

FCC Part 15C Compliance Test Report

Test Report no.:	Tre_FCC_0541_05.doc	Date of Report:	10.11.2005
Number of pages:	52	Customer's Contact person:	Steve Walmsley
Testing laboratory:	TCC Nokia Tampere Laboratory P.O. Box 68 Sinitaival 5 FIN-33720 TAMPERE, FINLAND Tel. +358 (0) 7180 46800 Fax. +358 (0) 7180 46880	Client:	Nokia Corporation 9200 Glenlyon Parkway Burnaby, British Columbia, Canada V5J 5J8 Tel: +1 604 456 5400 Fax: +1 604 456 5454
FCC listing no.:	94436		
IC recognition no.:	3608		
Tested devices/ accessories:	GSM phone RM-43 / Battery BL-5C, AC charger AC-4U, Headset HS-28, Adapter AD-36, Data cable DKE-2, Laptop IBM Thinkpad T22, AC adapter 02K6543, Printer HP deskjet 1600CC3540A, Digital camera FUJI DS-7, Serial cable for camera, Parallel cable for printer		
FCC ID:	QEYRM-43	IC:	661L-RM43
Supplement reports:	-		
Testing has been carried out in accordance with:	CFR 47, FCC rules Part 15 Subpart C, ANSI C63.4 (2003), IC standards RSS-GEN and RSS-210. Deviations, modifications or clarifications (if any) to above mentioned documents are written in each section under "Test method and limit".		
Documentation:	The test report must always be reproduced in full; reproduction of an excerpt only is subject to written approval of the testing laboratory. The documentation of the testing performed on the tested devices is archived for 15 years at TCC Nokia.		
Test Results:	The EUT complies with the requirements in respect of all parameters subject to the test. The test results relate only to devices specified in this document.		
Date and signature for the contents:	 Digitally signed by Jari Jantunen DN: CN = Jari Jantunen, C = FI, O = Nokia, OU = CertMT Date: 2005.11.10 11:35:59 +02'00'		

Jari Jantunen, System Manager

1. Summary for FCC Part 15C Compliance Test Report

Date of receipt	3.10.2005
Testing completed	9.11.2005
The customer's contact person	Steve Walmsley
Test Plan referred to	T:\Projects\RM-43\TestPlan_RS\ RM-43_RS_TestPlan.xls
Notes	-
Document name	T:\Projects\RM-43\results\emc\FCC\Tre_FCC_0541_05.doc

1.1. EUT and Accessory Information

The EUT is a quadri band (GSM900/1800/1900 and WCDMA2100) mobile phone with GPRS, EGPRS, Bluetooth and WLAN. Bluetooth and WLAN are tested with maximum rated TX power.

Product	Type	SN	HW	MV	SW	DUT
GSM phone	RM-43	004400421662378	4005	-	05w36_p1	40378
GSM phone	RM-43	004400421661404	4005	-	05w36_p1	40377
GSM phone	RM-43	004400421661321	4005	-	v05w42	40431
GSM phone	RM-43	004400421661677	4005	-	v05w42	40432
Battery	BL-5C	M09241CF31143	-	-	-	40379
Battery	BL-5C	M09241CF31588	-	-	-	40380
AC-Charger	AC-4U	03997915213061101207	-	-	-	40381
Headset	HS-28	160	-	2.0	-	40383
Adapter	AD-36	-	9.4	1.5	-	40384
Data cable	DKE-2	108882532510	-	-	-	40382
Laptop	IBM Thinkpad T22	555V2PT	-	-	-	40201
AC Adapter	02K6543	-	-	-	-	40202
Printer	HP deskjet 1600CC3540A	USB8302546	-	-	-	40077
Digital camera	FUJI DS-7	7102516	-	-	-	40076
Serial cable for camera	-	-	-	-	-	40088
Parallel cable for printer	-	-	-	-	-	40087

1.2. Summary of Test Results

Bluetooth:

Section in CFR 47	Section in RSS-210	Name of the test	Result
15.247(b)(1)	A8.4 (2)	Peak output power	Passed
15.247(c)	A8.5	Band edge compliance of RF emissions	Passed
15.247(c)	A8.5	Spurious RF conducted emissions	Passed
15.247(c), 15.209	A8.5	Spurious radiated emissions	Passed
15.207	7.2.2	AC powerline conducted emissions	Passed
15.247(a)(1)	A8.1 (1)	20 dB bandwidth	Passed
15.247(a)(1)	A8.1 (2)	Carrier frequency separation	Passed
15.247(a)(1)(iii)	A8.1 (4)	Number of hopping frequencies	Passed
15.247(a)(1)(iii)	A8.1 (4)	Time of occupancy	Passed

WLAN:

Section in CFR 47	Section in RSS-210	Name of the test	Result
15.247(b)(1)	A8.4 (4)	Peak output power	Passed
15.247(c)	A8.5	Band edge compliance of RF emissions	Passed
15.247(c)	A8.5	Spurious RF conducted emissions	Passed
15.247(c), 15.209	A8.5	Spurious radiated emissions	Passed
15.207	7.2.2	AC powerline conducted emissions	Passed
15.247(a)(2)	A8.2 (1)	6 dB bandwidth	Passed
15.247(e)	A8.2 (2)	Power spectral density	Passed

PASSED

FAILED

NP

The EUT complies with the essential requirements in the standard.

The EUT does not comply with the essential requirements in the standard.

The test was not performed by the TCC Nokia Tampere Laboratory.

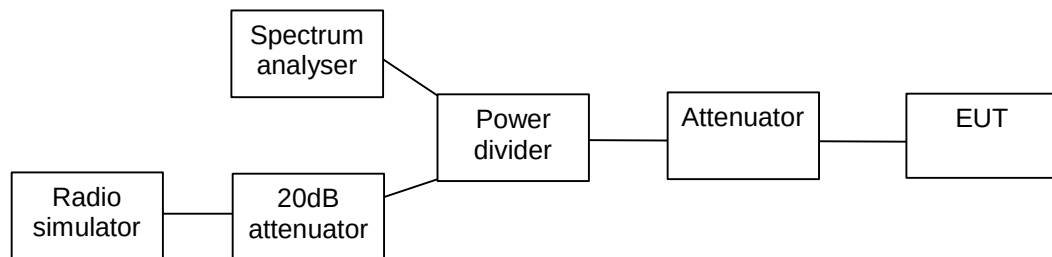
CONTENTS

1. Summary for FCC Part 15C Compliance Test Report.....	2
1.1. EUT and Accessory Information	2
1.2. Summary of Test Results	2
2. Test setups.....	6
2.1. Conducted RF test setup	6
2.2. AC powerline conducted emissions test setup.....	6
2.3. Spurious radiated emissions test setup	6
3. Peak output power (FCC §15.247(b)(1), RSS-210 6.2.2(o)(a3))	7
3.1. Test method and limit.....	7
3.2. Bluetooth Test results	7
4. Band edge compliance of RF emissions (FCC §15.247(c), RSS-210 6.2.2(o)(e1))	9
4.1. Test method and limit.....	9
4.2. Bluetooth Test results	9
5. Spurious RF conducted emissions (FCC §15.247(c), RSS-210 6.2.2(o)(e1))	12
5.1. Test method and limit.....	12
5.2. Bluetooth Test results	12
6. Spurious radiated emissions (FCC §15.247(c), §15.209, RSS-210 6.2.2(o)(e1))	14
6.1. Test method and limit.....	14
6.2. Bluetooth Test results	15
7. AC powerline conducted emissions (FCC §15.207, RSS-210 6.6).....	17
7.1. Test method and limit.....	17
7.2. Bluetooth Test results	18
8. 20 dB bandwidth (FCC §15.247(a)(1), RSS-210 6.2.2(o)(a3))	19
8.1. Test method and limit.....	19
8.2. Bluetooth Test results	19
9. Carrier frequency separation (FCC §15.247(a)(1), RSS-210 6.2.2(o)(a1))	22
9.1. Test method and limit.....	22
9.2. Bluetooth Test results	22
10. Number of hopping frequencies (FCC §15.247(a)(1)(iii), RSS-210 Amend I(ii))	23
10.1. Test method and limit.....	23
10.2. Bluetooth Test results	23
11. Time of occupancy (FCC §15.247(a)(1)(iii), RSS-210 Amend I(ii))	24

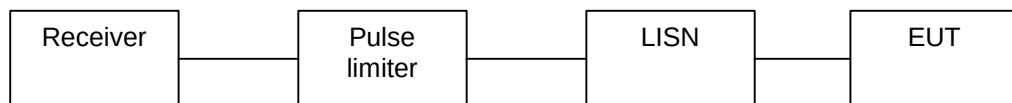
11.1.	Test method and limit	24
11.2.	Bluetooth test results	24
12.	Peak output power (FCC §15.247(b)(1), RSS-210 A8.4 (4))	26
12.1.	Test method and limit	26
12.2.	WLAN Test results	26
13.	Band edge compliance of RF emissions (FCC §15.247(c), RSS-210 A8.5)	30
14.		30
14.1.	Test method and limit	30
14.2.	WLAN Test results	30
15.	Spurious RF conducted emissions (FCC §15.247(c), RSS-210 A8.5)	33
15.1.	Test method and limit	33
15.2.	WLAN Test results	33
16.	Spurious radiated emissions (FCC §15.247(c), §15.209, RSS-210 A8.5)	38
16.1.	Test method and limit	38
16.2.	WLAN Test results	39
17.	AC powerline conducted emissions (FCC §15.207, RSS-GEN 7.2.2)	41
17.1.	Test method and limit	41
17.2.	WLAN Test results	42
18.	6 dB bandwidth (FCC §15.247(a)(2), RSS-210 A8.2 (1))	44
18.1.	Test method and limit	44
18.2.	WLAN test results.....	44
19.	Power spectral density (FCC §15.247(e), RSS-210 A8.2 (2))	48
19.1.	Test method and limit	48
19.2.	WLAN test results.....	48
20.	Test Equipment	52
20.1.	Conducted measurements	52
20.2.	Radiated measurements	52

2. Test setups

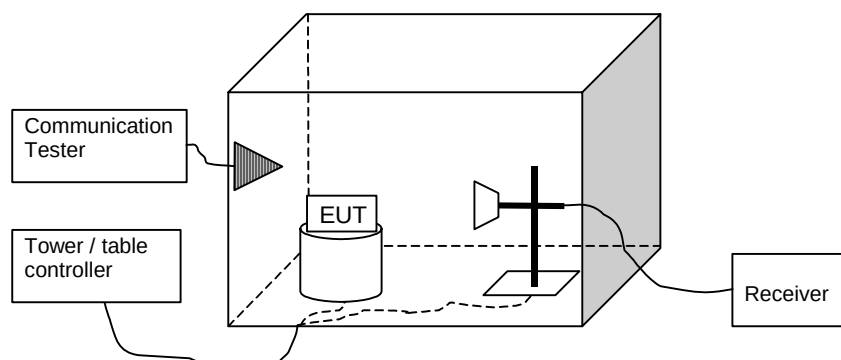
2.1. Conducted RF test setup



2.2. AC powerline conducted emissions test setup



2.3. Spurious radiated emissions test setup



3. Peak output power (FCC §15.247(b)(1), RSS-210 6.2.2(o)(a3))

EUT with DUT number	Phone: DUT 40378
Accessories with DUT numbers	Battery: DUT 40380
Operation Voltage [V] / [Hz]	-
Result	Passed
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	24/51/102.5
Date of measurements	18.10.2005
Measured by	Jan-Erik Lilja

3.1. Test method and limit

The measurement is made according to FCC rules part 15.247 and IC standard RSS-210.

Limits for peak output power measurements

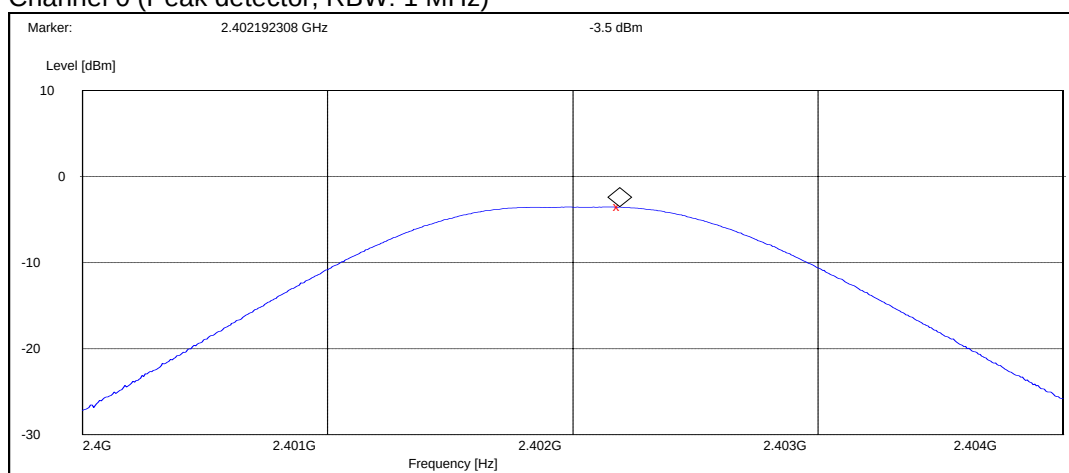
Frequency range [MHz]	Limit [W]	Limit [dBm]
2400 – 2483.5	≤ 1	≤ 30

3.2. Bluetooth Test results

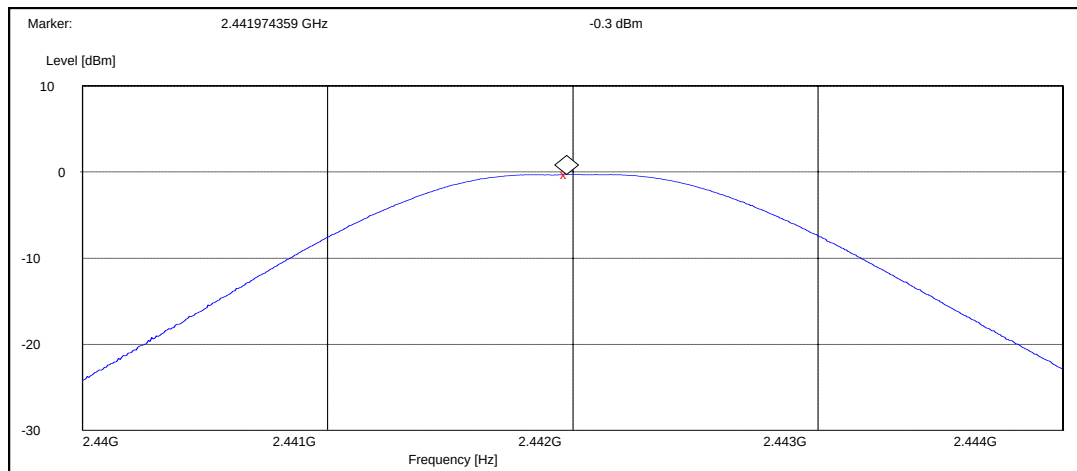
3.2.1 GSKF modulation, PRBS packet type

Channel	P [dBm]	P [mW]	Result
0	-3.50	0.447	Passed
40	-0.30	0.933	Passed
78	0.10	1.023	Passed

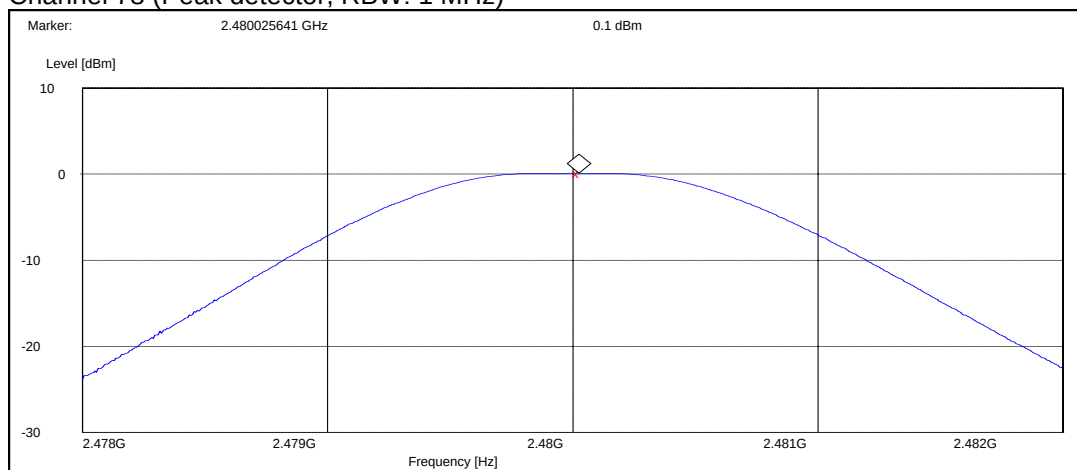
Channel 0 (Peak detector, RBW: 1 MHz)



Channel 40 (Peak detector, RBW: 1 MHz)



Channel 78 (Peak detector, RBW: 1 MHz)



4. Band edge compliance of RF emissions (FCC §15.247(c), RSS-210 6.2.2(o)(e1))

EUT with DUT number	RM-43 DUT 40377
Accessories with DUT numbers	BL-5C DUT 40379, AC-4U DUT 40381, HS-28 DUT 40383, AD-36 DUT 40384
Operation Voltage [V] / [Hz]	115 / 60
Result	PASSED
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	22 / 44 / 101.5
Date of measurements	25.10.2005
Measured by	Jari Jantunen

4.1. Test method and limit

The measurement is made according to FCC rules part 15.247 and IC standard RSS-210.

Limits for band edge compliance of RF emissions measurements (3 m measurement distance)

Frequency range [MHz]	Limit Average [dBμV/m]	Limit Peak [dBμV/m]
Below 2390 and above 2483.5	≤ 54	≤ 74

4.2. Bluetooth Test results

4.2.1 GFSK modulation, PRBS packet type

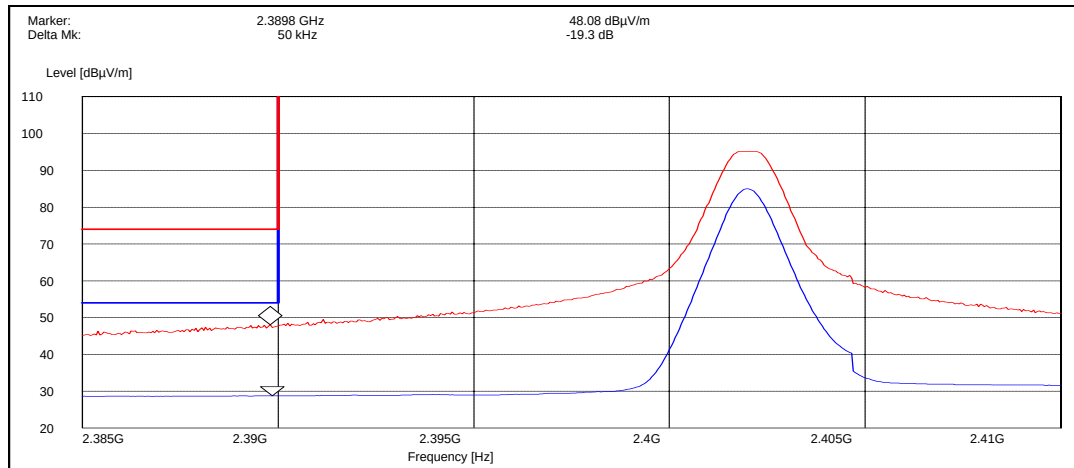
Average (RBW: 1 MHz)

Channel	E [dBμV/m]	Result
0	28.78	PASSED
78	32.22	PASSED
Hopping on, low end	28.56	PASSED
Hopping on, high end	30.94	PASSED

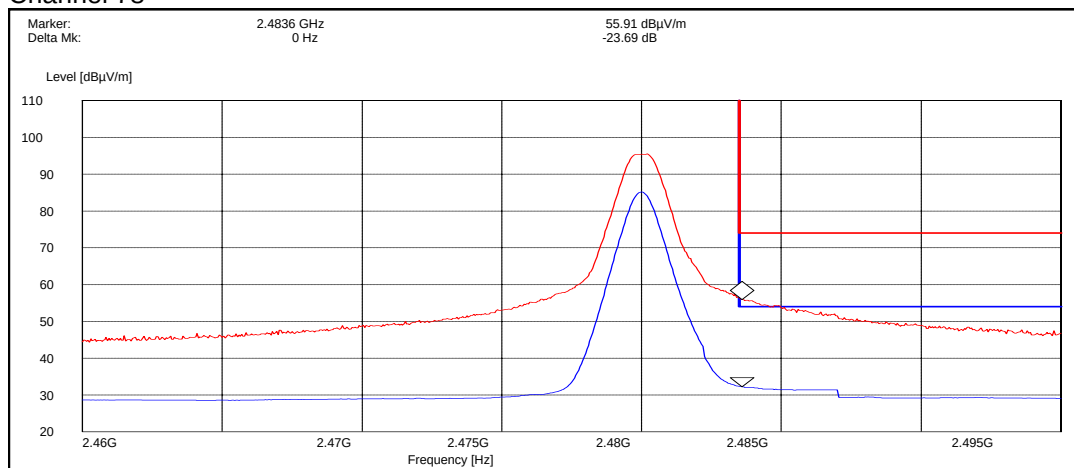
Peak (RBW: 1 MHz)

Channel	E [dBμV/m]	Result
0	48.08	PASSED
78	55.91	PASSED
Hopping on, low end	48.48	PASSED
Hopping on, high end	55.64	PASSED

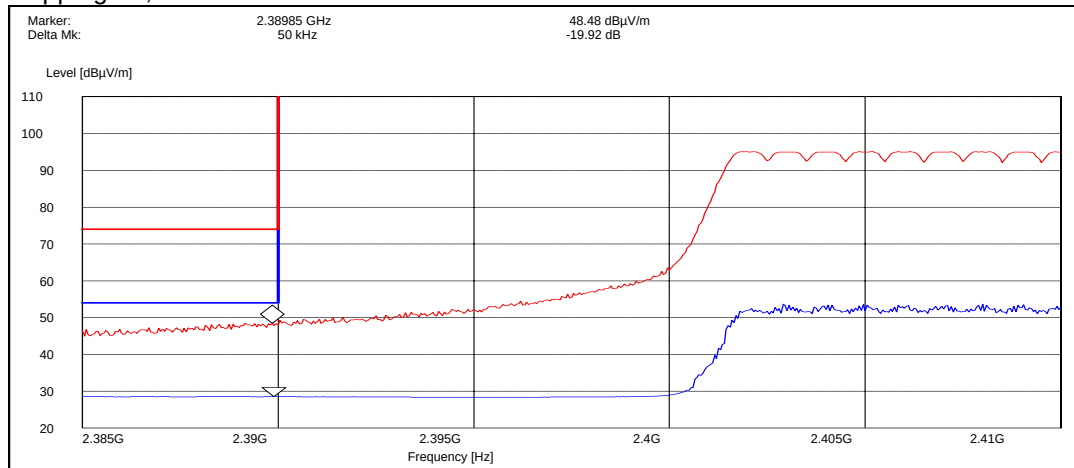
Channel 0



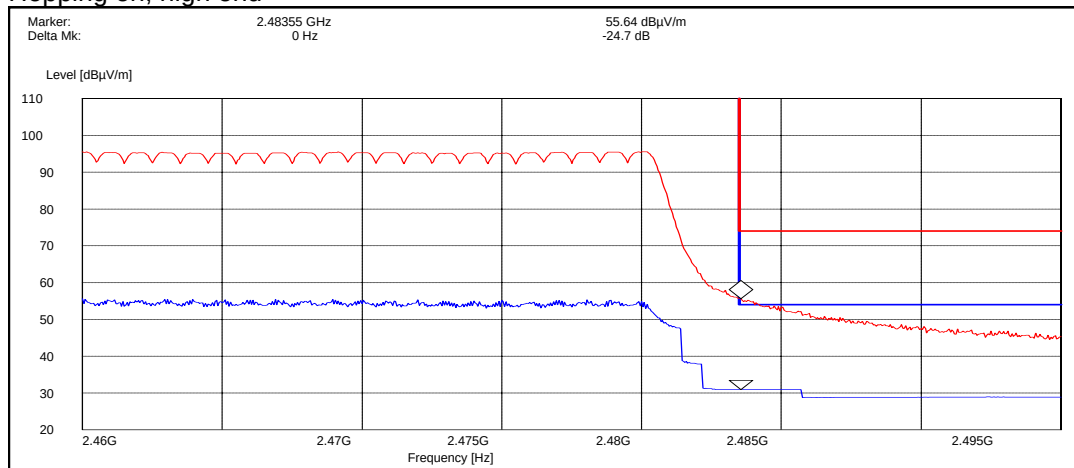
Channel 78



Hopping on, low end



Hopping on, high end



5. Spurious RF conducted emissions (FCC §15.247(c), RSS-210 6.2.2(o)(e1))

EUT with DUT number	Phone: DUT 40378
Accessories with DUT numbers	Battery: DUT 40380
Operation Voltage [V] / [Hz]	-
Result	Passed
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	24/51/102.5
Date of measurements	18.10.2005
Measured by	Jan-Erik Lilja

5.1. Test method and limit

The measurement is made according to FCC rules part 15.247 and IC standard RSS-210.

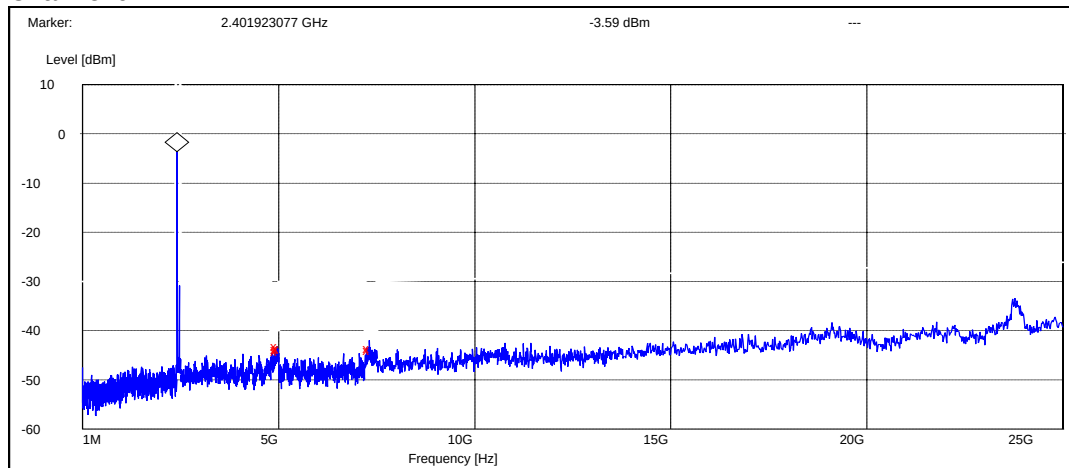
Limits for spurious RF conducted emissions measurements

Frequency range [MHz]	Limit [dBc]
1 – 25000	≤ -20

5.2. Bluetooth Test results

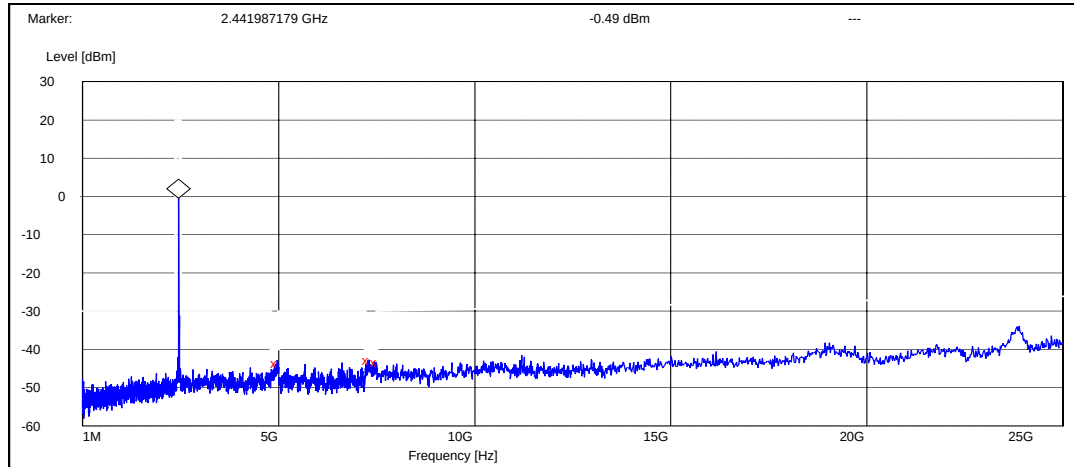
5.2.1 GFSK modulation, PRBS packet type

Channel 0



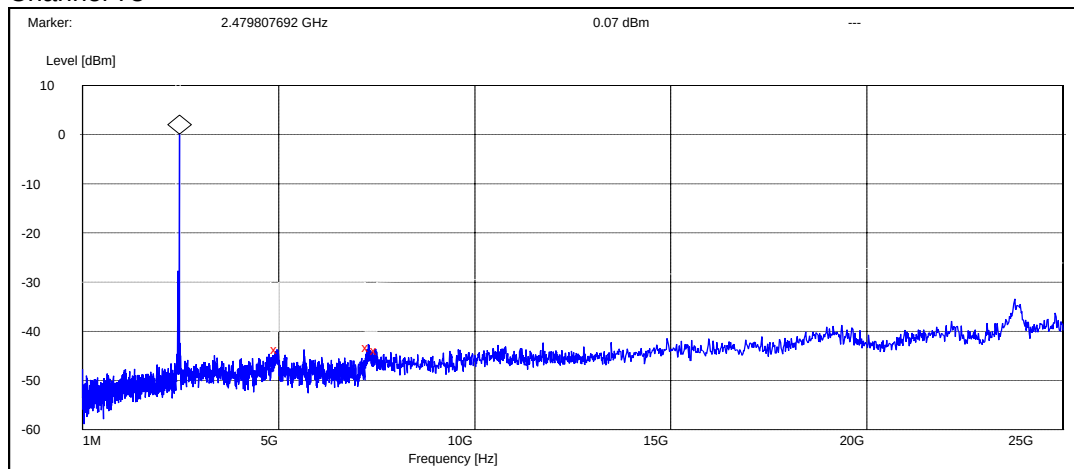
Frequency [MHz]	P [dBc]	Result
4963.482051	-39.705124	Passed
4999.800000	-40.105124	Passed
7307.611538	-39.905124	Passed

Channel 40



Frequency [MHz]	P [dBc]	Result
4961.217949	-43.107111	Passed
7306.250000	-42.207111	Passed
7500.000000	-42.807111	Passed

Channel 78



Frequency [MHz]	P [dBc]	Result
4965.064103	-43.770710	Passed
7289.423077	-43.370710	Passed
7500.000000	-43.970710	Passed

6. Spurious radiated emissions (FCC §15.247(c), §15.209, RSS-210 A8.5)

EUT with DUT number	RM-43 DUT 40377
Accessories with DUT numbers	BL-5C DUT 40379, AC-4U DUT 40381, HS-28 DUT 40383, AD-36 DUT 40384
Operation Voltage [V] / [Hz]	115 / 60
Result	PASSED
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	22 / 44 / 101.5
Date of measurements	25.10.2005
Measured by	Jari Jantunen

6.1. Test method and limit

The measurement is made according to FCC rules part 15.247 and IC standard RSS-210 as follows:

The measurement is divided into the Preliminary Measurement and the Final Measurement.

The suspected frequencies are searched for in Preliminary Measurement with absorbers on the floor and measuring antenna at fixed height using 2-axis EUT position system.

The Final Measurement is performed in the Semi-Anechoic Chamber with conducting metal floor, if the Preliminary Measurement results are closer than 20 dB to the permissible value.

The EUT is placed at nonconductive plate at the turntable center.

For each suspected frequency, the turntable is rotated 360 degrees and antenna is scanned from 1 to 4 m. This is repeated for both horizontal and vertical receive antenna polarizations.

The emissions less than 20 dB below the permissible value are reported.

The measurement results are obtained as described below:

$$E [\mu V/m] = U_{RX} + A_{TOT}$$

Where U_{RX} is receiver reading and A_{TOT} is total correction factor including cable loss, antenna factor and preamplifier gain ($A_{TOT} = L_{CABLES} + AF - G_{PREAMP}$).

Limits for spurious radiated emissions measurements (3 m measurement distance)

Frequency range [MHz]	Limit [$\mu\text{V/m}$]	Limit [dB $\mu\text{V/m}$]	Detector
30 – 88	100	40	Quasi peak
88 – 216	150	43.5	Quasi peak
216 – 960	200	46	Quasi peak
960 – 1000	500	54	Quasi peak
Above 1000	500	54	Average
Above 1000	5000	74	Peak

6.2. Bluetooth Test results

6.2.1 GFSK modulation, PRBS packet type

Channel 0

Peak (RBW: 1 MHz)

Frequency [MHz]	E [dB $\mu\text{V/m}$]	E [$\mu\text{V/m}$]	U _{RX} [dB μV]	A _{TOT} [dB]	Polarisation	Result
4804.000000	42.10	127.35	42.40	-0.30	HORIZONTAL	PASSED
7206.000000	44.30	164.06	41.30	3.00	VERTICAL	PASSED
9608.000000	47.00	223.87	37.70	9.30	HORIZONTAL	PASSED

Average (RBW: 1 MHz)

Frequency [MHz]	E [dB $\mu\text{V/m}$]	E [$\mu\text{V/m}$]	U _{RX} [dB μV]	A _{TOT} [dB]	Polarisation	Result
4804.000000	30.10	31.99	30.40	-0.30	HORIZONTAL	PASSED
7206.000000	30.40	33.11	27.40	3.00	VERTICAL	PASSED
9608.000000	33.60	47.86	24.30	9.30	VERTICAL	PASSED

Channel 40

Peak (RBW: 1 MHz)

Frequency [MHz]	E [dB $\mu\text{V/m}$]	E [$\mu\text{V/m}$]	U _{RX} [dB μV]	A _{TOT} [dB]	Polarisation	Result
4884.000000	43.00	141.25	43.70	-0.70	HORIZONTAL	PASSED
7351.695391	44.20	162.18	39.80	4.40	VERTICAL	PASSED
17956.407816	56.40	660.69	34.80	21.60	VERTICAL	PASSED

Average (RBW: 1 MHz)

Frequency [MHz]	E [dB $\mu\text{V/m}$]	E [$\mu\text{V/m}$]	U _{RX} [dB μV]	A _{TOT} [dB]	Polarisation	Result
4884.000000	30.50	33.50	31.20	-0.70	HORIZONTAL	PASSED
7346.195391	31.70	38.46	27.40	4.30	VERTICAL	PASSED
17955.407816	42.90	139.64	21.20	21.70	VERTICAL	PASSED

Channel 78

Peak (RBW: 1 MHz)

Frequency [MHz]	E [dB $\mu\text{V/m}$]	E [$\mu\text{V/m}$]	U _{RX} [dB μV]	A _{TOT} [dB]	Polarisation	Result
-----------------	-------------------------	-----------------------	-------------------------------------	-----------------------	--------------	--------

4960.000000	43.30	146.22	43.40	-0.10	HORIZONTAL	PASSED
7440.000000	44.60	169.82	40.20	4.40	HORIZONTAL	PASSED
9920.000000	46.40	208.93	37.20	9.20	VERTICAL	PASSED

Average (RBW: 1 MHz)

Frequency [MHz]	E [dB μ V/m]	E [μ V/m]	U _{RX} [dB μ V]	A _{TOT} [dB]	Polarisation	Result
4960.000000	30.50	33.50	30.60	-0.10	HORIZONTAL	PASSED
7440.000000	32.00	39.81	27.60	4.40	HORIZONTAL	PASSED
9920.000000	33.80	48.98	24.60	9.20	VERTICAL	PASSED

7. AC powerline conducted emissions (FCC §15.207, RSS-GEN 7.2.2)

EUT with DUT number	RM-43 DUT 40377
Accessories with DUT numbers	BL-5C DUT 40379, AC-4U DUT 40381, HS-28 DUT 40383, AD-36 DUT 40384
Operation Voltage [V] / [Hz]	115 / 60
Result	PASSED
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	21 / 48 / 101.4
Date of measurements	20.10.2005
Measured by	Jari Jantunen

7.1. Test method and limit

The measurement is made according to FCC rules part 15.247 and IC standard RSS-210 as follows:

The EUT is placed on a wooden table 80 cm above the reference groundplane.

The EUT is connected via LISN to a test power supply.

The measurement results are obtained as described below:

$$U [dB\mu V] = U_{RX} + A_{TOT}$$

Where U_{RX} is receiver reading and A_{TOT} is total correction factor including cable and pulse limiter attenuations.

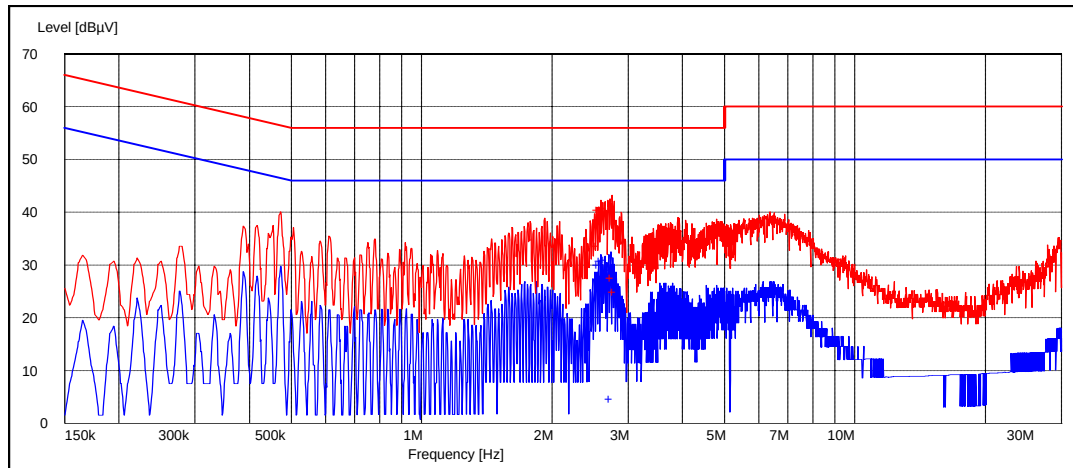
CISPR 22 Class B limits

Frequency range [MHz]	Quasi peak limit [dBμV]	Average limit [dBμV]
0.15 - 0.5	66 - 56	56 - 46
0.5 - 5	56	46
5 - 30	60	50

7.2. Bluetooth Test results

7.2.1 GFSK modulation, PRBS packet type

Channel 40



Quasi peak (RBW: 9 kHz)

Frequency [MHz]	U [dBμV]	Line	Result
2.541082	33.70	N	PASSED
2.565130	40.40	L1	PASSED
2.595190	39.10	L1	PASSED
2.649299	40.70	L1	PASSED
2.751503	27.50	N	PASSED
2.781563	24.90	N	PASSED

Average (RBW: 9 kHz)

Frequency [MHz]	U [dBμV]	Line	Result
2.565130	29.90	N	PASSED
2.595190	30.70	N	PASSED
2.649299	31.00	N	PASSED
2.703407	26.80	N	PASSED
2.733467	4.70	N	PASSED
2.763527	29.00	L1	PASSED

8. 20 dB bandwidth (FCC §15.247(a)(1), RSS-210 A8.1 (1))

EUT with DUT number	Phone: DUT 40378
Accessories with DUT numbers	Battery: DUT 40380
Operation Voltage [V] / [Hz]	-
Result	Passed
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	24/51/102.5
Date of measurements	18.10.2005
Measured by	Jan-Erik Lilja

8.1. Test method and limit

The measurement is made according to FCC rules part 15.247 and IC standard RSS-210.

Limits for 20 dB bandwidth measurements

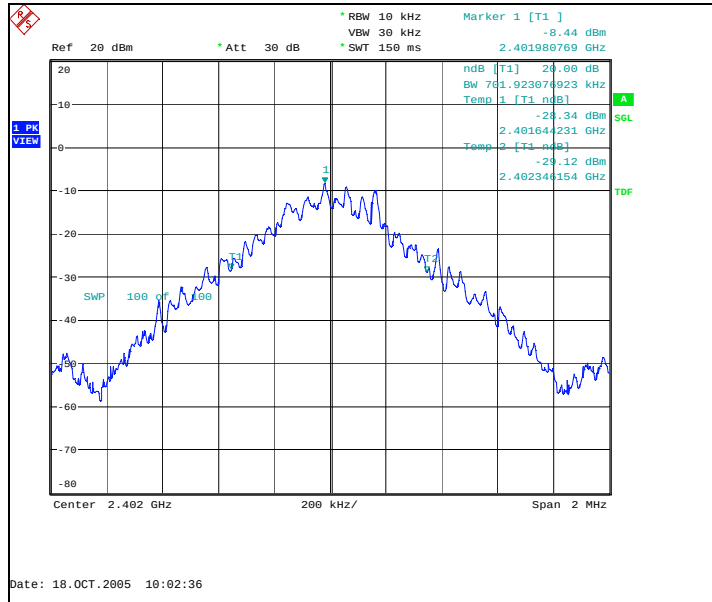
Limit [MHz]
≤ 1

8.2. Bluetooth Test results

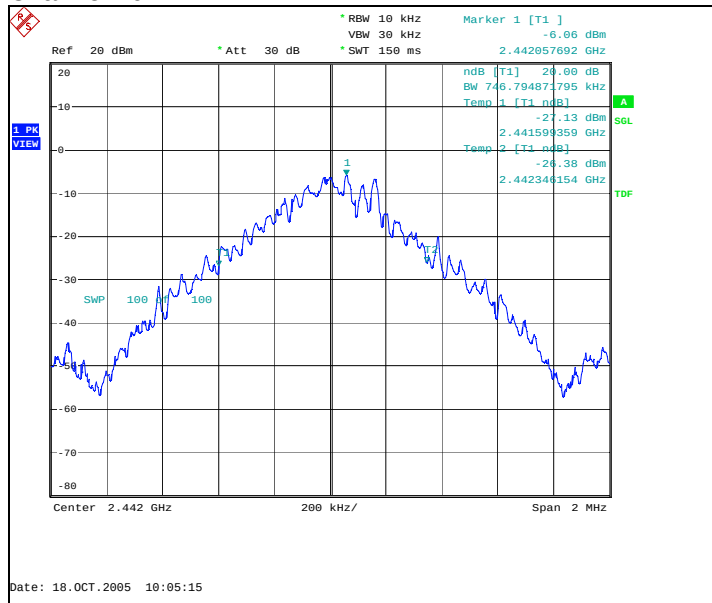
8.2.1 GFSK modulation, PRBS packet type

Channel	20 dB bandwidth [kHz]	Result
0	701.923	Passed
40	746.795	Passed
78	759.615	Passed

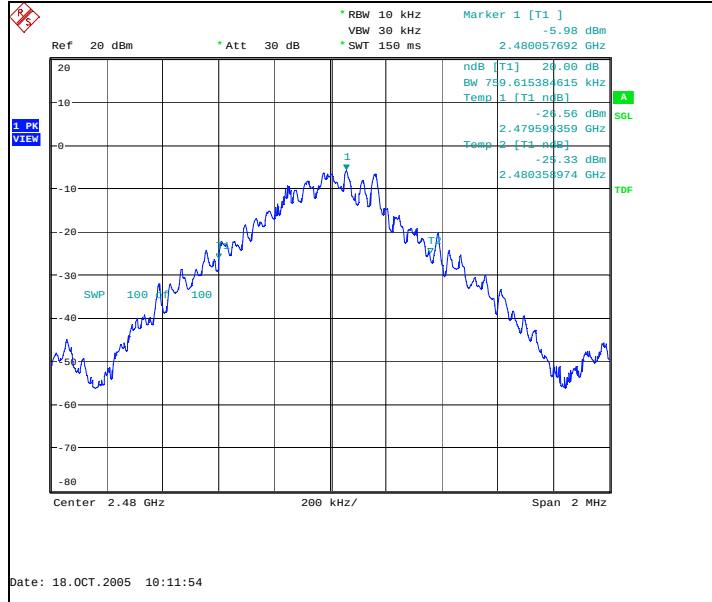
Channel 0



Channel 40



Channel 78



9. Carrier frequency separation (FCC §15.247(a)(1), RSS-210 A8.1 (2))

EUT with DUT number	Phone: DUT 40378
Accessories with DUT numbers	Battery: DUT 40380
Operation Voltage [V] / [Hz]	-
Result	Passed
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	24/51/102.5
Date of measurements	18.10.2005
Measured by	Jan-Erik Lilja

9.1. Test method and limit

The measurement is made according to FCC rules part 15.247 and IC standard RSS-210.

Limits for carrier frequency separation measurements

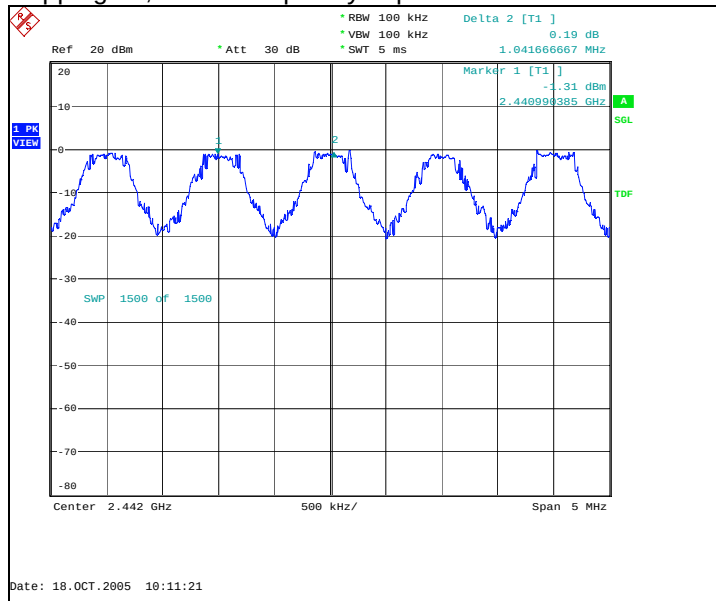
Limit [MHz]
≥ 0.025 or 20 dB bandwidth

9.2. Bluetooth Test results

9.2.1 GFSK modulation, PRBS packet type

Carrier frequency separation [kHz]	Result
1041.667	Passed

Hopping on, carrier frequency separation of channels 39 and 40



10. Number of hopping frequencies

(FCC §15.247(a)(1)(iii), RSS-210 A8.1 (4))

EUT with DUT number	Phone: DUT 40378
Accessories with DUT numbers	Battery: DUT 40380
Operation Voltage [V] / [Hz]	-
Result	Passed
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	24/51/102.5
Date of measurements	18.10.2005
Measured by	Jan-Erik Lilja

10.1. Test method and limit

The measurement is made according to FCC rules part 15.247 and IC standard RSS-210.

Limits for number of hopping frequencies measurements

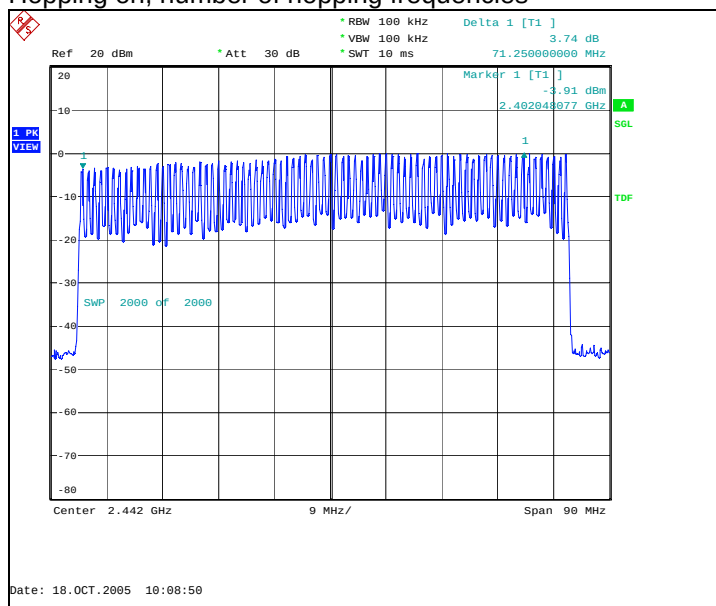
Limit [number]
≥ 75

10.2. Bluetooth Test results

10.2.1 GFSK modulation, PRBS packet type

Measured number of hopping frequencies	Result
79	Passed

Hopping on, number of hopping frequencies



11. Time of occupancy (FCC §15.247(a)(1)(iii), RSS-210 A8.1 (4))

EUT with DUT number	Phone: DUT 40378
Accessories with DUT numbers	Battery: DUT 40380
Operation Voltage [V] / [Hz]	-
Result	Passed
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	24/51/102.5
Date of measurements	18.10.2005
Measured by	Jan-Erik Lilja

11.1. Test method and limit

The measurement is made according to FCC rules part 15.247 and IC standard RSS-210 as follows:

The total time of occupancy is get by multiplying the measured number of transmissions occurred during 31.6 second period with the duration of one transmission.

Limits for time of occupancy measurements

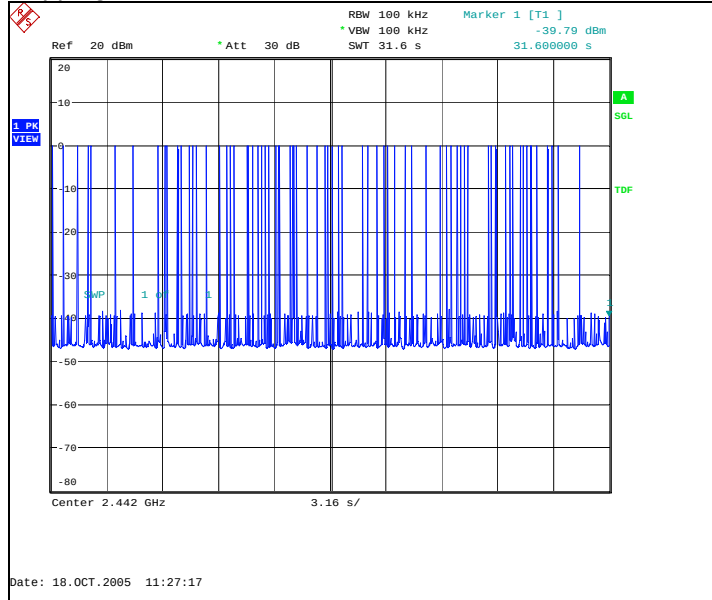
Limit [s]
≤ 0.4

11.2. Bluetooth test results

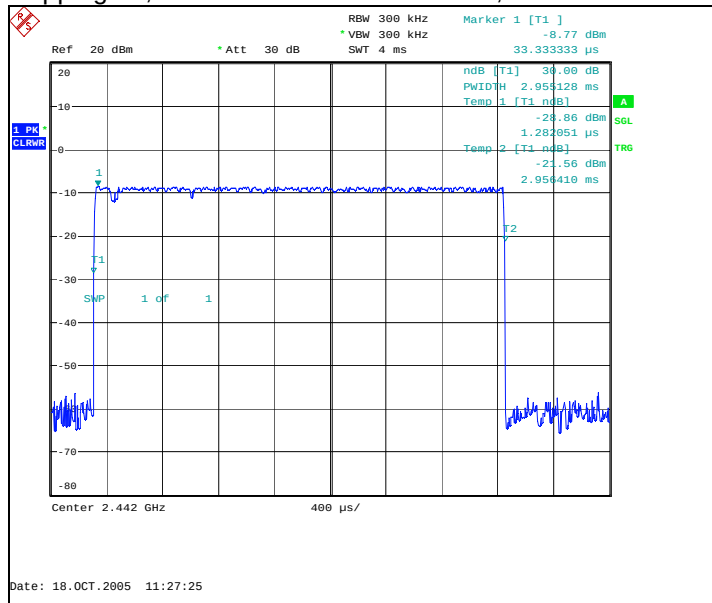
11.2.1 GFSK modulation, PRBS packet type

Measured number of transmissions	Duration of one transmission [μs]	Time of occupancy [s]	Result
69	2955.128	0.203904	Passed

Hopping on, number of transmissions, channel 40



Hopping on, duration of one transmission, channel 40



12. Peak output power (FCC §15.247(b)(1), RSS-210 A8.4 (4))

EUT with DUT number	Phone: DUT 40432
Accessories with DUT numbers	Battery: DUT 40362
Operation Voltage [V] / [Hz]	-
Result	Passed
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	23/50/102.2
Date of measurements	8-9.11.2005
Measured by	Jan-Erik Lilja

12.1. Test method and limit

The measurement is made according to FCC rules part 15.247 and IC standard RSS-210.

Limits for peak output power measurements

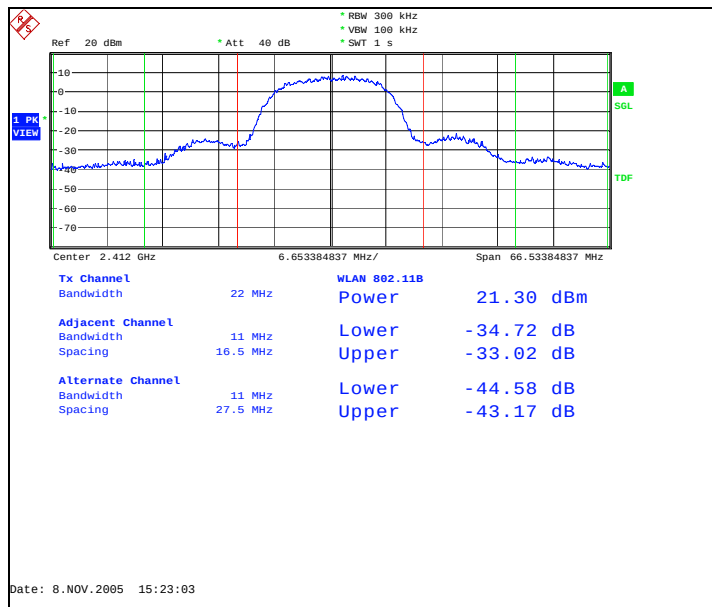
Frequency range [MHz]	Limit [W]	Limit [dBm]
2400 – 2483.5	≤ 1	≤ 30

12.2. WLAN Test results

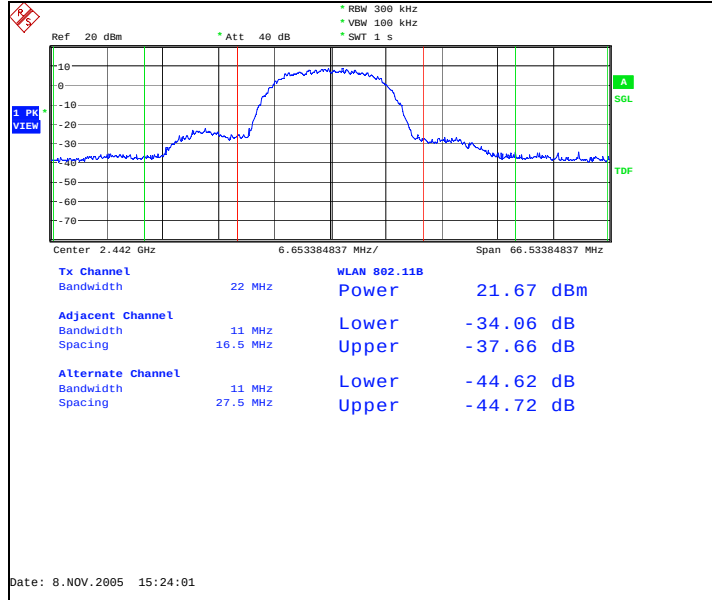
12.2.1 DSSS mode, QPSK modulation, 11 Mbps data rate

Channel	P [dBm]	P [W]	Result
1	21.30	0.135	Passed
7	21.67	0.147	Passed
11	22.39	0.173	Passed

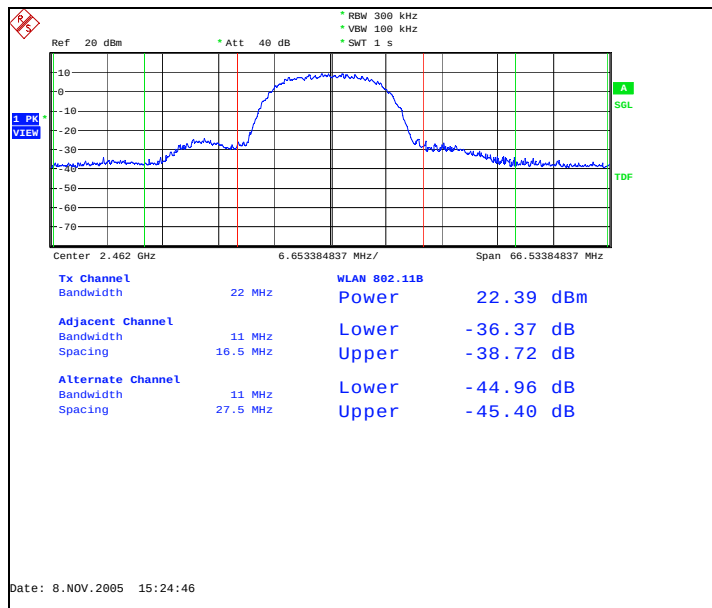
Channel 1



Channel 7



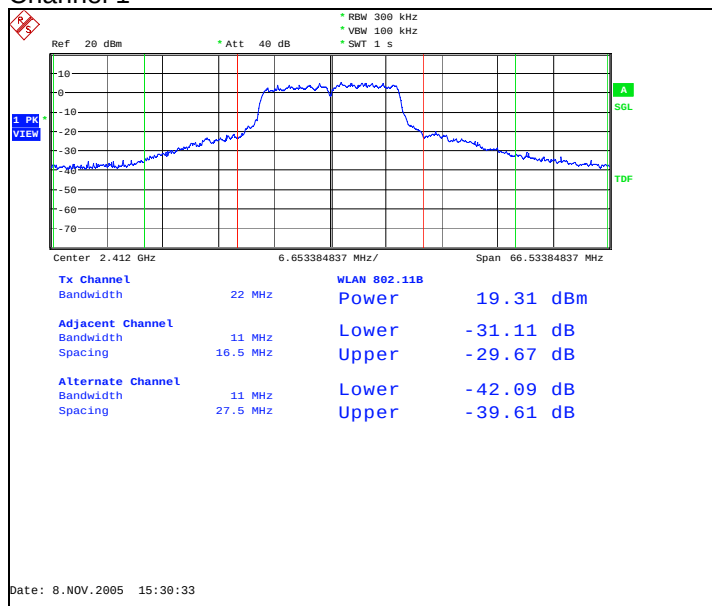
Channel 11



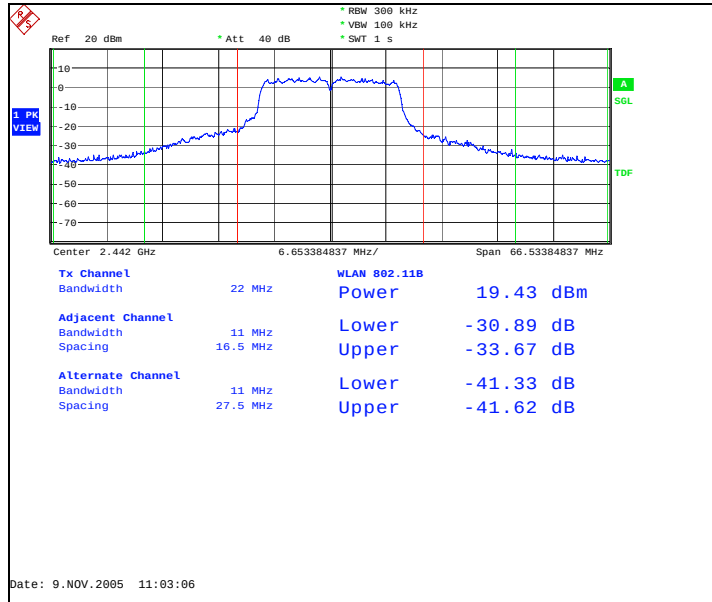
12.2.2 OFDM mode, BPSK modulation, 6 Mbps data rate

Channel	P [dBm]	P [W]	Result
1	19.31	0.085	Passed
7	19.43	0.088	Passed
11	20.19	0.104	Passed

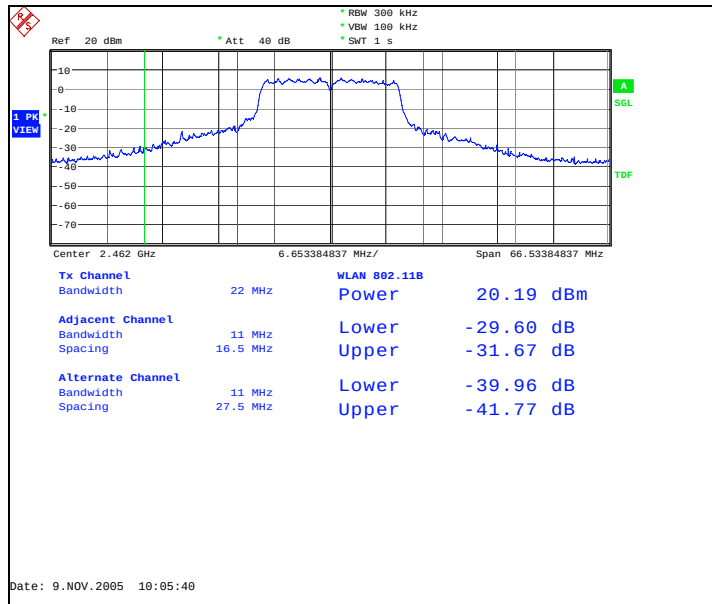
Channel 1



Channel 7



Channel 11



13. Band edge compliance of RF emissions (FCC §15.247(c), RSS-210 A8.5)

EUT with DUT number	RM-43 DUT 40431
Accessories with DUT numbers	BL-5C DUT 40379, AC-4U DUT 40381, HS-28 DUT 40383, AD-36 DUT 40384
Operation Voltage [V] / [Hz]	115 / 60
Result	PASSED
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	23 / 46 / 103.1
Date of measurements	28.10.2005
Measured by	Jari Jantunen

13.1. Test method and limit

The measurement is made according to FCC rules part 15.247 and IC standard RSS-210.

Limits for band edge compliance of RF emissions measurements (3 m measurement distance)

Frequency range [MHz]	Limit Average [dBμV/m]	Limit Peak [dBμV/m]
Below 2390 and above 2483.5	≤ 54	≤ 74

13.2. WLAN Test results

13.2.1 DSSS mode, QPSK modulation, 11 Mbps data rate

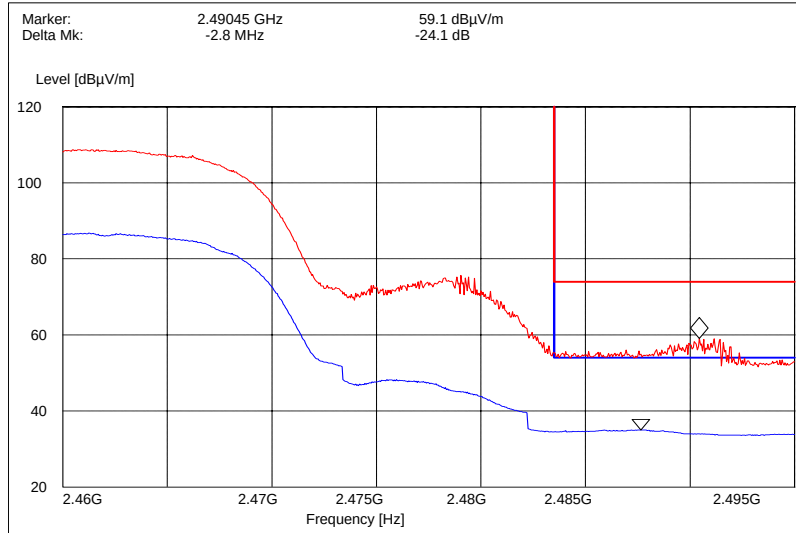
Average (RBW: 1 MHz)

Channel	E [dBμV/m]	Result
1	35.00	PASSED
11	46.29	PASSED

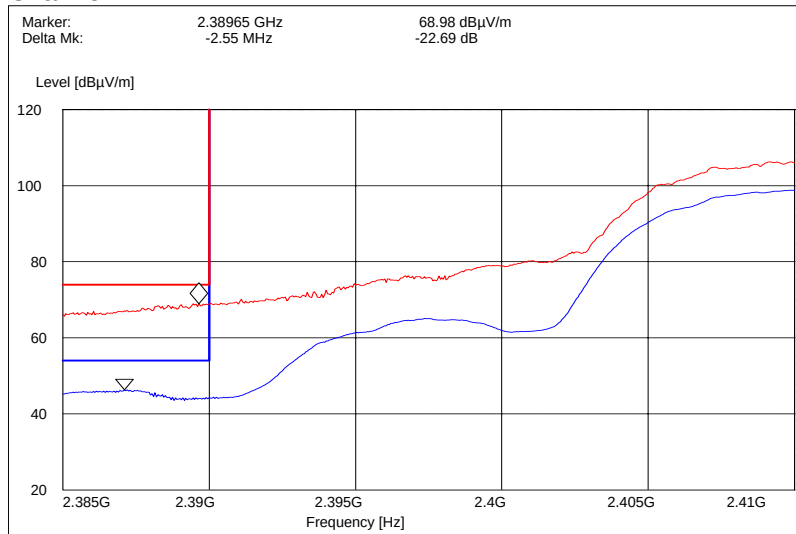
Peak (RBW: 1 MHz)

Channel	E [dBμV/m]	Result
1	59.10	PASSED
11	68.98	PASSED

Channel 1



Channel 11



13.2.2 OFDM mode, BPSK modulation, 6 Mbps data rate

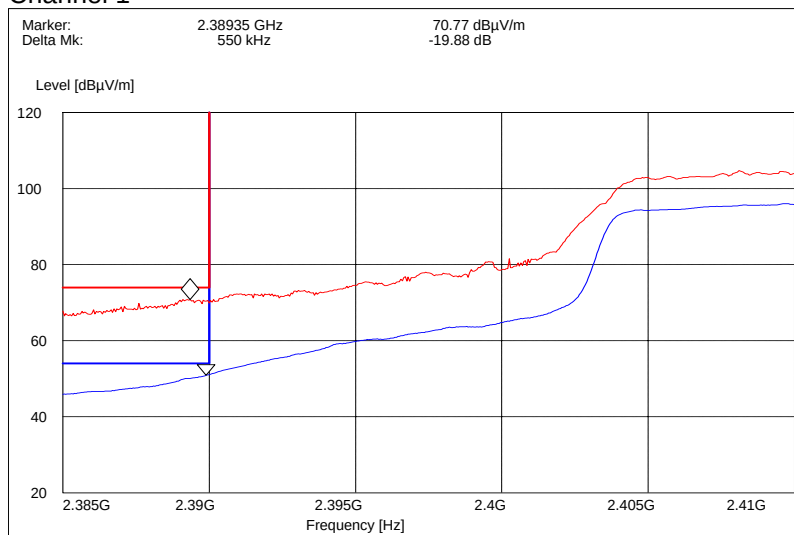
Average (RBW: 1 MHz)

Channel	E [dB μ V/m]	Result
1	50.89	PASSED
11	53.78	PASSED

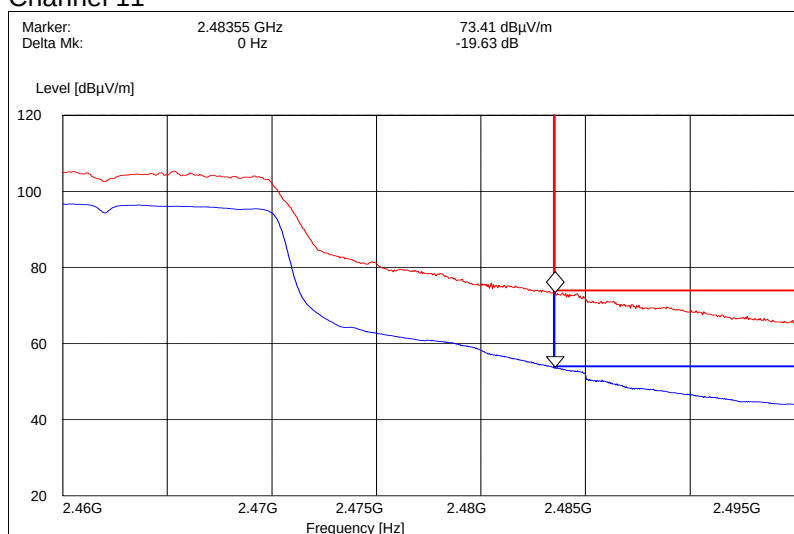
Peak (RBW: 1 MHz)

Channel	E [dB μ V/m]	Result
1	70.77	PASSED
11	73.41	PASSED

Channel 1



Channel 11



14. Spurious RF conducted emissions (FCC §15.247(c), RSS-210 A8.5)

EUT with DUT number	Phone: DUT 40432
Accessories with DUT numbers	Battery: DUT 40362
Operation Voltage [V] / [Hz]	-
Result	Passed
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	23/50/102.2
Date of measurements	8-9.11.2005
Measured by	Jan-Erik Lilja

14.1. Test method and limit

The measurement is made according to FCC rules part 15.247 and IC standard RSS-210.

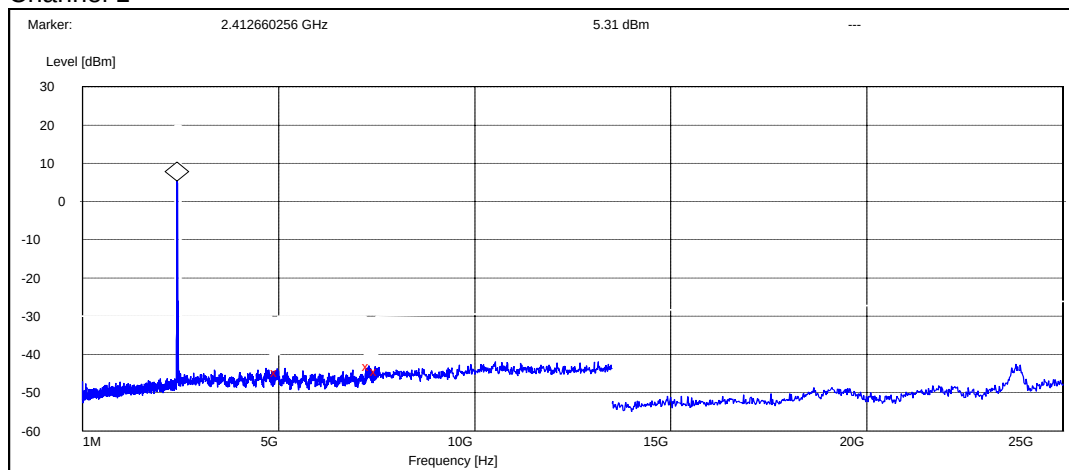
Limits for spurious RF conducted emissions measurements

Frequency range [MHz]	Limit [dBc]
1 – 25000	≤ -20

14.2. WLAN Test results

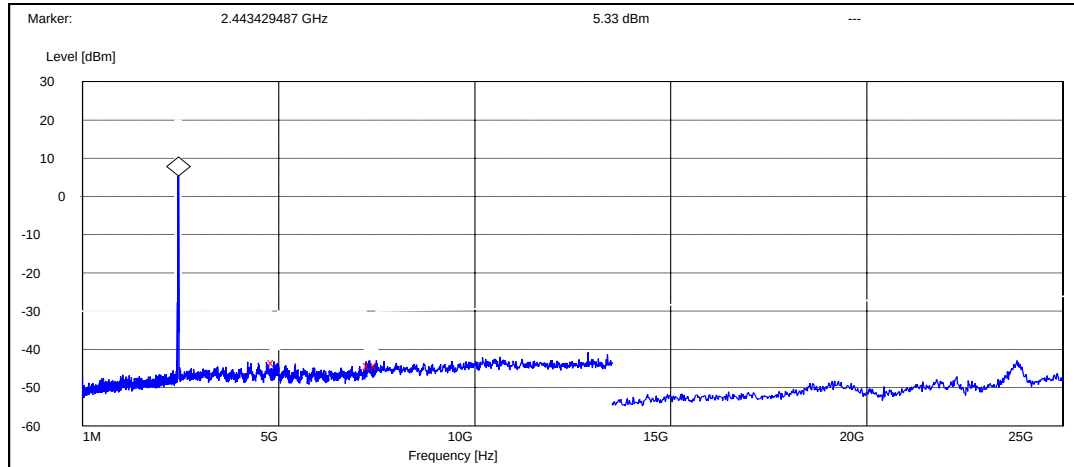
14.2.1 DSSS mode, QPSK modulation, 11 Mbps data rate

Channel 1



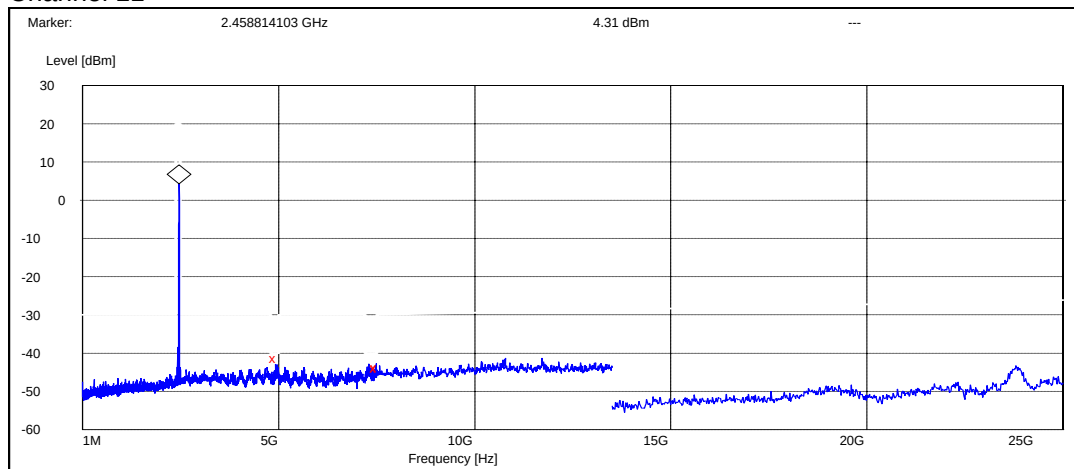
Frequency [MHz]	P [dBc]	Result
4967.948718	-50.013690	Passed
7302.884615	-48.313690	Passed
7500.000000	-49.613690	Passed

Channel 7



Frequency [MHz]	P [dBc]	Result
4883.974359	-48.834566	Passed
7320.192308	-49.434566	Passed
7500.000000	-49.434566	Passed

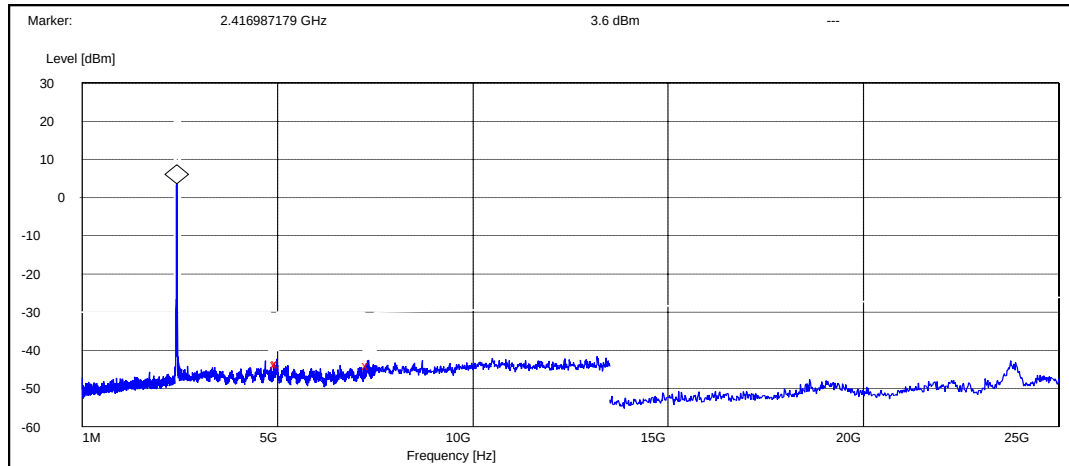
Channel 11



Frequency [MHz]	P [dBc]	Result
4924.038462	6.174723	Passed
7492.307692	3.574723	Passed
7500.000000	3.974723	Passed

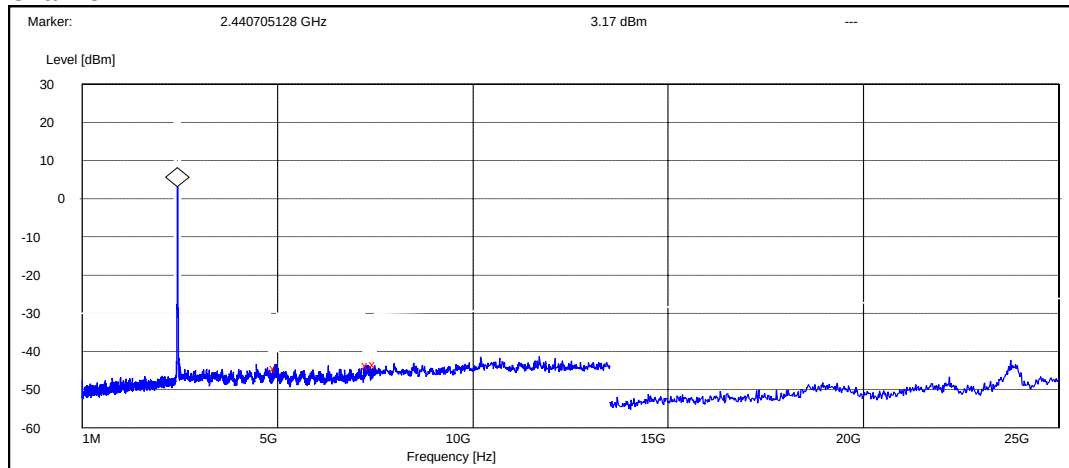
14.2.2 OFDM mode, BPSK modulation, 6 Mbps data rate

Channel 1



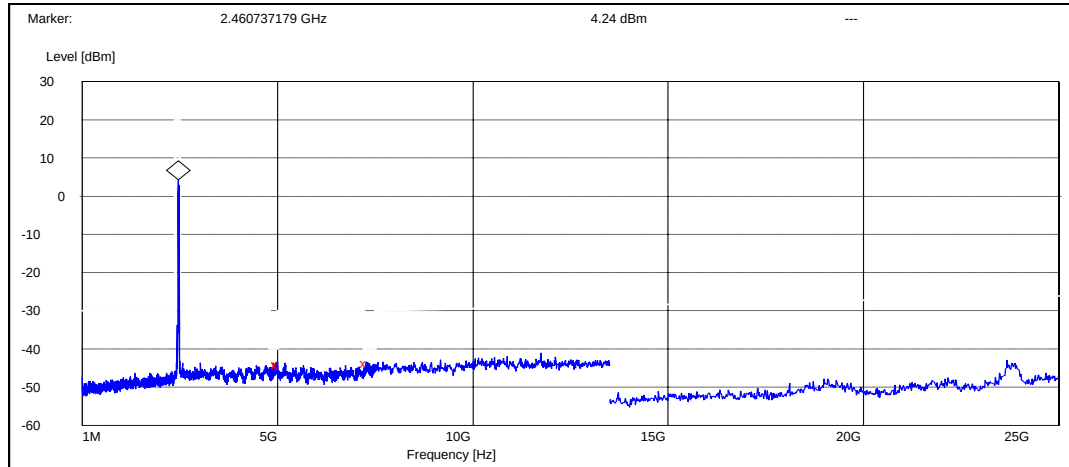
Frequency [MHz]	P [dBc]	Result
4977.243590	-47.195660	Passed
5000.000000	-47.095660	Passed
7329.326923	-47.495660	Passed

Channel 7



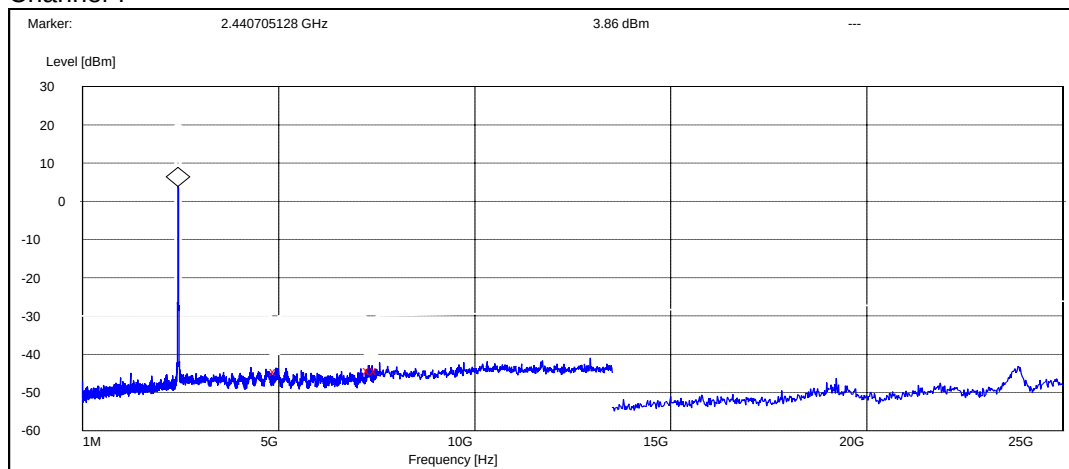
Frequency [MHz]	P [dBc]	Result
4959.615385	-47.470573	Passed
7314.423077	-46.770573	Passed
7500.000000	-46.570573	Passed

Channel 11



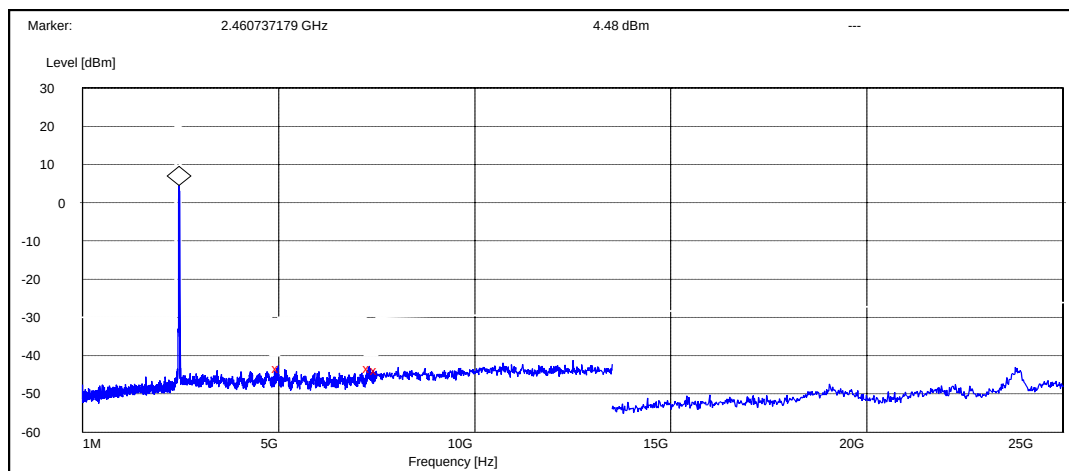
Frequency [MHz]	P [dBc]	Result
4998.717949	-48.142007	Passed
5000.000000	-48.542007	Passed
7275.480769	-48.042007	Passed

Channel 7



Frequency [MHz]	P [dBc]	Result
4937.179487	-48.363101	Passed
7316.826923	-47.963101	Passed
7500.000000	-47.963101	Passed

Channel 11



Frequency [MHz]	P [dBc]	Result
4991.987179	-47.679846	Passed
7308.653846	-47.879846	Passed
7500.000000	-48.379846	Passed

15. Spurious radiated emissions (FCC §15.247(c), §15.209, RSS-210 A8.5)

EUT with DUT number	RM-43 DUT 40431
Accessories with DUT numbers	BL-5C DUT 40379, AC-4U DUT 40381, HS-28 DUT 40383, AD-36 DUT 40384
Operation Voltage [V] / [Hz]	115 / 60
Result	PASSED
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	22-23 / 41-44 / 100.8-102.5
Date of measurements	28-31.10, 8.11.2005
Measured by	Jari Jantunen

15.1. Test method and limit

The measurement is made according to FCC rules part 15.247 and IC standard RSS-210 as follows:

The measurement is divided into the Preliminary Measurement and the Final Measurement.

The suspected frequencies are searched for in Preliminary Measurement with absorbers on the floor and measuring antenna at fixed height using 2-axis EUT position system.

The Final Measurement is performed in the Semi-Anechoic Chamber with conducting metal floor, if the Preliminary Measurement results are closer than 20 dB to the permissible value.

The EUT is placed at nonconductive plate at the turntable center.

For each suspected frequency, the turntable is rotated 360 degrees and antenna is scanned from 1 to 4 m. This is repeated for both horizontal and vertical receive antenna polarizations.

The emissions less than 20 dB below the permissible value are reported.

The measurement results are obtained as described below:

$$E [\mu V/m] = U_{RX} + A_{TOT}$$

Where U_{RX} is receiver reading and A_{TOT} is total correction factor including cable loss, antenna factor and preamplifier gain ($A_{TOT} = L_{CABLES} + AF - G_{PREAMP}$).

Limits for spurious radiated emissions measurements (3 m measurement distance)

Frequency range [MHz]	Limit [$\mu\text{V/m}$]	Limit [dB $\mu\text{V/m}$]	Detector
30 – 88	100	40	Quasi peak
88 – 216	150	43.5	Quasi peak
216 – 960	200	46	Quasi peak
960 – 1000	500	54	Quasi peak
Above 1000	500	54	Average
Above 1000	5000	74	Peak

15.2. WLAN Test results

15.2.1 DSSS mode, QPSK modulation, 11 Mbps data rate

Channel 1

Peak (RBW: 1 MHz)

Frequency [MHz]	E [dB $\mu\text{V/m}$]	E [$\mu\text{V/m}$]	U _{RX} [dB μV]	A _{TOT} [dB]	Polarisation	Result
4824.000000	49.40	295.12	50.00	-0.60	HORIZONTAL	PASSED
7236.000000	43.30	146.22	40.10	3.20	HORIZONTAL	PASSED

Average (RBW: 1 MHz)

Frequency [MHz]	E [dB $\mu\text{V/m}$]	E [$\mu\text{V/m}$]	U _{RX} [dB μV]	A _{TOT} [dB]	Polarisation	Result
4824.000000	36.50	66.83	37.10	-0.60	HORIZONTAL	PASSED
7236.000000	31.30	36.73	28.10	3.20	HORIZONTAL	PASSED

Channel 7

Peak (RBW: 1 MHz)

Frequency [MHz]	E [dB $\mu\text{V/m}$]	E [$\mu\text{V/m}$]	U _{RX} [dB μV]	A _{TOT} [dB]	Polarisation	Result
4883.767535	45.40	186.21	46.10	-0.70	HORIZONTAL	PASSED
7347.193387	45.10	179.89	40.80	4.30	VERTICAL	PASSED
17994.997996	56.50	668.34	34.40	22.10	VERTICAL	PASSED

Average (RBW: 1 MHz)

Frequency [MHz]	E [dB $\mu\text{V/m}$]	E [$\mu\text{V/m}$]	U _{RX} [dB μV]	A _{TOT} [dB]	Polarisation	Result
4883.769539	29.80	30.90	30.50	-0.70	HORIZONTAL	PASSED
7424.841683	31.80	38.90	27.30	4.50	VERTICAL	PASSED
17995.997996	43.40	147.91	21.20	22.20	VERTICAL	PASSED

Channel 11

Peak (RBW: 1 MHz)

Frequency [MHz]	E [dB $\mu\text{V/m}$]	E [$\mu\text{V/m}$]	U _{RX} [dB μV]	A _{TOT} [dB]	Polarisation	Result
4924.000000	49.00	281.84	49.60	-0.60	VERTICAL	PASSED
7386.000000	44.90	175.79	40.60	4.30	HORIZONTAL	PASSED

Average (RBW: 1 MHz)

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Polarisation	Result
4924.000000	36.70	68.39	37.30	-0.60	VERTICAL	PASSED
7386.000000	32.20	40.74	27.90	4.30	HORIZONTAL	PASSED

15.2.2 OFDM mode, BPSK modulation, 6 Mbps data rate

Channel 1

Peak (RBW: 1 MHz)

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Polarisation	Result
4824.000000	47.80	245.47	48.40	-0.60	HORIZONTAL	PASSED
7236.000000	45.50	188.36	42.30	3.20	HORIZONTAL	PASSED

Average (RBW: 1 MHz)

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Polarisation	Result
4824.000000	36.00	63.10	36.60	-0.60	HORIZONTAL	PASSED
7236.000000	32.20	40.74	29.00	3.20	HORIZONTAL	PASSED

Channel 7

Peak (RBW: 1 MHz)

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Polarisation	Result
4921.349699	44.70	171.79	45.30	-0.60	HORIZONTAL	PASSED
7347.687375	45.90	197.24	41.50	4.40	HORIZONTAL	PASSED
17995.485972	56.40	660.69	34.20	22.20	HORIZONTAL	PASSED

Average (RBW: 1 MHz)

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Polarisation	Result
4924.851703	31.50	37.58	32.10	-0.60	HORIZONTAL	PASSED
7384.771543	32.90	44.16	28.60	4.30	VERTICAL	PASSED
17995.485972	43.40	147.91	21.20	22.20	HORIZONTAL	PASSED

Channel 11

Peak (RBW: 1 MHz)

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Polarisation	Result
4924.000000	45.20	181.97	45.80	-0.60	HORIZONTAL	PASSED
7386.000000	45.20	181.97	40.90	4.30	HORIZONTAL	PASSED

Average (RBW: 1 MHz)

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Polarisation	Result
4924.000000	31.50	37.58	32.10	-0.60	HORIZONTAL	PASSED
7386.000000	31.90	39.36	27.60	4.30	HORIZONTAL	PASSED

16. **AC powerline conducted emissions**
(FCC §15.207, RSS-GEN 7.2.2)

EUT with DUT number	RM-43 DUT 40431
Accessories with DUT numbers	BL-5C DUT 40379, AC-4U DUT 40381, DKE-2 DUT 40382, IBM Thinkpad T22 DUT 40201, AC adapter 40202, HP deskjet 1600CC3540A DUT 40077, FUJI DS-7 DUT 40076, Serial cable for camera DUT 40088, Parallel cable for printer DUT 40087
Operation Voltage [V] / [Hz]	115 / 60
Result	PASSED
Remarks	Continuous data transfer was active between the phone and the computer during the test
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	18 / 50 / 101.9
Date of measurements	8.11.2005
Measured by	Jari Jantunen

16.1. **Test method and limit**

The measurement is made according to FCC rules part 15.247 and IC standard RSS-210 as follows:

The EUT is placed on a wooden table 80 cm above the reference groundplane.

The EUT is connected via LISN to a test power supply.

The measurement results are obtained as described below:

$$U [dB\mu V] = U_{RX} + A_{TOT}$$

Where U_{RX} is receiver reading and A_{TOT} is total correction factor including cable and pulse limiter attenuations.

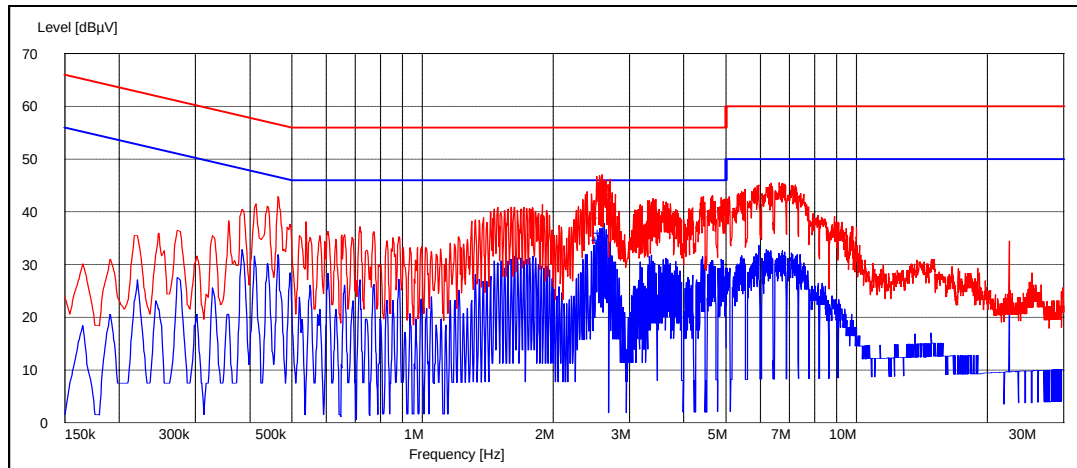
CISPR 22 Class B limits

Frequency range [MHz]	Quasi peak limit [dBμV]	Average limit [dBμV]
0.15 - 0.5	66 - 56	56 - 46
0.5 - 5	56	46
5 - 30	60	50

16.2. WLAN Test results

16.2.1 DSSS mode, QPSK modulation, 11 Mbps data rate

Channel 7



Quasi peak (RBW: 9 kHz)

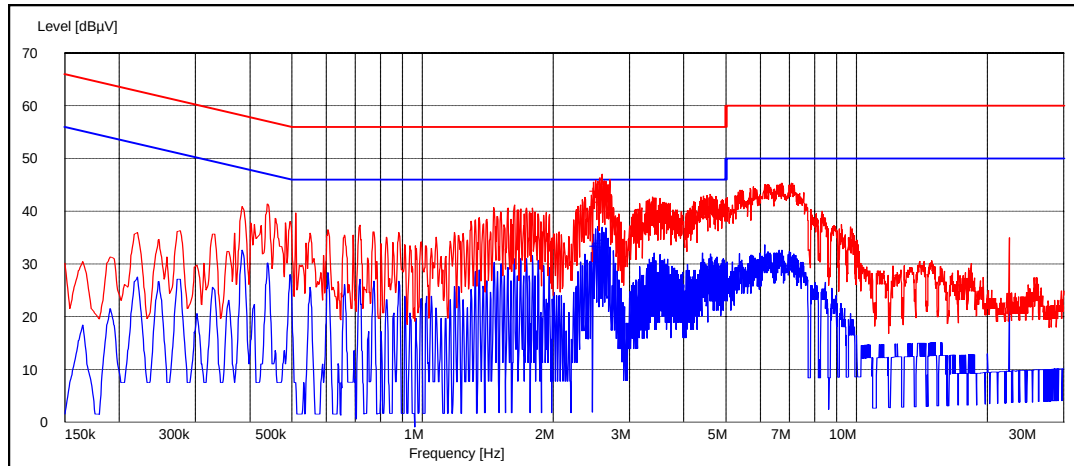
Frequency [MHz]	U [dBμV]	Line	Result
2.517034	38.90	N	PASSED
2.559118	42.10	L1	PASSED
2.589178	44.10	L1	PASSED
2.619238	44.60	L1	PASSED
2.673347	43.50	L1	PASSED
2.703407	41.90	L1	PASSED

Average (RBW: 9 kHz)

Frequency [MHz]	U [dBμV]	Line	Result
2.535070	34.70	L1	PASSED
2.565130	36.00	L1	PASSED
2.589178	30.30	N	PASSED
2.619238	35.90	L1	PASSED
2.649299	34.30	N	PASSED
2.673347	31.60	N	PASSED

16.2.2 OFDM mode, BPSK modulation, 6 Mbps data rate

Channel 7



Quasi peak (RBW: 9 kHz)

Frequency [MHz]	U [dBμV]	Line	Result
2.505010	43.90	L1	PASSED
2.565130	41.70	L1	PASSED
2.589178	45.20	L1	PASSED
2.619238	43.80	L1	PASSED
2.643287	44.20	L1	PASSED
2.697395	42.60	L1	PASSED

Average (RBW: 9 kHz)

Frequency [MHz]	U [dBμV]	Line	Result
2.505010	33.50	L1	PASSED
2.535070	33.30	N	PASSED
2.565130	33.90	N	PASSED
2.589178	33.20	N	PASSED
2.613226	30.40	L1	PASSED
2.643287	34.50	L1	PASSED

17. 6 dB bandwidth (FCC §15.247(a)(2), RSS-210 A8.2 (1))

EUT with DUT number	Phone: DUT 40432
Accessories with DUT numbers	Battery: DUT 40362
Operation Voltage [V] / [Hz]	-
Result	Passed
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	23/50/102.2
Date of measurements	8-9.11.2005
Measured by	Jan-Erik Lilja

17.1. Test method and limit

The measurement is made according to FCC rules part 15.247 and IC standard RSS-210.

Limits for 6 dB bandwidth measurements

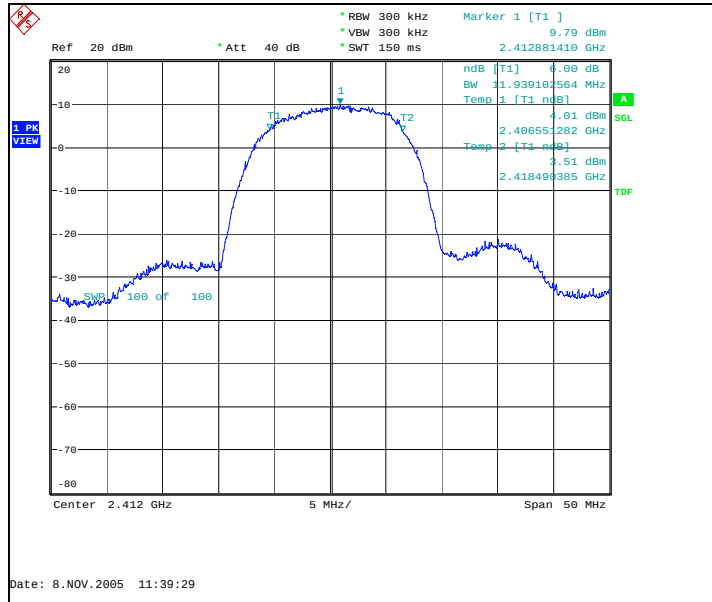
Limit [kHz]
≥ 500

17.2. WLAN test results

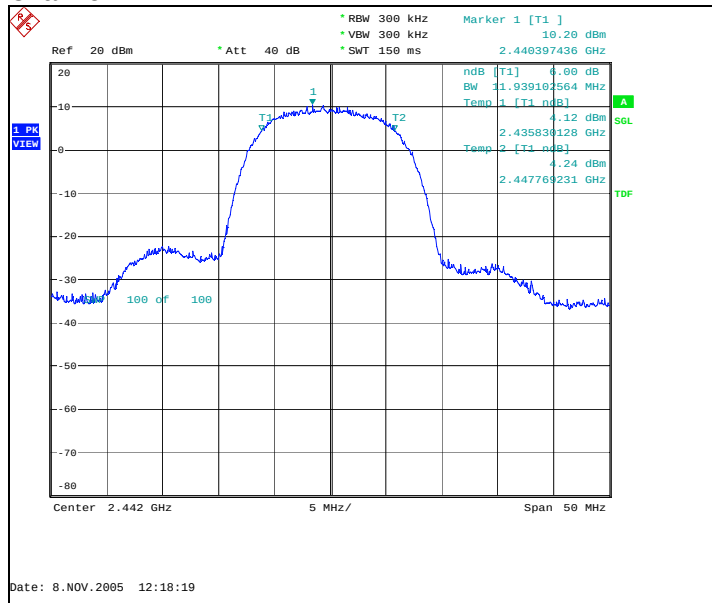
17.2.1 DSSS mode, QPSK modulation, 11 Mbps data rate

Channel	6 dB bandwidth [kHz]	Result
1	11939.103	Passed
7	11939.103	Passed
11	12419.872	Passed

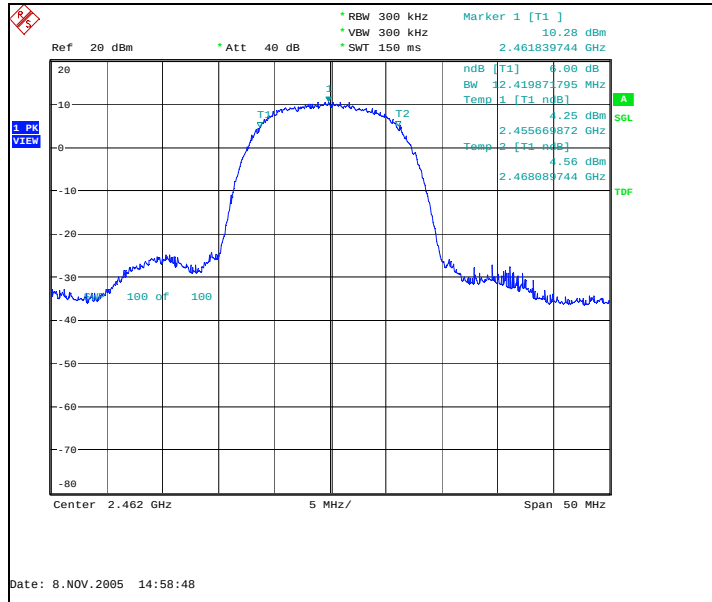
Channel 1



Channel 7



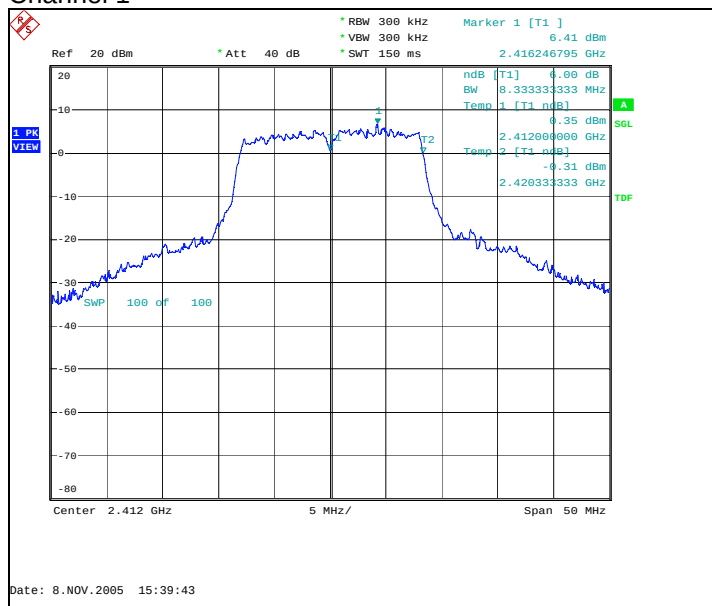
Channel 11



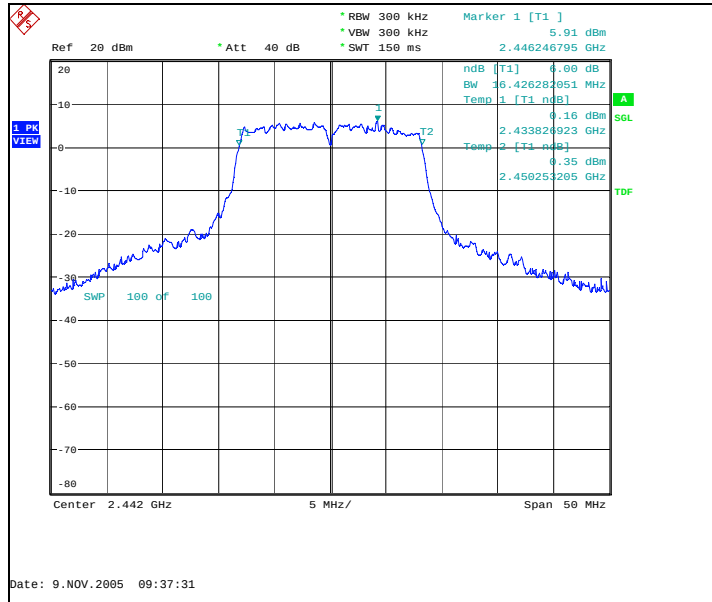
17.2.2 OFDM mode, BPSK modulation, 6 Mbps data rate

Channel	6 dB bandwidth [kHz]	Result
1	8333.333	Passed
7	16426.282	Passed
11	16506.410	Passed

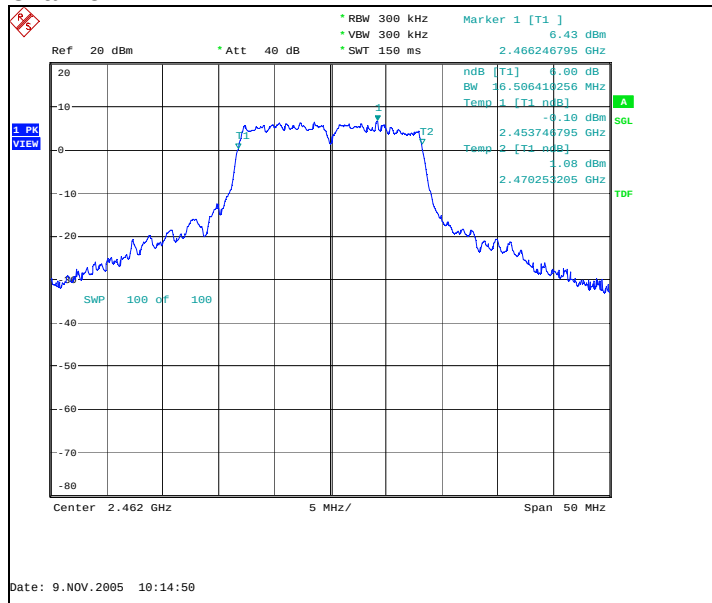
Channel 1



Channel 7



Channel 11



18. Power spectral density (FCC §15.247(e), RSS-210 A8.2 (2))

EUT with DUT number	Phone: DUT 40432
Accessories with DUT numbers	Battery: DUT 40362
Operation Voltage [V] / [Hz]	-
Result	Passed
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	23/50/102.2
Date of measurements	8-9.11.2005
Measured by	Jan-Erik Lilja

18.1. Test method and limit

The measurement is made according to FCC rules part 15.247 and IC standard RSS-210.

Limits for power spectral density measurements

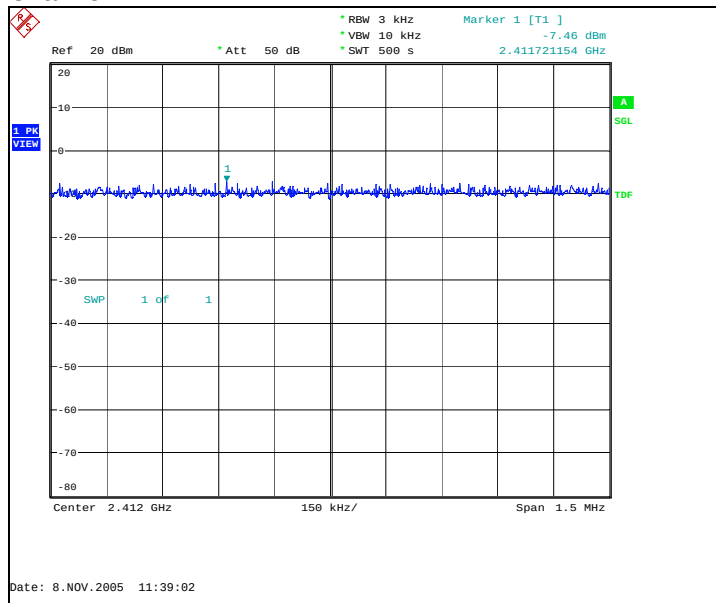
Limit [dBm] @ 3 kHz
≤ 8

18.2. WLAN test results

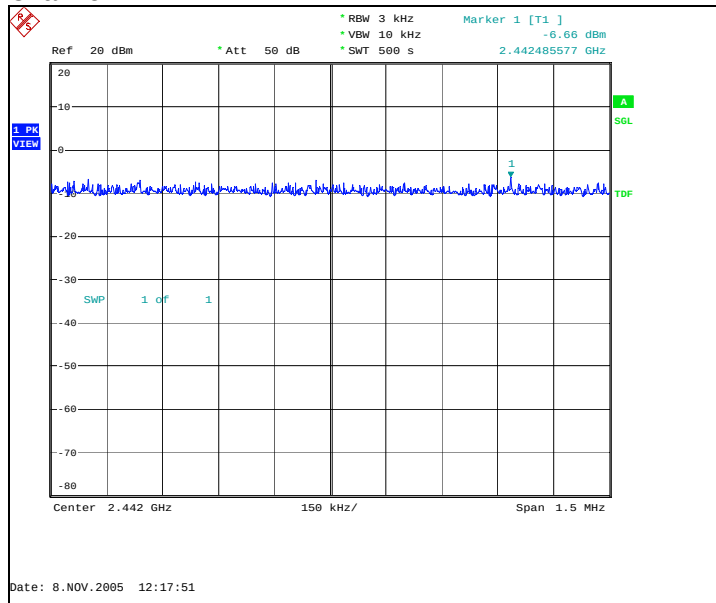
18.2.1 DSSS mode, QPSK modulation, 11 Mbps data rate

Channel	P [dBm]	Result
1	-7.46	Passed
7	-6.66	Passed
11	-6.12	Passed

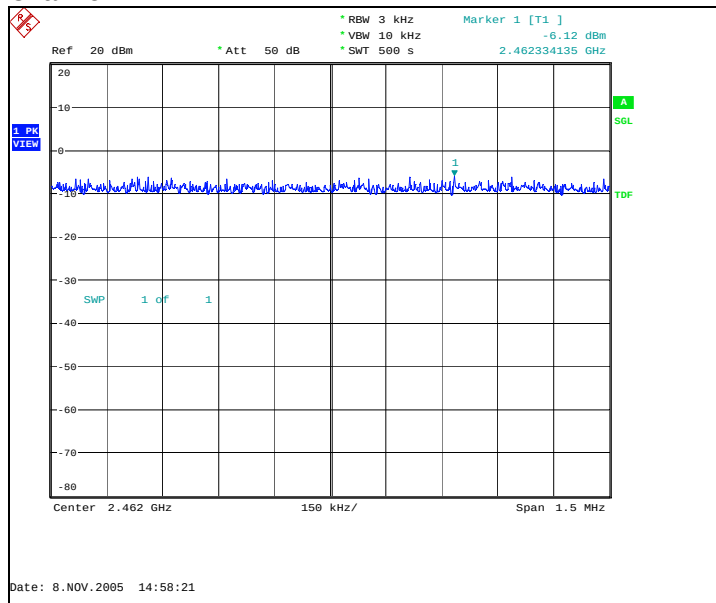
Channel 1



Channel 7



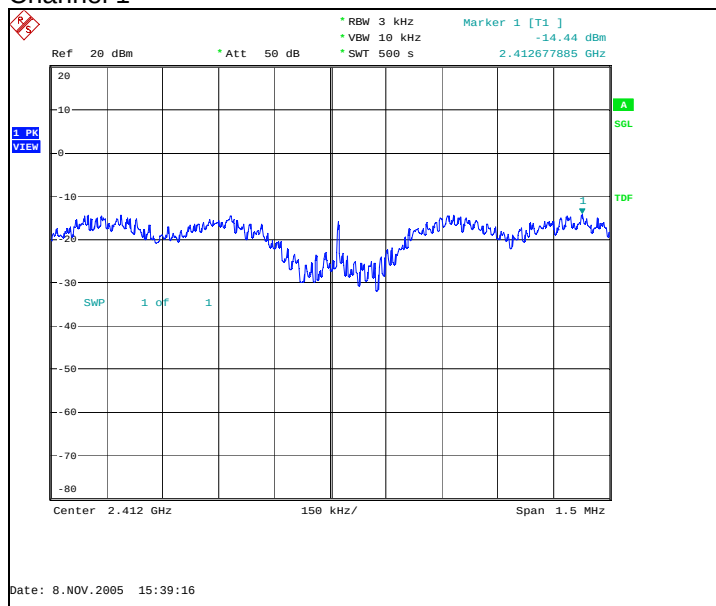
Channel 11



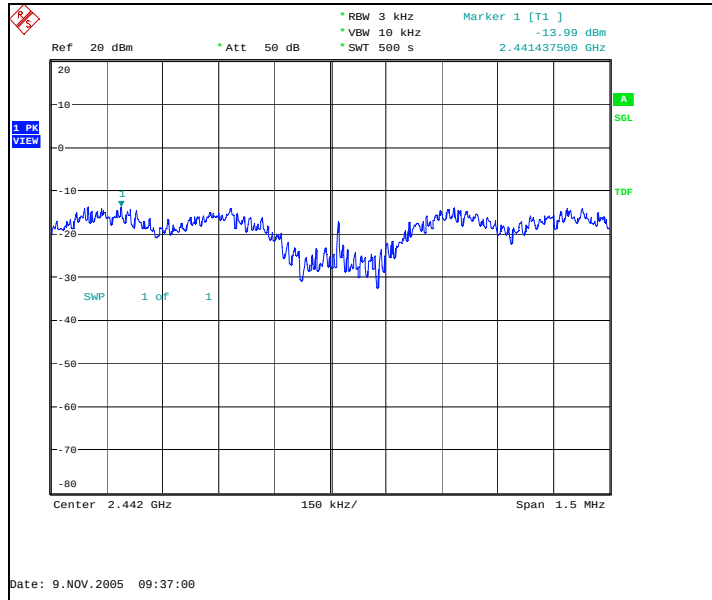
18.2.2 OFDM mode, BPSK modulation, 6 Mbps data rate

Channel	P [dBm]	Result
1	-14.44	Passed
7	-13.99	Passed
11	-12.66	Passed

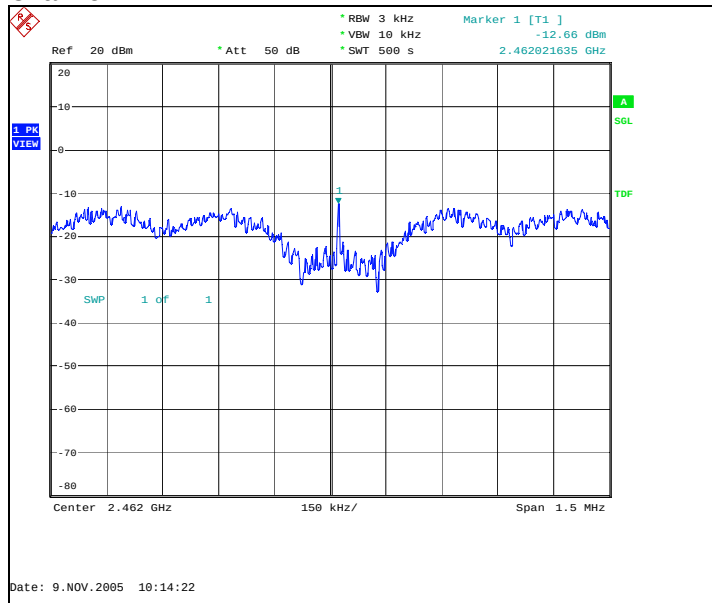
Channel 1



Channel 7



Channel 11



19. Test Equipment

19.1. Conducted measurements

Eq. No	Equipment	Type	Manufacturer	Used in
TM37610	Spectrum analyzer	FSU	R&S	15C,22/24
TM37678	Radio communication tester	CMU-200	R&S	15C,22/24
	Attenuator 10 dB	6251.17.A	Huber+Suhner AG	15C,22/24
TM22901	Step attenuator 110dB	8496A	Agilent	15C,22/24
TM37499	Power splitter	11667A	Agilent	15C,22/24
	Temperature chamber	VT4002	Vötsch	15C,22/24
TM38112	DC power supply	6632A	Agilent	15C,22/24
TM38111	Multimeter	34401A	Agilent	15C,22/24
TM38845	EMI receiver	ESI 40	R&S	15B,15C
TM37773	Radio communication tester	CMU-200	R&S	15B,15C
TM38631	Signal generator	83640L	Agilent	15B,15C
TM38114	DC power supply	6632A	Agilent	15B,15C
TM22835	Multimeter	87	Fluke	15B,15C
TM30600	Pulse Limiter	ESH3-Z2	R&S	15B,15C
TM26490	LISN 50 µH	ESH3-Z5/	R&S	15B,15C
TM30636	LISN 50 µH	L2-16/	PMM	15B,15C

19.2. Radiated measurements

Eq. No	Equipment	Type	Manufacturer	Used in
TM30599	3m semi-anechoic chamber		TDK	15B,15C, 22/24
TM38845	EMI receiver	ESI 40	R&S	15B,15C, 22/24
TM37498	Preamplifier	AMF-5D-020180-26-10P	MITEQ	15B,15C, 22/24
TM37523	Preamplifier	AMF-4D-10M-3G-25-20P	MITEQ	15B,15C, 22/24
TM37516	Biconilog antenna	HL562	R&S	15B,15C, 22/24
TM26496	Double ridged waveguide antenna	3115	EMCO	15B,15C, 22/24
TM39158	Horn antenna	3116	EMCO	15B,15C, 22/24
TM26492	Reference dipole set	UHAP/VHAP	Schwarzbeck	15B,15C, 22/24
TM37501	Dipole antenna	3125-870	EMCO	22/24
TM37502	Dipole antenna	3125-1880	EMCO	22/24
TM37773	Radio communication tester	CMU-200	R&S	15B,15C, 22/24
TM38631	Signal generator	83640L	Agilent	15B,15C, 22/24
TM38066	High pass filter	4HC3000/18000-3-KK	Trilithic	15B,15C, 22/24
	High pass filter	WHK2010-10SS	Trilithic	15B,15C, 22/24
	Low pass filter	WLK1750-10SS	Trilithic	15B,15C, 22/24
TM26511	Tunable notch filter	WRCA870	Wainwright	22/24
TM38215	Tunable notch filter	WRCD1850/1910-0.2/40	Wainwright	22/24
TM38214	Band reject filter	WRCT 2402/2480-2400/2483.5-30	Wainwright	15C
TM30642	Turntable controller	HD-100	Deisel	15B,15C, 22/24
TM26500	Turntable	DS412	Deisel	15B,15C, 22/24
TM38842	Antenna mast controller	2090	EMCO	15B,15C, 22/24
TM38843	Antenna mast	2075	EMCO	15B,15C, 22/24
TM38114	DC power supply	6632A	Agilent	15B,15C, 22/24
TM22835	Multimeter	87	Fluke	15B,15C, 22/24