

FCC Part 15C Compliance Test Report

Test Report no.:	Tre_FCC_0747_11.doc	Date of Report:	10.12.2007
Number of pages:	23	Customer's Contact person:	Pasi Vainio
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FCC listing no.:	94436		
IC recognition no.:	3608		
Tested devices/ accessories:	GSM-Phone RM-321 / Battery BL-6F / AC-Charger AC-6C / USB charger adapter CA-100C / Audio adapter AD-54 / Headset HS-45		
FCC ID:	PDNRM-321	IC:	661R-RM321
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 (Issue 2, June 2007) and RSS-210 (Issue 7, June 2007). 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	16.11.2007
Testing completed	28.11.2007
The customer's contact person	Pasi Vainio
Test Plan referred to	T:\Projects\
Notes	-
Document name	T:\Projects\RM-321\EMC\Results\FCC\Tre_FCC_0747_11.doc

1.1. EUT and Accessory Information

The EUT is a 4-band (GSM850/900/1800/1900) mobile phone with GPRS, EGPRS and Bluetooth. Bluetooth is tested with maximum rated TX power.

Product	Type	SN	HW	MV	SW	DUT
GSM-Phone	RM-321	04401014251132	4000.0	-	1.1.005	41317
GSM-Phone	RM-321	004401014251785	4000.0	-	1.1.005	41319
Battery	BL-6F	-	-	-	-	41320
Battery	BL-6F	-	-	-	-	41321
AC Charger	AC-6C	-	2.2	-	-	41322
AC-Charger	AC-6C	-	2.2	-	-	41323
USB charger adapter	CA-100C	-	-	-	-	41324
USB charger adapter	CA-100C	-	-	-	-	41325
Audio adapter	AD-54	45	0.5	1.5	0.1	41043
Audio adapter	AD-54	1499	0.5	1.7	0.1	41326
Headset	HS-45	-	-	-	-	41044
Headset	HS-45	-	-	-	-	41327

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(d)	A8.5	Band edge compliance of RF emissions	PASSED
15.247(d)	A8.5	Spurious RF conducted emissions	PASSED
15.247(d), 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	NP
15.247(a)(1)	A8.1 (2)	Carrier frequency separation	NP
15.247(a)(1)(iii)	A8.1 (4)	Number of hopping frequencies	NP
15.247(a)(1)(iii)	A8.1 (4)	Time of occupancy	NP

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.

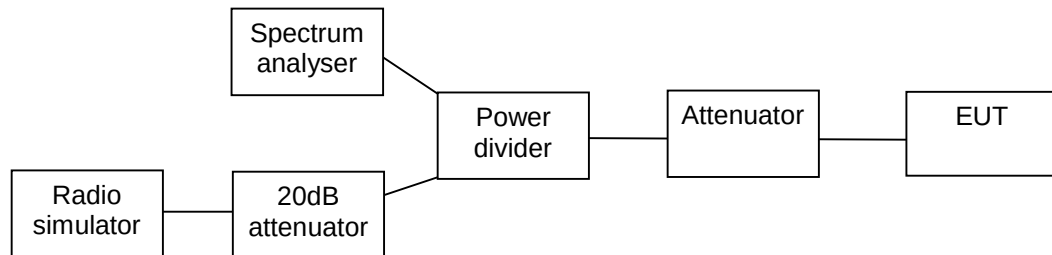
The test was not performed by the TCC Nokia Tampere Laboratory.

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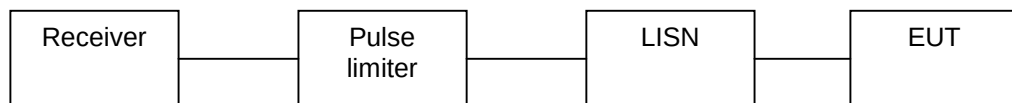
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2. Test setups

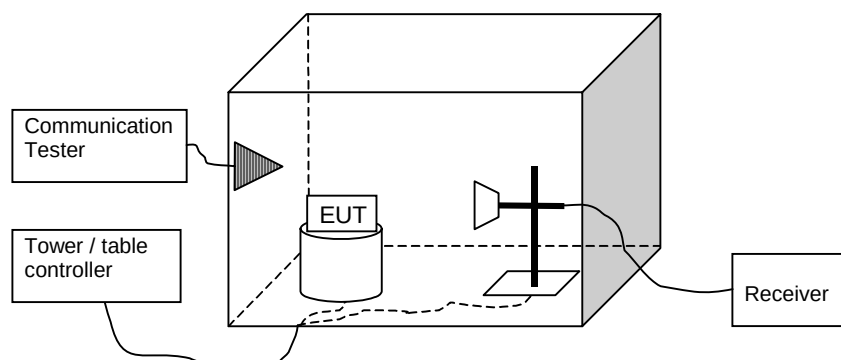
2.1. Conducted RF test setup



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	RM-321 DUT 41319
Accessories with DUT numbers	BL-6F DUT 41321 / AC-6C DUT 41323 / CA-100C DUT 41325 / AD-54 DUT 41043 / HS-45 DUT 41044
Operation Voltage [V] / [Hz]	Nominal
Result	PASSED
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	20 / 45 / 100
Date of measurements	23.11.2007
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

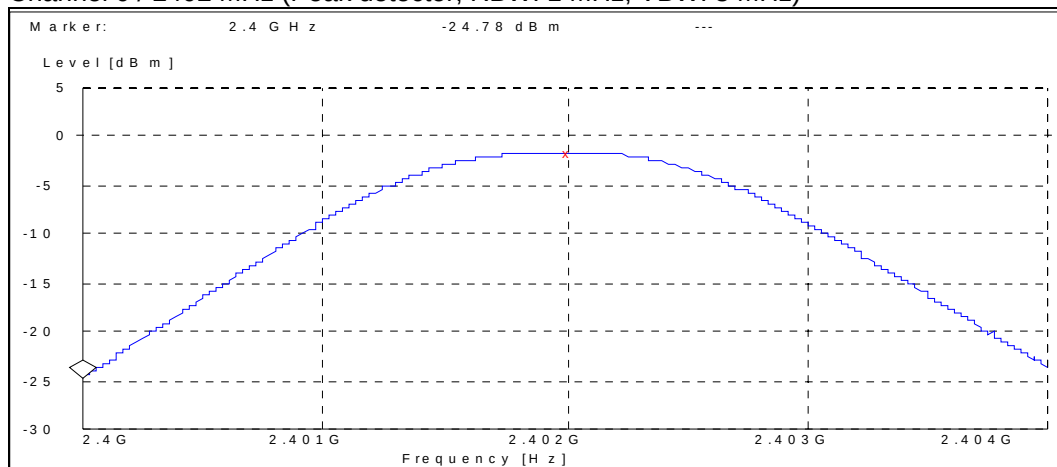
Frequency range [MHz]	Limit [W]	Limit [dBm]
2400 – 2483.5	≤ 1	≤ 30

3.2. Bluetooth Test results

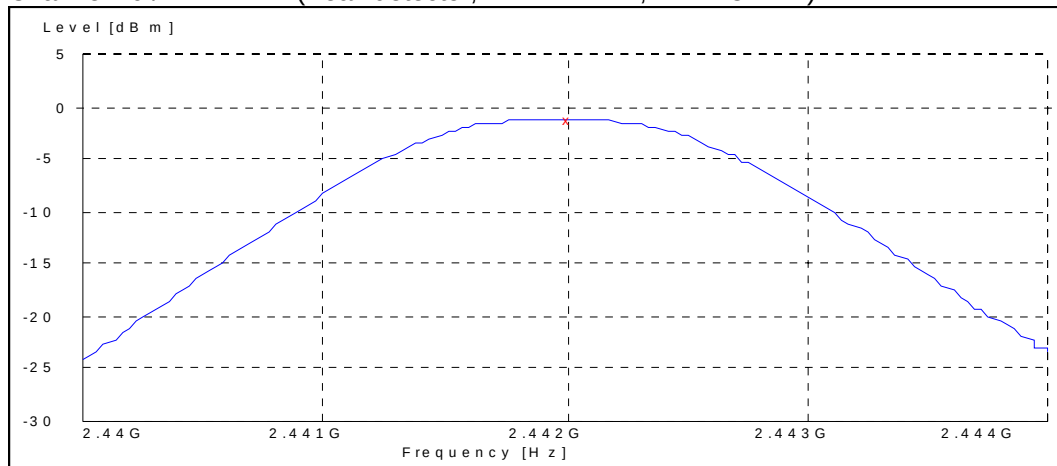
3.2.1 GFSK modulation, PRBS packet type

Channel / f_c [MHz]	P [dBm]	P [mW]	Result
0 / 2402	-1.70	0.676	PASSED
40 / 2442	-1.30	0.741	PASSED
78 / 2480	-1.20	0.759	PASSED

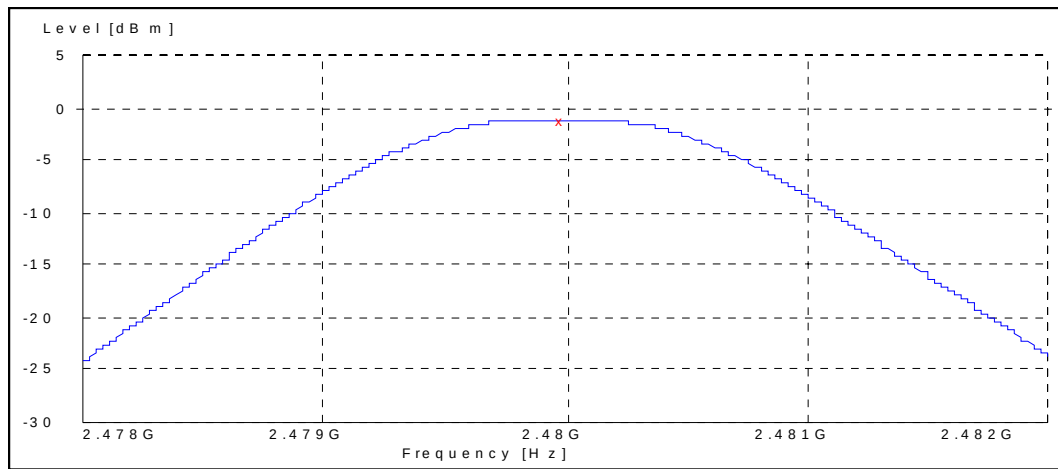
Channel 0 / 2402 MHz (Peak detector, RBW: 1 MHz, VBW: 3 MHz)



Channel 40 / 2442 MHz (Peak detector, RBW: 1 MHz, VBW: 3 MHz)



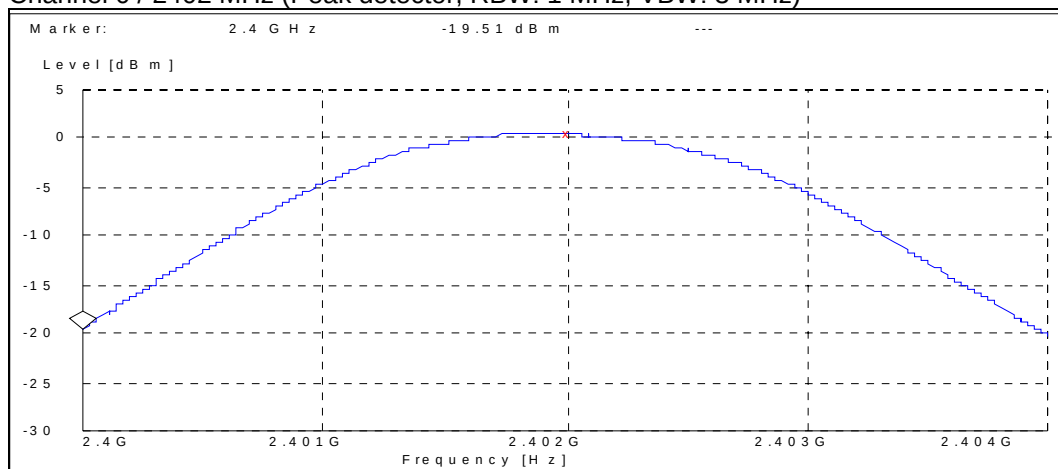
Channel 78 / 2480 MHz (Peak detector, RBW: 1 MHz, VBW: 3 MHz)



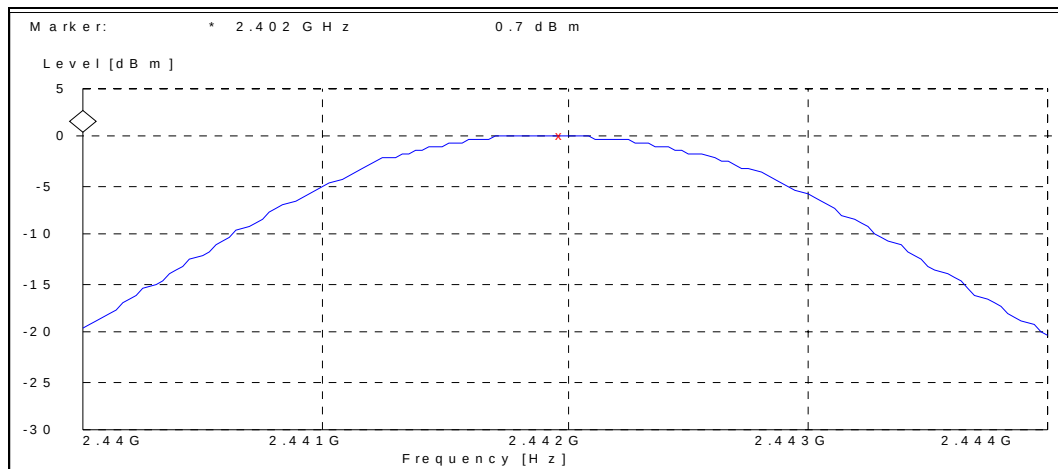
3.2.2 8DPSK modulation, PRBS packet type

Channel / f_c [MHz]	P [dBm]	P [mW]	Result
0 / 2402	0.70	1.175	PASSED
40 / 2442	0.30	1.072	PASSED
78 / 2480	-0.30	0.933	PASSED

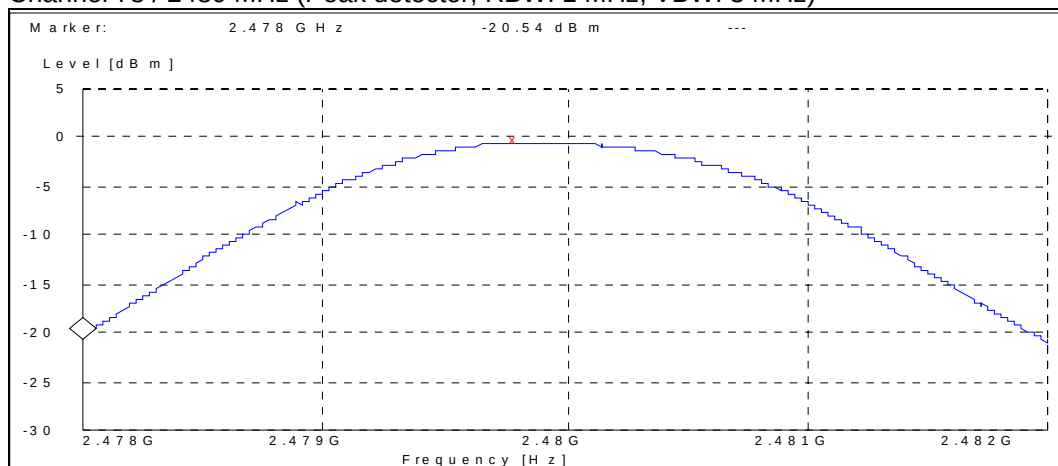
Channel 0 / 2402 MHz (Peak detector, RBW: 1 MHz, VBW: 3 MHz)



Channel 40 / 2442 MHz (Peak detector, RBW: 1 MHz, VBW: 3 MHz)



Channel 78 / 2480 MHz (Peak detector, RBW: 1 MHz, VBW: 3 MHz)



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

EUT with DUT number	RM-321 DUT 41317
Accessories with DUT numbers	BL-6F DUT 41320, AC-6C DUT 41322, CA-100C DUT 41324, AD-54 DUT 41326, HS-45 DUT 41327
Operation Voltage [V] / [Hz]	115 / 60
Result	PASSED
Remarks	Slide open
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	22 / 50 / 100.9
Date of measurements	28.11.2007
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.

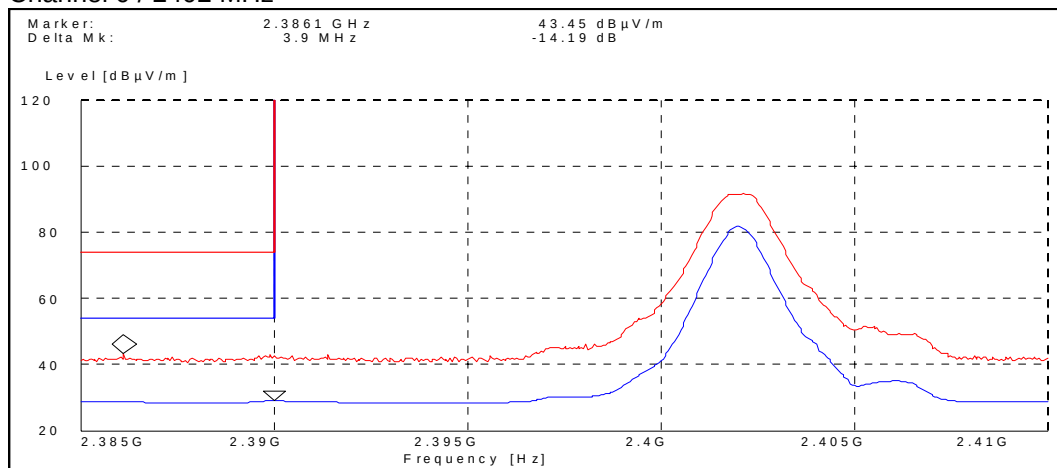
Limits for band edge compliance of RF emissions measurements (3 m measurement distance)

Frequency range [MHz]	Limit Average [dBμV/m]	Limit Peak [dBμV/m]
Below 2390 and above 2483.5	≤ 54	≤ 74

4.2. Bluetooth Test results

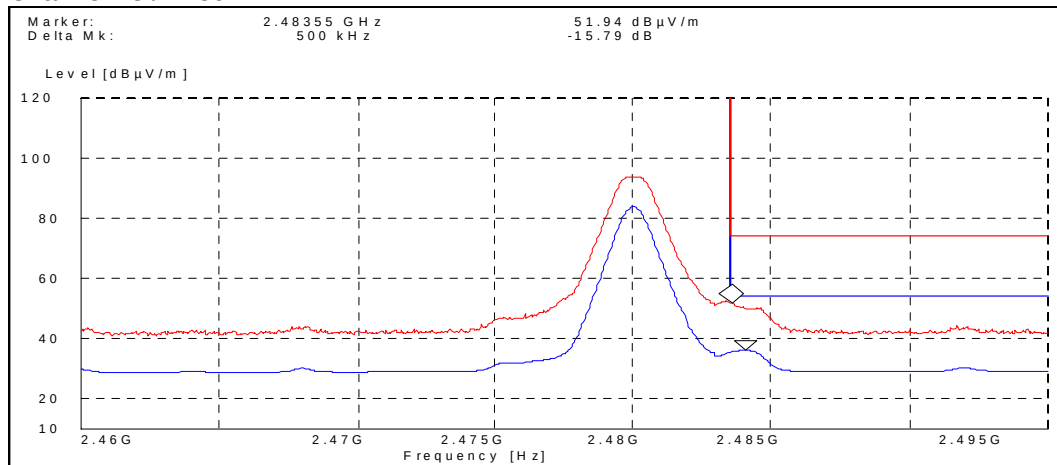
4.2.1 GFSK modulation, PRBS packet type

Channel 0 / 2402 MHz



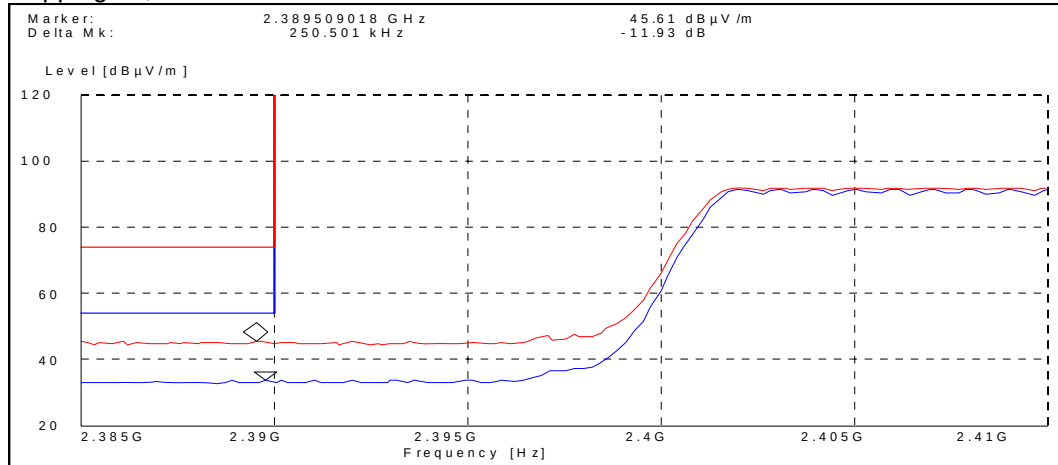
Detector (RBW: 1 MHz)	E [dBμV/m]	Result
Peak	43.50	PASSED
Average	29.30	PASSED

Channel 78 / 2480 MHz



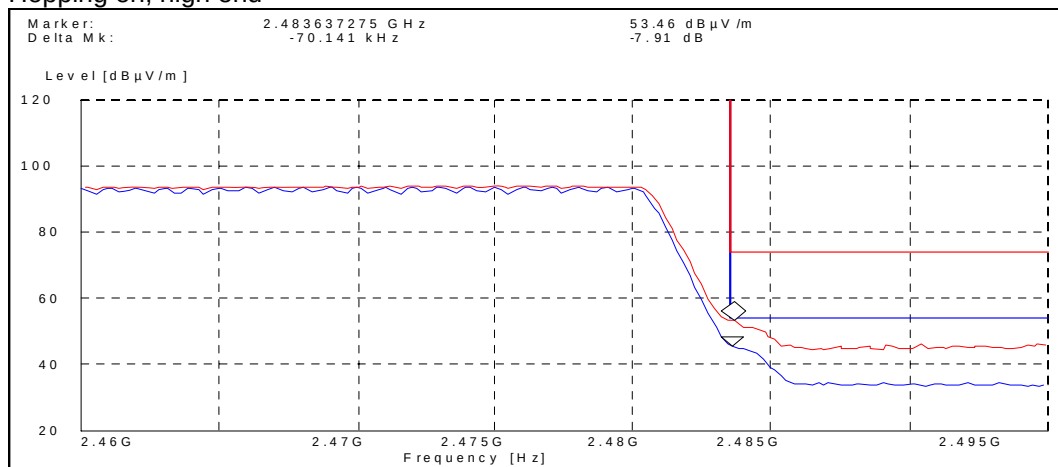
Detector (RBW: 1 MHz)	E [dBμV/m]	Result
Peak	51.90	PASSED
Average	36.10	PASSED

Hopping on, low end



Detector (RBW: 1 MHz)	E [dBμV/m]	Result
Peak	45.60	PASSED
Average	33.70	PASSED

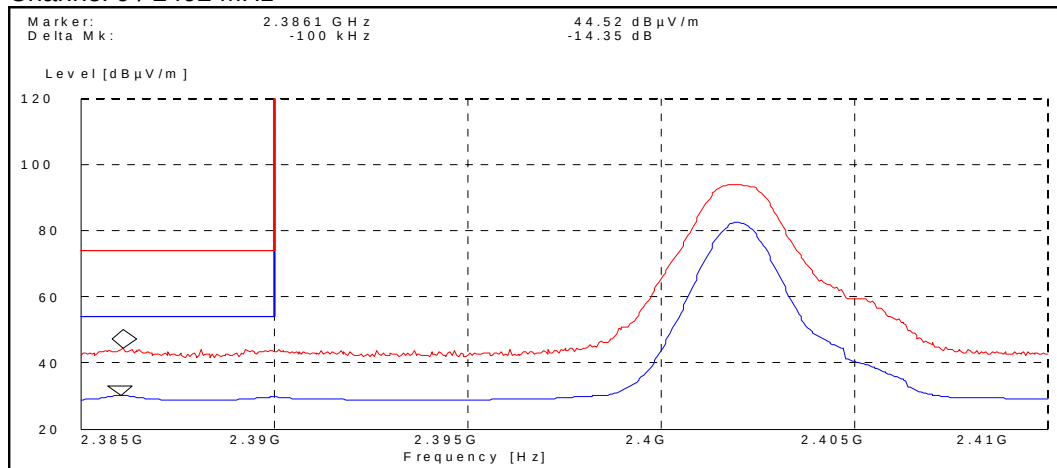
Hopping on, high end



Detector (RBW: 1 MHz)	E [dBμV/m]	Result
Peak	53.50	PASSED
Average	45.50	PASSED

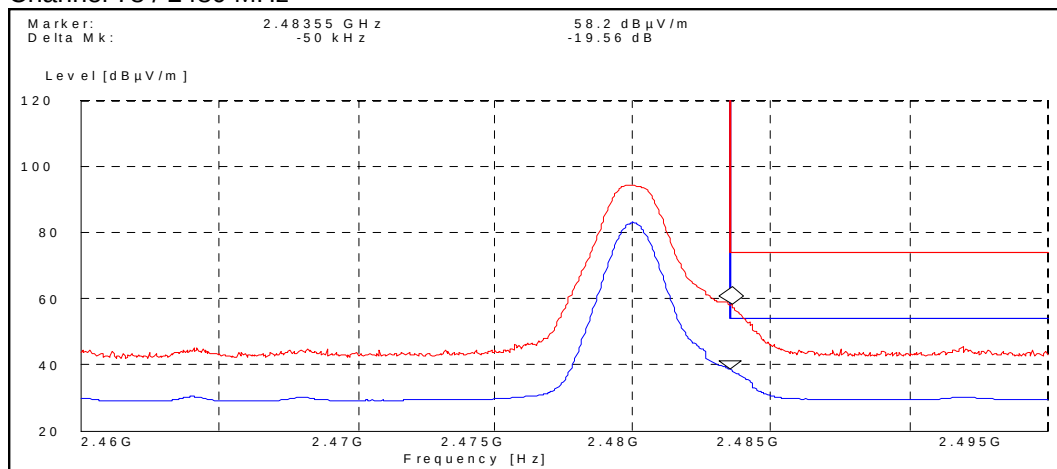
4.2.2 8DPSK modulation, PRBS packet type

Channel 0 / 2402 MHz



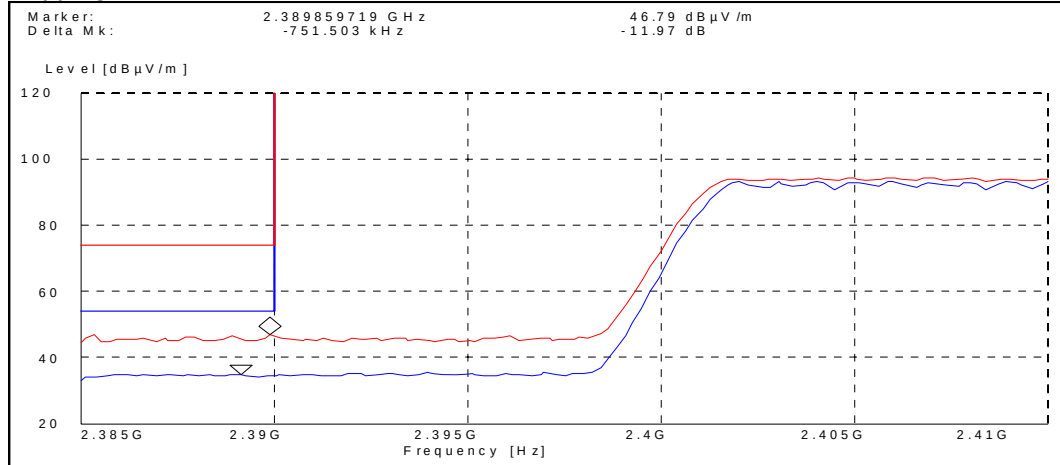
Detector (RBW: 1 MHz)	E [dBμV/m]	Result
Peak	44.50	PASSED
Average	30.20	PASSED

Channel 78 / 2480 MHz



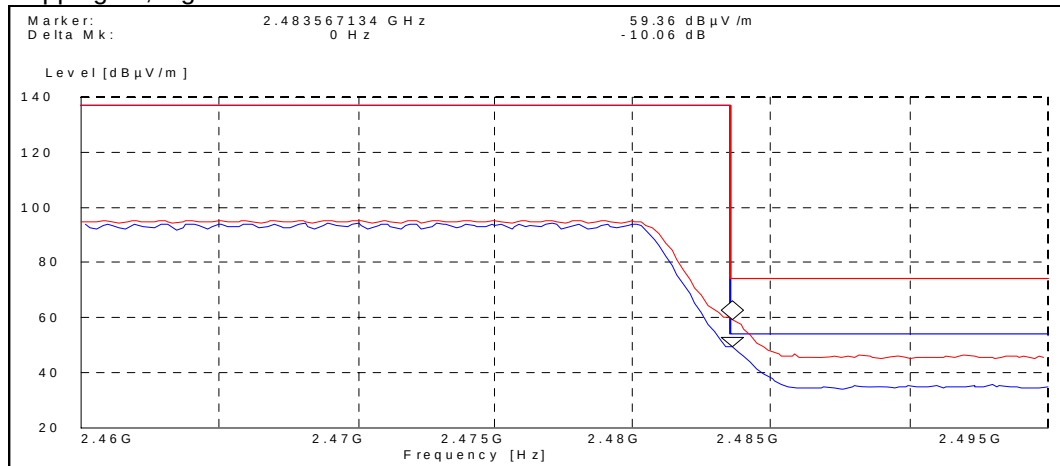
Detector (RBW: 1 MHz)	E [dBμV/m]	Result
Peak	58.20	PASSED
Average	38.60	PASSED

Hopping on, low end



Detector (RBW: 1 MHz)	E [dB μ V/m]	Result
Peak	46.80	PASSED
Average	34.80	PASSED

Hopping on, high end



Detector (RBW: 1 MHz)	E [dB μ V/m]	Result
Peak	59.40	PASSED
Average	49.30	PASSED

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

EUT with DUT number	RM-321 DUT 41319
Accessories with DUT numbers	BL-6F DUT 41321 / AC-6C DUT 41323 / CA-100C DUT 41325 / AD-54 DUT 41043 / HS-45 DUT 41044
Operation Voltage [V] / [Hz]	Nominal
Result	PASSED
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	20 / 45 / 100
Date of measurements	23.11.2007
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.

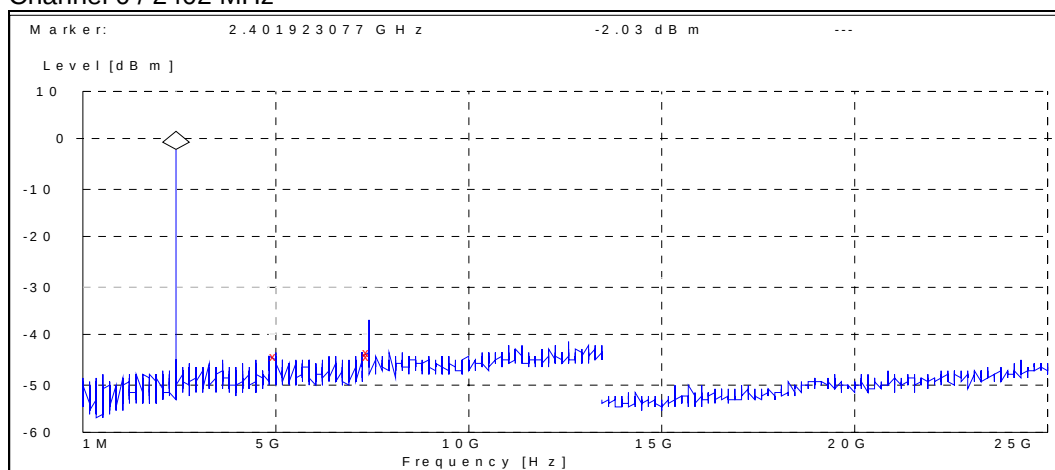
Limits for spurious RF conducted emissions measurements

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

5.2. Bluetooth Test results

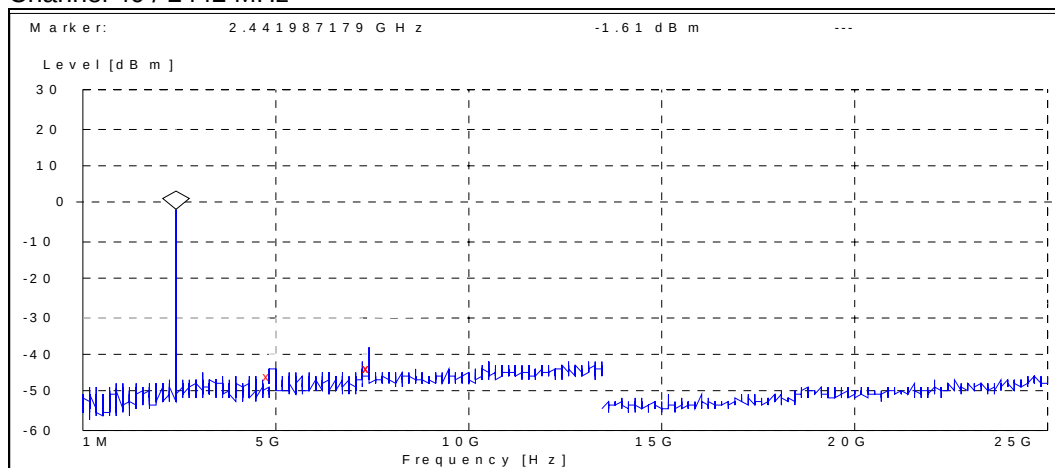
5.2.1 GFSK modulation, PRBS packet type

Channel 0 / 2402 MHz



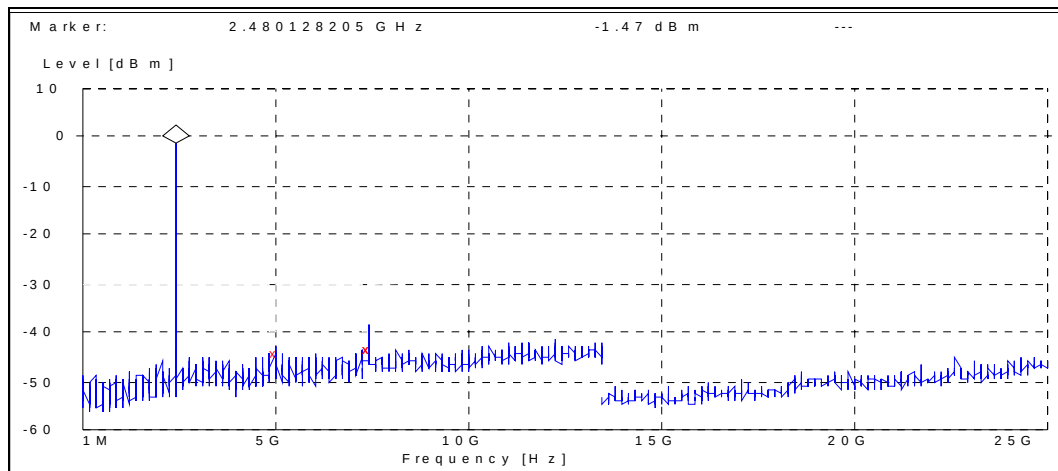
Frequency [MHz]	P [dBc]	Result
4971.474359	-42.167715	PASSED
7419.711538	-42.267715	PASSED
7500.000000	-41.467715	PASSED

Channel 40 / 2442 MHz



Frequency [MHz]	P [dBc]	Result
4864.102564	-43.793366	PASSED
7419.711538	-42.193366	PASSED
7500.000000	-42.193366	PASSED

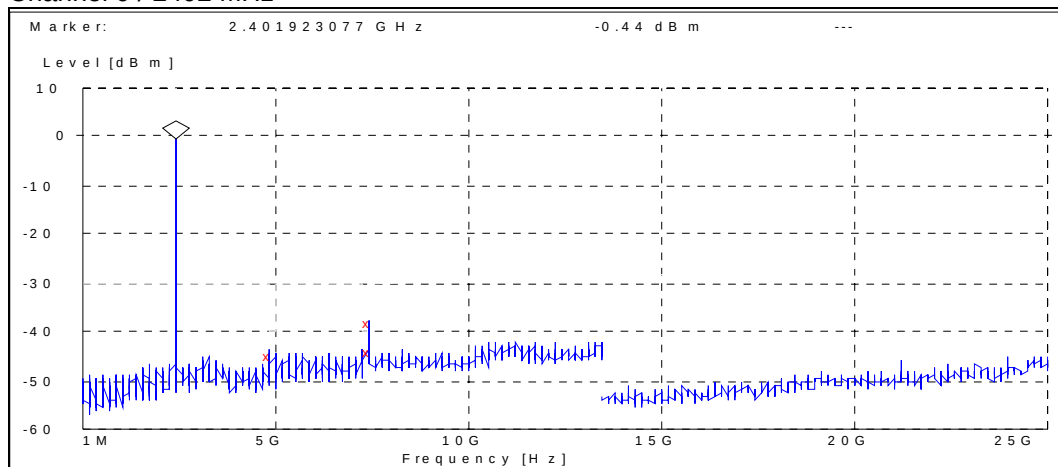
Channel 78 / 2480 MHz



Frequency [MHz]	P [dBc]	Result
4951.282051	-43.226272	PASSED
7419.711538	-42.426272	PASSED
7500.000000	-42.226272	PASSED

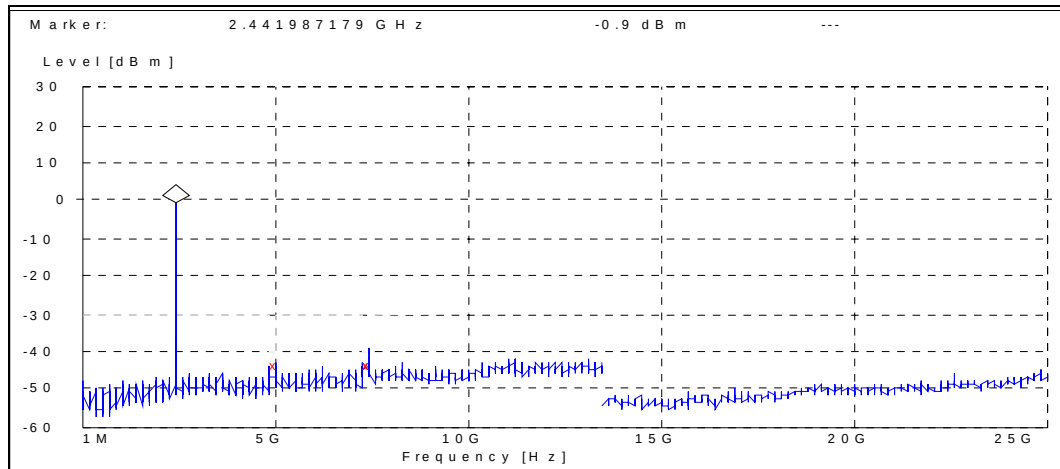
5.2.2 8DPSK modulation, PRBS packet type

Channel 0 / 2402 MHz



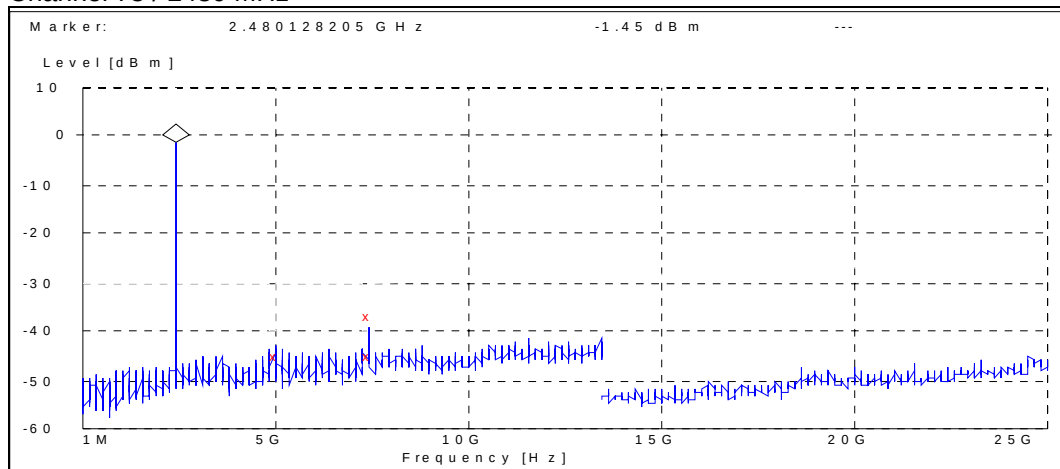
Frequency [MHz]	P [dBc]	Result
4907.051282	-44.658055	PASSED
7419.230769	-38.058055	PASSED
7500.000000	-43.758055	PASSED

Channel 40 / 2442 MHz



Frequency [MHz]	P [dBc]	Result
4959.935897	-43.097437	PASSED
7419.711538	-42.997437	PASSED
7500.000000	-42.697437	PASSED

Channel 78 / 2480 MHz



Frequency [MHz]	P [dBc]	Result
4978.525641	-43.446963	PASSED
7419.230769	-35.146963	PASSED
7500.000000	-43.346963	PASSED

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

EUT with DUT number	RM-321 DUT 41317
Accessories with DUT numbers	BL-6F DUT 41320, AC-6C DUT 41322, CA-100C DUT 41324, AD-54 DUT 41326, HS-45 DUT 41327
Operation Voltage [V] / [Hz]	115 / 60
Result	PASSED
Remarks	Slide open
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	22 / 50 / 100.9
Date of measurements	28.11.2007
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, VBW: 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	39.00	89.13	40.80	-1.8	VERTICAL	PASSED
7206.000000	42.70	136.46	40.10	2.6	HORIZONTAL	PASSED

Average (RBW: 1 MHz, VBW: 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	26.10	20.18	27.90	-1.8	HORIZONTAL	PASSED
7206.000000	29.20	28.84	26.60	2.6	HORIZONTAL	PASSED

Channel 40 / 2442 MHz

Quasi peak (RBW: 100 kHz, VBW: 100 kHz)

Frequency [MHz]	E [dB $\mu\text{V/m}$]	E [$\mu\text{V/m}$]	U _{RX} [dB μV]	A _{TOT} [dB]	Polarisation	Result
37.576353	11.80	3.89	26.40	-14.6	VERTICAL	PASSED

Peak (RBW: 1 MHz, VBW: 1 MHz)

Frequency [MHz]	E [dB $\mu\text{V/m}$]	E [$\mu\text{V/m}$]	U _{RX} [dB μV]	A _{TOT} [dB]	Polarisation	Result
4967.435872	40.50	105.93	41.70	-1.2	HORIZONTAL	PASSED
7284.575150	42.90	139.64	39.90	3.0	HORIZONTAL	PASSED
7285.069138	43.30	146.22	40.30	3.0	HORIZONTAL	PASSED
7420.341683	44.50	167.88	40.80	3.7	HORIZONTAL	PASSED
17859.217435	53.20	457.09	34.20	19.0	VERTICAL	PASSED

Average (RBW: 1 MHz, VBW: 1 MHz)

Frequency [MHz]	E [dB $\mu\text{V/m}$]	E [$\mu\text{V/m}$]	U _{RX} [dB μV]	A _{TOT} [dB]	Polarisation	Result
4965.935872	27.40	23.44	28.60	-1.2	HORIZONTAL	PASSED
7283.069138	30.40	33.11	27.40	3.0	HORIZONTAL	PASSED
7284.575150	30.30	32.73	27.30	3.0	HORIZONTAL	PASSED
7422.341683	30.80	34.67	27.10	3.7	HORIZONTAL	PASSED

17860.217435	39.90	98.86	20.90	19.0	VERTICAL	PASSED
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Channel 78 / 2480 MHz

Peak (RBW: 1 MHz, VBW: 1 MHz)

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Polarisation	Result
4960.000000	40.00	100.00	41.30	-1.3	VERTICAL	PASSED
7440.000000	43.50	149.62	39.90	3.6	HORIZONTAL	PASSED

Average (RBW: 1 MHz, VBW: 1 MHz)

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Polarisation	Result
4960.000000	27.00	22.39	28.30	-1.3	VERTICAL	PASSED
7440.000000	30.30	32.73	26.70	3.6	VERTICAL	PASSED

6.2.2 8DPSK modulation, PRBS packet type

Channel 0 / 2402 MHz

Peak (RBW: 1 MHz, VBW: 1 MHz)

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Polarisation	Result
4804.000000	38.80	87.10	40.60	-1.8	HORIZONTAL	PASSED
7206.000000	42.60	134.90	40.00	2.6	HORIZONTAL	PASSED

Average (RBW: 1 MHz, VBW: 1 MHz)

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Polarisation	Result
4804.000000	25.80	19.50	27.60	-1.8	VERTICAL	PASSED
7206.000000	29.20	28.84	26.60	2.6	HORIZONTAL	PASSED

Channel 40 / 2442 MHz

Quasi peak (RBW: 100 kHz, VBW: 100 kHz)

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Polarisation	Result
37.776353	11.20	3.63	25.90	-14.7	VERTICAL	PASSED

Peak (RBW: 1 MHz, VBW: 1 MHz)

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Polarisation	Result
7284.565130	43.30	146.22	40.30	3.0	HORIZONTAL	PASSED
7348.689379	43.80	154.88	40.60	3.2	VERTICAL	PASSED
7410.825651	43.30	146.22	39.60	3.7	VERTICAL	PASSED
7418.341683	43.00	141.25	39.30	3.7	HORIZONTAL	PASSED
17993.493988	53.40	467.74	34.00	19.4	HORIZONTAL	PASSED

Average (RBW: 1 MHz, VBW: 1 MHz)

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Polarisation	Result
7286.065130	30.30	32.73	27.30	3.0	HORIZONTAL	PASSED

7342.689379	30.20	32.36	27.00	3.2	VERTICAL	PASSED
7409.325651	30.60	33.88	26.90	3.7	VERTICAL	PASSED
7420.841683	30.70	34.28	27.00	3.7	HORIZONTAL	PASSED
17995.493988	40.50	105.93	21.10	19.4	HORIZONTAL	PASSED

Channel 78 / 2480 MHz

Peak (RBW: 1 MHz, VBW: 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	39.70	96.61	41.00	-1.3	HORIZONTAL	PASSED
7440.000000	43.00	141.25	39.40	3.6	HORIZONTAL	PASSED

Average (RBW: 1 MHz, VBW: 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	26.80	21.88	28.10	-1.3	VERTICAL	PASSED
7440.000000	30.40	33.11	26.80	3.6	HORIZONTAL	PASSED

7. Test Equipment

7.1. Conducted measurements

Eq. No	Equipment	Type	Manufacturer	Used in
TM30597	Power splitter	11667A	Agilent	22/24/27, 15C
TM37499	Power splitter	11667A	Agilent	22/24/27, 15C
TM38111	Multimeter	34401A	Agilent	22/24/27, 15C
TM38112	DC power supply	6632A	Agilent	22/24/27, 15C
TM22901	Attenuator	8496A	Agilent	22/24/27, 15C
TM30636	Artificial mains net	L2-16	PMM	15C, 15B
TM37678	Radio communication tester	CMU-200	R&S	22/24/27, 15C, 15B
TM37773	Radio communication tester	CMU-200	R&S	22/24/27, 15C, 15B
TM30600	Pulse Limiter	ESH3-Z2	R&S	15C, 15B
TM26490	LISN 50 µH	ESH3-Z5	R&S	15C, 15B
TM37610	Spectrum analyzer	FSU	R&S	22/24/27, 15C
TM22835	Multimeter	87	Fluke	15C, 15B
TM37500	Microwave switch system	7116-MSW	Keithley	22/24/27, 15C, 15B
TM22638	Power supply	OL63743-901	Transmatic	22/24/27, 15C, 15B
	Temperature chamber	VT4002	Vötsch	22/24/27, 15C
2058	EMI Test receiver	ESPC	R&S	15C, 15B
2001	Bluetooth tester	CBT	R&S	22/24/27, 15C, 15B
2002	Radio communication tester	CMU-200	R&S	22/24/27, 15C, 15B

7.2. Radiated measurements

Eq. No	Equipment	Type	Manufacturer	Used in
TM30599	3m semi-anechoic chamber		TDK	22/24/27, 15C, 15B
TM38845	EMI receiver	ESI 40	R&S	22/24/27, 15C, 15B
TM37498	Preamplifier	AMF-5D-020180-26-10P	MITEQ	22/24/27, 15C, 15B
TM37523	Preamplifier	AMF-4D-10M-3G-25-20P	MITEQ	22/24/27, 15C, 15B
TM37516	Biconilog antenna	HL562	R&S	22/24/27, 15C, 15B
TM26496	Double ridged waveguide antenna	3115	EMCO	22/24/27, 15C, 15B
TM39158	Horn antenna	3116	EMCO	22/24/27, 15C, 15B
TM26492	Reference dipole set	UHAP/VHAP	Schwarzbeck	22/24/27, 15C, 15B
TM37501	Dipole antenna	3125-870	EMCO	22/24/27
TM37502	Dipole antenna	3125-1880	EMCO	22/24/27
TM37773	Radio communication tester	CMU-200	R&S	22/24/27, 15C, 15B
TM38631	Signal generator	83640L	Agilent	22/24/27, 15C, 15B
TM38066	High pass filter	4HC3000/18000-3-KK	Trilithic	22/24/27, 15C, 15B
TM26511	Tunable notch filter	WRCA870	Wainwright	22/24/27
TM38215	Tunable notch filter	WRCD1850/1910-0.2/40	Wainwright	22/24/27
TM38214	Band reject filter	WRCT 2402/2480-2400/2483.5-30	Wainwright	15C
TM30642	Mast/Turntable controller	HD-100	Deisel	22/24/27, 15C, 15B
TM26500	Turntable	DS412	Deisel	22/24/27, 15C, 15B
TM38842	Antenna mast controller	2090	EMCO	22/24/27, 15C, 15B
TM38843	Antenna mast	2075	EMCO	22/24/27, 15C, 15B
TM38114	DC power supply	6632A	Agilent	22/24/27, 15C, 15B
TM38323	Preamplifier	PA-02 18-26 GHz	EMC Automation	22/24/27, 15C, 15B
TM37678	Radio communication tester	CMU-200	R&S	22/24/27, 15C, 15B
TM22638	Power supply	OL63743-901	Transmatic	22/24/27, 15C, 15B

Eq. No	Equipment	Type	Manufacturer	Used in
TM23892	Yaesu controller	G-1000SDX	Yaesu	22/24/27, 15C, 15B
2001	Bluetooth tester	CBT	R&S	22/24/27, 15C, 15B
2002	Radio communication tester	CMU-200	R&S	22/24/27, 15C, 15B