

Test & Certification Center (TCC) - Dallas

FCC ID: GMLRM-88
Test Report #: WR895.002
Amended A
17-Jan-06

Accredited Laboratory
Certificate Number: 1819-01

Ver 2.0

Bluetooth Test Report

Test Report Number: **WR895.002****Terminal device:**

FCC ID: **GMLRM-88** Model: **E 62-1** Type: **RM-88** HW: **4004** SW: **Vp5.4002.00**
(Detailed information is listed in section 4).

Originator: Michael Sundstrom
Function: TCC - Dallas – EMC
Version/Status: 1.0 / Approved
Location: TCC Directories
Date: 17-Jan-06

Change History:

Version	Date	Status	Handled By	Comments
0.1	14-Dec-05	Draft	Michael Sundstrom	
0.2	14-Dec-05	Review	Hai To	
1.0	14-Dec-05	Approved	Hai To	
1.1	17-Jan-06	Reviewed	Michael Sundstorm	
2.0	17-Jan-06	Approved	Hai To	ATCB003101

Testing laboratory:

Test & Certification Center (TCC) Dallas
Nokia Mobile Phones
6021 Connection Drive
Irving, Texas 75039
U.S.A.
Tel. 972-894-5000
Fax.

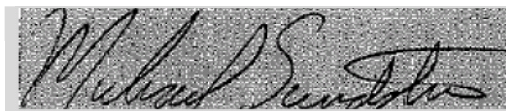
Client:

Nokia Inc.
Nokia Mobile Phones
6021 Connection Drive
Irving, Texas 75039
U.S.A.
Tel. 972-894-5000

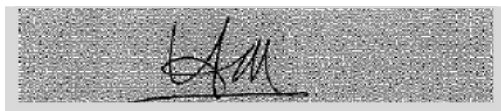
Date and signatures:

17-Jan-06

For the contents:



Michael Sundstrom
Operator Review



Hai To
Technical Review

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1. GENERAL

1.1 Quality System

The quality system in place for TCC-Dallas conforms to ISO/IEC 17025 and has been audited to the standard by A2LA (American Association of Laboratory Accreditation). TCC - Dallas has also been audited using the ISO 9000 Quality System, as part of Nokia Mobile Phones, Inc., by ABS (American Bureau of Shipping) Quality Evaluations Inc.

TCC-Dallas is a recognized laboratory with the Federal Communications Commission in filing applications for Certification under Parts 15 and 18, Registration Number 100060, and Industry Canada, Registration Number IC 661N.

1.2 Objective

All tests and measurement data shown was performed to determine whether the selected handset was in compliance as specified in FCC: CFR47 Parts 15.207 and 15.247.

1.3 Test Summary

Test Results: *The test result relates only to those tested devices mentioned in Section 4 of this test report.*

Test Performed	CFR 47	RSS-210	Section of Report	Complies / Does not comply / Not Tested
Carrier frequency separation	15.247 (a)(1)	6.2.2 (o), a1	7	Complies
Number of hopping frequencies	15.247 (a)(1)(iii)	6.2.2 (o), a3	8	Complies
Time of occupancy	15.247 (a)(1)(iii)	6.2.2 (o), a3	9	Complies
20dB bandwidth	15.247 (a)(1)	6.2.2 (o), a1	10	Complies
Peak output power	15.247 (b)(1)	6.2.2 (o), a3	11	Complies
Band-edge compliance of RF emissions	15.247 (c)	6.2.2 (o), e1	12	Complies
AC powerline conducted emissions	15.207	6.6	13	Complies

2. STANDARDS BASIS

Testing has been carried out in accordance with:

REF.	Code of the standard	Name of the standard
1	ANSI C63.4	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9kHz to 40GHz.
2	FCC: CFR 47 Part 15	Code of Federal Regulations (CFR) Title 47, Part 15 – Radio Frequency Devices: Subpart B – Unintentional Radiators and Subpart C – Intentional Radiators
3	CISPR 22 / EN55022	Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement.
4	ICES-003	Digital Apparatus, Industry Canada
5	RSS-210	Low Power License-Exempt Radio communication Devices (All Frequency Bands)
6	RSS-212	Test Facilities and Test Methods for Radio Equipment, Industry Canada (Provisional)
7	RSP-100	Radio Equipment Certification Procedure

Note: Unless otherwise stated, (by reference to a version number and a publication date), the latest version of the above documents applies.

Deviations:

Not Applicable.

3. LIST OF ABBREVIATIONS, ACRONYMS AND TERMS

3.1 Abbreviations

dB - decibel

dBm - decibels per milliwatt (absolute measurement)

dB μ V - decibel per microvolt

dB μ V/m - decibel of microvolt per meter

GHz - gigahertz or 1000000000 hertz

kHz - kilohertz or 1000 hertz

MHz - megahertz or 1000000 hertz

ms - millisecond or 0.001 second

μ s - microsecond or 0.000001 second

3.2 Acronyms

BT - Bluetooth

EMC - Electromagnetic Compatibility

EMI - Electromagnetic Interference

EUT - Equipment under Test

PRBS - Pseudo Random Bit Sequence

RF - Radio Frequency

3.3 Terms

Base Station Simulator (BSS) - simulates all the necessary signals that a phone would experience while on a live network. There are many types of base station simulators catering for all current protocols, i.e., GSM, AMPS, TDMA, and CDMA.

4. EQUIPMENT-UNDER-TEST (EUT)

The results in this report relate only to the items listed below:

4.1 Description of Tested Device(s):

Test Performed	Mode of Operation	Date of Receipt	Condition of Sample	Item	Identifying Information
47CFR15.247	Bluetooth Hopping	13-Dec-05	Operational	Phone	IMEI:001004/00/192406/8 FCC ID: GMLRM-88 Type: RM-88 HW: 4004 SW: Vp5.4002.00
FCC Part 15.207	Bluetooth Hopping	13-Dec-05	Operational	Phone	IMEI:001004/00/192913/3 FCC ID: GMLRM-88 Type: RM-88 HW: 4004 SW: Vp5.4002.00
N/A	N/A	N/A	N/A	Battery	Type: BP-5L Other: 3.7 V
N/A	N/A	N/A	N/A	Charger	Type: ACP-4U
N/A	N/A	N/A	N/A	Headset	Type: HS-40

5. TEST EQUIPMENT LIST

The listing below indicates the test equipment utilized for the test (s). Calibration interval on all items listed can be obtained from the Engineering Services Group within NMP, Product Creation - Dallas. Where relevant, measuring equipment is subjected to in-service checks between testing. TCC - Dallas shall notify clients promptly, in writing, of identification of defective measuring equipment that casts doubt on the validity of results given in this report.

Section of Report	NMP#	Test Equipment	Mfr. #	Model #	Calibration Due Date	Calibration Interval
13	03008	LISN	EMCO	3816/2	23-Aug-06	12 months
	N/A	10dB Attenuator	Weinschel	Model 2	N/A	N/A
7,8,9,10,11,12,13	02666	Base Station	R&S	CMU 200	25-May-06	12 months
13	02664 / 02665	EMI Receiver	Hewlett Packard	8546 / 85460A	09-Feb-06	12 months
7,8,9,10,11,12		Power Splitter (must have 6 dB insertion loss)	Agilent	33120A	N/A	N/A
13	N/A	6dB Attenuator	Weinschel	Model 2	N/A	N/A
7,8,9,10,11,12	03462	Spectrum Analyzer	Rhodes & Schwartz	FSP	20-Jul-06	12 months

6. EUT TEST SETUPS

For each test the EUT was exercised to find out the worst case of operation modes and device configuration.

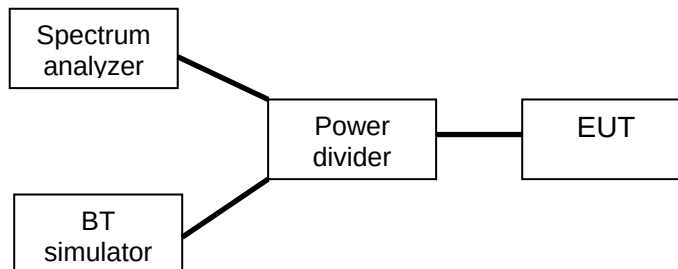
Two different test setups were used: one for conducted measurements, another for radiated measurements. One EUT was equipped with an external antenna connector for conductive measurements.

6.1 EUT test set-up A (conducted measurement)

This setup was used in conducted measurements. The Bluetooth simulator was used to control the following:

- set the EUT channel (0 – 79)
- set the number of EUT TX slots (1, 3, 5)
- set the EUT to TX, RX and TX/RX mode
- enable/disable frequency hopping
- select between several different test modulation patterns

In tests, where absolute level reporting were required, the results were corrected with all applicable factors as detailed in the result section of each measurement.



7. CARRIER FREQUENCY SEPARATION

Specification: FCC Part 15.247(a)(1); RSS-210 6.2.2(o), a1

7.1 Setup

Used test set-up: A (see section 6)

7.2 Test Results

Test Operator	Michael Sundstrom
Date of Measurement	13-Dec-05
Temperature	22-24 °C
Humidity	29-33 %RH
Test Result	Complies

7.3 EUT operation mode

EUT operation mode	Connected, DH5, Static PRBS
EUT channel	Hopping mode (Euro/US)
EUT TX power level	Nominal

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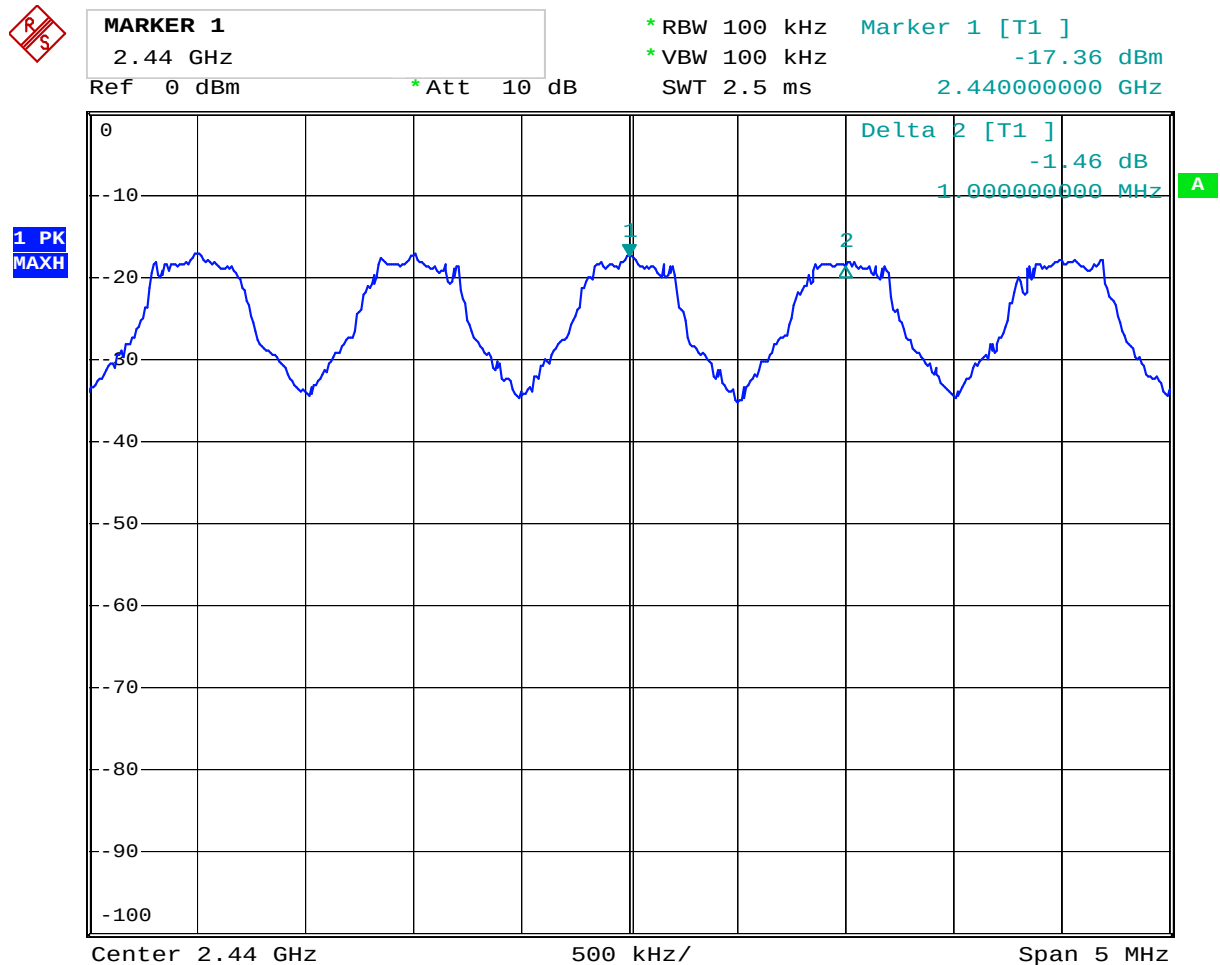
Ver 2.0

7.4 Pass/Fail Criteria

Limit (MHz)	Measured value (MHz)
≥ 0.025 or 20dB	1.0

7.5 Results

Carrier Frequency Separation of Channels 38 and 39



Date: 13.DEC.2005 19:32:51

8. NUMBER OF HOPPING FREQUENCIES

Specification: FCC Part 15.247(a)(1)(iii); RSS-210 6.2.2(o), a3

8.1 Setup

Used test set-up: A (see section 6)

8.2 Test Results

Test Operator	Michael Sundstrom
Date of Measurement	13-Dec-05
Temperature	22-24 °C
Humidity	29-33 %RH
Test Result	Complies

8.3 EUT operation mode

EUT operation mode	Connected, DH5, Static PRBS
EUT channel	Hopping Mode
EUT TX power level	Nominal

8.4 Pass/Fail Criteria

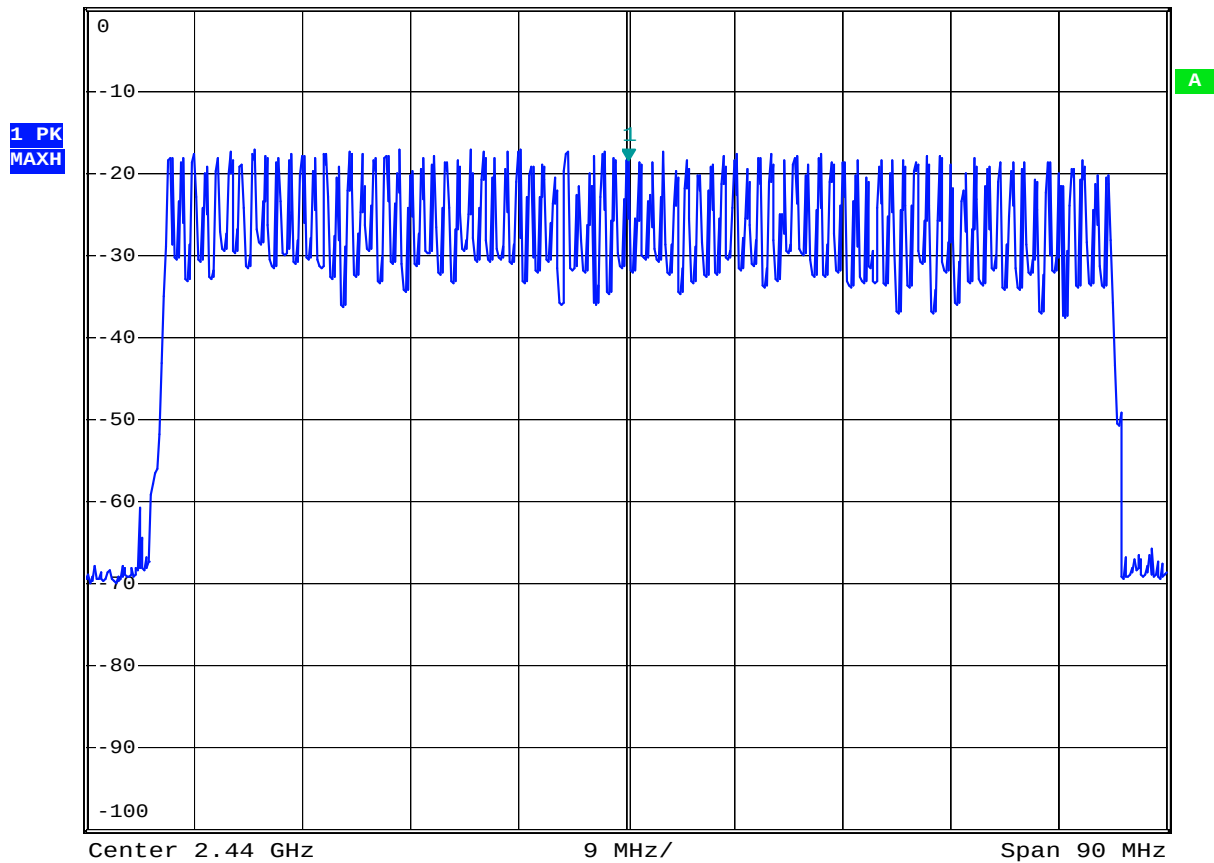
Number	Measured value
≥ 75	79

8.5 Results

Number of Hopping Channels



Ref 0 dBm * Att 10 dB RBW 100 kHz Marker 1 [T1] -18.51 dBm
VBW 100 kHz 2.440180000 GHz
SWT 10 ms



Date: 13.DEC.2005 19:42:42

9. TIME OF OCCUPANCY

Specification: FCC Part 15.247(a)(1)(iii); RSS-210 6.2.2(o), a3

9.1 Setup

Used test set-up: A (see section 6)

9.2 Test Results

Test Operator	Michael Sundstrom
Date of Measurement	13-Dec-05
Temperature	22-24 °C
Humidity	29-33 %RH
Test Result Connected mode	Complies

9.3 EUT operation mode: Connected mode

EUT operation mode	Connected, DH5, static PRBS
EUT channel	Hopping mode
EUT TX power level	Nominal

9.4 Pass/Fail Criteria

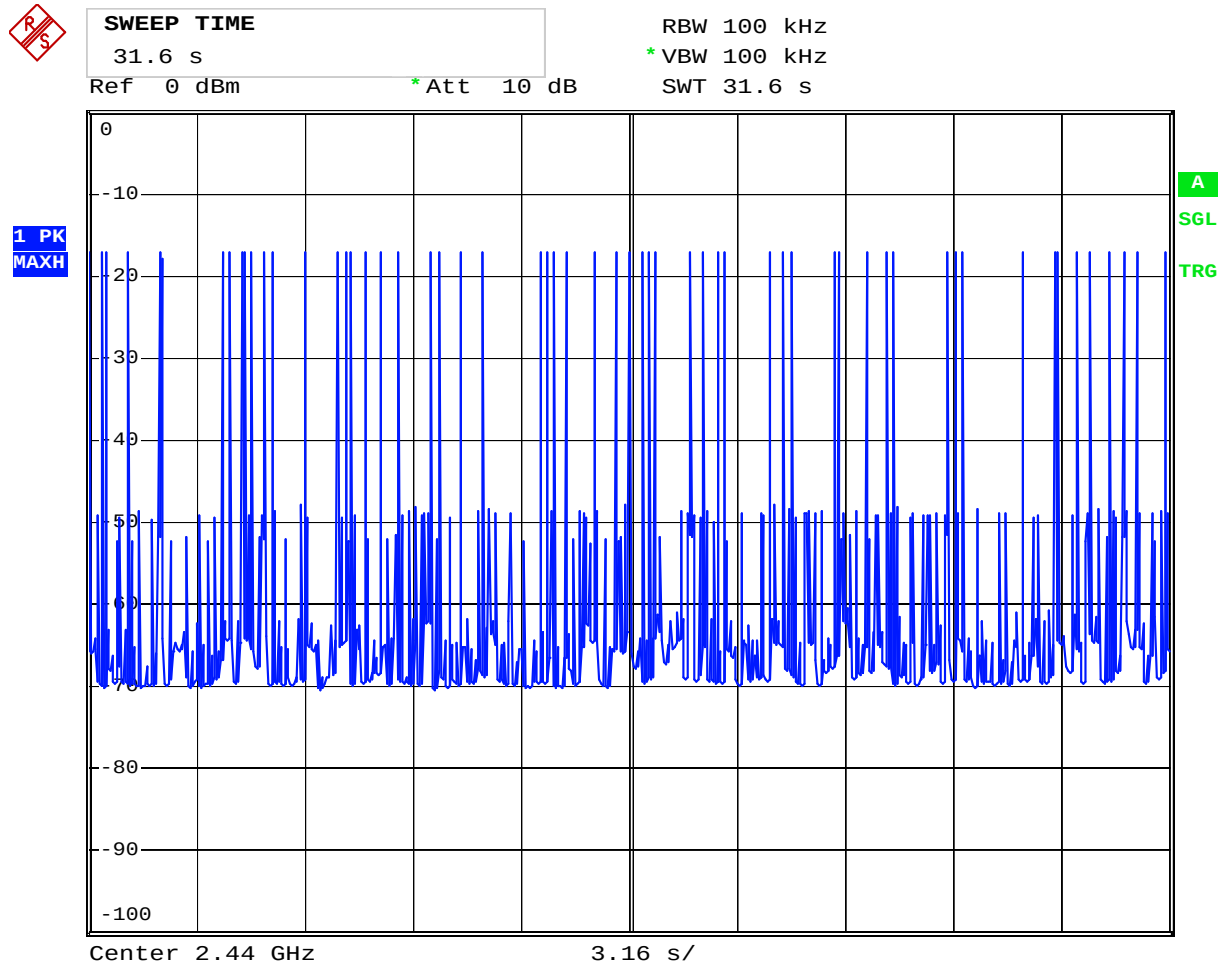
Number of transmissions	Duration of transmissions (ms)	Time of Occupancy (ms)	Limit (ms)
55	2.94	161.7	≤ 400

Time of Occupancy = $TX_n * TX_d$

where: TX_n = Number of transmissions in 31.6 seconds (0.4 seconds * 79 channels)
 TX_d = Duration of transmission.

9.5 Results

Number of transmissions on channel 38



Date: 13.DEC.2005 19:48:53

Duration of one transmission, channel 38



DELTA MARKER 1

2.94 ms

Ref 0 dBm

* Att 10 dB

RBW 100 kHz

Delta 1 [T1]

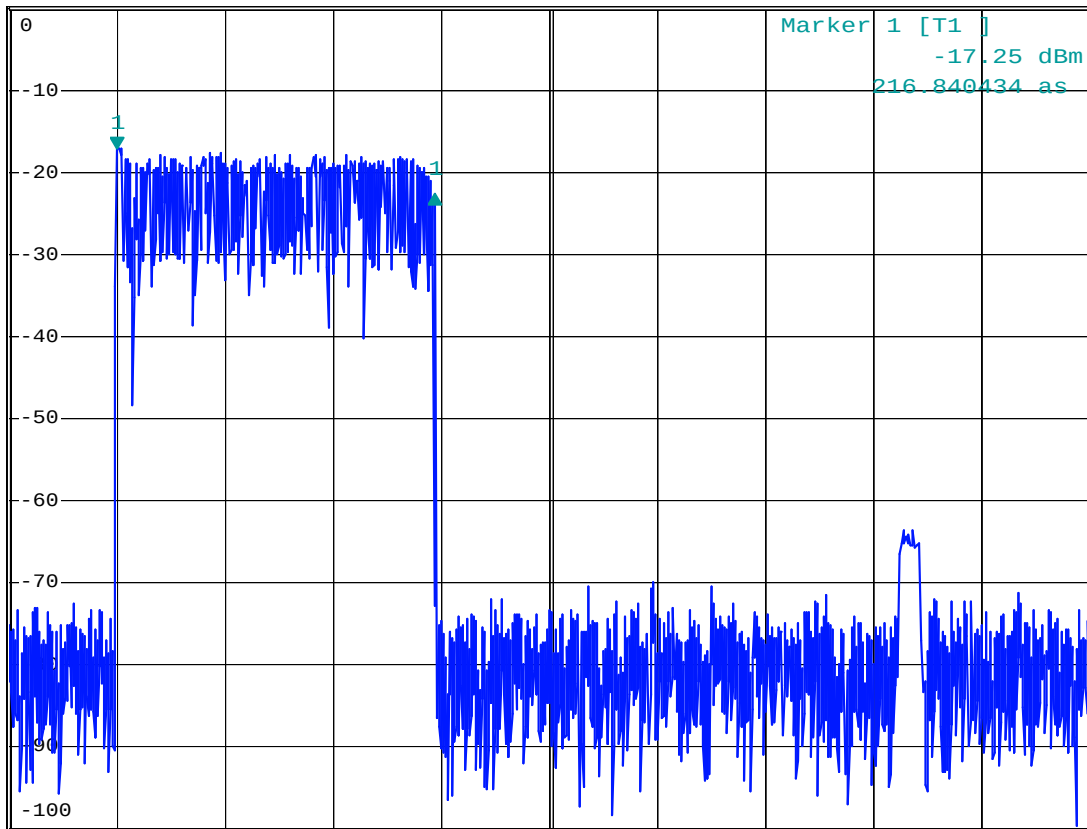
* VBW 100 kHz

-5.44 dB

SWT 10 ms

2.940000 ms

1 AP
CLRWR



A
SGL
TRG

Center 2.44 GHz

1 ms/

Date: 13.DEC.2005 19:59:40

10. 20dB BANDWIDTH

Specification: FCC Part 15.247(a)(1); RSS-210 6.2.2(o), a1

10.1 Setup

Used test set-up: A (see section 6)

10.2 Test Results

Test Operator	Michael Sundstrom
Date of Measurement	13-Dec-05
Temperature	22-24 °C
Humidity	29-33 %RH
Test Result	Complies

10.3 EUT operation mode

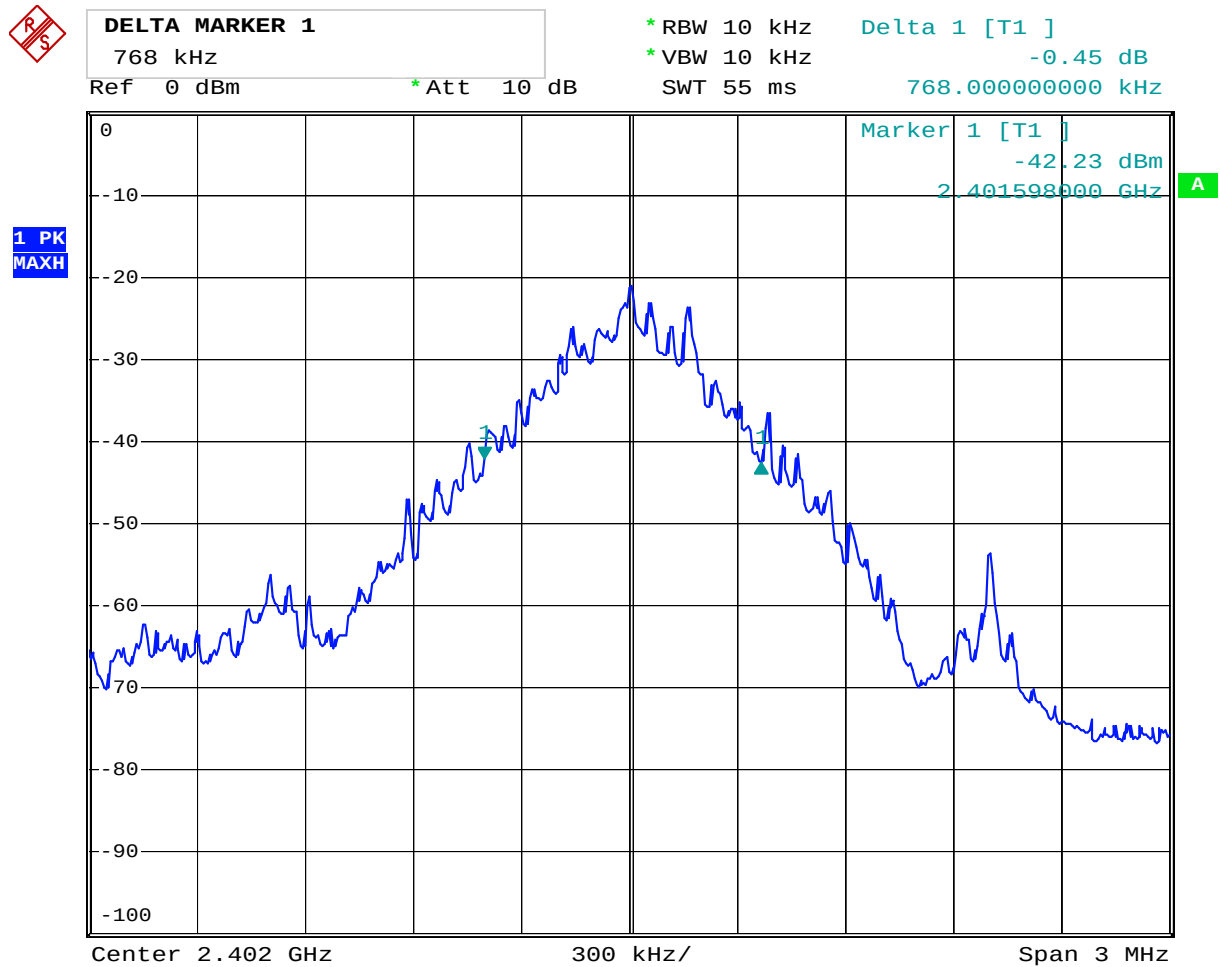
EUT operation mode	Connected, DH5, Static PRBS
EUT channel	0 (2402 MHz), 38 (2440 MHz), 78 (2480MHz)
EUT TX power level	Nominal

10.4 Pass/Fail Criteria

EUT channel	Limit (MHz)	Measured value (kHz)
0	≤ 1.0	768
38		762
78		708

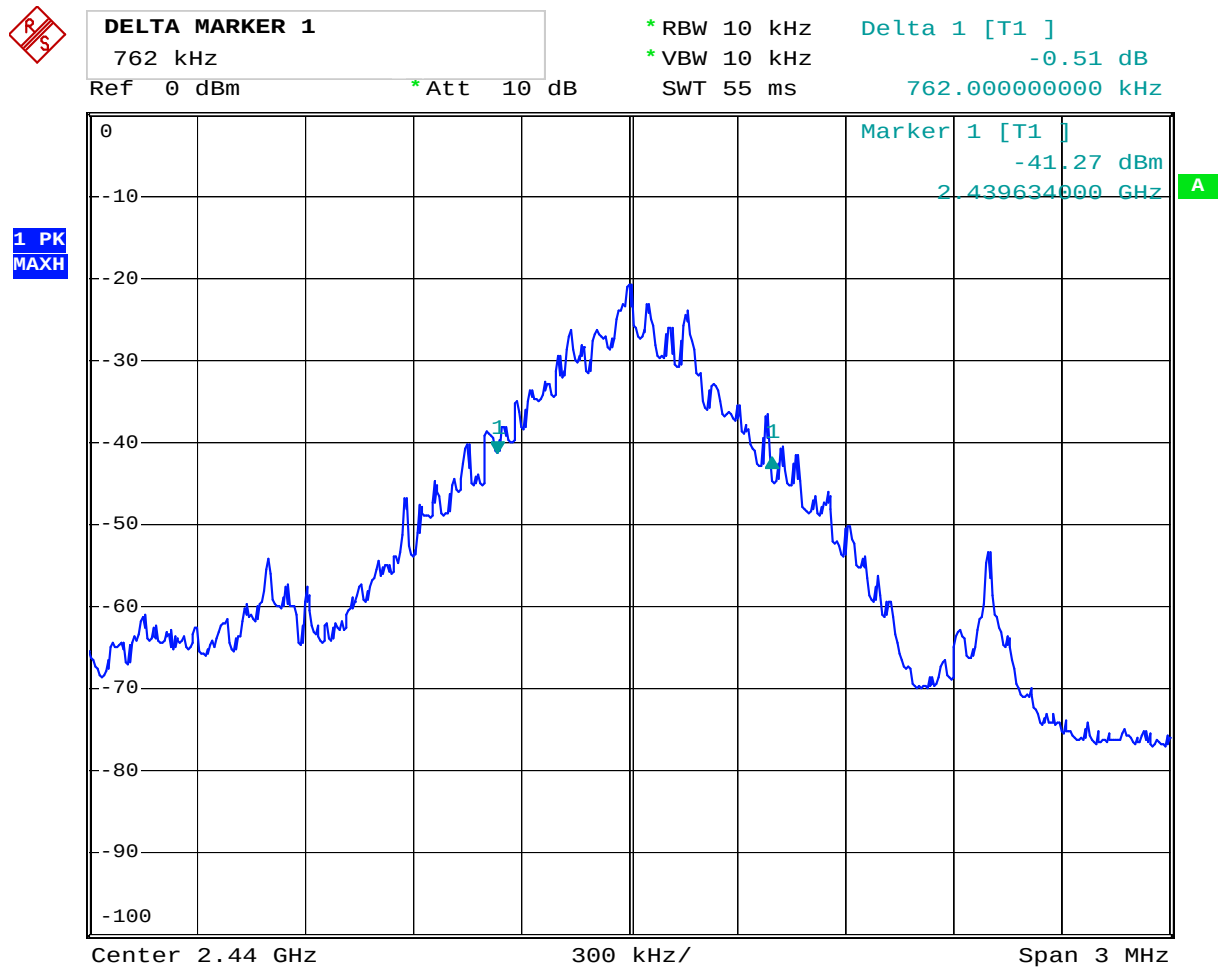
10.5 Results

20dB bandwidth, channel 0



Date: 13.DEC.2005 20:15:53

20dB bandwidth, channel 38



Date: 13.DEC.2005 20:20:20

20dB bandwidth, channel 78



DELTA MARKER 1

708 kHz

Ref 0 dBm

* Att 10 dB

* RBW 10 kHz

* VBW 10 kHz

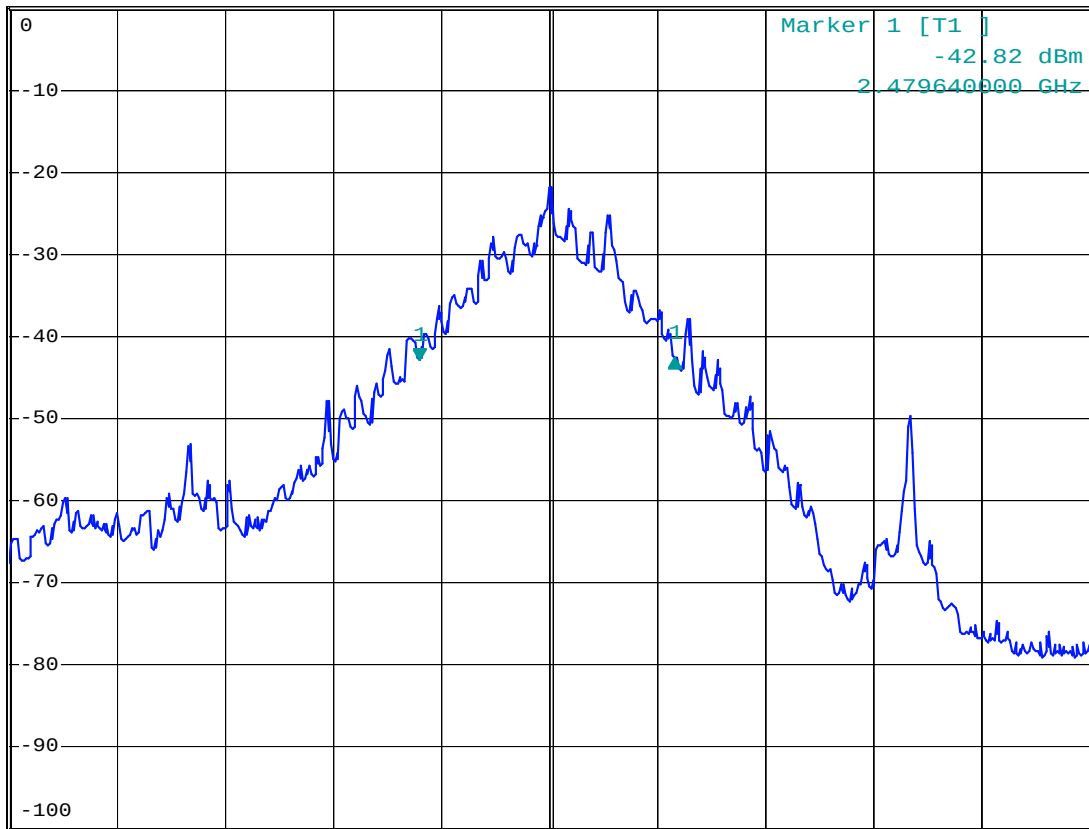
SWT 55 ms

Delta 1 [T1]

0.06 dB

708.000000000 kHz

1 PK
MAXH



Center 2.48 GHz

300 kHz/

Span 3 MHz

Date: 13.DEC.2005 20:21:59

11. PEAK OUTPUT POWER

Specification: FCC Part 15.247(b)(1); RSS-210 6.2.2(o), a3

11.1 Setup

Used test set-up: A (see section 6)

11.2 Test Results

Test Operator	Michael Sundstrom
Date of Measurement	13-Dec-05
Temperature	22-24 °C
Humidity	29-33 %RH
Test Result	Complies

11.3 EUT operation mode

EUT operation mode	Connected, DH5, Static PRBS
EUT channel	0 (2402 MHz), 38 (2440 MHz), 78 (2480MHz)
EUT TX power level	Nominal

11.4 Pass/Fail Criteria

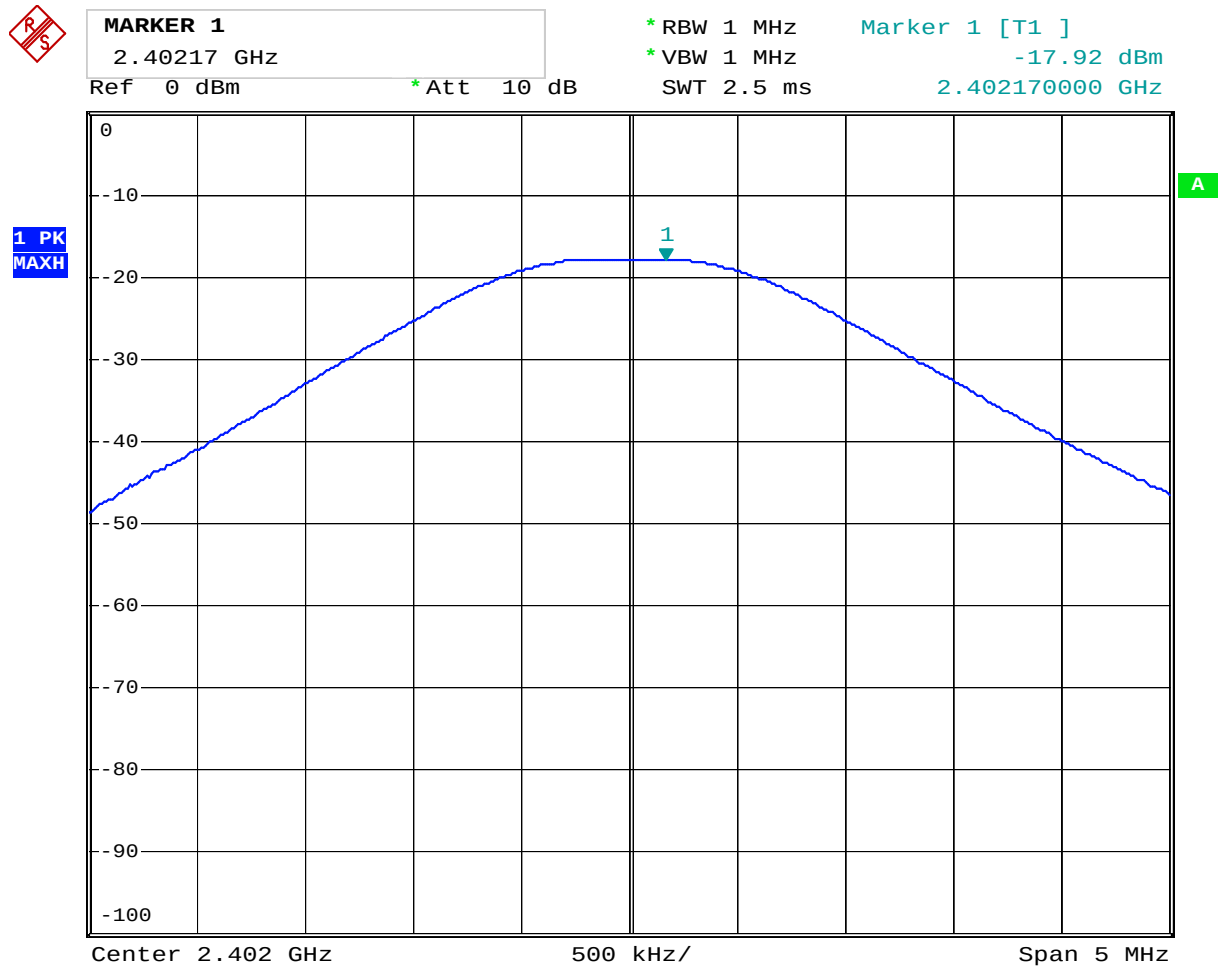
EUT channel	Limit (W)	Test result (mW)
0	≤ 1.0	0.673
38		0.676
78		0.488

The measured power values were corrected with the attenuation of the cables, attenuator and power divider using the formula:

EUT channel	Trace value (dBm)	Cable loss (dB)	Divider loss (dB)	Peak output power (dBm)	Peak output power (mW)
0	-17.92	10.2	6	-1.72	0.673
38	-17.9	10.2	6	-1.7	0.676
78	-19.34	10.2	6	-3.12	0.488

11.5 Results

Peak output power, channel 0



Date: 13.DEC.2005 20:27:44

Peak output power, channel 38



MARKER 1

2.44013 GHz

Ref 0 dBm

* Att 10 dB

* RBW 1 MHz

* VBW 1 MHz

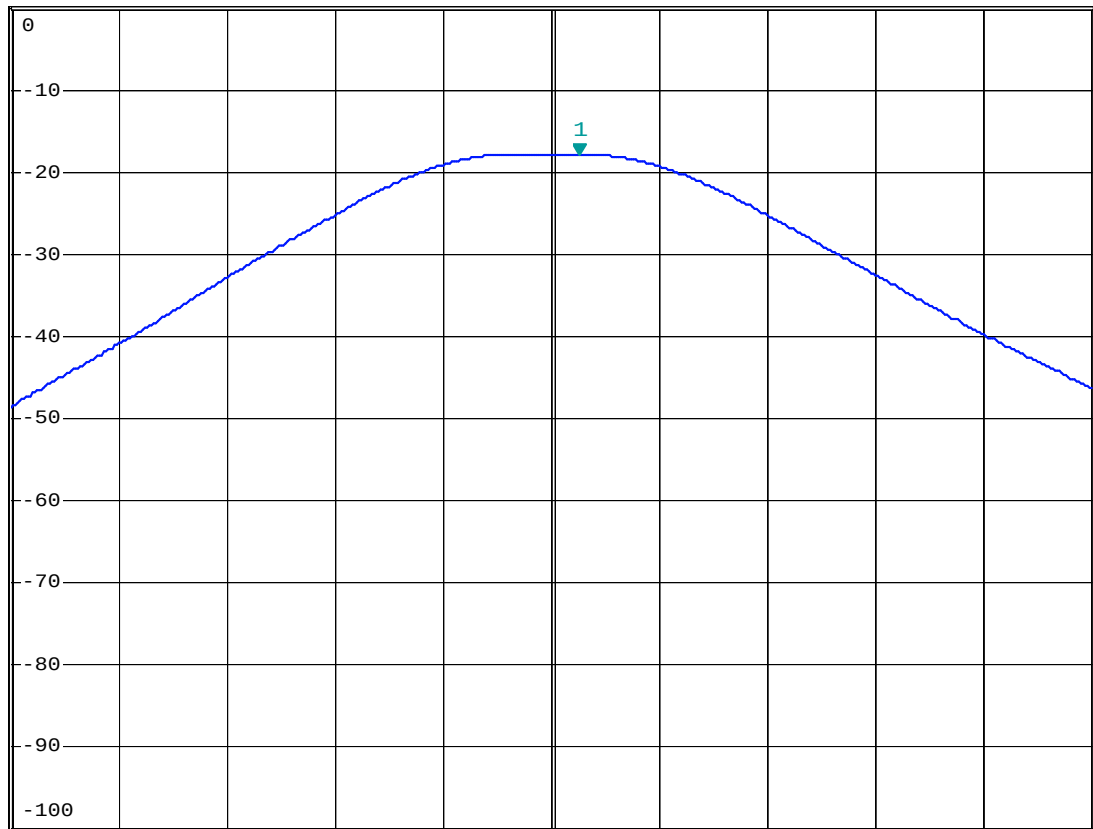
SWT 2.5 ms

Marker 1 [T1]

-17.90 dBm

2.440130000 GHz

1 PK
MAXH



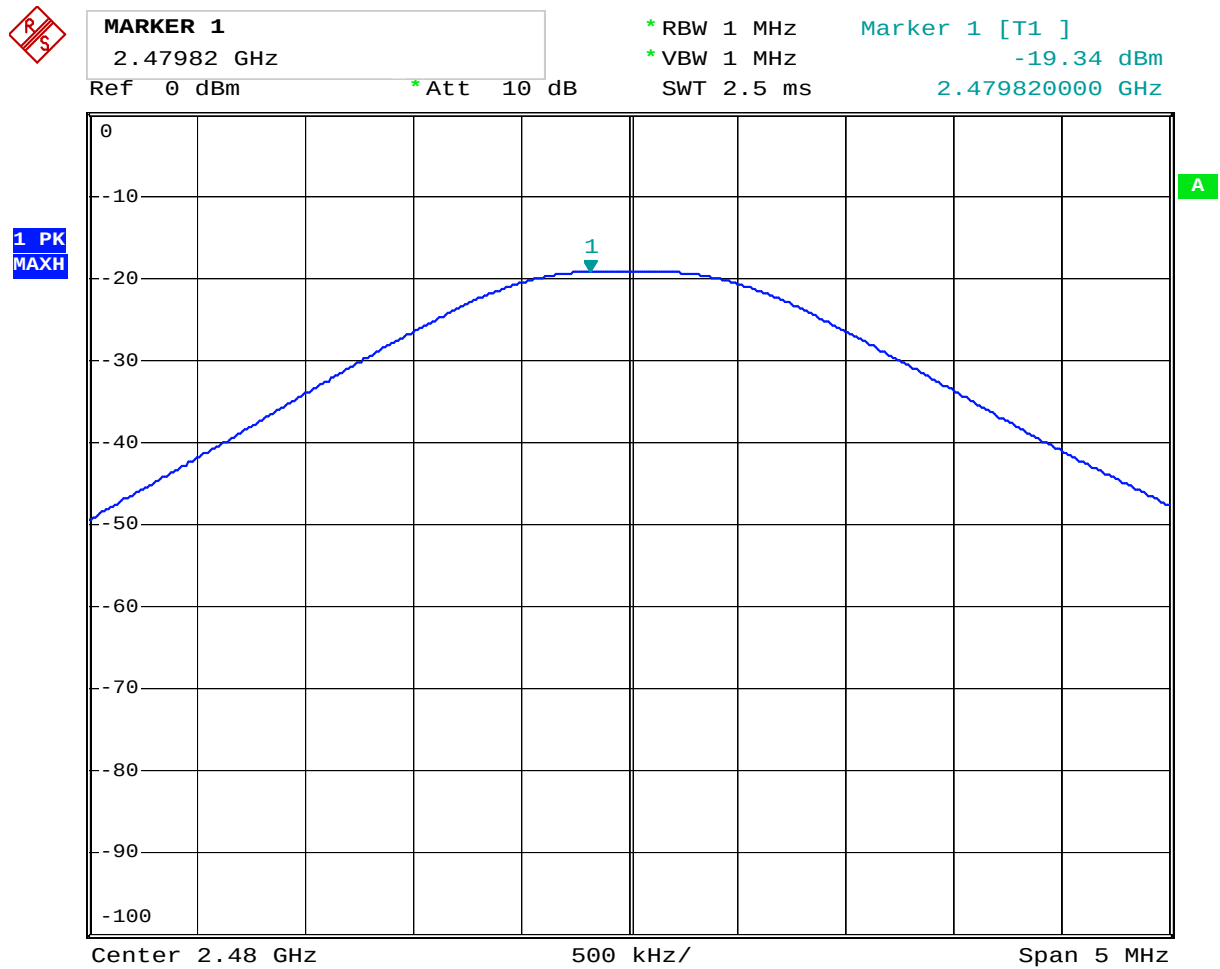
Center 2.44 GHz

500 kHz/

Span 5 MHz

Date: 13.DEC.2005 20:27:04

Peak output power, channel 78



Date: 13.DEC.2005 20:25:17

12. BAND-EDGE COMPLIANCE OF RF CONDUCTED EMISSIONS

Specification: FCC Part 15.247(c); RSS-210 6.2.2(o), e1

12.1 Setup

Used test set-up: A (see section 6)

12.2 Test Results

Test Operator	Michael Sundstrom
Date of Measurement	13-Dec-05
Temperature	22-24 °C
Humidity	29-33 %RH
Test Result	Complies

12.3 EUT operation mode

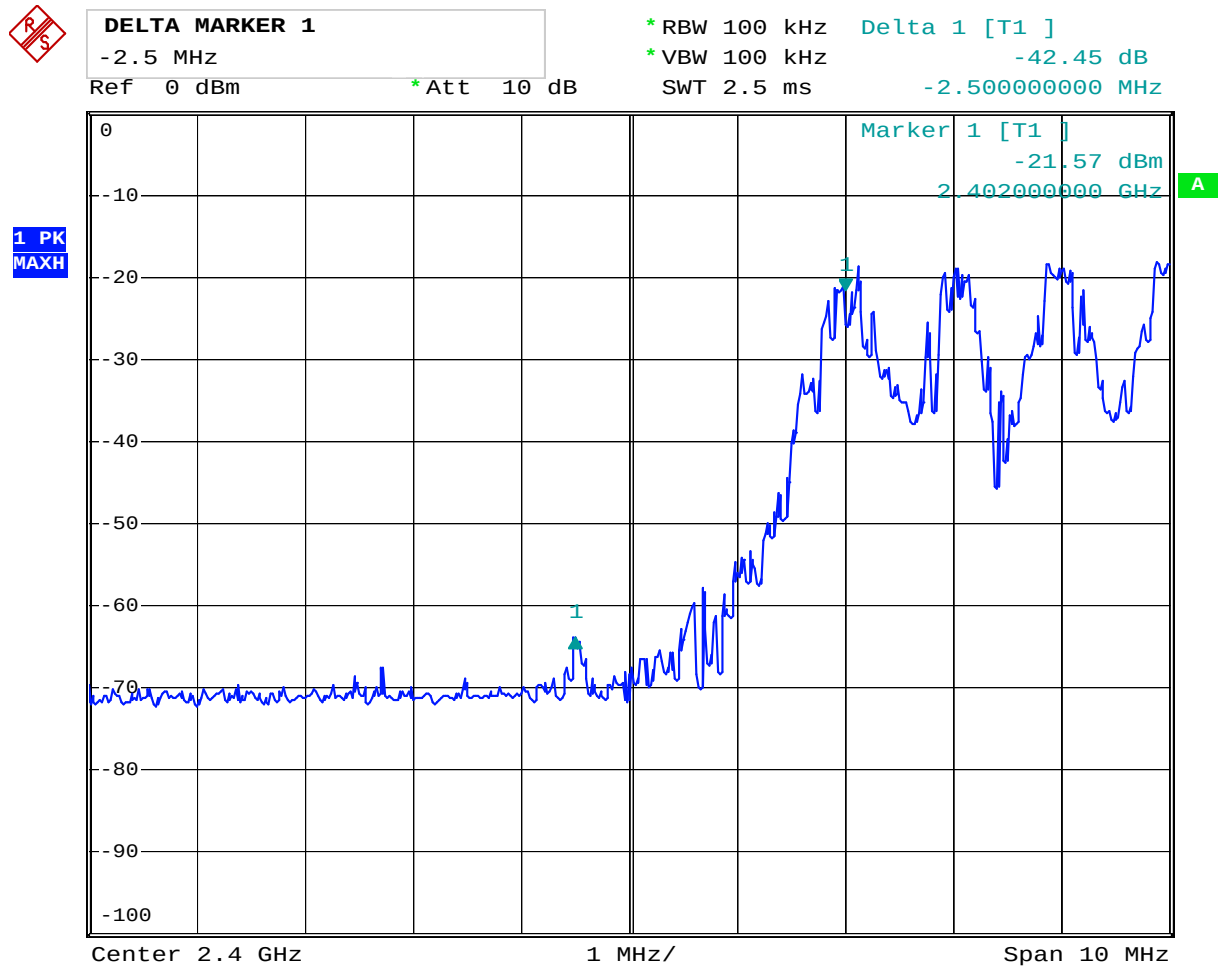
EUT operation mode	Connected, DH5, Static PRBS
EUT channel	Hopping mode, 0 (2402 MHz); 78 (2480 MHz)
EUT TX power level	Nominal

12.4 Pass/Fail Criteria

EUT channel	Limit (dBc)	Measured value (dBc)
Low End, Hopping Mode	≤ -20	-42.45
High End, Hopping Mode		-45.36
0		-44.52
78		-44.52

12.5 Results

Bandedge Compliance, Low end, hopping mode



Date: 13.DEC.2005 21:09:43

Bandedge Compliance, High end, hopping mode



DELTA MARKER 1

4.48 MHz

Ref 0 dBm

* Att 10 dB

* RBW 100 kHz

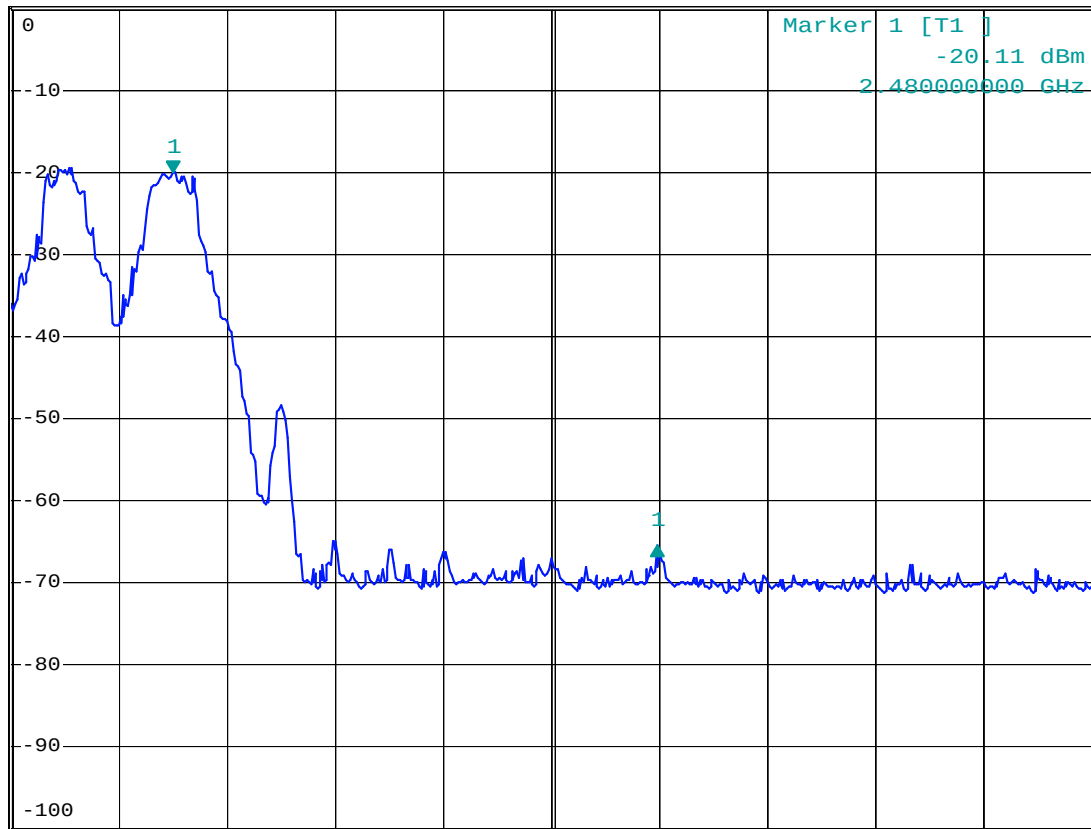
* VBW 100 kHz

SWT 2.5 ms

Delta 1 [T1]

-45.36 dB

4.480000000 MHz



Center 2.4835 GHz

1 MHz/

Span 10 MHz

Date: 13.DEC.2005 21:07:15

Bandedge Compliance, Low end, channel 0



DELTA MARKER 1

-2.48 MHz

Ref 0 dBm

* Att 10 dB

* RBW 100 kHz

* VBW 100 kHz

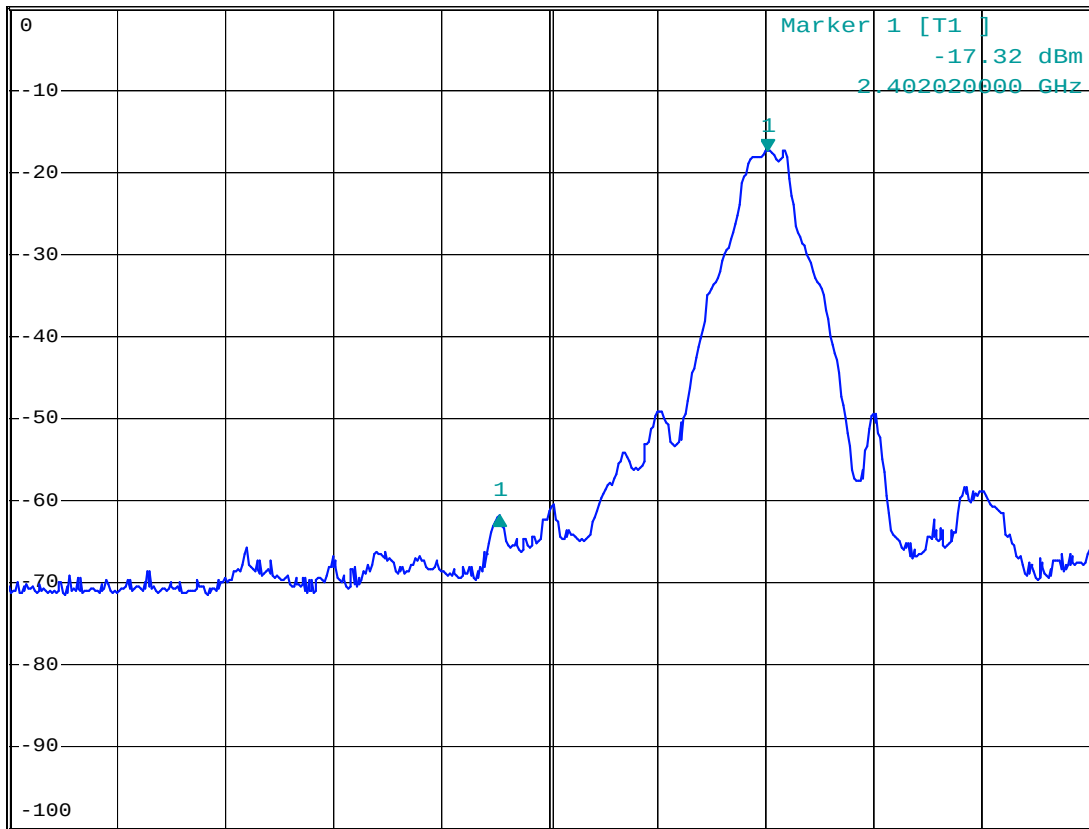
SWT 2.5 ms

Delta 1 [T1]

-44.52 dB

-2.480000000 MHz

1 PK
MAXH



Date: 13.DEC.2005 21:12:11

Bandedge Compliance, High end, channel 78



DELTA MARKER 1

4 MHz

Ref 0 dBm

* Att 10 dB

* RBW 100 kHz

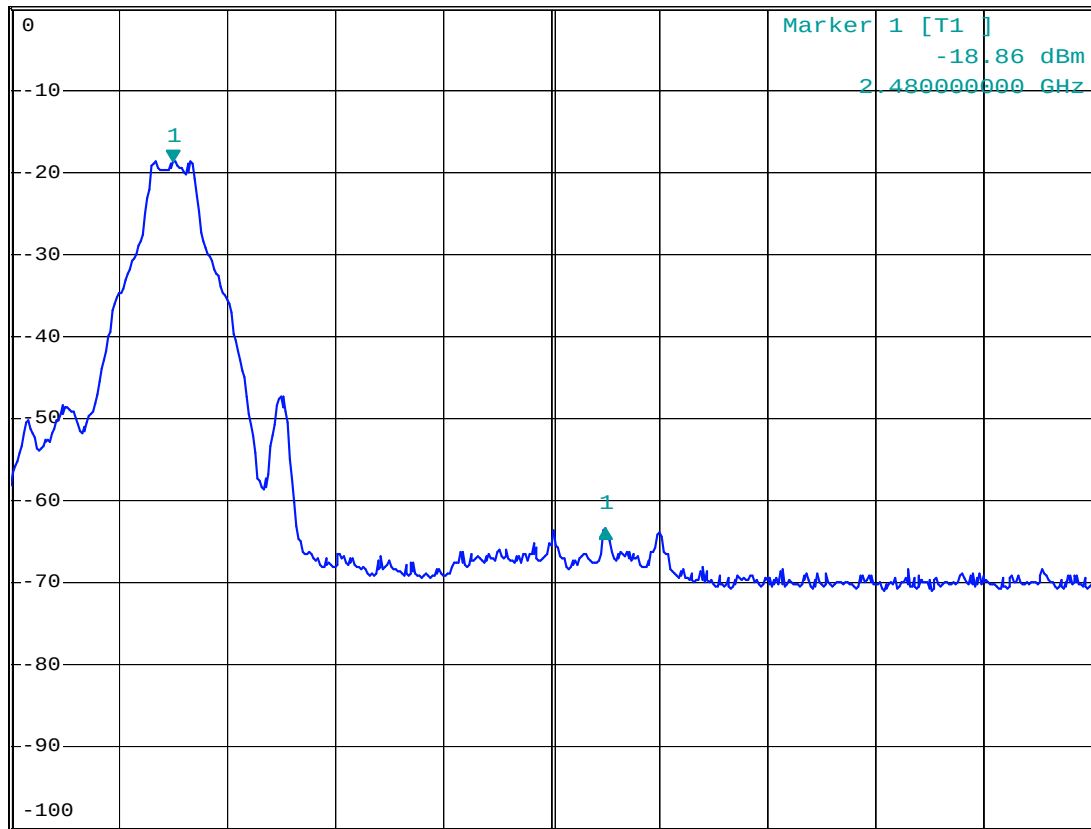
* VBW 100 kHz

SWT 2.5 ms

Delta 1 [T1]

-44.52 dB

4.000000000 MHz



1 PK
MAXH

Center 2.4835 GHz

1 MHz/

Span 10 MHz

Date: 13.DEC.2005 21:01:43

13. AC CONDUCTED EMISSIONS

Specification: FCC Part 15.207; RSS-210 6.6

13.1 Setup

Testing was performed in accordance with ANSI C63.4, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9kHz to 40GHz.

Insert photo of test setup

13.2 Test Results

Test Operator	Michael Sundstrom
Date of Measurement	14-Dec-05
Temperature	22-24 °C
Humidity	29-33 %RH
Test Result	Complies

13.3 Pass/Fail Criteria

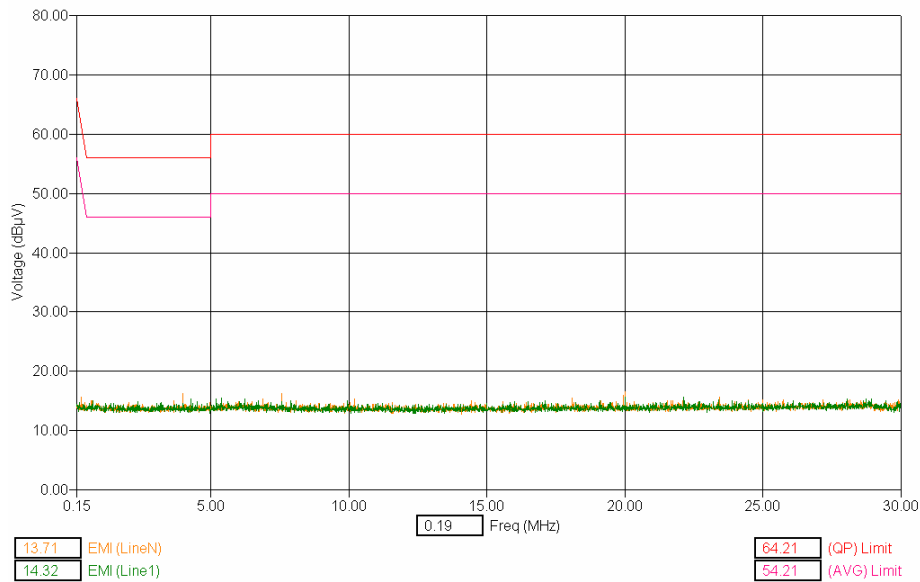
Frequency Range	AC Conducted Emission Limits (CISPR 22)	
	Quasi-peak (dBμV)	Average (dBμV)
0.15MHz - 0.5MHz	66 - 56	56 - 46
0.5MHz - 5MHz -	56	46
5MHz - 30MHz	60	50

13.4 EUT operation mode

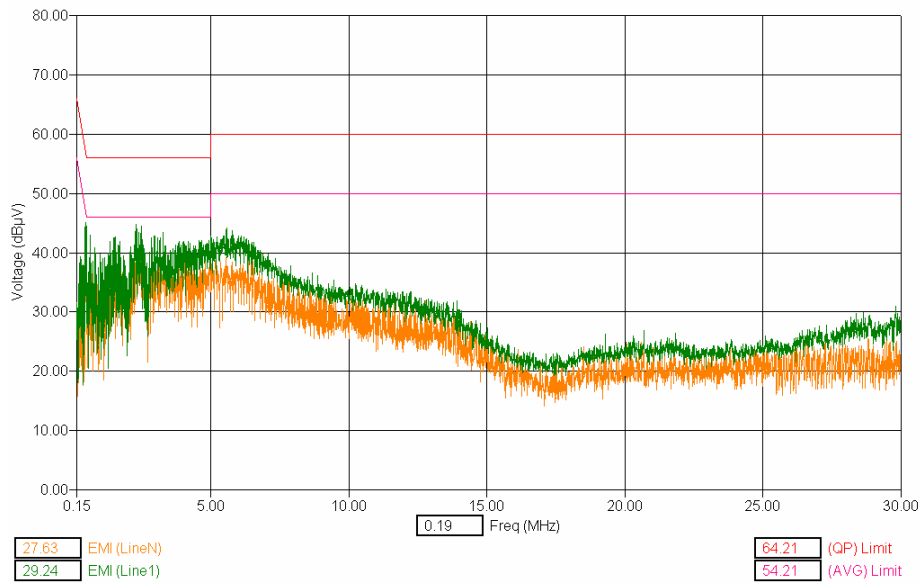
EUT operation mode	Connected, DH5, Static PRBS
EUT channel	0 (2402 MHz), 38 (2440 MHz), 78 (2480MHz)
EUT TX power level	Nominal

13.5 Results

Ambient Scan:



Bluetooth Connected (Hopping Mode)



Freq [Max] [MHz]	[AVG] Trace [dBµV]	[QP] Trace [dBµV]	Transducer [dB]	Cable [dB]	Line	[AVG] EMI [dBµV]	[QP] EMI [dBµV]	[AVG] Limit [dBµV]	[QP] Limit [dBµV]
0.331	32.26	36.36	0.15	0.11	N	32.52	36.62	49.45	59.45
0.461	37.84	43.42	0.17	0.10	L1	38.11	43.69	46.60	56.60
0.461	35.42	40.53	0.17	0.09	N	35.68	40.79	46.77	56.77
0.495	37.99	43.74	0.17	0.10	L1	38.26	44.01	46.13	56.13
0.495	36.10	40.65	0.17	0.10	N	36.37	40.92	46.13	56.13
2.275	27.59	39.79	0.24	0.00	L1	27.83	40.03	46.00	56.00