

Bluetooth Test Report

Test Report Number: **WR 901.004****Terminal device:**FCC ID: **QMNRM-124** Model: **2855i** Type: **RM-124** HW: **2001** SW: **SW VR100_5w21_18.nep**
(Detailed information is listed in section 4).

Originator: Michael Sundstrom
Function: TCC - Dallas – EMC
Version/Status: 1.0 / Approved
Location: TCC Directories
Date: 24 October, 2005

Change History:

Version	Date	Status	Handled By	Comments
0.1	17-Oct-05	Draft	Michael Sundstrom	
0.2	19-Oct-05	Review	Michael Sundstrom	
1.0	24 Oct 05	Approved	Hai To	

Testing laboratory:

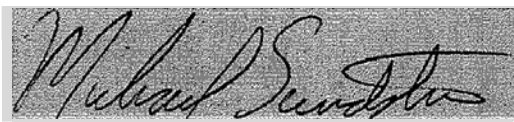
Test & Certification Center (TCC) Dallas
Nokia Mobile Phones
6021 Connection Drive
Irving, Texas 75039
U.S.A.
Tel. 972-894-5000
Fax.

Client:

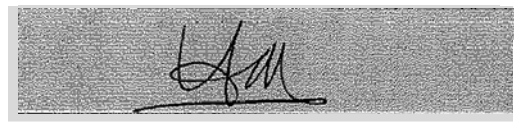
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Date and signatures:**24-Oct-05**

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 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	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 Licence-Exempt Radiocommunication 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
FCC 15.247	BT	17 Oct 05	Operational	Phone	ESN: 033/06001519 FCC ID: QMNRM-124 Type: 2855i HW: 2001 SW: VR100_5w21_18.nep
FCC 15.207 (BT)	CDMA 850, BT	18 Oct 05	operational	Phone	ESN: 033/06001526 FCC ID: QMNRM-124 Type: 2855i HW: 2001 SW: VR100_5w21_18.nep
FCC 15.247, FCC 15.207	N/A	N/A	N/A	Battery	Type: BL-6C Other: 3.7 V
FCC 15.207 (BT)	N/A	N/A	N/A	Charger	Type: AC-3U
FCC 15.207 (BT)	N/A	N/A	N/A	Headset	Type: HS-9

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	23Aug06	12 months
13	N/A	10dB Attenuator	Weinschel	Model 2	N/A	N/A
13	30530	Base Station	Anritsu	MT8802A	16Dec05	12 months
13	02664/ 02665	EMI Receiver	Hewlett Packard	8546 / 85460A	9Feb06	12 months
7, 8, 9, 10, 11, 12	N/A	Power Splitter (must have 6 dB insertion loss)	Agilent	33120A	N/A	N/A
7, 8, 9, 10, 11, 12	N/A	6dB Attenuator	Weinschel	Model 2	N/A	N/A
7, 8, 9, 10, 11, 12	03462	Spectrum Analyzer	Rhode & Schwarz	FSP	20Jul06	12 months
7, 8, 9, 10, 11, 12, 13	02666	Base Station (BT)	Rhode & Schwarz	CMU 200	25May06	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.

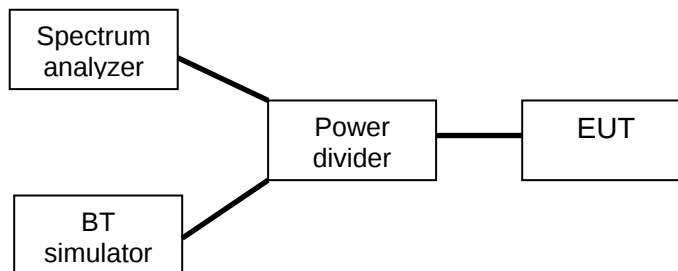
Two different test setups were used: one for conducted measurements, another for radiated measurements. One EUT was equipped with an external antenna connector for conductive measurements.

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	17, 18-Oct-05
Temperature	21-24 °C
Humidity	43-56 %RH
Test Result	Complies

7.3 EUT operation mode

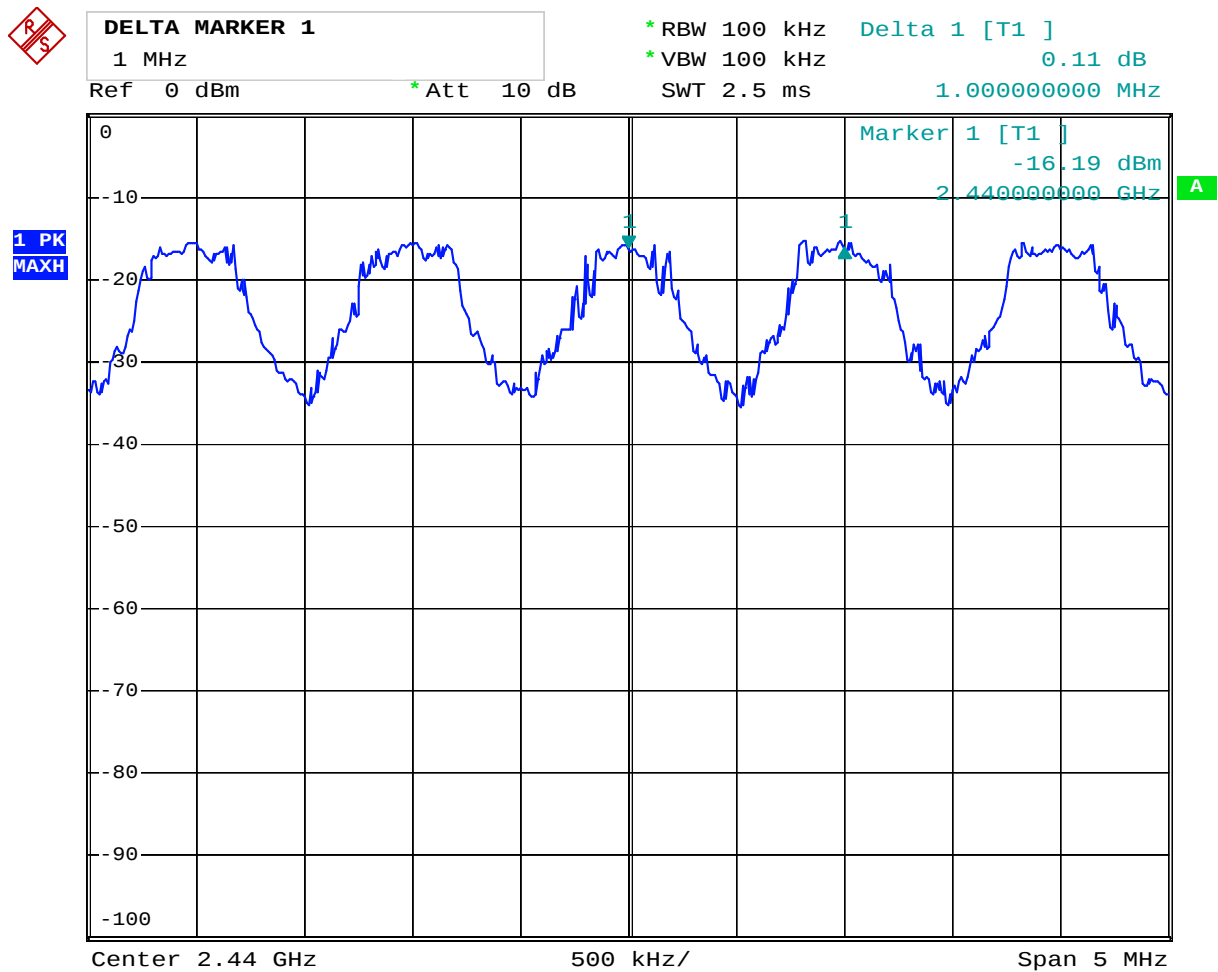
EUT operation mode	Connected, DH5, Static PRBS
EUT channel	Hopping mode (Euro/US)
EUT TX power level	Nominal

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: 18.OCT.2005 19:55:31

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	18-Oct-05
Temperature	21-24 °C
Humidity	43-56 %RH
Test Result	Complies

8.3 EUT operation mode

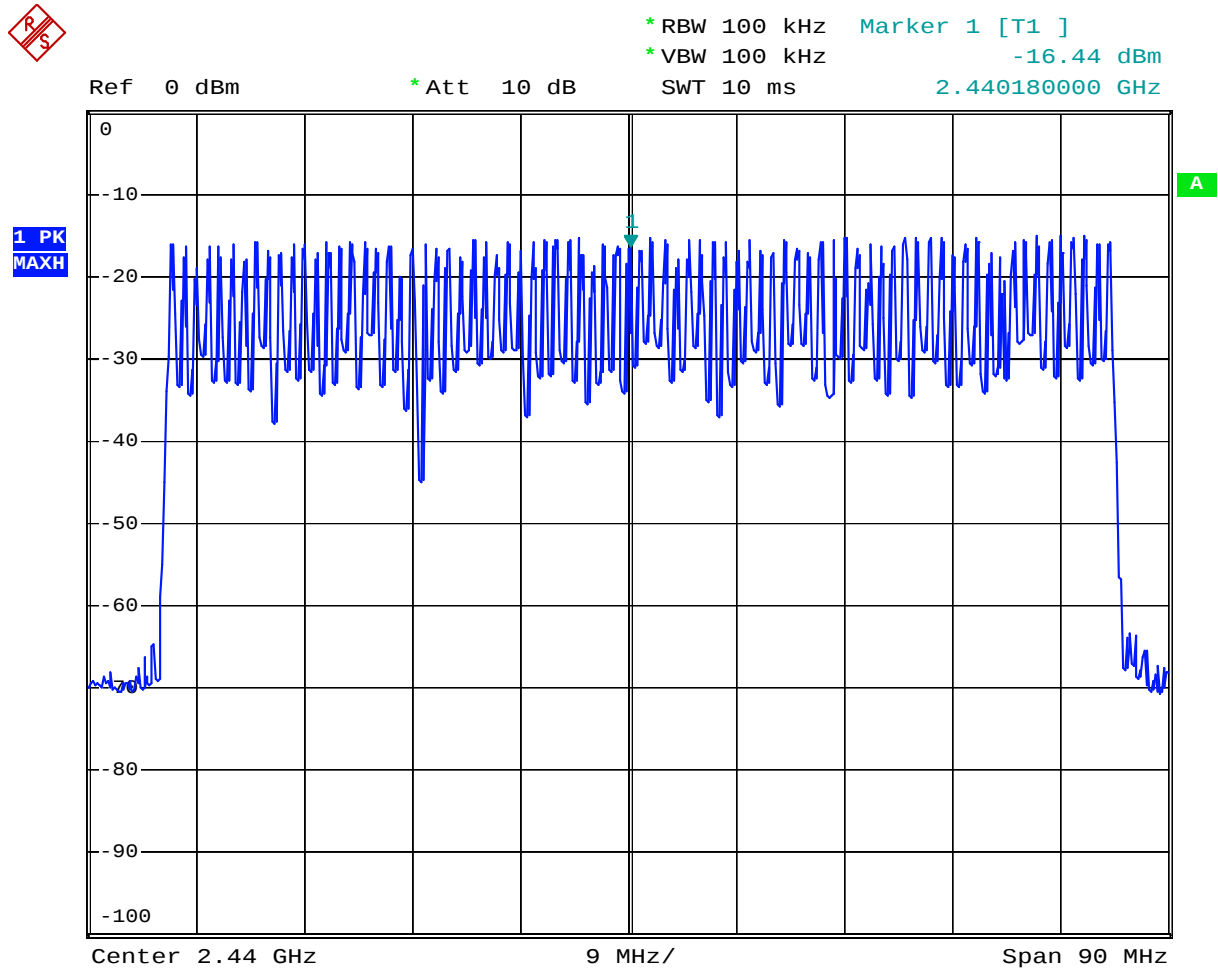
EUT operation mode	Connected, DH5, Static PRBS
EUT channel	Hopping Mode
EUT TX power level	Nominal

8.4 Pass/Fail Criteria

Number	Measured value
≥ 75	79

8.5 Results

Number of Hopping Channels



Date: 18.OCT.2005 19:57:03

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	18-Oct-05
Temperature	21-24 °C
Humidity	43-56 %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

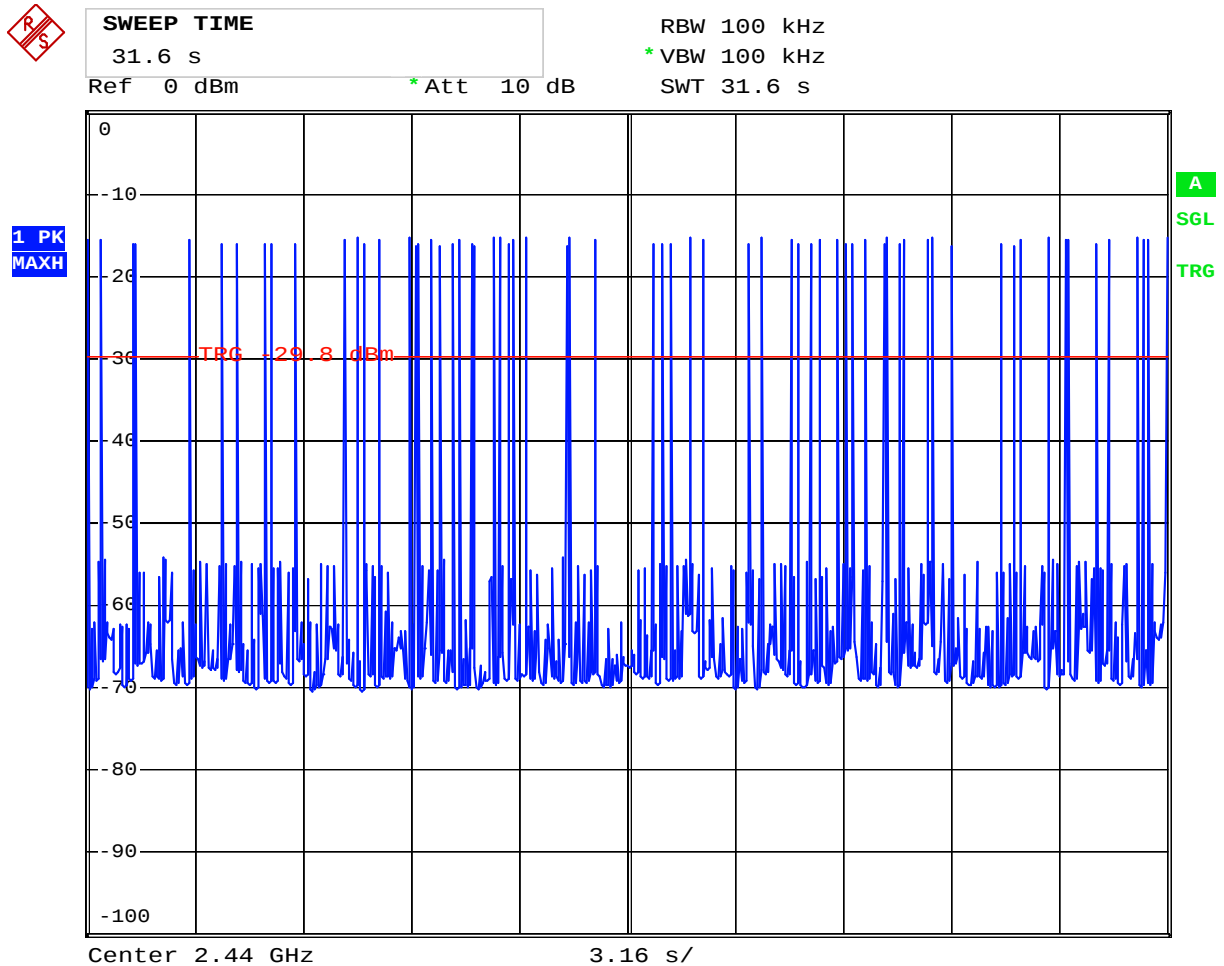
Number of transmissions	Duration of transmissions (ms)	Time of Occupancy (ms)	Limit (ms)
59	2.88	169.22	≤ 400

$$\text{Time of Occupancy} = TX_n * TX_d$$

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

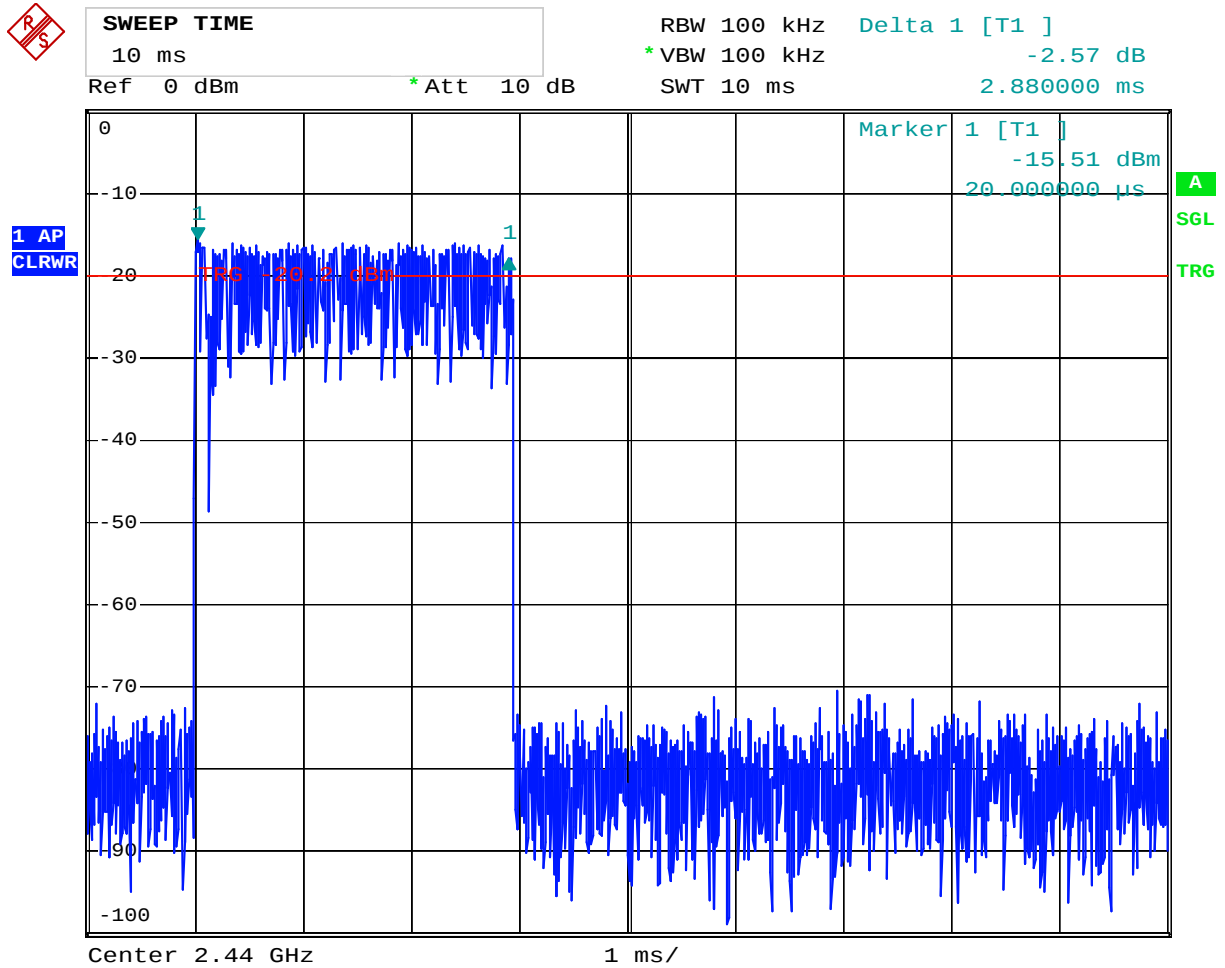
9.5 Results

Number of transmissions on channel 38



Date: 18.OCT.2005 21:01:17

Duration of one transmission, channel 38



Date: 18.OCT.2005 20:57:57

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	18-Oct-05
Temperature	21-24 °C
Humidity	43-56 %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 (MHz)
0	≤ 1.0	0.966
38		0.876
78		0.852

10.5 Results

20dB bandwidth, channel 0



DELTA MARKER 1

-966 kHz

* RBW 10 kHz

* VBW 10 kHz

SWT 55 ms

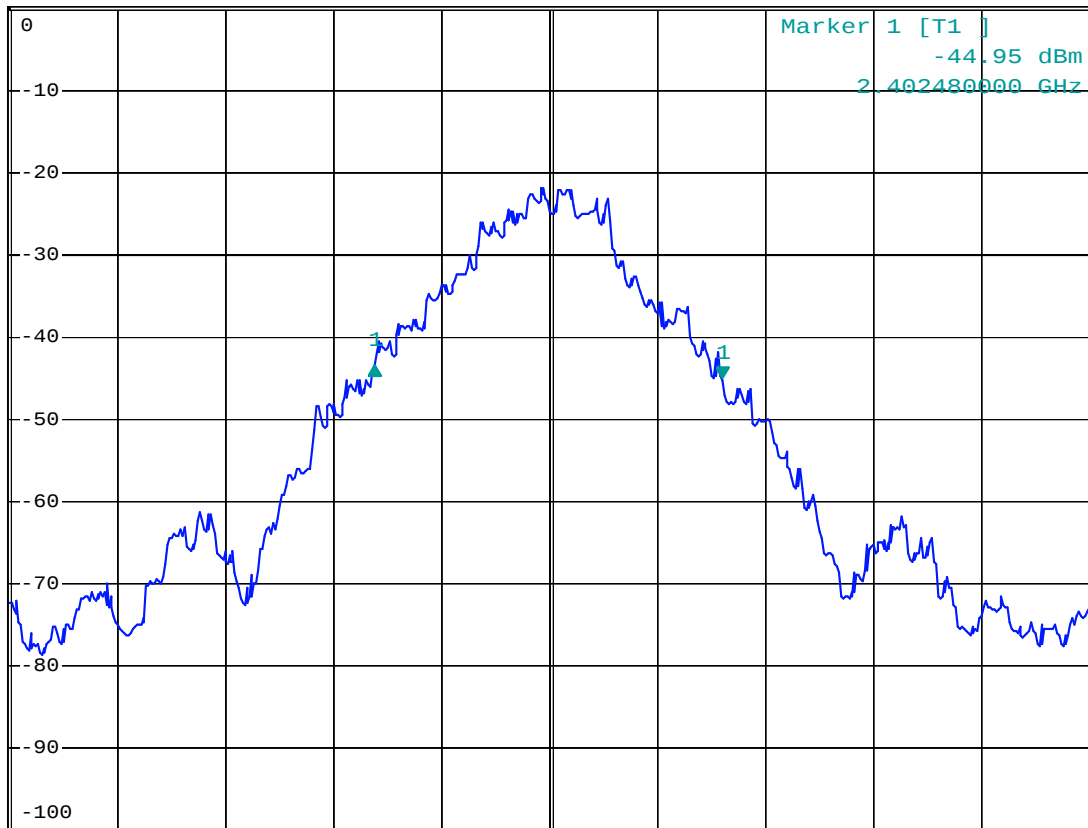
Delta 1 [T1]

1.40 dB

-966.000000000 kHz

Ref 0 dBm * Att 10 dB

**1 PK
MAXH**



Center 2.402 GHz

300 kHz/

Span 3 MHz

Date: 18.OCT.2005 21:07:49

20dB bandwidth, channel 38



DELTA MARKER 1

876 kHz

* RBW 10 kHz

* VBW 10 kHz

SWT 55 ms

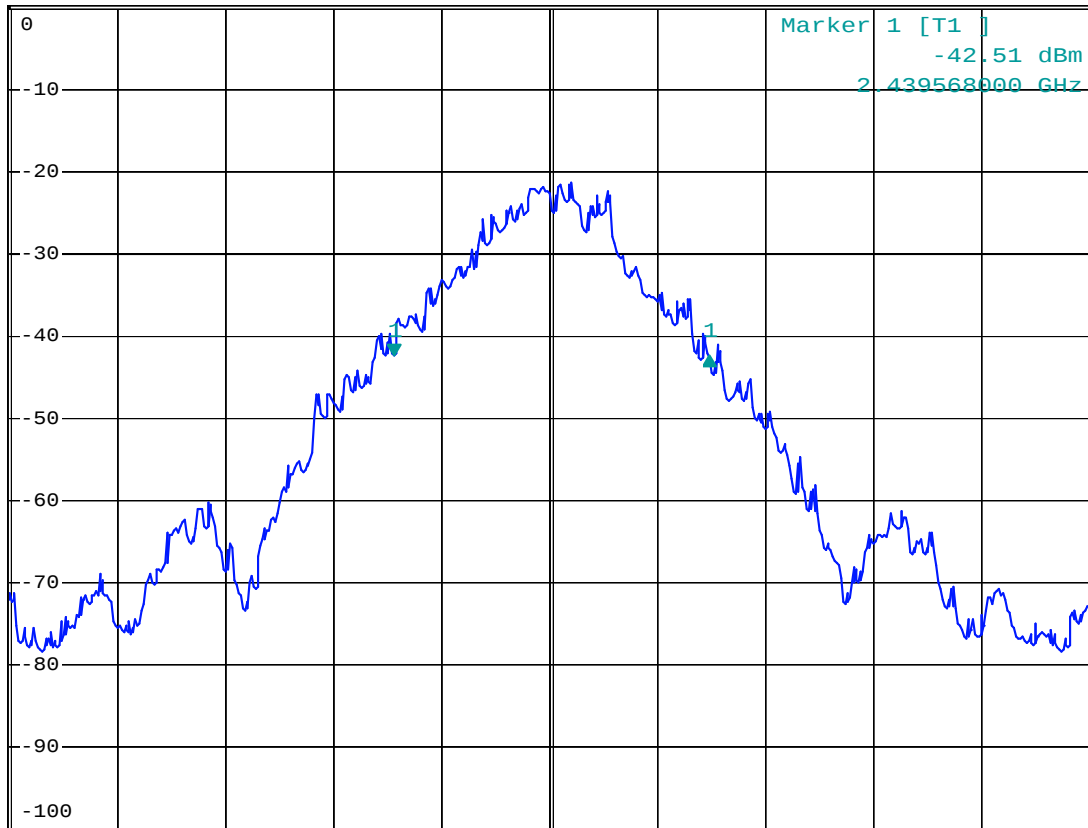
Delta 1 [T1]

0.01 dB

876.000000000 kHz

Ref 0 dBm * Att 10 dB

1 PK
MAXH



Center 2.44 GHz

300 kHz/

Span 3 MHz

Date: 18.OCT.2005 21:09:42

20dB bandwidth, channel 78



DELTA MARKER 1

852 kHz

* RBW 10 kHz

* VBW 10 kHz

SWT 55 ms

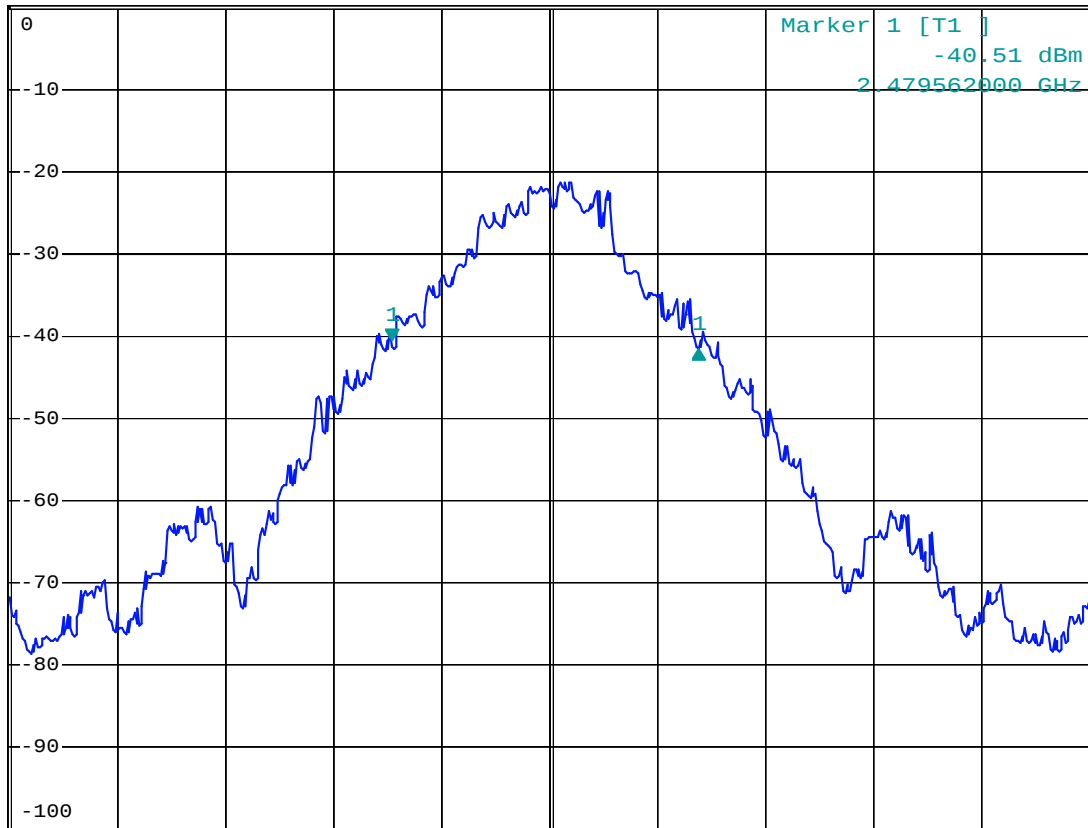
Delta 1 [T1]

-1.04 dB

852.000000000 kHz

Ref 0 dBm * Att 10 dB

1 PK
MAXH



Center 2.48 GHz

300 kHz/

Span 3 MHz

Date: 18.OCT.2005 21:11:11

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	18-Oct-05
Temperature	21-24 °C
Humidity	43-56 %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	1.09
38		1.28
78		1.36

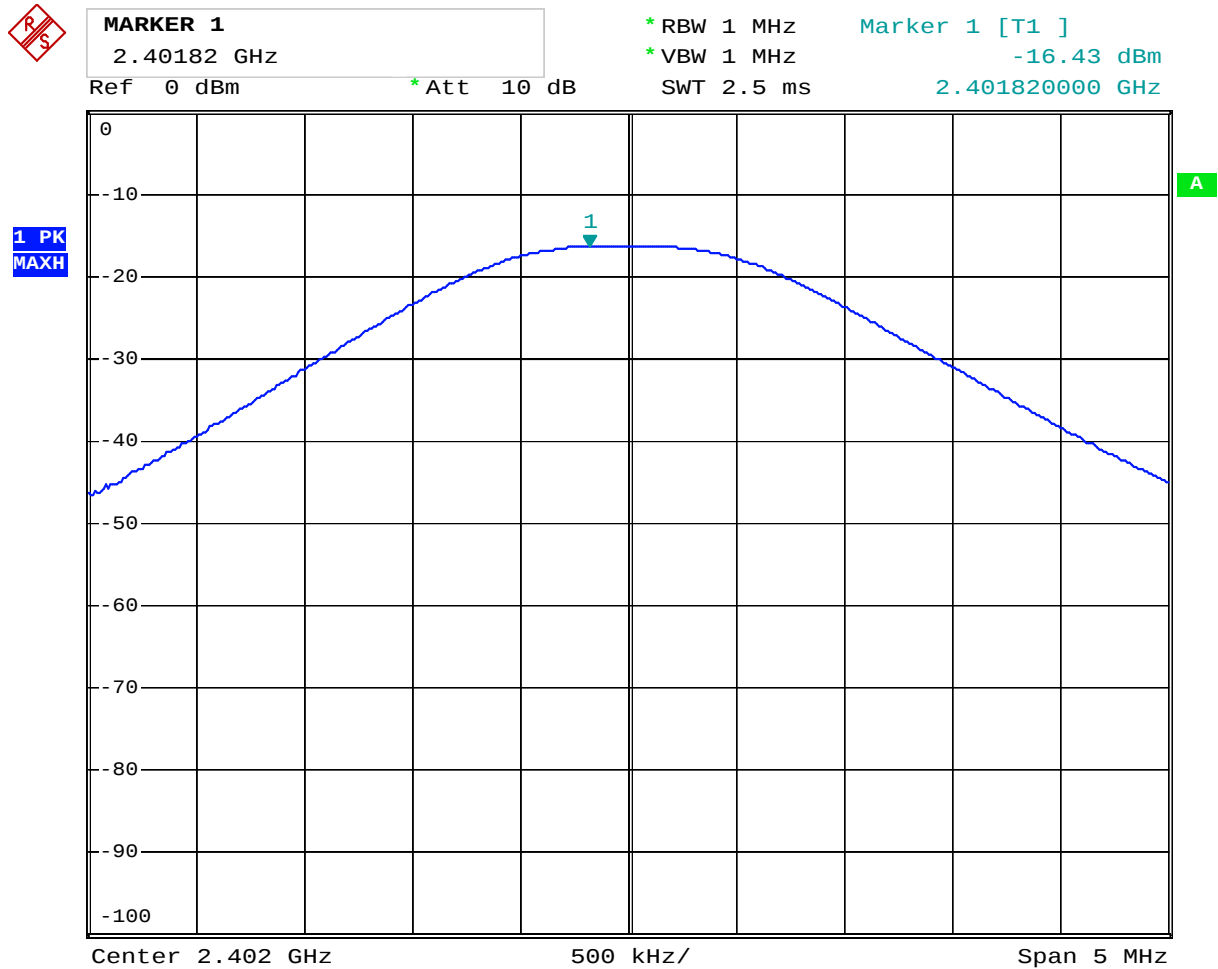
The measured power values were corrected with the attenuation of the cables, attenuator and power divider using the formula:

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

EUT channel	Trace value (dBm)	Cable loss (dB)	Divider loss (dB)	Peak output power (dBm)	Peak output power (mW)
0	-16.42	10.8	6	0.38	1.09
38	-15.73	10.8	6	1.07	1.28
78	-15.47	10.8	6	1.33	1.36

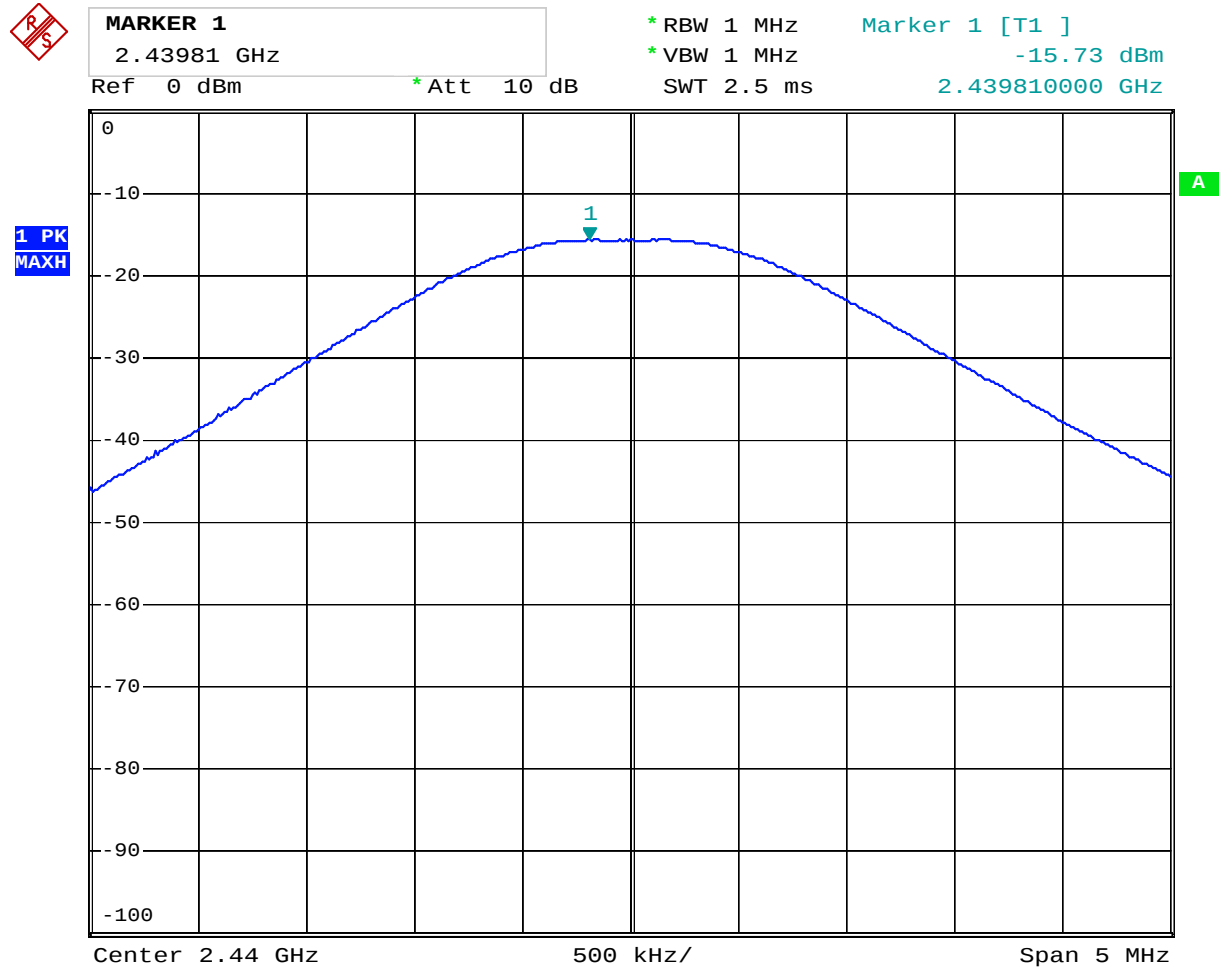
11.5 Results

Peak output power, channel 0



Date: 18.OCT.2005 21:18:49

Peak output power, channel 38



Date: 18.OCT.2005 21:18:04

Peak output power, channel 78



MARKER 1

2.48017 GHz

Ref 0 dBm

* Att 10 dB

* RBW 1 MHz

* VBW 1 MHz

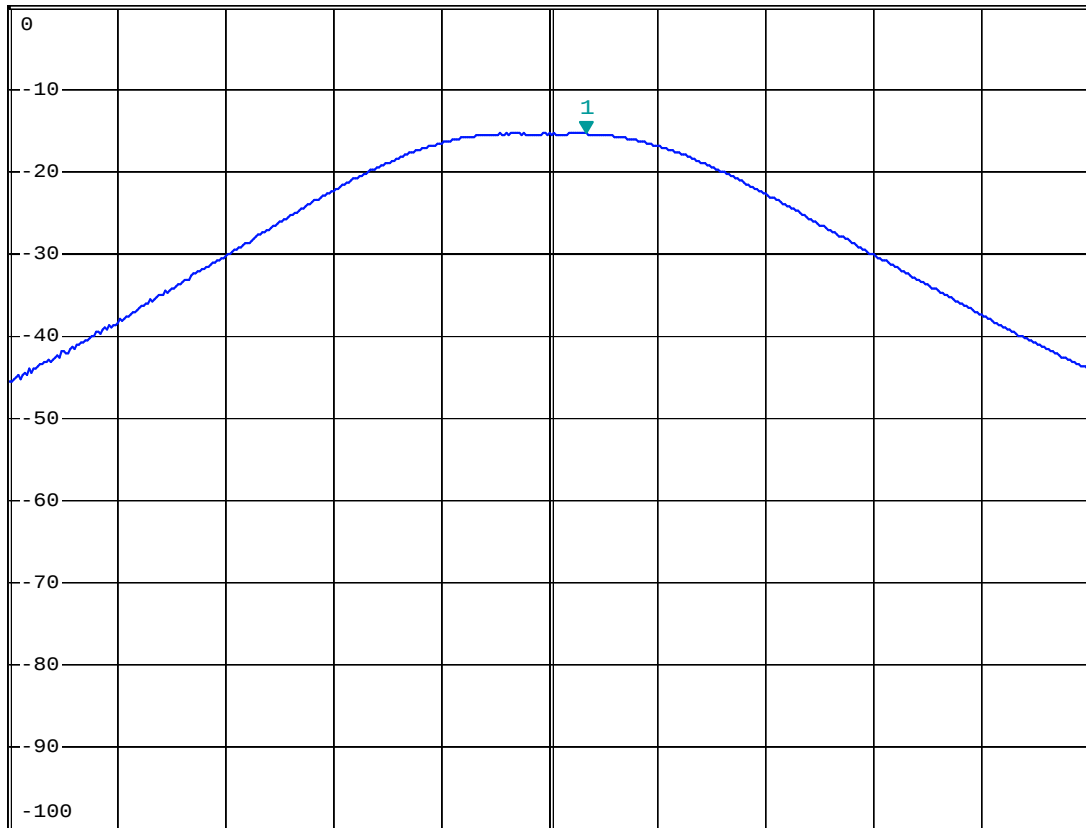
SWT 2.5 ms

Marker 1 [T1]

-15.47 dBm

2.480170000 GHz

1 PK
MAXH



Center 2.48 GHz

500 kHz/

Span 5 MHz

Date: 18.OCT.2005 21:17:15

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	18-Oct-05
Temperature	21-24 °C
Humidity	43-56 %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	-45.46
High End, Hopping Mode		-52.40
0		-48.30
78		-51.31

12.5 Results

Bandedge Compliance, Low end, hopping mode



DELTA MARKER 1

-2.08 MHz

Ref 0 dBm

*Att 10 dB

*RBW 100 kHz

*VBW 100 kHz

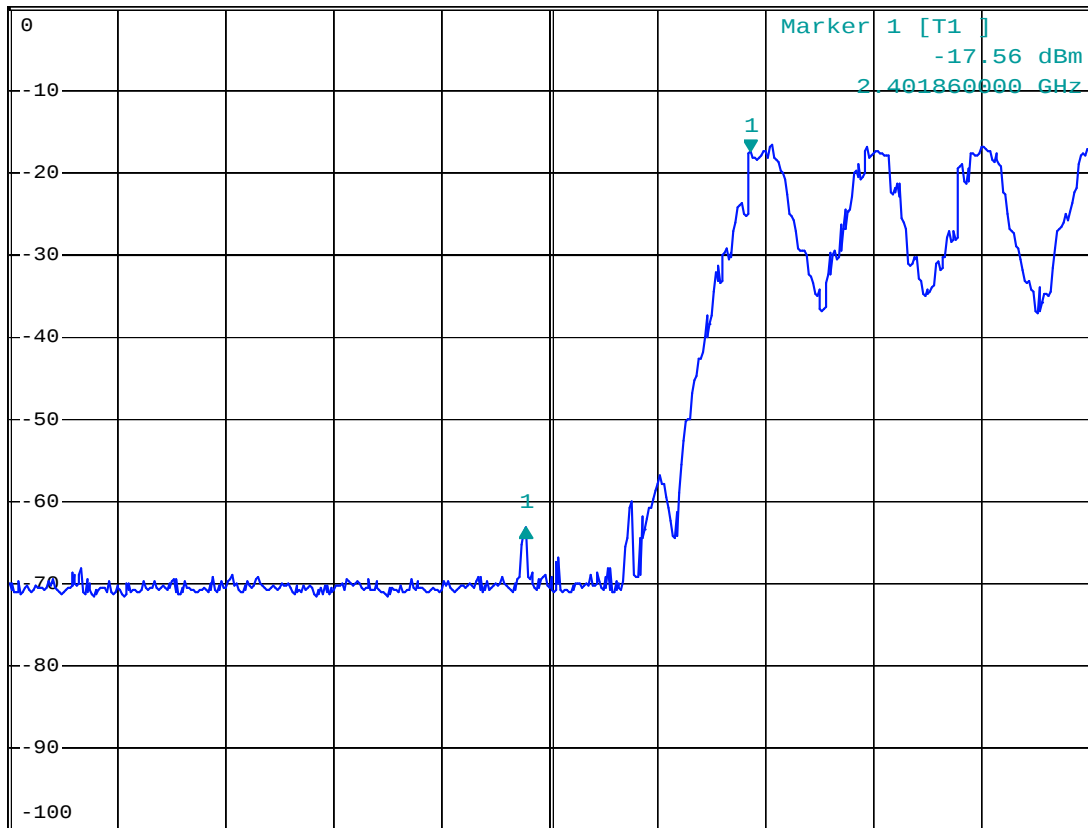
SWT 2.5 ms

Delta 1 [T1]

-45.46 dB

-2.080000000 MHz

**1 PK
MAXH**



Center 2.4 GHz

1 MHz/

Span 10 MHz

Date: 18.OCT.2005 21:40:09

Bandedge Compliance, High end, hopping mode



DELTA MARKER 1

3.96 MHz

Ref 0 dBm

* Att 10 dB

* RBW 100 kHz

* VBW 100 kHz

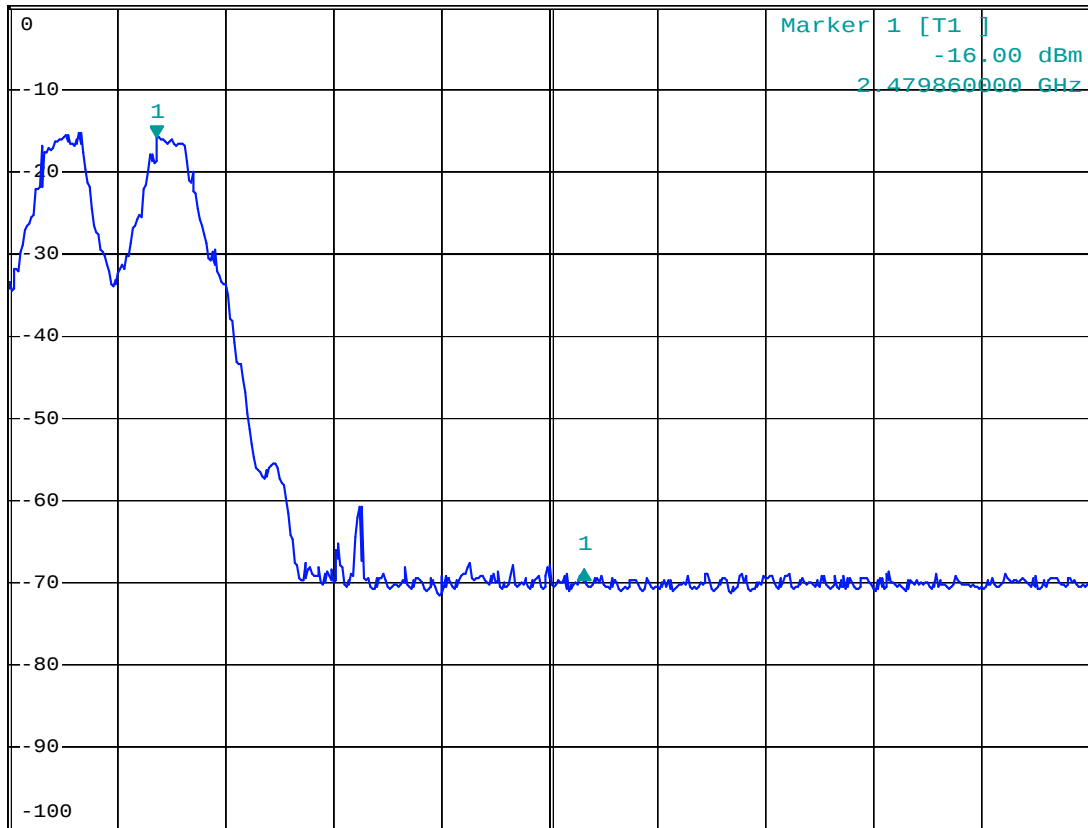
SWT 2.5 ms

Delta 1 [T1]

-52.40 dB

3.960000000 MHz

1 PK
MAXH



Center 2.4835 GHz

1 MHz/

Span 10 MHz

Date: 18.OCT.2005 21:29:59

Bandedge Compliance, Low end, channel 0



DELTA MARKER 1

-2.16 MHz

Ref 0 dBm

*Att 10 dB

* RBW 100 kHz

* VBW 100 kHz

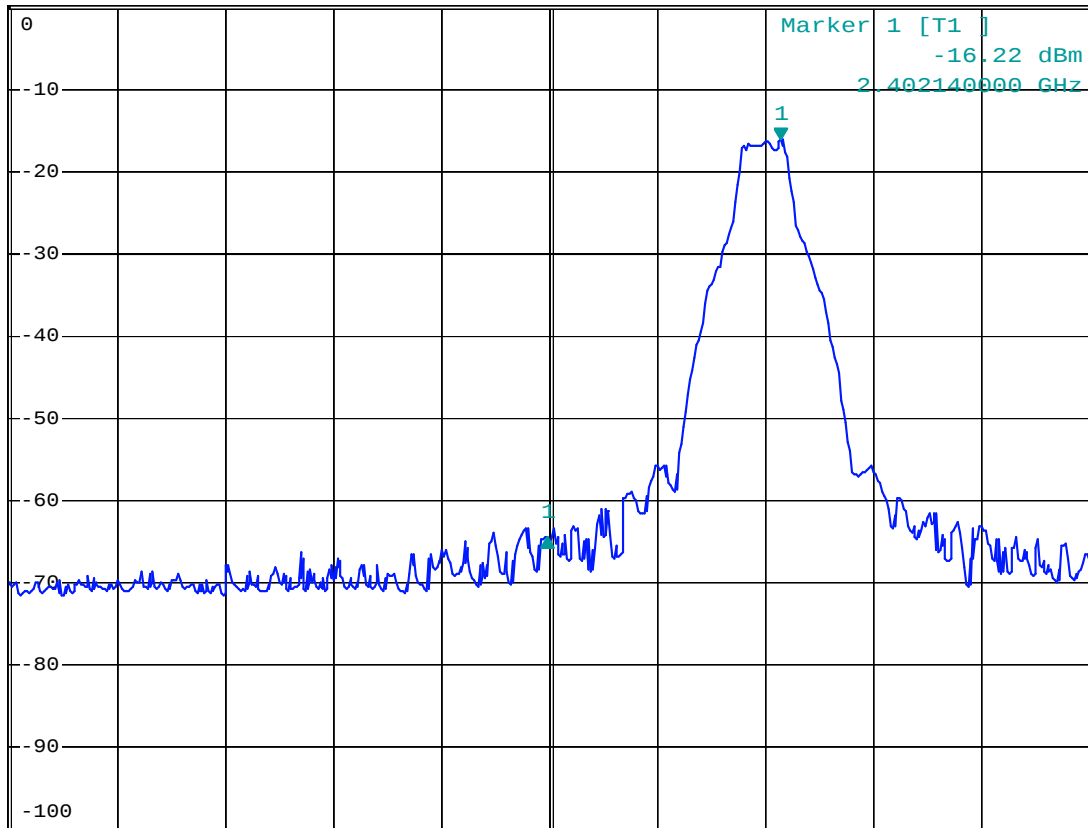
SWT 2.5 ms

Delta 1 [T1]

-48.30 dB

-2.160000000 MHz

1 PK
MAXH



Center 2.4 GHz

1 MHz/

Span 10 MHz

Date: 18.OCT.2005 21:24:14

Bandedge Compliance, High end, channel 78



DELTA MARKER 1

3.56 MHz

Ref 0 dBm

* Att 10 dB

* RBW 100 kHz

* VBW 100 kHz

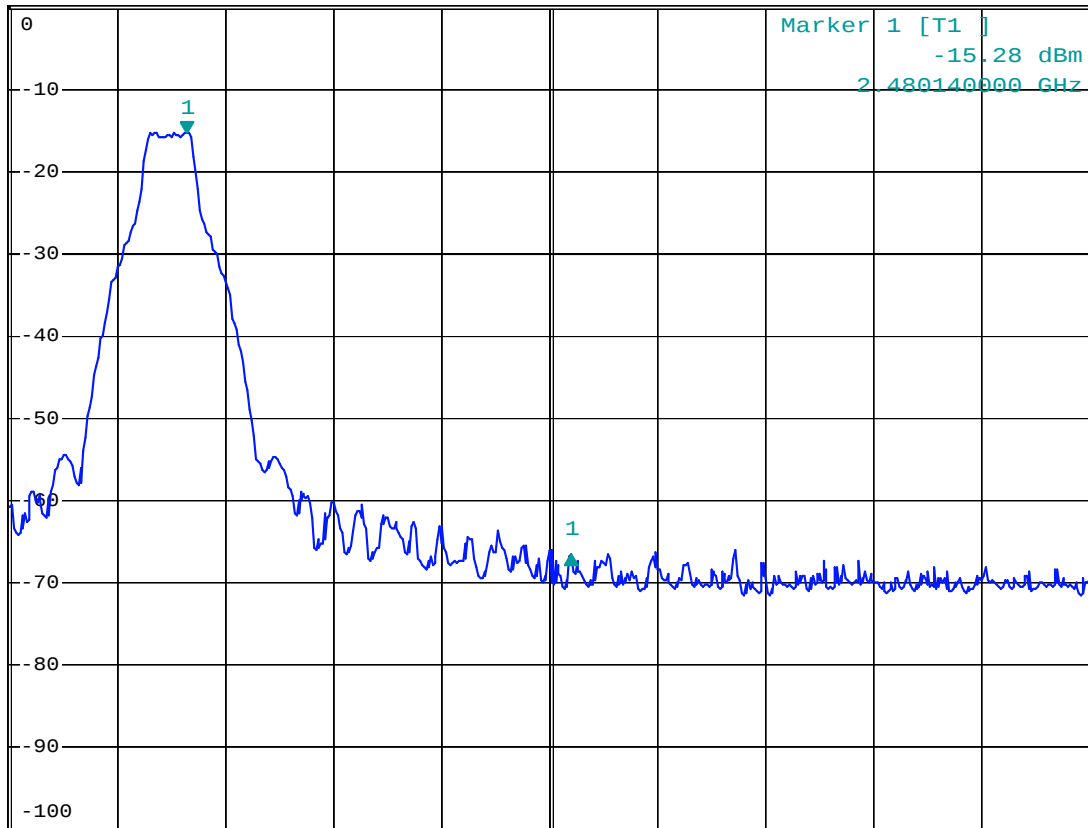
SWT 2.5 ms

Delta 1 [T1]

-51.31 dB

3.560000000 MHz

1 PK
MAXH



Center 2.4835 GHz

1 MHz/

Span 10 MHz

Date: 18.OCT.2005 21:27:00

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	18, 19-Oct-05
Temperature	21-24 °C
Humidity	43-56 %RH
Test Result	Complies

13.3 Pass/Fail Criteria

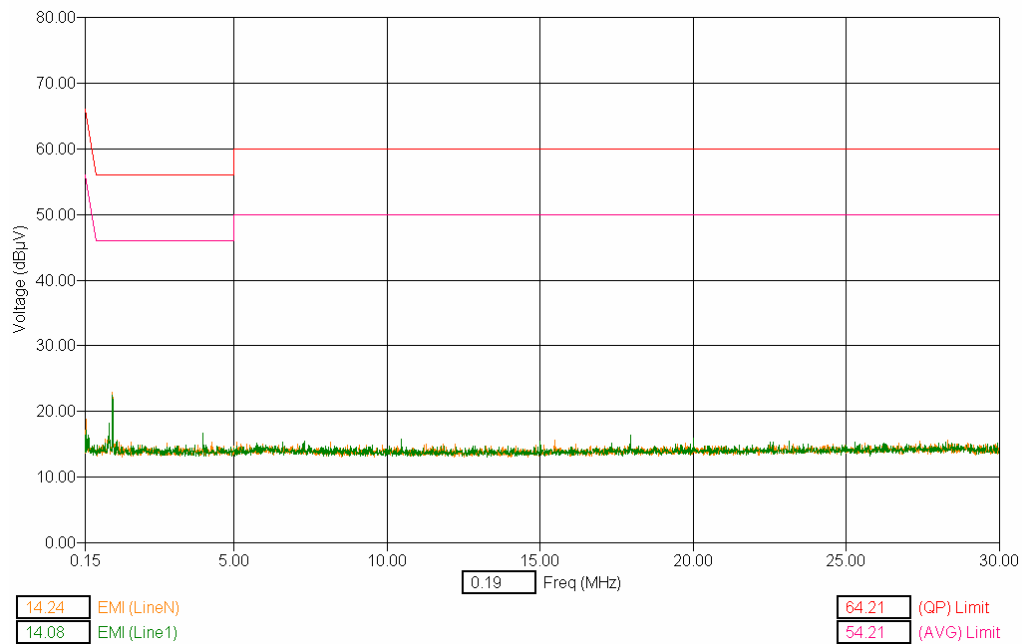
Frequency Range	AC Conducted Emission Limits (CISPR 22)	
	Quasi-peak (dBμV)	Average (dBμV)
0.15MHz - 0.5MHz	66 - 56	56 - 46
0.5MHz - 5MHz -	56	46
5MHz - 30MHz	60	50

13.4 EUT operation mode

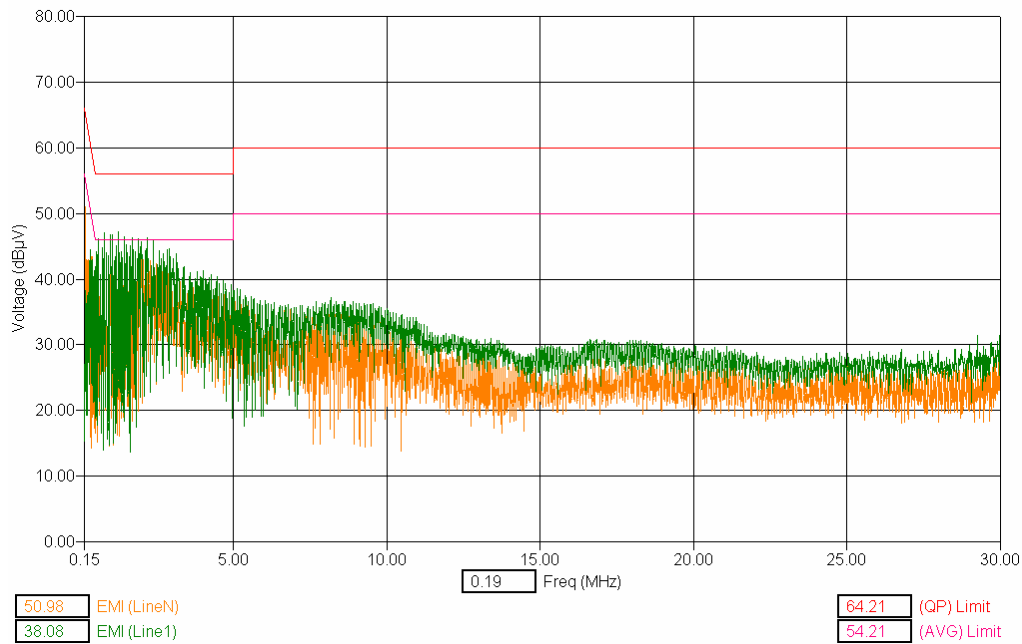
EUT operation mode	Connected, DH5, Static PRBS
EUT channel	38 (2440 MHz)
EUT TX power level	Nominal

13.5 Results

Ambient Scan



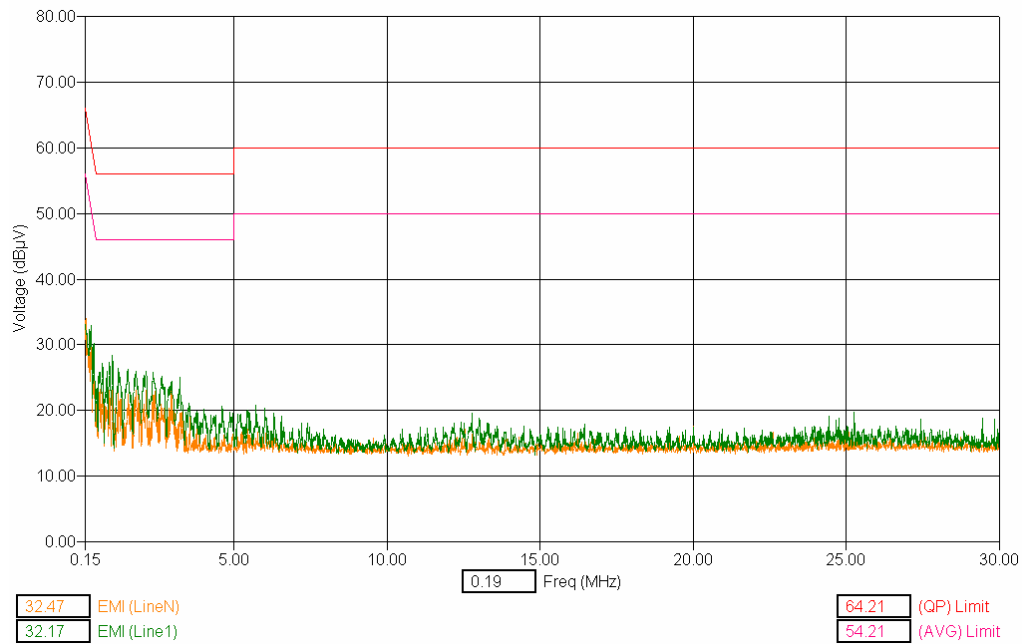
Bluetooth Paired (Idle)



Final Measurement table:

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)
0.605	35.39	43.16	0.18	0.11	L1	35.68	43.45	46.00	56.00
0.807	31.74	40.92	0.19	0.11	L1	32.04	41.22	46.00	56.00
0.886	23.18	32.70	0.19	0.14	N	23.51	33.03	46.00	56.00
1.641	13.62	23.48	0.22	0.00	N	13.84	23.70	46.00	56.00
1.745	29.46	26.29	0.22	0.00	L1	29.68	26.51	46.00	56.00
1.830	5.08	15.03	0.23	0.00	N	5.31	15.26	46.00	56.00

Bluetooth Connected (Hopping Mode)



Final Measurement table:

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)
0.210	13.43	27.21	0.13	0.08	N	13.65	27.43	53.09	63.09
0.299	17.94	29.35	0.15	0.08	L1	18.17	29.58	50.41	60.41
0.338	18.37	29.73	0.15	0.09	L1	18.61	29.97	49.23	59.23
0.340	12.67	24.99	0.15	0.09	N	12.91	25.23	49.23	59.23
0.428	15.24	26.54	0.16	0.12	L1	15.52	26.82	47.27	57.27
0.442	9.13	20.74	0.16	0.12	N	9.41	21.02	47.10	57.10

14. APPENDIX A

14.1 EUT Pictures:



14.2 Set up Pictures:

AC Emissions:



RF Conducted:

