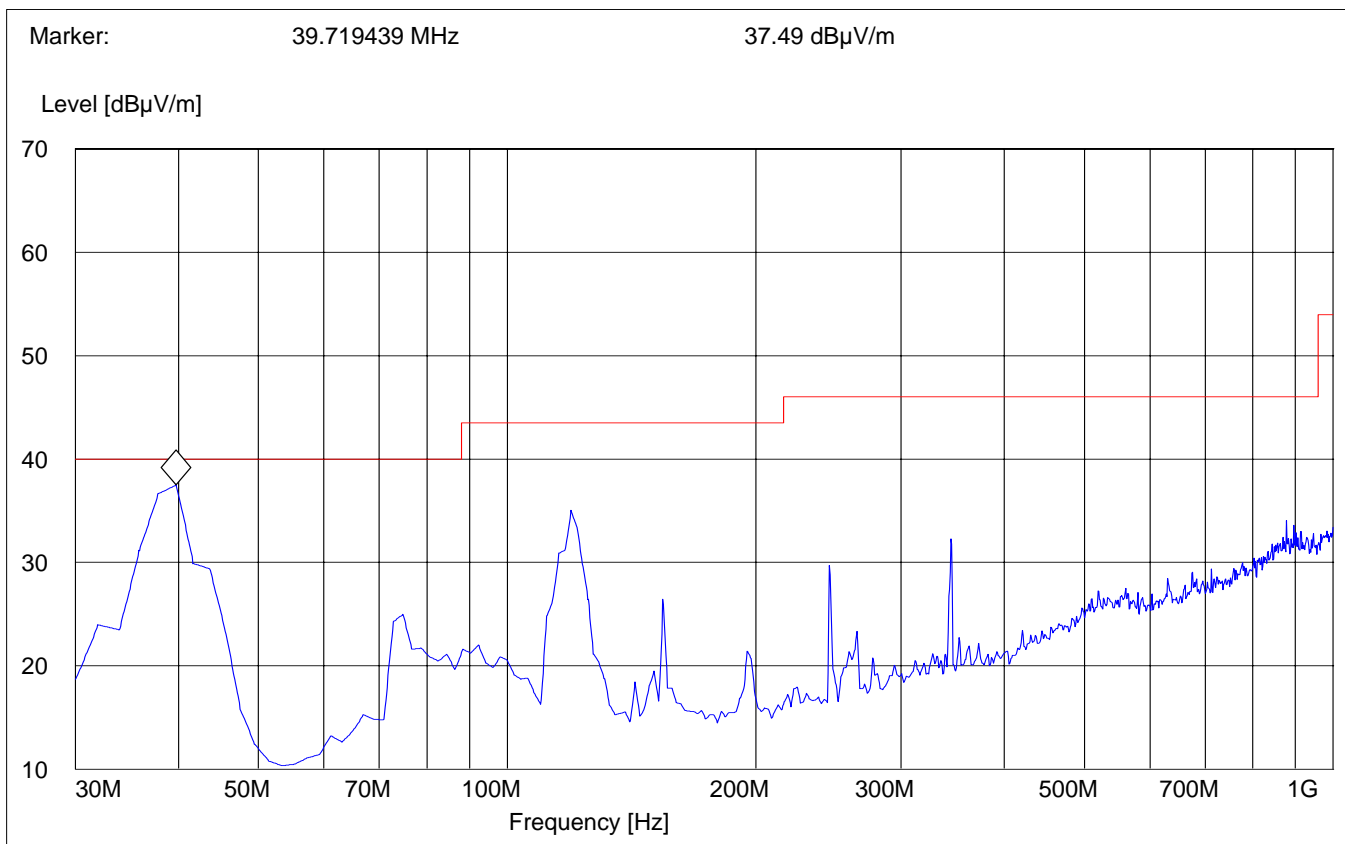
EUT in Rx Mode: 30MHz – 1GHz

Antenna: vertical

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

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

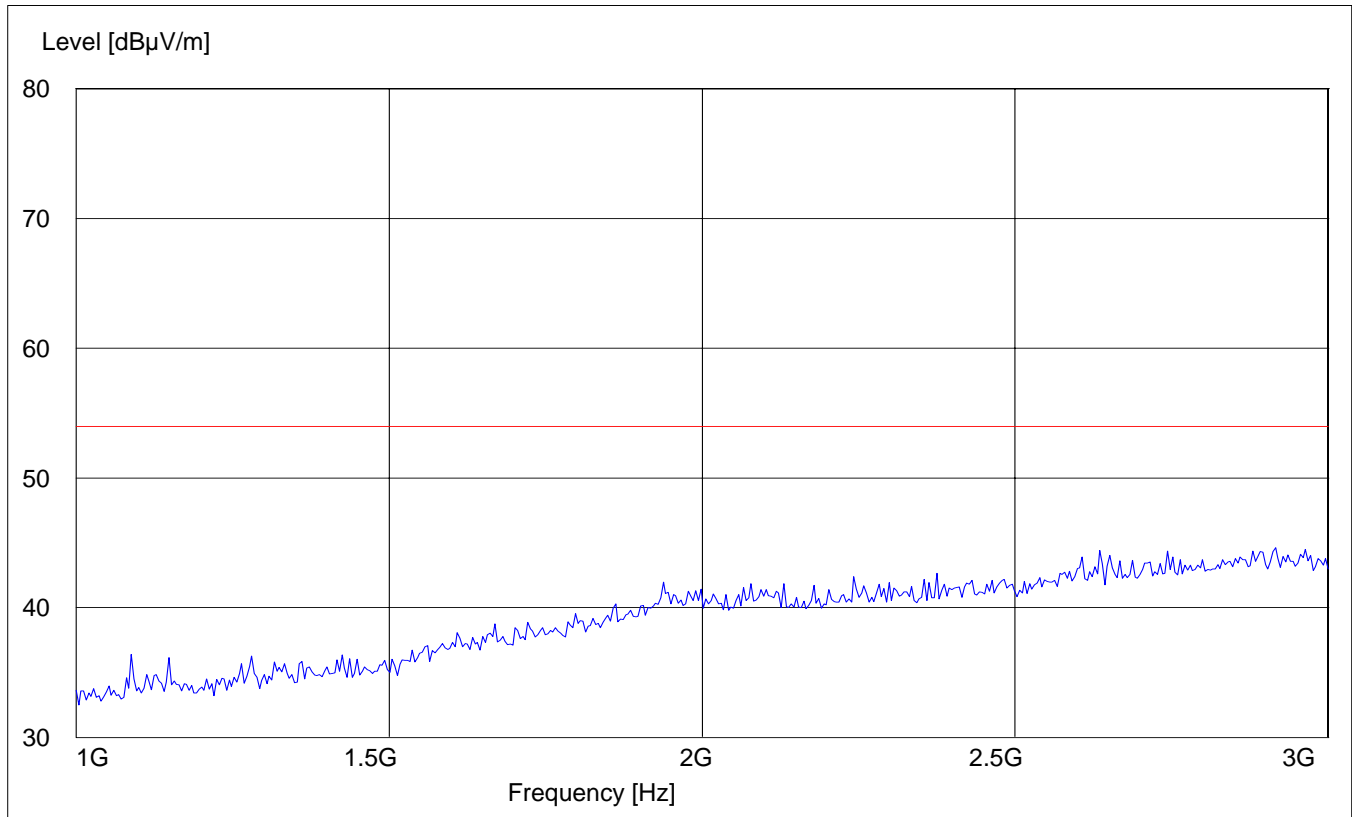
Start Frequency	Stop Frequency	Detector	Meas. Time	RBW/VBW
30MHz	1GHz	Max Peak	Coupled	100KHz



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

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

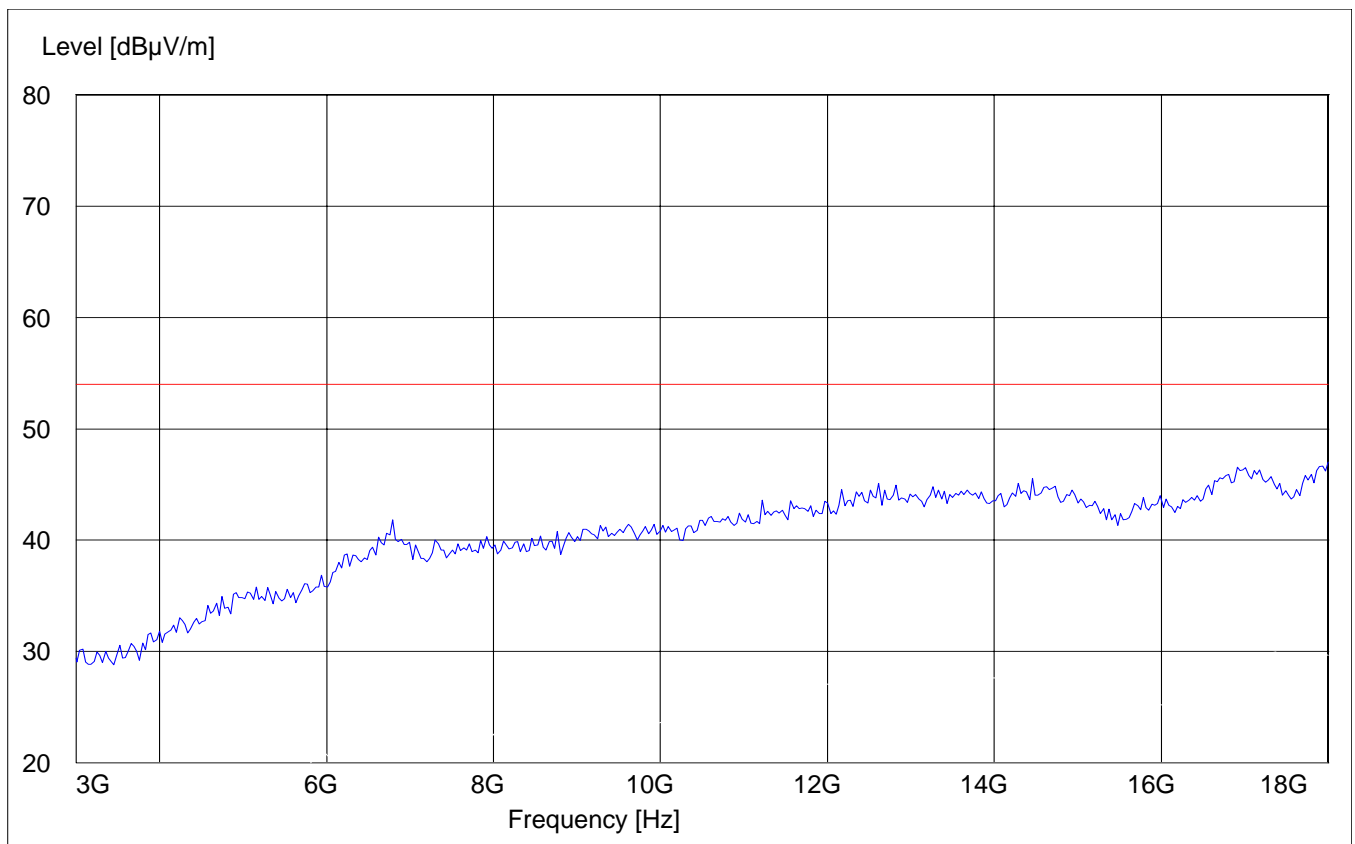
<i>Start</i>	<i>Stop</i>	<i>Detector</i>	<i>Meas.</i>	<i>RBW/VBW</i>
<i>Frequency</i>	<i>Frequency</i>		<i>Time</i>	
1GHz	3GHz	Max Peak	Coupled	1 MHz



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.



Marker 1 [T1]

RBW 1 MHz RF Att 40 dB

Ref Lvl 33.52 dBm

VBW 1 MHz

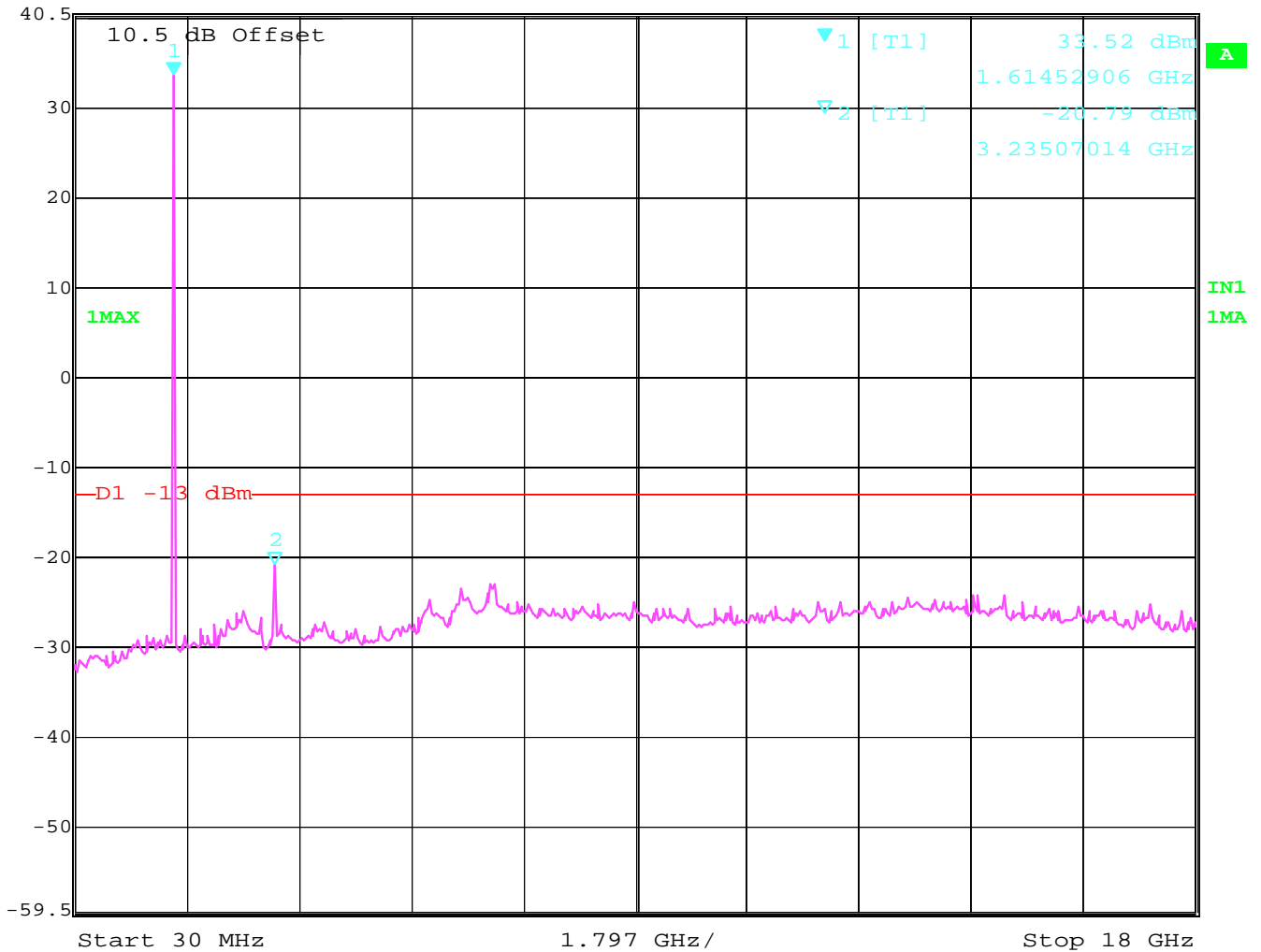
40.5 dBm

1.61452906 GHz

SWT 180 ms

Unit

dBm



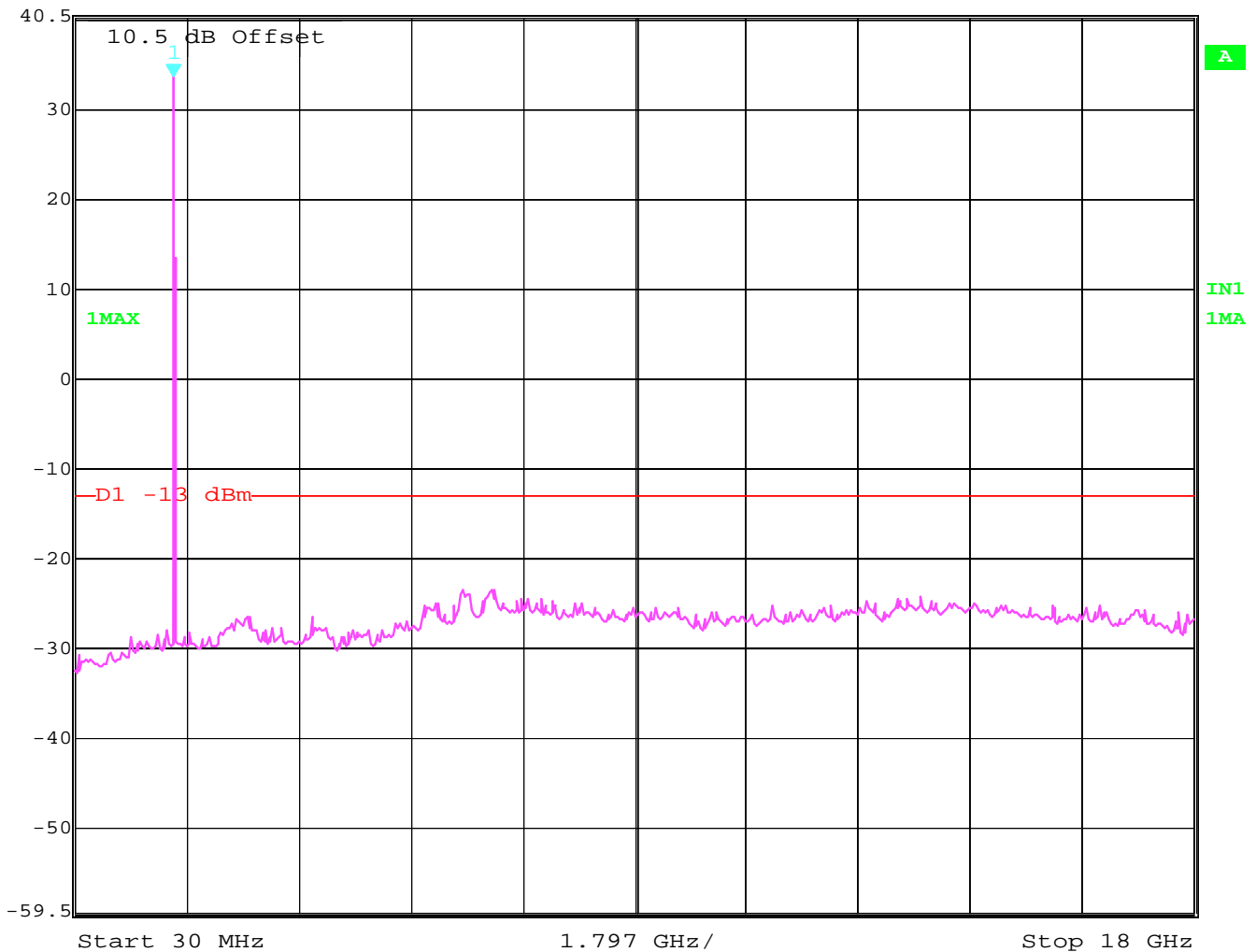
Date: 11.MAR.2004 09:31:53

CONDUCTED SPURIOUS EMISSIONS
Mid Channel (1643.5MHz):30MHz - 18GHz
 Spurious emission limit -13dBm

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



Ref Lvl	Marker 1 [T1]	RBW	1 MHz	RF Att	40 dB
40.5 dBm	33.65 dBm	VBW	1 MHz	Unit	dBm
	1.61452906 GHz	SWT	180 ms		



Date: 11.MAR.2004 09:32:44

CONDUCTED SPURIOUS EMISSIONS

Highest Channel (1660.5MHz):30MHz - 18GHz

Spurious emission limit -13dBm

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



Marker 1 [T1]

RBW 1 MHz RF Att 40 dB

Ref Lvl 33.44 dBm

VBW 1 MHz

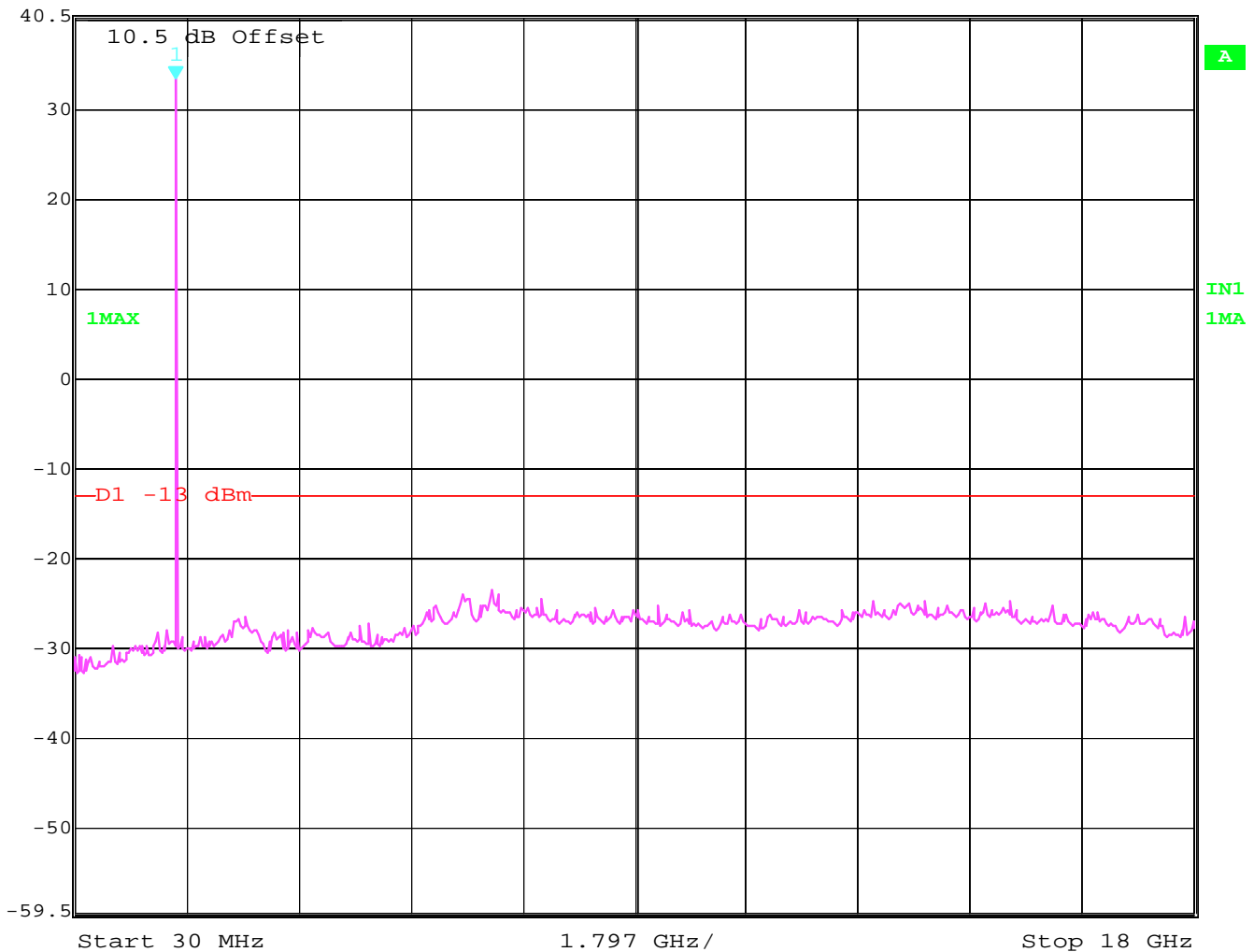
40.5 dBm

1.65054108 GHz

SWT 180 ms

Unit

dBm



Date: 11.MAR.2004 09:33:26

CONDUCTED EMISSIONS

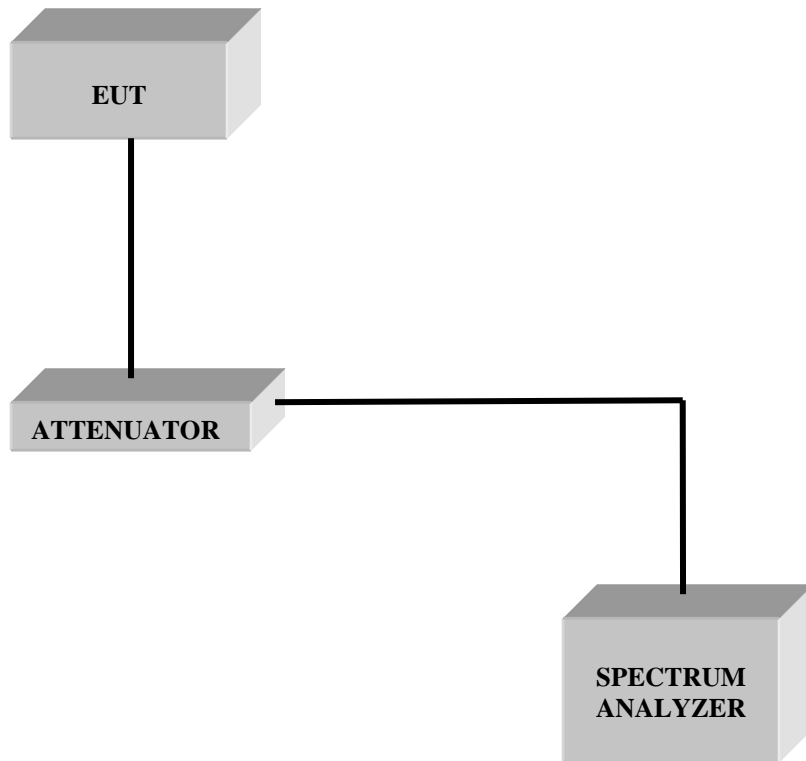
§ 15.107/207

This measurement is not applicable for EUT

TEST EQUIPMENT AND ANCILLARIES USED FOR TESTS

No	Instrument/Ancillary	Type	Manufacturer	Serial No.
01	Spectrum Analyzer	ESIB 40	Rohde & Schwarz	100107
02	Spectrum Analyzer	FSEM 30	Rohde & Schwarz	826880/010
03	Signal Generator	SMY02	Rohde & Schwarz	836878/011
04	Power-Meter	NRVD	Rohde & Schwarz	0857.8008.02
05	Biconilog Antenna	3141	EMCO	0005-1186
06	Horn Antenna (1-18GHz)	SAS-200/571	AH Systems	325
07	Horn Antenna (18-26.5GHz)	3160-09	EMCO	1240
08	Power Splitter	11667B	Hewlett Packard	645348
09	Climatic Chamber	VT4004	Voltsch	G1115
10	High Pass Filter	5HC2700	Trilithic Inc.	9926013
11	High Pass Filter	4HC1600	Trilithic Inc.	9922307
12	Pre-Amplifier	JS4-00102600	Miteq	00616
13	Power Sensor	URV5-Z2	Rohde & Schwarz	DE30807
14	Digital Radio Comm. Tester	CMD-55	Rohde & Schwarz	847958/008
15	Universal Radio Comm. Tester	CMU 200	Rohde & Schwarz	832221/06

BLOCK DIAGRAMS
Conducted Testing



Radiated Testing

ANECHOIC CHAMBER

