

FCC Part 15C Compliance Test Report

Test Report no.:	Salo_FCC_0636_05.doc	Date of Report:	11.09.2006
Number of pages:	31	Customer's Contact person:	Juha.I Lahti
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FCC listing no.:	533467		
IC recognition no.:	5385		
Tested devices/ accessories:	BT Headset HS-51W_EDR / AC-Charger AC-3E		
FCC ID:	PYAW04M	IC:	661V- WE04M
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:			

Sami Lehtonen, System Manager

1. Summary for FCC Part 15C Compliance Test Report

Date of receipt	04.09.2006
Testing completed	06.09.2006
The customer's contact person	Juha.I Lahti
Test Plan referred to	T:\Projects\accessor\BT_Headset\HS-50W_51W_52W\TestPlan_RS\RS_testplan_HS-51W_EDR.xls
Notes	-
Document name	T:\Projects\accessor\BT_Headset\HS-50W_51W_52W\EMC\Results\FCC\Salo_FCC_0636_05.doc

1.1. EUT and Accessory Information

The EUT is a Bluetooth device. Bluetooth is tested with maximum rated TX power.

Product	Type	SN	HW	MV	SW	DUT
BT Headset	HS-51W	000127	B2.4	a1.0	4006	11456
BT Headset	HS-51W	000198	B2.4	a1.0	4006	11457
AC-Charger	AC-3E	3997915354051200048;0675370	-	-	-	11447

1.2. Summary of Test Results

Bluetooth:

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

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.

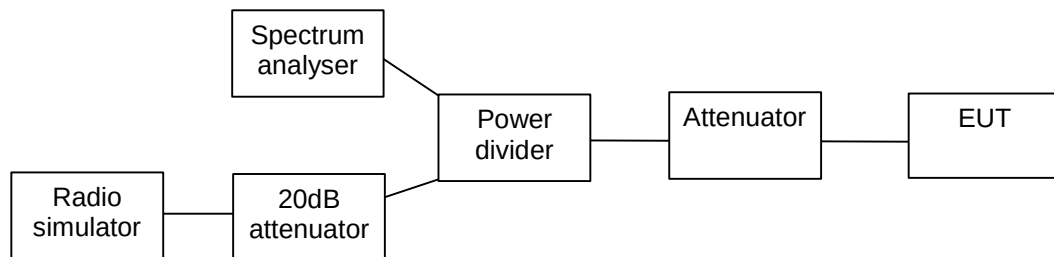
CONTENTS

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.....	5
2.1. Conducted RF test setup	5
2.2. AC powerline conducted emissions test setup.....	5
2.3. Spurious radiated emissions test setup	5
3. Peak output power (FCC §15.247(b)(1), RSS-210 A8.4 (2)).....	6
3.1. Test method and limit.....	6
3.2. Bluetooth Test results	7
4. Band edge compliance of RF emissions (FCC §15.247(c), RSS-210 A8.5)	9
4.1. Test method and limit.....	9
4.2. Bluetooth Test results	10
5. Spurious RF conducted emissions (FCC §15.247(c), RSS-A8.5).....	12
5.1. Test method and limit.....	12
5.2. Bluetooth Test results	13
6. Spurious radiated emissions (FCC §15.247(c), §15.209, RSS-210 A8.5).....	15
6.1. Test method and limit.....	15
6.2. Bluetooth Test results	16
7. AC powerline conducted emissions (FCC §15.207, RSS-GEN 7.2.2)	18
7.1. Test method and limit.....	18
7.2. Bluetooth Test results	19
8. 20 dB bandwidth (FCC §15.247(a)(1), RSS-210 A8.1 (1))	20
8.1. Test method and limit.....	20
8.2. Bluetooth Test results	21
9. Carrier frequency separation (FCC §15.247(a)(1), RSS-210 A8.1 (2))	23
9.1. Test method and limit.....	23
9.2. Bluetooth Test results	24
10. Number of hopping frequencies (FCC §15.247(a)(1)(iii), RSS-210 A8.1 (4))	25
10.1. Test method and limit.....	25
10.2. Bluetooth Test results	26
11. Time of occupancy (FCC §15.247(a)(1)(iii), RSS-210 A8.1 (4))	27

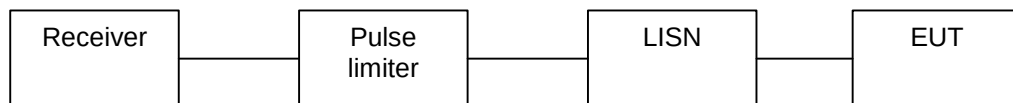
11.1.	Test method and limit	27
11.2.	Bluetooth test results	28
12.	Test Equipment	30
12.1.	Conducted measurements	30
12.2.	Radiated measurements	30

2. Test setups

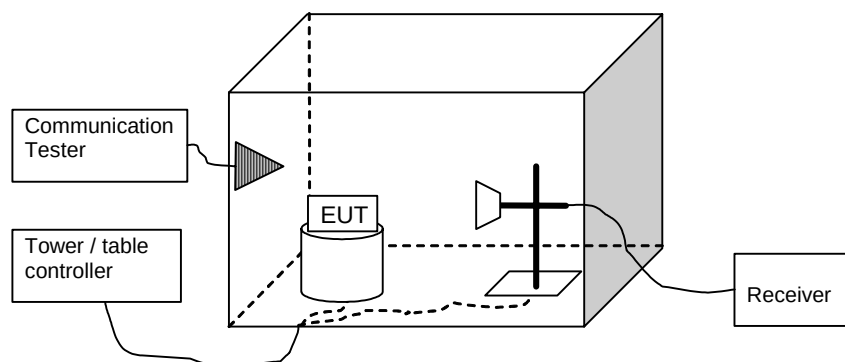
2.1. Conducted RF test setup



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 (2))

EUT with DUT number	HS-51W, DUT 11457
Accessories with DUT numbers	AC-3E, DUT 11447
Operation Voltage [V] / [Hz]	115 / 60
Result	PASSED
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	21 / 48 / 100
Date of measurements	06.09.2006
Measured by	Anni Manninen

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

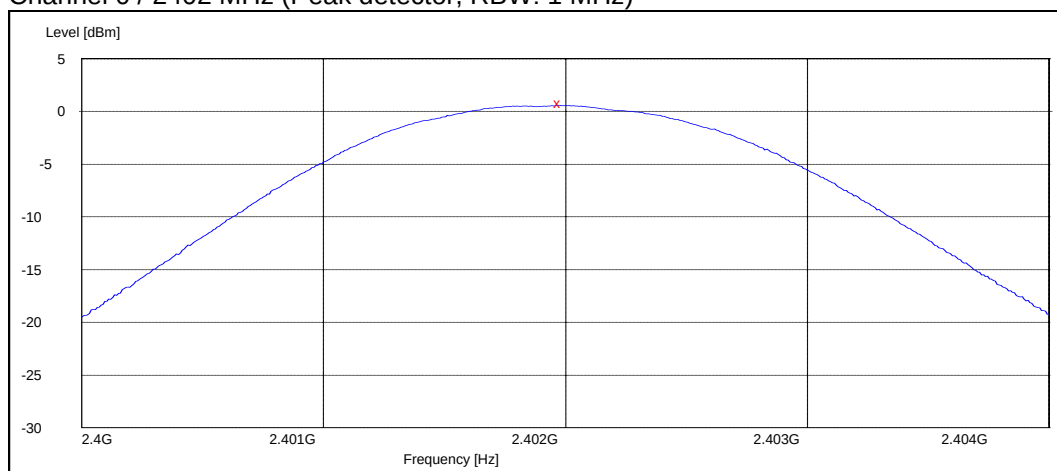
Frequency range [MHz]	Limit [W]	Limit [dBm]
2400 – 2483.5	≤ 1	≤ 30

3.2. Bluetooth Test results

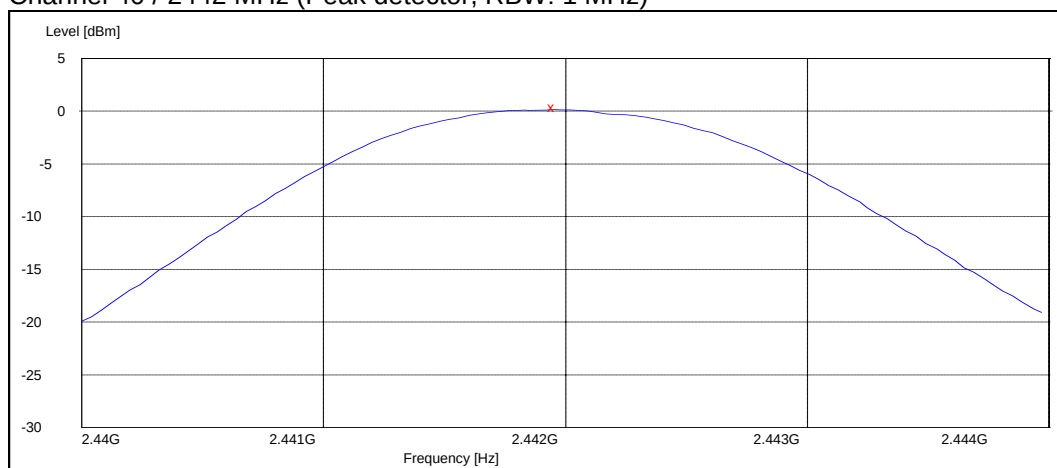
3.2.1 8DPSK modulation, PRBS packet type

Channel / f_c [MHz]	P [dBm]	P [mW]	Result
0 / 2402	0.80	1.202	PASSED
40 / 2442	0.40	1.096	PASSED
78 / 2480	0.30	1.072	PASSED

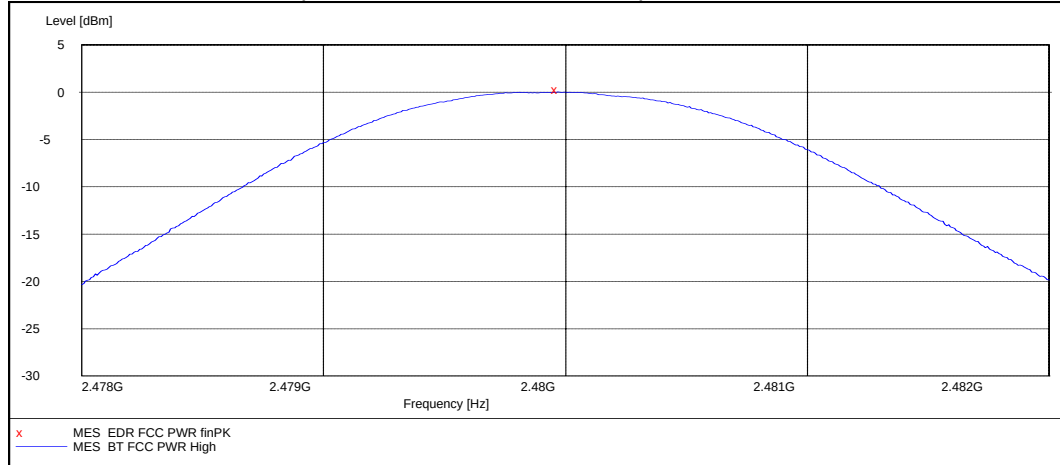
Channel 0 / 2402 MHz (Peak detector, RBW: 1 MHz)



Channel 40 / 2442 MHz (Peak detector, RBW: 1 MHz)



Channel 78 / 2480 MHz (Peak detector, RBW: 1 MHz)



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

EUT with DUT number	HS-51W, DUT 11456
Accessories with DUT numbers	AC-3E, DUT 11447
Operation Voltage [V] / [Hz]	115 / 60
Result	PASSED
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	21 / 48 / 100
Date of measurements	06.09.2006
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 Average [dBμV/m]	Limit Peak [dBμV/m]
Below 2390 and above 2483.5	≤ 54	≤ 74

4.2. Bluetooth Test results

4.2.1 8DPSK modulation, PRBS packet type

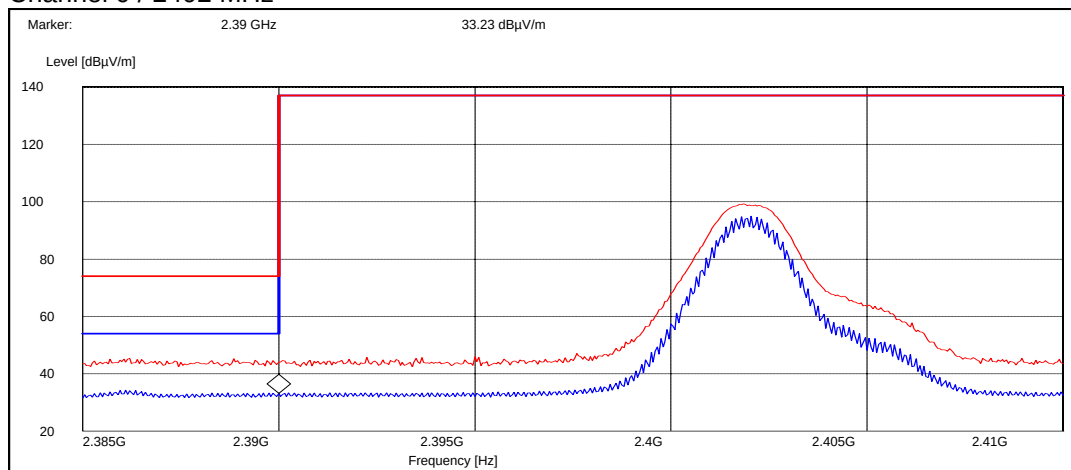
Average (RBW: 1 MHz)

Channel / f_c [MHz]	E [dB μ V/m]	Result
0 / 2402	33.23	PASSED
78 / 2480	51.30	PASSED
Hopping on, low end	38.12	PASSED
Hopping on, high end	50.72	PASSED

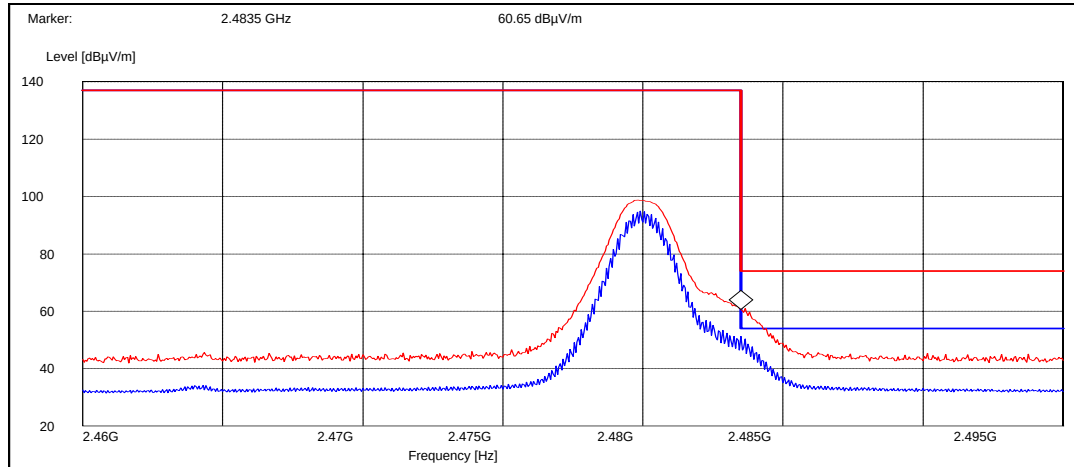
Peak (RBW: 1 MHz)

Channel / f_c [MHz]	E [dB μ V/m]	Result
0 / 2402	44.05	PASSED
78 / 2480	60.65	PASSED
Hopping on, low end	47.66	PASSED
Hopping on, high end	59.95	PASSED

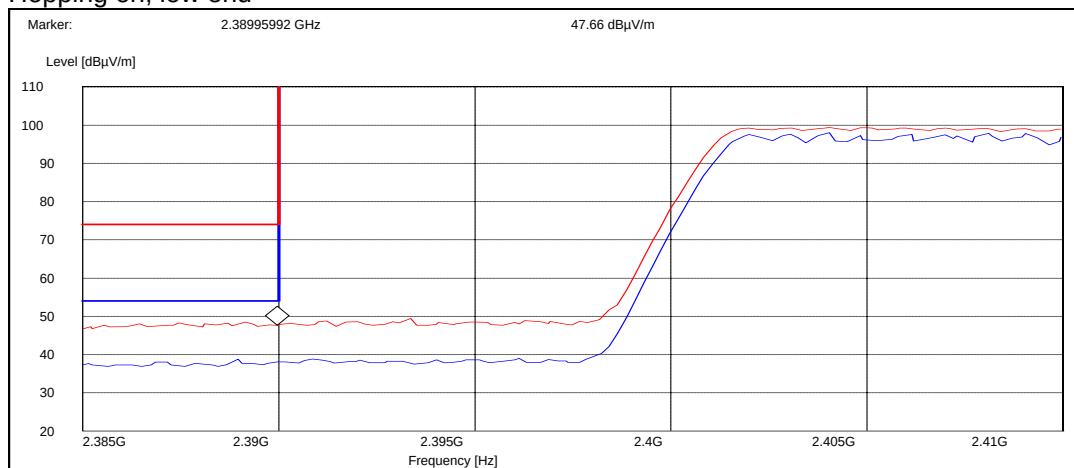
Channel 0 / 2402 MHz



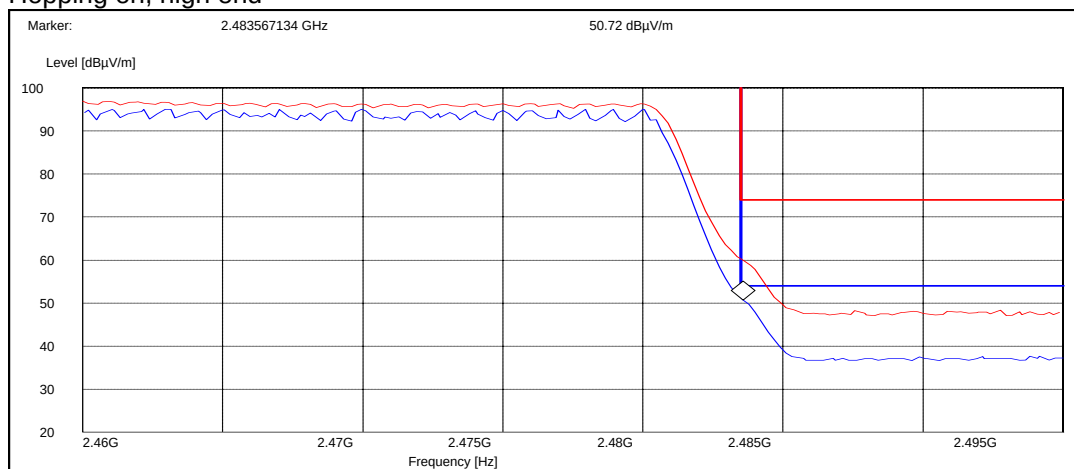
Channel 78 / 2480 MHz



Hopping on, low end



Hopping on, high end



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

EUT with DUT number	HS-51W, DUT 11457
Accessories with DUT numbers	AC-3E, DUT 11447
Operation Voltage [V] / [Hz]	115 / 60
Result	PASSED
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	21 / 48 / 100
Date of measurements	06.09.2006
Measured by	Anni Manninen

5.1. Test method and limit

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

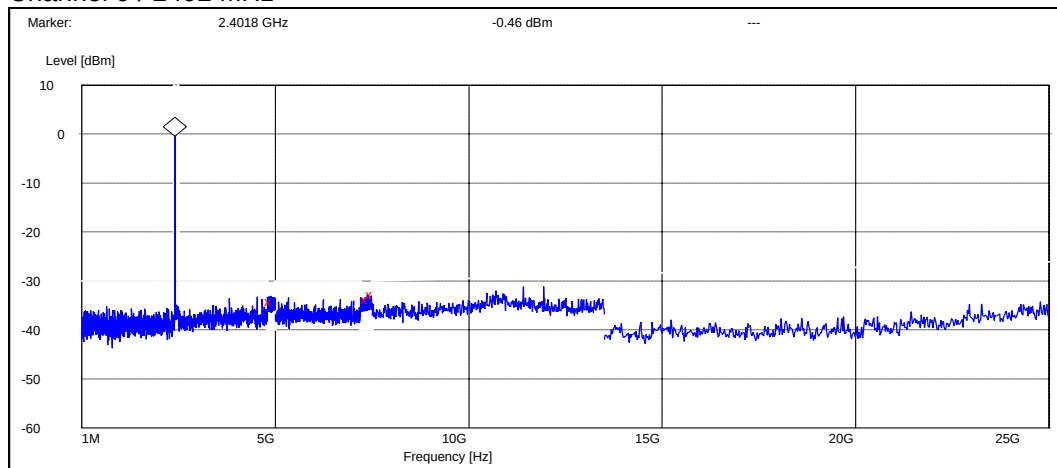
Limits for spurious RF conducted emissions measurements

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

5.2. Bluetooth Test results

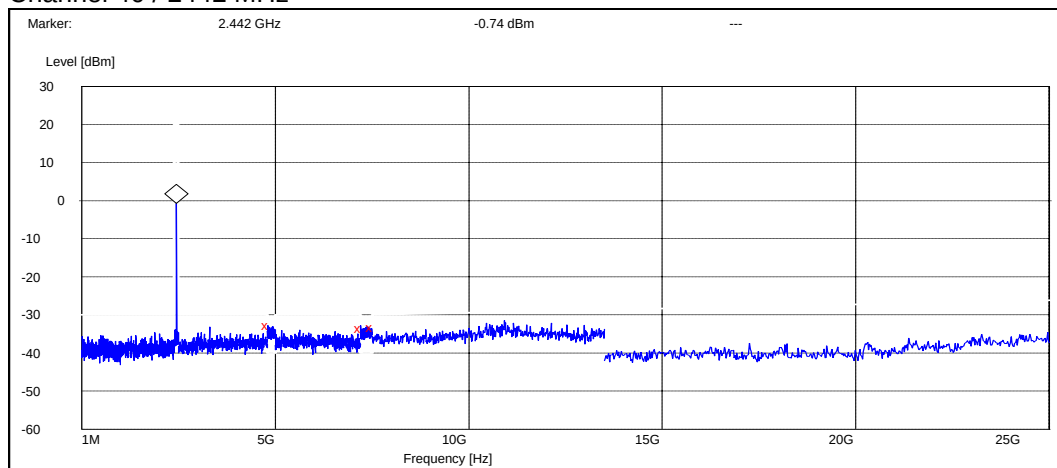
5.2.1 8DPSK modulation, PRBS packet type

Channel 0 / 2402 MHz



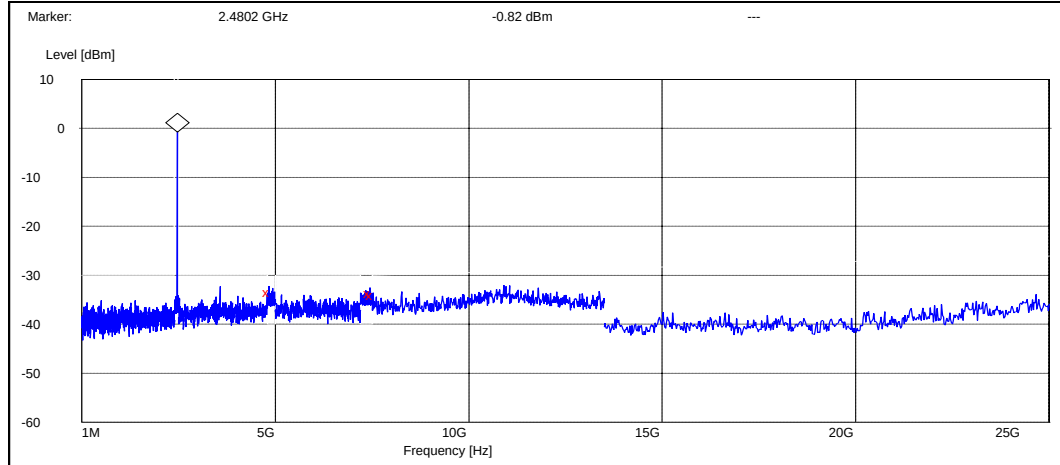
Frequency [MHz]	P [dBc]	Result
4900.000000	-33.639648	PASSED
7383.000000	-33.339648	PASSED
7500.000000	-32.339648	PASSED

Channel 40 / 2442 MHz



Frequency [MHz]	P [dBc]	Result
4814.800000	-32.062549	PASSED
7209.600000	-32.862549	PASSED
7500.000000	-32.562549	PASSED

Channel 78 / 2480 MHz



Frequency [MHz]	P [dBc]	Result
4840.000000	-32.678015	PASSED
7453.200000	-32.978015	PASSED
7500.000000	-33.278015	PASSED

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

EUT with DUT number	HS-51W, DUT 11456
Accessories with DUT numbers	AC-3E, DUT 11447
Operation Voltage [V] / [Hz]	115 / 60
Result	PASSED
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	21 / 48 / 100
Date of measurements	06.09.2006
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:

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

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

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

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

6.2. Bluetooth Test results

6.2.1 8DPSK modulation, PRBS packet type

Channel 0 / 2402 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
4804.000000	53.40	467.74	52.70	0.70	VERTICAL	PASSED
7206.000000	45.80	194.98	42.90	2.90	HORIZONTAL	PASSED

Average (RBW: 1 MHz)

Frequency [MHz]	E [dB $\mu\text{V/m}$]	E [$\mu\text{V/m}$]	U _{RX} [dB μV]	A _{TOT} [dB]	Polarisation	Result
4804.000000	38.40	83.18	37.70	0.70	VERTICAL	PASSED
7206.000000	33.10	45.19	30.20	2.90	VERTICAL	PASSED

Channel 40 / 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
37.795391	22.30	13.03	41.00	-18.70	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
4883.767535	53.10	451.86	52.00	1.10	HORIZONTAL	PASSED
7388.769539	46.80	218.78	43.00	3.80	HORIZONTAL	PASSED
12489.471944	51.60	380.19	41.00	10.60	VERTICAL	PASSED
14498.000000	52.50	421.70	38.10	14.40	VERTICAL	PASSED
15420.343687	52.20	407.38	35.50	16.70	HORIZONTAL	PASSED
15859.715431	54.70	543.25	36.80	17.90	VERTICAL	PASSED
16179.358717	55.30	582.10	36.70	18.60	HORIZONTAL	PASSED
17986.467936	55.80	616.60	36.70	19.10	VERTICAL	PASSED

Average (RBW: 1 MHz)

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Polarisation	Result
1627.252505	36.60	67.61	44.80	-8.20	VERTICAL	PASSED
1627.256513	36.60	67.61	44.80	-8.20	VERTICAL	PASSED
4883.767535	38.00	79.43	36.90	1.10	HORIZONTAL	PASSED
7383.269539	33.70	48.42	29.90	3.80	HORIZONTAL	PASSED
12482.471944	38.80	87.10	28.20	10.60	VERTICAL	PASSED
14498.500000	39.60	95.50	25.20	14.40	VERTICAL	PASSED
15422.843687	39.30	92.26	22.60	16.70	HORIZONTAL	PASSED
15859.215431	41.60	120.23	23.70	17.90	VERTICAL	PASSED
16181.858717	42.30	130.32	23.60	18.70	HORIZONTAL	PASSED
17983.967936	43.00	141.25	24.00	19.00	VERTICAL	PASSED

Channel 78 / 2480 MHz

Peak (RBW: 1 MHz)

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Polarisation	Result
4960.000000	53.90	495.45	53.90	0.00	HORIZONTAL	PASSED
7440.000000	46.20	204.17	42.20	4.00	HORIZONTAL	PASSED

Average (RBW: 1 MHz)

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Polarisation	Result
4960.000000	39.70	96.61	39.70	0.00	HORIZONTAL	PASSED
7440.000000	33.30	46.24	29.30	4.00	HORIZONTAL	PASSED

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

EUT with DUT number	HS-51W, DUT 11456
Accessories with DUT numbers	AC-3E, DUT 11447
Operation Voltage [V] / [Hz]	115 / 60
Result	PASSED
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	21 / 48 / 100
Date of measurements	06.09.2006
Measured by	Anni Manninen

7.1. 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.

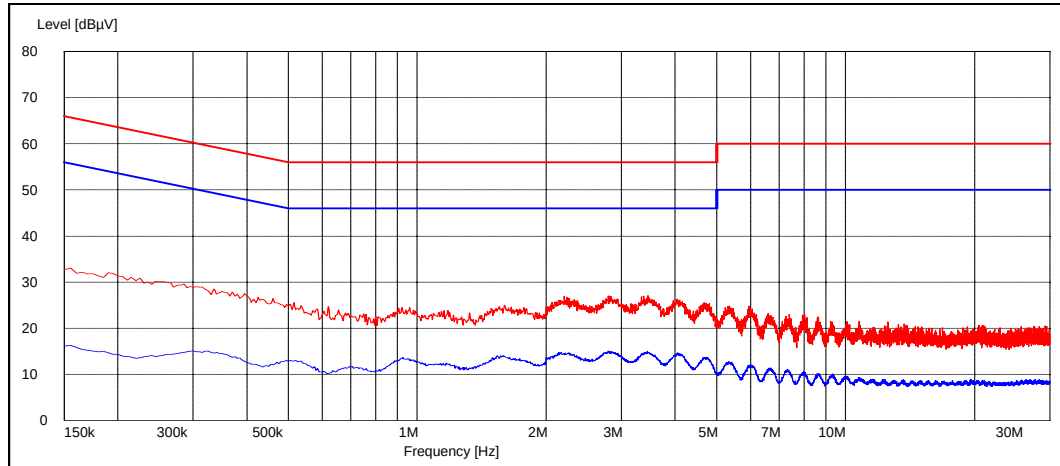
CISPR 22 Class B limits

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

7.2. Bluetooth Test results

7.2.1 8DPSK modulation, PRBS packet type

Channel 40 / 2442 MHz



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

EUT with DUT number	HS-51W, DUT 11457
Accessories with DUT numbers	AC-3E, DUT 11447
Operation Voltage [V] / [Hz]	115 / 60
Result	PASSED
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	21 / 48 / 100
Date of measurements	06.09.2006
Measured by	Anni Manninen

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

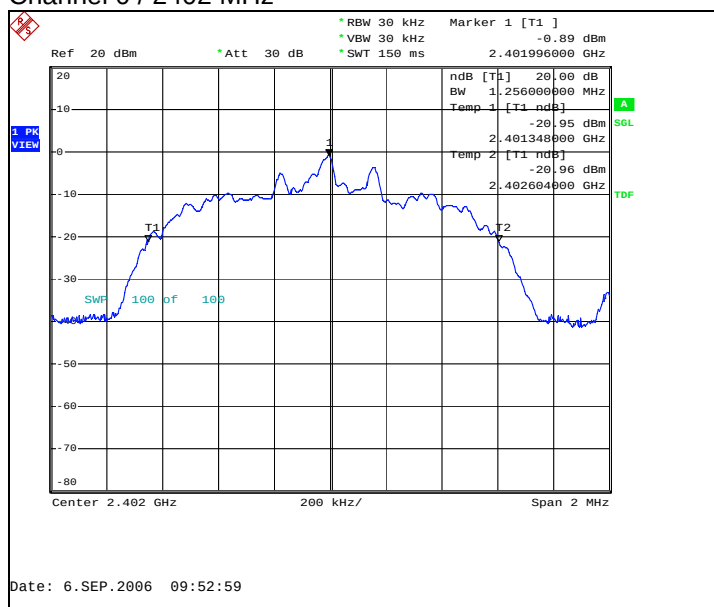
Limit [MHz]
N/A

8.2. Bluetooth Test results

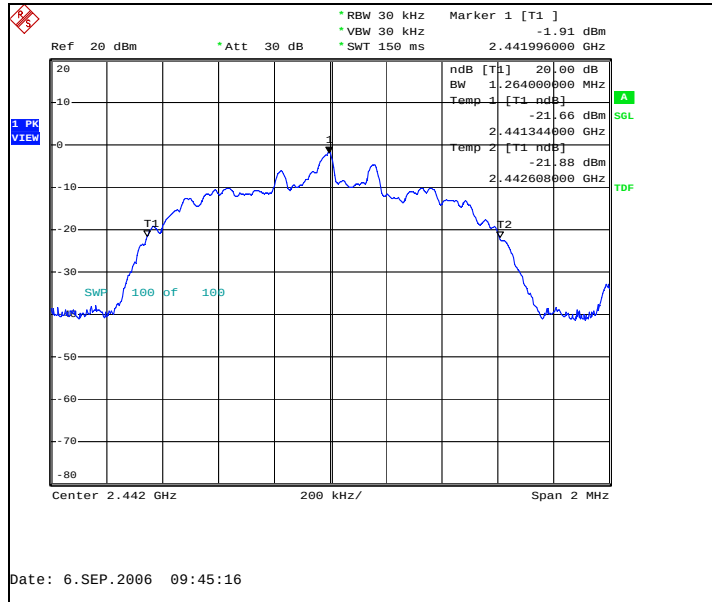
8.2.1 8DPSK modulation, PRBS packet type

Channel / f _c [MHz]	20 dB bandwidth [kHz]	Result
0 / 2402	1256.000	PASSED
40 / 2442	1264.000	PASSED
78 / 2480	1256.000	PASSED

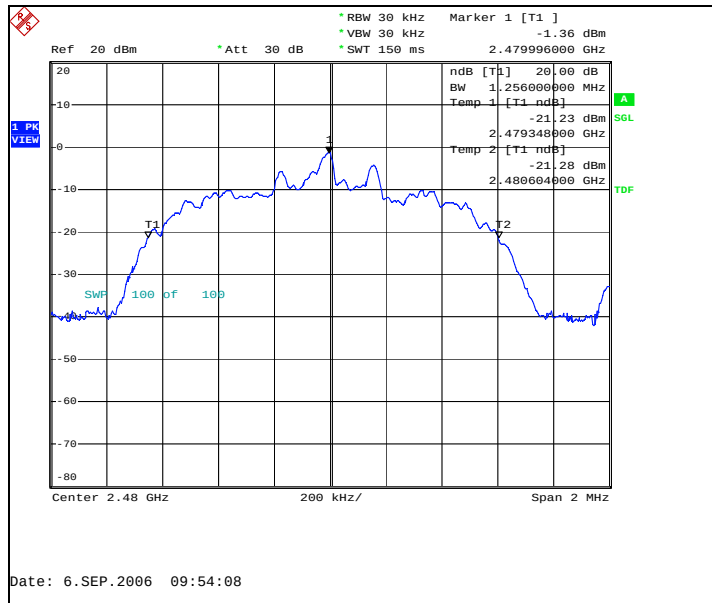
Channel 0 / 2402 MHz



Channel 40 / 2442 MHz



Channel 78 / 2480 MHz



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

EUT with DUT number	HS-51W, DUT 11457
Accessories with DUT numbers	AC-3E, DUT 11447
Operation Voltage [V] / [Hz]	115 / 60
Result	PASSED
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	21 / 48 / 100
Date of measurements	06.09.2006
Measured by	Anni Manninen

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

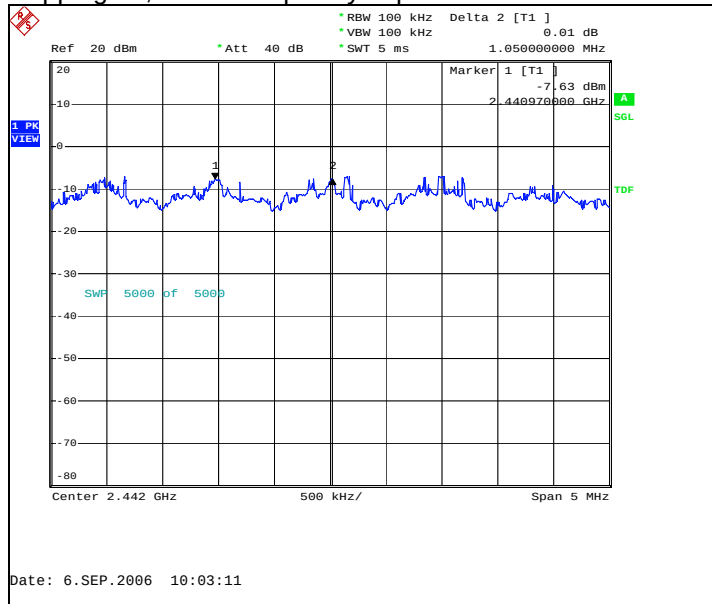
Limit [MHz]
≥ 0.025 or 2/3 of the 20 dB bandwidth

9.2. Bluetooth Test results

9.2.1 8DPSK modulation, PRBS packet type

Carrier frequency separation [kHz]	Result
1050	PASSED

Hopping on, carrier frequency separation of channels 39 / 2441 MHz and 40 / 2442 MHz



10. Number of hopping frequencies (FCC §15.247(a)(1)(iii), RSS-210 A8.1 (4))

EUT with DUT number	HS-51W, DUT 11457
Accessories with DUT numbers	AC-3E, DUT 11447
Operation Voltage [V] / [Hz]	115 / 60
Result	PASSED
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	21 / 48 / 100
Date of measurements	06.09.2006
Measured by	Anni Manninen

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

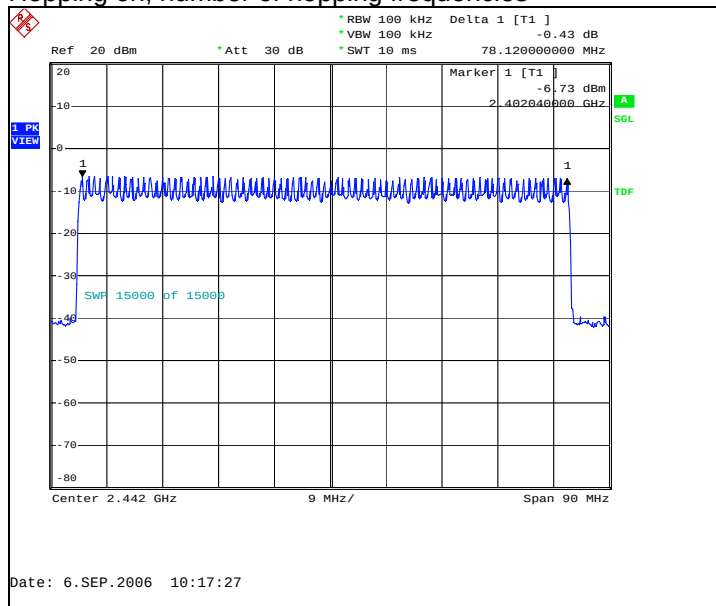
Limit [number]
≥ 15

10.2. Bluetooth Test results

10.2.1 8DPSK modulation, PRBS packet type

Measured number of hopping frequencies	Result
69	PASSED

Hopping on, number of hopping frequencies



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

EUT with DUT number	HS-51W, DUT 11457
Accessories with DUT numbers	AC-3E, DUT 11447
Operation Voltage [V] / [Hz]	115 / 60
Result	PASSED
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	21 / 48 / 100
Date of measurements	06.09.2006
Measured by	Anni Manninen

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

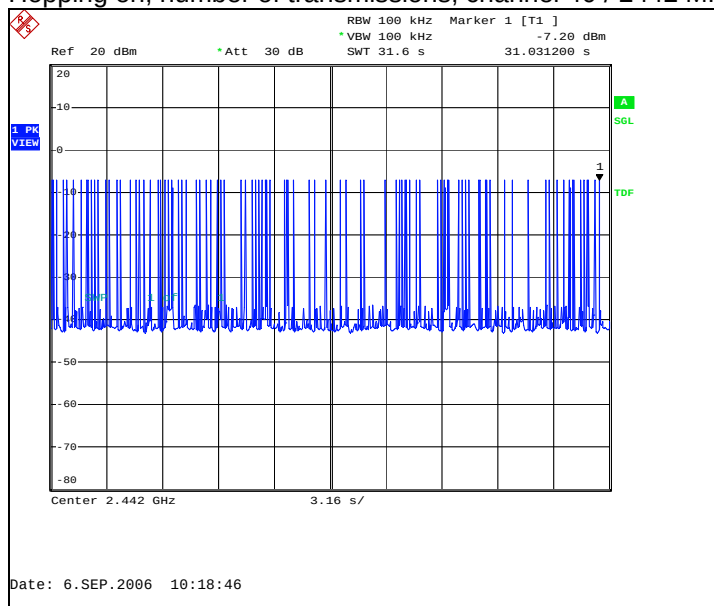
Limit [s]
≤ 0.4

11.2. Bluetooth test results

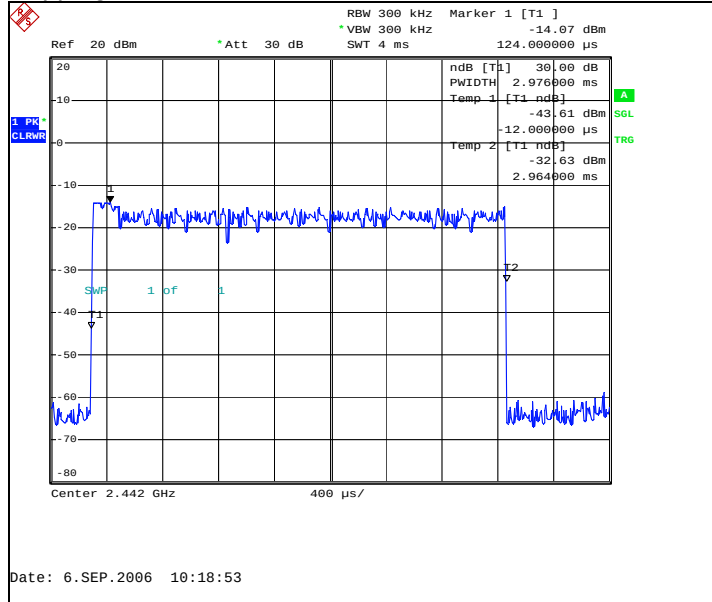
11.2.1 8DPSK modulation, PRBS packet type

Measured number of transmissions	Duration of one transmission [μ s]	Time of occupancy [s]	Result
86	2976.000	0.255936	PASSED

Hopping on, number of transmissions, channel 40 / 2442 MHz



Hopping on, duration of one transmission, channel 40 / 2442 MHz



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
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

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
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

Eq. No	Equipment	Type	Manufacturer	Used in
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	GPB 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
2363	Band Reject Filter	WRCG 832/838-825/845/5SS	Wainwright	22/24
2364	Band Reject Filter	WRCG1877/1883 - 1870/1890-40/6SS	Wainwright	22/24
2365	Relay Switch Unit	TS-RSP	R&S	22/24, 15C, 15B
2366	Relay Switch Unit	TS-RSP	R&S	22/24, 15C, 15B
-	RF Emission Software	ES-K1 v.1.71	R&S	22/24, 15C, 15B