TCC
Nokia

FINAS
Finnish Accreditation Service
T117 (EN ISO/IEC 17025)

FCC Part 15C Compliance Test Report

Test Report no.:	Salo_FCC_0511_10.doc	Date of Report:	07.04.2005
Number of pages:	26	Customer's Contact person:	Alison Kingston
Testing laboratory:	TCC Nokia Salo Laboratory P.O. Box 86 Joensuunkatu 7H / Kiila 1B FIN-24101 SALO, FINLAND Tel. +358 (0) 7180 08000 Fax. +358 (0) 7180 45220	Client:	Nokia Corporation Nokia House Summit Avenue, Southwood FARNBOROUGH HAMPSHIRE GU14 0NG UK Tel. +44 1252 866000 Fax. +44 1252 866001
FCC listing no.: IC recognition no.:	533467 5385		
Tested devices/ accessories:	**Phone RM-13 / Battery BL-5X, Headset HS-15 and AC- Charger ACP-12**		
FCC ID:	**QTKRM-13**	IC:	**661AD-RM13**
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: 07-04-2005

Kai Uusitalo
Senior Design Engineer, EMC

1. Summary for FCC Part 15C Compliance Test Report

Date of receipt	15.03.2005
Testing completed	16.03.2005
The customer's contact person	Alison Kingston
Test Plan referred to	T:\Projects\RM-13\testplans\EMC\TCC\RM-13_ EMC_Test_Plan.xls
Notes	-
Document name	T:\Projects\RM-13\results\emc\FCC\Salo_FCC_0511_10.doc

1.1. EUT and Accessory Information

The EUT is a single band (GSM1900) mobile phone with GPRS, EGPRS and Bluetooth. The EUT is tested with maximum rated TX power, modulated with pseudo random bit sequence (PRBS9). Bluetooth is tested with maximum rated TX power.

Product	Type	SN	HW	MV	SW	DUT
Phone	RM-13	004400/64/170460/4	0400	-	03.02	10473
Phone	RM-13	004400/64/170355/6	0400	-	03.02	10460
Battery	BL-5X	0670471392066M021010000311	-	-	-	10427
AC-Charger	ACP-12E	067529439434 9J493120295910	-	-	-	10458
Headset	HS-15	0252	0.2	0.4	-	10549

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

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 Salo Laboratory.

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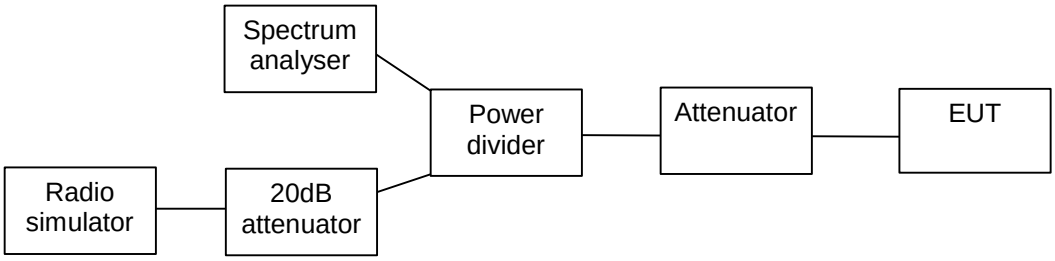
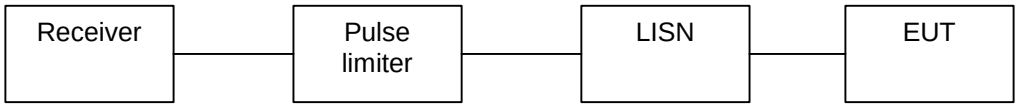
2. Test setups

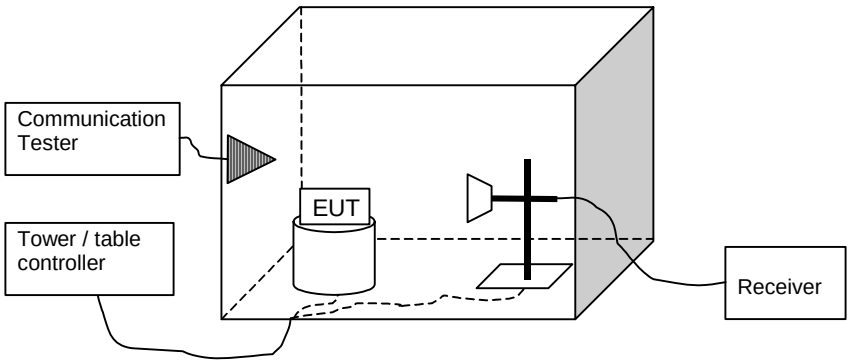
2.1. Conducted RF test setup



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	RM-13, DUT 10473
Accessories with DUT numbers	BL-5X, DUT 10427
Operation Voltage V / Hz	115V / 60 Hz
Result	PASSED
Remarks	-
Temp °C / Humidity RH % / Air Pressure kPa	22 / 44 / 101.4
Date of measurements	17.03.2005
Measured by	Janne Niemi

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

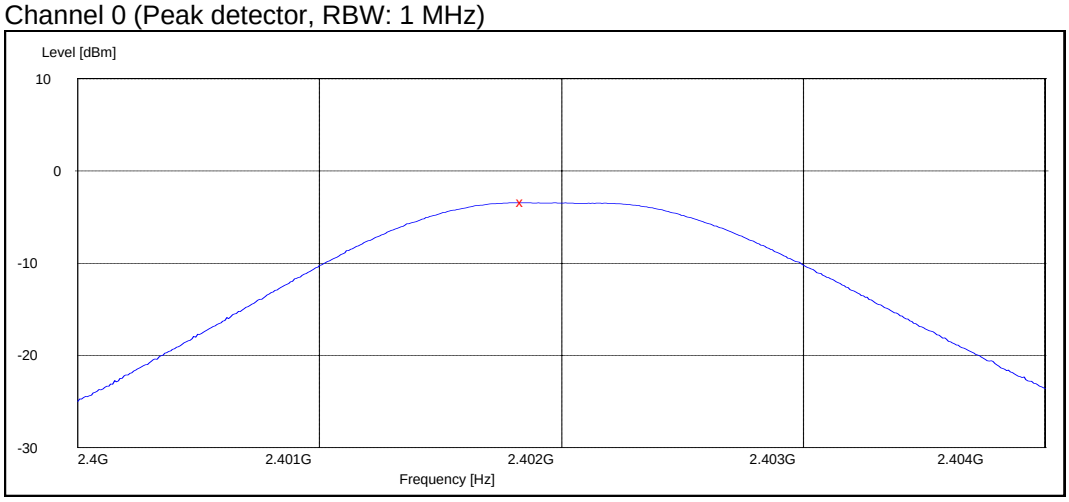
Frequency range / MHz	Limit / W	Limit / dBm
2400 – 2483.5	≤ 1	≤ 30

3.2. Bluetooth Test results

3.2.1 GSFK modulation, PRBS packet type

Channel	Frequency / MHz	Level / dBm	Level / mW	$A_{CORRECTION}$ / dB	Result
0	2401.840000	-3.40	0.457	13.40	PASSED
40	2441.832000	-3.30	0.468	13.40	PASSED
78	2479.832000	-2.30	0.589	13.40	PASSED

Channel 0 (Peak detector, RBW: 1 MHz)



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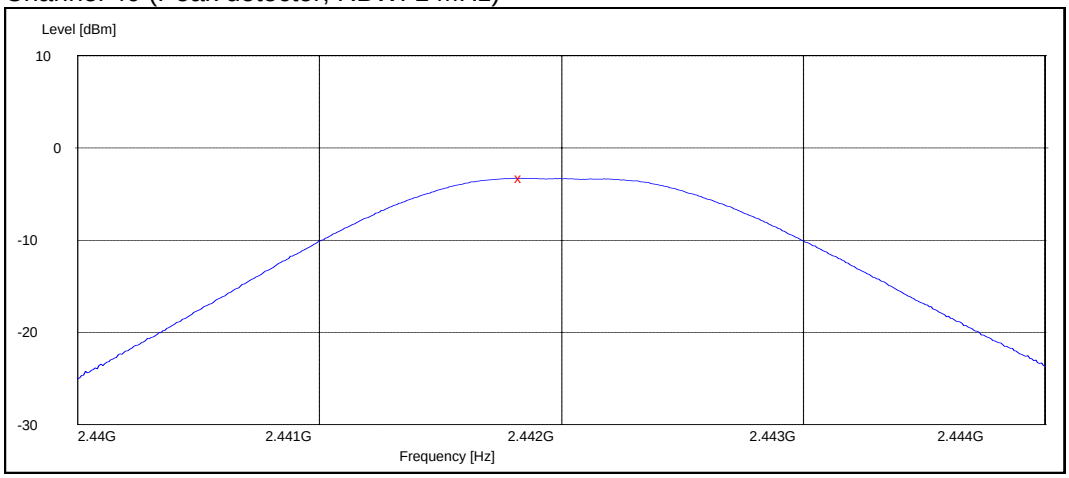
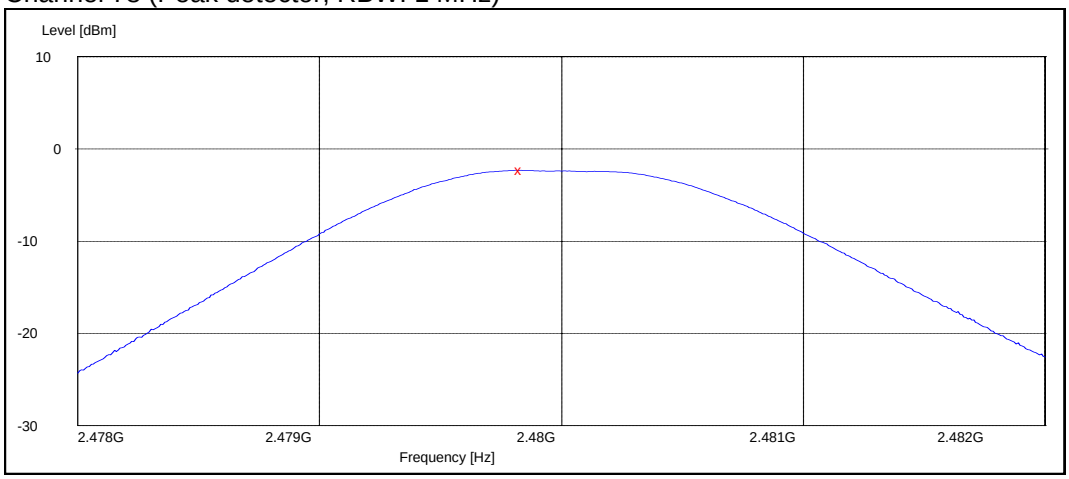
Channel 40 (Peak detector, RBW: 1 MHz)



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-13, DUT 10460
Accessories with DUT numbers	BL-5X, DUT 10427; ACP-12, DUT 10458; HS-15, DUT 10549
Operation Voltage V / Hz	115V / 60 Hz
Result	PASSED
Remarks	-
Temp °C / Humidity RH % / Air Pressure kPa	22 / 44 / 101.4
Date of measurements	17.03.2005
Measured by	Janne Niemi

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 / dBµV/m
Below 2390 and above 2483.5	≤ 54

4.2. Bluetooth Test results

4.2.1 GFSK modulation, PRBS packet type

Average (RBW: 1 MHz)

Channel	Level / dBµV/m	Result
0	35.23	PASSED
78	30.30	PASSED
Hopping on, low end	30.22	PASSED
Hopping on, high end	30.97	PASSED

Peak (RBW: 1 MHz)

Channel	Level / dBµV/m	Result
0	50.96	PASSED
78	43.61	PASSED
Hopping on, low end	48.92	PASSED
Hopping on, high end	50.69	PASSED

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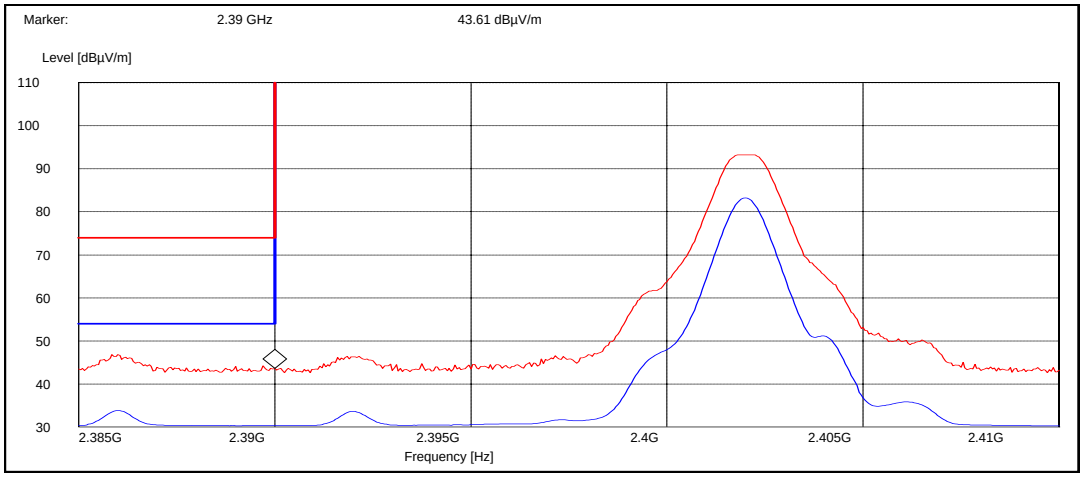
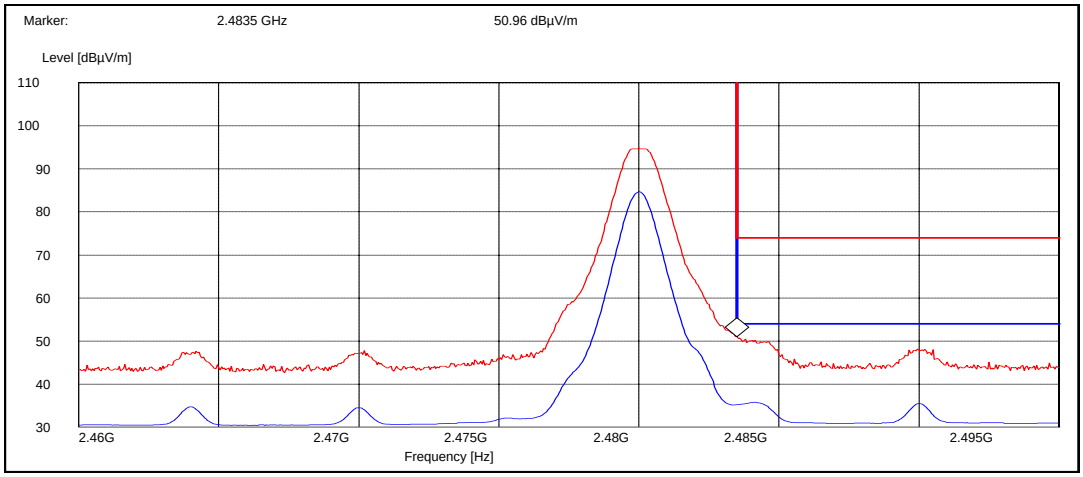
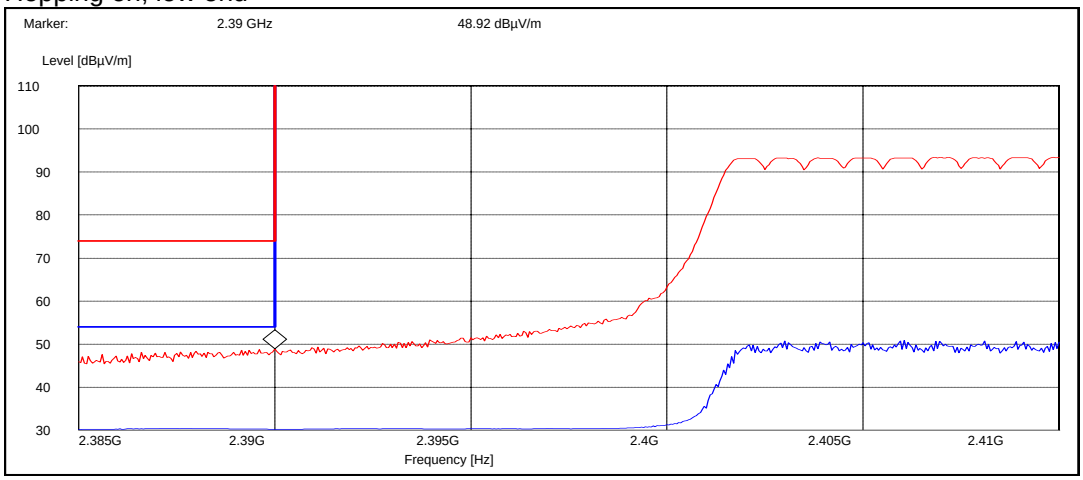
Channel 0



Channel 78



Hopping on, low end



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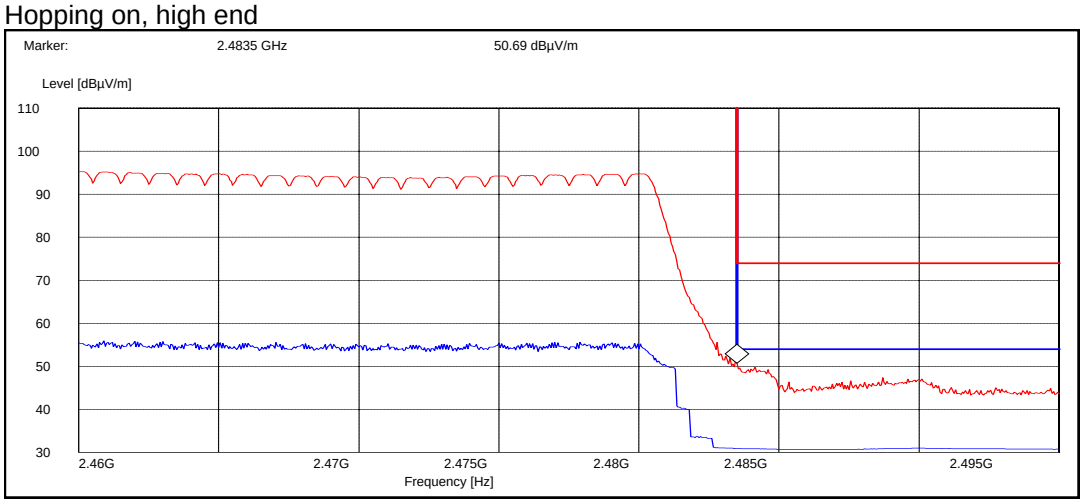
Hopping on, high end



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5. Spurious RF conducted emissions

(FCC §15.247(c), RSS-210 6.2.2(o)(e1)

EUT with DUT number	RM-13, DUT 10473
Accessories with DUT numbers	BL-5X, DUT 10427
Operation Voltage V / Hz	115V / 60 Hz
Result	PASSED
Remarks	-
Temp °C / Humidity RH % / Air Pressure kPa	22 / 44 / 101.4
Date of measurements	17.03.2005
Measured by	Janne Niemi

5.1. Test method and limit

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

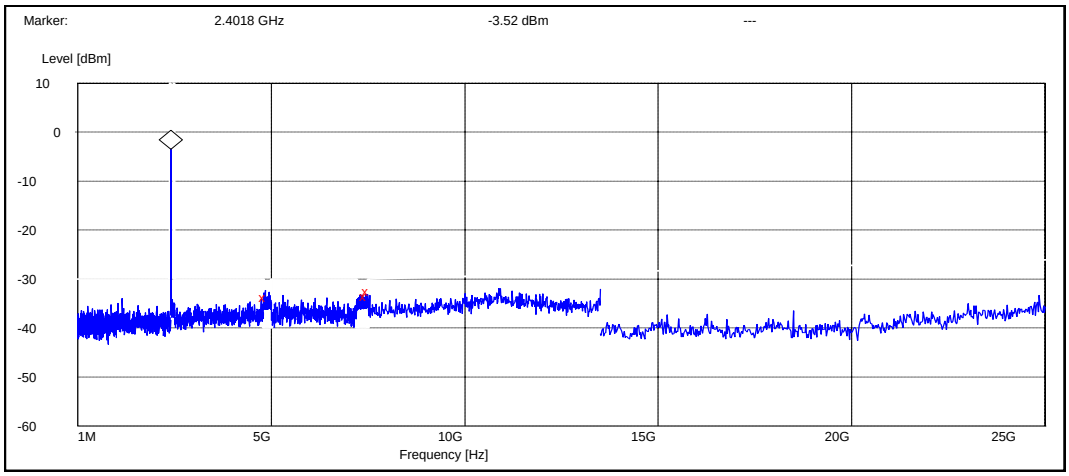
Limits for spurious RF conducted emissions measurements

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	Level / dBc	Result
4849.200000	-30.175706	PASSED
7456.800000	-29.975706	PASSED
7500.000000	-28.975706	PASSED

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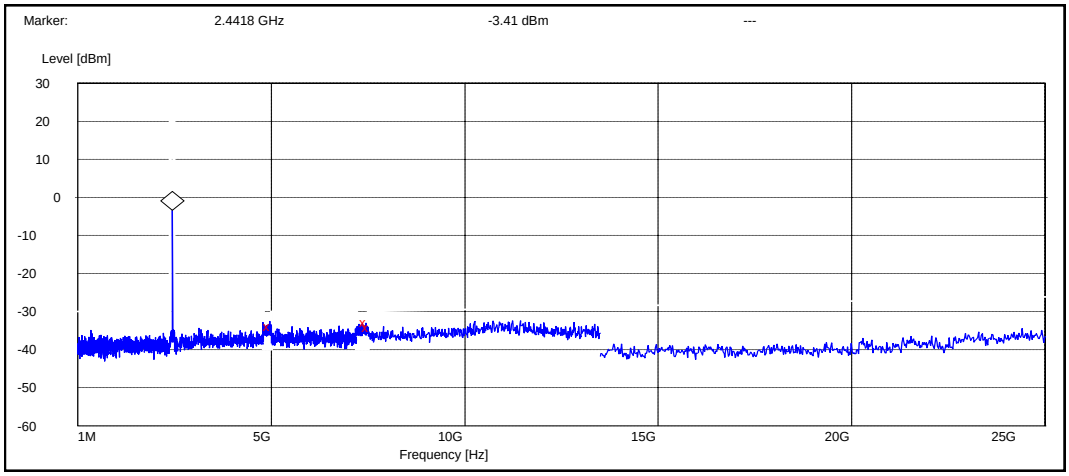
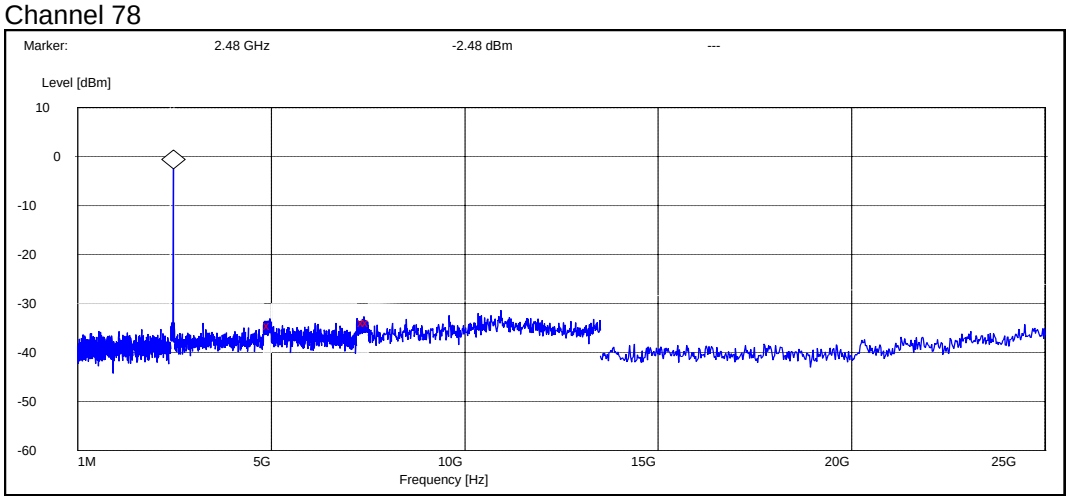
Channel 40



Frequency / MHz	Level / dBc	Result
4962.400000	-30.394588	PASSED
7453.800000	-29.394588	PASSED
7500.000000	-30.694588	PASSED

Channel 78



Frequency / MHz	Level / dBc	Result
4966.400000	-31.919629	PASSED
7390.800000	-31.419629	PASSED
7500.000000	-31.419629	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-13, DUT 10460
Accessories with DUT numbers	BL-5X, DUT 10427; ACP-12, DUT 10458; HS-15, DUT 10549
Operation Voltage V / Hz	115V / 60 Hz
Result	PASSED
Remarks	-
Temp °C / Humidity RH % / Air Pressure kPa	22 / 44 / 101.4
Date of measurements	17.03.2005
Measured by	Janne Niemi

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:

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

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

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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	Level / dBµV/m	Level / µV/m	$A_{CORRECTION}$ / dB	Polarisation	Result
4804.000000	42.90	139.64	-4.40	VERTICAL	PASSED
7206.000000	42.60	134.90	-1.00	VERTICAL	PASSED

Average (RBW: 1 MHz)

Frequency / MHz	Level / dBµV/m	Level / µV/m	$A_{CORRECTION}$ / dB	Polarisation	Result
4804.000000	27.00	22.39	-4.40	VERTICAL	PASSED
7206.000000	30.00	31.62	-1.00	VERTICAL	PASSED

Channel 40

Quasi peak (RBW: 120 kHz)

Frequency / MHz	Level / dBµV/m	Level / µV/m	$A_{CORRECTION}$ / dB	Polarisation	Result
36.092986	18.70	8.61	-19.50	VERTICAL	PASSED
37.995391	11.80	3.89	-20.60	VERTICAL	PASSED

Peak (RBW: 1 MHz)

Frequency / MHz	Level / dBµV/m	Level / µV/m	$A_{CORRECTION}$ / dB	Polarisation	Result
4882.000000	41.80	123.03	-4.20	VERTICAL	PASSED
7323.000000	43.10	142.89	-0.50	VERTICAL	PASSED

Average (RBW: 1 MHz)

Frequency / MHz	Level / dBµV/m	Level / µV/m	$A_{CORRECTION}$ / dB	Polarisation	Result
4882.000000	27.30	23.17	-4.20	VERTICAL	PASSED
7323.000000	30.50	33.50	-0.50	VERTICAL	PASSED

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Channel 78

Peak (RBW: 1 MHz)

Frequency / MHz	Level / dBµV/m	Level / µV/m	$A_{CORRECTION}$ / dB	Polarisation	Result
4960.000000	43.20	144.54	-3.90	VERTICAL	PASSED
7440.000000	43.20	144.54	0.00	VERTICAL	PASSED

Average (RBW: 1 MHz)

Frequency / MHz	Level / dBµV/m	Level / µV/m	$A_{CORRECTION}$ / dB	Polarisation	Result
4960.000000	27.90	24.83	-3.90	VERTICAL	PASSED
7440.000000	30.00	31.62	0.00	VERTICAL	PASSED

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7. AC powerline conducted emissions

(FCC §15.207, RSS-210 6.6)

EUT with DUT number	RM-13, DUT 10460
Accessories with DUT numbers	BL-5X, DUT 10427; ACP-12, DUT 10458; HS-15, DUT 10549
Operation Voltage V / Hz	115V / 60 Hz
Result	PASSED
Remarks	FM Radio was active during the test.
Temp °C / Humidity RH % / Air Pressure kPa	22 / 44 / 101.4
Date of measurements	17.03.2005
Measured by	Janne Niemi

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:

$$U\,[\mu V] = U_{RX} + A_{CORRECTIONS}$$

Where U_{RX} is receiver reading and $A_{CORRECTIONS}$ is combined 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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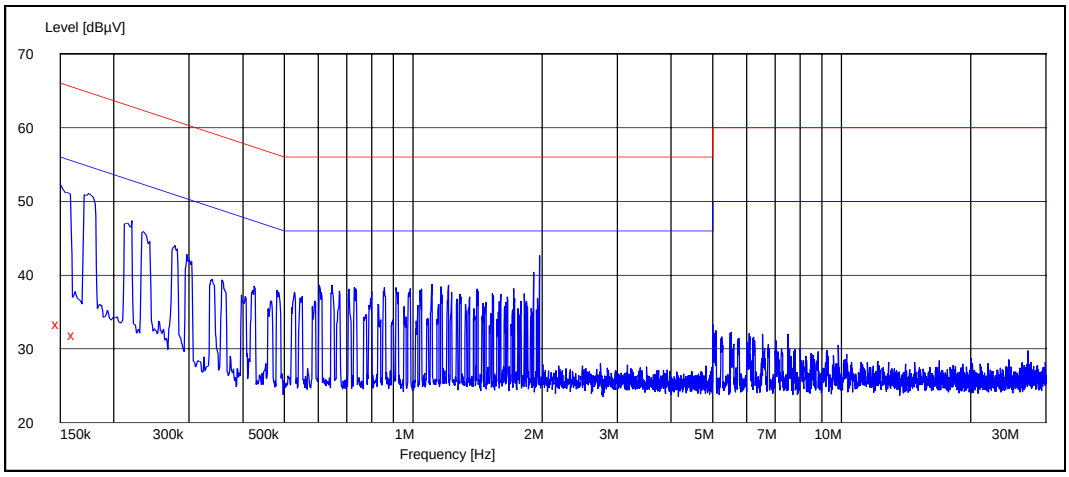
7.2. Bluetooth Test results

7.2.1 GFSK modulation, PRBS packet type

Channel 40



Quasi peak (RBW: 9 kHz)

Frequency / MHz	Level / dBµV	Line	Result
0.150000	33.40	N	PASSED
0.163500	31.90	N	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	RM-13, DUT 10473
Accessories with DUT numbers	BL-5X, DUT 10427
Operation Voltage V / Hz	115V / 60Hz
Result	PASSED
Remarks	-
Temp °C / Humidity RH % / Air Pressure kPa	22 / 44 / 101.4
Date of measurements	17.03.2005
Measured by	Janne Niemi

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	592.000	PASSED
40	588.000	PASSED
78	592.000	PASSED

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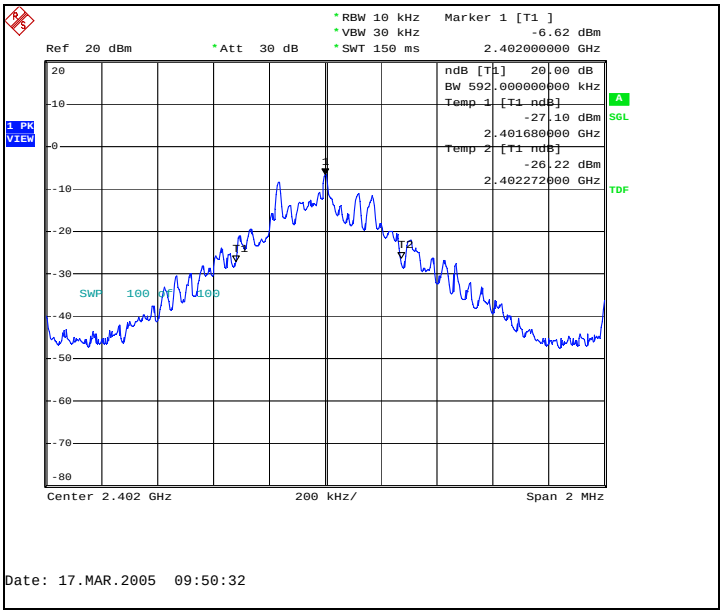
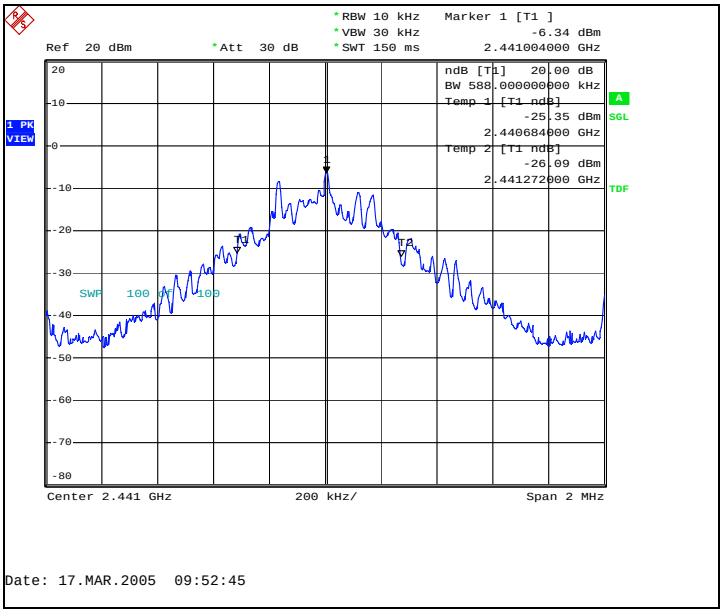
Channel 0



Channel 40



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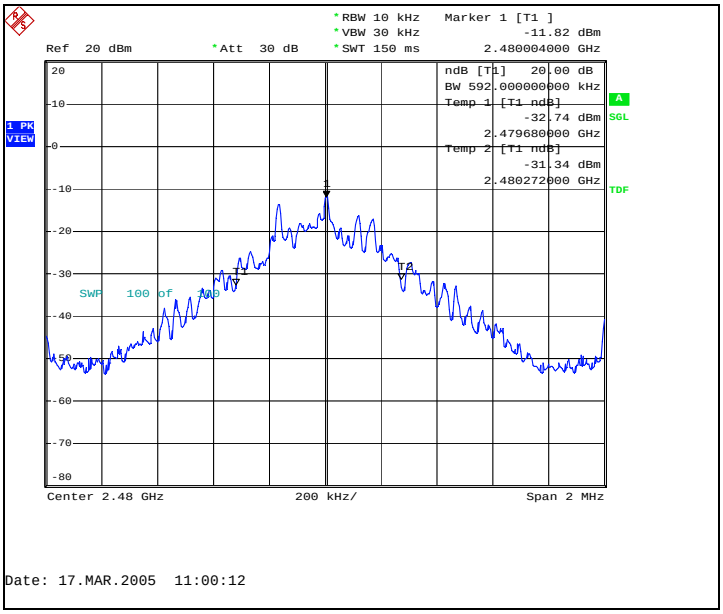
Channel 78



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

EUT with DUT number	RM-13, DUT 10473
Accessories with DUT numbers	BL-5X, DUT 10427
Operation Voltage V / Hz	115V / 60Hz
Result	PASSED
Remarks	-
Temp °C / Humidity RH % / Air Pressure kPa	22 / 44 / 101.4
Date of measurements	17.03.2005
Measured by	Janne Niemi

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

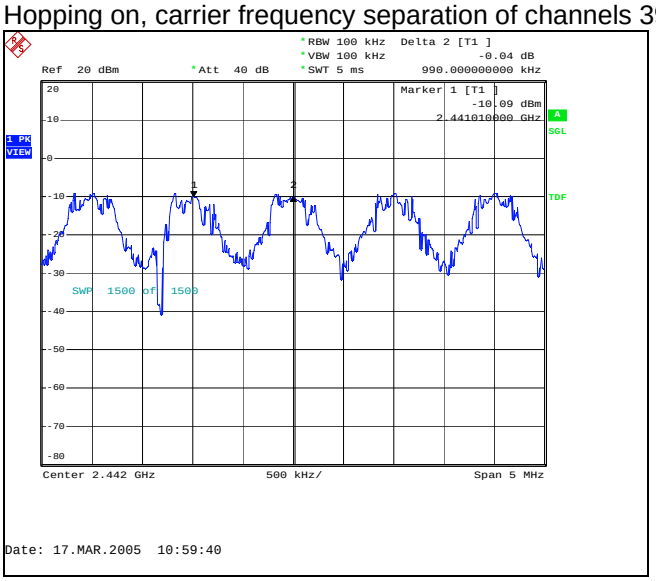
Limit / MHz
≥ 0.025 or 20 dB bandwidth

9.2. Bluetooth Test results

9.2.1 GFSK modulation, PRBS packet type

Carrier frequency separation / kHz	Result
990	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	RM-13, DUT 10473
Accessories with DUT numbers	BL-5X, DUT 10427
Operation Voltage V / Hz	115V / 60Hz
Result	PASSED
Remarks	-
Temp °C / Humidity RH % / Air Pressure kPa	22 / 44 / 101.4
Date of measurements	17.03.2005
Measured by	Janne Niemi

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

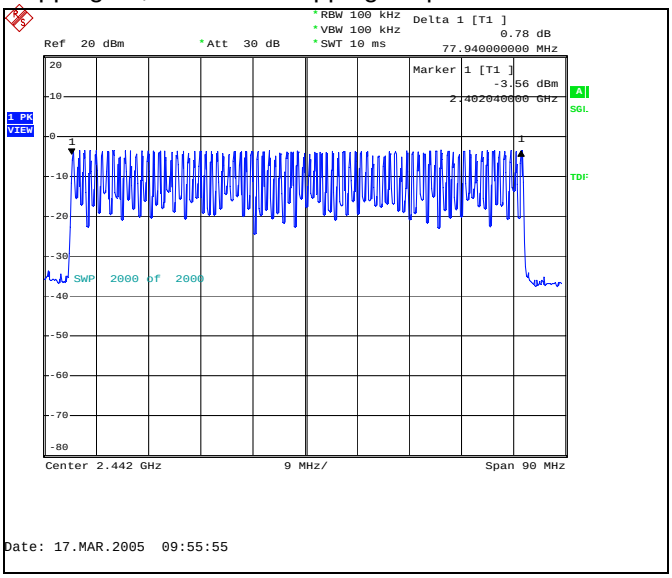
Limit / number
≥ 75

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	RM-13, DUT 10473
Accessories with DUT numbers	BL-5X, DUT 10427
Operation Voltage V / Hz	115V / 60Hz
Result	PASSED
Remarks	-
Temp °C / Humidity RH % / Air Pressure kPa	22 / 44 / 101.4
Date of measurements	17.03.2005
Measured by	Janne Niemi

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
52	2960.000	0.153920	PASSED

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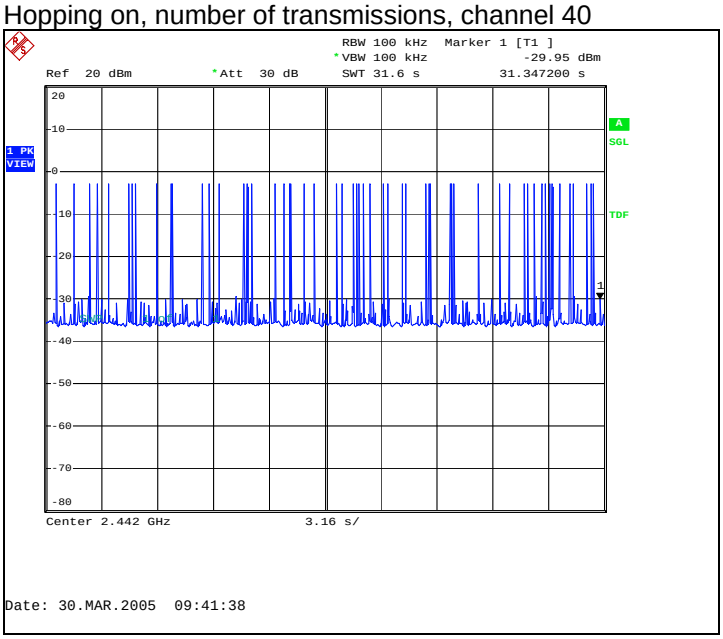
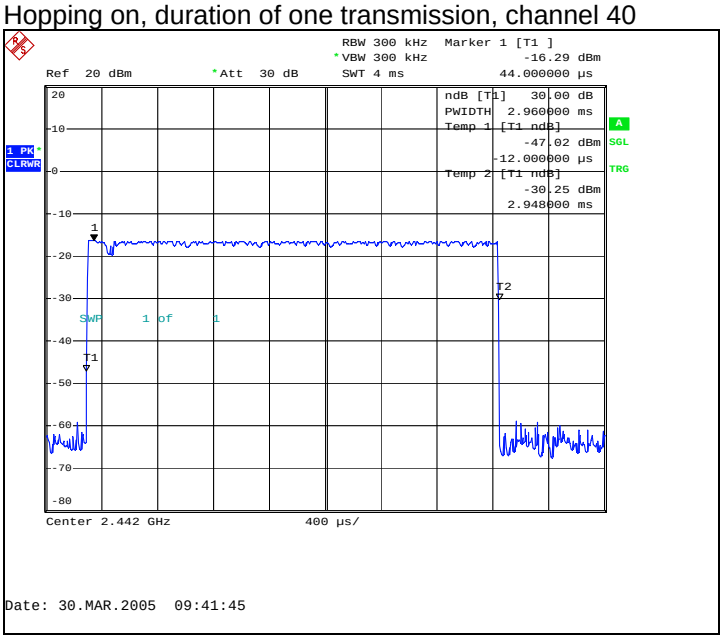
Hopping on, number of transmissions, channel 40



Hopping on, duration of one transmission, channel 40



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12. Test Equipment

12.1. 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
-	RF Emission Software	ES-K1 v.1.60	R&S	15C, 15B

12.2. 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
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

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Eq. No	Equipment	Type	Manufacturer	Used in
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	Biconial 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	GPIB 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
2398	Horn antenna	HF906	R&S	22/24, 15C
-	RF Emission Software	ES-K1 v.1.71	R&S	22/24, 15C, 15B

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