

FCC Part 15C Compliance Test Report

Test Report no.:	Salo_FCC_0525_04.doc	Date of Report:	08.07.2005
Number of pages:	26	Customer's Contact person:	Lasse Vaattovaara
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FCC listing no.:	533467		
IC recognition no.:	5385		
Tested devices/ accessories:	Phone RA-8 / Battery BP-6M, AC-Charger ACP-12 and Headset HS-5		
FCC ID:	PYARA-8	IC:	661V-RA8
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:			

Tomi Lipponen
Design Engineer, EMC

1. Summary for FCC Part 15C Compliance Test Report

Date of receipt	14.06.2005
Testing completed	07.07.2005
The customer's contact person	Lasse Vaattovaara
Test Plan referred to	T:\Projects\RA-8\testplans\EMC\TCC\RA-8_EMC_TESTPLAN.xls
Notes	-
Document name	T:\Projects\RA-8\results\emc\FCC\Salo_FCC_0525_04.doc

1.1. EUT and Accessory Information

The EUT is a triple band (GSM900/1800/1900) 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
Phone	RA-8	004400/65/171145/7	4102	-	05.20(01)	10672
Phone	RA-8	004400/65/171146/5	4102	-	05.20(01)	10655
Battery (Sony)	BP-6M	T-10	-	-	-	10636
AC-Charger	ACP-12	067529439439L474811094951	-	-	-	10587
Headset	HS-5	-	-	-	-	10174

1.2. Summary of Test Results

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, Conducted	PASSED
15.247(b)(1)	6.2.2(o)(b)	Peak output power, Radiated	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
FAILED
NP

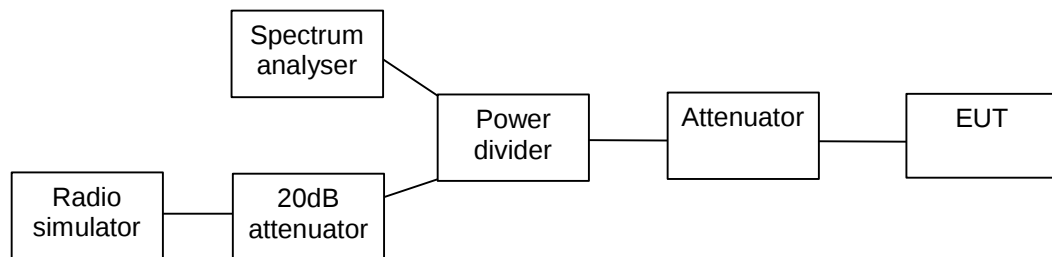
The EUT complies with the essential requirements in the standard.
The EUT does not comply with the essential requirements in the standard.
The test was not performed by the TCC Nokia Salo Laboratory.

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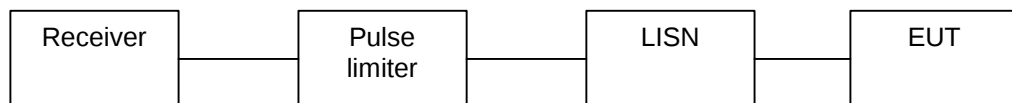
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2. Test setups

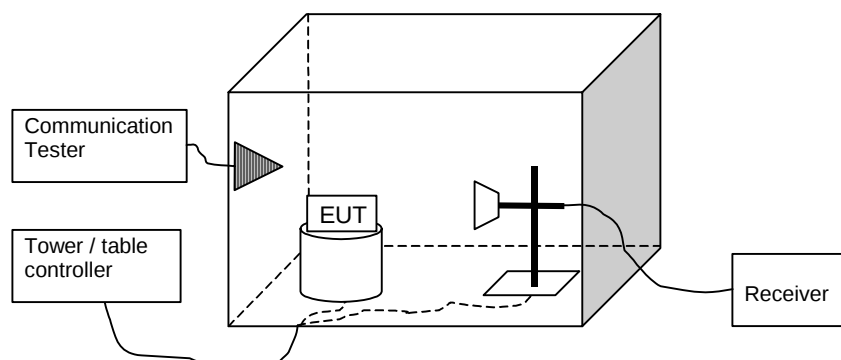
2.1. Conducted RF test setup



2.2. AC powerline conducted emissions test setup



2.3. Spurious radiated emissions test setup



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

EUT with DUT number	RA-8, DUT 10655
Accessories with DUT numbers	BP-6M, DUT 10636; ACP-12, DUT 10587; HS-5, DUT 10174
Operation Voltage [V] / [Hz]	110 / 60
Result	PASSED
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	20 / 50 / 101
Date of measurements	22.06.2005
Measured by	Tomi Lipponen

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

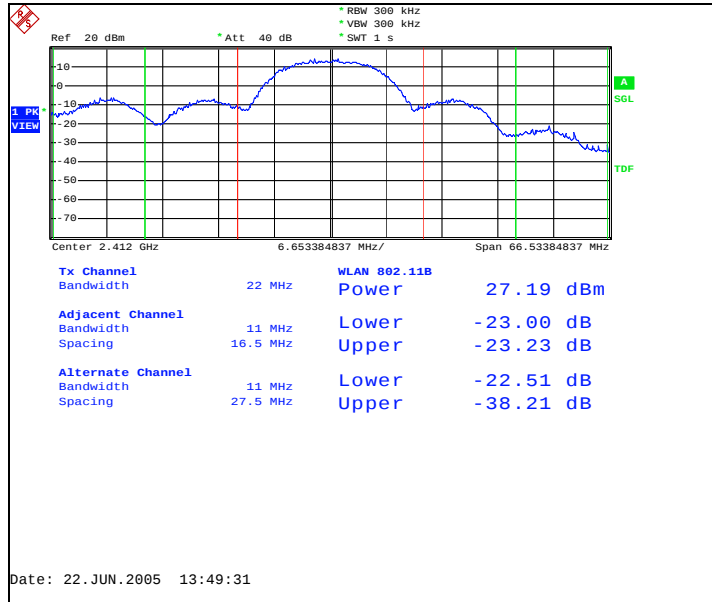
Frequency range [MHz]	Limit [W]	Limit [dBm]
2400 – 2483.5	≤ 1	≤ 30

3.2. WLAN Test results

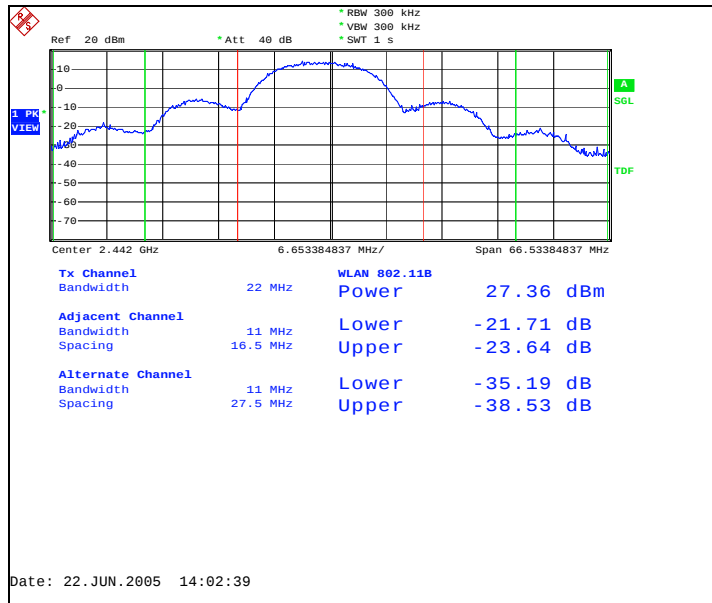
3.2.1 DSSS mode, QPSK modulation, 11 Mbps data rate

Channel	P [dBm]	P [W]	Result
1	27.19	0.524	PASSED
7	27.36	0.545	PASSED
11	27.70	0.589	PASSED

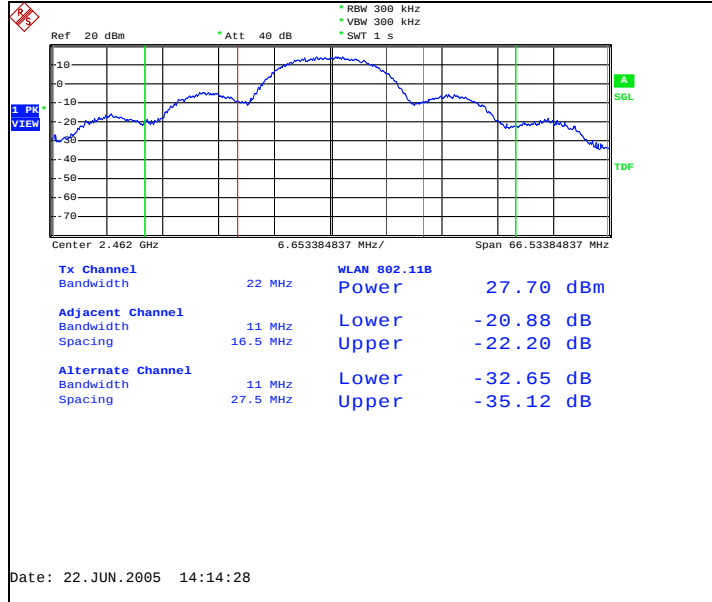
Channel 1



Channel 7



Channel 11



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

EUT with DUT number	RA-8, DUT 10672
Accessories with DUT numbers	BP-6M, DUT 10636; ACP-12, DUT 10587; HS-5, DUT 10174
Operation Voltage [V] / [Hz]	110 / 60
Result	PASSED
Remarks	Phone tested in flip open mode.
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	20 / 50 / 101
Date of measurements	04.07.2005
Measured by	Janne Niemi, Harri Tervo

4.1. Test method and limit

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

The measurement is performed in the Anechoic Chamber with absorbers on the floor and measuring antenna at fixed height using 2-axis EUT position system. The turntable is rotated 360 degrees and this is repeated for both horizontal and vertical receive antenna polarizations.

The EUT is placed on a nonconductive plate at 170 cm height.

The substitution method is used. Substitution values at each frequencies are measured beforehand and saved to the test software.

The substitution corrections are obtained as described below:

$$A_{SUBST} = P_{SUBST_TX} - P_{SUBST_RX} - L_{SUBST_CABLES} + G_{SUBST_TX_ANT}$$

Where A_{SUBST} is the final substitution correction including receive antenna gain. P_{SUBST_TX} is signal generator level, P_{SUBST_RX} is receiver level, L_{SUBST_CABLES} is cable losses including both TX and RX cables and $G_{SUBST_TX_ANT}$ is substitution antenna gain.

The measurement results are obtained as described below:

$$P [dBm] = P_{MEAS} + A_{TOT}$$

Where P_{MEAS} is receiver reading in dBm and A_{TOT} is total correction factor including cable loss and substitution correction ($A_{TOT} = L_{CABLES} + A_{SUBST}$).

Limits for peak output power measurements

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

4.2. WLAN Test results

4.2.1 DSSS mode, QPSK modulation, 11 Mbps data rate

Channel	EIRP [dBm]	EIRP [W]	P _{MEAS} [dBm]	A _{TOT} [dB]	Polarisation	Result
1	27.90	0.617	- 19.50	47.40	HORIZONTAL	PASSED
7	26.80	0.479	- 20.70	47.50	HORIZONTAL	PASSED
11	27.30	0.537	- 20.00	47.50	HORIZONTAL	PASSED

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

EUT with DUT number	RA-8, DUT 10672
Accessories with DUT numbers	BP-6M, DUT 10636; ACP-12, DUT 10587; HS-5, DUT 10174
Operation Voltage [V] / [Hz]	110 / 60
Result	PASSED
Remarks	Phone tested in flip open mode.
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	20 / 50 / 101
Date of measurements	06.07.2005
Measured by	Tomi Lipponen

5.1. 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

5.2. WLAN Test results

5.2.1 DSSS mode, QPSK modulation, 11 Mbps data rate

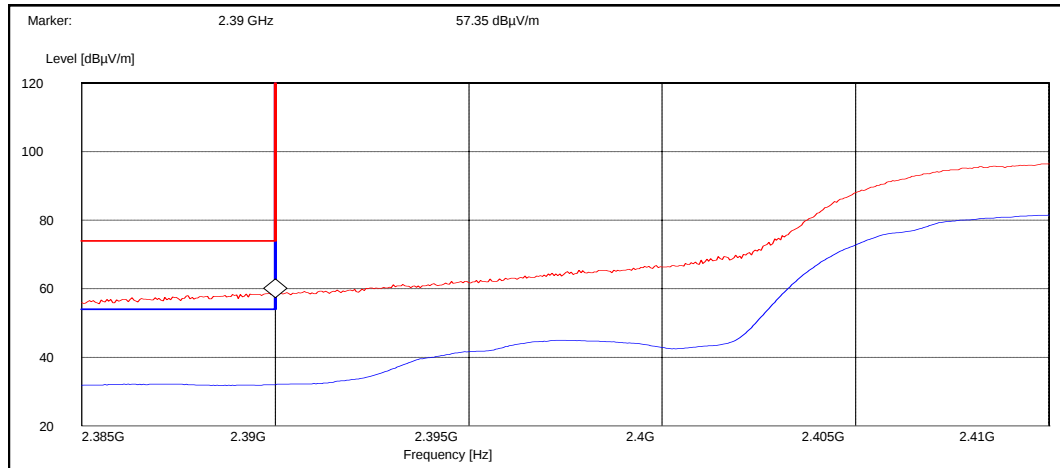
Average (RBW: 1 MHz)

Channel	E [dBμV/m]	Result
1	31.97	PASSED
11	31.99	PASSED

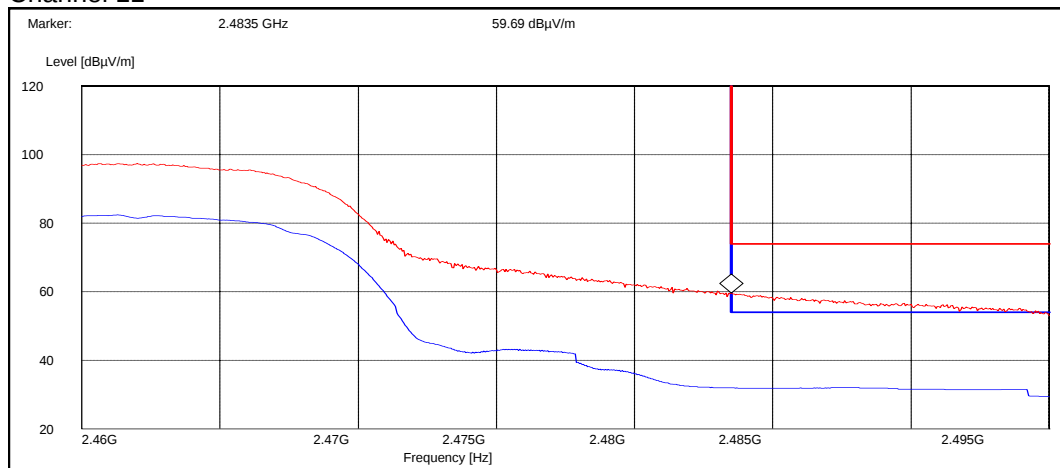
Peak (RBW: 1 MHz)

Channel	E [dBμV/m]	Result
1	57.35	PASSED
11	59.69	PASSED

Channel 1



Channel 11



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

EUT with DUT number	RA-8, DUT 10655
Accessories with DUT numbers	BP-6M, DUT 10636; ACP-12, DUT 10587; HS-5, DUT 10174
Operation Voltage [V] / [Hz]	110 / 60
Result	PASSED
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	20 / 50 / 101
Date of measurements	22.06.2005
Measured by	Tomi Lipponen

6.1. Test method and limit

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

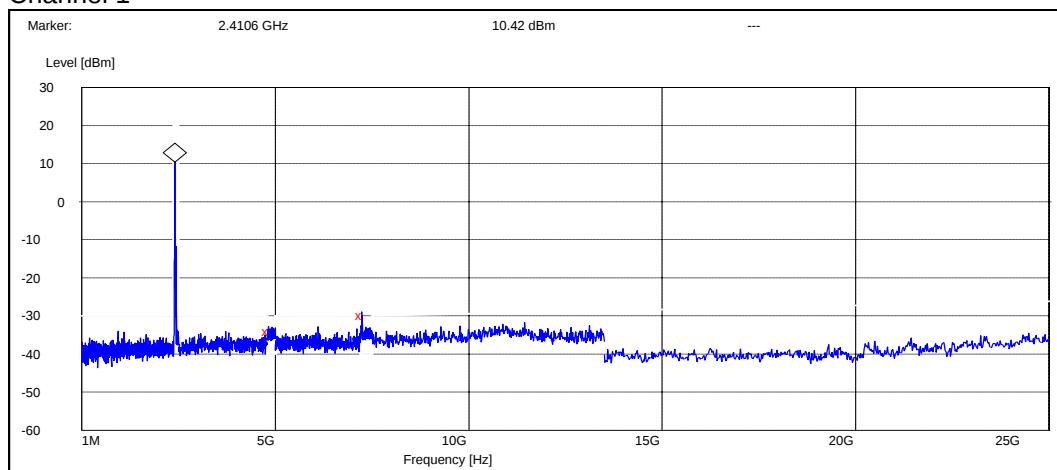
Limits for spurious RF conducted emissions measurements

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

6.2. WLAN Test results

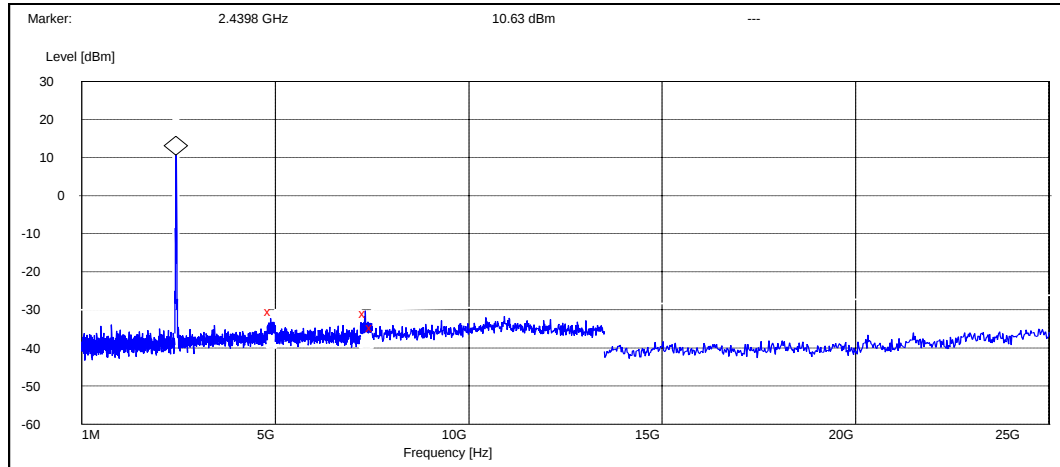
6.2.1 DSSS mode, QPSK modulation, 11 Mbps data rate

Channel 1



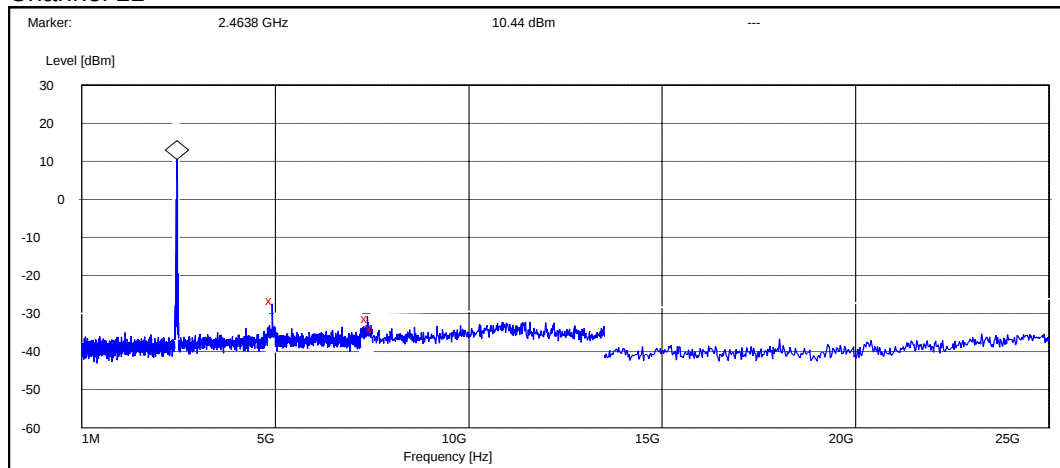
Frequency [MHz]	P [dBc]	Result
4825.600000	-44.521278	PASSED
7233.600000	-40.221278	PASSED

Channel 7



Frequency [MHz]	P [dBc]	Result
4882.000000	-41.027928	PASSED
7321.200000	-41.527928	PASSED
7500.000000	-45.127928	PASSED

Channel 11



Frequency [MHz]	P [dBc]	Result
4924.000000	-37.040901	PASSED
7387.800000	-41.640901	PASSED
7500.000000	-44.240901	PASSED

7. Spurious radiated emissions (FCC §15.247(c), §15.209, RSS-210 6.2.2(o)(e1))

EUT with DUT number	RA-8, DUT 10672
Accessories with DUT numbers	BP-6M, DUT 10636; ACP-12, DUT 10587; HS-5, DUT 10174
Operation Voltage [V] / [Hz]	110 / 60
Result	PASSED
Remarks	Phone tested in flip open mode.
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	20 / 50 / 101
Date of measurements	06.07.2005
Measured by	Tomi Lipponen

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 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

7.2. WLAN Test results

7.2.1 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	48.40	263.03	52.70	-4.30	HORIZONTAL	PASSED
7236.000000	44.10	160.32	44.90	-0.80	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	31.70	38.46	36.00	-4.30	VERTICAL	PASSED
7236.000000	30.50	33.50	31.30	-0.80	VERTICAL	PASSED

Channel 7

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
30.000000	24.10	16.03	37.70	-13.60	VERTICAL	PASSED
37.695391	16.30	6.53	35.10	-18.80	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
2441.482966	95.10	56 885.29	102.50	-7.40	VERTICAL	PASSED
4881.769539	39.00	89.13	43.20	-4.20	VERTICAL	PASSED
7323.649299	42.20	128.82	42.70	-0.50	VERTICAL	PASSED
7330.157315	42.40	131.83	42.80	-0.40	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
2441.982966	79.40	9 332.54	86.80	-7.40	VERTICAL	PASSED
4887.769539	25.80	19.50	29.90	-4.10	VERTICAL	PASSED
7324.657315	28.80	27.54	29.30	-0.50	VERTICAL	PASSED
7326.649299	28.60	26.92	29.10	-0.50	VERTICAL	PASSED

Channel 11

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	51.30	367.28	55.30	-4.00	HORIZONTAL	PASSED
7386.000000	43.00	141.25	43.00	0.00	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
4924.000000	25.50	18.84	29.50	-4.00	HORIZONTAL	PASSED
7386.000000	30.70	34.28	30.70	0.00	VERTICAL	PASSED

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

EUT with DUT number	RA-8, DUT 10655
Accessories with DUT numbers	BP-6M, DUT 10636; ACP-12, DUT 10587; HS-5, DUT 10174
Operation Voltage [V] / [Hz]	110 / 60
Result	PASSED
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	20 / 50 / 101
Date of measurements	07.07.2005
Measured by	Sami Lehtonen

8.1. 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.

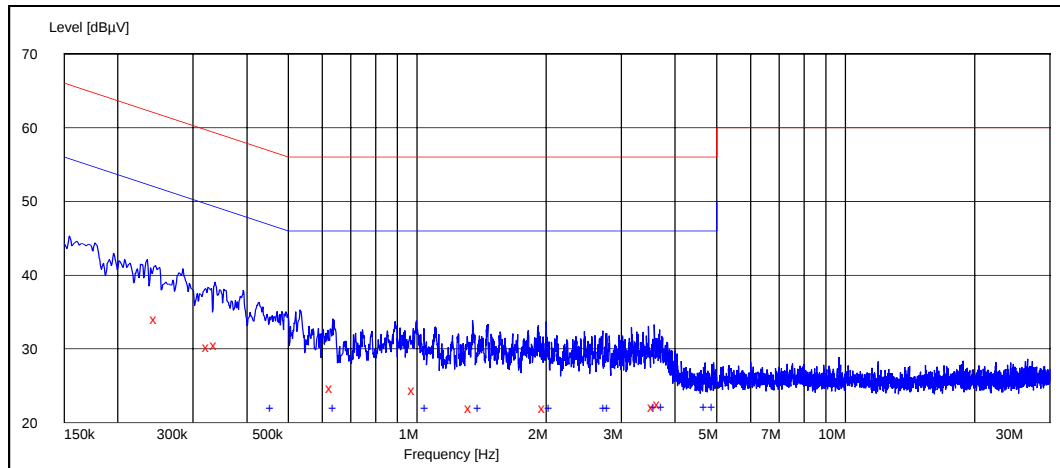
CISPR 22 Class B limits

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

8.2. WLAN Test results

8.2.1 DSSS mode, QPSK modulation, 11 Mbps data rate

Channel 7



Quasi peak (RBW: 9 kHz)

Frequency [MHz]	U [dBμV]	Line	Result
0.249000	34.00	N	PASSED
0.330000	30.30	N	PASSED
0.343500	30.50	N	PASSED
0.640500	24.70	L1	PASSED
0.996000	24.40	L1	PASSED
1.351500	22.00	L1	PASSED
2.008500	22.00	L1	PASSED
3.619500	22.10	L1	PASSED
3.723000	22.50	L1	PASSED

Average (RBW: 9 kHz)

Frequency [MHz]	U [dBμV]	Line	Result
0.465000	22.00	N	PASSED
0.649500	22.00	N	PASSED
1.068000	22.00	N	PASSED
1.419000	22.00	N	PASSED
2.076000	22.00	N	PASSED
2.782500	22.00	N	PASSED
2.841000	22.00	N	PASSED
3.651000	22.10	N	PASSED
3.799500	22.10	N	PASSED
4.780500	22.10	N	PASSED
4.996500	22.10	N	PASSED

9. 6 dB bandwidth (FCC §15.247(a)(2), RSS-210 Amend I(iv))

EUT with DUT number	RA-8, DUT 10655
Accessories with DUT numbers	BP-6M, DUT 10636; ACP-12, DUT 10587; HS-5, DUT 10174
Operation Voltage [V] / [Hz]	110 / 60
Result	PASSED
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	20 / 50 / 101
Date of measurements	22.06.2005
Measured by	Tomi Lipponen

9.1. 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

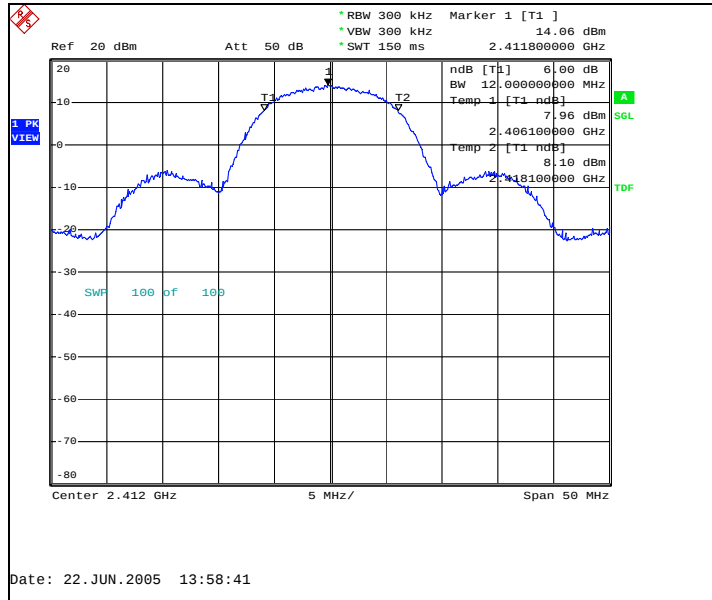
Limit [kHz]
≥ 500

9.2. WLAN test results

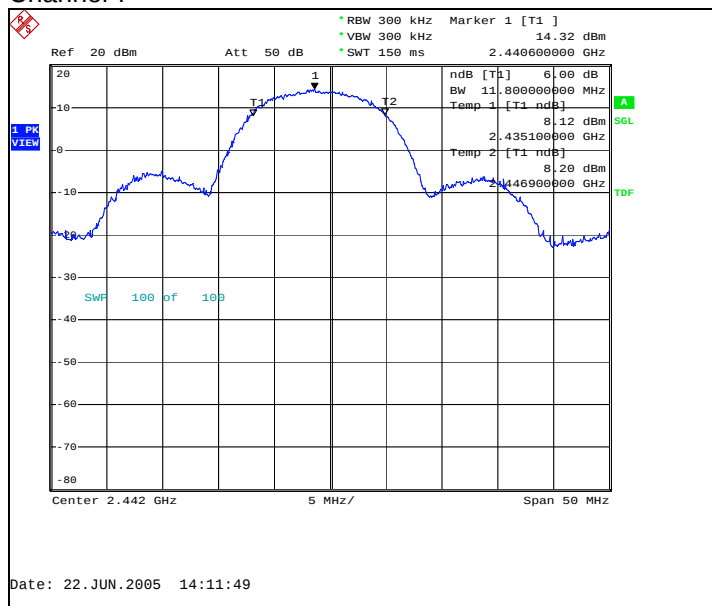
9.2.1 DSSS mode, QPSK modulation, 11 Mbps data rate

Channel	6 dB bandwidth [kHz]	Result
1	12000.000	PASSED
7	11800.000	PASSED
11	11800.000	PASSED

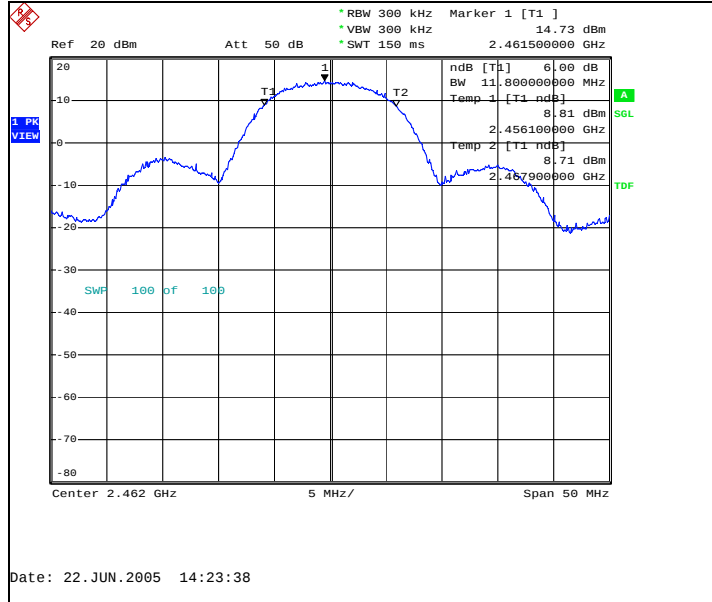
Channel 1



Channel 7



Channel 11



10. Power spectral density (FCC §15.247(e), RSS-210 Amend I(iv))

EUT with DUT number	RA-8, DUT 10655
Accessories with DUT numbers	BP-6M, DUT 10636; ACP-12, DUT 10587; HS-5, DUT 10174
Operation Voltage [V] / [Hz]	110 / 60
Result	PASSED
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	20 / 50 / 101
Date of measurements	22.06.2005
Measured by	Tomi Lipponen

10.1. 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

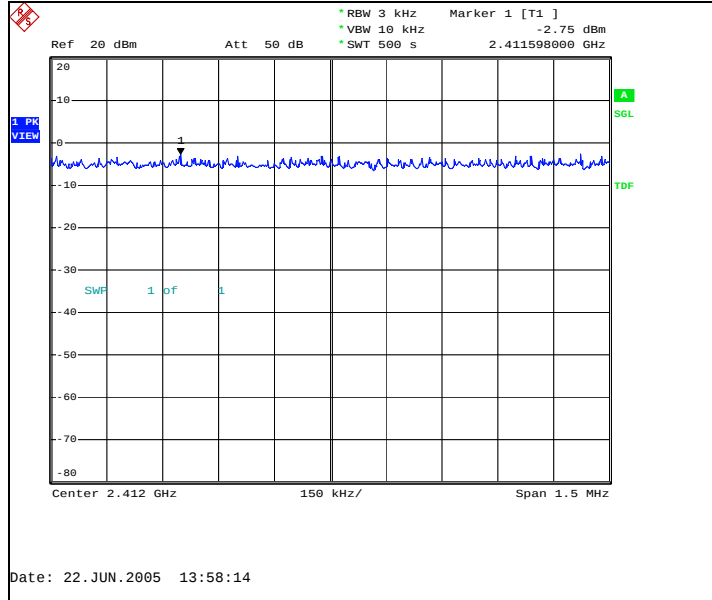
Limit [dBm] @ 3 kHz
≤ 8

10.2. WLAN test results

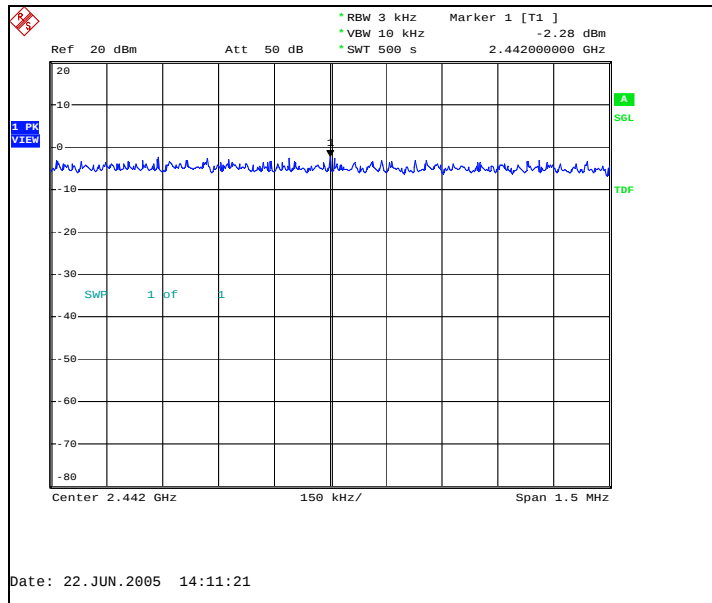
10.2.1 DSSS mode, QPSK modulation, 11 Mbps data rate

Channel	P [dBm]	Result
1	-2.75	PASSED
7	-2.28	PASSED
11	-2.14	PASSED

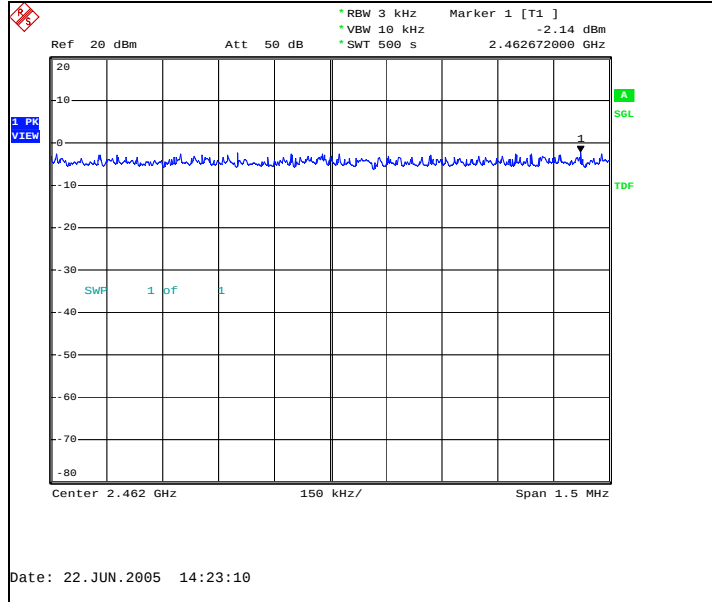
Channel 1



Channel 7



Channel 11



11. Test Equipment

11.1. Conducted measurements

Eq. No	Equipment	Type	Manufacturer	Used in
1742	EMI Test Receiver	ESMI	R&S	15C, 15B
1759	LISN 50 µH	ESH3-Z5	R&S	15C, 15B
1872	Thermo- Hygrograph	00.02520.150700	Lambrecht	15C, 15B
1916	Radio Communication tester	CMTA84	R&S	15C, 15B
2039	Power Supply	PL330QMD	THURLBY	15C, 15B
2060	LISN 50 µH	ESH3-Z5	R&S	15C, 15B
2068	CDN-Antenna line	S1	NMP	15C, 15B
2097	Pulse Limiter	ESH3-Z2	R&S	15C, 15B
2111	Multimeter	TX3	Tektronix	15C, 15B
2156	Digital Radio Communication Tester	CMU200	R&S	15C, 15B
2206	Signal generator	SMX	R&S	15C, 15B
2335	GPIB Switch 2 to 1	-	National Instruments	15C, 15B
2347	Digital Radio Communication Tester	CMU200	R&S	22/24, 15C, 15B
2352	Spectrum Analyzer	FSP	R&S	22/24, 15C
2359	Temperature Test system	VT4002	Vötsch Industrietechnik	22/24
2360	Serial Bus Converter	Serial 488A	IO Tech	22/24
2362	Power Supply	NGPX 70/5	R&S	22/24
-	RF Emission Software	ES-K1 v.1.60	R&S	15C, 15B

11.2. Radiated measurements

Eq. No	Equipment	Type	Manufacturer	Used in
1748	Log. per. Antenna	HL025	R&S	22/24, 15C
1749	Log. per. Antenna	HL025	R&S	22/24, 15C
1875	Thermo- Hygrograph	00.02520.150700	Lambrecht	22/24, 15C, 15B
1917	Radio Communication tester	CMTA84	R&S	22/24, 15C, 15B
1933	Precision half-wave dipole antennas	HZ-13	R&S	22/24, 15C
1938	Precision half-wave dipole antennas	HZ-12	R&S	22/24, 15C
2004	Relay Switch Unit	RSU	R&S	22/24, 15C, 15B
2006	Radiation Reference Source	VSQ	MEB	22/24, 15C, 15B
2009	Signal generator	SMP 22	R&S	22/24, 15C, 15B
2019	Multimeter	34401A	HP	22/24, 15C, 15B
2027	Coupling and Decoupling Network	M2 (modified) DC1	MEB	22/24, 15C, 15B
2028	Coupling and Decoupling Network	M3 (modified) DC2	MEB	22/24, 15C, 15B
2029	Power Supply	PL330	THURLBY	22/24, 15C
2043	Band Reject Filter	WRCA824/849-0,2-6SS	Wainwright	22/24, 15C, 15B
2047	Band Reject Filter	WRCC1800/2000-0,2-10SS	Wainwright	22/24, 15C, 15B
2051	High Pass Filter	4HC1700-1-KK	R&S	22/24, 15C
2057	Log. per. Antenna	HL025	R&S	22/24, 15C

Eq. No	Equipment	Type	Manufacturer	Used in
2109	Power Supply	PL330QMD	THURLBY	22/24, 15C, 15B
2110	Multimeter	34401A	HP	22/24, 15C, 15B
2112	Multimeter	TX3	Tektronix	22/24, 15C, 15B
2116	Controller	EMCO MODEL 2090	ETS	22/24, 15C, 15B
2133	Power Meter	NRVS	R&S	22/24, 15C
2134	Power Sensor	NRV-Z32	R&S	22/24, 15C
2135	Coupling and Decoupling Network	CDN 801-M3	LÜTHI	22/24, 15C, 15B
2138	Ultra Broadband Antenna	HL562	R&S	22/24, 15C, 15B
2140	Biconical Antenna	EMCO93110B	EMCO	22/24, 15C
2142	Log.-per.-dipol Antenna	3146	EMCO	22/24, 15C
2144	Attenuator	6803.17B	Huber-Suhner	22/24, 15C, 15B
2150	High Pass Filter	F-15041	RLC ELECTRONICS	22/24, 15C
2176	Coupling and Decoupling Network	CDN 801-M3	LÜTHI	22/24, 15C, 15B
2180	Digital Radio Communication Tester	CMU200	R&S	22/24, 15C, 15B
2188	Preamplifier	AFS4-00100300-20-23P-6	MITEQ	22/24, 15C, 15B
2330	EMI Test receiver	ESIB26	R&S	22/24, 15C, 15B
2334	GPIO Switch 2 to 1	-	National Instruments	22/24, 15C, 15B
2348	Yaesu controller	G-1000DXC	YAESU	22/24, 15C, 15B
2349	Computer controller (Yaesu)	GS-232B	YAESU	22/24, 15C, 15B
2350	Preamplifier	AMF-6D-020180-29-20P	MITEQ	22/24, 15C
2361	Anechoic chamber	3 meter semi/full anechoic chamber	Euroshield	22/24, 15C, 15B
2398	Horn antenna	HF906	R&S	22/24, 15C
-	RF Emission Software	ES-K1 v.1.71	R&S	22/24, 15C, 15B