TEST REPORT

Report Number: 3148909MPK-002
Project Number: 3148909
Report Date: April 30, 2003

Testing performed on the
Wireless Headset of the Wireless Headset System for Walkie-Talkie
Models: SWEP2375
FCC ID: V9Z-STW-2375
IC: 7829A-SWEP2375

to
FCC Part 15.247 and RSS-210 Annex 8
for
Stealthweare

A2LA Certification Number: 1755-01

Test Performed by:	Test Authorized by:
Intertek Testing Services 1365 Adams Court Menlo Park, CA 94025	Stealthwear 29374 Via Milagro Valencia, CA 91354 USA

Prepared by: David Chernomordik **Date:** April 30, 2007
David Chernomordik, EMC Technical Manager

Reviewed by: **Date:** April 30, 2007
Oliie Moyrong, Operation Manager

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1.0 Summary of Tests

TEST	REFERENCE FCC Rule	REFERENCE RSS-210/RSS-GEN Rule	RESULTS
Max. Output power	15.247(b)	A8.4(2)	Complies
20 dB Bandwidth	15.247(a)(1)	A8.1(a)	Complies
Min. Channel Separation	15.247(a)(1)	A8.1(b)	Complies
Min. Hopping Channels	15.247(a)(1)	A8.1(d)	Complies
Average Channel Occupancy Time	15.47(a)(1)	A8.1(d)	Complies
Out-of-band Emission	15.247(d)	A8.5	Complies
Radiated Emission in Restricted Bands	15.247(d), 15.205	2.2	Complies
AC Conducted Emission	15.207	RSS-GEN	Not Applicable; EUT is battery powered
Radiated Emission from Digital Part	15.109	ICES-003	Complies

2.0 General Description

2.1 Product Description

The EUT is a Wireless Headset which is a part of Wireless Headset System. The System consists a Wireless Headset (earpiece) and a Wireless Remote that is coupled to the mobile communications device – two-way radio, known as "Walkie-Talkie". The Headset and Remote use the Bluetooth radio.

Overview of the EUT

Applicant	Stealthwear
Model No.	STW-2375
Use of Product	In Wireless Headset System for Walkie-Talkie
Type of Transmission	Spread Spectrum, Frequency Hopping
Rated RF Output	1 mW
Frequency Range	2402-2480 MHz
Number of Channel(s)	79
Modulation Type	GFSK
Data Rates and	1 Mbps
Antenna(s) type & Gain	Omnidirectional Dipole, 1.5 dBi
Antenna Requirement	The antenna is a fixed internal module, not user replaceable

2.2 Related Submittal(s) Grants

Wireless Remote. FCC ID: V9Z-STW-0373
IC: 7829A- SWTS0373

2.3 Test Methodology

Radiated and AC Line conducted emissions measurements were performed according to the procedures in ANSI C63.4 (1992). Radiated tests were performed at an antenna to EUT distance of 3 meters, unless stated otherwise in the **"Data Sheet"** of this Application. All other measurements were made in accordance with the procedures described in DA 00-705.

2.4 Test Facility

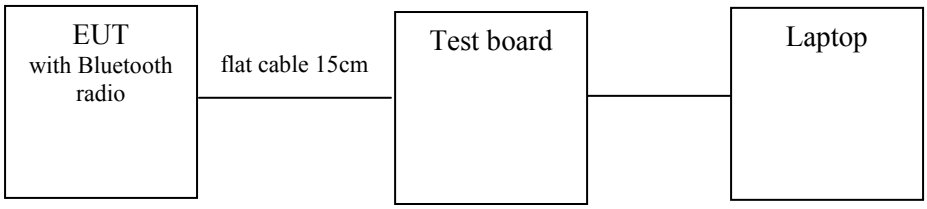
Then radiated emission test site and conducted measurement facility used to collect the data is site 1 located in Menlo Park, California. This test facility and site measurement data have been fully placed on file with the FCC.

3.0 System Test Configuration

3.1 Support Equipment

Item #	Description	Model No.
1	Compaq Laptop	Armada E 500

3.2 Block Diagram of Test Setup



3.3 Justification

In normal operation the EUT is battery powered. For testing the EUT was attached to a test board, connected to a laptop, which provides the power to the EUT and control the radio by the test software. The EUT was tested without a plastic enclosure because it was impossible to control the radio when it is inside the enclosure.

3.4 Software Exercise Program

The EUT exercise program used during radiated and conducted testing was provided by the Applicant. It exercised the various system components in a manner similar to a typical use..

3.5 Mode of Operation During Test

The EUT was tested in two modes: hopping mode as in normal use and hopping disabled mode in which the EUT was transmitting at the lowest, middle, and highest channels (frequencies).

3.6 Modifications Required for Compliance

No modifications were installed by Intertek Testing Services during compliance testing in order to bring the product into compliance.

4.0 Measurement Results

4.1 Conducted Output Power at Antenna Terminals
FCC 15.247(b)(1)

Requirements

For systems operating in the 2400-2483.5 MHz band employing at least 75 hopping channels, the maximum peak output power is 1 watt (30 dBm), for all other systems – 0.125 W (21 dBm).

Procedure

Since the EUT doesn't have an antenna connector, the output power is calculated from Field Strength (FS) measured at 3 m.

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CF - AG
Where FS = Field Strength in dB(μV/m)
RA = Receiver Amplitude (including preamplifier) in dB(μV)
CF = Cable Attenuation Factor in dB
AF = Antenna Factor in dB
AG = Amplifier Gain in dB.

The conducted power (P in dBm) is calculated using the formula:

P = FS – 95.3 – G

Where G is antenna gain in dBi.

Test Results

Frequency	FS at 3m	SA reading	Cable loss	Antenna Factor	EIRP	Calculated Conducted Power
MHz	dB(uV/m)	dB(uV)	dB	dB(1/m)	dBm	dBm
2402.0	82.6	50.8	3.1	28.7	-12.7	-14.2
2441.0	84.6	52.7	3.1	28.8	-10.7	-12.2
2480.0	88.6	56.5	3.1	29.0	-6.7	-8.2

4.2 Hopping Channel 20-dB Bandwidth
FCC 15.247(a)(ii)(iii)

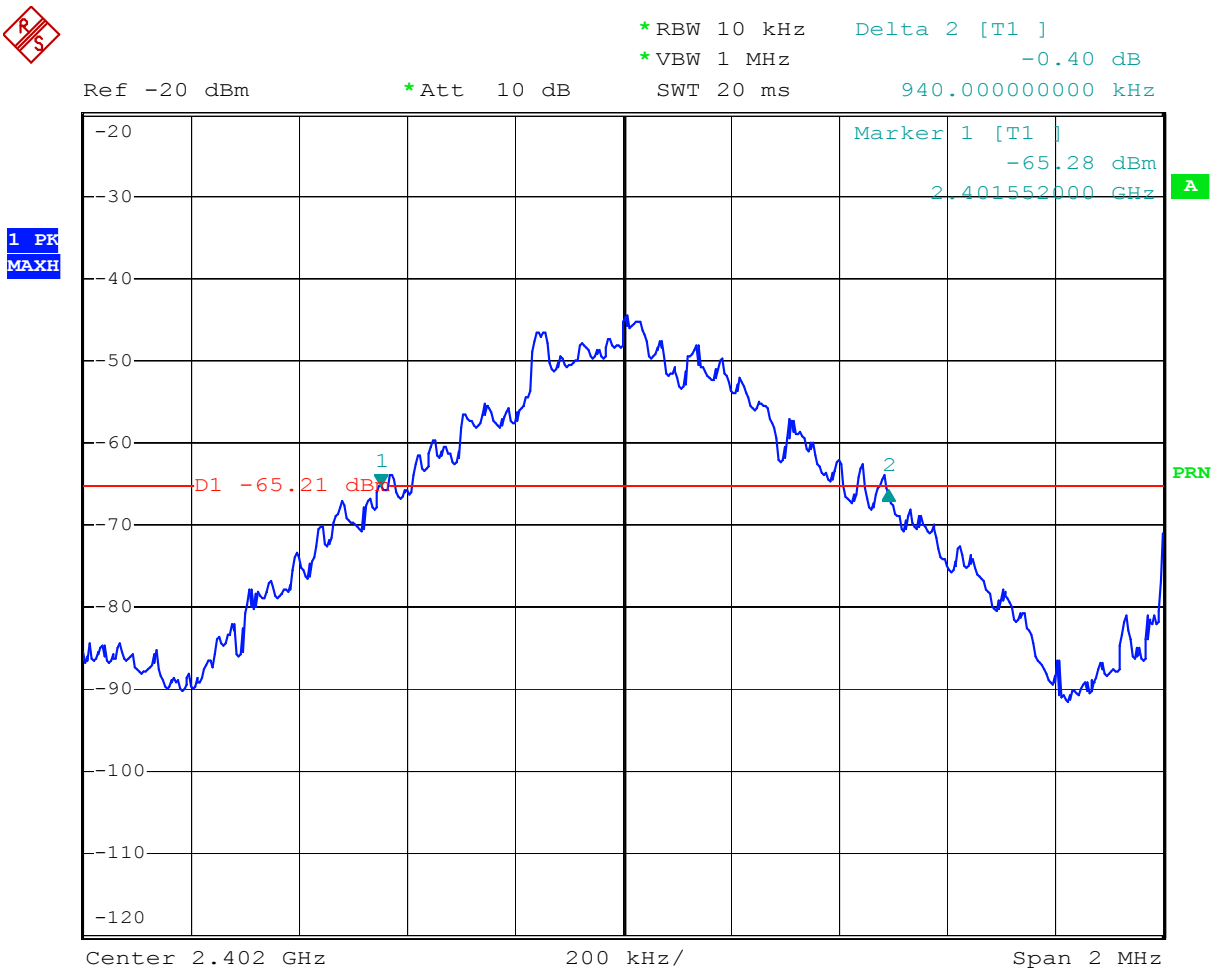
Requirements

For systems operating in the 2400-2483.5 MHz band employing at least 75 hopping channels, the maximum 20 dB bandwidth of the hopping channel is 1 MHz. Systems may utilize hopping channels whose 20 dB bandwidth is greater than 1 MHz provided the system use at least 15 non-overlapping channels.

Test Results

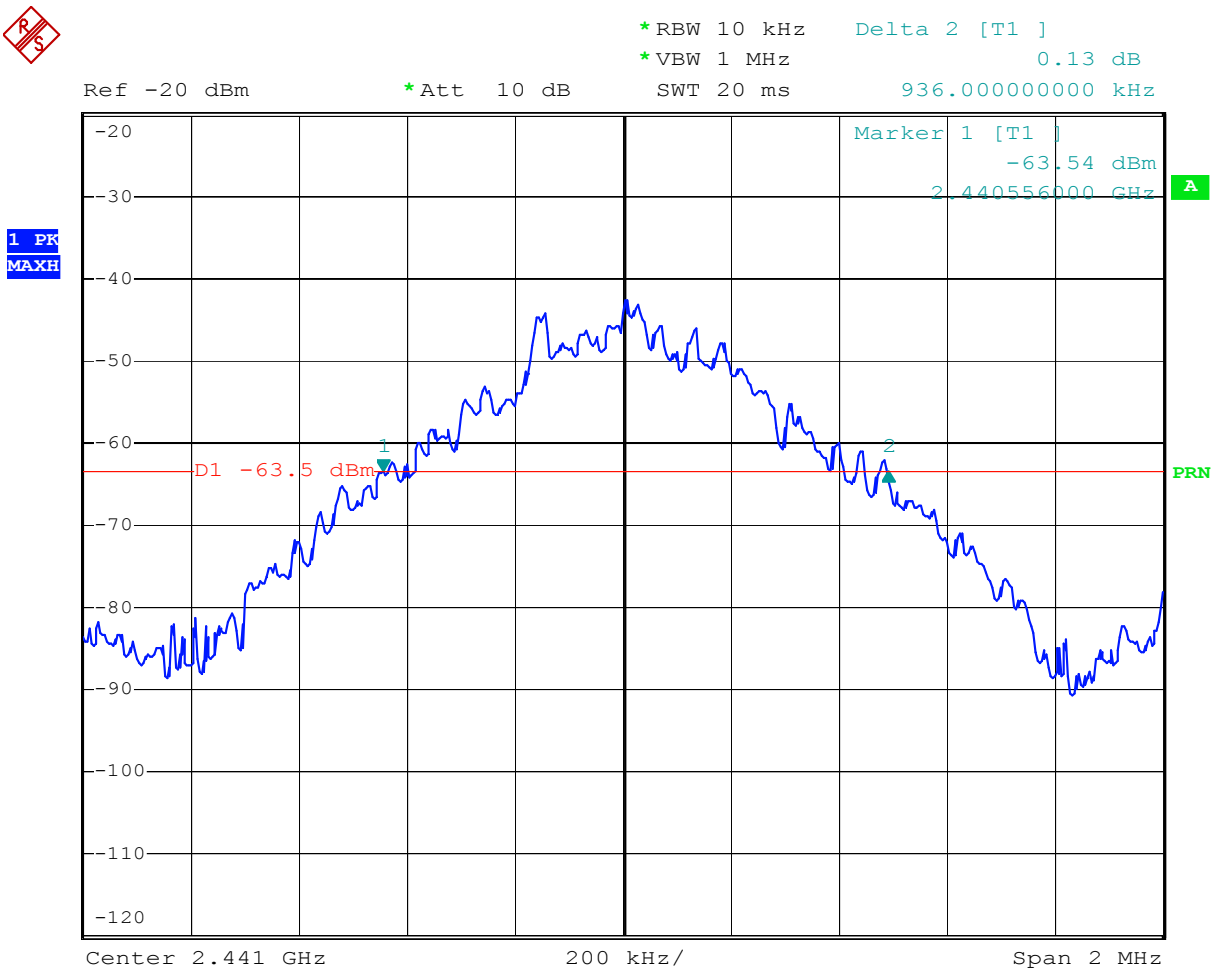
Frequency (MHz)	20-dB channel bandwidth (MHz)	Occupied bandwidth (MHz)	Plot
2402	0.940	0.864	2.1, 2.4
2440	0.936	0.864	2.2, 2.5
2480	0.932	0.868	2.3, 2.6

Graph 2.1



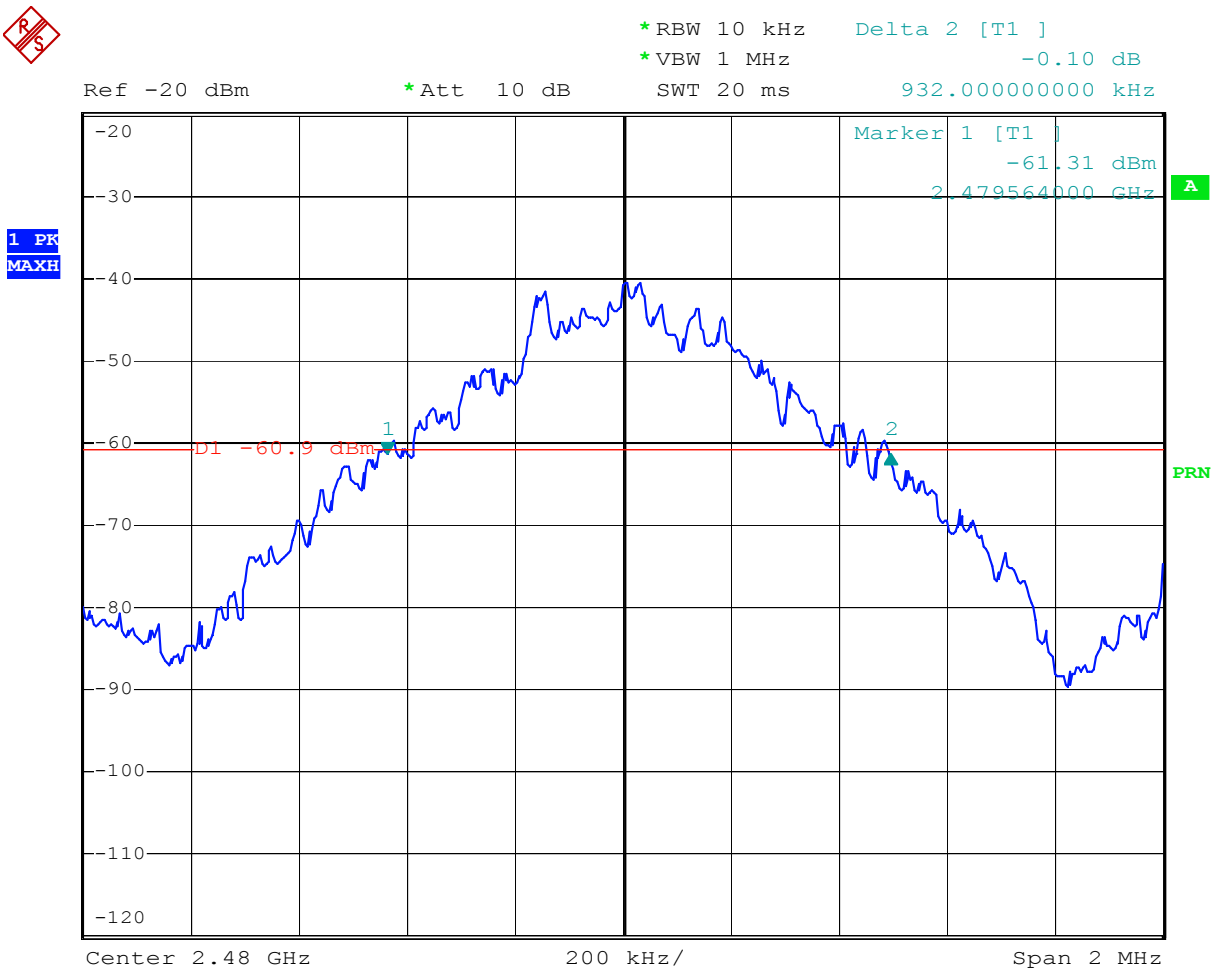
Comment: 26-dB bandwidth
Date: 24.APR.2008 18:43:15

Graph 2.2



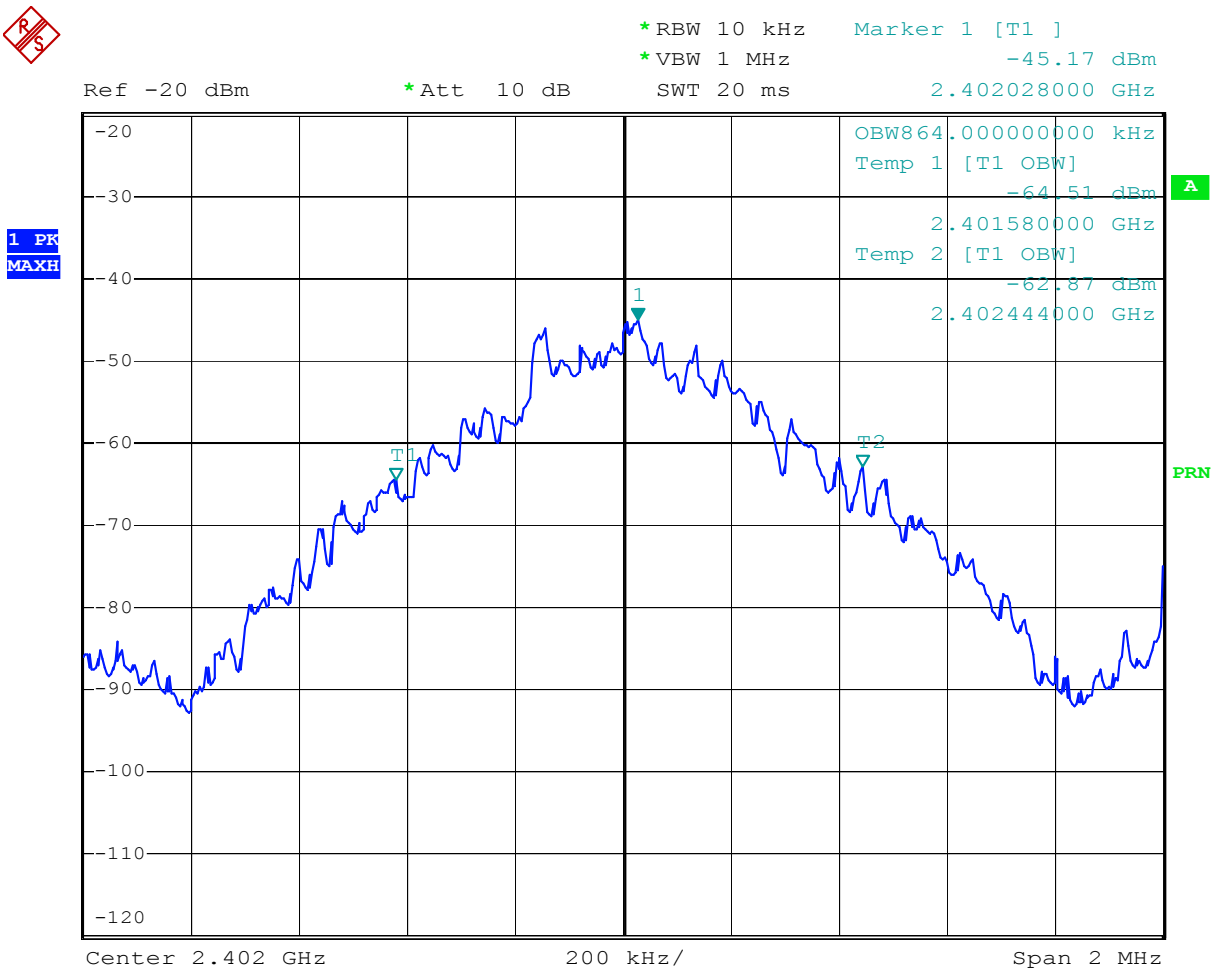
Comment: 26-dB bandwidth
Date: 24.APR.2008 18:45:13

Graph 2.3



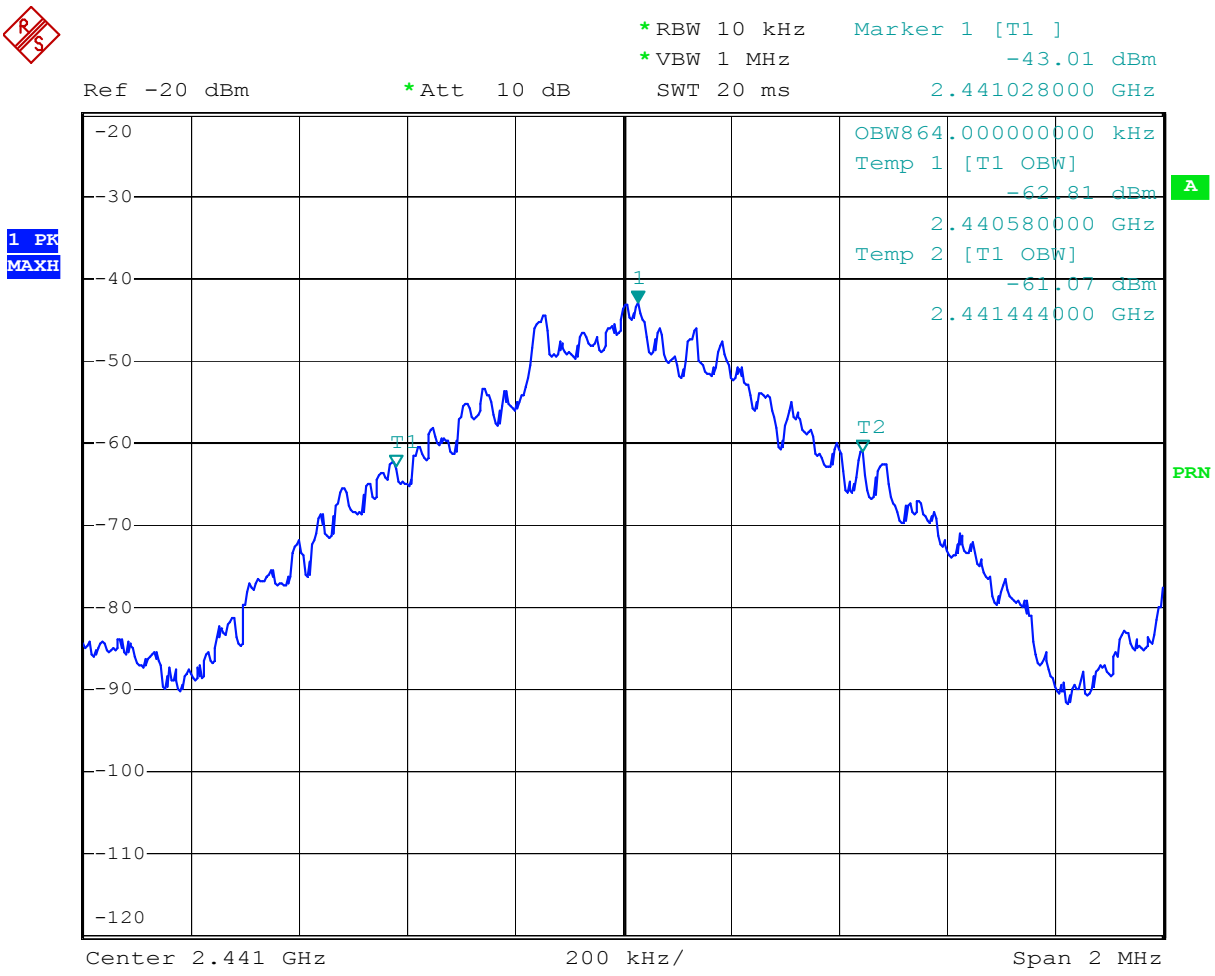
Comment: 26-dB bandwidth
Date: 24.APR.2008 18:46:57

Graph 2.4



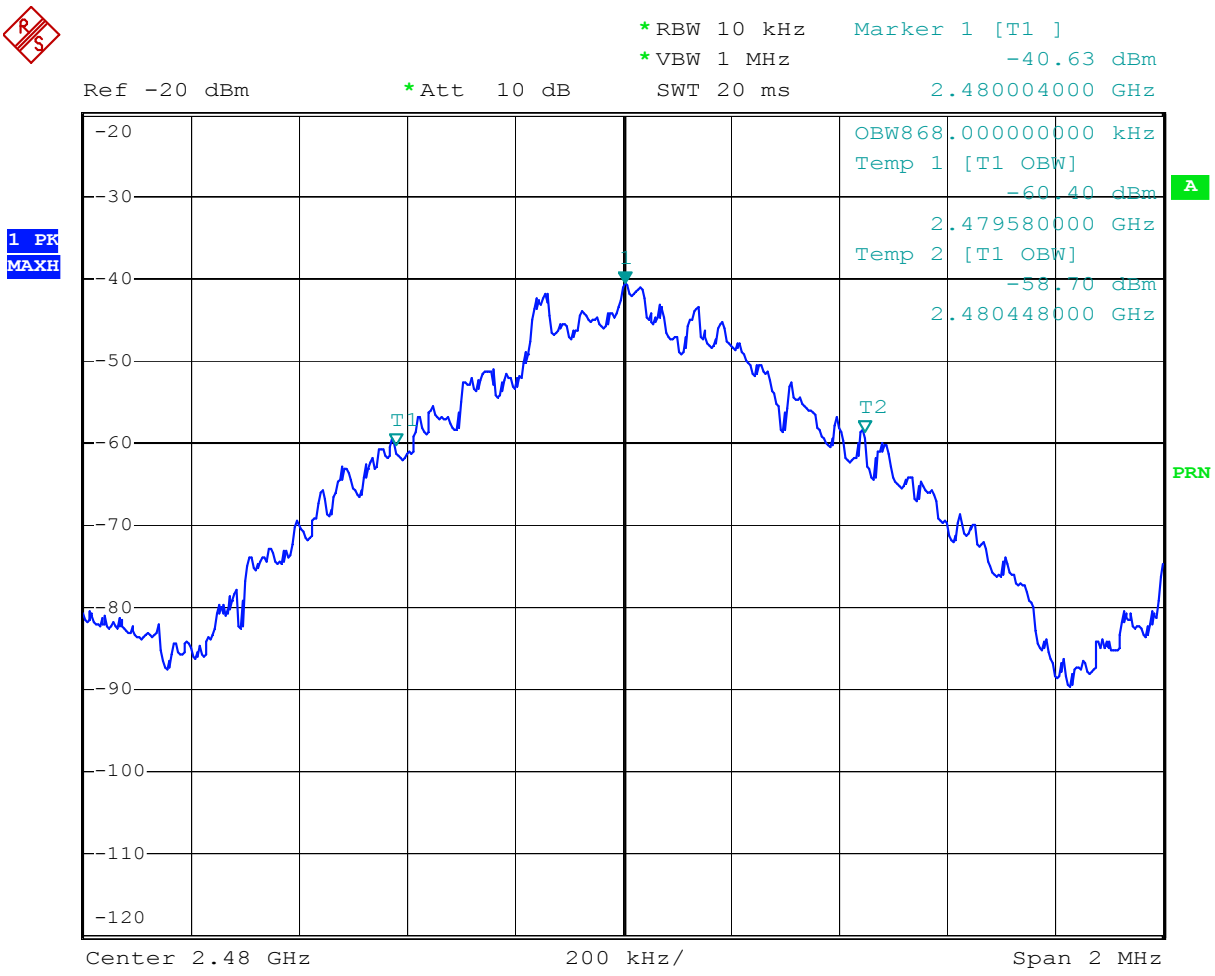
Comment: Occupied bandwidth
Date: 24.APR.2008 18:50:13

Graph 2.5



Comment: Occupied bandwidth
Date: 24.APR.2008 18:49:09

Graph 2.6



Comment: Occupied bandwidth
Date: 24.APR.2008 18:48:04

4.3 Minimum Hopping Channel Carrier Frequency Separation

FCC Ref: 15.247(a)(1)

Requirements

Systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth, whichever is greater.

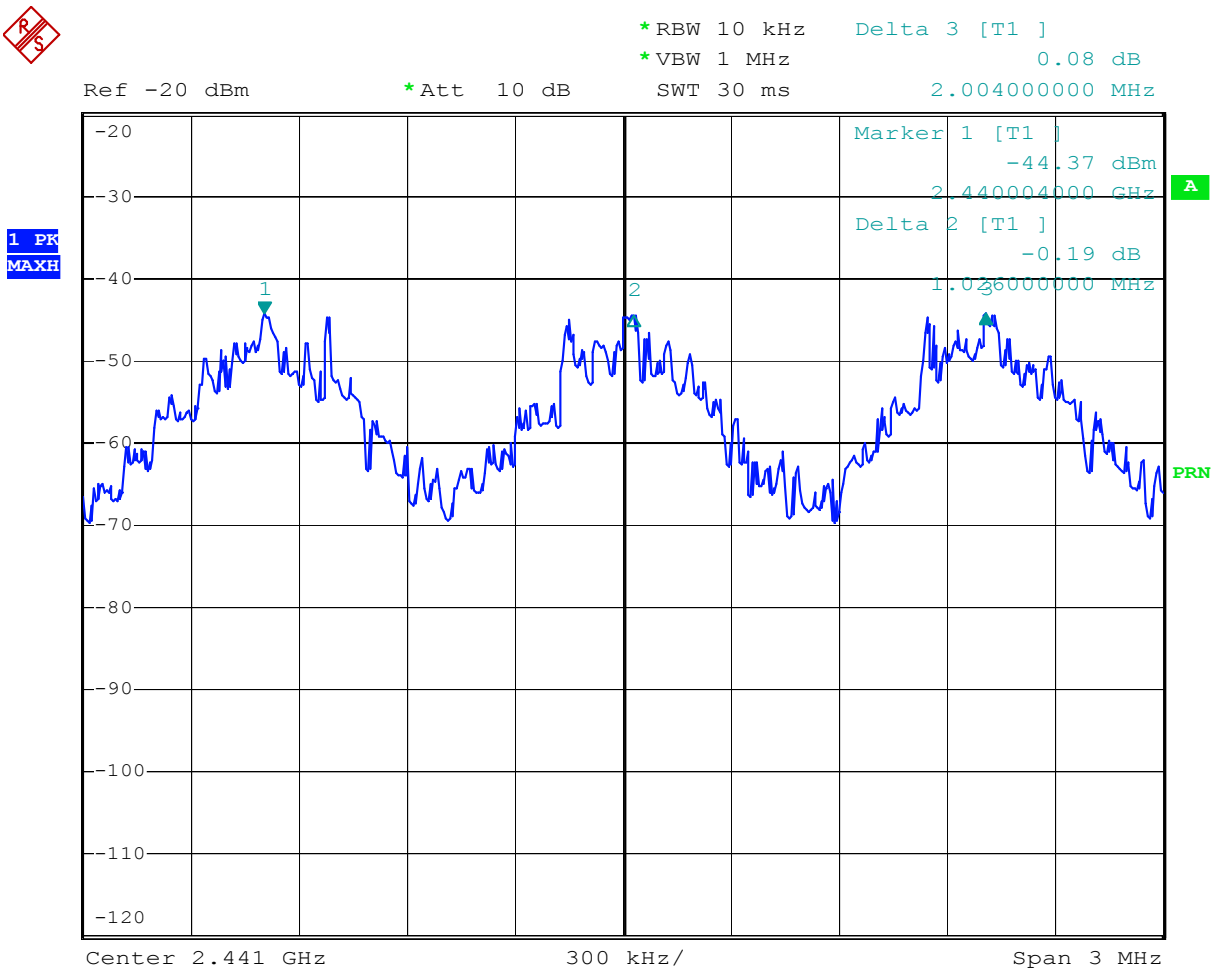
Procedure

Using the DELTA MARKER function of the analyzer, the frequency separation between two adjacent channels was measured and compared against the limit.

Test Results

Refer to the attached spectrum analyzer Graph 3.1 for the test result.
The channel separation is 1.026 MHz.

Graph 3.1



Comment: Carrier frequency separation
Date: 24.APR.2008 19:00:39

4.4 Minimum Number of Hopping Channels
FCC Ref: 15.247(a)(1)(i&ii)

Requirements

Systems operating in the 2400-2483.5 MHz band shall use at least 75 hopping channels having the 20 dB bandwidth of 1 MHz or less, and at least 15 non-overlapping channels having the 20 dB bandwidth of more than 1 MHz.

Procedure

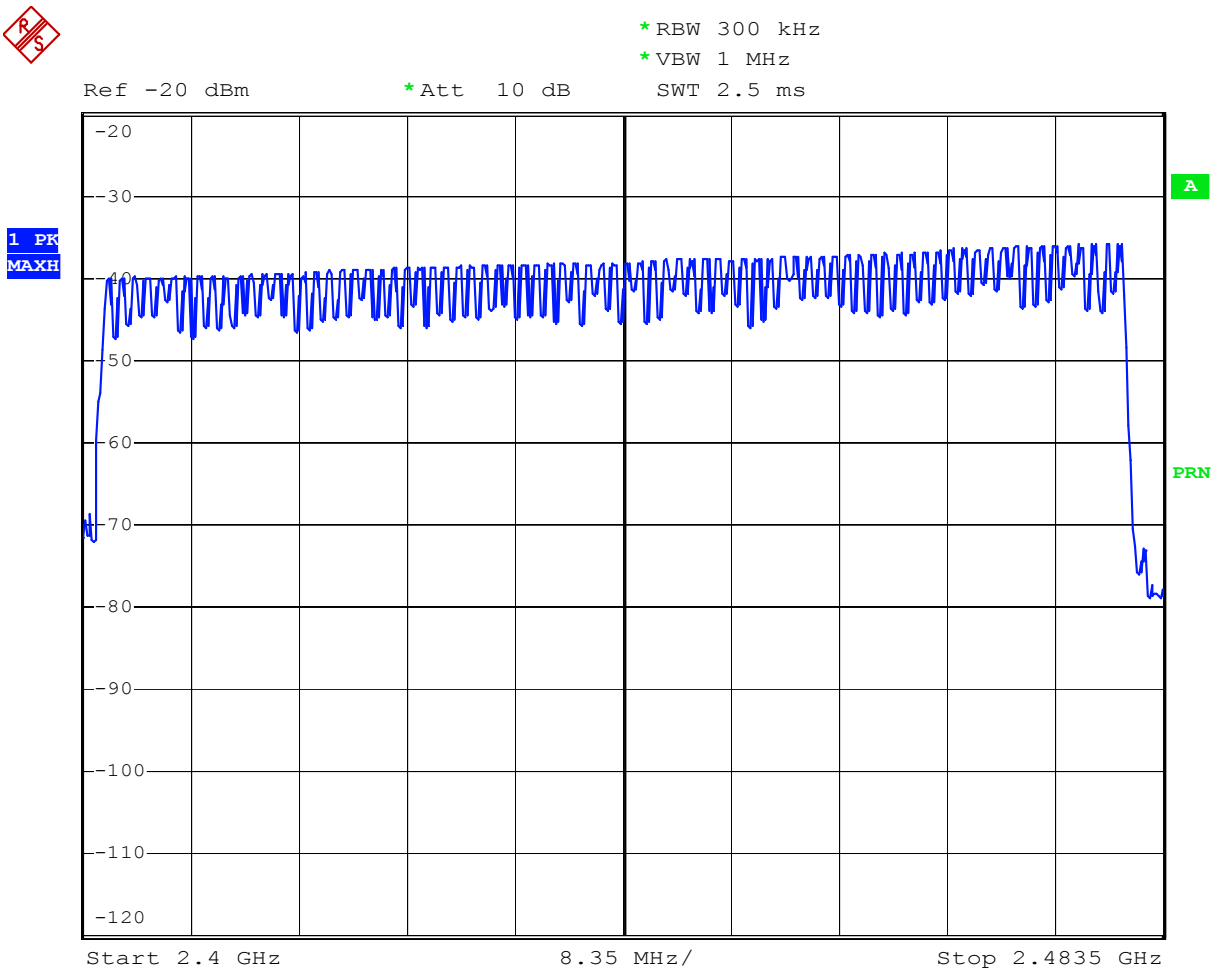
With the analyzer set to MAX HOLD, readings were taken for 2 - 3 minutes The channel peaks so recorded and compared to the minimum number of channels required in the regulation.

Test Results

Number of hopping channels with the bandwidth of 1 MHz or less	79

Refer to attached spectrum analyzer charts: Graph 4.1.

Graph 4.1



Comment: Number of hopping channels
Date: 24.APR.2008 18:55:19

4.5 Average Channel Occupancy Time
FCC 15.247(a)(1)(ii)(iii)

Requirements

For systems operating in the 2400-2483.5 MHz band and using at least 75 hopping channels with the 20-dB bandwidth of 1 MHz or less, the average time of occupancy on any frequency shall not be greater than 0.4 second within a 30 second period.
For systems operating in the 2400-2483.5 MHz band and using at least 15 hopping channels with the 20-dB bandwidth greater than 1 MHz, the average time of occupancy on any frequency shall not be greater than 0.4 second within the time period required to hop through all channels.

Procedure

The spectrum analyzer center frequency was set to one of the known hopping channels. The SWEEP was set to 0.4 second, the SPAN was set to ZERO SPANS, and the TRIGGER was set to VIDEO. The time duration of the transmission so captured was measured with the MARKER DELTA function.

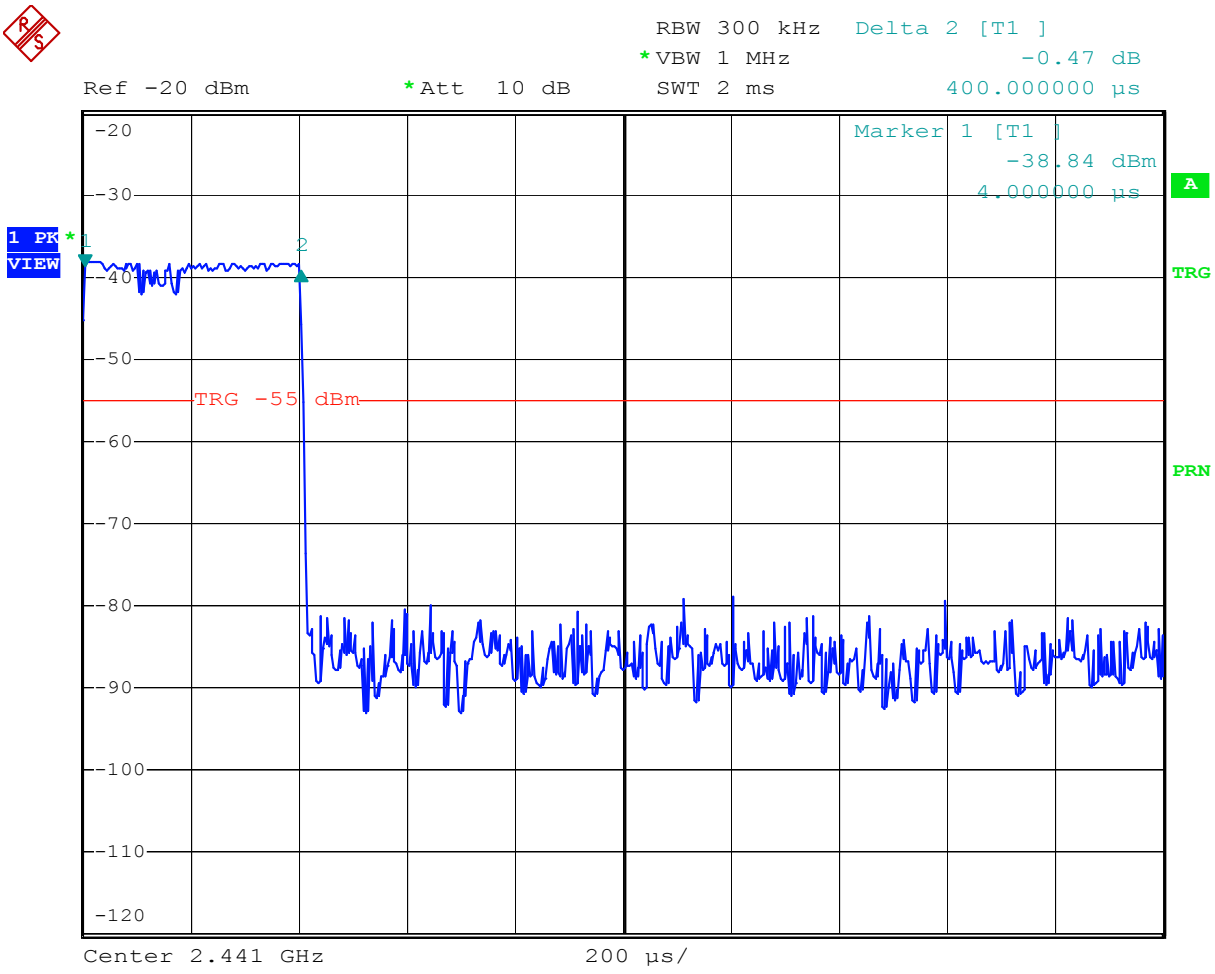
The SWEEP was then set to the time required by the regulation (30 seconds). The analyzer was set to SINGLE SWEEP, the total ON time was added and compared against the limit (0.4 seconds).

Test Results

The average time occupancy is: $0.40 \times 6 \times 60 = 144$ ms.

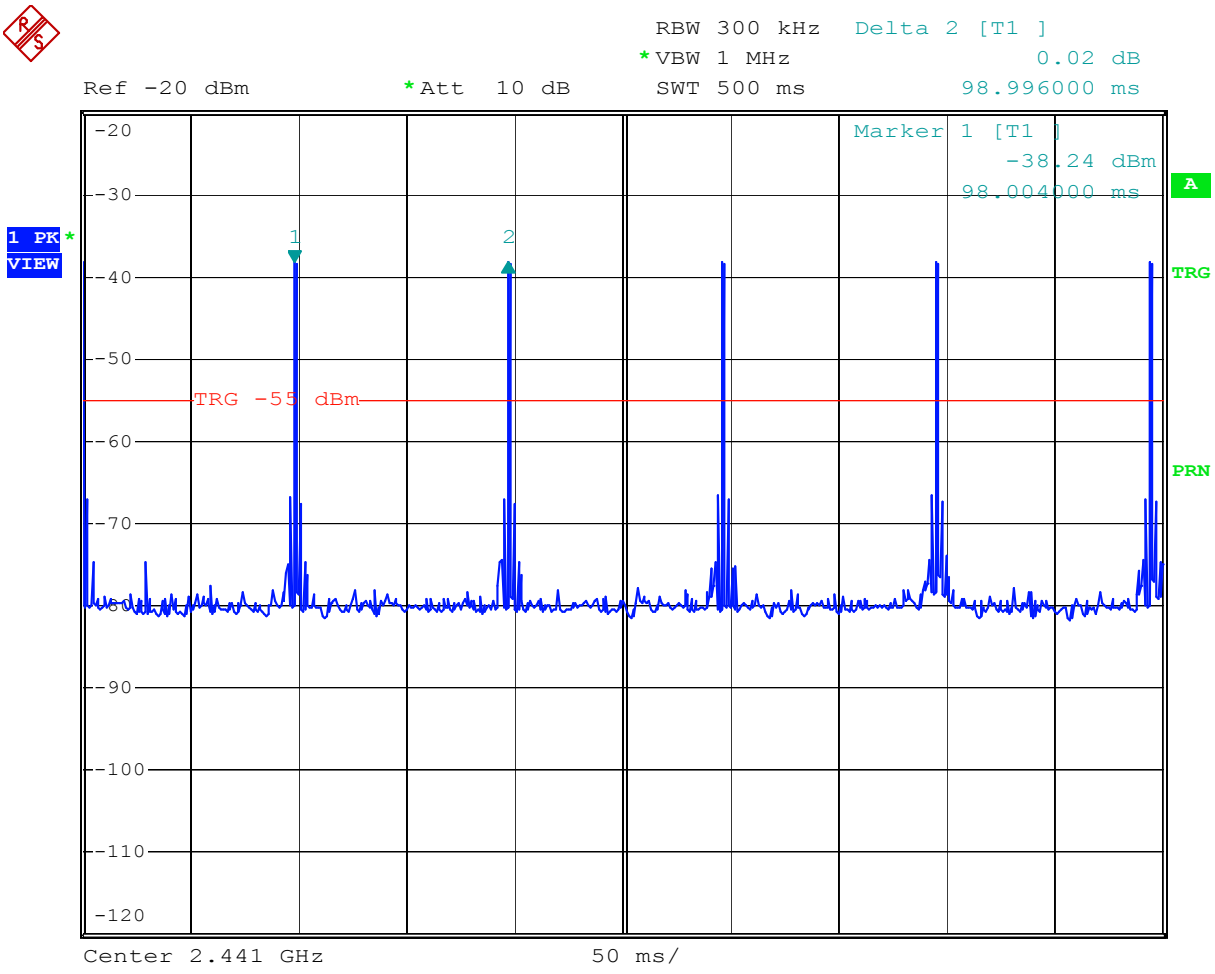
Refer to attached spectrum analyzer Graphs 5.1-5.2 for details..

Graph 5.1



Comment: Dwell time
Date: 24.APR.2008 19:03:23

Graph 5.2



Comment: Dwell time
Date: 24.APR.2008 19:05:05

4.6 Out of Band emissions (except emissions in restricted bands)
FCC 15.247(d)

Requirements

In any 100 kHz bandwidth outside the EUT passband, the RF power shall be at least 20 dB below that of the maximum in-band 100 kHz emission.

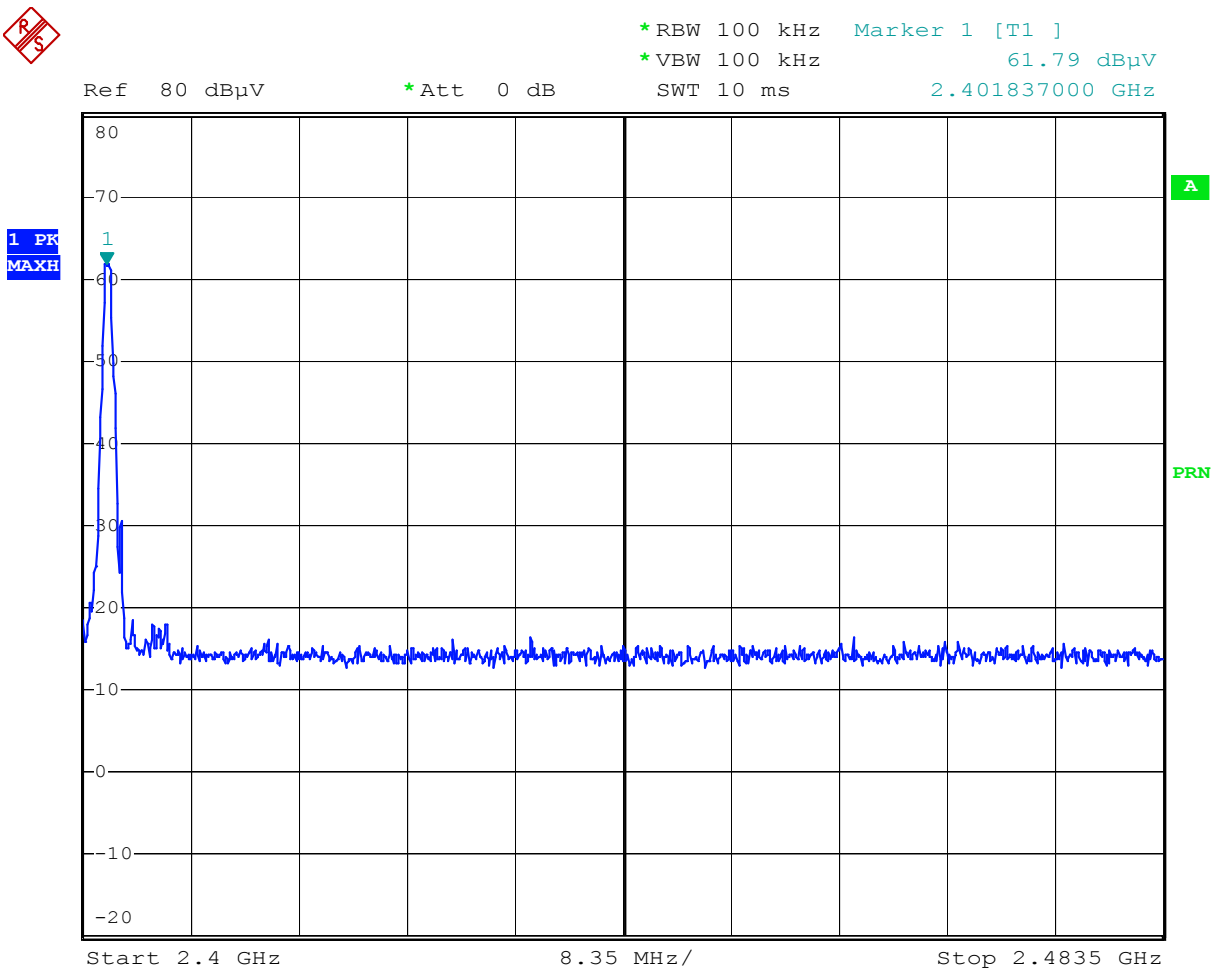
Procedure

A spectrum analyzer was connected to the antenna port of the transmitter. Analyzer Resolution Bandwidth was set to 100 kHz. For each channel investigated, the in-band and out-of-band emission measurements were performed. The out-of-band emissions were measured from 10 MHz to 25 GHz.

Test Result - Headset

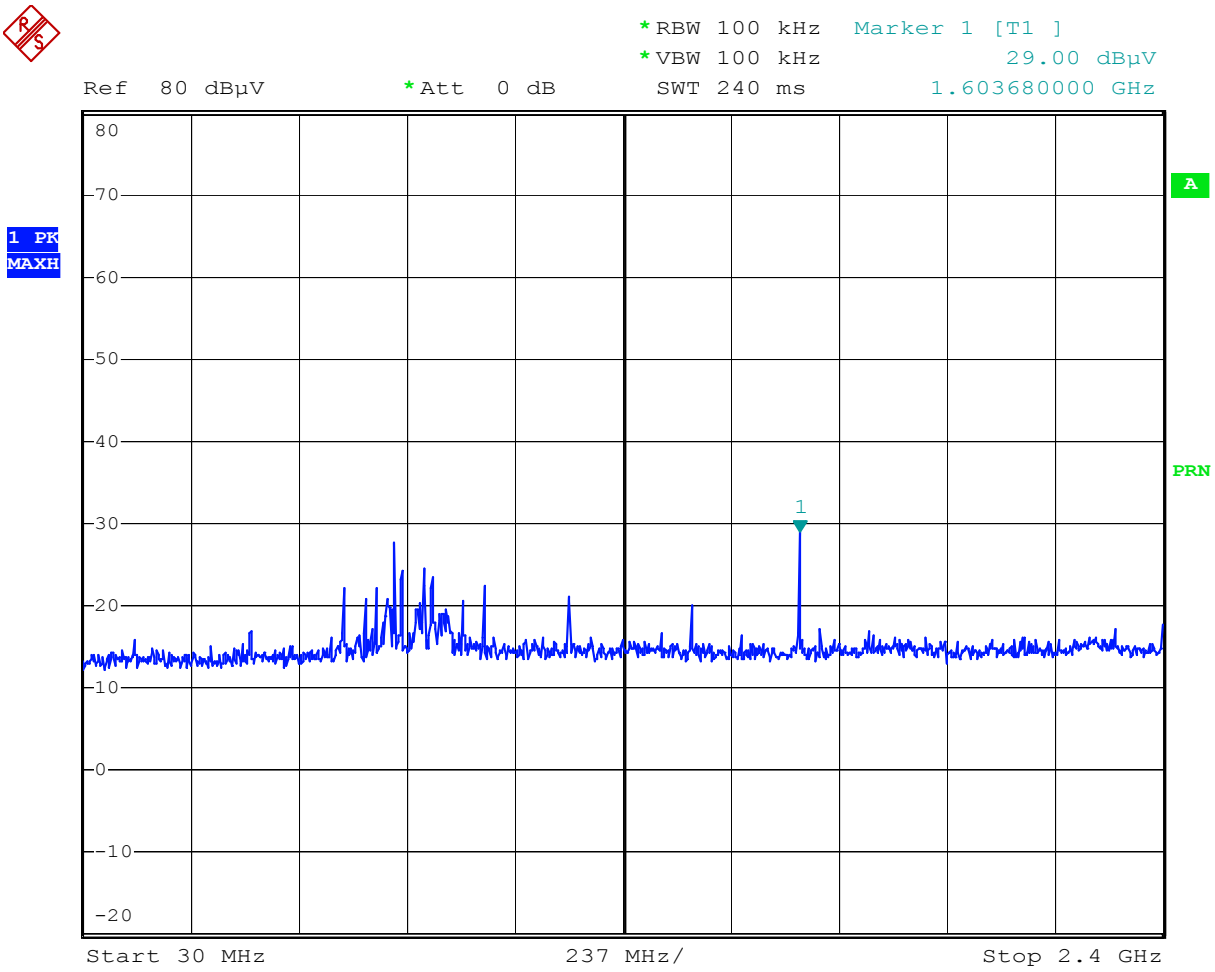
Refer to the following Graphs for the test result.

Graph 6.1



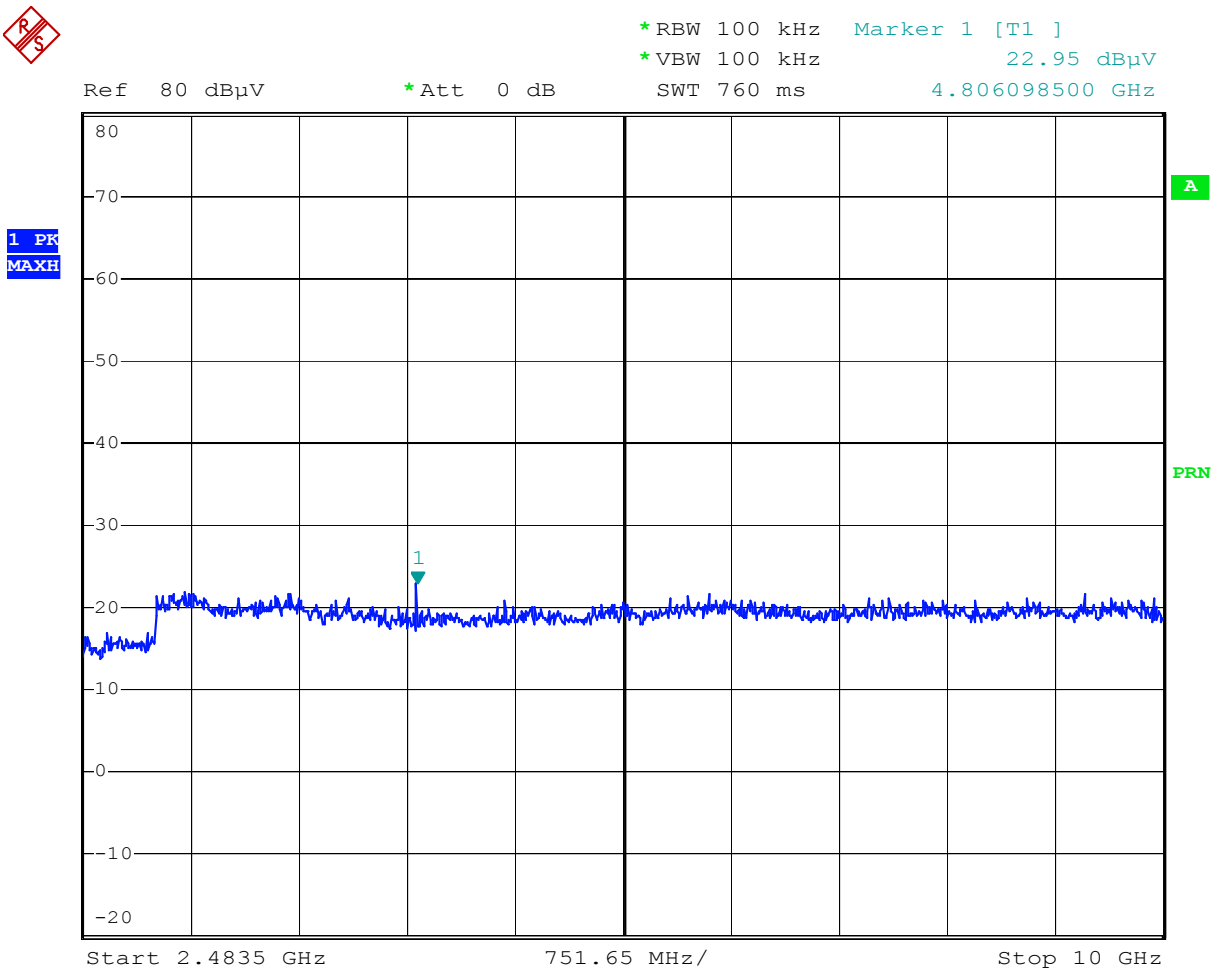
Comment: In-band emissions, Ch 0
Date: 28.APR.2008 18:47:25

Graph 6.2



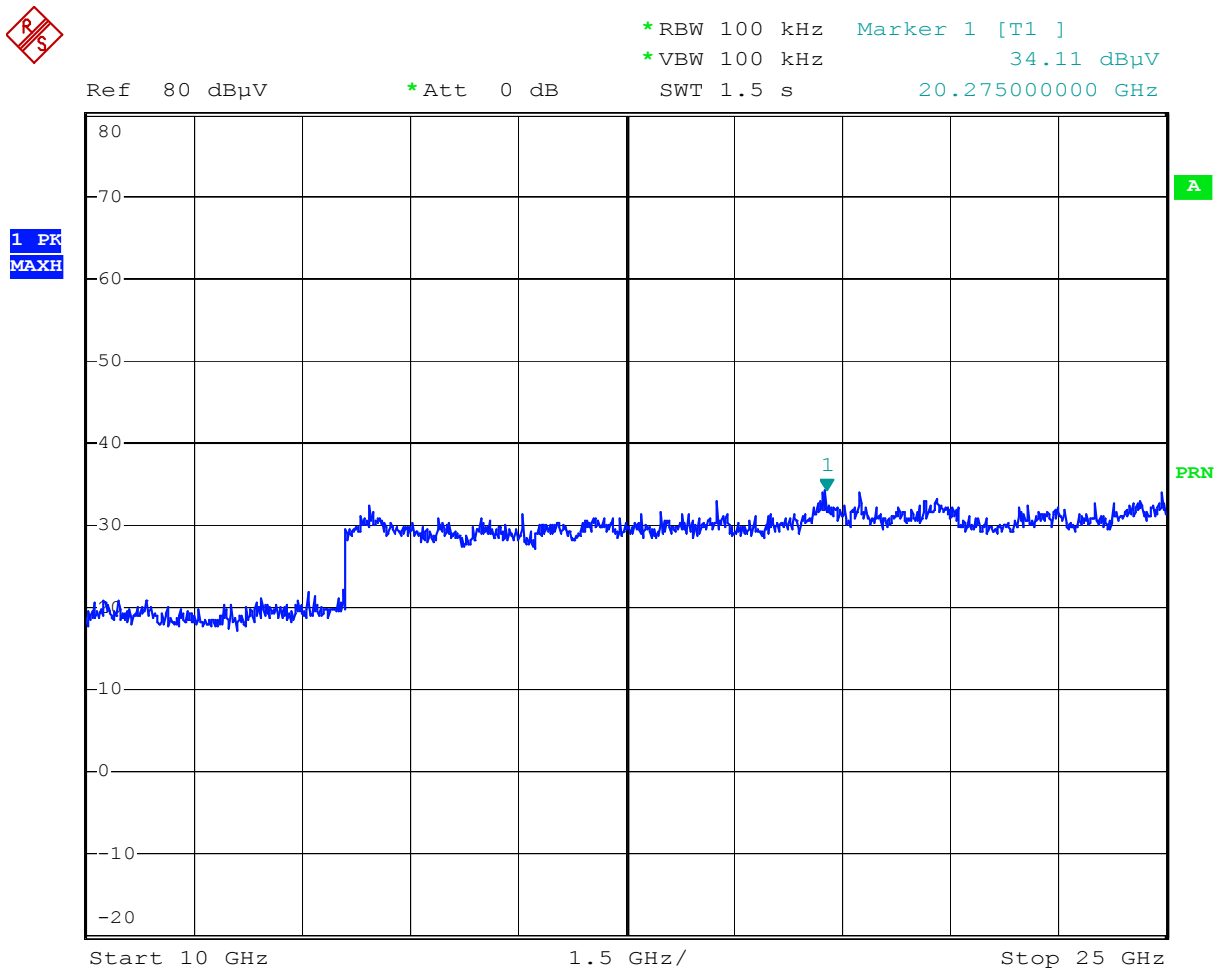
Comment: Spurious emissions, Ch 0
Date: 28.APR.2008 18:48:26

Graph 6.3



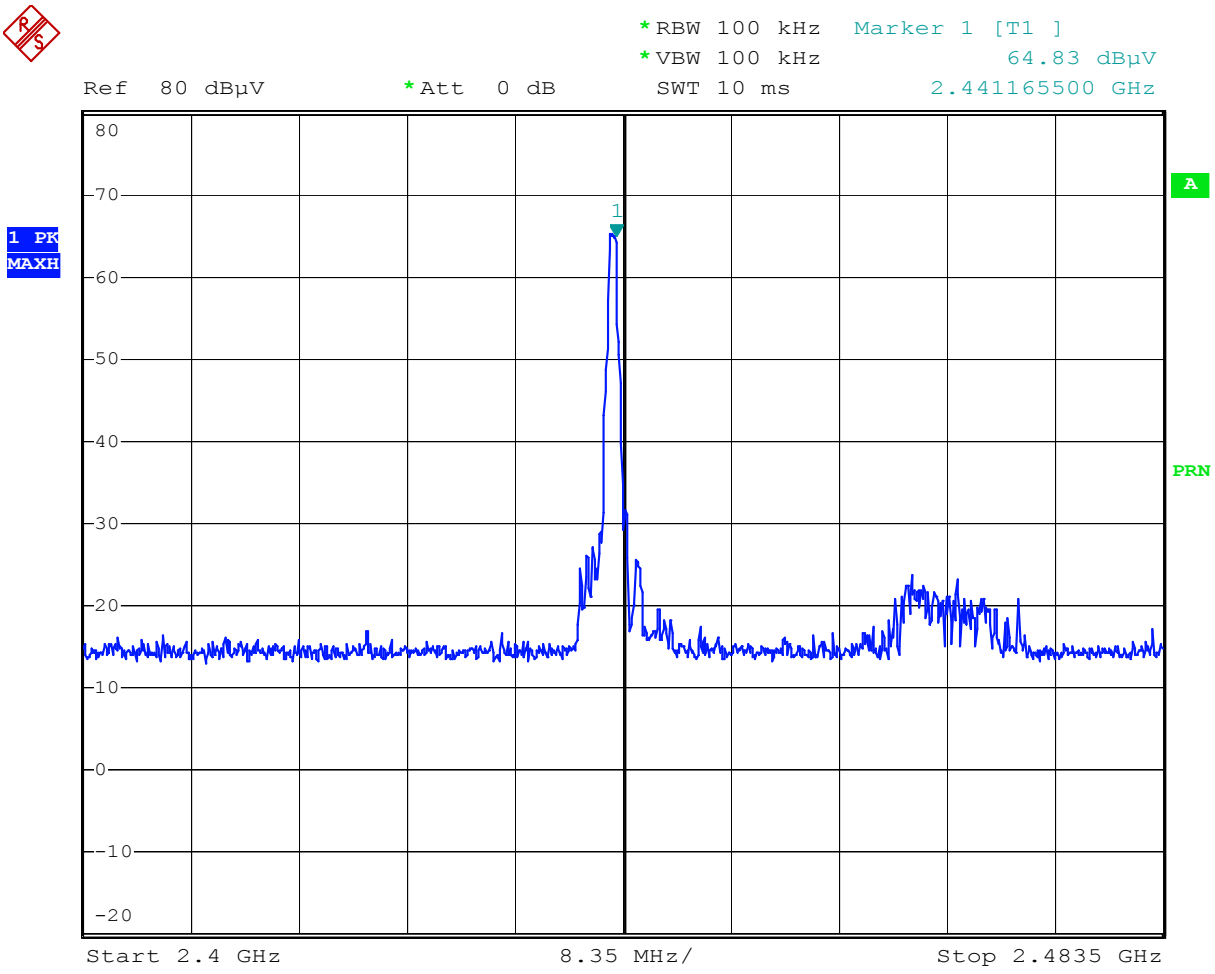
Comment: Spurious emissions, Ch 0
Date: 28.APR.2008 18:54:51

Graph 6.4



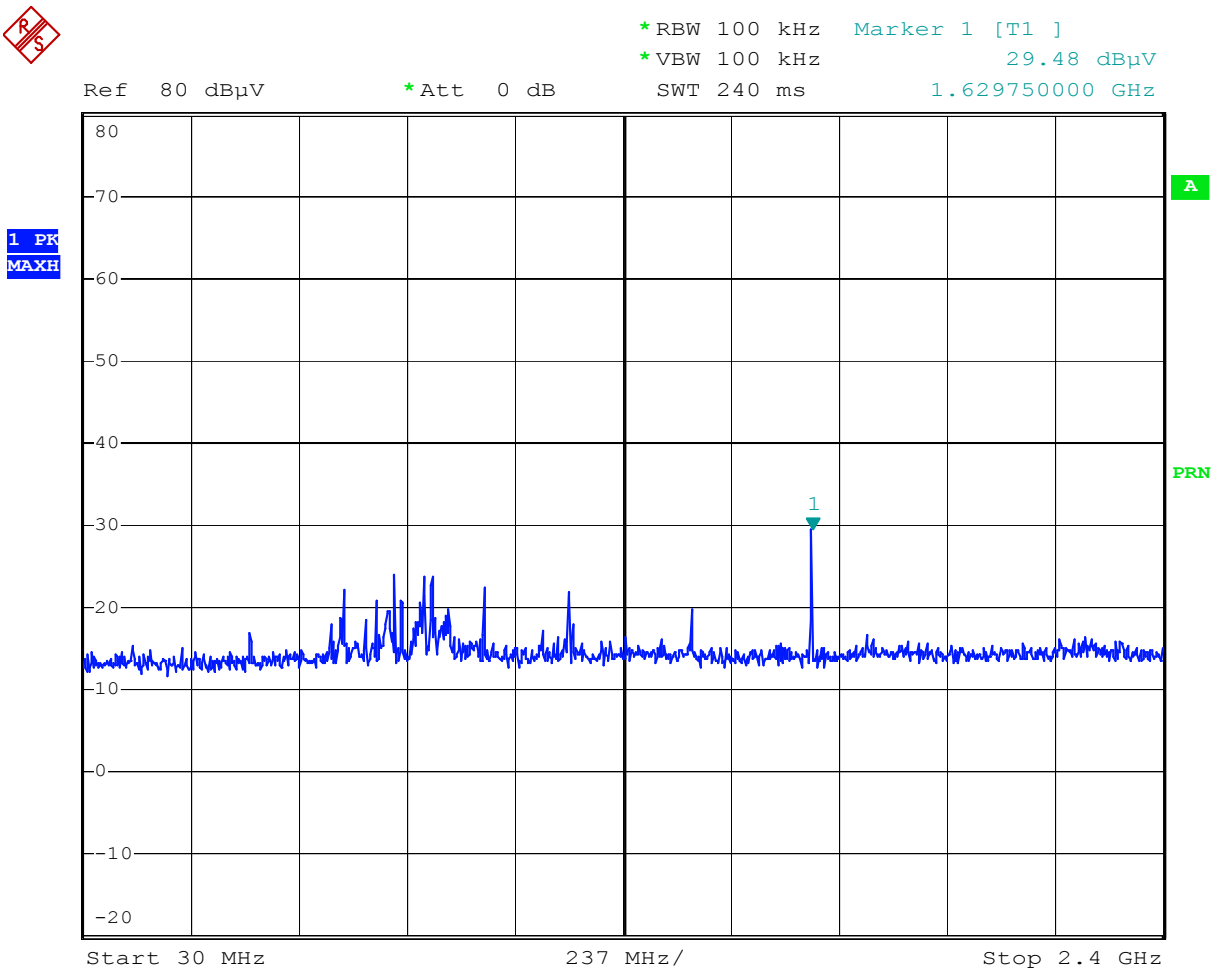
Comment: Spurious emissions, Ch 0
Date: 28.APR.2008 18:55:58

Graph 6.5



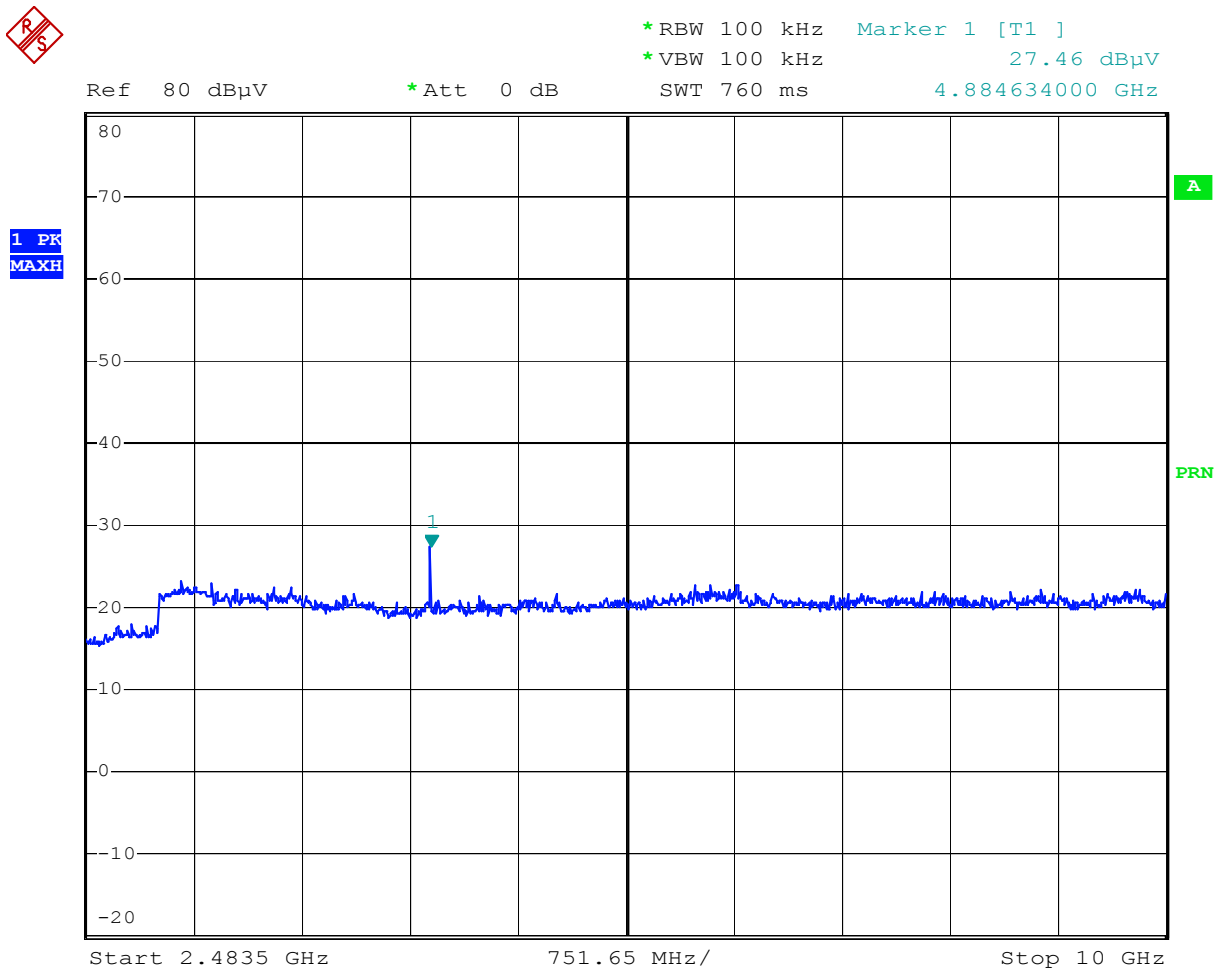
Comment: In-band emissions, Ch 38
Date: 28.APR.2008 17:01:42

Graph 6.6



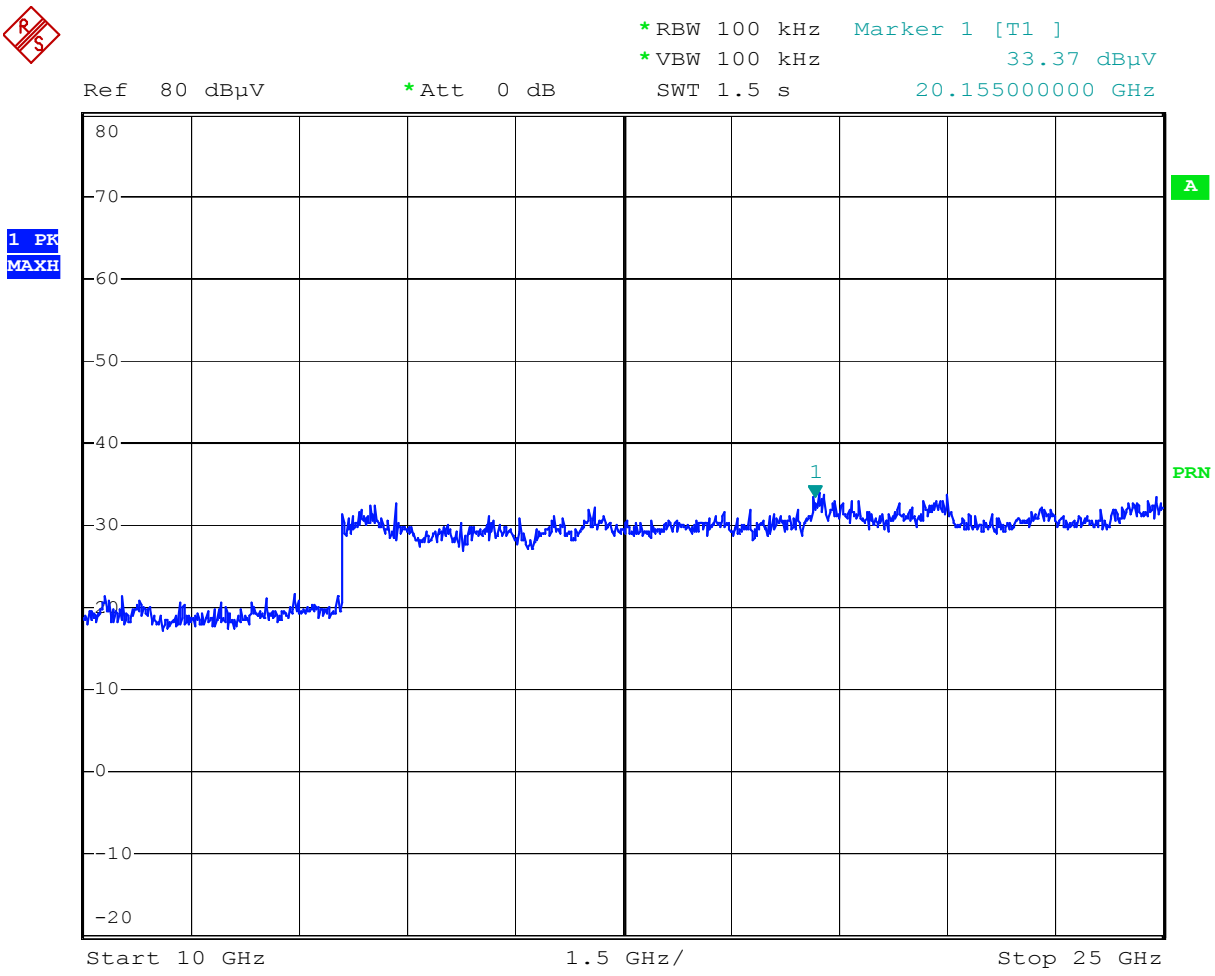
Comment: Spurious emissions, Ch 38
Date: 28.APR.2008 17:02:42

Graph 6.7



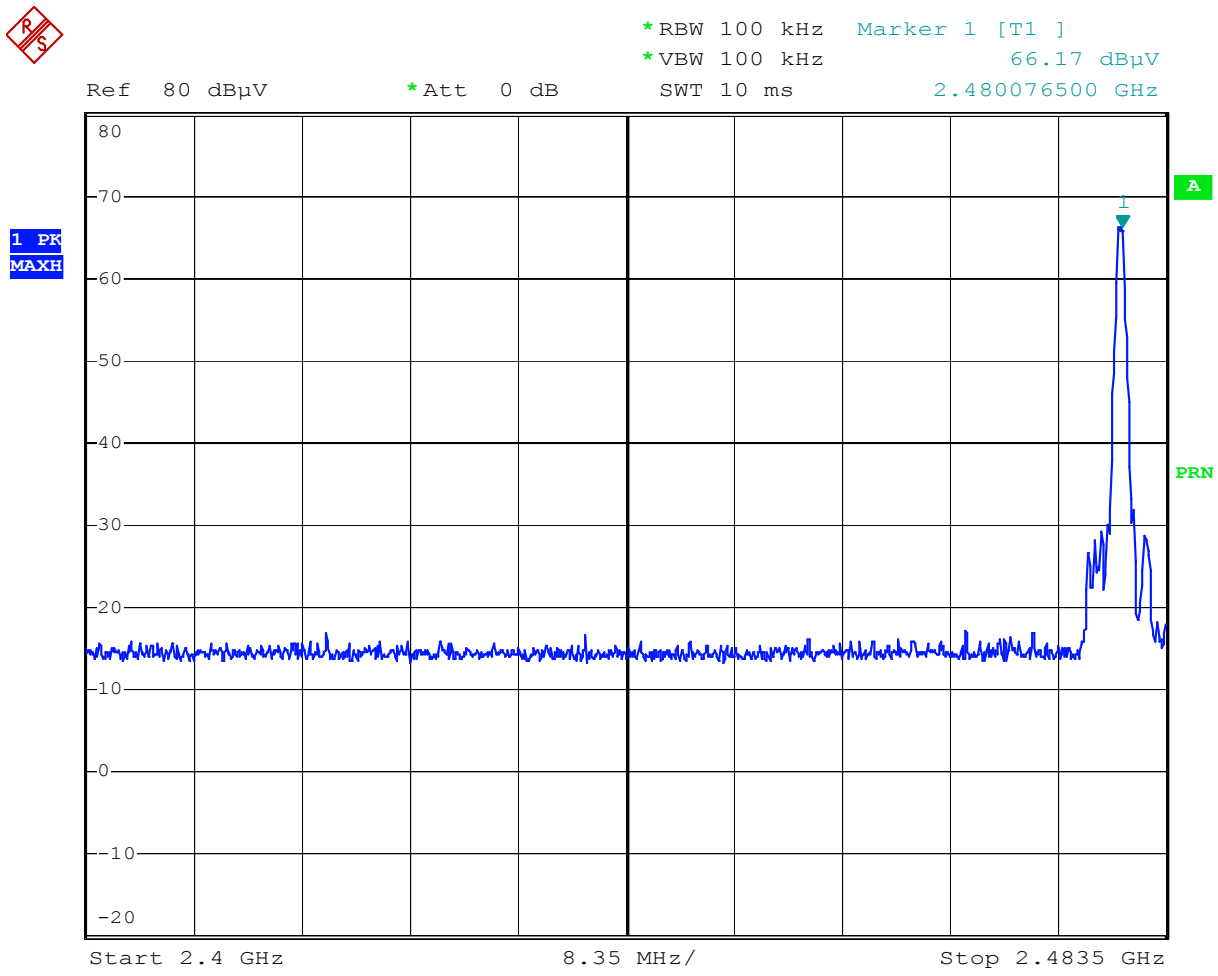
Comment: Spurious emissions, Ch 38
Date: 28.APR.2008 17:19:18

Graph 6.8



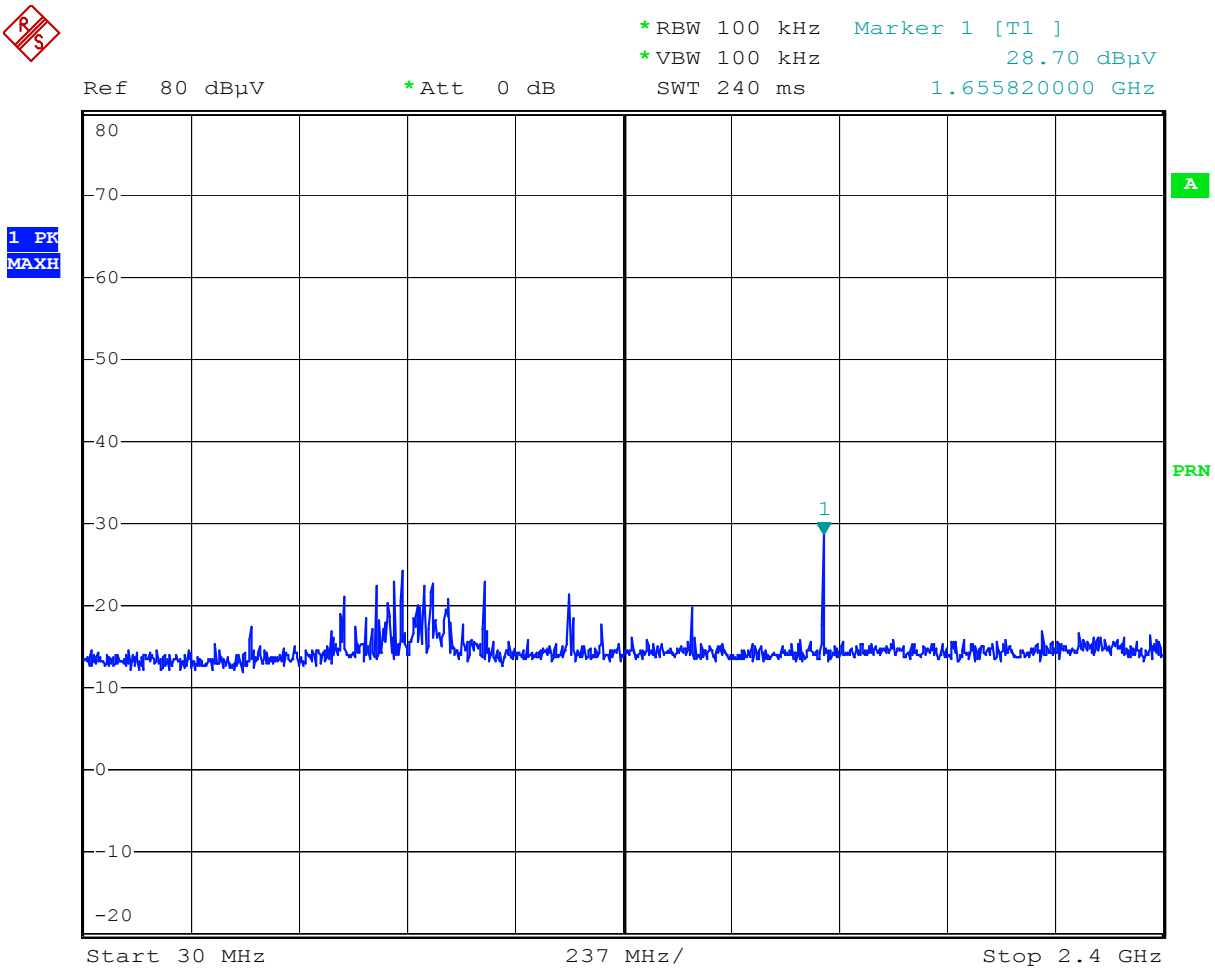
Comment: Spurious emissions, Ch 38
Date: 28.APR.2008 17:19:57

Graph 6.9



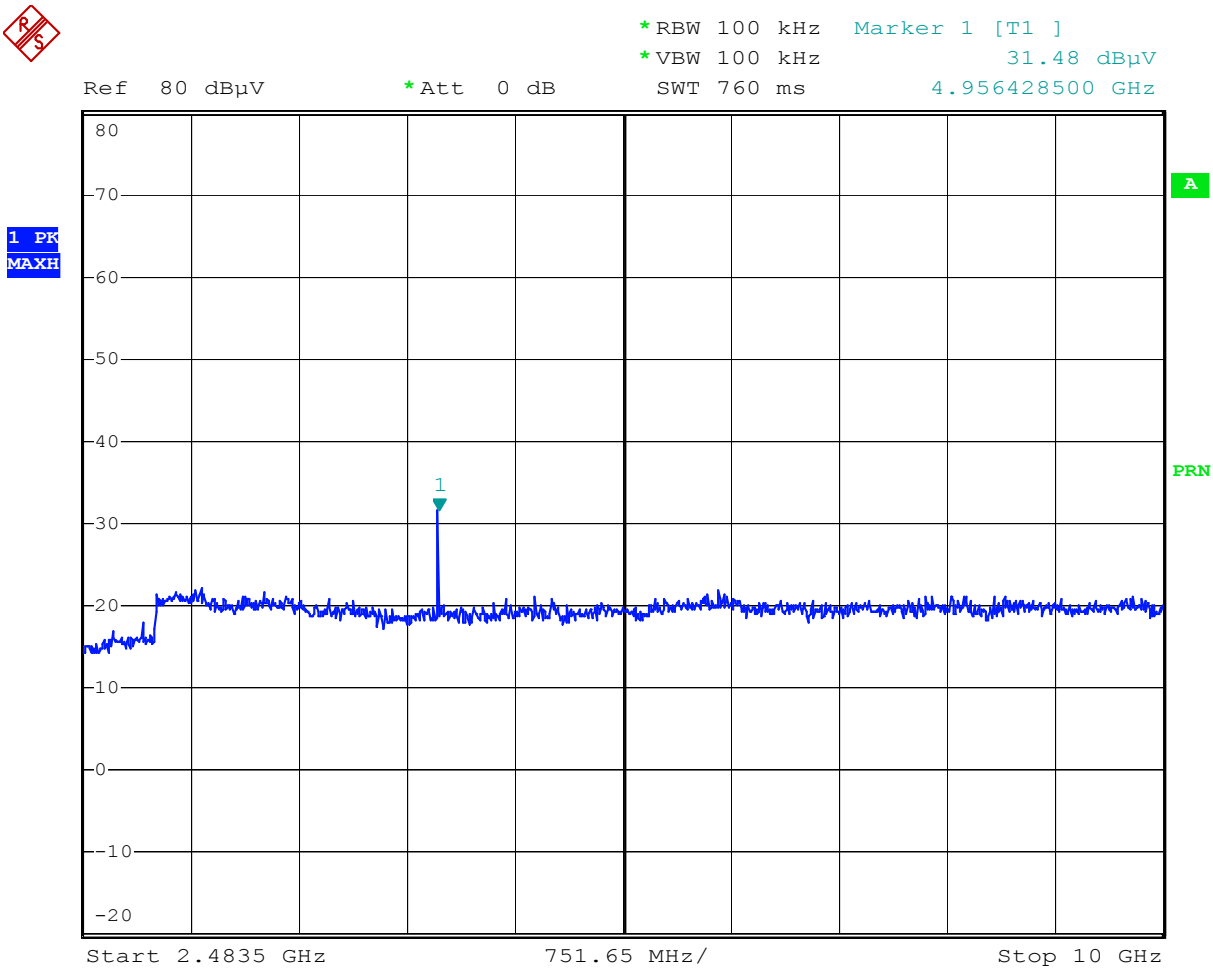
Comment: In-band emissions, Ch 78
Date: 28.APR.2008 16:44:27

Graph 6.10



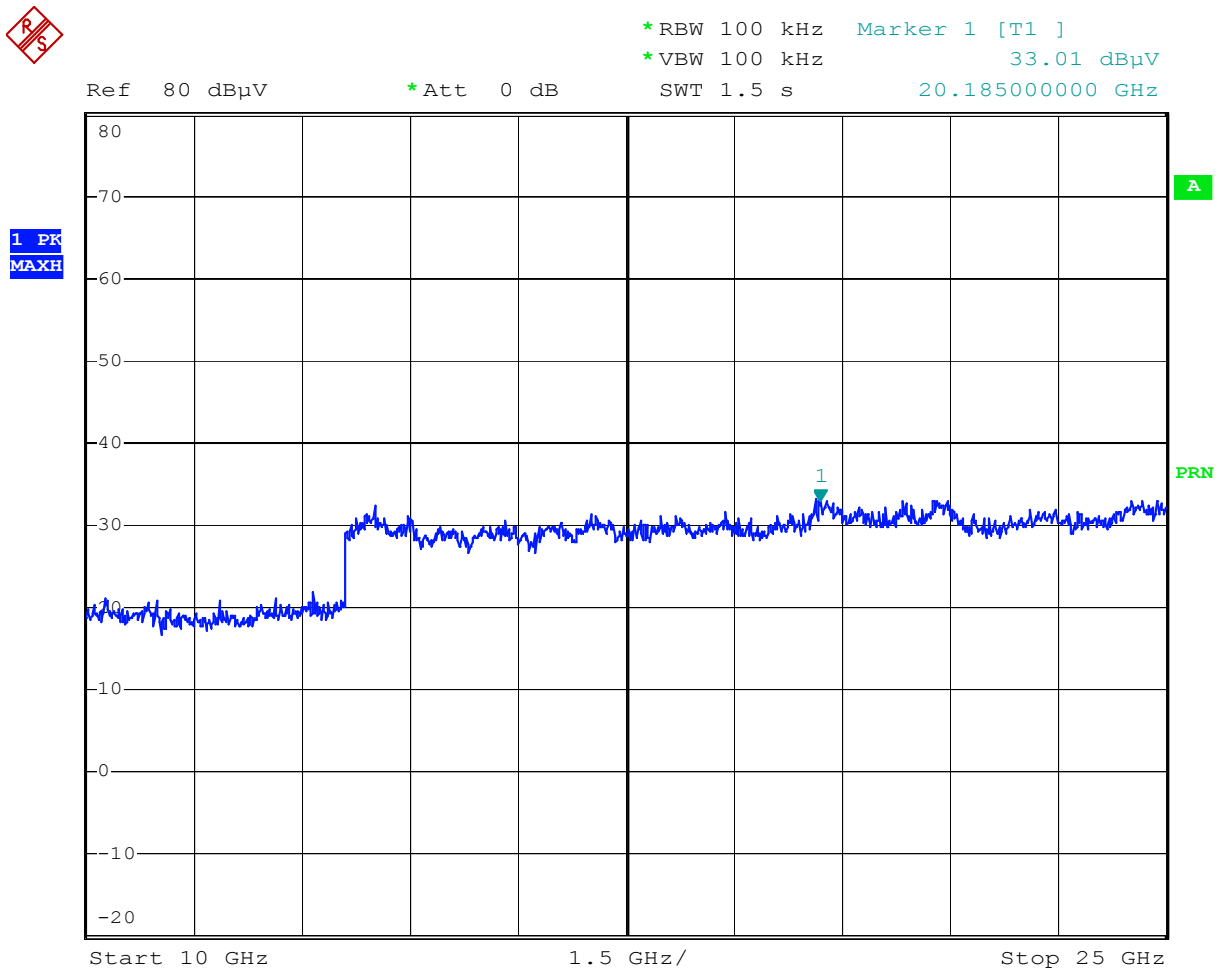
Comment: Spurious emissions, Ch 78
Date: 28.APR.2008 16:48:02

Graph 6.11



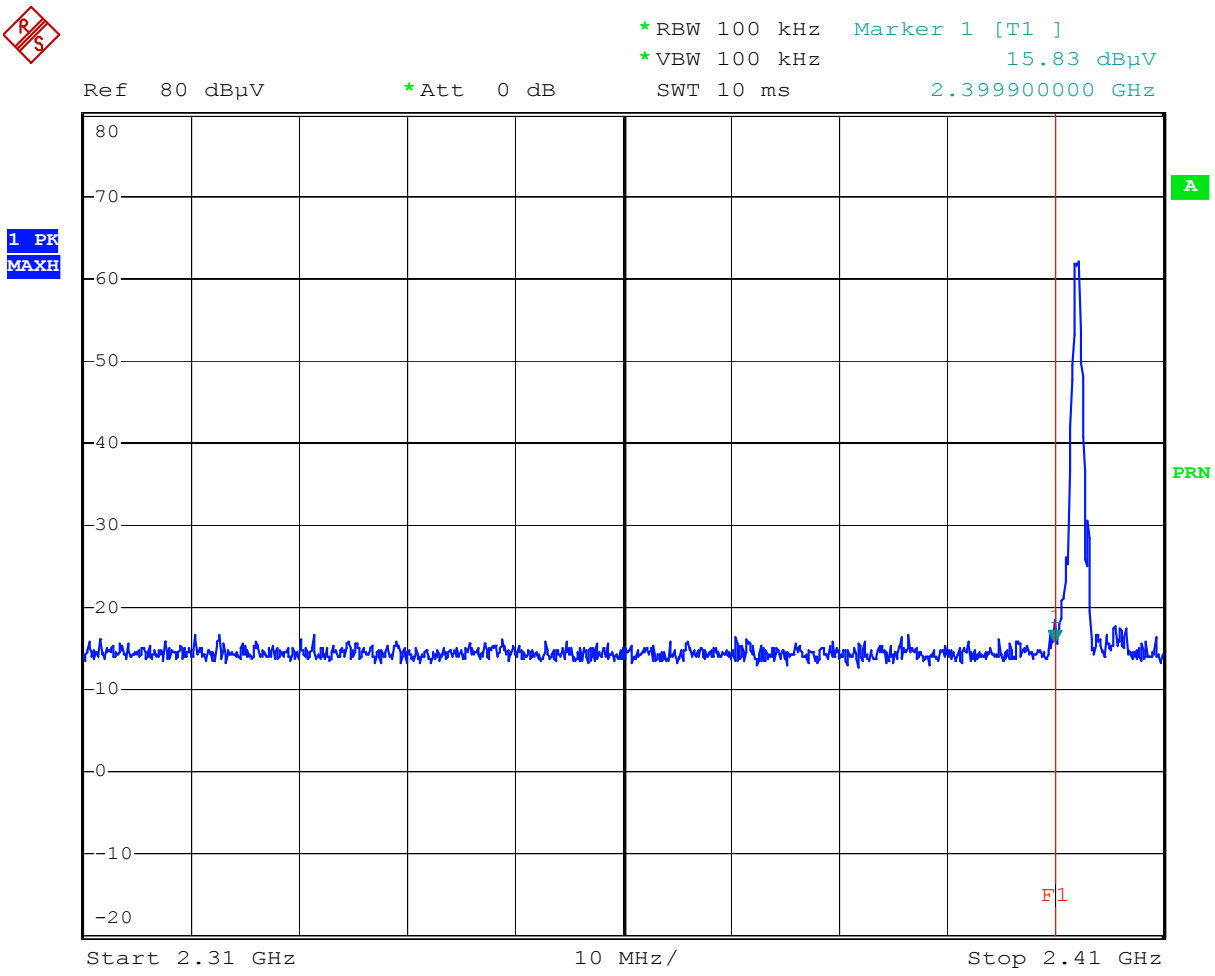
Comment: Spurious emissions, Ch 78
Date: 28.APR.2008 16:46:26

Graph 6.12



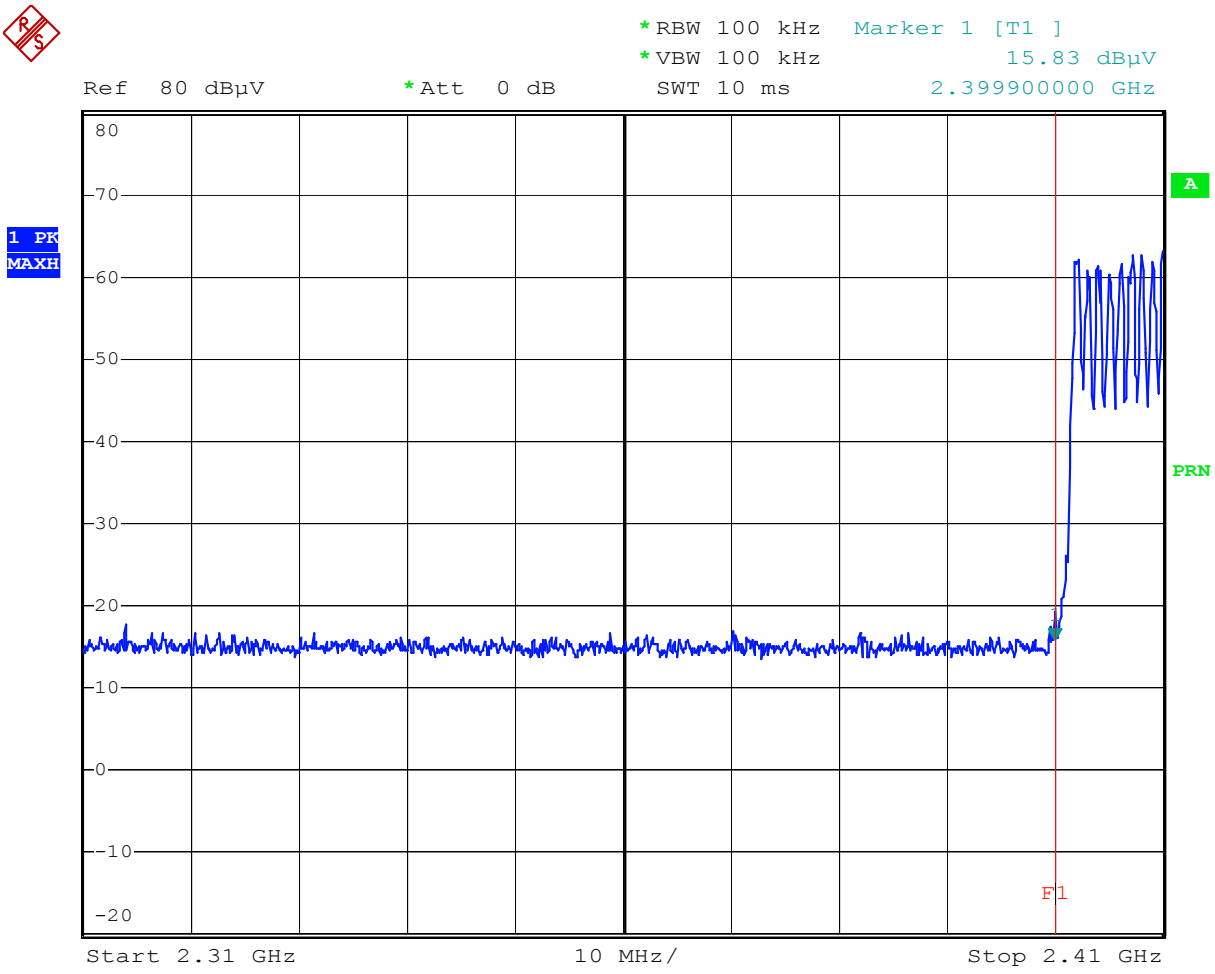
Comment: Spurious emissions, Ch 78
Date: 28.APR.2008 16:47:04

Graph 6.13



Comment: Spurious emissions, Ch 0
Date: 28.APR.2008 18:50:05

Graph 6.14



Comment: Spurious emissions, hopping, Ch 0
Date: 28.APR.2008 18:51:47

4.7 Radiated Emissions in Restricted Bands
FCC 15.247(d), 15.205

Procedure

Radiated emission measurements were performed from 30 MHz to 25,000 MHz. Spectrum Analyzer Resolution Bandwidth is 100 kHz or greater for frequencies 30 MHz to 1000 MHz, 1 MHz - for frequencies above 1000 MHz.

The EUT is placed on a plastic turntable. If the EUT attaches to peripherals, they are connected and operational (as typical as possible). During testing, all cables were manipulated to produce worst case emissions. The signal is maximized through rotation. The antenna height and polarization are varied during the search for maximum signal level. The antenna height is varied from 1 to 4 meters.

Radiated emissions are taken at three meters unless the signal level is too low for measurement at that distance. If necessary, a pre-amplifier is used and/or the test is conducted at a closer distance. All readings are extrapolated back to the equivalent three-meter reading using inverse scaling with distance.

Data is included of the worst case configuration (the configuration which resulted in the highest emission levels). A sample calculation, configuration photographs and data tables of the emissions are included.

Field Strength Calculation is performed as described in sec. 4.1

Result

The data on the following pages list the significant emission frequencies, the limit and the margin of compliance.

The EUT transmit with duty cycle of less than 1%. To obtain the average field strength the duty cycle correction factor of 20 dB is used.

The radiated emissions in the restricted bands near the operating band are presented on the following Graphs 7.1 – 7.7. On these graphs antenna factor and cable loss are included in the OFFSET of the spectrum analyzer reading, therefore the readings are field strength.

The EUT passed the test by 3.6 dB.

Channel # 0, 2402 MHz

Frequency MHz	Detector	RA dB(uV)	AG dB	CF dB	AF dB(1/m)	FS at 3m dB(uV/m)	FS Limit dB(uV/m)	Margin dB
4804.0	Peak	54.4	35.0	7.1	33.0	59.5	74.0	-14.5
4804.0	Average	34.4	35.0	7.1	33.0	39.5	54.0	-14.5
7206.0	Peak	34.9 *	34.2	9.7	36.1	46.5	54.0	-7.5
9608.0	Peak	35.4 *	34.5	10.5	38.4	49.8	54.0	-4.2
12010.0	Peak	31.8 *	36.6	14.0	39.1	48.3	54.0	-5.7

Channel # 38, 2441 MHz

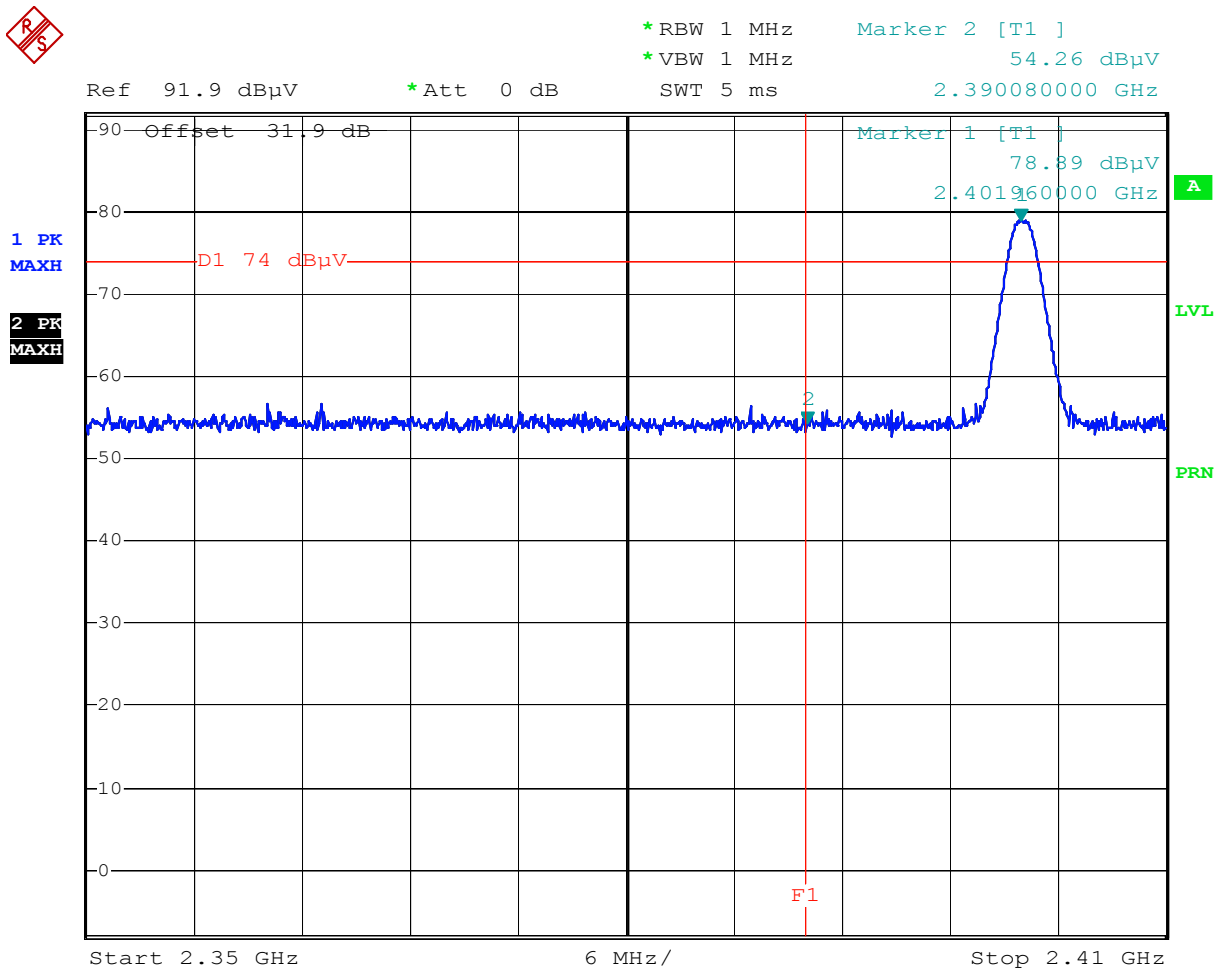
Frequency MHz	Detector	RA dB(uV)	AG dB	CF dB	AF dB(1/m)	FS at 3m dB(uV/m)	FS Limit dB(uV/m)	Margin dB
4882.0	Peak	55.2	35.0	7.1	33.0	60.3	74.0	-13.7
4882.0	Average	35.2	35.0	7.1	33.0	40.3	54.0	-13.7
7323.0	Peak	35.2 *	34.2	9.7	36.1	46.8	54.0	-7.2
9764.0	Peak	35.8 *	34.5	10.5	38.4	50.2	54.0	-3.8
12205.0	Peak	32.0 *	36.6	14.0	39.1	48.5	54.0	-5.5

Channel # 78, 2480 MHz

Frequency MHz	Detector	RA dB(uV)	AG dB	CF dB	AF dB(1/m)	FS at 3m dB(uV/m)	FS Limit dB(uV/m)	Margin dB
4960.0	Peak	52.2	35.0	7.1	33.0	57.3	74.0	-16.7
4960.0	Average	32.2	35.0	7.1	33.0	37.3	54.0	-16.7
7440.0	Peak	35.5 *	34.2	9.7	36.1	47.1	54.0	-6.9
9920.0	Peak	36.0 *	34.5	10.5	38.4	50.4	54.0	-3.6
12400.0	Peak	32.3 *	36.6	14.0	39.1	48.8	54.0	-5.2

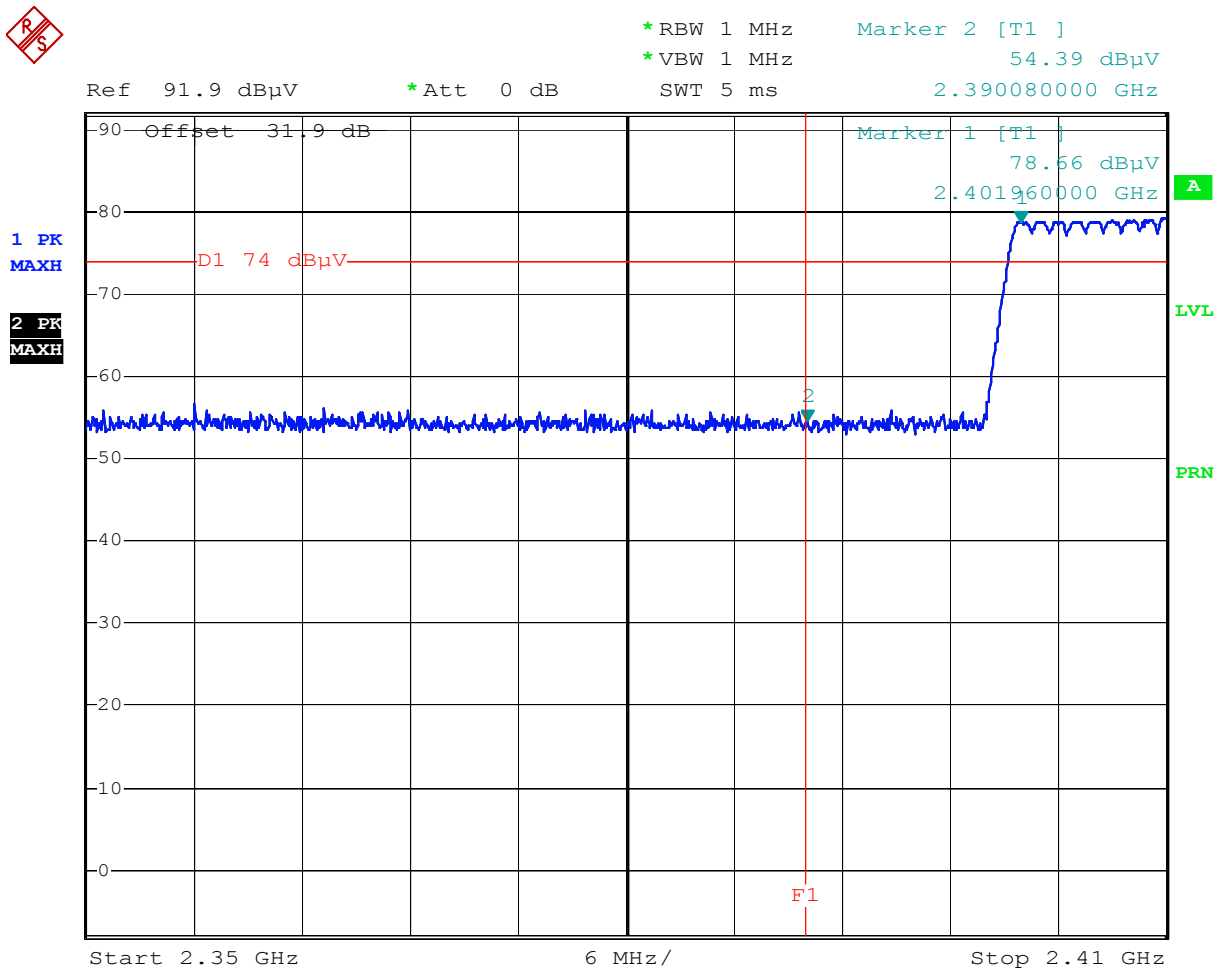
a) RBW = 1 MHz, VBW = 1 MHz - for peak measurements
   RBW = 1MHz, VBW = 100 Hz - for average measurements
b) * Noise floor
c) All other emissions not reported are at least 6 dB below the limit

Graph 7.1



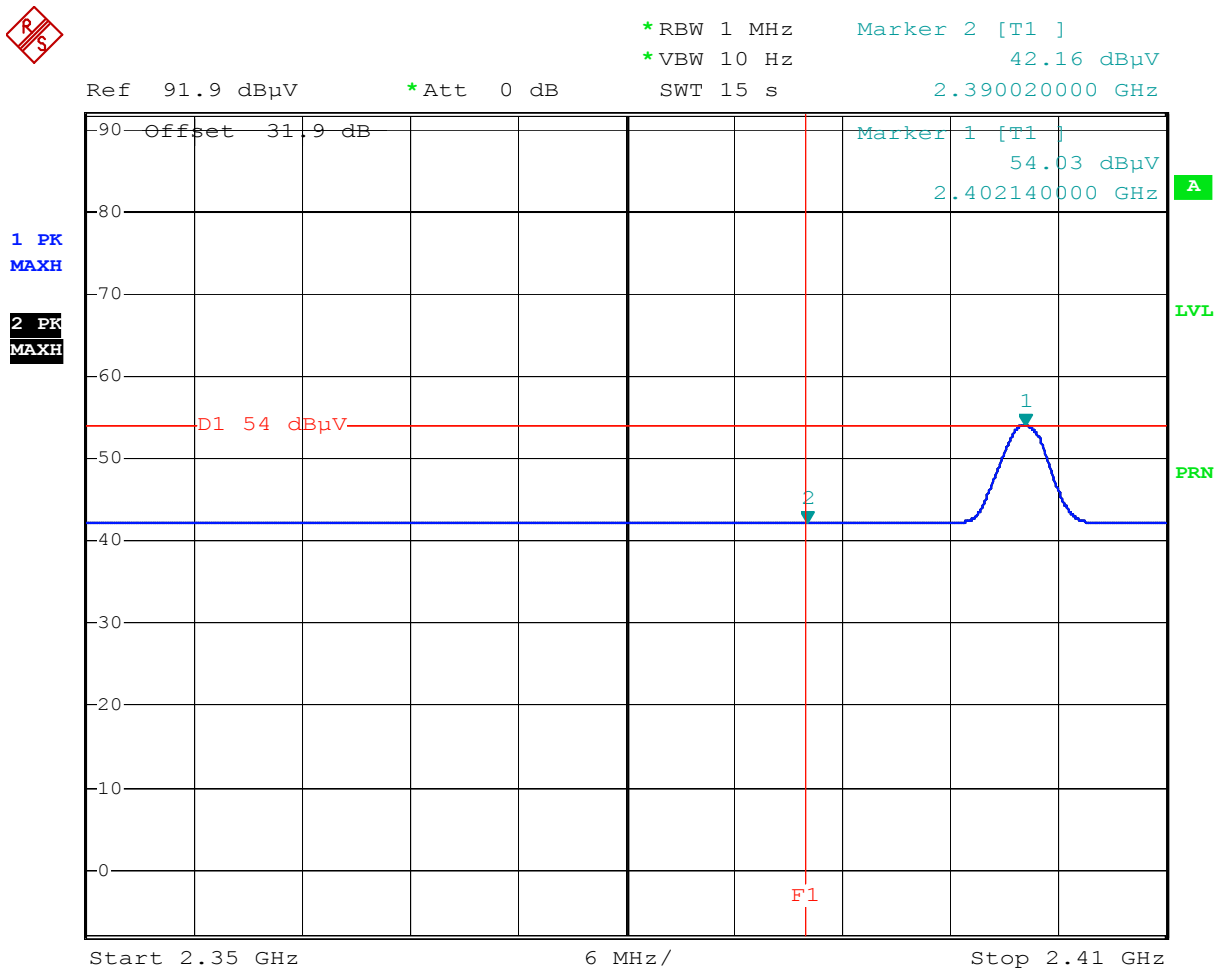
Comment: Emissions on band-edge frequency, peak, Ch 0
Date: 28.APR.2008 23:17:52

Graph 7.2



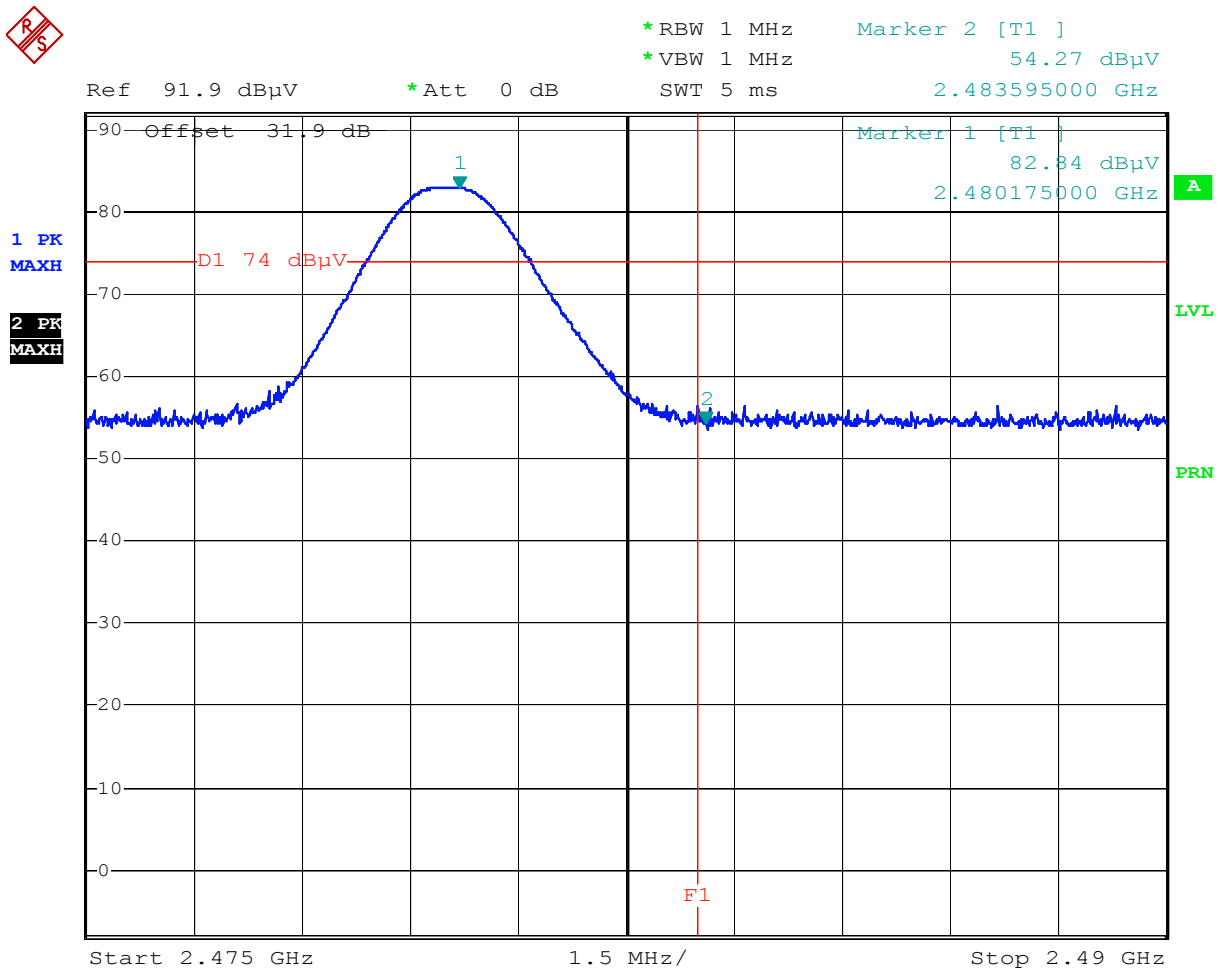
Comment: Emissions on band-edge frequency, peak, hopping
Date: 28.APR.2008 23:19:50

Graph 7.3



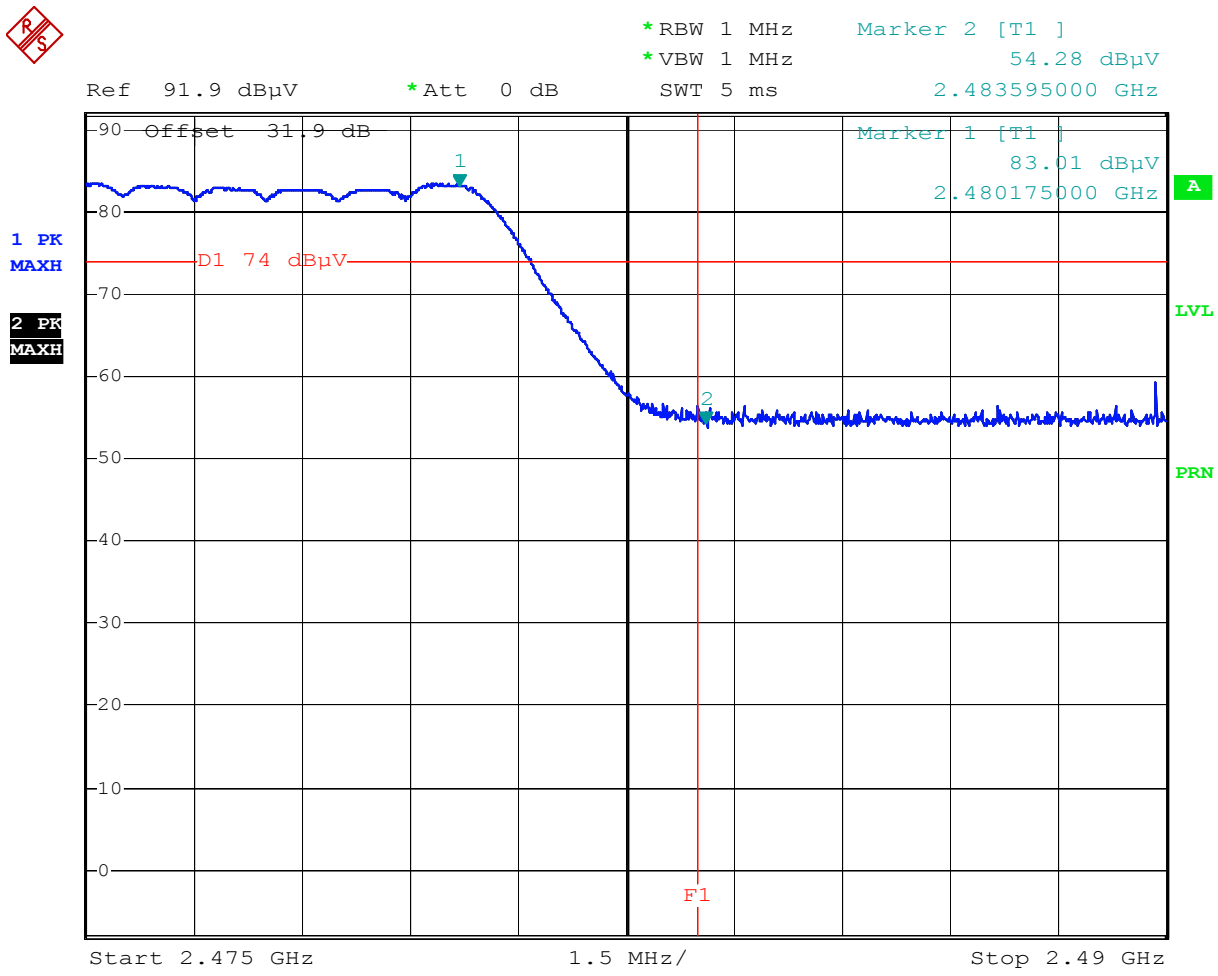
Comment: Emissions on band-edge frequency, average, Ch 0
Date: 28.APR.2008 23:22:50

Graph 7.4



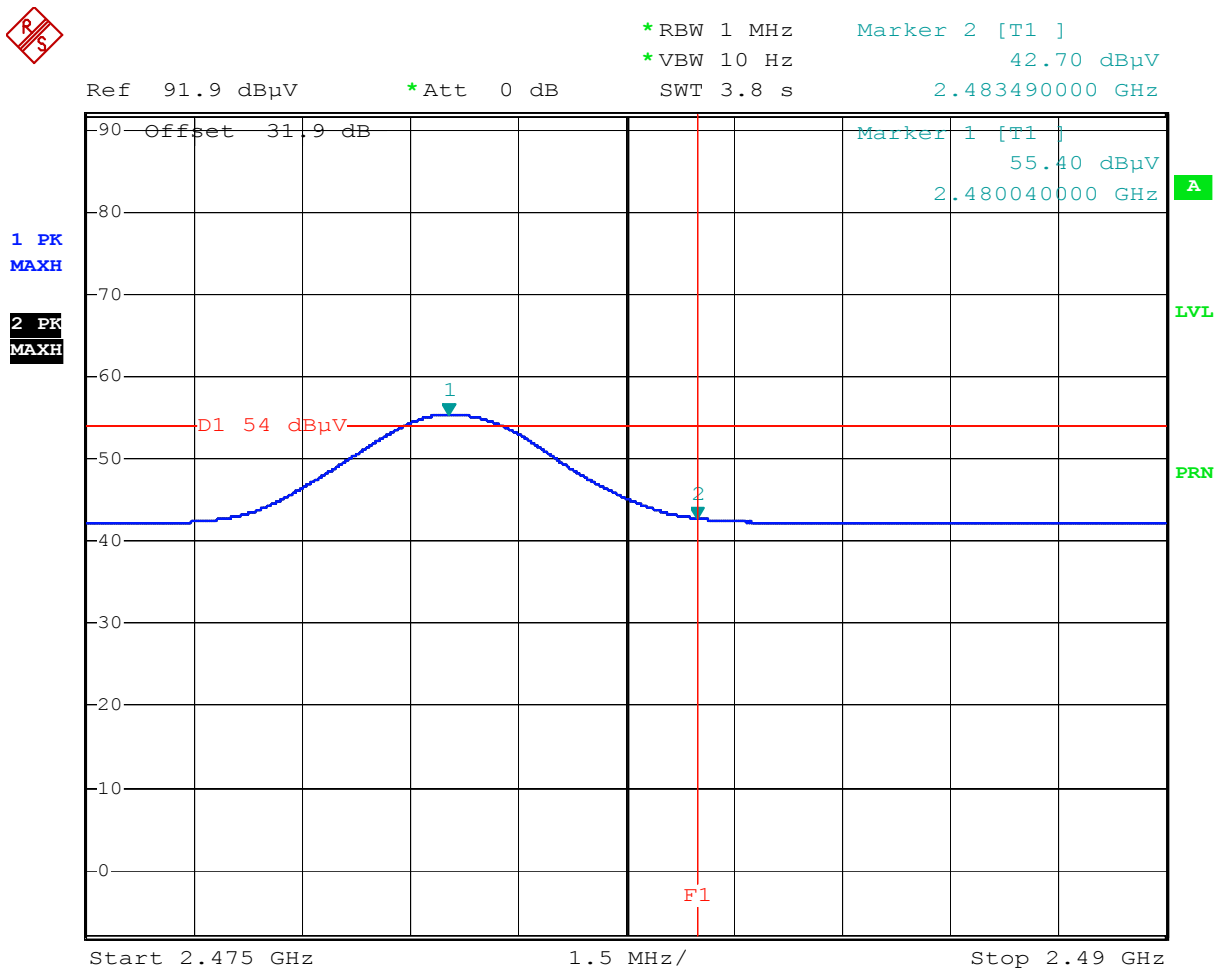
Comment: Emissions on band-edge frequency, peak, Ch 78
Date: 28.APR.2008 23:06:24

Graph 7.5



Comment: Emissions on band-edge frequency, hopping, peak
Date: 28.APR.2008 23:07:56

Graph 7.6



Comment: Emissions on band-edge frequency, average, Ch 78
Date: 28.APR.2008 23:10:43

4.8 Radiated Emissions from digital part
FCC Ref: 15.109

Test Limit

Limits for Electromagnetic Radiated Emissions, FCC Section 15.109(b) and ICES 003 *

Frequency (MHz)	Class A at 10m dB(µV/m)	Class B at 3m dB(µV/m)
30-88	39	40.0
88-216	43.5	43.5
216-960	46.4	46.0
Above 960	49.5	54.0

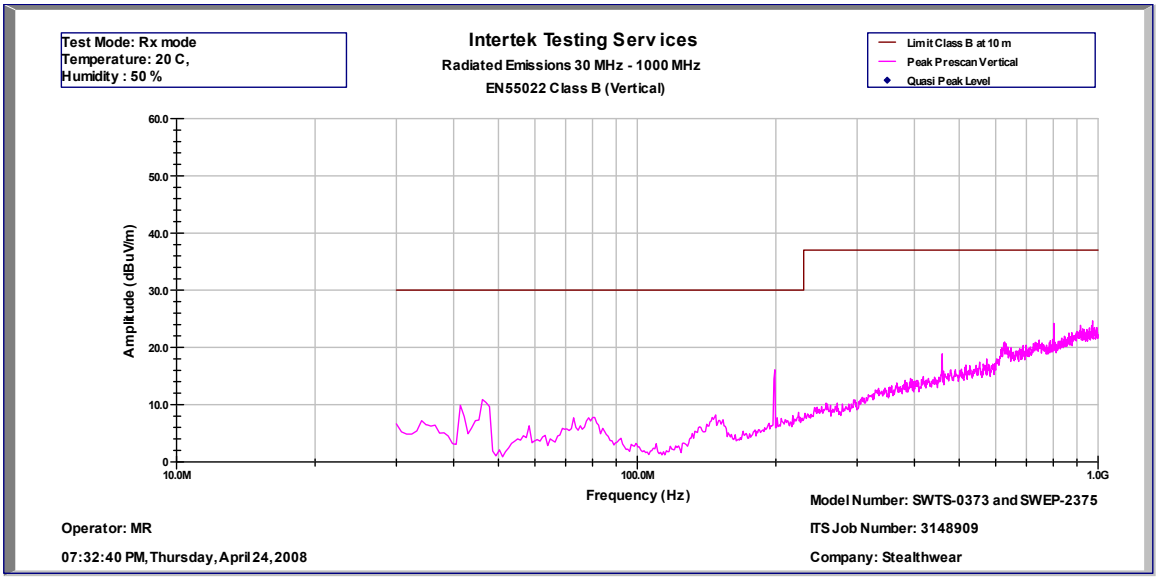
* According to FCC Part 15.109(g) an alternative to the radiated emission limits shown above, digital devices may be shown to comply with the limit of CISPR Pub. 22

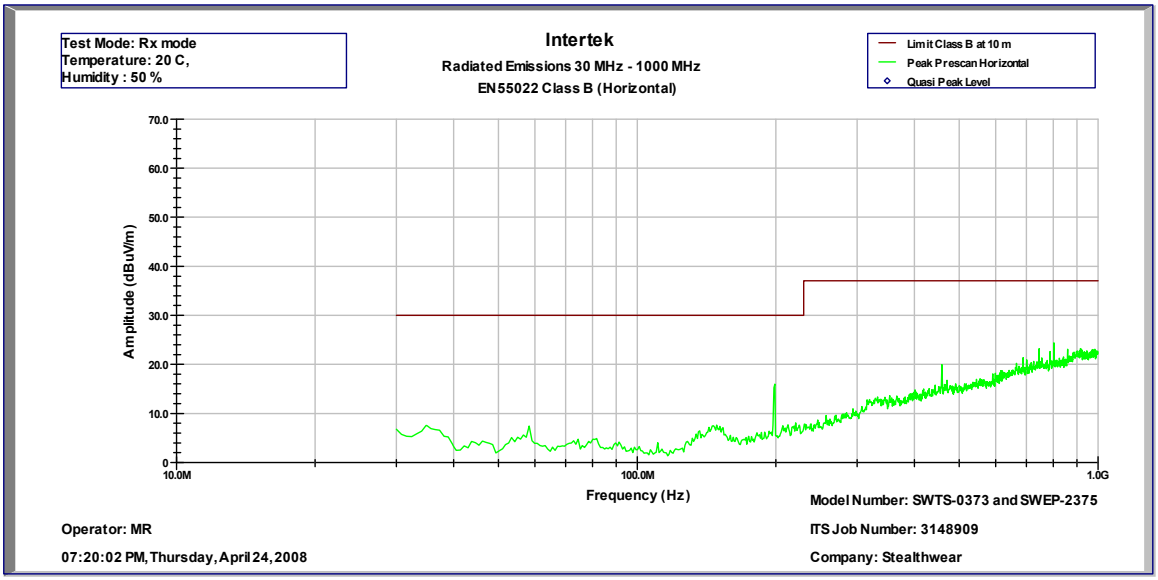
Test Results

Radiated emission measurements were performed from 30 MHz to 1000 MHz. Spectrum Analyzer Resolution Bandwidth is 100 kHz or greater below 1000 MHz and 1 MHz - above 1000 MHz.

Refer to the following Graphs for the test result.

Note: Both Wireless Headset and Wireless Remote were tested simultaneously.





Result:	**Complies** with Class B requirements by 15 dB

4.9 RF Exposure evaluation

The EUT is a Bluetooth device used in portable application, less than 20 cm from any body part of the user or nearby persons.

The maximum EIRP is -6.7 dBm or 0.21 mW. Since this level is well below the low threshold level, which is 25 mW for 2.4 GHz band, the EUT is excluded from SAR testing.

EUT is considered to comply with SAR requirement without testing.

5.0 List of test equipment

Measurement equipment used for emission compliance testing utilized the equipment on the following list:

Equipment	Manufacturer	Model/Type	Serial #	Cal Int	Cal Due
EMI Receiver	Hewlett Packard	8546A	3710A00373	12	10/02/08
Spectrum Analyzer	R & S	FSP40	036612004	12	10/01/08
BI-Log Antenna	EMCO	3143	9509-1160	12	09/05/08
Horn Antenna	EMCO	3115	8812-3049	12	07/16/08
Horn Antenna	EMCO	3160-09	Not Labeled	#	#
Pre-Amplifier	Sonoma Inst.	310	185634	12	09/26/08
Pre-Amplifier	Miteq	AMF-4D-001180-24-10P	799159	12	07/13/08
Pre-amplifier	CTT	ACO/400	47526	12	07/13/08

No Calibration required

6.0 Document History

Revision/ Job Number	Writer Initials	Date	Change
1.0 / 3148909	DC	April 30, 2008	Original document