FCC Part 15C Compliance Test Report

Test Report no.:	Tre_FCC_0541_03.doc	**Date of Report:**	27.10.2005
Number of pages:	51	**Customer's Contact person:**	Stefan Emery
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 Frederikskaj 1790 COPENHAGEN V DENMARK Tel. +45 33 292929 Fax. +45 33 292934
FCC listing no.: **IC recognition no.:**	94436 3608		
Tested devices/ accessories:	**GSM phone RM-91 / Battery BL-5B, AC charger AC-4E, Headset HS-23**		
FCC ID:	QTKRM-91	**IC:**	661AD-RM91
Supplement reports:	-		
Testing has been carried out in accordance with:	**CFR 47, FCC rules Part 15 Subpart C, ANSI C63.4 (2003) and IC standard 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 Jan-Erik Lilja DN: CN = Jan-Erik Lilja, C = FI, O = Nokia, OU = CertMt Date: 2005.10.27 11:24:27 +03'00'		

Jan-Erik Lilja, System Manager

1. Summary for FCC Part 15C Compliance Test Report

Date of receipt	5.10.2005
Testing completed	25.10.2005
The customer's contact person	Stefan Emery
Test Plan referred to	\EMC\TESTPLAN\
Notes	-
Document name	T:\Projects\RM-91\EMC\Results\FCC\Tre_FCC_0541_03.doc

1.1. EUT and Accessory Information

The EUT is a five band (GSM850/900/1800/1900 and WCDMA1900) mobile phone with Bluetooth and WLAN. Bluetooth and WLAN are tested with maximum rated TX power.

Product	Type	SN	HW	MV	SW	DUT
GSM phone	RM-91	004400681620256	4003	-	1.0536.0.6	40391
GSM phone	RM-91	004400681622989	4002	-	1.0536.0.6	40392
Battery	BL-5B	M183412200148	-	-	-	40393
Battery	BL-5B	M183412200259	-	-	-	40394
AC-Charger	AC-4E	-	1.1	1.0	-	40395
Headset	HS-23	-	0.6	1.2	0.2	40396

1.2. Summary of Test Results

Bluetooth:

Section in CFR 47	Section in RSS-210	Name of the test	Result
15.247(b)(1)	6.2.2(o)(a3)	Peak output power	PASSED
15.247(c)	6.2.2 (o)(e1)	Band edge compliance of RF emissions	PASSED
15.247(c)	6.2.2 (o)(e1)	Spurious RF conducted emissions	PASSED
15.247(c), 15.209	6.2.2 (o)(e1)	Spurious radiated emissions	PASSED
15.207	6.6	AC powerline conducted emissions	PASSED
15.247(a)(1)	6.2.2(o)(a3)	20 dB bandwidth	PASSED
15.247(a)(1)	6.2.2(o)(a1)	Carrier frequency separation	PASSED
15.247(a)(1)(iii)	Amend I(ii)	Number of hopping frequencies	PASSED
15.247(a)(1)(iii)	Amend I(ii)	Time of occupancy	PASSED

WLAN:

Section in CFR 47	Section in RSS-210	Name of the test	Result
15.247(b)(1)	6.2.2(o)(b)	Peak output power	PASSED
15.247(c)	6.2.2(o)(e1)	Band edge compliance of RF emissions	PASSED
15.247(c)	6.2.2(o)(e1)	Spurious RF conducted emissions	PASSED
15.247(c), 15.209	6.2.2(o)(e1)	Spurious radiated emissions	PASSED
15.207	6.6	AC powerline conducted emissions	PASSED
15.247(a)(2)	Amend I(iv)	6 dB bandwidth	PASSED
15.247(e)	Amend I(iv)	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.

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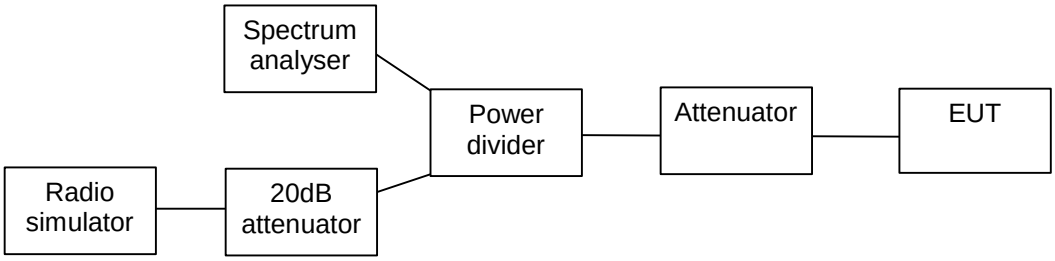
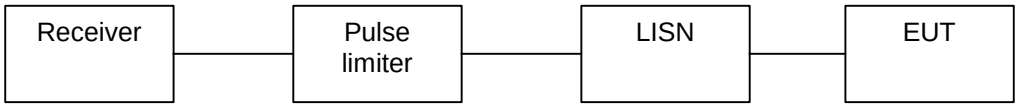
2. Test setups

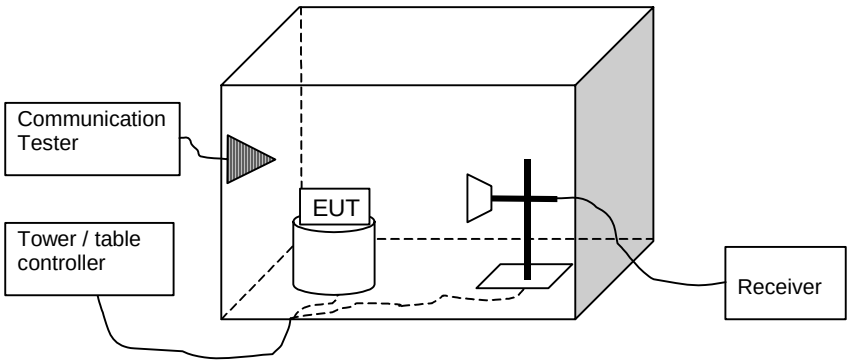
2.1. Conducted RF test setup



2.2. AC powerline conducted emissions test setup



2.3. Spurious radiated emissions test setup



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3. Peak output power

(FCC §15.247(b)(1), RSS-210 6.2.2(o)(a3))

EUT with DUT number	Phone: DUT 40392
Accessories with DUT numbers	Battery: DUT 40394
Operation Voltage [V] / [Hz]	-
Result	Passed
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	25/46/102.6
Date of measurements	10.10.2005
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

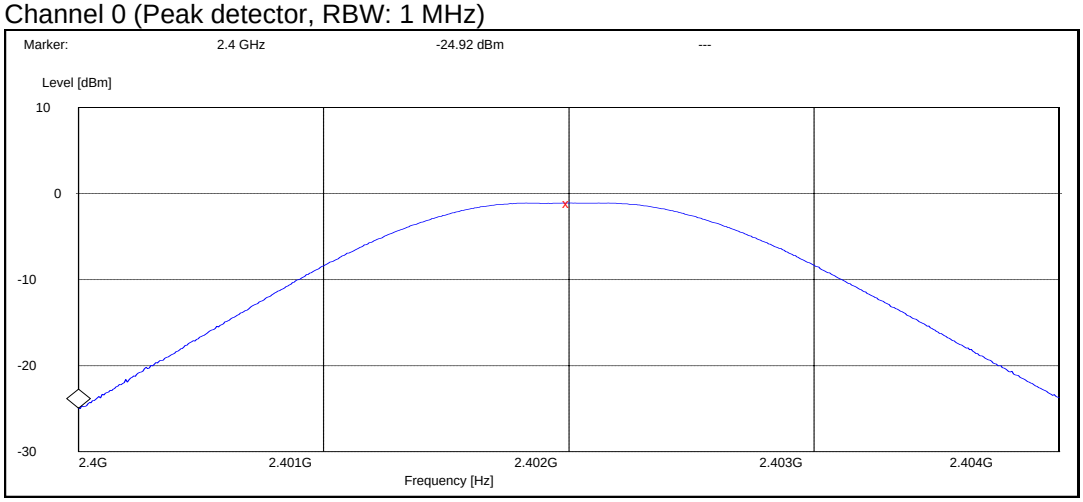
Frequency range [MHz]	Limit [W]	Limit [dBm]
2400 – 2483.5	≤ 1	≤ 30

3.2. Bluetooth Test results

3.2.1 GSFK modulation, PRBS packet type

Channel	P [dBm]	P [mW]	Result
0	-1.10	0.776	Passed
40	-0.80	0.832	Passed
78	-0.90	0.813	Passed

Channel 0 (Peak detector, RBW: 1 MHz)



Channel 40 (Peak detector, RBW: 1 MHz)

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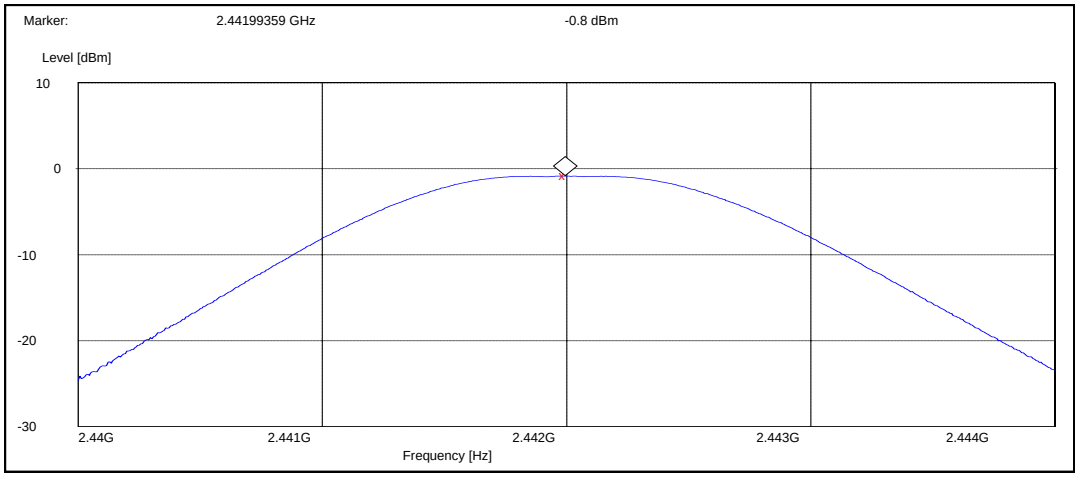
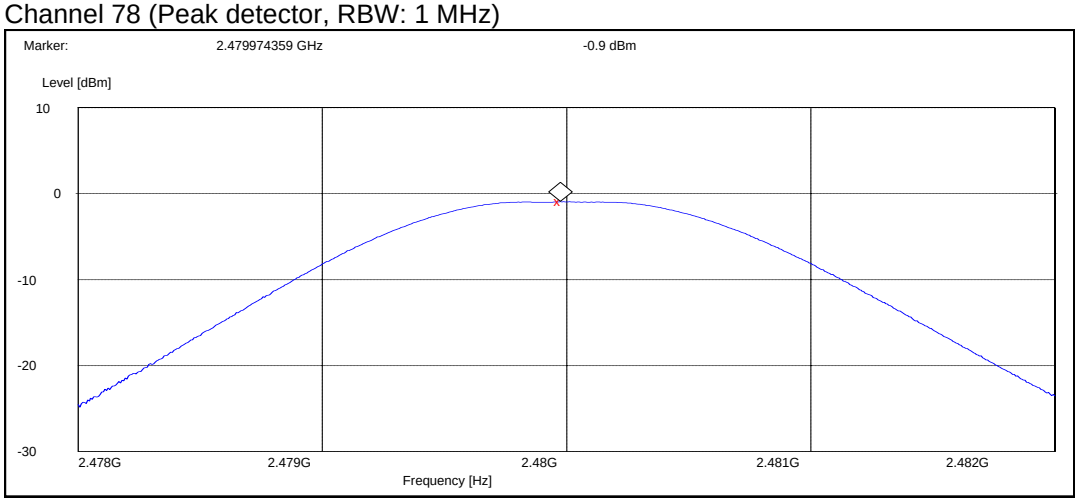


Channel 78 (Peak detector, RBW: 1 MHz)



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4. Band edge compliance of RF emissions

(FCC §15.247(c), RSS-210 6.2.2(o)(e1))

EUT with DUT number	RM-91 DUT 40391
Accessories with DUT numbers	BL-5B DUT 40393, AC-4E DUT 40395, HS-23 DUT 40396
Operation Voltage [V] / [Hz]	115 / 60
Result	PASSED
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	22 / 42 / 103.0
Date of measurements	11.10.2005
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

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4.2. Bluetooth Test results

4.2.1 GFSK modulation, PRBS packet type

Average (RBW: 1 MHz)

Channel	E [dBµV/m]	Result
0	28.47	PASSED
78	32.22	PASSED
Hopping on, low end	30.79	PASSED
Hopping on, high end	37.43	PASSED

Peak (RBW: 1 MHz)

Channel	E [dBµV/m]	Result
0	45.85	PASSED
78	55.94	PASSED
Hopping on, low end	55.05	PASSED
Hopping on, high end	64.36	PASSED

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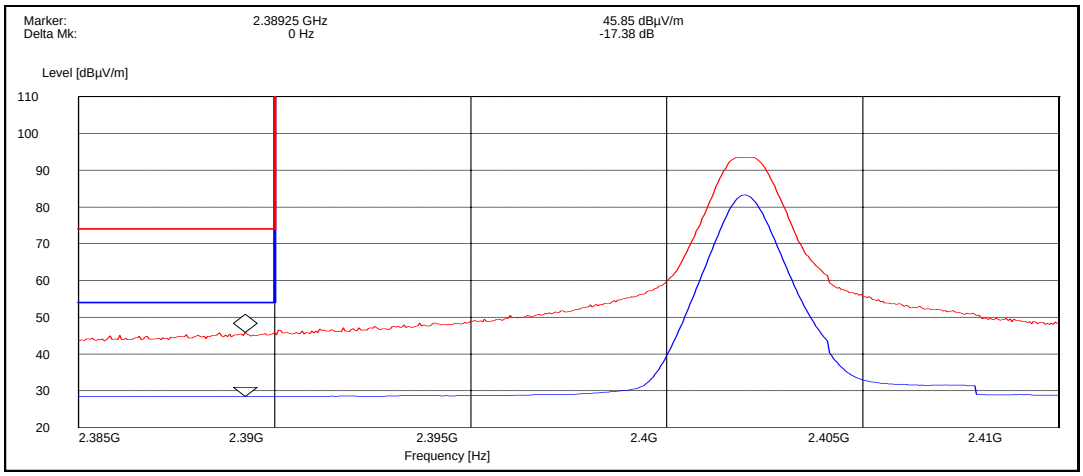
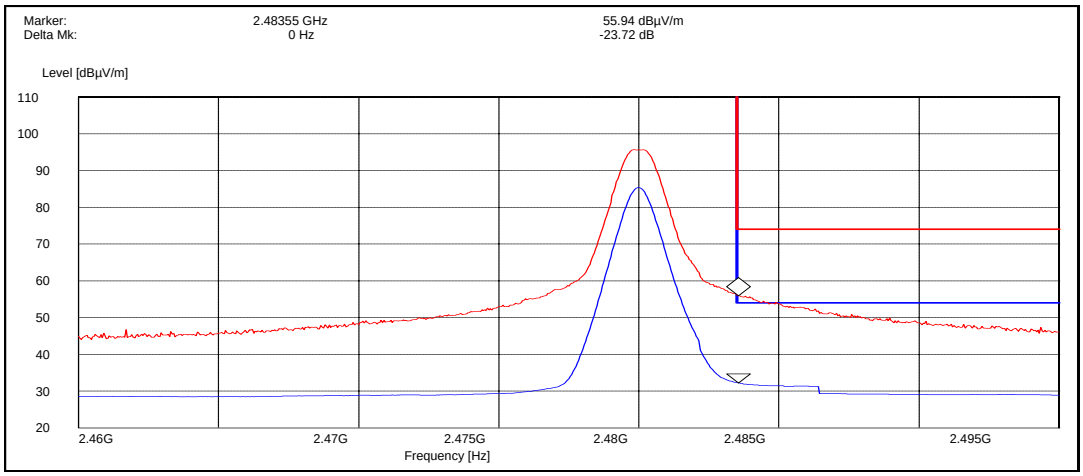
Channel 0



Channel 78



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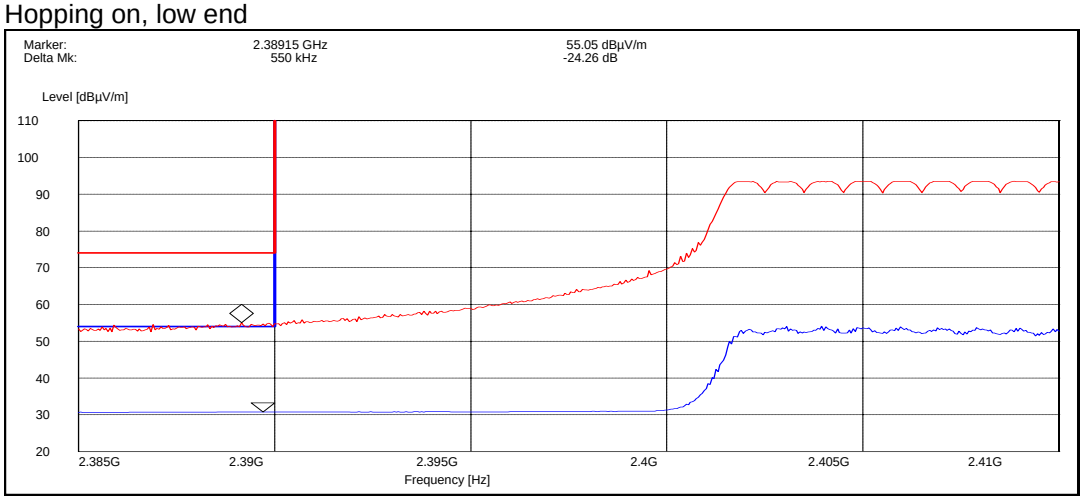
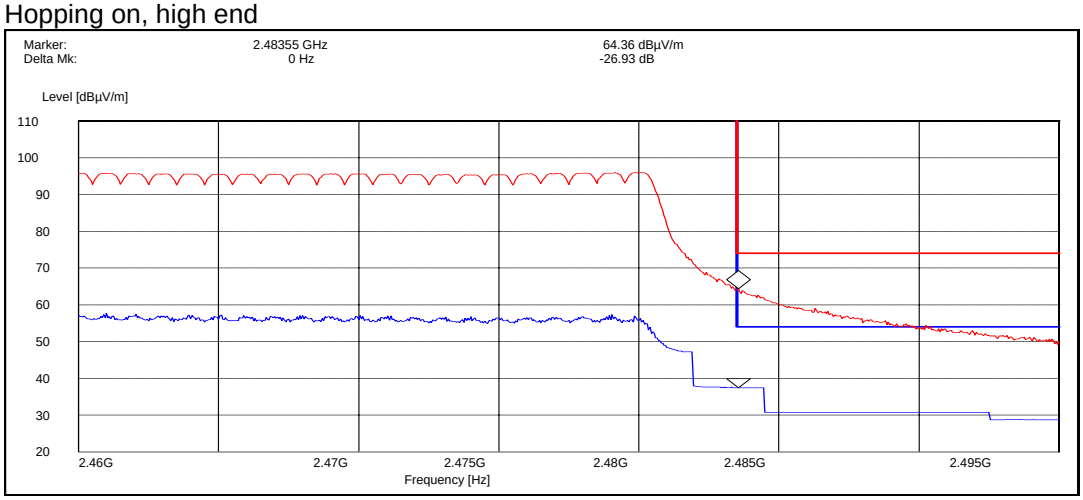
Hopping on, low end



Hopping on, high end



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

EUT with DUT number	Phone: DUT 40392
Accessories with DUT numbers	Battery: DUT 40394
Operation Voltage [V] / [Hz]	-
Result	Passed
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	25/46/102.6
Date of measurements	10.10.2005
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.

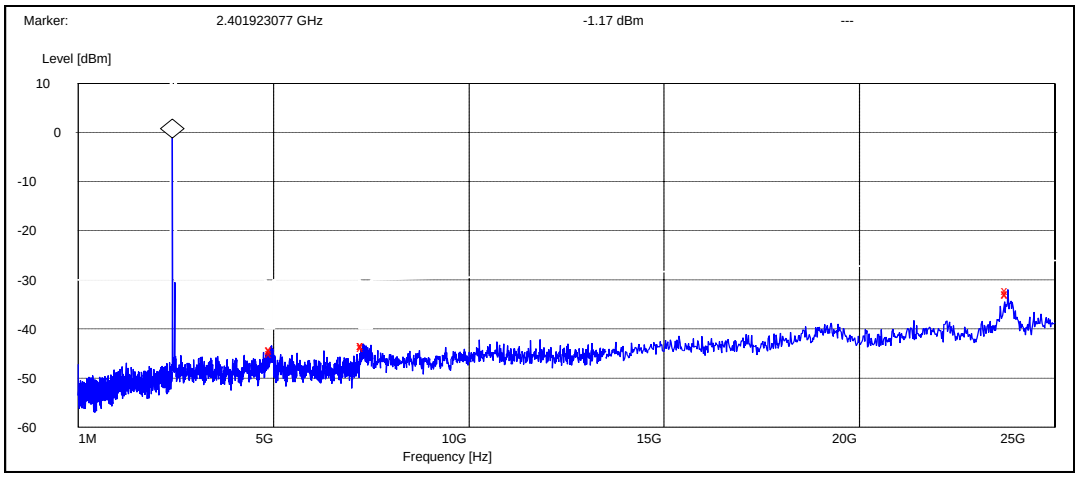
Limits for spurious RF conducted emissions measurements

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
4944.871795	-43.034346	Passed
7294.230769	-42.034346	Passed
23802.083333	-31.034346	Passed

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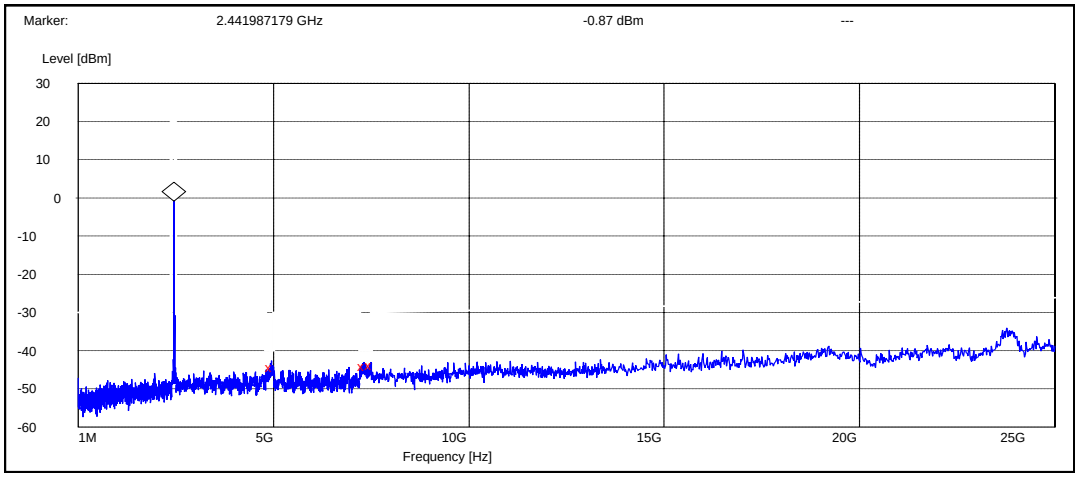
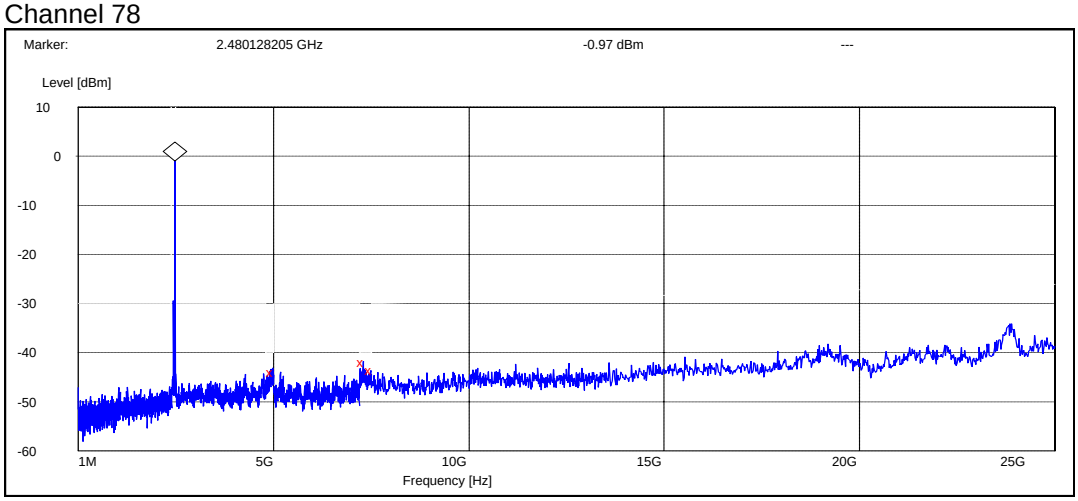
Channel 40



Frequency [MHz]	P [dBc]	Result
4948.397436	-43.433790	Passed
7317.307692	-43.133790	Passed
7500.000000	-42.933790	Passed

Channel 78



Frequency [MHz]	P [dBc]	Result
4972.756410	-42.925079	Passed
7299.519231	-40.925079	Passed
7500.000000	-42.625079	Passed

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6. Spurious radiated emissions

(FCC §15.247(c), §15.209, RSS-210 6.2.2(o)(e1)

EUT with DUT number	RM-91 DUT 40391
Accessories with DUT numbers	BL-5B DUT 40393, AC-4E DUT 40395, HS-23 DUT 40396
Operation Voltage [V] / [Hz]	115 / 60
Result	PASSED
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	22 / 42-44 / 101.5-103.0
Date of measurements	11, 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 ($A_{TOT} = L_{CABLES} + AF - G_{PREAMP}$).

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

Frequency range [MHz[	Limit [µV/m]	Limit [dBµV/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 [dBµV/m]	E [µV/m]	U_{RX} [dBµV]	A_{TOT} [dB]	Polarisation	Result
4804.000000	41.00	112.20	41.30	-0.30	VERTICAL	PASSED
7206.000000	43.40	147.91	40.40	3.00	HORIZONTAL	PASSED
9608.000000	46.40	208.93	37.10	9.30	VERTICAL	PASSED

Average (RBW: 1 MHz)

Frequency [MHz]	E [dBµV/m]	E [µV/m]	U_{RX} [dBµV]	A_{TOT} [dB]	Polarisation	Result
4804.000000	28.00	25.12	28.30	-0.30	HORIZONTAL	PASSED
7206.000000	30.40	33.11	27.40	3.00	HORIZONTAL	PASSED
9608.000000	33.50	47.32	24.20	9.30	HORIZONTAL	PASSED

Channel 40

Peak (RBW: 1 MHz)

Frequency [MHz]	E [dBµV/m]	E [µV/m]	U_{RX} [dBµV]	A_{TOT} [dB]	Polarisation	Result
4947.393788	41.30	116.14	41.50	-0.20	VERTICAL	PASSED
7350.195391	44.80	173.78	40.40	4.40	VERTICAL	PASSED
7427.351703	44.60	169.82	40.10	4.50	VERTICAL	PASSED
17994.983968	56.20	645.65	34.10	22.10	VERTICAL	PASSED

Average (RBW: 1 MHz)

Frequency [MHz]	E [dBµV/m]	E [µV/m]	U_{RX} [dBµV]	A_{TOT} [dB]	Polarisation	Result
4947.893788	28.40	26.30	28.60	-0.20	VERTICAL	PASSED
7349.695391	31.70	38.46	27.30	4.40	VERTICAL	PASSED
7427.351703	32.00	39.81	27.50	4.50	VERTICAL	PASSED
17995.483968	43.40	147.91	21.20	22.20	VERTICAL	PASSED

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Channel 78

Peak (RBW: 1 MHz)

Frequency [MHz]	E [dBµV/m]	E [µV/m]	U_{RX} [dBµV]	A_{TOT} [dB]	Polarisation	Result
4960.000000	43.00	141.25	43.10	-0.10	HORIZONTAL	PASSED
7440.000000	45.10	179.89	40.70	4.40	HORIZONTAL	PASSED
9920.000000	46.70	216.27	37.50	9.20	HORIZONTAL	PASSED

Average (RBW: 1 MHz)

Frequency [MHz]	E [dBµV/m]	E [µV/m]	U_{RX} [dBµV]	A_{TOT} [dB]	Polarisation	Result
4960.000000	30.50	33.50	30.60	-0.10	HORIZONTAL	PASSED
7440.000000	31.80	38.90	27.40	4.40	HORIZONTAL	PASSED
9920.000000	33.80	48.98	24.60	9.20	VERTICAL	PASSED

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7. AC powerline conducted emissions

(FCC §15.207, RSS-210 6.6)

EUT with DUT number	RM-91 DUT 40391
Accessories with DUT numbers	BL-5B DUT 40393, AC-4E DUT 40395, HS-23 DUT 40396
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

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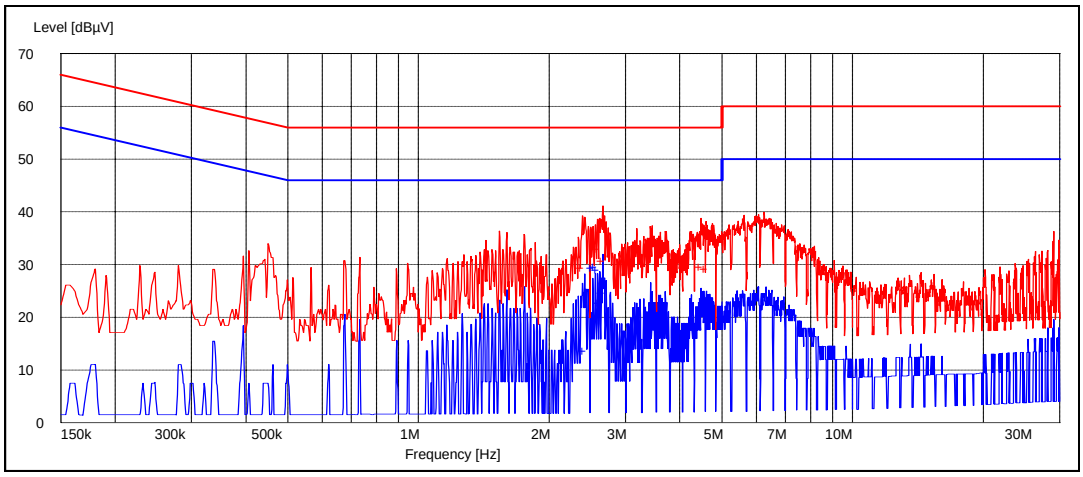
7.2. Bluetooth Test results

7.2.1 GFSK modulation, PRBS packet type

Channel 40



Quasi peak (RBW: 9 kHz)

Frequency [MHz]	U [dBµV]	Line	Result
2.384770	29.30	L1	PASSED
2.583166	32.90	L1	PASSED
2.661323	30.60	L1	PASSED
2.709419	37.40	L1	PASSED
4.476954	29.60	L1	PASSED
4.597194	29.10	L1	PASSED

Average (RBW: 9 kHz)

Frequency [MHz]	U [dBµV]	Line	Result
2.414830	13.60	L1	PASSED
2.523046	29.40	L1	PASSED
2.553106	29.50	L1	PASSED
2.583166	28.90	L1	PASSED
2.613226	22.70	L1	PASSED
2.661323	24.50	L1	PASSED

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8. 20 dB bandwidth

(FCC §15.247(a)(1), RSS-210 6.2.2(o)(a3))

EUT with DUT number	Phone: DUT 40392
Accessories with DUT numbers	Battery: DUT 40394
Operation Voltage [V] / [Hz]	-
Result	Passed
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	25/46/102.6
Date of measurements	10.10.2005
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	759.615	Passed
40	759.615	Passed
78	746.795	Passed

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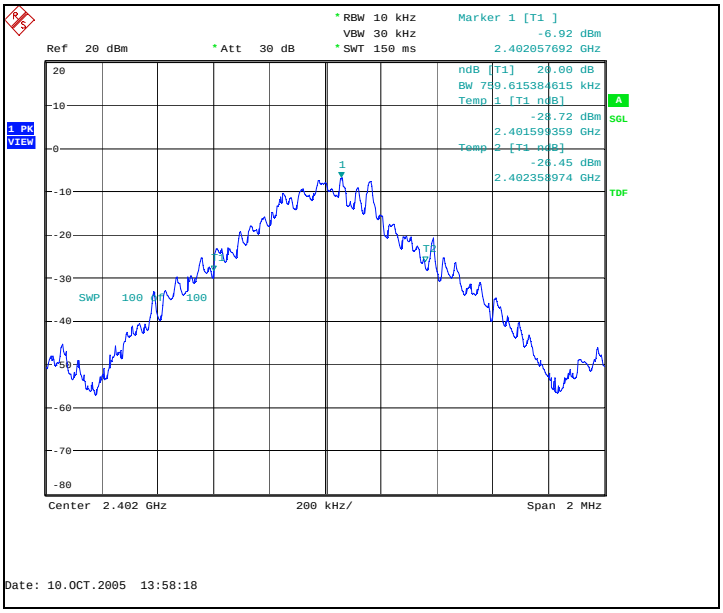
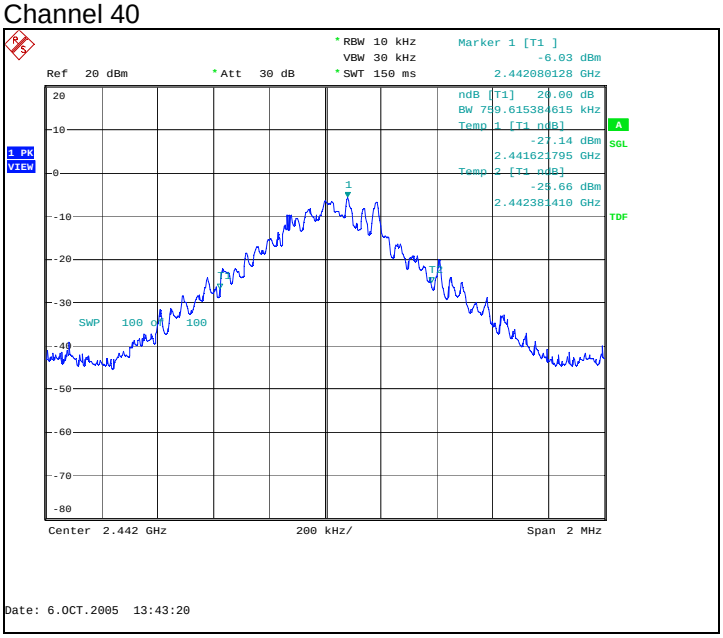
Channel 0



Channel 40



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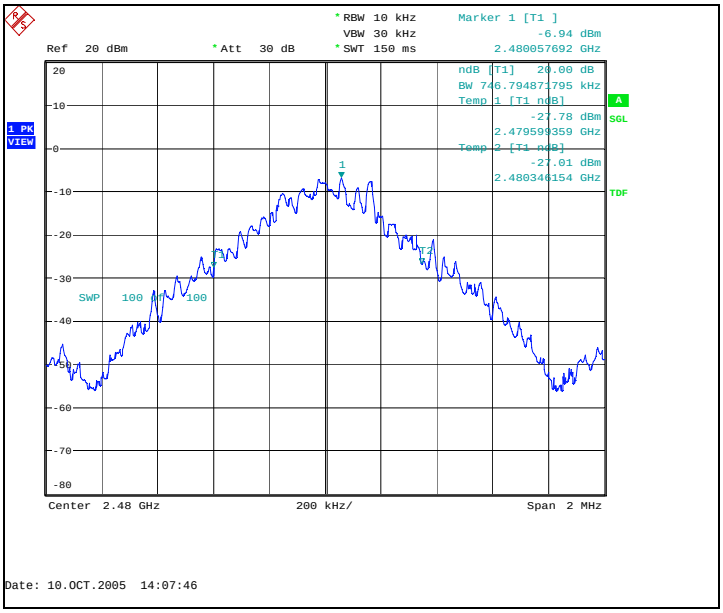
Channel 78



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9. Carrier frequency separation
(FCC §15.247(a)(1), RSS-210 6.2.2(o)(a1))

EUT with DUT number	Phone: DUT 40392
Accessories with DUT numbers	Battery: DUT 40394
Operation Voltage [V] / [Hz]	-
Result	Passed
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	25/46/102.6
Date of measurements	10.10.2005
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

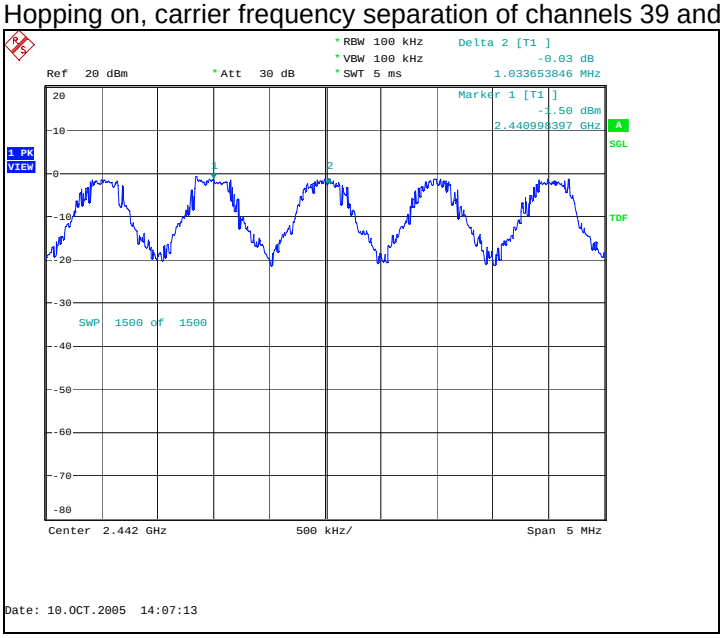
Limit [MHz]
≥ 0.025 or 20 dB bandwidth

9.2. Bluetooth Test results

9.2.1 GFSK modulation, PRBS packet type

Carrier frequency separation [kHz]	Result
1033.654	Passed

Hopping on, carrier frequency separation of channels 39 and 40



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10. Number of hopping frequencies

(FCC §15.247(a)(1)(iii), RSS-210 Amend I(ii))

EUT with DUT number	Phone: DUT 40392
Accessories with DUT numbers	Battery: DUT 40394
Operation Voltage [V] / [Hz]	-
Result	Passed
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	25/46/102.6
Date of measurements	10.10.2005
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

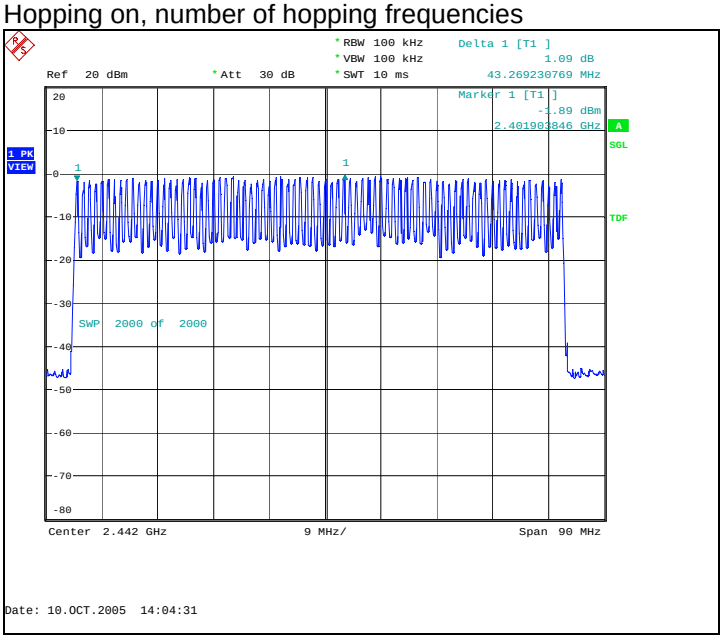
Limit [number]
≥ 75

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



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11. Time of occupancy

(FCC §15.247(a)(1)(iii), RSS-210 Amend I(ii))

EUT with DUT number	Phone: DUT 40392
Accessories with DUT numbers	Battery: DUT 40394
Operation Voltage [V] / [Hz]	-
Result	Passed
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	25/46/102.6
Date of measurements	10.10.2005
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

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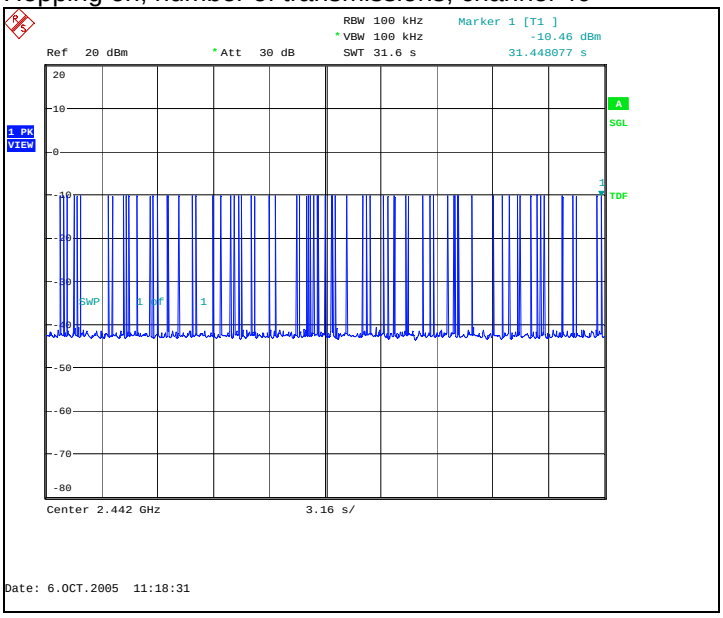
11.2. Bluetooth test results

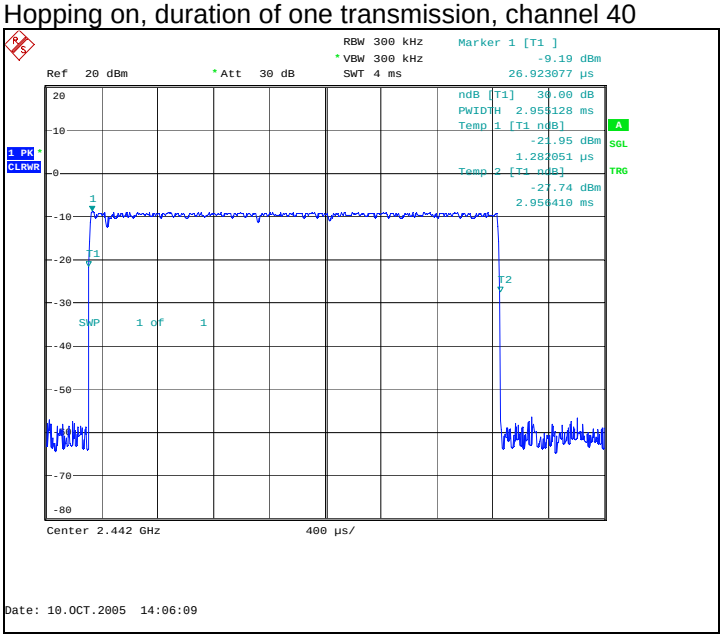
11.2.1 GFSK modulation, PRBS packet type

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



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12. Peak output power

(FCC §15.247(b)(1), RSS-210 6.2.2(o)(b))

EUT with DUT number	Phone: DUT 40392
Accessories with DUT numbers	Battery: DUT 40394
Operation Voltage [V] / [Hz]	-
Result	Passed
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	24/50/103.3
Date of measurements	12.10.2005
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, 5.5 Mbps data rate

Channel	P [dBm]	P [W]	Result
1	20.77	0.119	Passed
7	17.95	0.062	Passed
11	18.15	0.065	Passed

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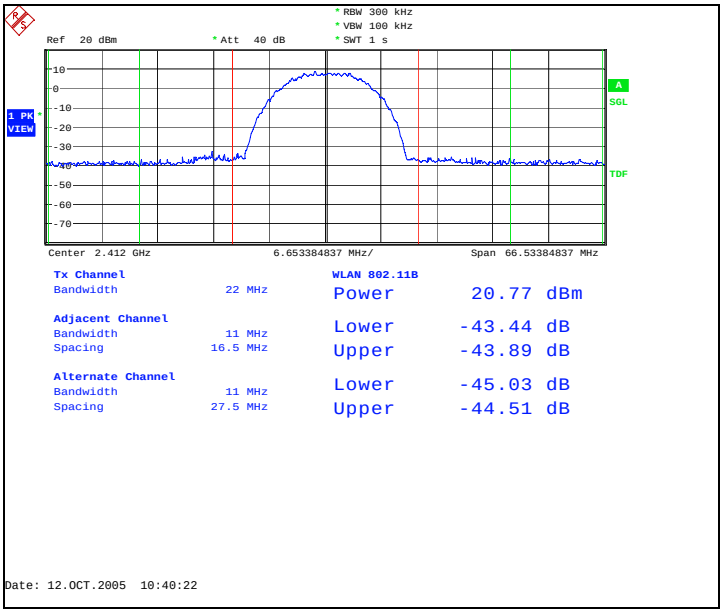
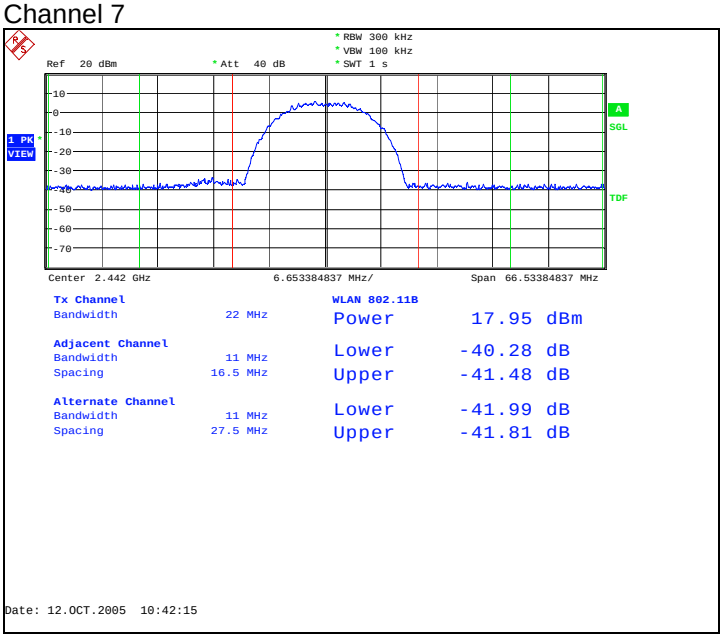
Channel 1



Channel 7



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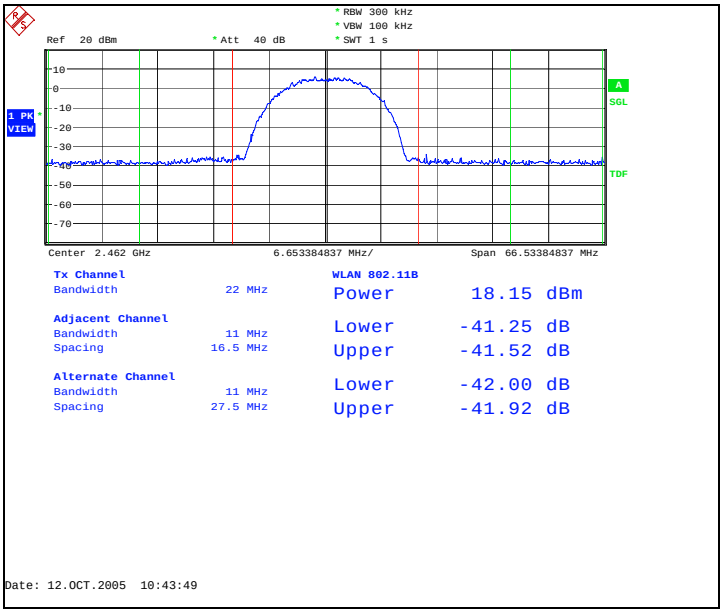
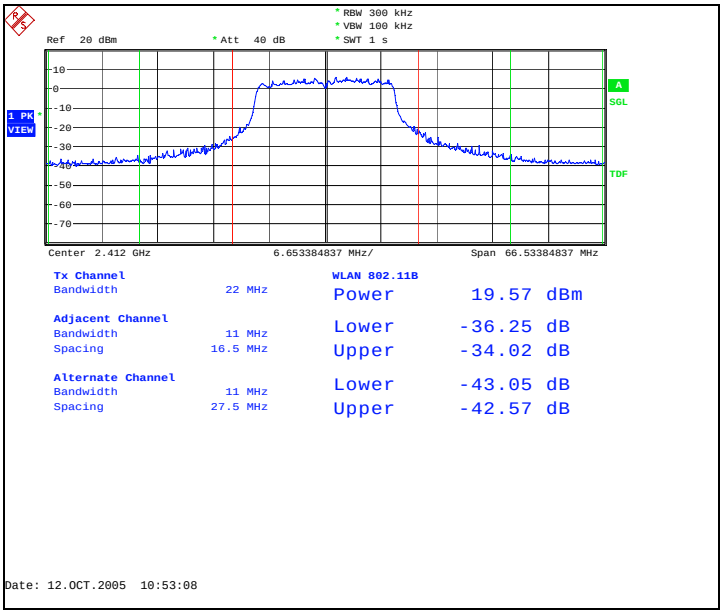
Channel 11



12.2.2 OFDM mode, BPSK modulation, 9 Mbps data rate

Channel	P [dBm]	P [W]	Result
1	19.57	0.091	Passed
7	17.56	0.057	Passed
11	17.51	0.056	Passed

Channel 1



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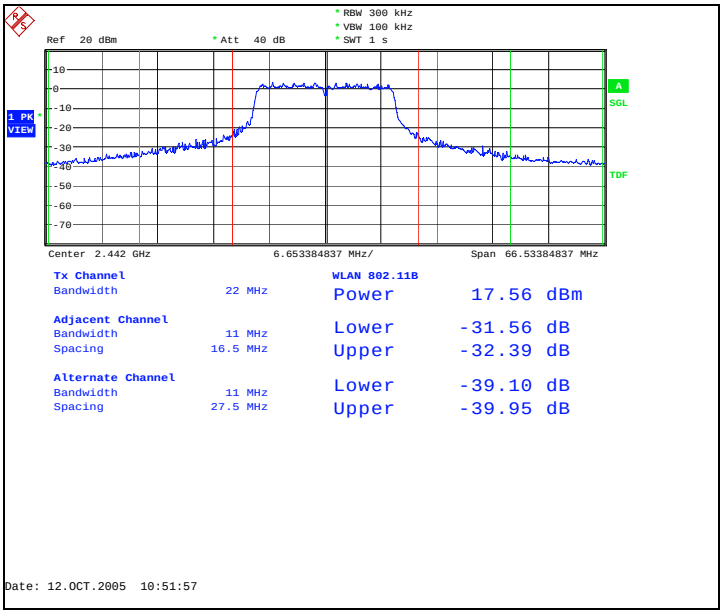
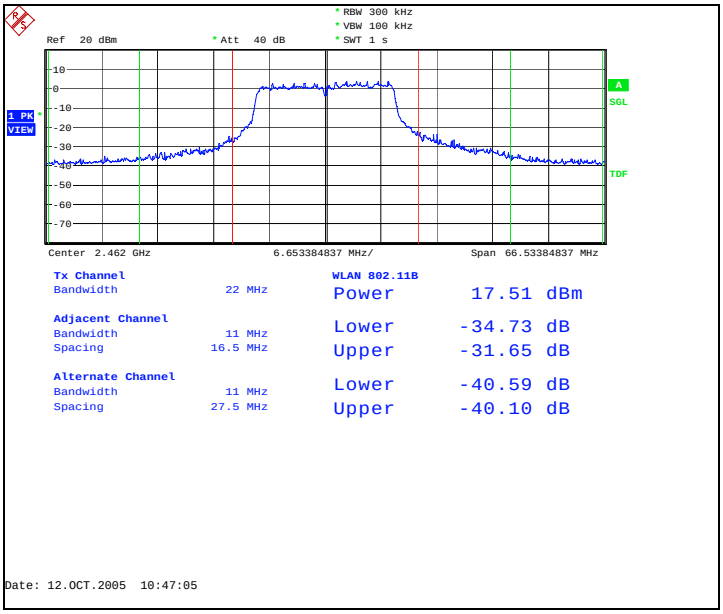
Channel 7



Channel 11



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13. Band edge compliance of RF emissions

(FCC §15.247(c), RSS-210 6.2.2(o)(e1))

EUT with DUT number	RM-91 DUT 40391
Accessories with DUT numbers	BL-5B DUT 40393, AC-4E DUT 40395, HS-23 DUT 40396
Operation Voltage [V] / [Hz]	115 / 60
Result	PASSED
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	23 / 43 / 103.3
Date of measurements	17.10.2005
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

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13.2. WLAN Test results

13.2.1 DSSS mode, QPSK modulation, 5.5 Mbps data rate

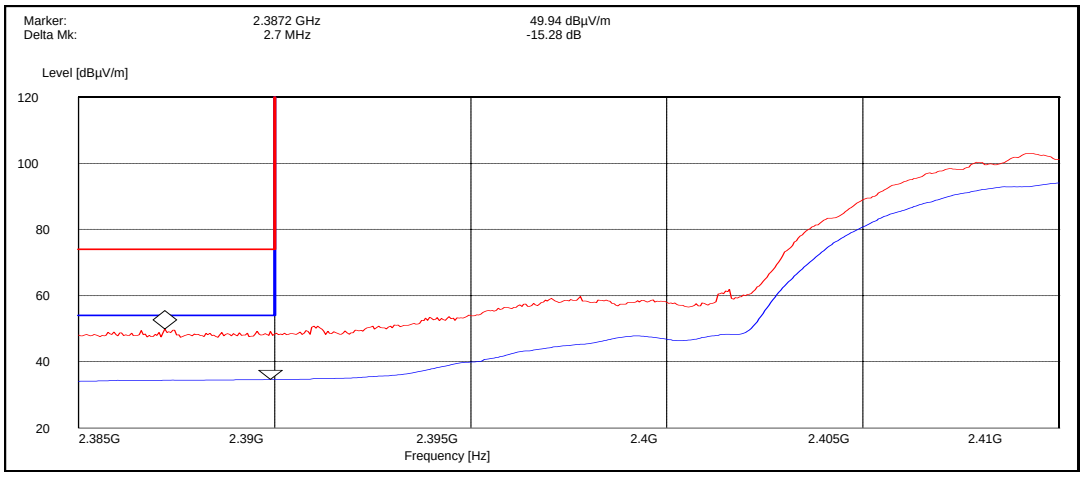
Average (RBW: 1 MHz)

Channel	E [dBµV/m]	Result
1	34.66	PASSED
11	38.11	PASSED

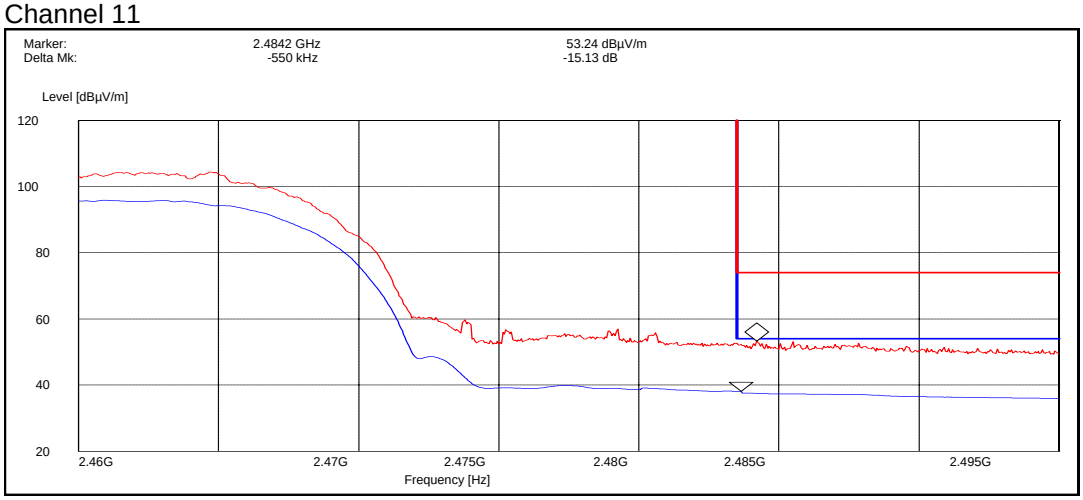
Peak (RBW: 1 MHz)

Channel	E [dBµV/m]	Result
1	49.94	PASSED
11	53.24	PASSED

Channel 1



Channel 11



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13.2.2 OFDM mode, BPSK modulation, 9 Mbps data rate

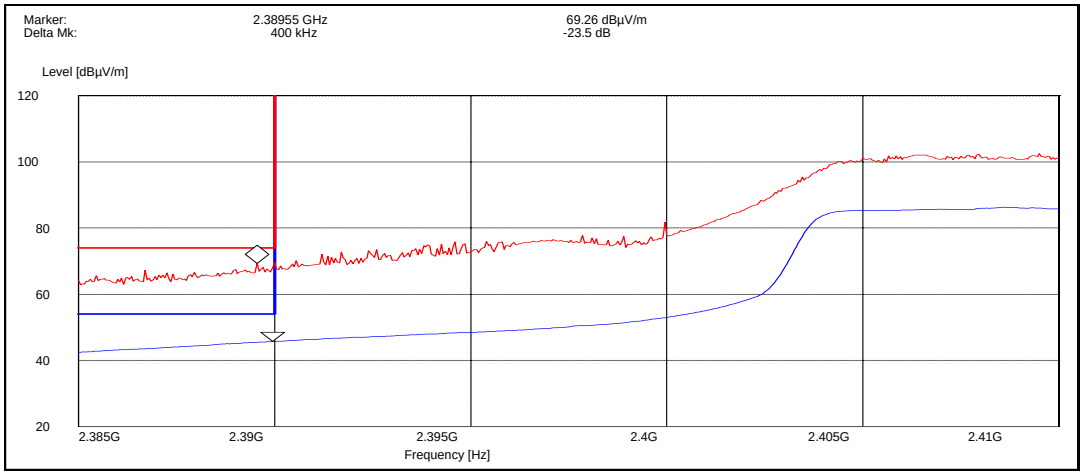
Average (RBW: 1 MHz)

Channel	E [dBµV/m]	Result
1	45.76	PASSED
11	51.10	PASSED

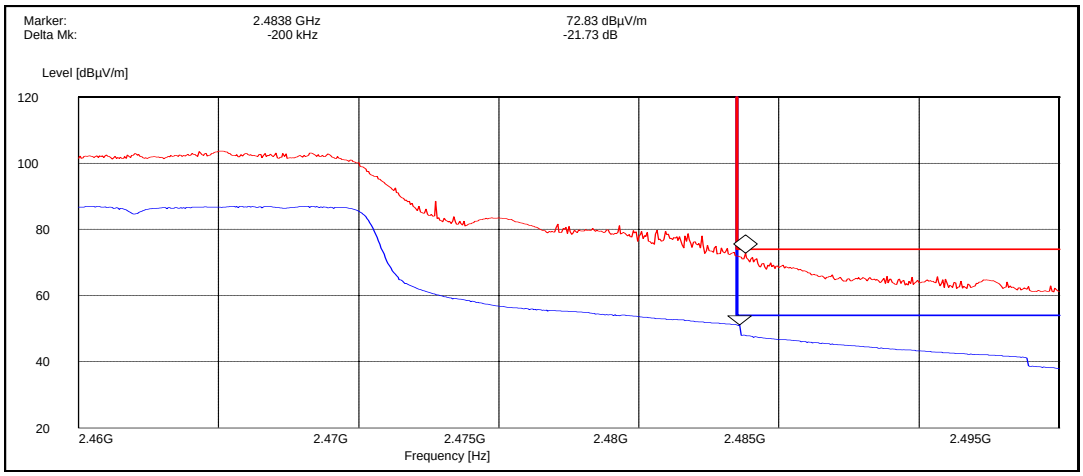
Peak (RBW: 1 MHz)

Channel	E [dBµV/m]	Result
1	69.26	PASSED
11	72.83	PASSED

Channel 1



Channel 11



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14. Spurious RF conducted emissions

(FCC §15.247(c), RSS-210 6.2.2(o)(e1)

EUT with DUT number	Phone: DUT 40392
Accessories with DUT numbers	Battery: DUT 40394
Operation Voltage [V] / [Hz]	-
Result	Passed
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	24/50/103.3
Date of measurements	12.10.2005
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.

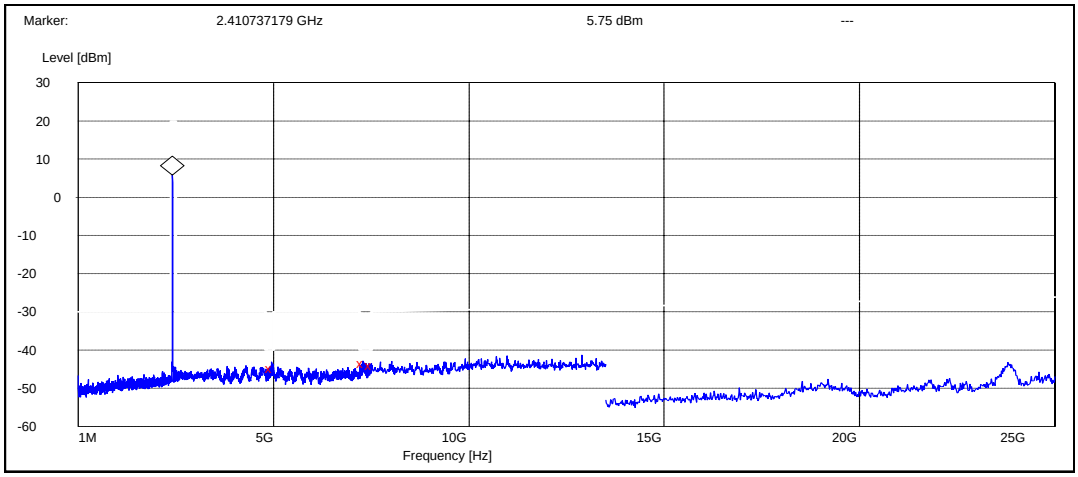
Limits for spurious RF conducted emissions measurements

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

14.2. WLAN Test results

14.2.1 DSSS mode, QPSK modulation, 5.5 Mbps data rate

Channel 1



Frequency [MHz]	P [dBc]	Result
4954.166667	-50.453794	Passed
7292.788462	-49.253794	Passed
7500.000000	-49.653794	Passed

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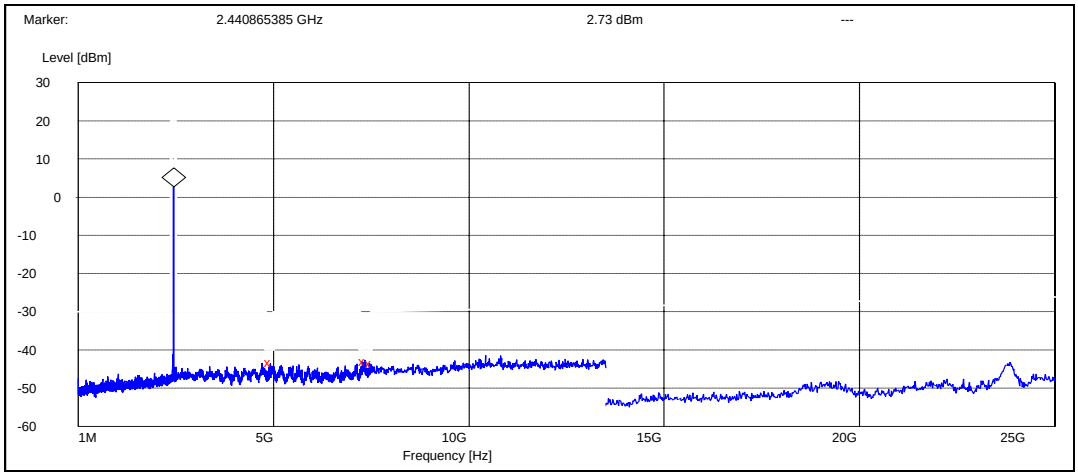
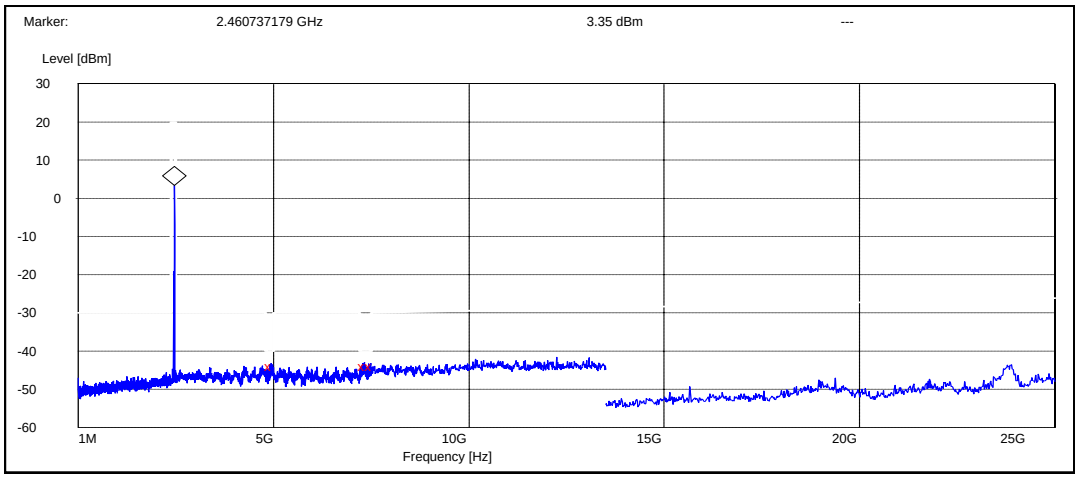
Channel 7



Frequency [MHz]	P [dBc]	Result
4927.564103	-46.027524	Passed
7347.115385	-45.827524	Passed
7500.000000	-46.227524	Passed

Channel 11



Frequency [MHz]	P [dBc]	Result
4936.217949	-47.449574	Passed
7333.653846	-47.249574	Passed
7500.000000	-47.449574	Passed

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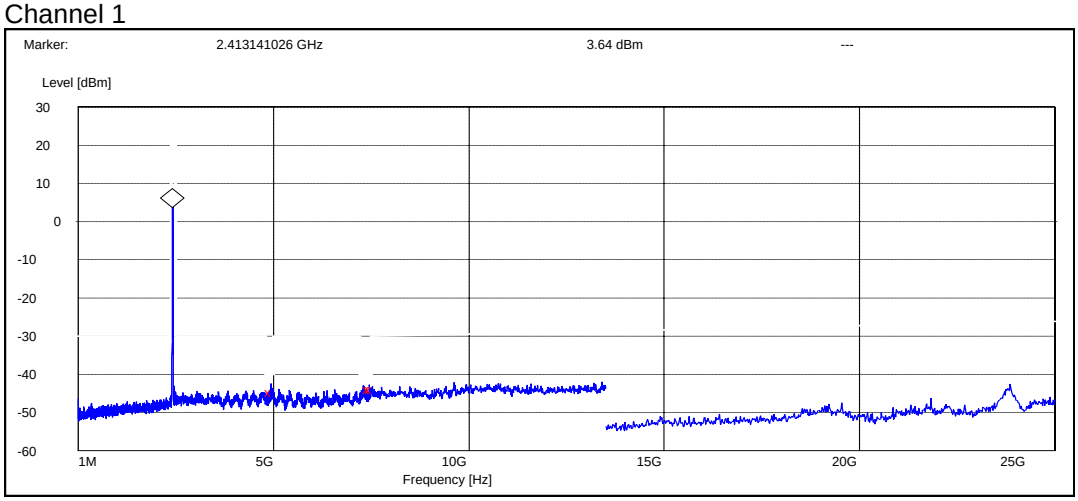
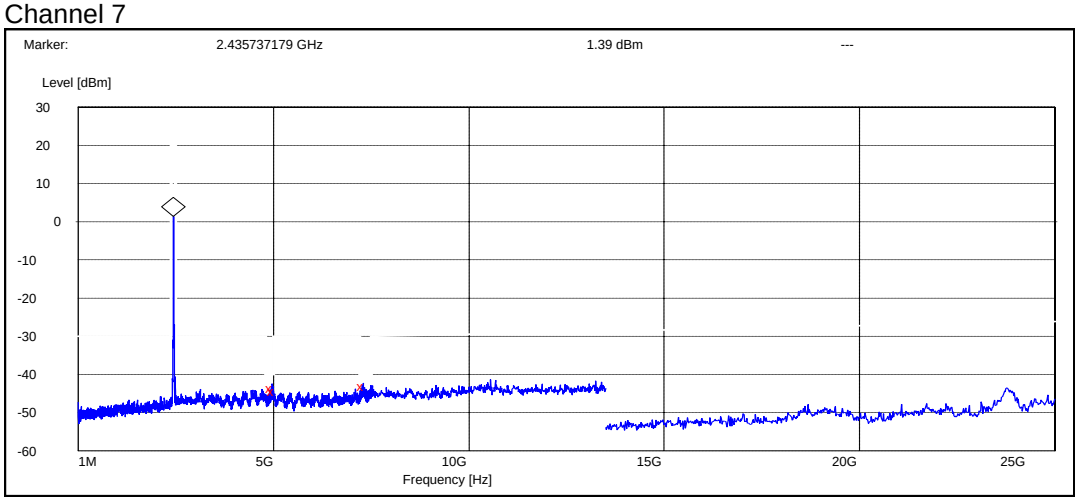
14.2.2 OFDM mode, BPSK modulation, 9 Mbps data rate

Channel 1



Frequency [MHz]	P [dBc]	Result
4941.346154	-48.435805	Passed
7448.557692	-47.635805	Passed
7500.000000	-47.635805	Passed

Channel 7



Frequency [MHz]	P [dBc]	Result
4961.538462	-44.993143	Passed
5000.000000	-45.793143	Passed
7300.480769	-44.493143	Passed

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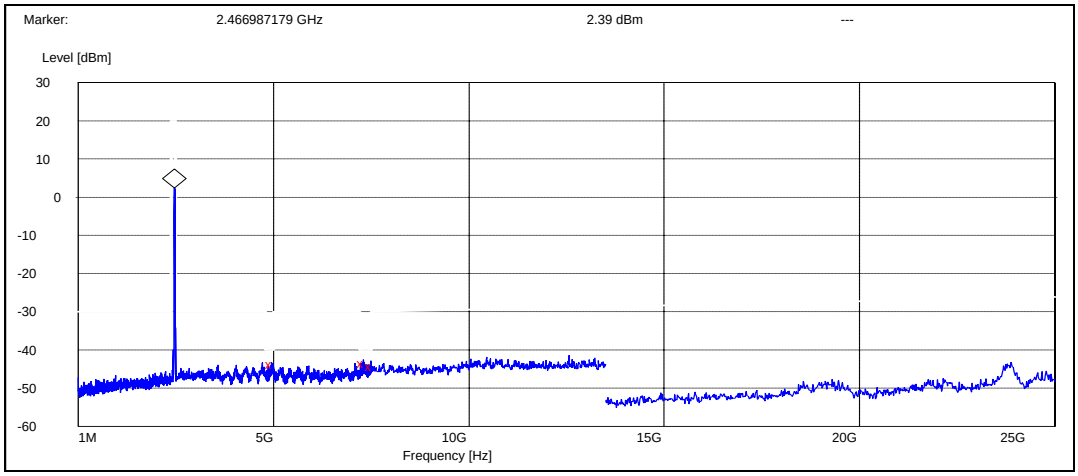
Channel 11



Frequency [MHz]	P [dBc]	Result
4943.589744	-46.092895	Passed
7306.250000	-45.892895	Passed
7500.000000	-46.692895	Passed

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15. Spurious radiated emissions

(FCC §15.247(c), §15.209, RSS-210 6.2.2(o)(e1)

EUT with DUT number	RM-91 DUT 40391
Accessories with DUT numbers	BL-5B DUT 40393, AC-4E DUT 40395, HS-23 DUT 40396
Operation Voltage [V] / [Hz]	115 / 60
Result	PASSED
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	23 / 44 / 103.2
Date of measurements	12.10.2005
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 ($A_{TOT} = L_{CABLES} + AF - G_{PREAMP}$).

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

Frequency range [MHz[	Limit [µV/m]	Limit [dBµV/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, 5.5 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	52.20	407.38	52.80	-0.60	HORIZONTAL	PASSED
7236.000000	43.20	144.54	40.00	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	34.10	50.70	34.70	-0.60	HORIZONTAL	PASSED
7236.000000	30.80	34.67	27.60	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
4883.769539	49.40	295.12	50.10	-0.70	HORIZONTAL	PASSED
7423.841683	44.80	173.78	40.30	4.50	VERTICAL	PASSED
17913.823647	56.10	638.26	34.50	21.60	VERTICAL	PASSED

Average (RBW: 1 MHz)

Frequency [MHz]	E [dBµV/m]	E [µV/m]	U_{RX} [dBµV]	A_{TOT} [dB]	Polarisation	Result
4878.757515	38.20	81.28	38.90	-0.70	HORIZONTAL	PASSED
7423.841683	31.80	38.90	27.30	4.50	VERTICAL	PASSED
17911.823647	42.60	134.90	21.10	21.50	VERTICAL	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	51.20	363.08	51.80	-0.60	HORIZONTAL	PASSED
7386.000000	44.70	171.79	40.40	4.30	HORIZONTAL	PASSED

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Average (RBW: 1 MHz)

Frequency [MHz]	E [dBµV/m]	E [µV/m]	U_{RX} [dBµV]	A_{TOT} [dB]	Polarisation	Result
4924.000000	33.60	47.86	34.20	-0.60	HORIZONTAL	PASSED
7386.000000	31.80	38.90	27.50	4.30	HORIZONTAL	PASSED

15.2.2 OFDM mode, BPSK modulation, 9 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	49.70	305.49	50.30	-0.60	HORIZONTAL	PASSED
7236.000000	43.60	151.36	40.40	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	32.90	44.16	33.50	-0.60	HORIZONTAL	PASSED
7236.000000	30.80	34.67	27.60	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
4947.393788	41.30	116.14	41.50	-0.20	VERTICAL	PASSED
7350.195391	44.80	173.78	40.40	4.40	VERTICAL	PASSED
17994.983968	56.20	645.65	34.10	22.10	VERTICAL	PASSED

Average (RBW: 1 MHz)

Frequency [MHz]	E [dBµV/m]	E [µV/m]	U_{RX} [dBµV]	A_{TOT} [dB]	Polarisation	Result
4947.893788	28.40	26.30	28.60	-0.20	VERTICAL	PASSED
7427.351703	32.00	39.81	27.50	4.50	VERTICAL	PASSED
17995.483968	43.40	147.91	21.20	22.20	VERTICAL	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	46.10	201.84	46.70	-0.60	HORIZONTAL	PASSED
7386.000000	44.40	165.96	40.10	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	32.20	40.74	32.80	-0.60	HORIZONTAL	PASSED
7386.000000	31.80	38.90	27.50	4.30	HORIZONTAL	PASSED

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16. AC powerline conducted emissions
(FCC §15.207, RSS-210 6.6)

EUT with DUT number	RM-91 DUT 40391
Accessories with DUT numbers	BL-5B DUT 40393, AC-4E DUT 40395, HS-23 DUT 40396
Operation Voltage [V] / [Hz]	115 / 60
Result	PASSED
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	19 / 49 / 102.5
Date of measurements	18.10.2005
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

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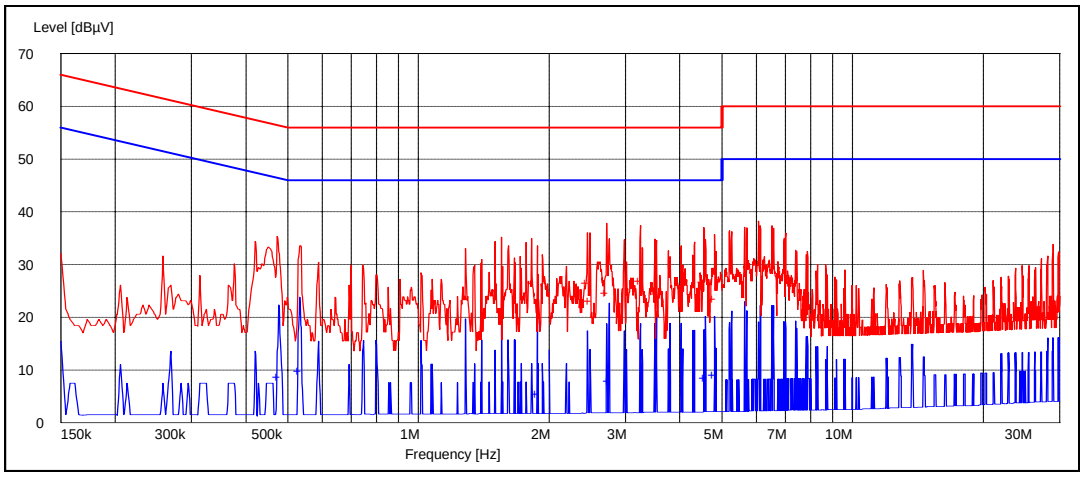
16.2. WLAN Test results

16.2.1 DSSS mode, QPSK modulation, 5.5 Mbps data rate

Channel 7



Quasi peak (RBW: 9 kHz)

Frequency [MHz]	U [dBµV]	Line	Result
2.450902	26.40	N	PASSED
2.480962	23.20	L1	PASSED
2.715431	24.60	L1	PASSED
3.244489	26.90	L1	PASSED
4.549098	26.70	N	PASSED
4.813627	23.40	L1	PASSED

Average (RBW: 9 kHz)

Frequency [MHz]	U [dBµV]	Line	Result
0.476253	8.60	N	PASSED
0.531864	9.80	L1	PASSED
1.877655	5.40	L1	PASSED
2.751503	7.90	L1	PASSED
4.585170	8.50	L1	PASSED
4.813627	9.00	L1	PASSED

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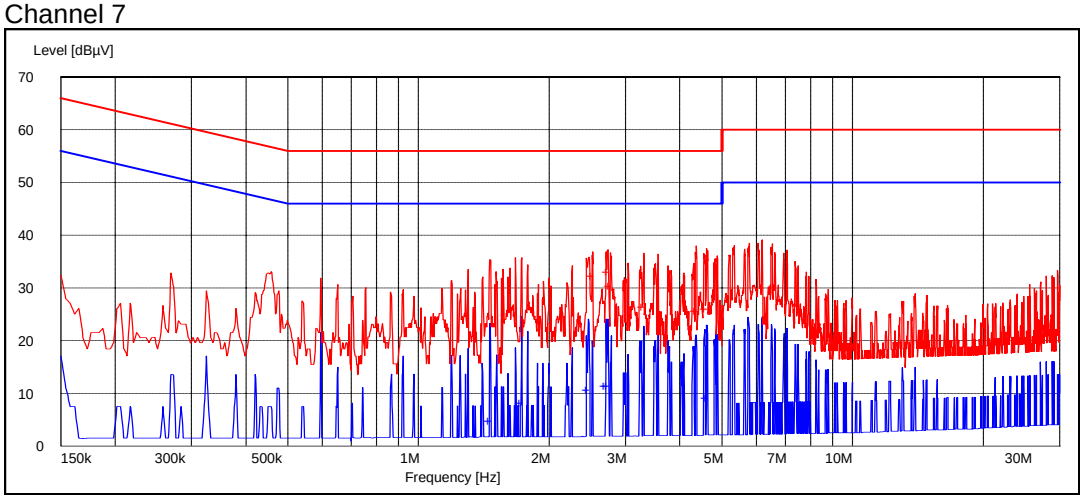
16.2.2 OFDM mode, BPSK modulation, 9 Mbps data rate

Channel 7



Quasi peak (RBW: 9 kHz)

Frequency [MHz]	U [dBµV]	Line	Result
2.523046	32.20	L1	PASSED
2.733467	33.10	L1	PASSED
2.769539	30.30	L1	PASSED
3.304609	26.30	L1	PASSED
4.368737	25.60	L1	PASSED
4.609218	26.00	N	PASSED

Average (RBW: 9 kHz)

Frequency [MHz]	U [dBµV]	Line	Result
1.462425	4.80	N	PASSED
1.729359	8.10	N	PASSED
2.462926	10.70	L1	PASSED
2.703407	11.30	L1	PASSED
2.733467	11.30	L1	PASSED
4.627255	9.20	L1	PASSED

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17. 6 dB bandwidth

(FCC §15.247(a)(2), RSS-210 Amend I(iv))

EUT with DUT number	Phone: DUT 40392
Accessories with DUT numbers	Battery: DUT 40394
Operation Voltage [V] / [Hz]	-
Result	Passed
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	24/50/103.3
Date of measurements	12.10.2005
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, 5.5 Mbps data rate

Channel	6 dB bandwidth [kHz]	Result
1	8894.231	Passed
7	8894.231	Passed
11	9615.385	Passed

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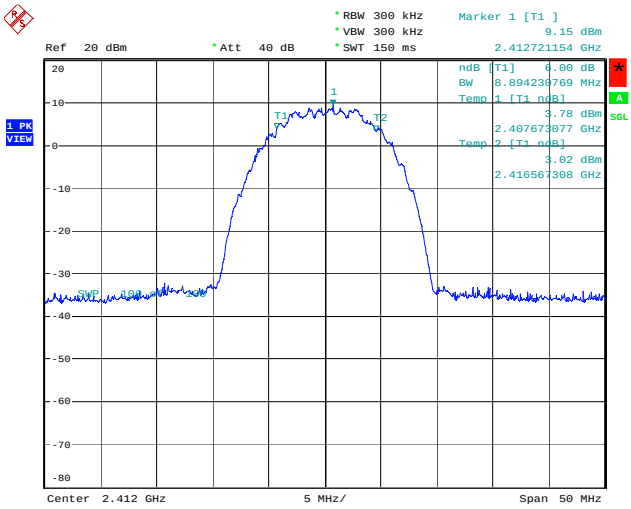
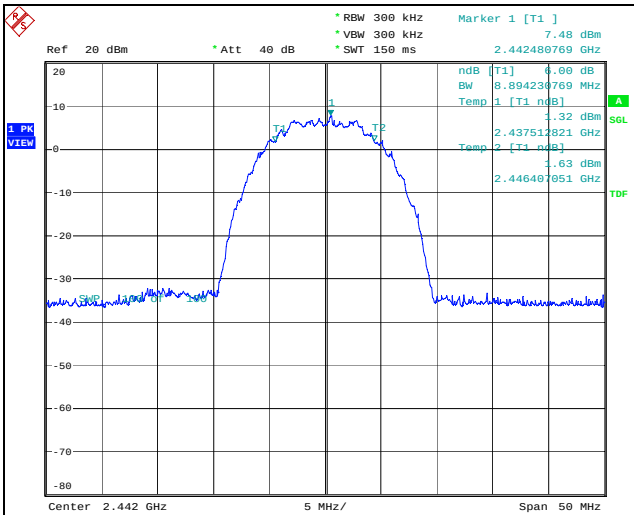
Channel 1



Date: 12.OCT.2005 13:00:41

Channel 7



Date: 12.OCT.2005 13:05:55

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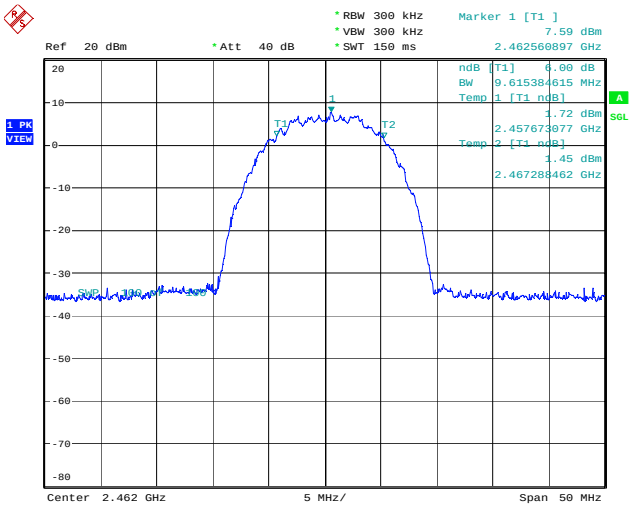
Channel 11

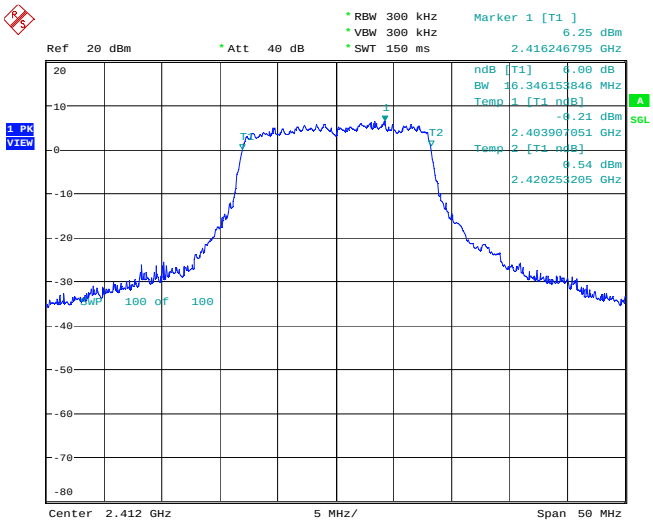


Date: 12.OCT.2005 13:10:09

17.2.2 OFDM mode, BPSK modulation, 9 Mbps data rate

Channel	6 dB bandwidth [kHz]	Result
1	16346.154	Passed
7	16506.410	Passed
11	16426.282	Passed

Channel 1



Date: 12.OCT.2005 13:18:52

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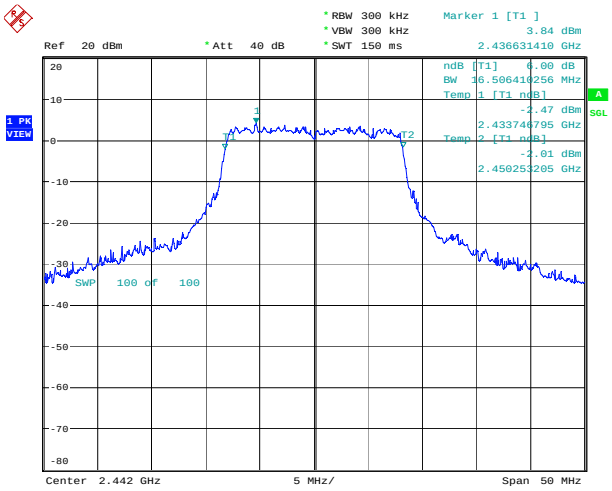
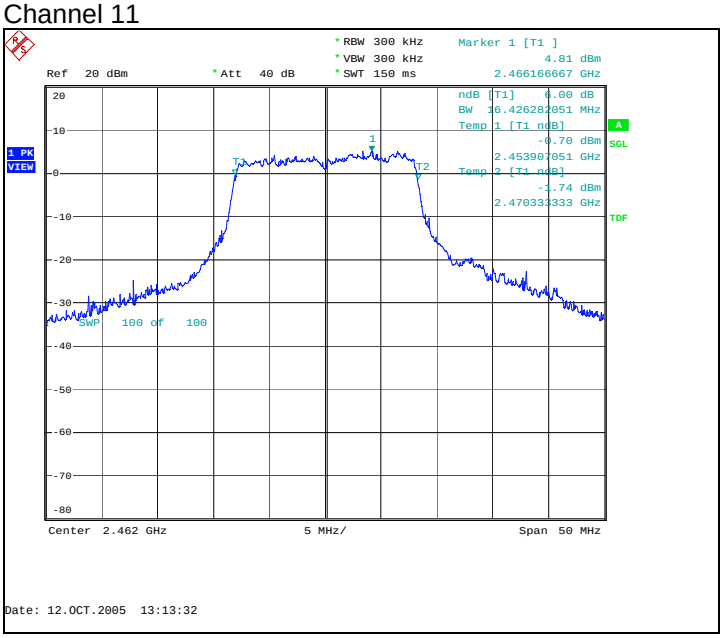
Channel 7



Date: 12.OCT.2005 13:16:47

Channel 11



Date: 12.OCT.2005 13:13:32

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18. Power spectral density

(FCC §15.247(e), RSS-210 Amend I(iv))

EUT with DUT number	Phone: DUT 40392
Accessories with DUT numbers	Battery: DUT 40394
Operation Voltage [V] / [Hz]	-
Result	Passed
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	24/50/103.3
Date of measurements	12.10.2005
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, 5.5 Mbps data rate

Channel	P [dBm]	Result
1	6.83	Passed
7	7.43	Passed
11	7.50	Passed

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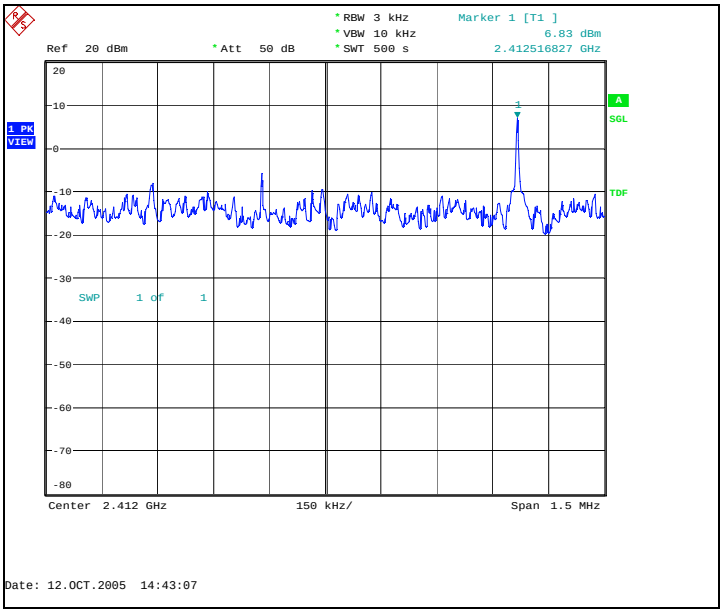
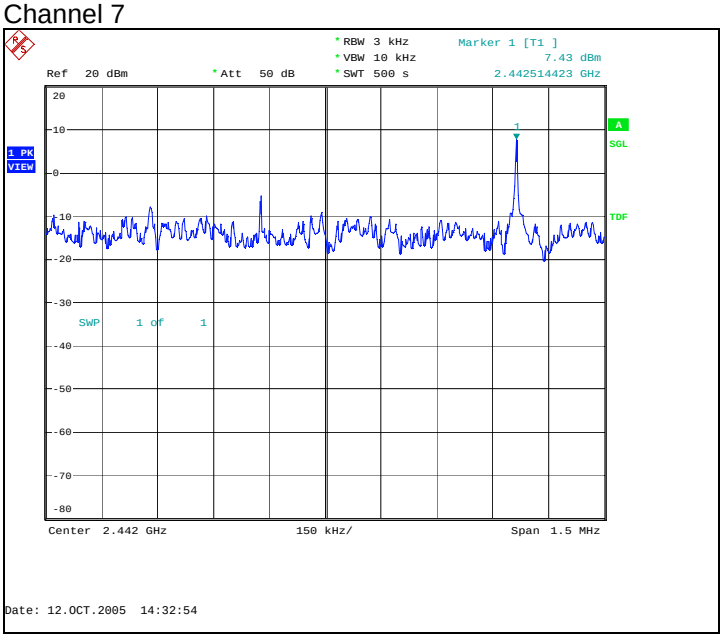
Channel 1



Channel 7



Channel 11

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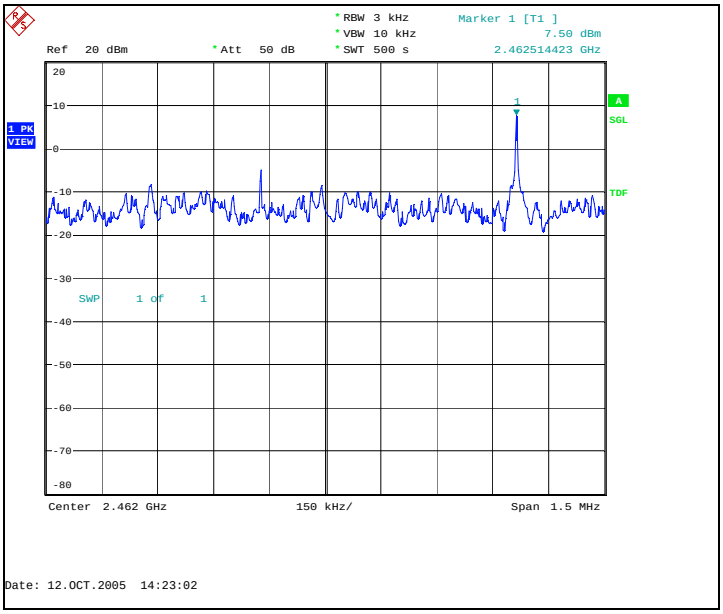
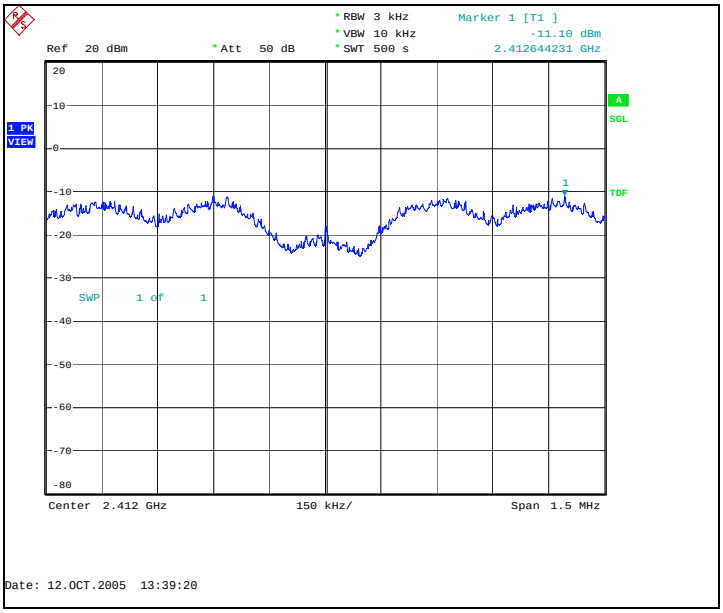


18.2.2 OFDM mode, BPSK modulation, 9 Mbps data rate

Channel	P [dBm]	Result
1	-11.10	Passed
7	-13.72	Passed
11	-13.36	Passed

Channel 1



Channel 7

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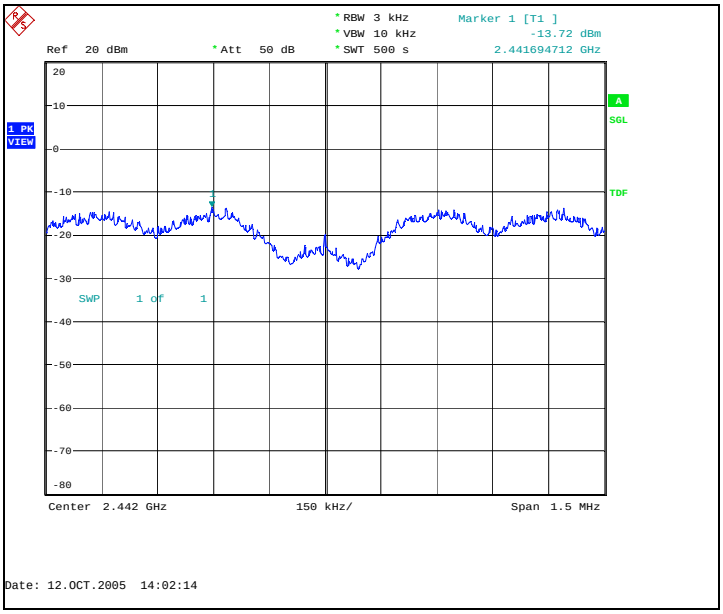
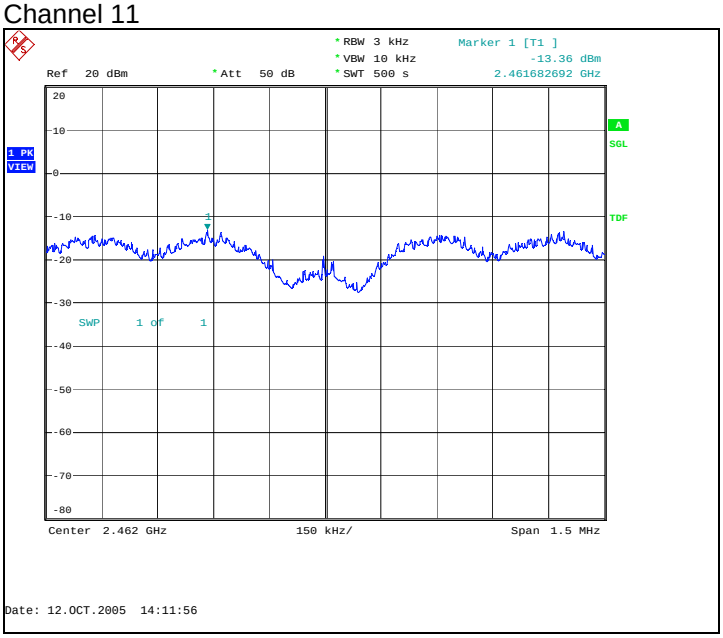


Channel 11



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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

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