

FCC Part 15C Compliance Test Report

Test Report no.:	Tre_FCC_0717_11.doc	Date of Report:	30.4.2007
Number of pages:	25	Customer's Contact person:	Ines Baufeld
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FCC listing no.:	94436		
IC recognition no.:	3608		
Tested devices/ accessories:	Handsfree Unit UHV LOW Audio Stream HT-3 / Cable tree for HT-3		
FCC ID:	OW3HT-3	IC:	661AA-HT3
Supplement reports:	-		
Testing has been carried out in accordance with:	CFR 47, FCC rules Part 15 Subpart C, ANSI C63.4 (2003), Public Notice DA 00-705, DTS procedures KDB 558074, 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:			

Jari Jantunen, System Manager

1. Summary for FCC Part 15C Compliance Test Report

Date of receipt	26.4.2007
Testing completed	29.4.2007
The customer's contact person	Ines Baufeld
Test Plan referred to	T:\Projects\
Notes	-
Document name	T:\Projects\HT-3\EMC\Results\FCC\Tre_FCC_0717_11.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
Handsfree unit	HT-3	020330610000187	0310	-	0.210	41081
Handsfree unit	HT-3	020330610000198	0310	-	0.210	41079
Cable set	-	-	-	-	-	41080

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)	Conducted 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	NP
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 Tampere Laboratory.

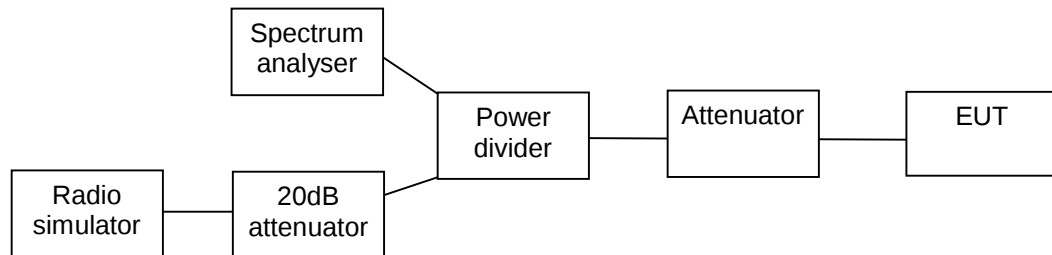
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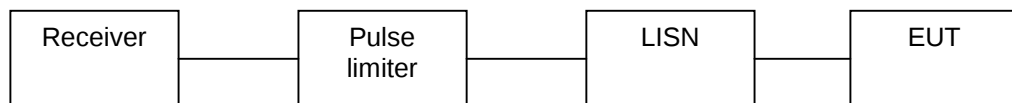
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2. Test setups

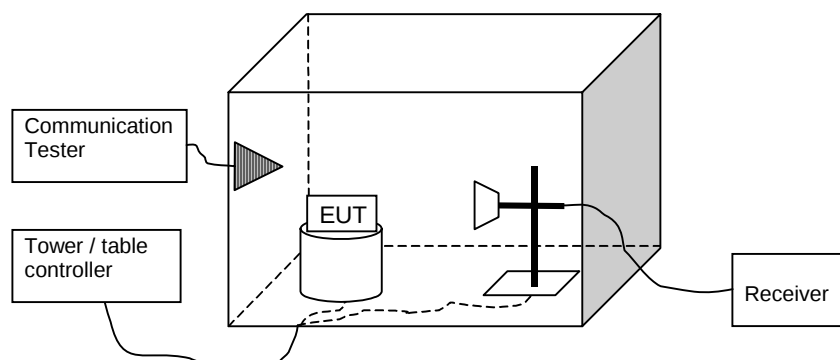
2.1. Conducted RF test setup



2.2. AC powerline conducted emissions test setup



2.3. Spurious radiated emissions test setup



3. Conducted peak output power (FCC §15.247(b)(1), RSS-210 A8.4 (2))

EUT with DUT number	HT-3 DUT 41081
Accessories with DUT numbers	Cable set DUT 41080
Operation Voltage [V] / [Hz]	13.5 VDC
Result	PASSED
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	20/45/102
Date of measurements	29.4.2007
Measured by	Petteri Suni

3.1. Test method and limit

The measurement is made according to Public notice DA 00-705 and IC standard RSS-210.

Limits for conducted peak output power measurements

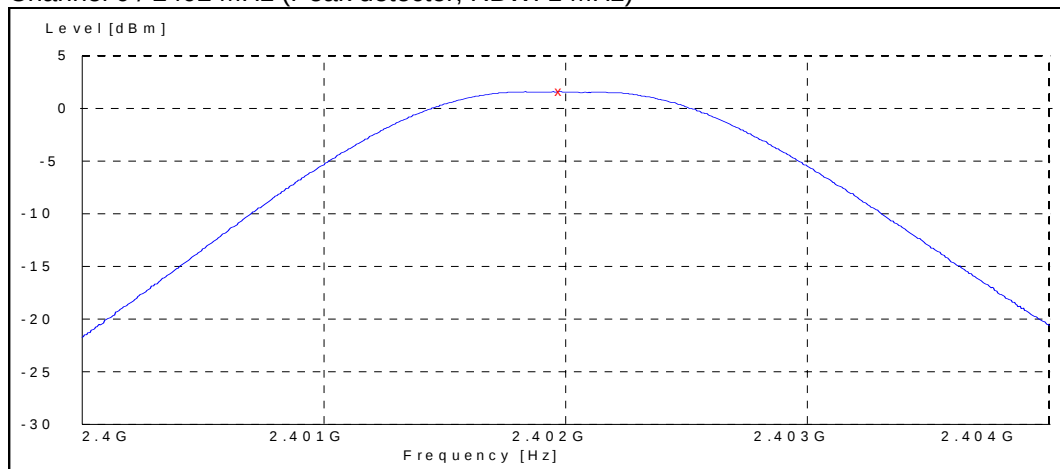
Frequency range [MHz]	Limit [W]	Limit [dBm]
2400 – 2483.5	≤ 1	≤ 30

3.2. Bluetooth Test results

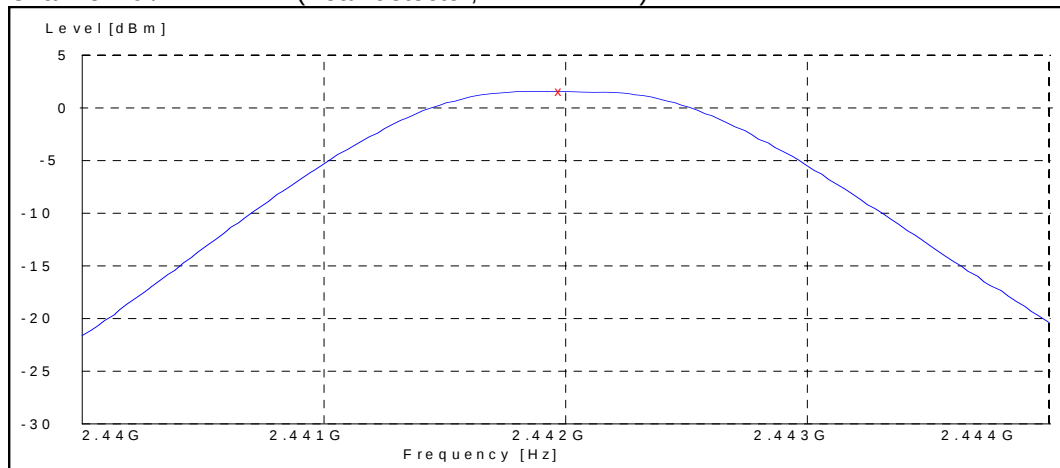
3.2.1 GFSK modulation, PRBS packet type

Channel / f_c [MHz]	P [dBm]	P [mW]	Result
0 / 2402	1.60	1.445	PASSED
40 / 2442	1.60	1.445	PASSED
78 / 2480	1.50	1.413	PASSED

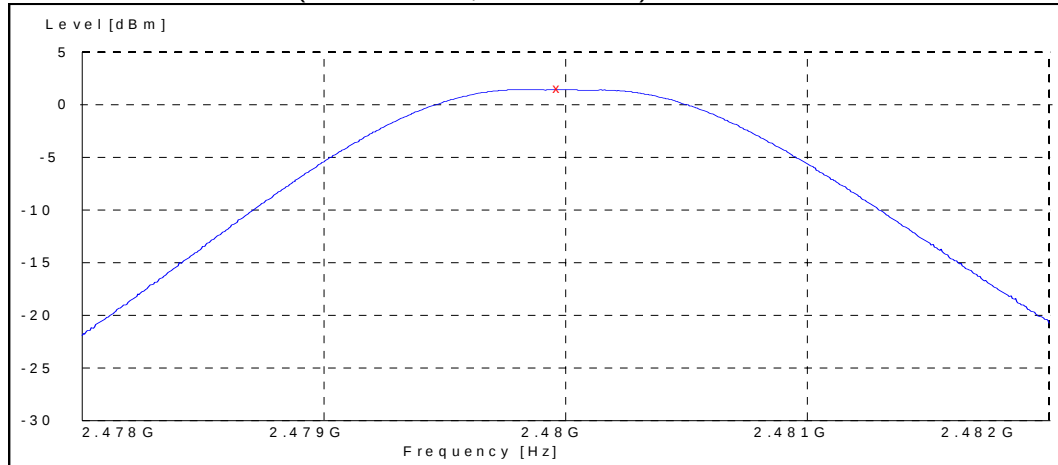
Channel 0 / 2402 MHz (Peak detector, RBW: 1 MHz)



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	HT-3 DUT 41079
Accessories with DUT numbers	Cable set 41080
Operation Voltage [V] / [Hz]	13.5 VDC
Result	PASSED
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	22 / 44 / 102.3
Date of measurements	28.4.2007
Measured by	Jari Jantunen

4.1. Test method and limit

The measurement is made according to Public notice DA 00-705 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 GFSK modulation, PRBS packet type

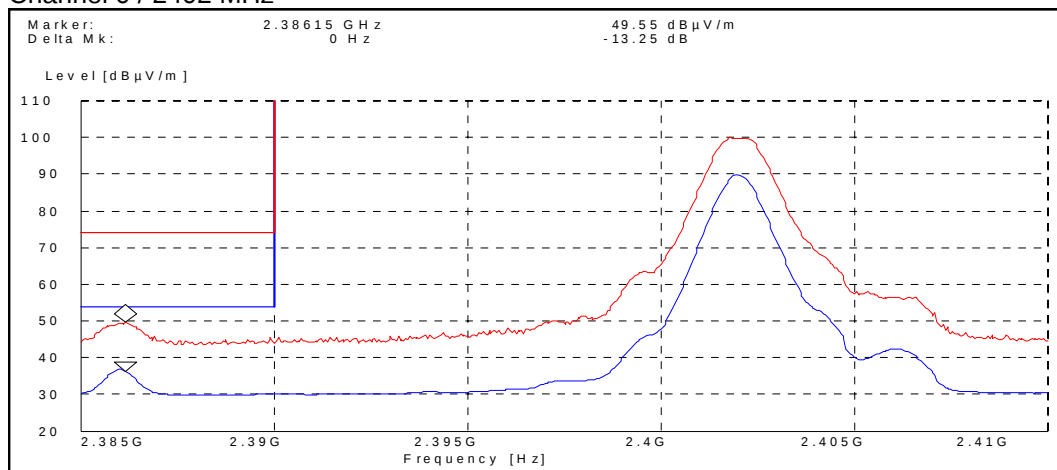
Average (RBW: 1 MHz)

Channel / f_c [MHz]	E [dB μ V/m]	Result
0 / 2402	36.30	PASSED
78 / 2480	40.67	PASSED
Hopping on, low end	43.62	PASSED
Hopping on, high end	52.11	PASSED

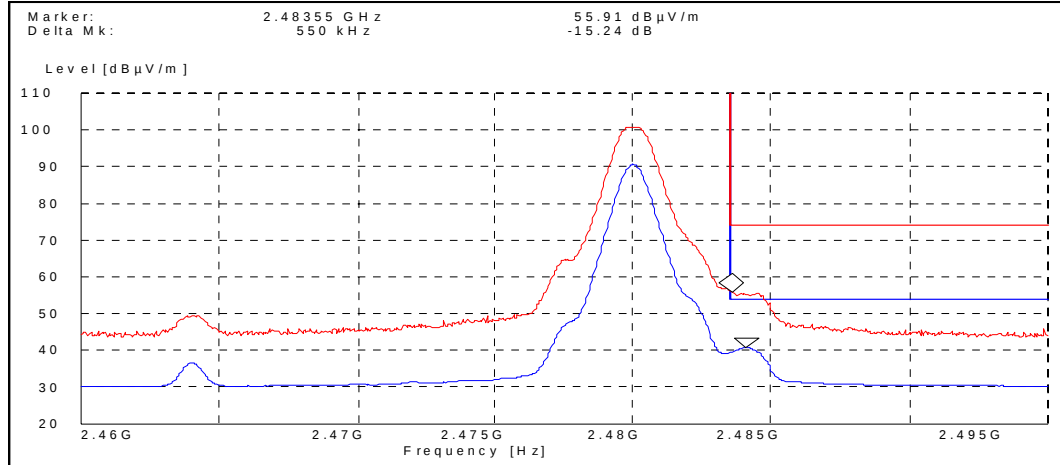
Peak (RBW: 1 MHz)

Channel / f_c [MHz]	E [dB μ V/m]	Result
0 / 2402	49.55	PASSED
78 / 2480	55.91	PASSED
Hopping on, low end	50.04	PASSED
Hopping on, high end	57.72	PASSED

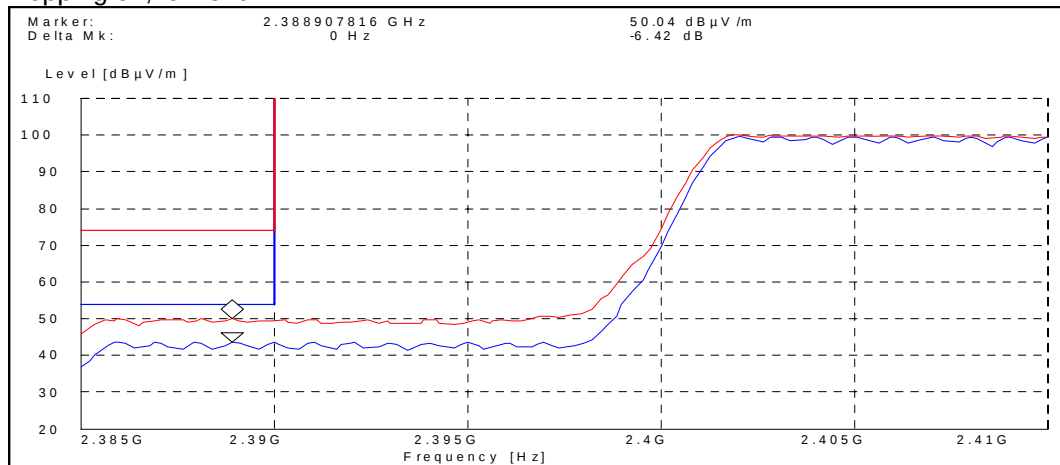
Channel 0 / 2402 MHz



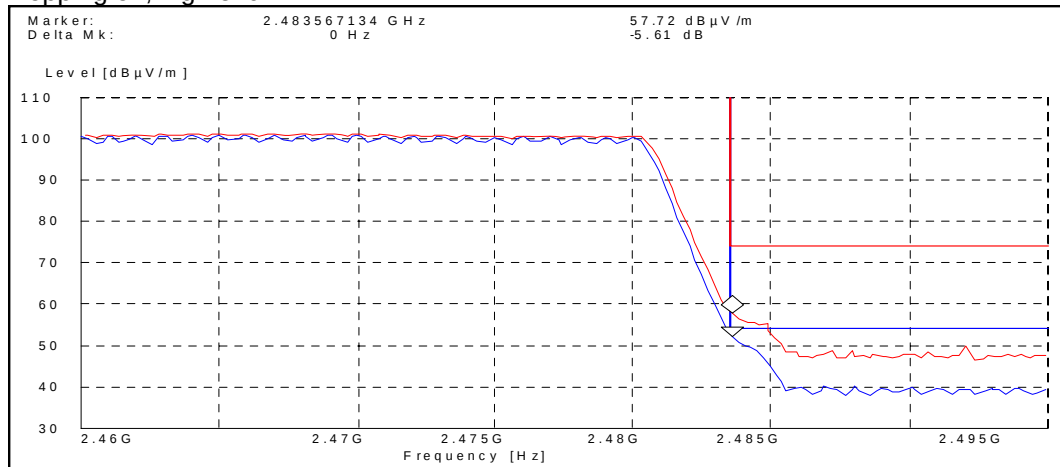
Channel 78 / 2480 MHz



Hopping on, low end



Hopping on, high end



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

EUT with DUT number	HT-3 DUT 41081
Accessories with DUT numbers	Cable set DUT 41080
Operation Voltage [V] / [Hz]	13.5 VDC
Result	PASSED
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	20/45/102
Date of measurements	29.4.2007
Measured by	Petteri Suni

5.1. Test method and limit

The measurement is made according to Public notice DA 00-705 and IC standard RSS-210.

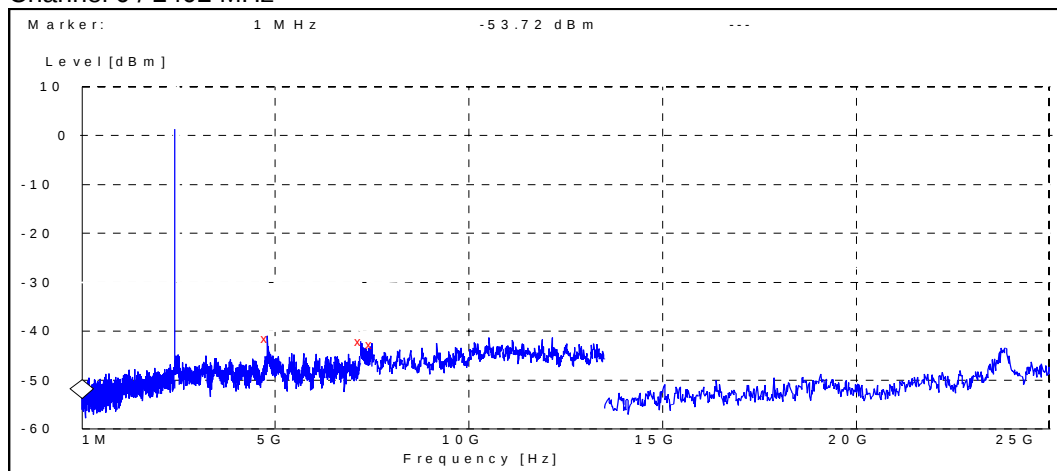
Limits for spurious RF conducted emissions measurements

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

5.2. Bluetooth Test results

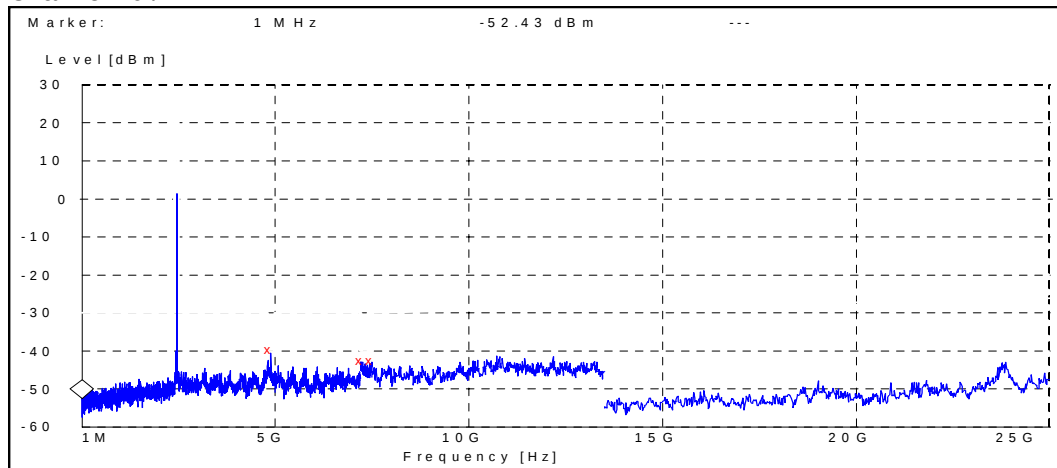
5.2.1 GFSK modulation, PRBS packet type

Channel 0 / 2402 MHz



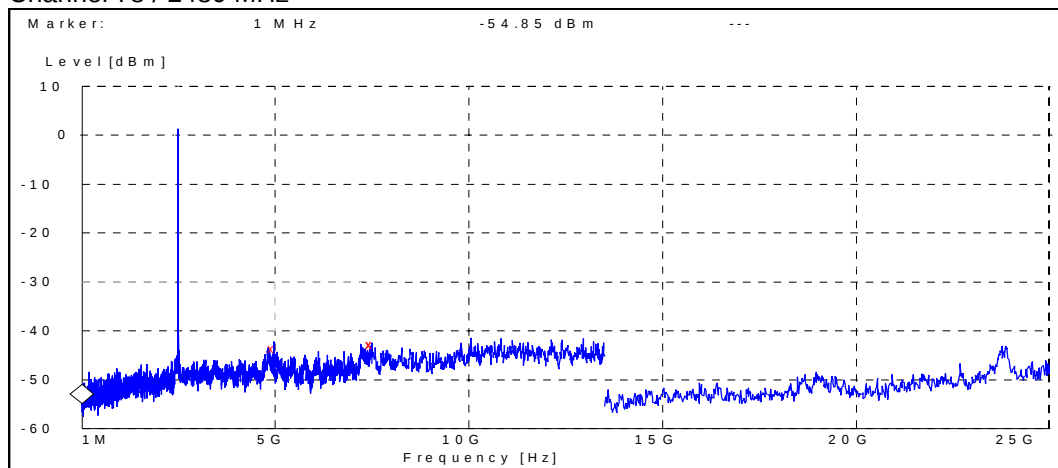
Frequency [MHz]	P [dBc]	Result
4804.166667	-41.60	PASSED
7204.807692	-42.10	PASSED
7500.000000	-42.80	PASSED

Channel 40 / 2442 MHz



Frequency [MHz]	P [dBc]	Result
4883.974359	-39.60	PASSED
7247.596154	-42.60	PASSED
7500.000000	-42.40	PASSED

Channel 78 / 2480 MHz



Frequency [MHz]	P [dBc]	Result
4960.256410	-43.50	PASSED
7486.538462	-42.70	PASSED
7500.000000	-42.70	PASSED

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

EUT with DUT number	HT-3 DUT 41079
Accessories with DUT numbers	Cable set 41080
Operation Voltage [V] / [Hz]	13.5 VDC
Result	PASSED
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	22 / 44 / 102.3
Date of measurements	28.4.2007
Measured by	Jari Jantunen

6.1. Test method and limit

The measurement is made according to Public notice DA 00-705 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 GFSK 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	44.10	160.32	45.80	-1.7	HORIZONTAL	PASSED
7206.000000	51.50	375.84	49.80	1.7	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
4804.000000	29.70	30.55	31.40	-1.7	HORIZONTAL	PASSED
7206.000000	38.00	79.43	36.30	1.7	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
37.635872	7.60	2.40	18.60	-11.0	HORIZONTAL	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
4883.769539	43.90	156.68	45.50	-1.6	HORIZONTAL	PASSED
4884.267535	43.40	147.91	45.00	-1.6	HORIZONTAL	PASSED
7325.649299	49.90	312.61	47.60	2.3	VERTICAL	PASSED
7325.651303	50.40	331.13	48.10	2.3	VERTICAL	PASSED
17969.941884	54.80	549.54	33.60	21.2	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
4883.767535	30.10	31.99	31.70	-1.6	HORIZONTAL	PASSED
4883.769539	31.20	36.31	32.80	-1.6	HORIZONTAL	PASSED
7325.649299	36.80	69.18	34.50	2.3	VERTICAL	PASSED
7325.651303	36.80	69.18	34.50	2.3	VERTICAL	PASSED

17969.941884	42.10	127.35	20.90	21.2	HORIZONTAL	PASSED
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Channel 78 / 2480 MHz

Peak (RBW: 1 MHz)

Frequency [MHz]	E [dB μ V/m]	E [μ V/m]	U _{RX} [dB μ V]	A _{TOT} [dB]	Polarisation	Result
4960.000000	45.40	186.21	46.60	-1.2	HORIZONTAL	PASSED
7440.000000	46.00	199.53	43.30	2.7	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
4960.000000	32.50	42.17	33.70	-1.2	HORIZONTAL	PASSED
7440.000000	32.40	41.69	29.70	2.7	VERTICAL	PASSED

7. 20 dB bandwidth (FCC §15.247(a)(1), RSS-210 A8.1 (1))

EUT with DUT number	HT-3 DUT 41081
Accessories with DUT numbers	Cable set DUT 41080
Operation Voltage [V] / [Hz]	13.5 VDC
Result	PASSED
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	20/45/102
Date of measurements	29.4.2007
Measured by	Petteri Suni

7.1. Test method and limit

The measurement is made according to Public notice DA 00-705 and IC standard RSS-210.

Limits for 20 dB bandwidth measurements

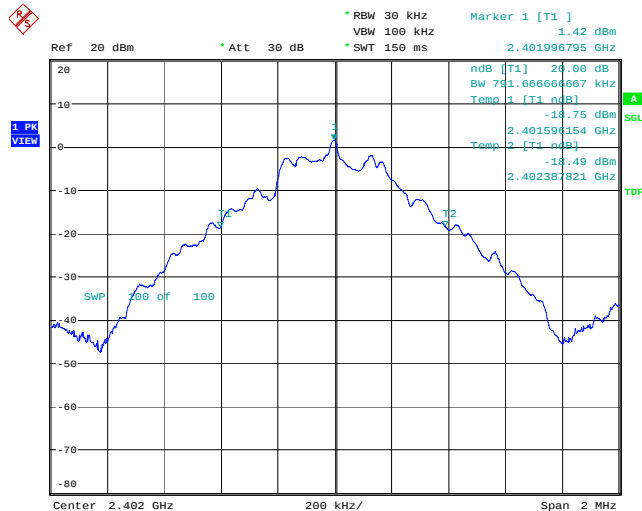
Limit [MHz]
N/A

7.2. Bluetooth Test results

7.2.1 GFSK modulation, PRBS packet type

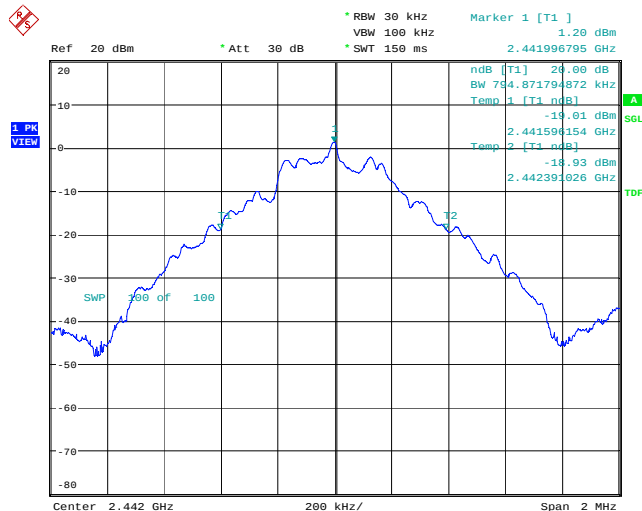
Channel / f_c [MHz]	20 dB bandwidth [kHz]	Result
0/2402	791.666	PASSED
40/2442	794.871	PASSED
78/2480	794.871	PASSED

Channel 0 / 2402 MHz



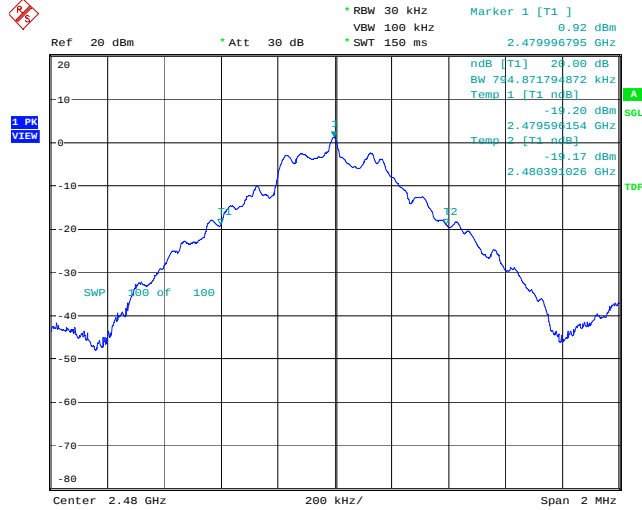
Date: 29. APR. 2007 10:43:23

Channel 40 / 2442 MHz



Date: 29. APR. 2007 10:44:07

Channel 78 / 2480 MHz



Date: 29.APR.2007 10:40:53

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

EUT with DUT number	HT-3 DUT 41081
Accessories with DUT numbers	Cable set DUT 41080
Operation Voltage [V] / [Hz]	13.5 VDC
Result	PASSED
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	20/45/102
Date of measurements	29.4.2007
Measured by	Petteri Suni

8.1. Test method and limit

The measurement is made according to Public notice DA 00-705 and IC standard RSS-210.

Limits for carrier frequency separation measurements

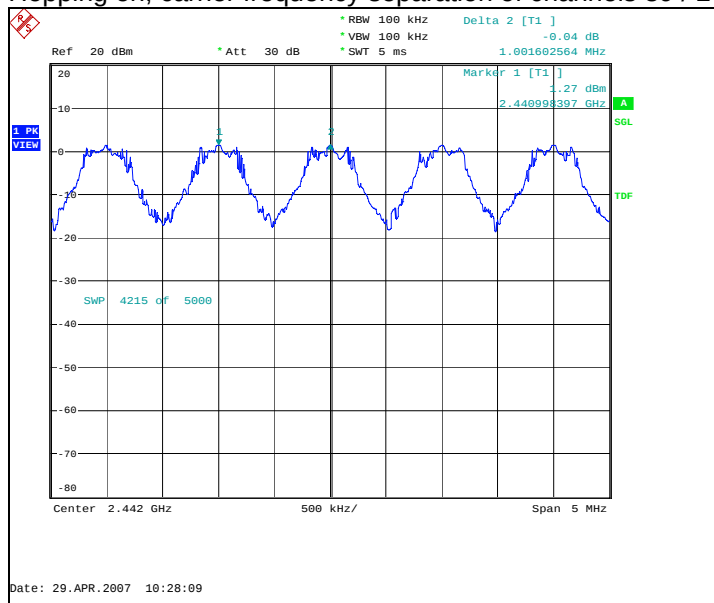
Limit [MHz]
≥ 0.025 or $2/3$ of the 20 dB bandwidth

8.2. Bluetooth Test results

8.2.1 GFSK modulation, PRBS packet type

Carrier frequency separation [kHz]	Result
1001.603	PASSED

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



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

EUT with DUT number	HT-3 DUT 41081
Accessories with DUT numbers	Cable set DUT 41080
Operation Voltage [V] / [Hz]	13.5 VDC
Result	PASSED
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	20/45/102
Date of measurements	29.4.2007
Measured by	Petteri Suni

9.1. Test method and limit

The measurement is made according to Public notice DA 00-705 and IC standard RSS-210.

Limits for number of hopping frequencies measurements

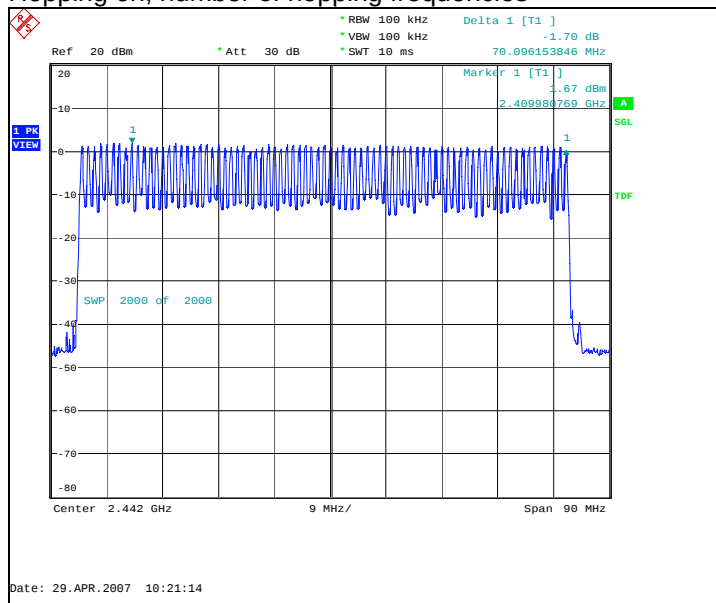
Limit [number]
≥ 15

9.2. Bluetooth Test results

9.2.1 GFSK modulation, PRBS packet type

Measured number of hopping frequencies	Result
80	PASSED

Hopping on, number of hopping frequencies



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

EUT with DUT number	HT-3 DUT 41081
Accessories with DUT numbers	Cable set DUT 41080
Operation Voltage [V] / [Hz]	13.5 VDC
Result	PASSED
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	20/45/102
Date of measurements	29.4.2007
Measured by	Petteri Suni

10.1. Test method and limit

The measurement is made according to Public notice DA 00-705 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

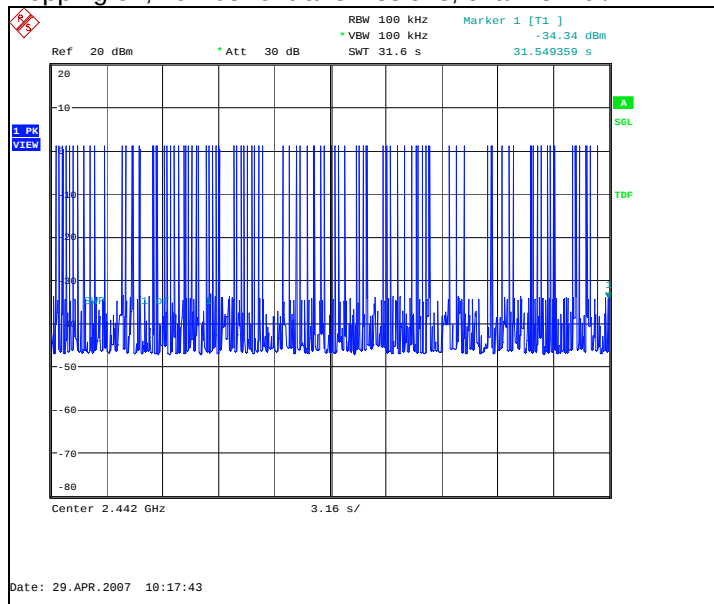
Limit [s]
≤ 0.4

10.2. Bluetooth test results

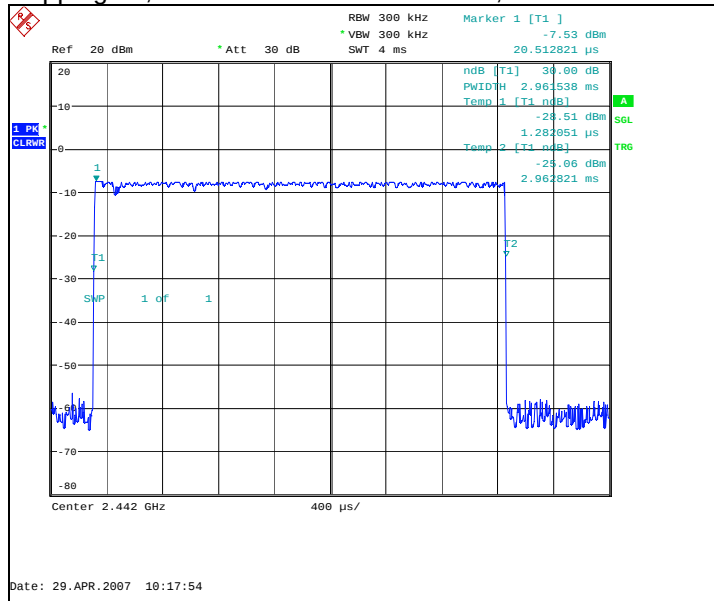
10.2.1 GFSK modulation, PRBS packet type

Measured number of transmissions	Duration of one transmission [μ s]	Time of occupancy [s]	Result
90	2 962	0.266538	PASSED

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



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



11. Test Equipment

11.1. Conducted measurements

Eq. No	Equipment	Type	Manufacturer	Used in
TM37610	Spectrum analyzer	FSU	R&S	22/24, 15C
TM37678	Radio communication tester	CMU-200	R&S	22/24, 15C
	Attenuator 10 dB	6251.17.A	Huber+Suhner AG	22/24, 15C
TM37499	Power splitter	11667A	Agilent	22/24, 15C
	Temperature chamber	VT4002	Vötsch	22/24, 15C
TM38112	DC power supply	6632A	Agilent	22/24, 15C
TM38111	Multimeter	34401A	Agilent	22/24, 15C
	EMI Test receiver	ESPC	R&S	15C, 15B
TM37773	Radio communication tester	CMU-200	R&S	15C, 15B
TM38631	Signal generator	83640L	Agilent	15C, 15B
TM38114	DC power supply	6632A	Agilent	15C, 15B
TM22835	Multimeter	87	Fluke	15C, 15B
TM30600	Pulse Limiter	ESH3-Z2	R&S	15C, 15B
TM26490	LISN 50 µH	ESH3-Z5/	R&S	15C, 15B
TM30636	LISN 50 µH	L2-16/	PMM	15C, 15B

11.2. Radiated measurements

Eq. No	Equipment	Type	Manufacturer	Used in
TM30599	3m semi-anechoic chamber		TDK	22/24, 15C, 15B
TM38845	EMI receiver	ESI 40	R&S	22/24, 15C, 15B
TM37498	Preamplifier	AMF-5D-020180-26-10P	MITEQ	22/24, 15C, 15B
TM37523	Preamplifier	AMF-4D-10M-3G-25-20P	MITEQ	22/24, 15C, 15B
TM37516	Biconilog antenna	HL562	R&S	22/24, 15C, 15B
TM26496	Double ridged waveguide antenna	3115	EMCO	22/24, 15C, 15B
TM39158	Horn antenna	3116	EMCO	22/24, 15C, 15B
TM26492	Reference dipole set	UHAP/VHAP	Schwarzbeck	22/24, 15C, 15B
TM37501	Dipole antenna	3125-870	EMCO	22/24
TM37502	Dipole antenna	3125-1880	EMCO	22/24
TM37773	Radio communication tester	CMU-200	R&S	22/24, 15C, 15B
TM38631	Signal generator	83640L	Agilent	22/24, 15C, 15B
TM38066	High pass filter	4HC3000/18000-3-KK	Trilithic	22/24, 15C, 15B
	High pass filter	WHK2010-10SS	Trilithic	22/24, 15C, 15B
	Low pass filter	WLK1750-10SS	Trilithic	22/24, 15C, 15B
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	22/24, 15C, 15B
TM26500	Turntable	DS412	Deisel	22/24, 15C, 15B
TM38842	Antenna mast controller	2090	EMCO	22/24, 15C, 15B
TM38843	Antenna mast	2075	EMCO	22/24, 15C, 15B
TM38114	DC power supply	6632A	Agilent	22/24, 15C, 15B
TM22835	Multimeter	87	Fluke	22/24, 15C, 15B