

FCC Part 15C Compliance Test Report

Test Report no.:	Tre_FCC_0609_02.doc	Date of Report:	15.03.2006
Number of pages:	28	Customer's Contact person:	Jorma Hanni
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FCC listing no.:	94436		
IC recognition no.:	3608		
Tested devices/ accessories:	GSM phone RM-199 / Battery BL-4C, Headset HS-23, AC charger AC-4		
FCC ID:	LJPRM-199	IC:	661E-RM199
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:			

Jan-Erik Lilja, System Manager

1. Summary for FCC Part 15C Compliance Test Report

Date of receipt	2.3.2006
Testing completed	9.3.2006
The customer's contact person	Jorma Hanni
Test Plan referred to	T:\Projects\RM-199\TestPlan_RS\ Puma_RM199_EMC_TestPlan.xls
Notes	-
Document name	T:\Projects\RM-199\EMC\Results\FCC\Tre_FCC_0609_02.doc

1.1. EUT and Accessory Information

The EUT is a quadri band (GSM850/900/1800/1900) mobile phone with GPRS, EGPRS and WLAN. WLAN is tested with maximum rated TX power.

Product	Type	SN	HW	MV	SW	DUT
Phone	RM-199	004400631642988	500432	-	3.09	40550
Phone	RM-199	004400631642987	500432	-	3.09	40549
Battery	BL-4C	-	-	-	-	40552
Battery	BL-4C	-	-	-	-	40553
AC-Charger	AC-4	-	-	-	-	40554
Headset	HS-23	-	-	-	-	40556

1.2. Summary of Test Results

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	NP
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

The EUT complies with the essential requirements in the standard.

FAILED

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

NP

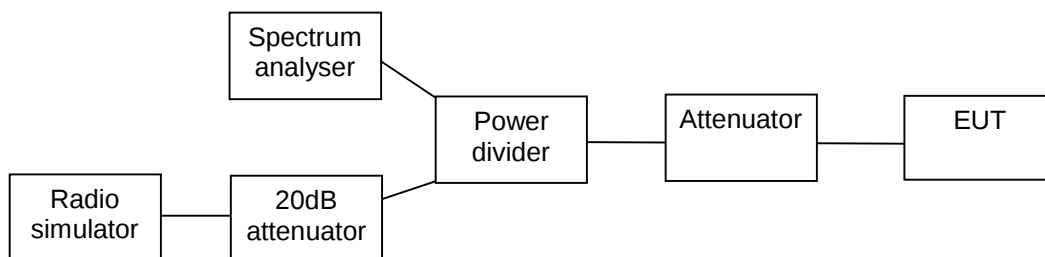
The test was not performed by the TCC Nokia Tampere Laboratory.

CONTENTS

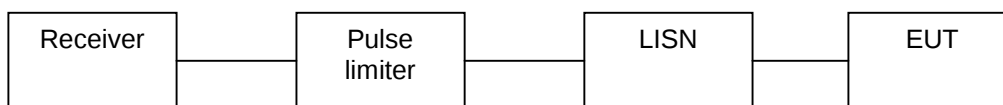
1. Summary for FCC Part 15C Compliance Test Report.....	2
1.1. EUT and Accessory Information	2
1.2. Summary of Test Results	2
2. Test setups.....	4
2.1. Conducted RF test setup	4
2.2. AC powerline conducted emissions test setup.....	4
2.3. Spurious radiated emissions test setup	4
3. Peak output power (FCC §15.247(b)(1), RSS-210 A8.4 (4)).....	5
3.1. Test method and limit.....	5
3.2. WLAN Test results	5
4. Spurious RF conducted emissions (FCC §15.247(c), RSS-210 A8.5).....	9
4.1. Test method and limit.....	9
4.2. WLAN Test results	9
5. Spurious radiated emissions (FCC §15.247(c), §15.209, RSS-210 A8.5).....	13
5.1. Test method and limit.....	13
5.2. WLAN Test results	14
6. AC powerline conducted emissions (FCC §15.207, RSS-GEN 7.2.2)	17
6.1. Test method and limit.....	17
6.2. WLAN Test results	18
7. 6 dB bandwidth (FCC §15.247(a)(2), RSS-210 A8.2 (1))	20
7.1. Test method and limit.....	20
7.2. WLAN test results	20
8. Power spectral density (FCC §15.247(e), RSS-210 A8.2 (2))	24
8.1. Test method and limit.....	24
8.2. WLAN test results	24
9. Test Equipment.....	28
9.1. Conducted measurements	28
9.2. Radiated measurements	28

2. Test setups

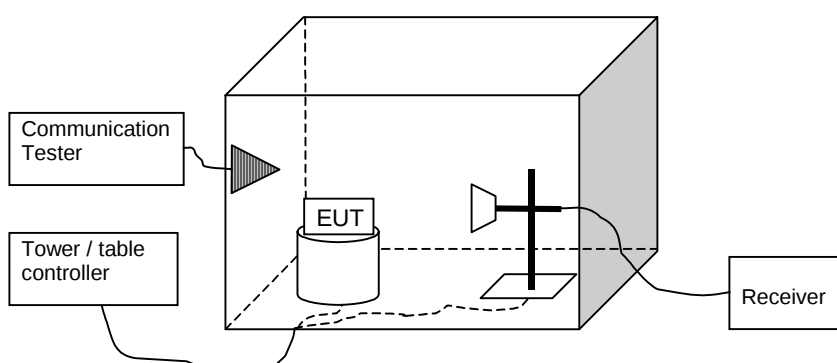
2.1. Conducted RF test setup



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 A8.4 (4))

EUT with DUT number	Phone: DUT 40550
Accessories with DUT numbers	Battery: DUT 40552
Operation Voltage [V] / [Hz]	-
Result	Passed
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	23/45/101.1
Date of measurements	09.03.2006
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

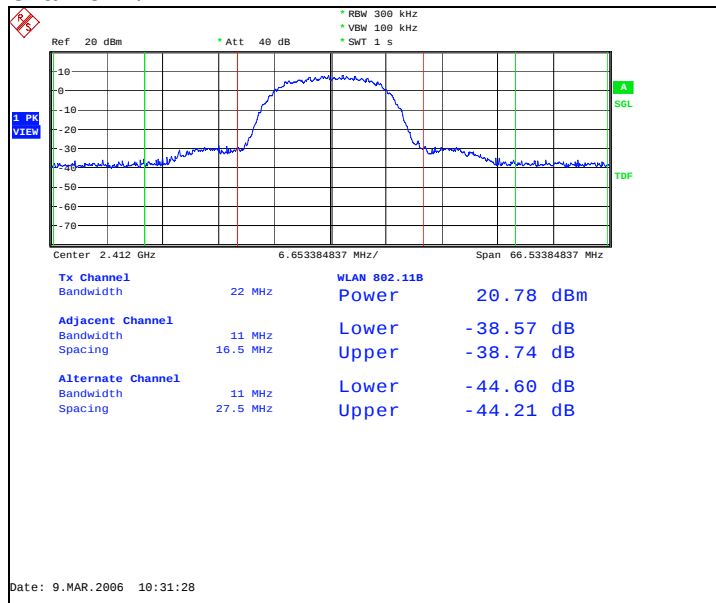
Frequency range [MHz]	Limit [W]	Limit [dBm]
2400 – 2483.5	≤ 1	≤ 30

3.2. WLAN Test results

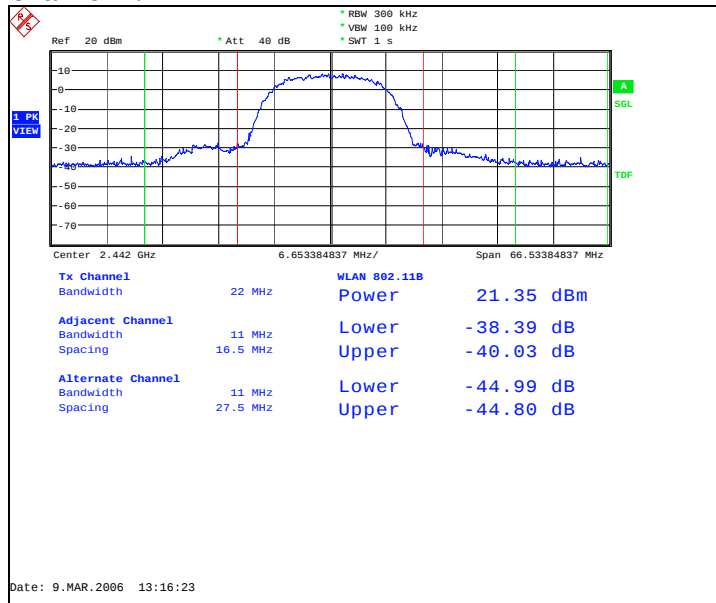
3.2.1 DSSS mode, QPSK modulation, 11 Mbps data rate

Channel / f_c [MHz]	P [dBm]	P [W]	Result
1 / 2412	20.78	0.120	Passed
7 / 2442	21.35	0.137	Passed
11 / 2462	20.36	0.109	Passed

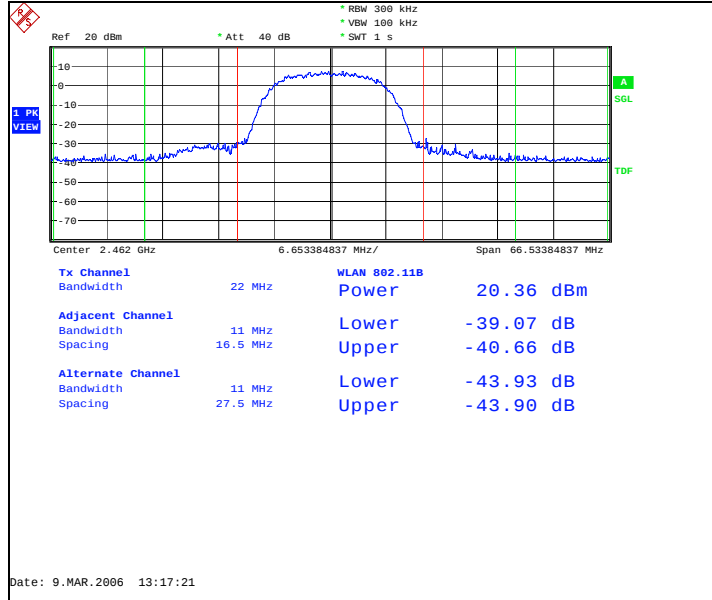
Channel 1 / 2412 MHz



Channel 7 / 2442 MHz



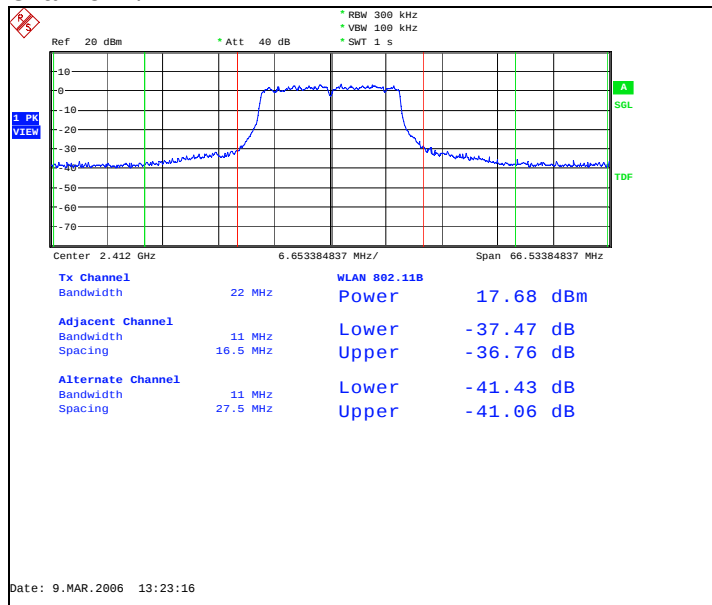
Channel 11 / 2462 MHz



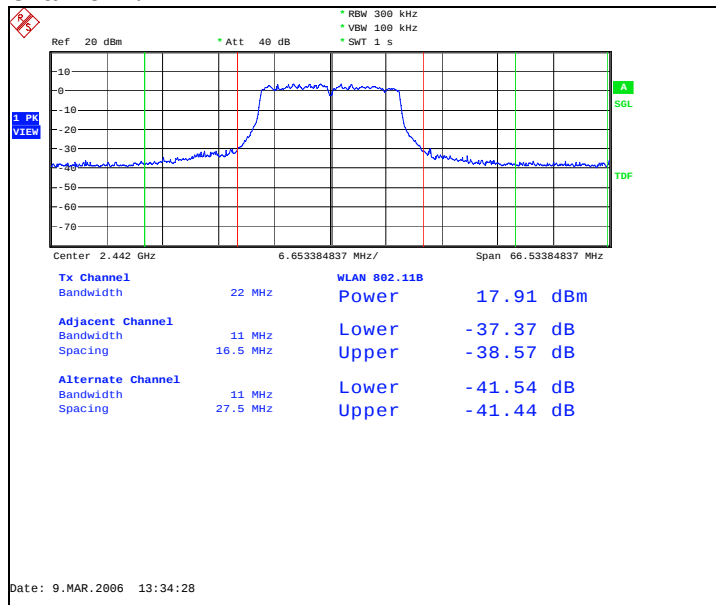
3.2.2 OFDM mode, 64QAM modulation, 48 Mbps data rate

Channel / f _c [MHz]	P [dBm]	P [W]	Result
1 / 2412	17.68	0.059	Passed
7 / 2442	17.91	0.062	Passed
11 / 2462	17.14	0.052	Passed

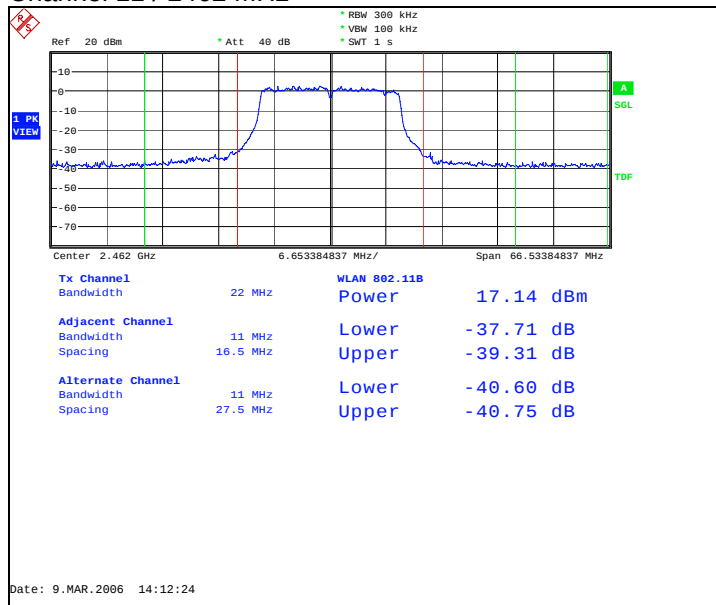
Channel 1 / 2412 MHz



Channel 7 / 2442 MHz



Channel 11 / 2462 MHz



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

EUT with DUT number	Phone: DUT 40550
Accessories with DUT numbers	Battery: DUT 40552
Operation Voltage [V] / [Hz]	-
Result	Passed
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	23/45/101.1
Date of measurements	09.03.2006
Measured by	Jan-Erik Lilja

4.1. Test method and limit

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

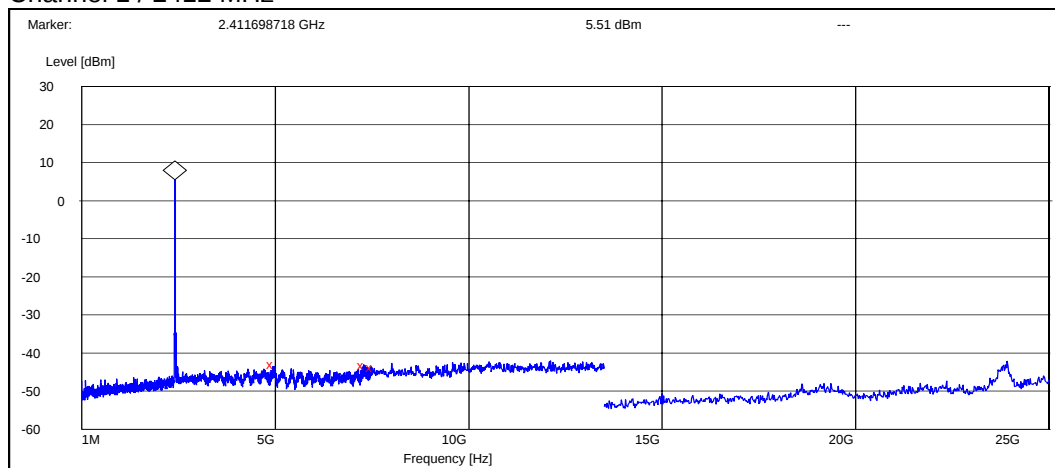
Limits for spurious RF conducted emissions measurements

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

4.2. WLAN Test results

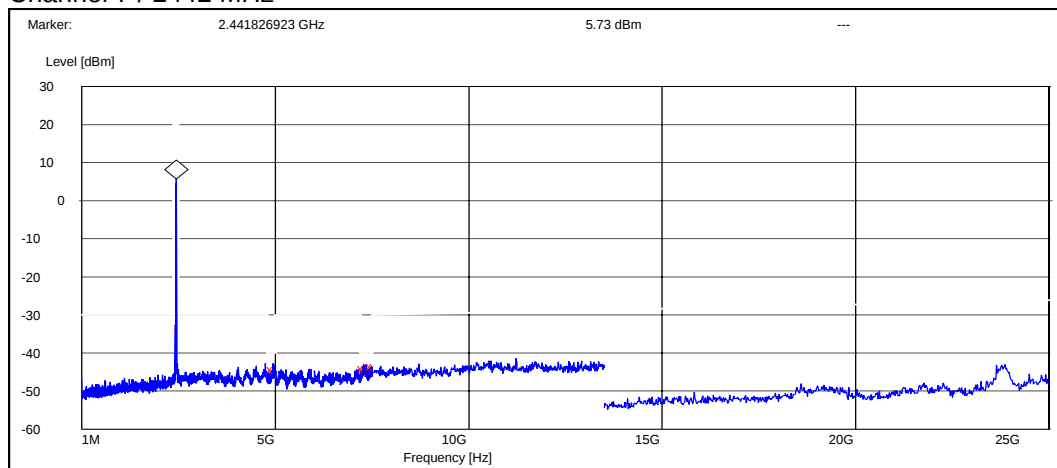
4.2.1 DSSS mode, QPSK modulation, 11 Mbps data rate

Channel 1 / 2412 MHz



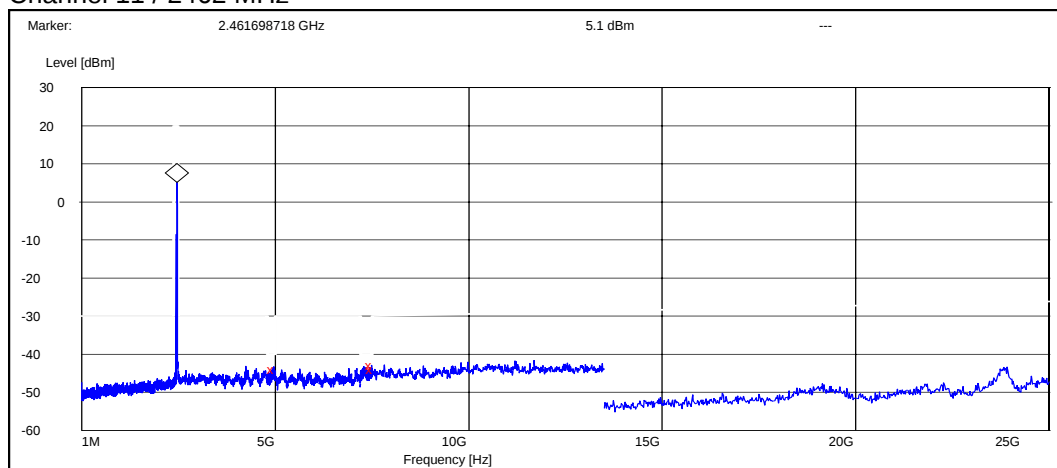
Frequency [MHz]	P [dBc]	Result
4946.794872	-48.512354	Passed
7291.826923	-48.612354	Passed
7500.000000	-49.112354	Passed

Channel 7 / 2442 MHz



Frequency [MHz]	P [dBc]	Result
4953.846154	-50.026391	Passed
7279.807692	-49.826391	Passed
7500.000000	-49.326391	Passed

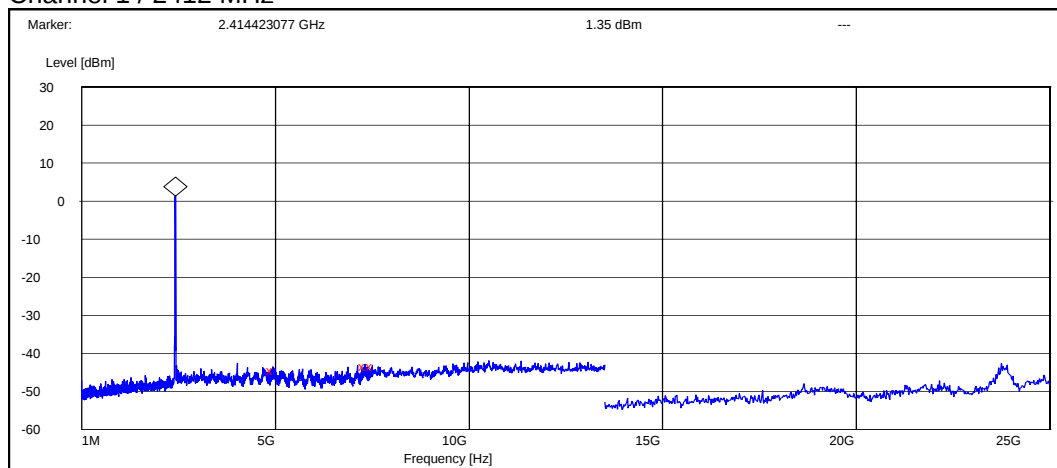
Channel 11 / 2462 MHz



Frequency [MHz]	P [dBc]	Result
4958.333333	-49.199554	Passed
7494.711538	-47.999554	Passed
7500.000000	-48.999554	Passed

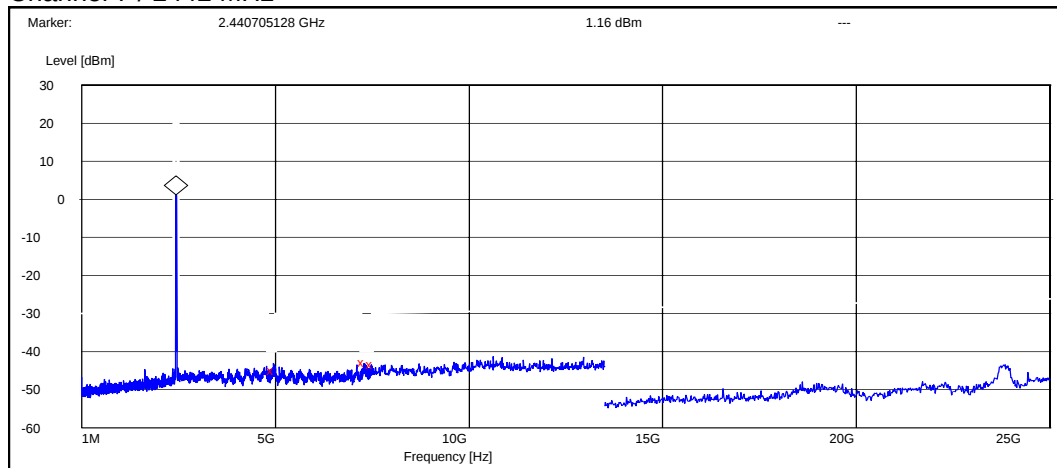
4.2.2 OFDM mode, 64QAM modulation, 48 Mbps data rate

Channel 1 / 2412 MHz



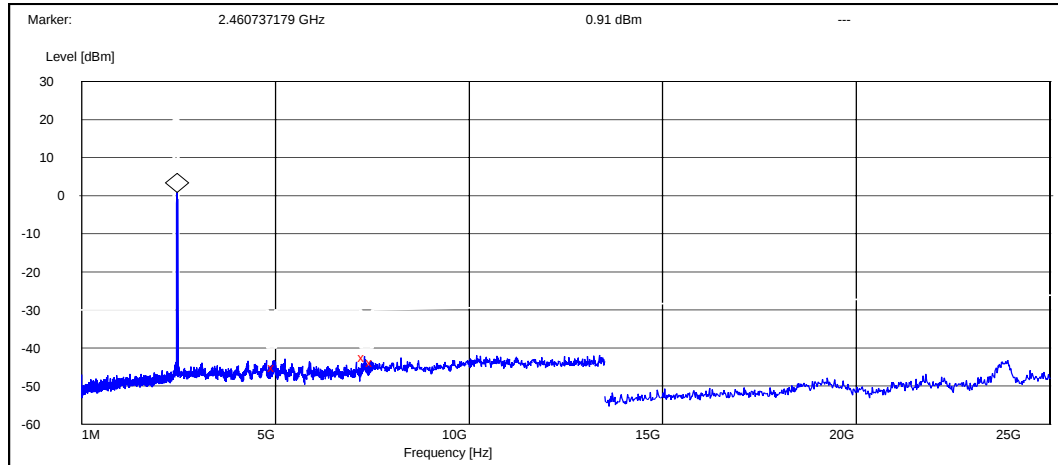
Frequency [MHz]	P [dBc]	Result
4940.705128	-45.845250	Passed
7315.384615	-44.845250	Passed
7500.000000	-44.745250	Passed

Channel 7 / 2442 MHz



Frequency [MHz]	P [dBc]	Result
4950.961538	-45.956939	Passed
7290.384615	-43.956939	Passed
7500.000000	-44.456939	Passed

Channel 11 / 2462 MHz



Frequency [MHz]	P [dBc]	Result
4979.807692	-46.011815	Passed
7298.076923	-43.311815	Passed
7500.000000	-44.611815	Passed

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

EUT with DUT number	RM-199 DUT 40549
Accessories with DUT numbers	BL-4C DUT 40553, AC-4 DUT 40554, HS-23 DUT 40556
Operation Voltage [V] / [Hz]	115 / 60
Result	PASSED
Remarks	Flip open
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	23 / 46 / 101.3
Date of measurements	9.3.2006
Measured by	Jari Jantunen

5.1. 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

5.2. WLAN Test results

5.2.1 DSSS mode, QPSK modulation, 11 Mbps data rate

Channel 1 / 2412 MHz

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	50.00	316.23	51.40	-1.40	VERTICAL	PASSED
7236.000000	43.10	142.89	40.80	2.30	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
4824.000000	31.40	37.15	32.80	-1.40	VERTICAL	PASSED
7236.000000	30.90	35.08	28.60	2.30	HORIZONTAL	PASSED

Channel 7 / 2442 MHz

Quasi peak (RBW: 120 kHz)

Frequency [MHz]	E [dB $\mu\text{V/m}$]	E [$\mu\text{V/m}$]	U _{RX} [dB μV]	A _{TOT} [dB]	Polarisation	Result
35.212024	12.20	4.07	22.70	-10.50	VERTICAL	PASSED
40.440681	18.40	8.32	32.90	-14.50	VERTICAL	PASSED

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	51.00	354.81	52.60	-1.60	HORIZONTAL	PASSED
7325.655311	47.10	226.46	44.40	2.70	HORIZONTAL	PASSED
7326.151303	46.80	218.78	44.10	2.70	HORIZONTAL	PASSED
17988.471944	55.70	609.54	34.20	21.50	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
4884.000000	36.70	68.39	38.30	-1.60	HORIZONTAL	PASSED
7326.000000	35.10	56.89	32.40	2.70	HORIZONTAL	PASSED
17983.471944	42.80	138.04	21.30	21.50	HORIZONTAL	PASSED

Channel 11 / 2462 MHz

Peak (RBW: 1 MHz)

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Polarisation	Result
4924.000000	47.30	231.74	48.80	-1.50	VERTICAL	PASSED
7386.000000	52.30	412.10	49.20	3.10	HORIZONTAL	PASSED

Average (RBW: 1 MHz)

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Polarisation	Result
4924.000000	34.70	54.33	36.20	-1.50	HORIZONTAL	PASSED
7386.000000	38.80	87.10	35.70	3.10	HORIZONTAL	PASSED

5.2.2 OFDM mode, 64QAM modulation, 48 Mbps data rate

Channel 1 / 2412 MHz

Peak (RBW: 1 MHz)

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Polarisation	Result
4824.000000	41.90	124.45	43.30	-1.40	HORIZONTAL	PASSED
7236.000000	42.70	136.46	40.40	2.30	HORIZONTAL	PASSED

Average (RBW: 1 MHz)

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Polarisation	Result
4824.000000	30.90	35.08	32.30	-1.40	HORIZONTAL	PASSED
7236.000000	30.20	32.36	27.90	2.30	VERTICAL	PASSED

Channel 7 / 2442 MHz

Peak (RBW: 1 MHz)

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Polarisation	Result
4881.757515	41.30	116.14	42.90	-1.60	VERTICAL	PASSED
4883.269539	41.50	118.85	43.10	-1.60	VERTICAL	PASSED
7327.655311	47.60	239.88	44.90	2.70	HORIZONTAL	PASSED
7327.657315	46.80	218.78	44.10	2.70	HORIZONTAL	PASSED
17931.863727	55.20	575.44	33.90	21.30	HORIZONTAL	PASSED

Average (RBW: 1 MHz)

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Polarisation	Result
4882.757515	28.20	25.70	29.80	-1.60	VERTICAL	PASSED
4884.269539	28.40	26.30	30.00	-1.60	VERTICAL	PASSED
7327.655311	31.70	38.46	29.00	2.70	HORIZONTAL	PASSED
7327.657315	32.30	41.21	29.60	2.70	HORIZONTAL	PASSED
17928.863727	42.40	131.83	21.20	21.20	HORIZONTAL	PASSED

Channel 11 / 2462 MHz

Peak (RBW: 1 MHz)

Frequency [MHz]	E [dB μ V/m]	E [μ V/m]	U _{RX} [dB μ V]	A _{TOT} [dB]	Polarisation	Result
4924.000000	43.30	146.22	44.80	-1.50	HORIZONTAL	PASSED
7386.000000	49.40	295.12	46.30	3.10	HORIZONTAL	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
4924.000000	32.50	42.17	34.00	-1.50	HORIZONTAL	PASSED
7386.000000	34.20	51.29	31.10	3.10	HORIZONTAL	PASSED

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

EUT with DUT number	RM-199 DUT 40549
Accessories with DUT numbers	BL-4C DUT 40553, AC-4 DUT 40554, HS-23 DUT 40556
Operation Voltage [V] / [Hz]	115 / 60
Result	PASSED
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	20 / 45 / 101.3
Date of measurements	9.3.2006
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-GEN 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.

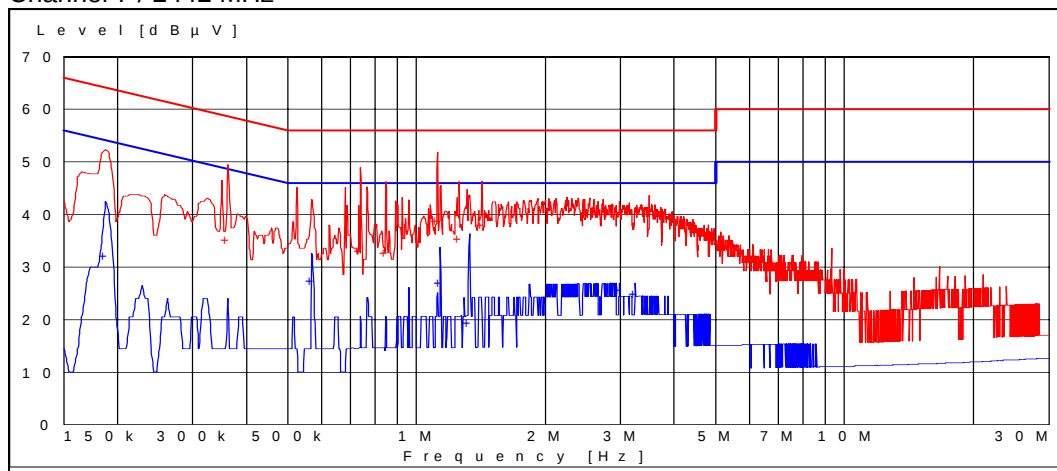
CISPR 22 Class B limits

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

6.2. WLAN Test results

6.2.1 DSSS mode, QPSK modulation, 11 Mbps data rate

Channel 7 / 2442 MHz



Quasi peak (RBW: 9 kHz)

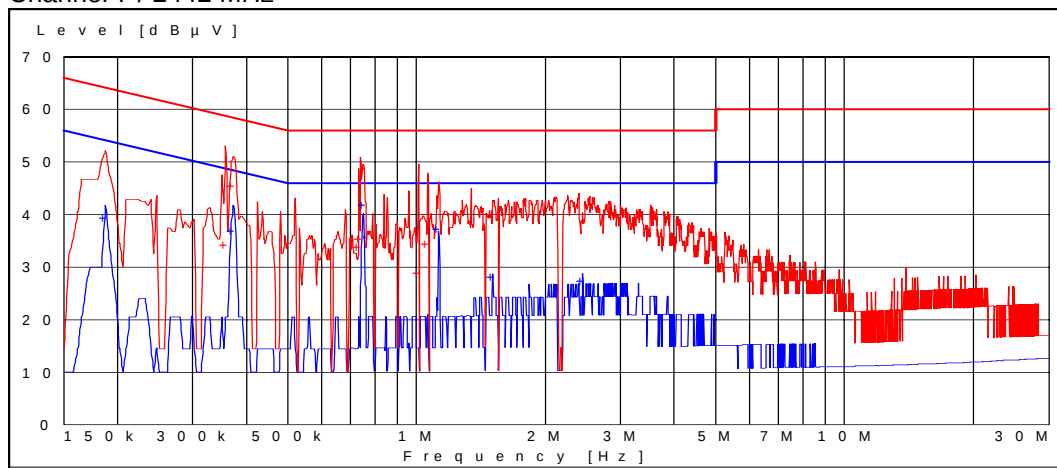
Frequency [MHz]	U [dBμV]	Line	Result
0.361323	35.20	L1	PASSED
0.739479	33.10	L1	PASSED
0.846994	32.70	L1	PASSED
1.117635	38.70	L1	PASSED
1.258517	35.40	L1	PASSED
1.421643	38.00	L1	PASSED

Average (RBW: 9 kHz)

Frequency [MHz]	U [dBμV]	Line	Result
0.187074	32.20	L1	PASSED
0.568938	27.40	N	PASSED
1.136172	27.00	N	PASSED
1.328958	19.40	N	PASSED
2.979960	25.60	L1	PASSED
3.250501	24.80	L1	PASSED

6.2.2 OFDM mode, 64QAM modulation, 48 Mbps data rate

Channel 7 / 2442 MHz



Quasi peak (RBW: 9 kHz)

Frequency [MHz]	U [dBμV]	Line	Result
0.357615	34.30	L1	PASSED
0.372445	45.50	L1	PASSED
0.732064	33.90	L1	PASSED
0.739479	35.40	L1	PASSED
1.010120	28.90	L1	PASSED
1.062024	34.50	L1	PASSED

Average (RBW: 9 kHz)

Frequency [MHz]	U [dBμV]	Line	Result
0.187074	39.50	L1	PASSED
0.372445	36.90	L1	PASSED
0.750601	41.90	L1	PASSED
1.125050	37.30	L1	PASSED
1.506914	28.10	L1	PASSED
2.444890	27.40	L1	PASSED

7. 6 dB bandwidth (FCC §15.247(a)(2), RSS-210 A8.2 (1))

EUT with DUT number	Phone: DUT 40550
Accessories with DUT numbers	Battery: DUT 40552
Operation Voltage [V] / [Hz]	-
Result	Passed
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	23/45/101.1
Date of measurements	09.03.2006
Measured by	Jan-Erik Lilja

7.1. 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

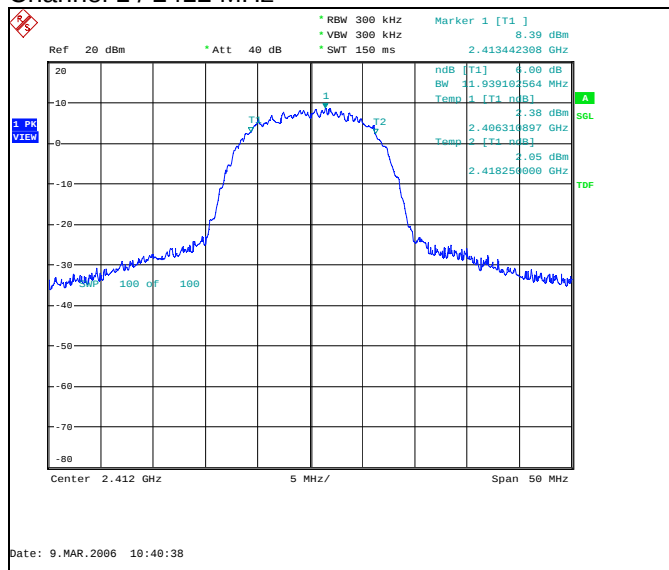
Limit [kHz]
≥ 500

7.2. WLAN test results

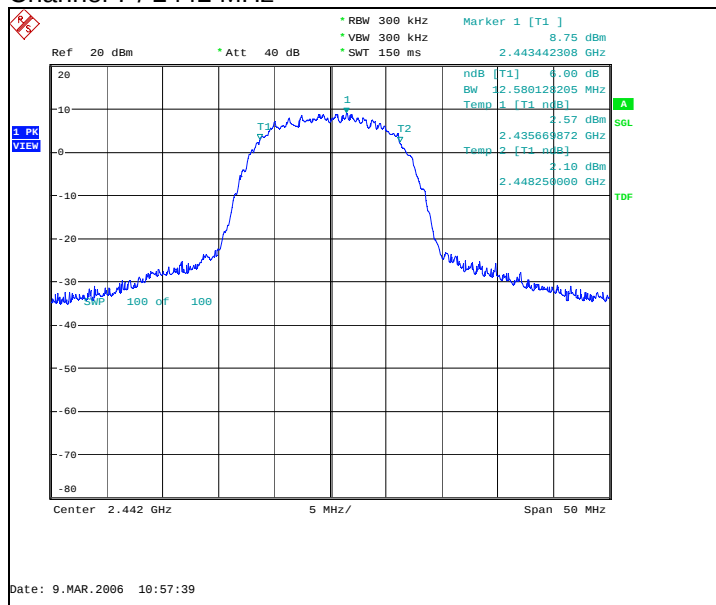
7.2.1 DSSS mode, QPSK modulation, 11 Mbps data rate

Channel / f _c [MHz]	6 dB bandwidth [kHz]	Result
1	11939.103	Passed
7	12580.128	Passed
11	12419.872	Passed

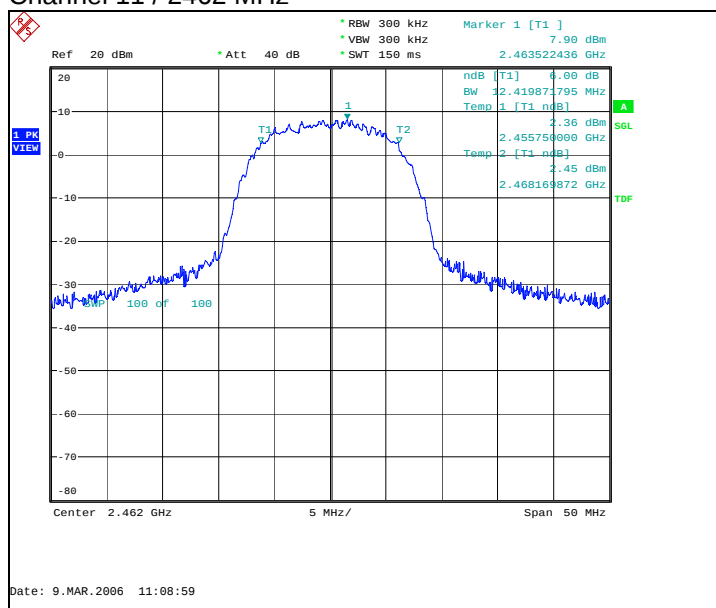
Channel 1 / 2412 MHz



Channel 7 / 2442 MHz



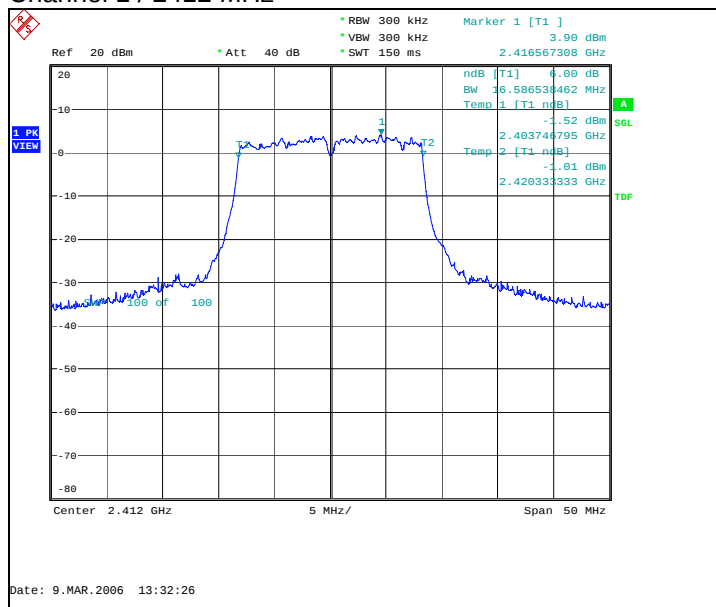
Channel 11 / 2462 MHz



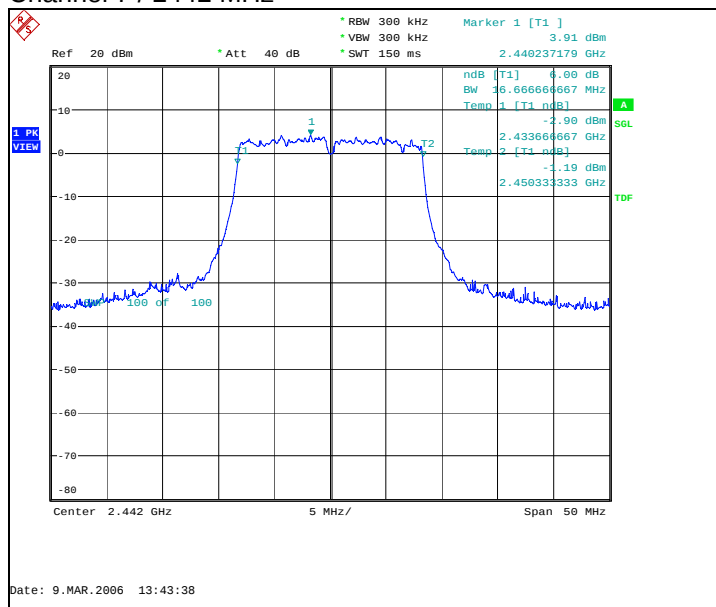
7.2.2 OFDM mode, 64QAM modulation, 48 Mbps data rate

Channel / f_c [MHz]	6 dB bandwidth [kHz]	Result
1	16586.538	Passed
7	16666.667	Passed
11	16666.667	Passed

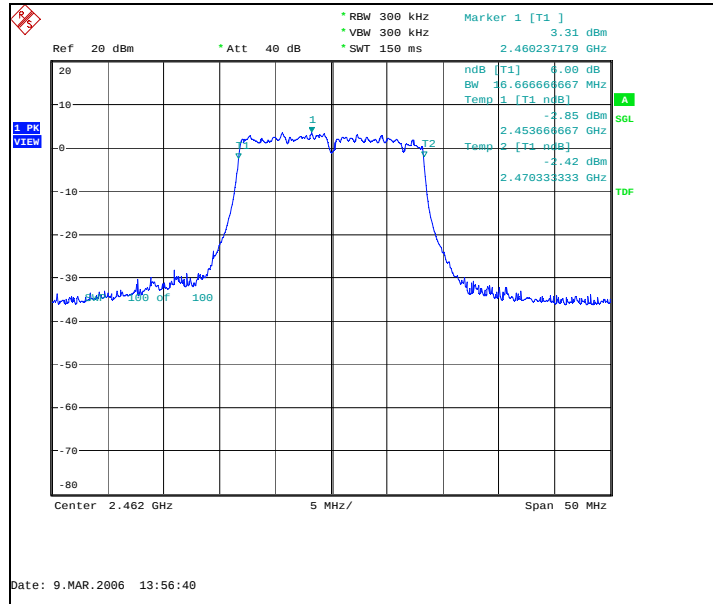
Channel 1 / 2412 MHz



Channel 7 / 2442 MHz



Channel 11 / 2462 MHz



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

EUT with DUT number	Phone: DUT 40550
Accessories with DUT numbers	Battery: DUT 40552
Operation Voltage [V] / [Hz]	-
Result	Passed
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	23/45/101.1
Date of measurements	09.03.2006
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 power spectral density measurements

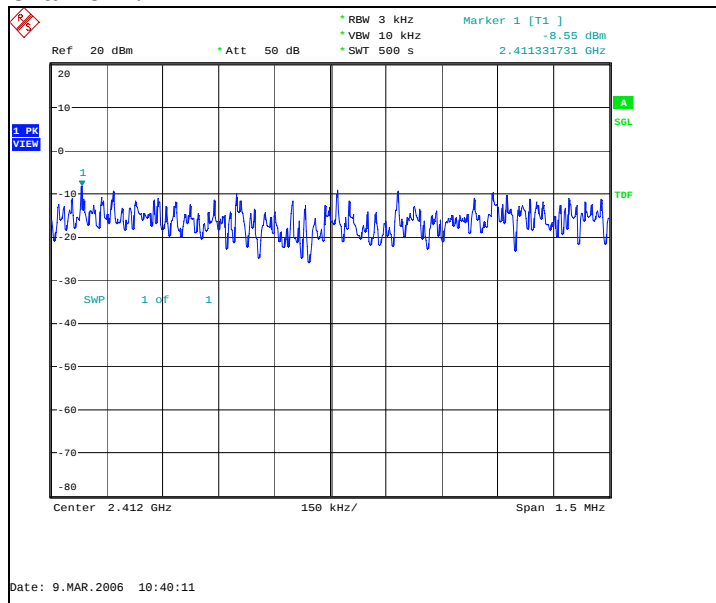
Limit [dBm] @ 3 kHz
≤ 8

8.2. WLAN test results

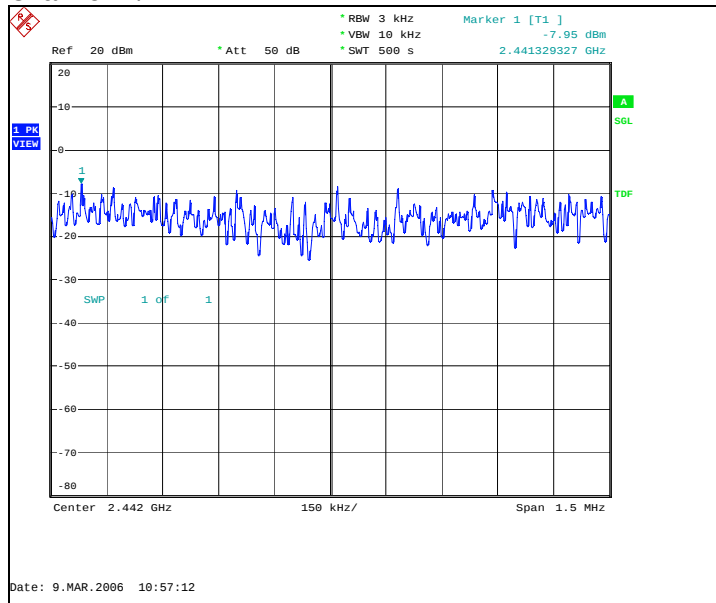
8.2.1 DSSS mode, QPSK modulation, 11 Mbps data rate

Channel / f _c [MHz]	P [dBm]	Result
1 / 2412	-8.55	Passed
7 / 2442	-7.95	Passed
11 / 2462	-8.84	Passed

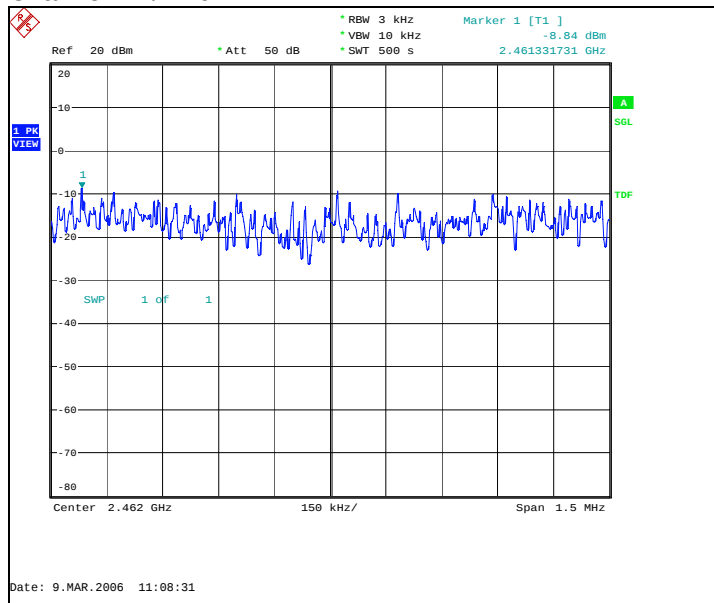
Channel 1 / 2412 MHz



Channel 7 / 2442 MHz



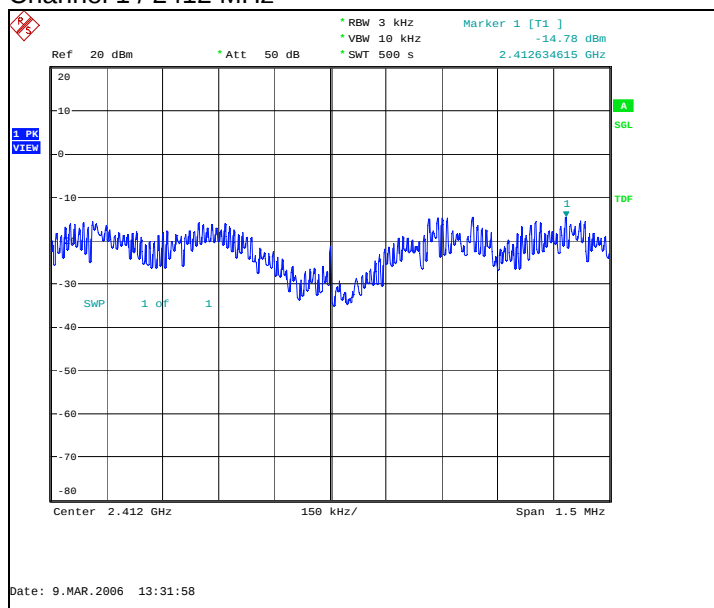
Channel 11 / 2462 MHz



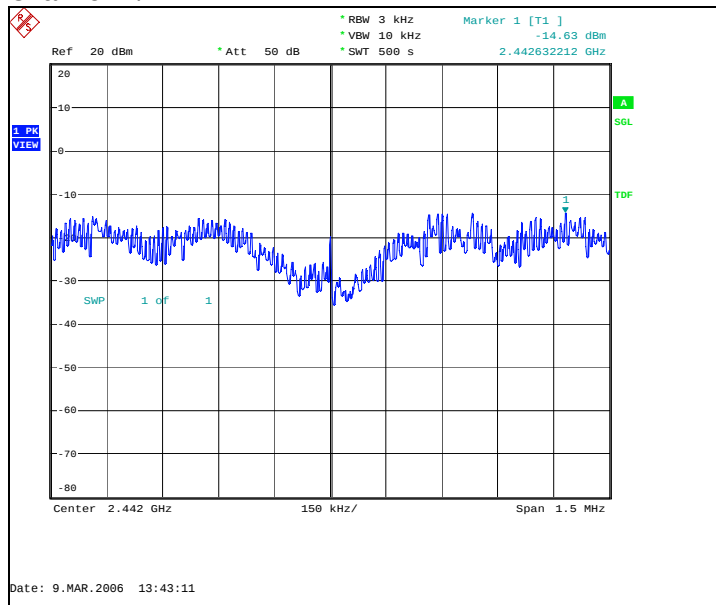
8.2.2 OFDM mode, 64QAM modulation, 48 Mbps data rate

Channel / f _c [MHz]	P [dBm]	Result
1 / 2412	-14.78	Passed
7 / 2442	-14.63	Passed
11 / 2462	-15.23	Passed

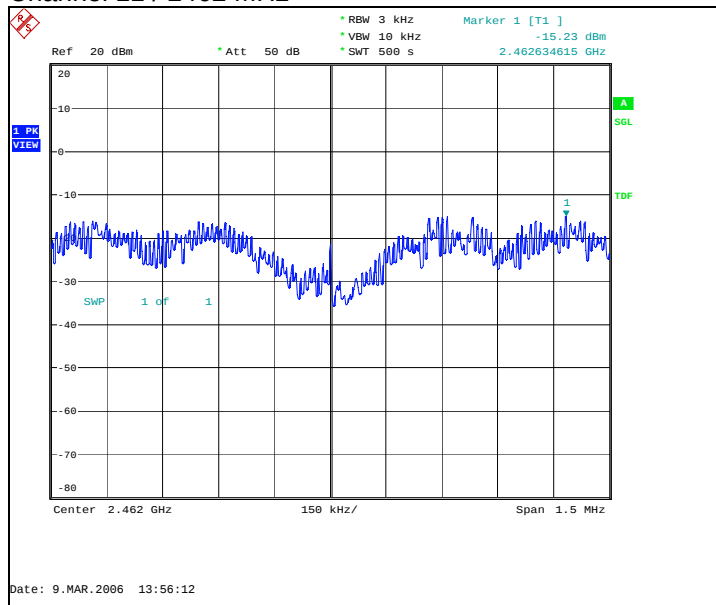
Channel 1 / 2412 MHz



Channel 7 / 2442 MHz



Channel 11 / 2462 MHz



9. Test Equipment

9.1. 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

9.2. 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