

Test & Certification Center (TCC) - Dallas

FCC ID: OW3RH-47
Test Report: WR-117.001A
7-Apr-04

Accredited Laboratory
Certificate Number: 1819-01

Ver 2.0

CFR 47 Part 15 Test Report

Test Report Number: WR-117.001A

Terminal device:

FCC ID: OW3RH-47, Type: RH-47, HW: 0413, SW: T02.25
(Detailed information is listed in section 4).

Originator: M. Sundstrom / J. Love
Function: TCC - Dallas – EMC
Version/Status: 2.0 Approved
Location: TCC Directories
Date: 7-Apr-04

Change History:

Version	Date	Status	Handled By	Comments
0.1	16-Feb-04	Draft	M. Sundstrom	
0.2	20-Feb-04	Proposal	M. Sundstrom	
0.3	16-Mar-04	Reviewed	M. Mobley / N. Walton	
1.0	22-Mar-04	Approved	A. Ewing	
1.1	7-Apr-04	Proposal	N. Walton	Amended to include Appendix A
2.0	7-Apr-04	Approved	A. Ewing	

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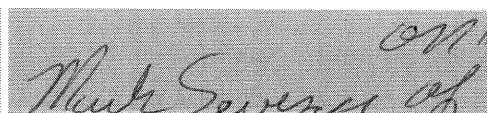
Date and signatures:

7-Apr-04

For the contents:



Nerina Walton, EMC Engineer
Technical Review



Alan Ewing, General Manager
Manager Review

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APPENDIX A: TEST SET-UP PHOTOS

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 661.

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	Reference		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 15.247 (f)	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
Spurious RF conducted emissions	15.247 (c)	6.2.2 (o), e1	13	Complies
AC powerline conducted emissions	15.207	6.6	14	Complies
Spurious radiated emissions	15.247 (c)	6.2.2 (o), e1	15	Refer to Test Report No. DTX09949-EN

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
- BSS - Base Station Simulator
- 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.

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
FCC Part 15.247 (a)(1), 15.247 (a)(1) iii, 15.247 (f), 15.247 (b)(1), 15.247 (c)(1), 15.247 (c)(2)	BT 2.4 - 2.4835 GHz	16 Feb 04	Operational	Phone	FCC ID: OW3RH-47 Type: RH-47 HW: 0412 SW: 2.20 IMEI: 001004/00/124832/8
FCC Part 15.207	BT 2.4 - 2.4835 GHz	16 Feb 04	Operational	Phone	FCC ID: OW3RH-47 Type: RH-47 HW: 0412 SW: 2.20 IMEI: 001004/00/124824/5
FCC Part 15.247 (a)(1), 15.247 (a)(1) iii, 15.247 (f), 15.247 (b)(1), 15.247 (c)(1), 15.247 (c)(2), 15.207	BT 2.4 - 2.4835 GHz	16 Feb 04	Operational	Battery	Type: BL-6C Other: 3.7 (Ver-11)
FCC Part 15.207	BT 2.4 - 2.4835 GHz	16 Feb 04	Operational	Headset	Type: HS-7N WH: 01 SN: 0152 Ver: 0.1

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
14	03007	LISN	EMCO	3816/2	20 May 04	1 year
14	N/A	10dB Attenuator	Weinschel	Model 2	N/A	N/A
7,8,9,10,11, 12,13,14	03857	Base Station	Rhodes & Schwartz	CMU 200	04 Sept 04	1 year
14	00367 00368	EMI Receiver	Hewlett Packard	8546 / 85460A	22 Jul 04	1 year
15	02679	EMI Analyzer	Agilent	E7405A	05 Mar 04	1 year
7,8,9,10,11, 12,13	03155	Power Splitter (must have 6 dB insertion loss)	Agilent	33120A	N/A	N/A
7,8,9,10,11, 12,13	N/A	6dB Attenuator	Weinschel	Model 2	N/A	N/A
7,8,9,10,11, 12,13	03459	Spectrum Analyzer	Rhodes & Schwartz	FSP	07-Jan-05	1 year

6. EUT TEST SETUPS

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

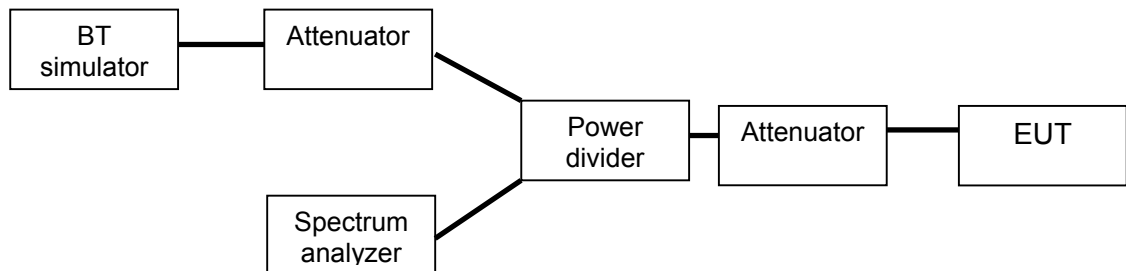
The EUT was equipped with an external antenna connector for conductive measurements.

6.1 EUT test set-up

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

- set the EUT channel (0 - 78)
- 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.



For a photo of the test set-up that was used for Bluetooth Conducted Measurements, please refer to Section 1 of Appendix A.

7. CARRIER FREQUENCY SEPARATION

Specification: FCC Part 15.247 (a) (1)

7.1 Setup

See Section 6.

7.2 Test Results

Test Technician / Engineer	M. Sundstrom
Date of Measurement	17, 18, 19, Feb 2004
Temperature	22-24 °C
Humidity	31-41 %RH
Test Result	Complies with FCC Part 15.247 (a) (1)

7.3 EUT operation mode

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

7.4 Pass/Fail Criteria

Limit (MHz)	Measured value (MHz)
≥ 0.025 or 20dB	1.000

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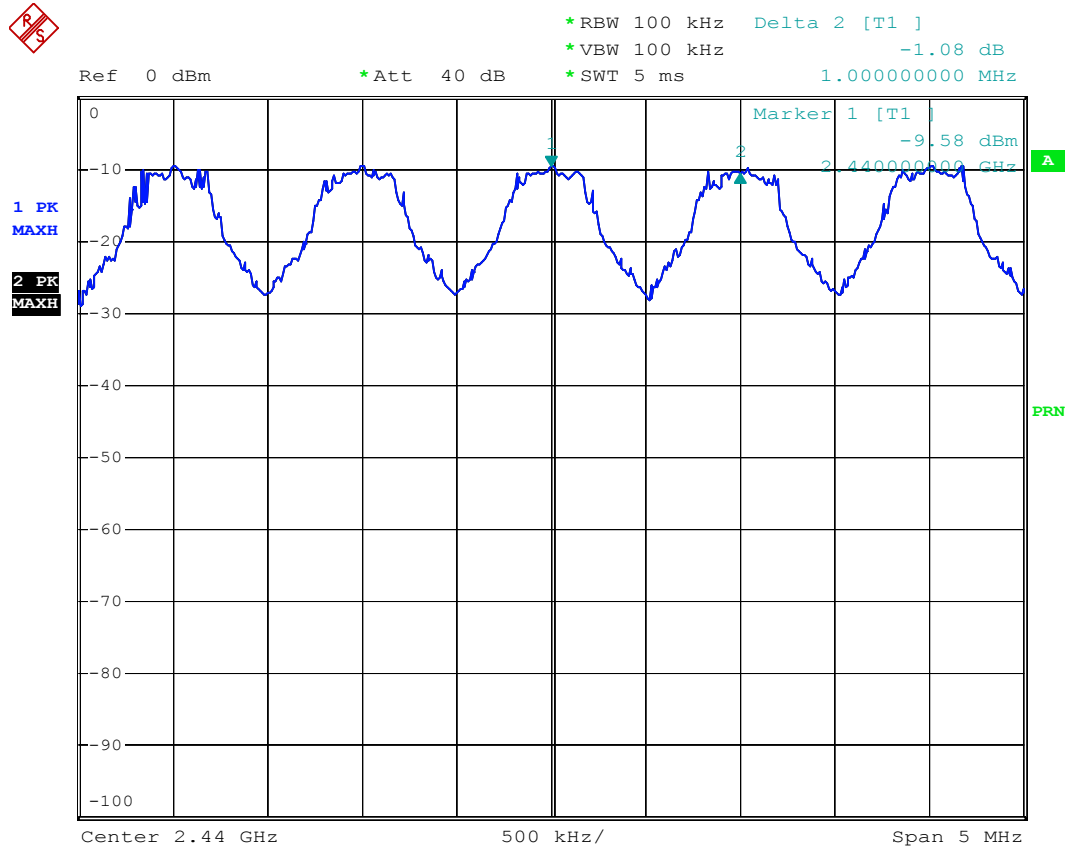
FCC ID: OW3RH-47
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Certificate Number: 1819-01

Ver 2.0

7.5 Screen shot

Carrier frequency separation of channels 38 and 39.



Date: 18.FEB.2004 09:15:01

8. NUMBER OF HOPPING FREQUENCIES

Specification: FCC Part 15.247 (a) (1)iii

8.1 Setup

See Section 6.

8.2 Test Results

Test Technician / Engineer	M. Sundstrom
Date of Measurement	17, 18, 19, Feb 2004
Temperature	22-24 °C
Humidity	31-41 %RH
Test Result	Complies with FCC Part 15.247 (a) (1)iii

8.3 EUT operation mode

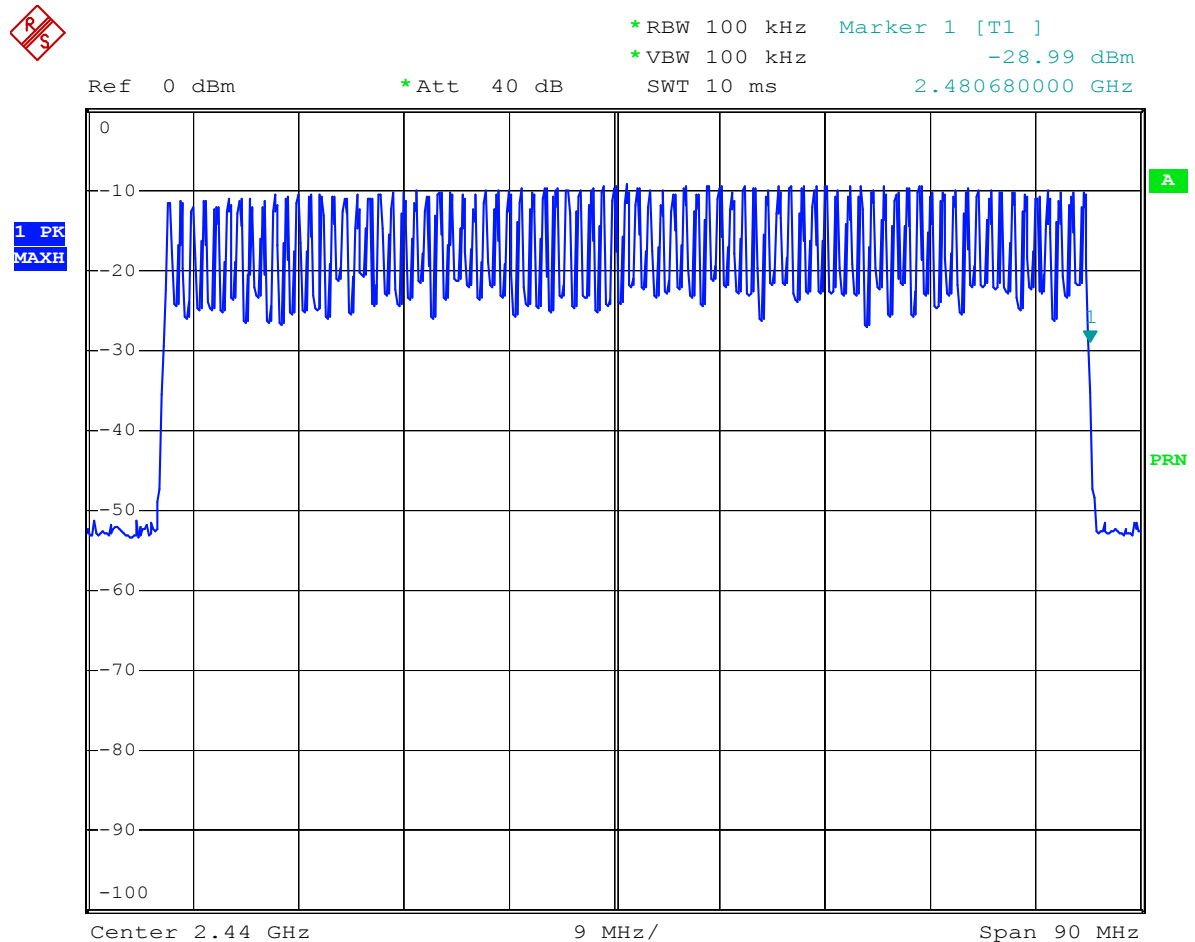
EUT operation mode	Connection, DH5, Static PRBS
EUT channel	Hopping
EUT TX power level	Nominal

8.4 Pass/Fail Criteria

Number	Measured value
≥ 75	79

8.5 Screen shot

Number of hopping frequencies.



Date: 18.FEB.2004 09:29:09

9. TIME OF OCCUPANCY

Specification: FCC Part 15.247 (a) (1)iii

9.1 Setup

See Section 6.

9.2 Test Results

Test Technician / Engineer	M. Sundstrom
Date of Measurement	17, 18, 19, Feb 2004
Temperature	22-24 °C
Humidity	31-41 %RH
Test Result inquiry	Complies with FCC Part 15.247 (a) (1)iii
Test Result paging	Complies with FCC Part 15.247 (a) (1)iii
Test Result connection mode	Complies with FCC Part 15.247 (a) (1)iii - see Section 9.5.2, screen shots have been provided.

9.3 EUT operation mode: Inquiry

EUT operation mode	Inquiry
EUT channel	Hopping
EUT TX power level	Nominal

9.3.1 Pass/Fail Criteria

Limit (ms)	Measured value (ms)
≤ 400	126.14

The inquiry consisted of 2 separate cycles, lengths 5.10s, and 2.52s. The complete inquiry cycle took 7.62s, during which the transmitter operated at every 10ms. The duration of one transmission was 165.54us. $(7.62s / 10ms) * 165.54us = 126.14ms$.

9.4 EUT operation mode: Paging

EUT operation mode	Paging
EUT channel	Hopping
EUT TX power level	Nominal

9.4.1 Pass/Fail Criteria

Limit (ms)	Measured value (ms)
≤ 400	135.5

The paging consisted of 7 separate cycles, lengths 1.32s, 1.26s, 1.26, 1.26, 1.32, 1.26, 0.60s. The complete paging cycle took 8.28s, during which the transmitter operated at every 10ms. The duration of one transmission was 163.66us. $(8.28 / 10) * 163.66 = 135.5ms$.

9.5 EUT operation mode: Connection mode

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

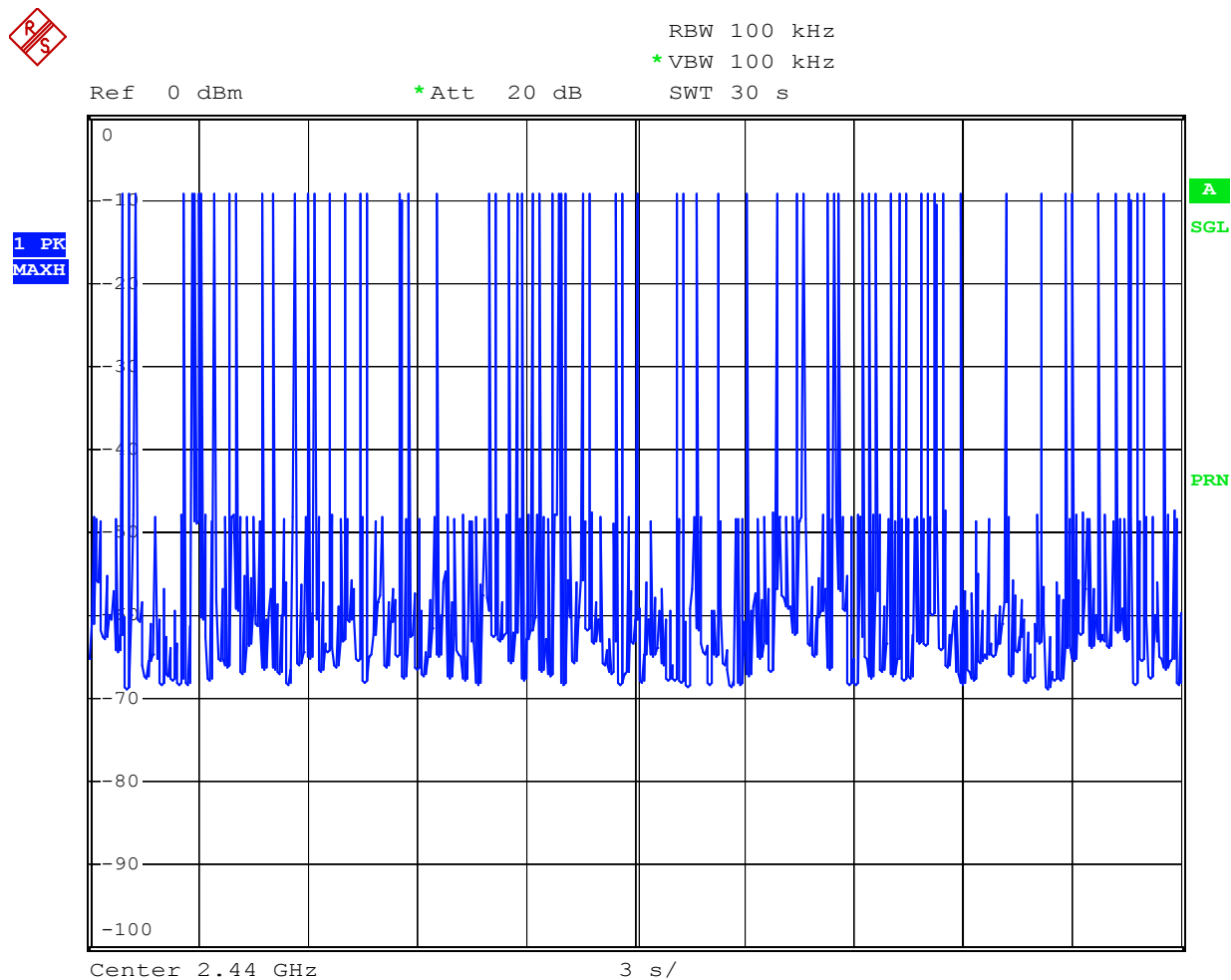
9.5.1 Pass/Fail Criteria

Limit (ms)	Measured value (ms)
≤ 400	208.25

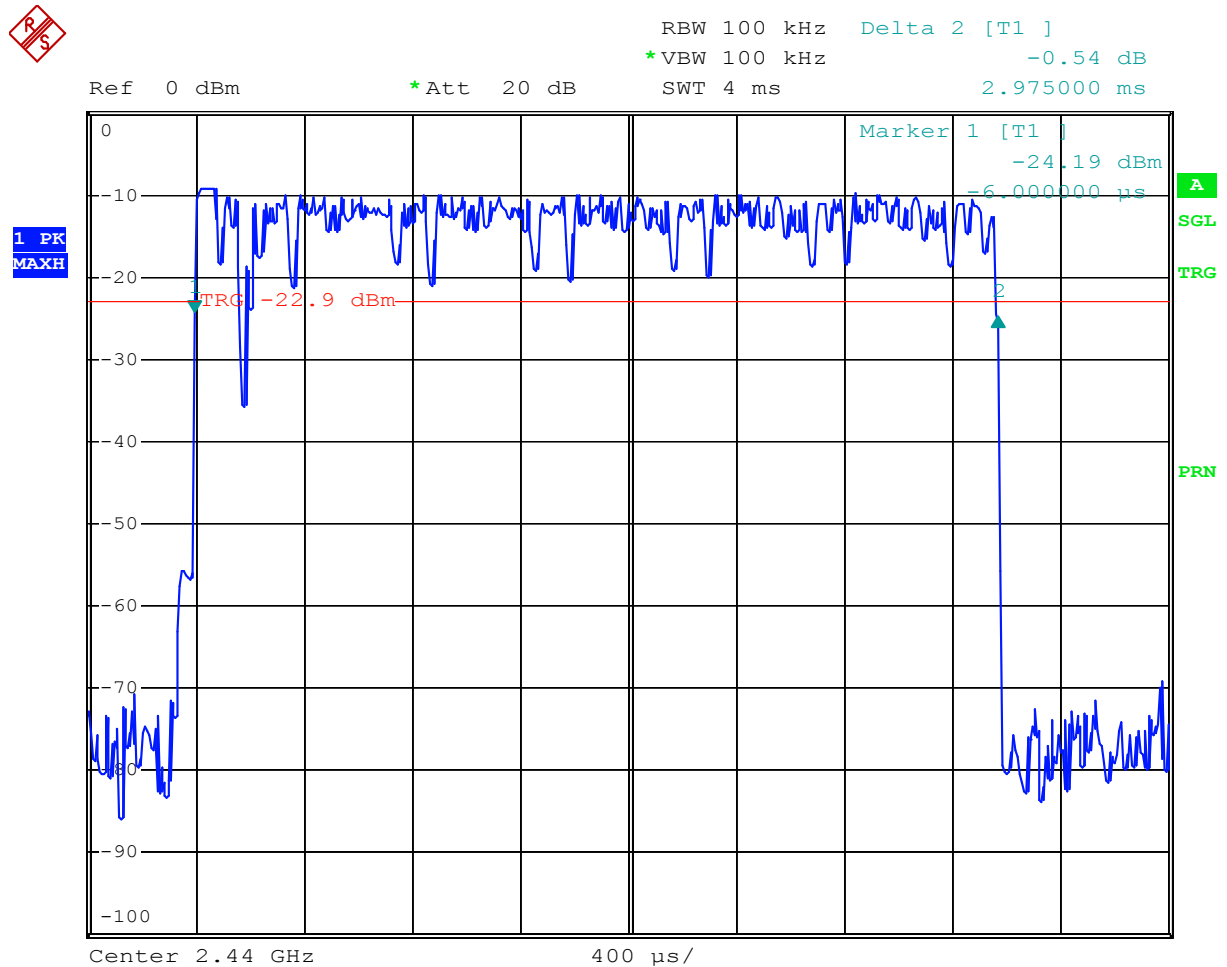
In measurement time of 30s, total of 70 transmissions occurred. The duration of one transmission was 2.975ms. $70 * 2.975e-3 = 208.25ms$.

9.5.2 Screen shots

Number of transmissions, channel 38.



Duration of one transmission, channel 38.



Date: 18.FEB.2004 12:44:15

10. 20dB BANDWIDTH

Specification: FCC Part 15.247 (a) (1)

10.1 Setup

See Section 6.

10.2 Test Results

Test Technician / Engineer	M. Sundstrom
Date of Measurement	17, 18, 19, Feb 2004
Temperature	22-24 °C
Humidity	31-41 %RH
Test Result	Complies with FCC Part 15.247 (a) (1)

10.3 EUT operation mode

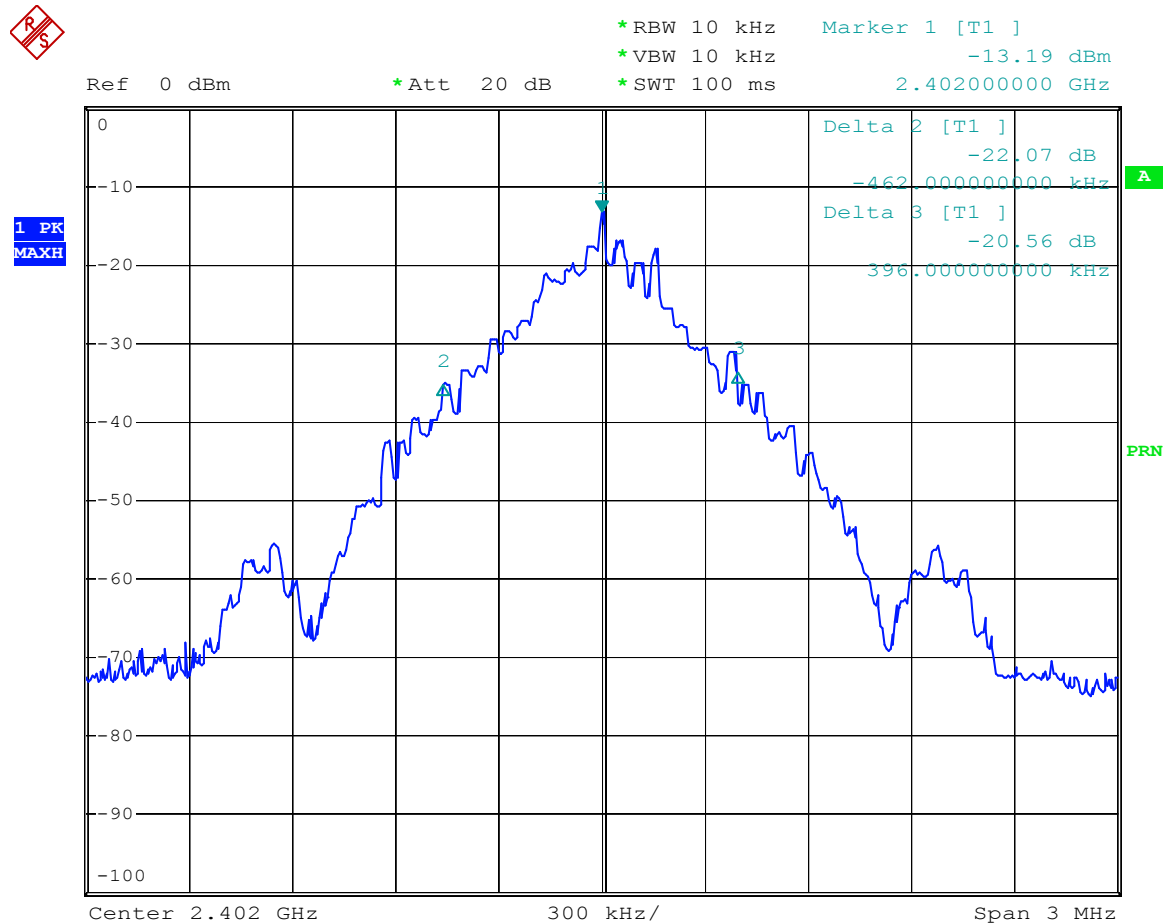
EUT operation mode	Connection, DH5, Static PRBS
EUT channel	0 (2402 MHz), 38 (2440 MHz), 78 (2480MHz)
EUT TX power level	Nominal

10.4 Pass/Fail Criteria

EUT channel	Limit (MHz)	Measured value (MHz)
0	≤ 1.0	0.858
38		0.810
78		0.900

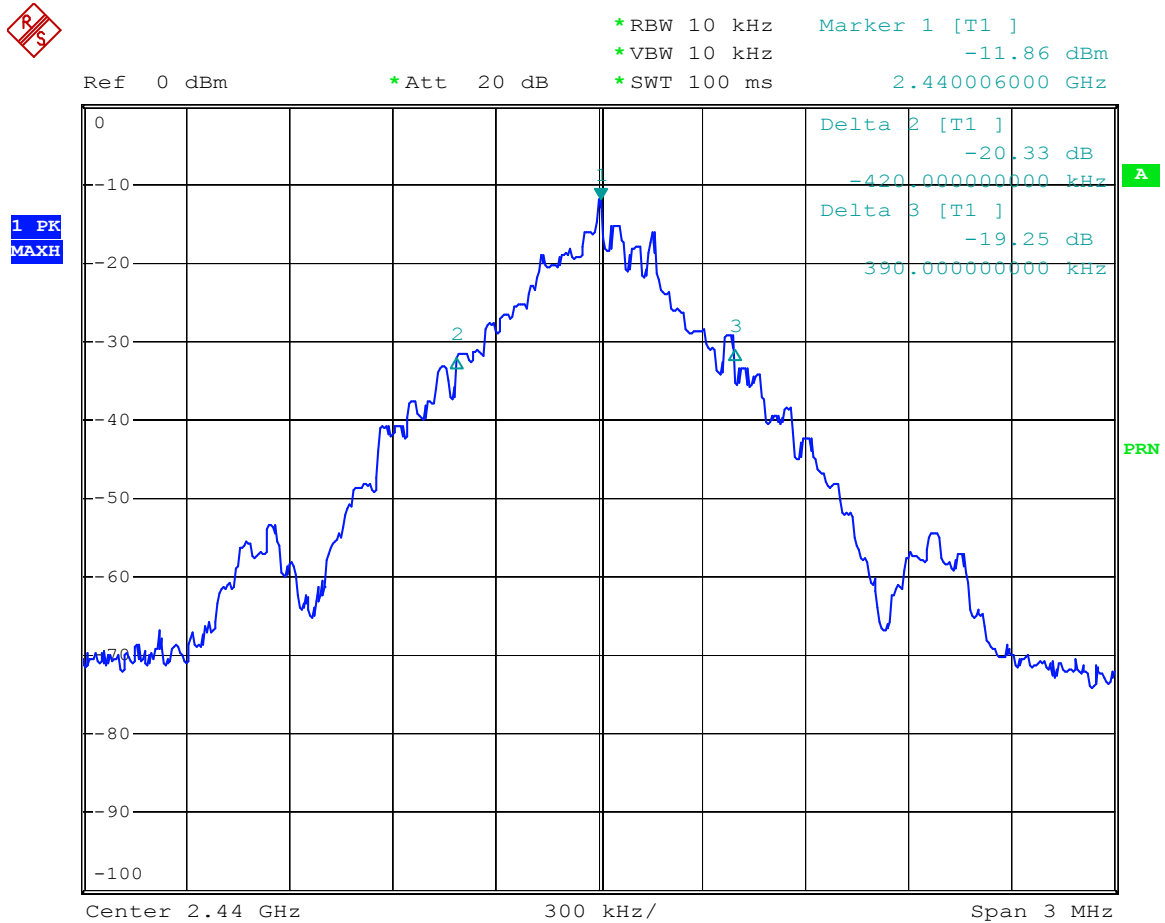
10.5 Screen shots

20dB bandwidth, channel 0.



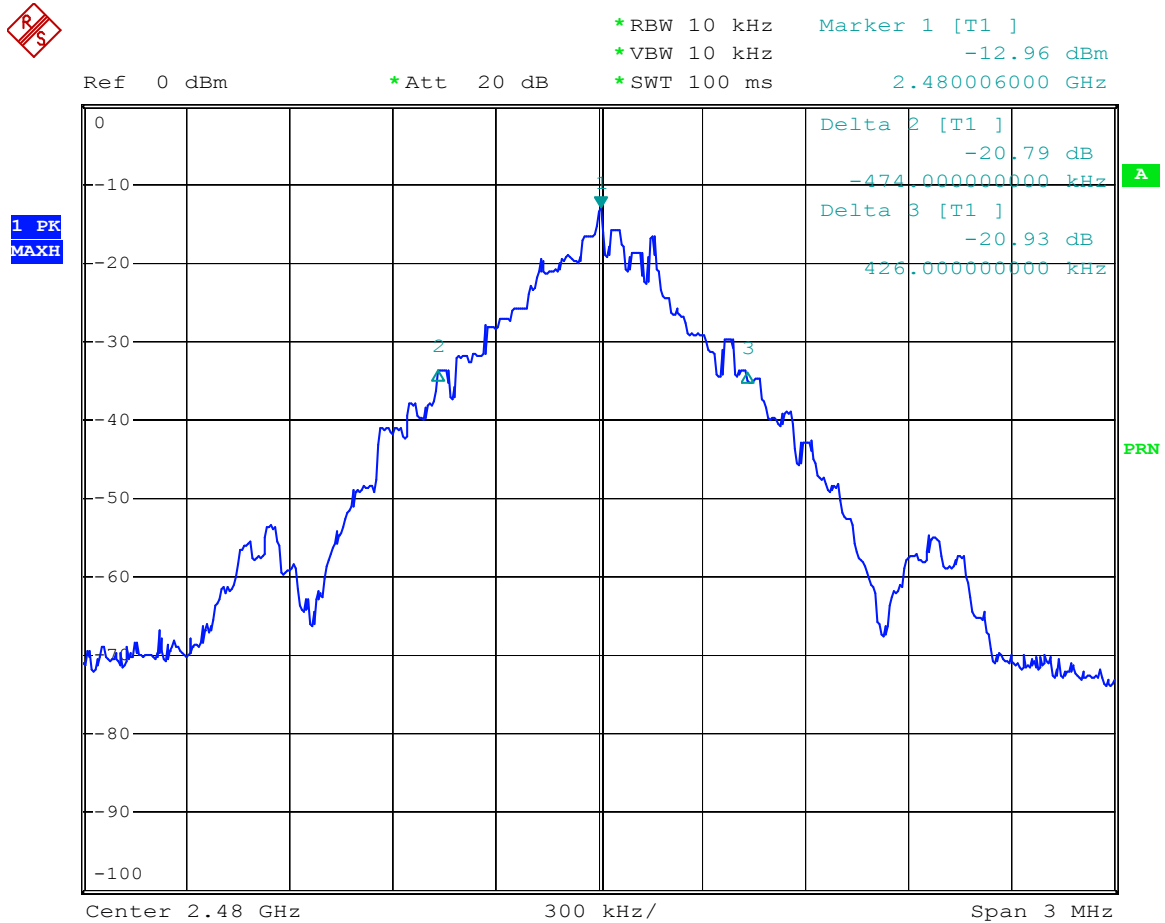
Date: 18.FEB.2004 13:24:34

20dB bandwidth, channel 38.



Date: 18.FEB.2004 13:22:58

20dB bandwidth, channel 78.



Date: 18.FEB.2004 13:21:21

11. PEAK OUTPUT POWER

Specification: FCC Part 15.247 (b) (1)

11.1 Setup

See Section 6.

11.2 Test Results

Test Technician / Engineer	M. Sundstrom
Date of Measurement	17, 18, 19, Feb 2004
Temperature	22-24 °C
Humidity	31-41 %RH
Test Result	Complies with FCC Part 15.247 (b) (1)

11.3 EUT operation mode

EUT operation mode	Connection, DH5, Static PRBS
EUT channel	0 (2402 MHz), 38 (2440 MHz), 78 (2480MHz)
EUT TX power level	Nominal
EUT antenna gain [dBi]	1

11.4 Pass/Fail Criteria

EUT channel	Limit (W)	Test result (W)
0	≤ 1.0	0.00139
38		0.00207
78		0.00182

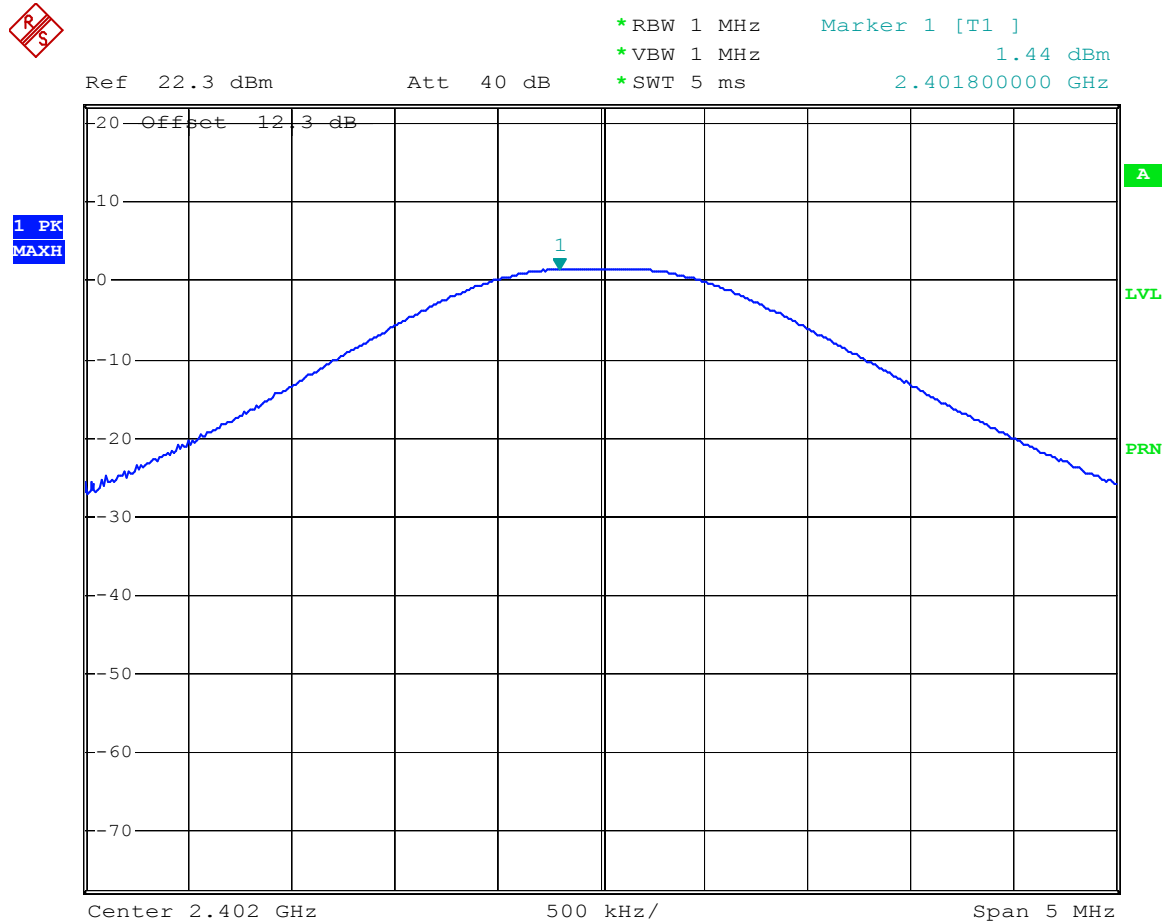
The measured power values were corrected with the attenuation of the cables, attenuator and power divider using the formula:

$$P[W] = \frac{10^{(P_{Meas}[dBm] + L_{Cables}[dB] + L_{Attenuator}[dB] + L_{Divider}[dB]) / 10}}{1000}$$

EUT channel	Cable loss [dB]	Attenuator loss [dB]	Divider loss [dB]	Peak output power [dBm]	Peak output power [W]
0	0.3	6.0	6.0	1.44	0.00139
38	0.3	6.0	6.0	3.15	0.00207
78	0.3	6.0	6.0	2.59	0.00182

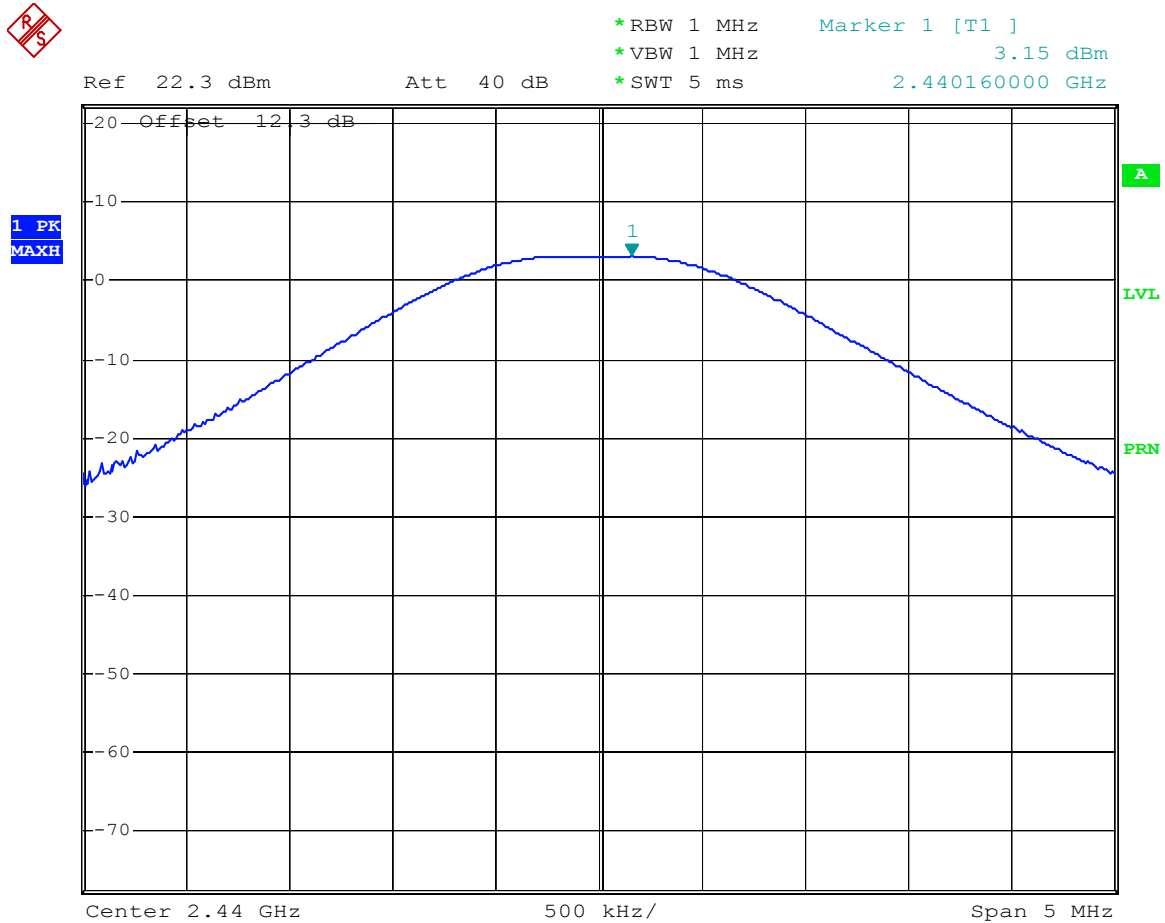
11.5 Screen shots

Peak output power, channel 0.



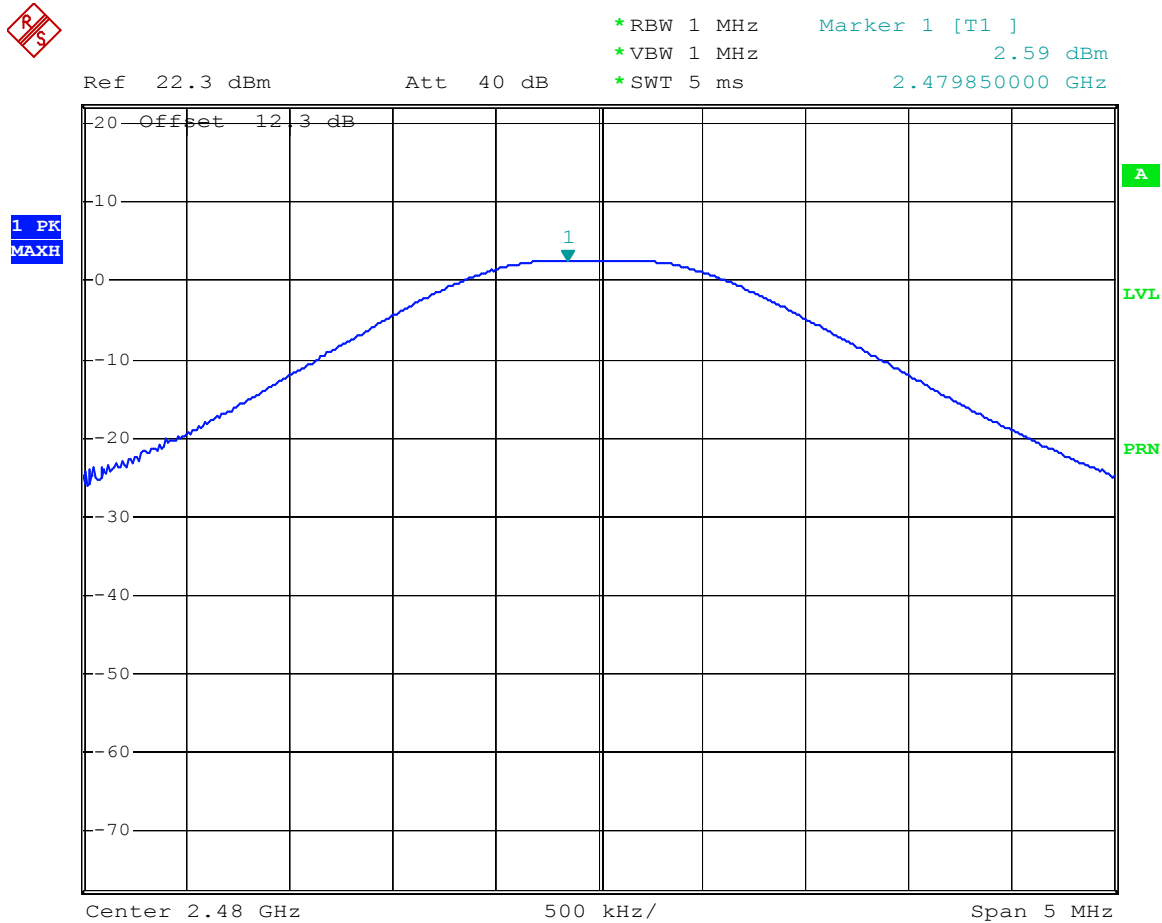
Date: 18.FEB.2004 15:21:02

Peak output power, channel 38.



Date: 18.FEB.2004 14:49:29

Peak output power, channel 78.



Date: 18.FEB.2004 14:52:33

12. BAND-EDGE COMPLIANCE OF RF CONDUCTED EMISSIONS

Specification: FCC Part 15.247 (c) (1)

12.1 Setup

See Section 6.

12.2 Test Results

Test Technician / Engineer	M. Sundstrom
Date of Measurement	17, 18, 19, Feb 2004
Temperature	22-24 °C
Humidity	31-41 %RH
Test Result	Complies with FCC Part 15.247 (c) (1)

12.3 EUT operation mode

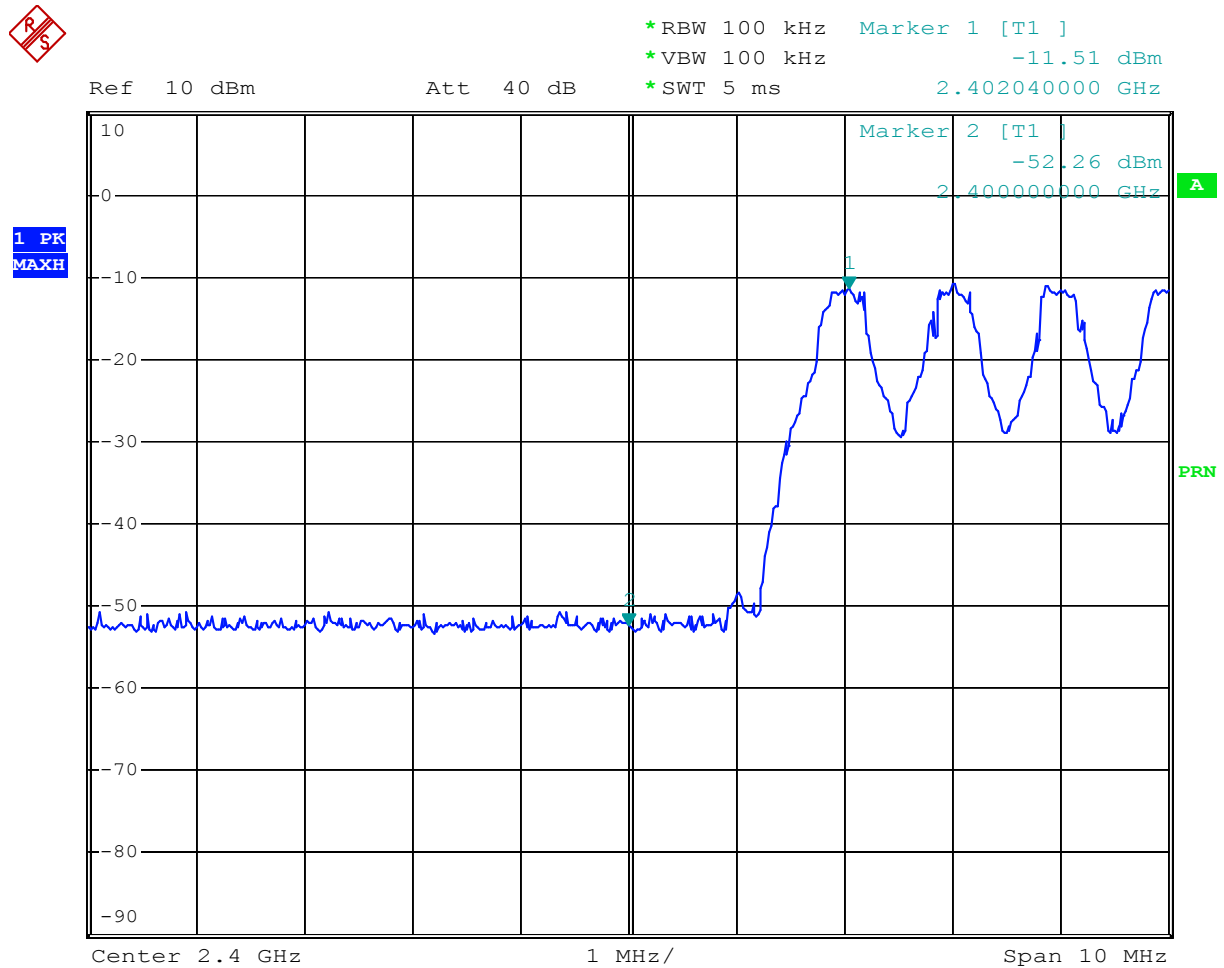
EUT operation mode	Connection, DH5, Static PRBS
EUT channel	Hopping, 0 (2402 MHz); 78 (2480 MHz)
EUT TX power level	Nominal

12.4 Pass/Fail Criteria

EUT channel	Limit (dBc)	Measured value (dBc)
0	≥ -20	-41.60
78		-42.29
Hopping Low end		-40.75
Hopping High end		-41.43

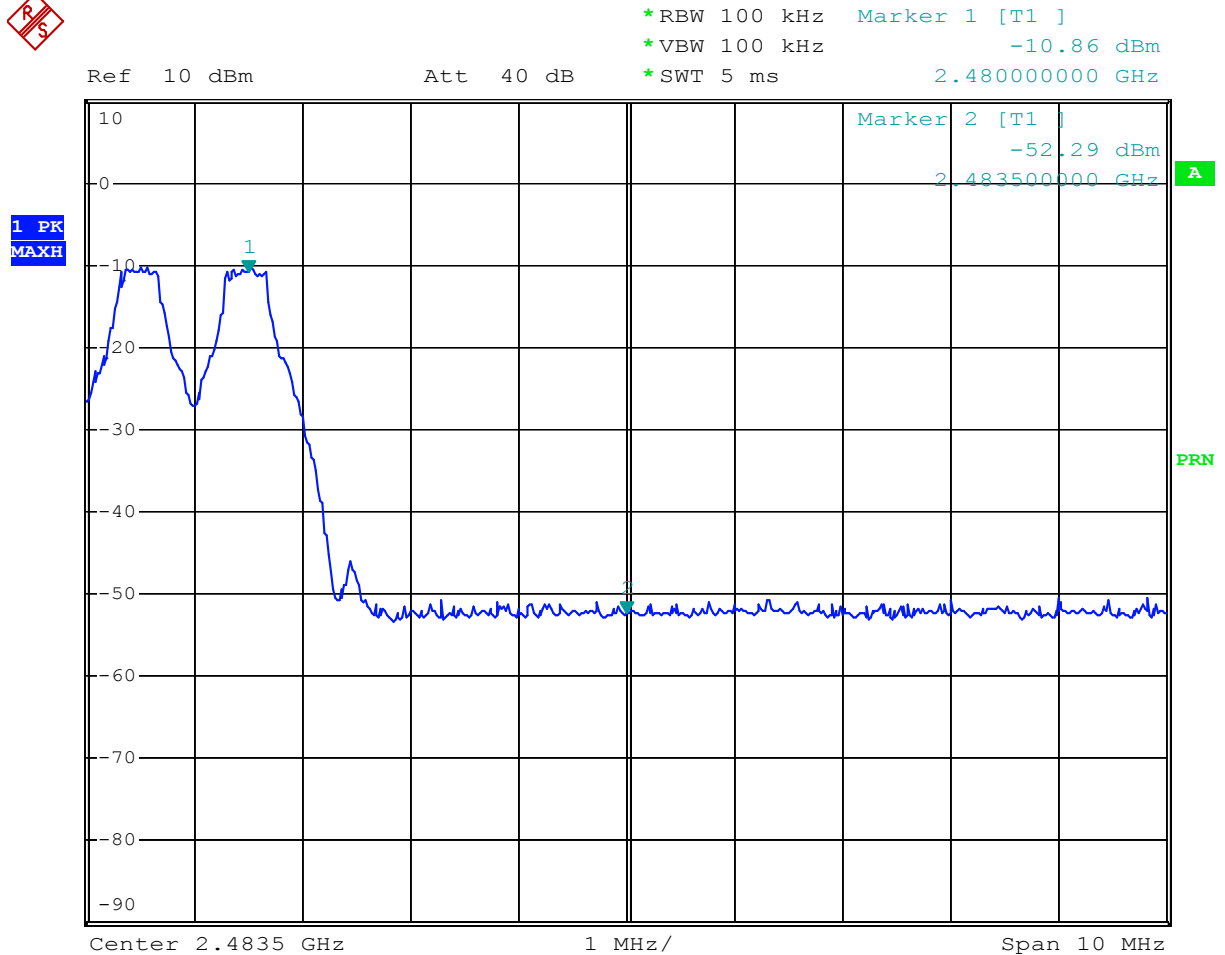
12.5 Screen shots

Bandedge compliance, low end, hopping mode.



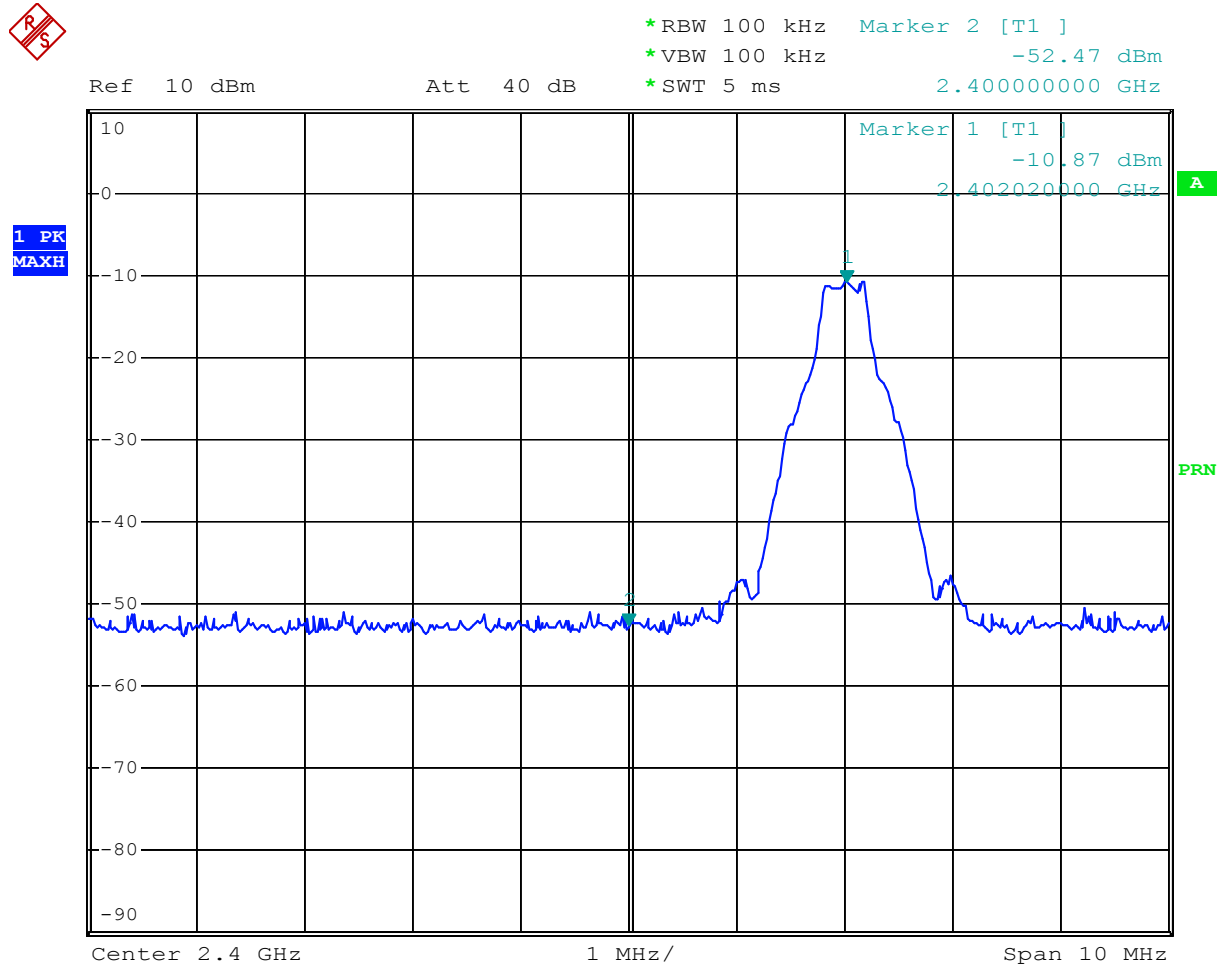
Date: 18.FEB.2004 15:11:07

Bandedge compliance, high end, hopping mode



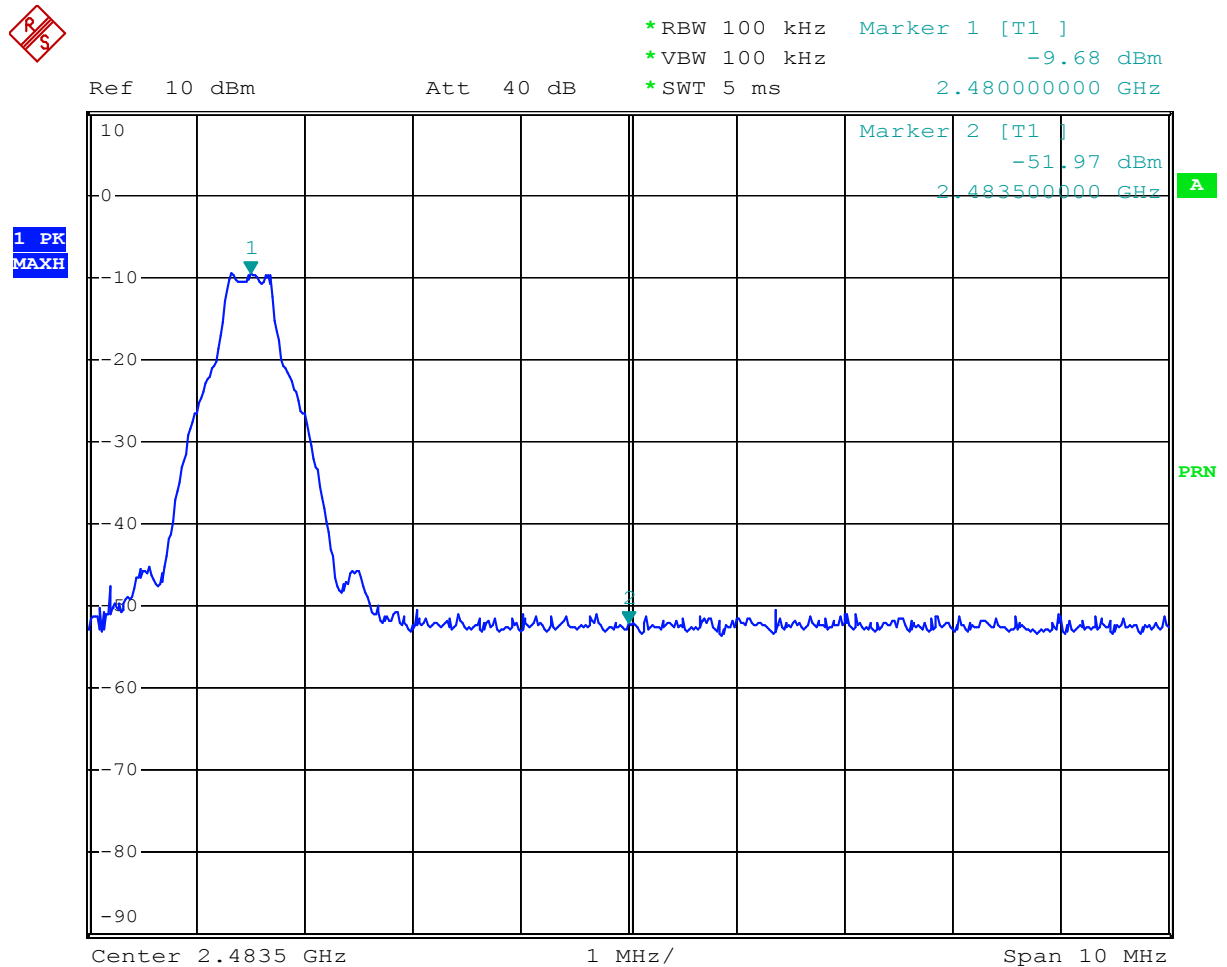
Date: 18.FEB.2004 15:15:11

Bandedge compliance, low end, channel 0.



Date: 18.FEB.2004 15:06:40

Bandedge compliance, high end, channel 78.



Date: 18.FEB.2004 15:17:58

13. SPURIOUS RF CONDUCTED EMISSIONS

Specification: FCC Part 15.247 (c) (2)

13.1 Setup

For a photo of the test set-up that was used for the Spurious RF Conducted Emissions, please refer to Section 2 of Appendix A.

13.2 Test Results

Test Technician / Engineer	M. Sundstrom
Date of Measurement	17, 18, 19, Feb 2004
Temperature	22-24 °C
Humidity	31-41 %RH
Test Result	Complies with FCC Part 15.247(c)(2)

13.3 EUT operation mode

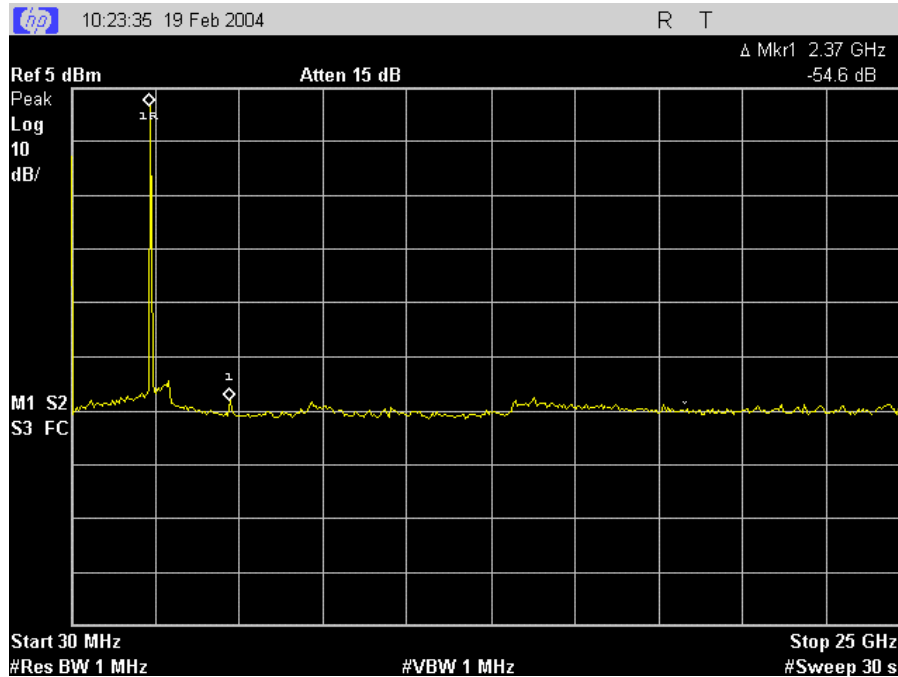
EUT operation mode	Connection, DH5, Static PRBS
EUT channel	0 (2402 MHz); 38 (2440 MHz); 78 (2480 MHz)
EUT TX power level	Nominal

13.4 Pass/Fail Criteria

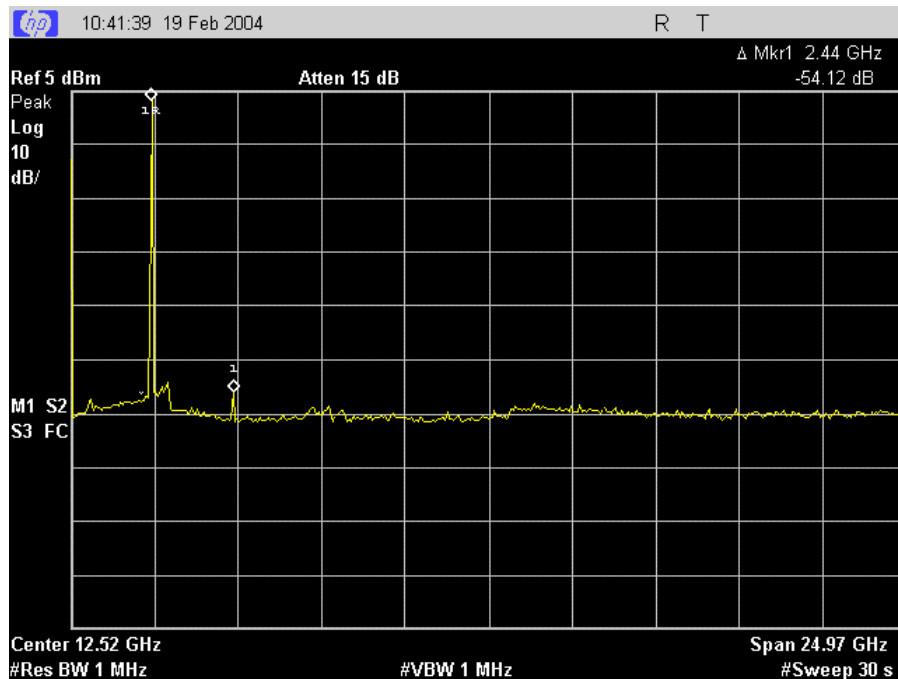
EUT channel	Limit (dBc)	Measured value (dBc)
0	≥ -20	-54.6
38		-54.12
78		-54.64

13.5 Screen shots

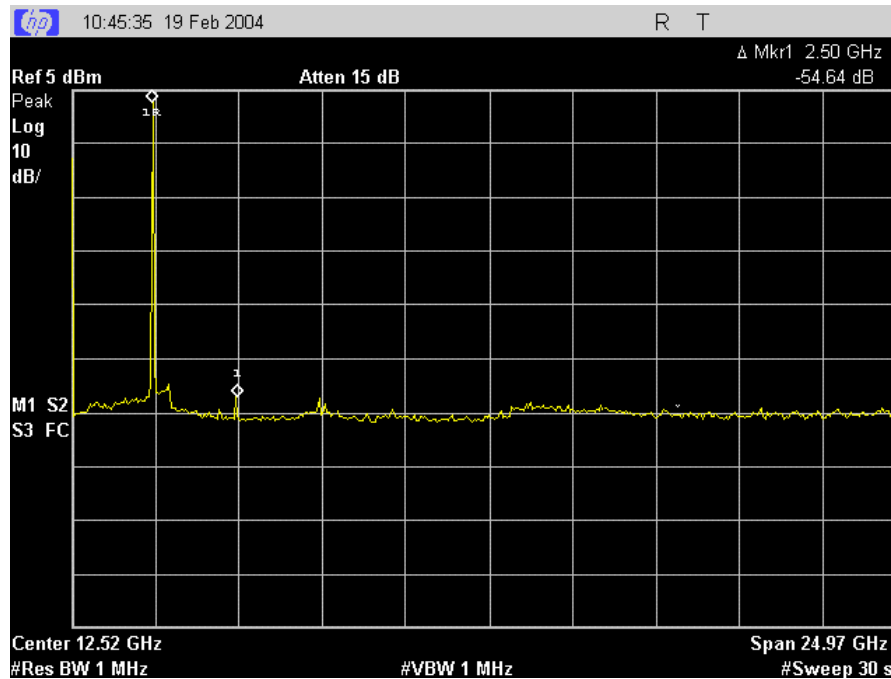
Spurious RF conducted emissions, TX on channel 0



Spurious RF conducted emissions, TX on channel 38



Spurious RF conducted emissions, TX on channel 78



13.6 Measurement Uncertainty

The measurement uncertainty for this test is +/- 3.7dB for 100kHz - 1000MHz and +/- 5.3dB for 1 - 20GHz.

14. AC CONDUCTED EMISSIONS

Specification: FCC Part 15.207

14.1 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.

For a photo of the test set-up that was used for AC Conducted Emissions, please refer to Section 3 of Appendix A.

14.2 Test Results

Test Technician / Engineer	J. Love
Date of Measurement	17 Feb 04
Temperature	22 - 24 °C
Humidity	30 – 36 %RH
Test Result	Complies with FCC Part 15.207

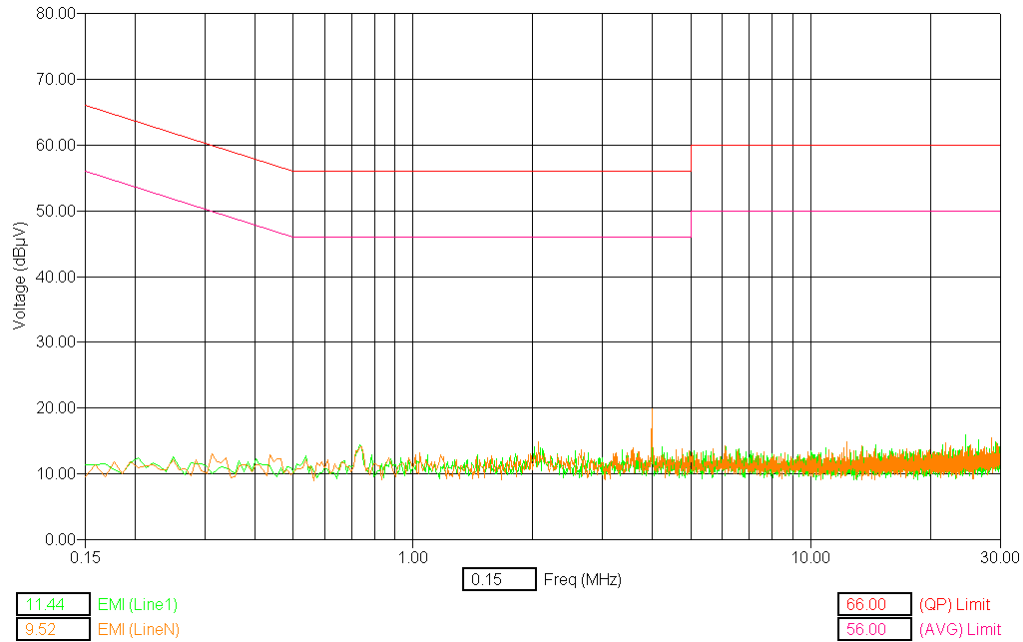
14.3 Pass/Fail Criteria

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

14.4 EUT operation mode

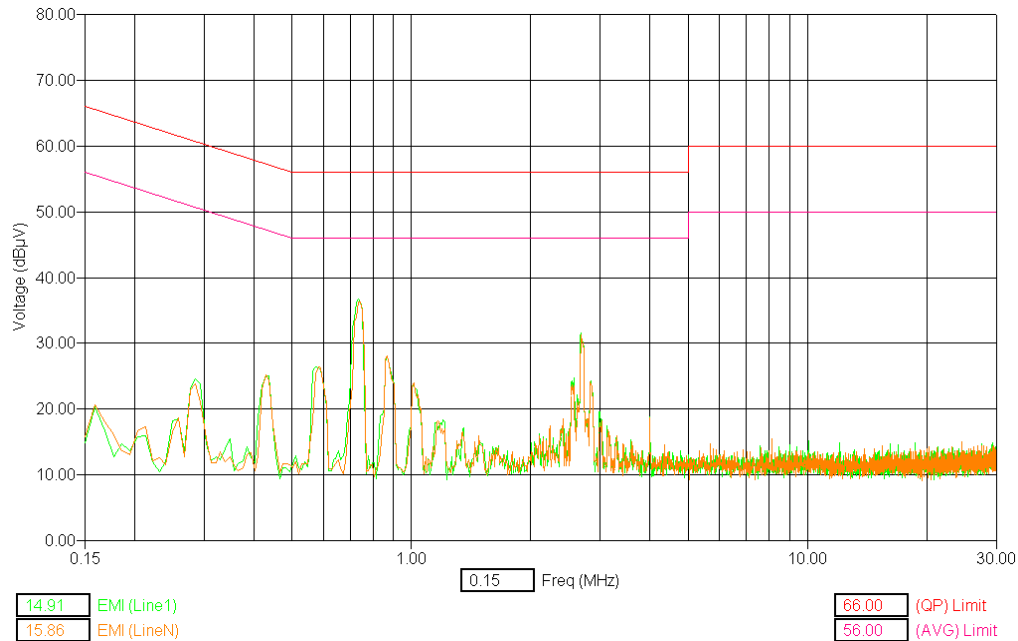
EUT operation mode	Connection, DH5, Static PRBS
EUT channel	0 (2402 MHz), 38 (2440 MHz), 78 (2480MHz)
EUT TX power level	Nominal

14.4.1 Ambient Scan



14.4.2 FCC Part 15.207

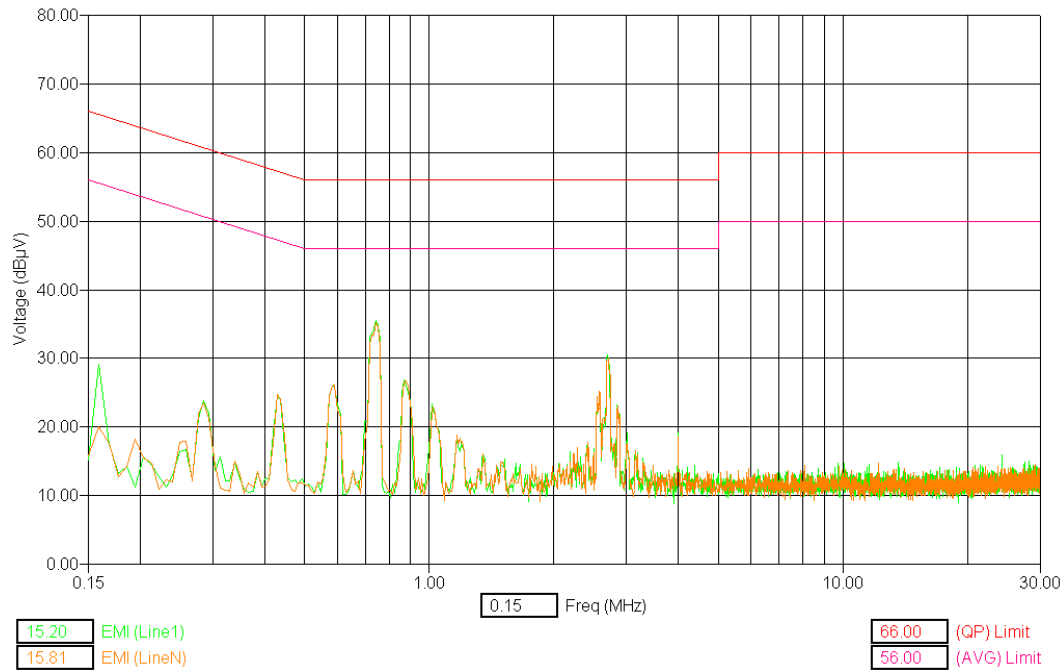
BT, Channel 0, RH-47 with ACP-12U and HS-7N



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)
0.29	20.99	22.23	0.05	0.07	L1	21.11	22.35	50.67	60.67
0.43	21.14	23.11	0.05	0.10	L1	21.28	23.25	47.10	57.10
0.58	16.12	24.55	0.05	0.08	L1	16.25	24.68	46.00	56.00
0.74	32.72	35.10	0.05	0.10	L1	32.87	35.25	46.00	56.00
0.86	20.58	26.37	0.05	0.10	L1	20.73	26.52	46.00	56.00
1.00	17.58	21.78	0.05	0.14	L1	17.77	21.97	46.00	56.00
2.68	15.71	28.15	0.07	0.21	L1	15.99	28.43	46.00	56.00

14.4.3 FCC Part 15.207

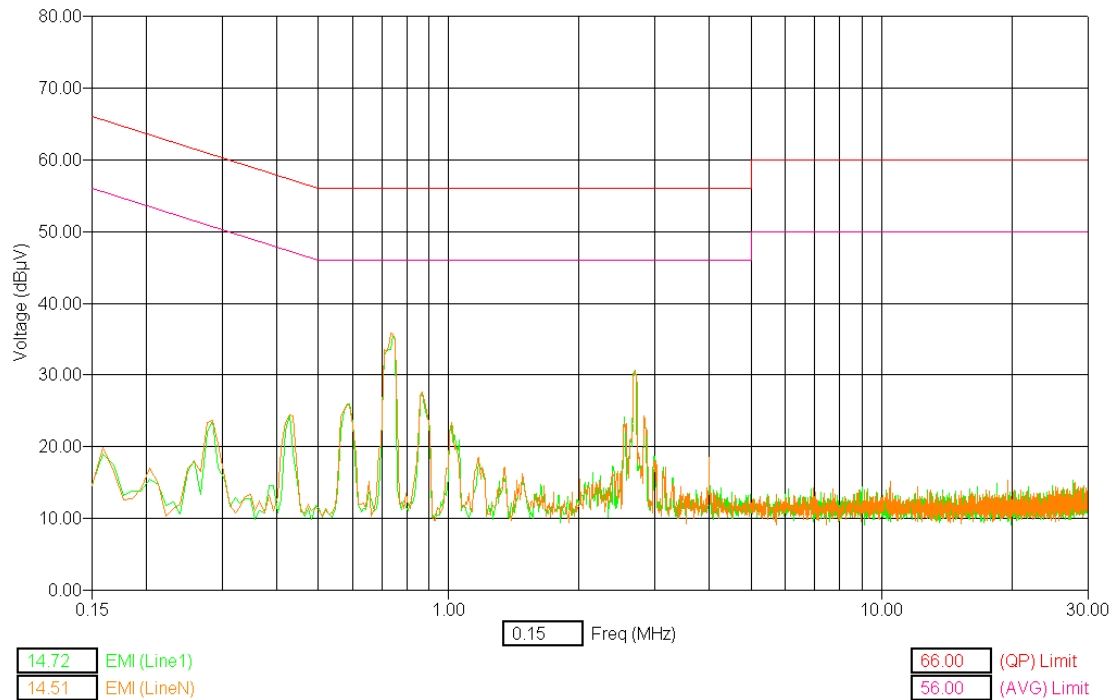
BT, Channel 38, RH-47 with ACP-12U and HS-7N



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)
0.44	18.13	22.90	0.05	0.10	L1	18.28	23.05	47.27	57.27
0.58	17.08	24.64	0.05	0.08	L1	17.21	24.77	46.00	56.00
0.74	31.18	35.13	0.05	0.10	L1	31.33	35.28	46.00	56.00
0.86	21.30	26.05	0.05	0.10	L1	21.45	26.20	46.00	56.00
1.00	12.38	21.05	0.05	0.14	L1	12.57	21.24	46.00	56.00
2.66	19.37	28.04	0.07	0.21	L1	19.65	28.32	46.00	56.00

14.4.4 FCC Part 15.207

BT, Channel 78, RH-47 with ACP-12U and HS-7N



Freq [Max] [MHz]	[AVG] Trace [dBµV]	[QP] Trace [dBµV]	Transducer [dB]	Cable [dB]	[AVG] EMI [dBµV]	[QP] EMI [dBµV]	[AVG] Limit [dBµV]	[QP] Limit [dBµV]
0.29	18.63	21.56	0.05	0.07	18.75	21.68	50.94	60.94
0.43	21.12	22.92	0.05	0.10	21.27	23.07	47.27	57.27
0.58	16.93	24.62	0.05	0.08	17.06	24.75	46.00	56.00
0.74	32.49	34.93	0.05	0.10	32.64	35.08	46.00	56.00
0.86	21.93	25.89	0.05	0.10	22.08	26.04	46.00	56.00
2.71	10.85	16.24	0.07	0.21	11.13	16.52	46.00	56.00

14.5 Measurement Uncertainty

The measurement uncertainty for this test is +/- 2.7dB.



Company Confidential

Test & Certification Center (TCC) - Dallas

FCC ID: OW3RH-47
Test Report: WR-117.001A
7-Apr-04



Accredited Laboratory
Certificate Number: 1819-01

38 (38)

Ver 2.0

15. RADIATED EMISSIONS

Specification: FCC Part 15.247 (c) (1)

PLEASE REFER TO TEST REPORT NO. DTX09949-EN