

FCC Part 15C Compliance Test Report

Test Report no.:	Tre_FCC_0521_02.doc	Date of Report:	03.06.2005
Number of pages:	23	Customer's Contact person:	Alison Kingston
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FCC listing no.:	94436		
IC recognition no.:	3608		
Tested devices/ accessories:	GSM phone RM-33 / Battery BL-5X, Headset HS-15, AC-charger ACP-12		
FCC ID:	QTKRM-33	IC:	661AD-RM33
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:	03-06-2005		

1. Summary for FCC Part 15C Compliance Test Report

Date of receipt	16.5.2005
Testing completed	1.6.2005
The customer's contact person	Alison Kingston
Test Plan referred to	\\satcc01nmp\TCC_Salo\Projects\RM-33\testplans\EMC\TCC\RM-33_EMC_Test_Plan.xls
Notes	-
Document name	T:\Projects\RM-33\results\emc\FCC\Tre_FCC_0521_02.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
GSM phone	RM-33	004400641731102	0551	-	3.13	40258
GSM phone	RM-33	004400641731177	0551	-	3.13	40257
Battery	BL-5X	-	-	-	-	40259
Battery	BL-5X	-	-	-	-	40260
Headset	HS-15	0485	0.2	0.7	-	40262
AC-Charger	ACP-12	-	-	-	-	40263

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

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.

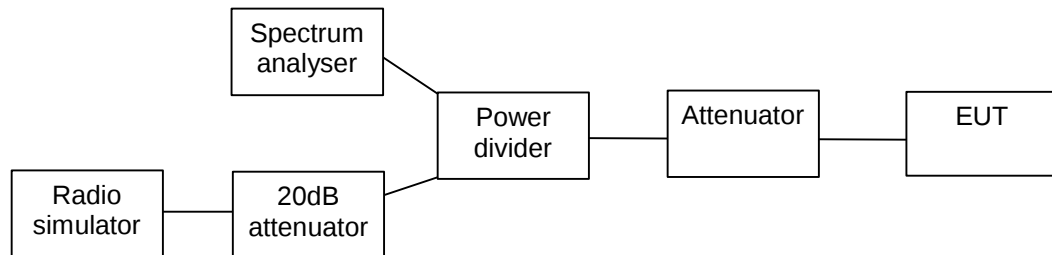
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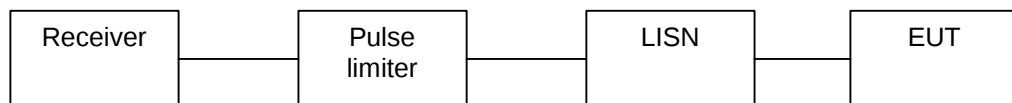
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2. Test setups

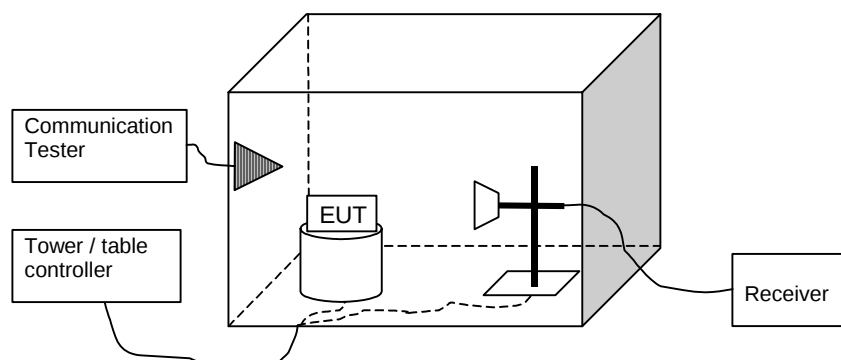
2.1. Conducted RF test setup



2.2. AC powerline conducted emissions test setup



2.3. Spurious radiated emissions test setup



3. Peak output power (FCC §15.247(b)(1), RSS-210 6.2.2(o)(a3))

EUT with DUT number	RM-33: DUT 40258
Accessories with DUT numbers	BL-5X: DUT 40259
Operation Voltage V / Hz	-
Result	Passed
Remarks	-
Temp °C / Humidity RH % / Air Pressure kPa	21.5/40/101.7
Date of measurements	26.5.2005
Measured by	Jan-Erik Lilja

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

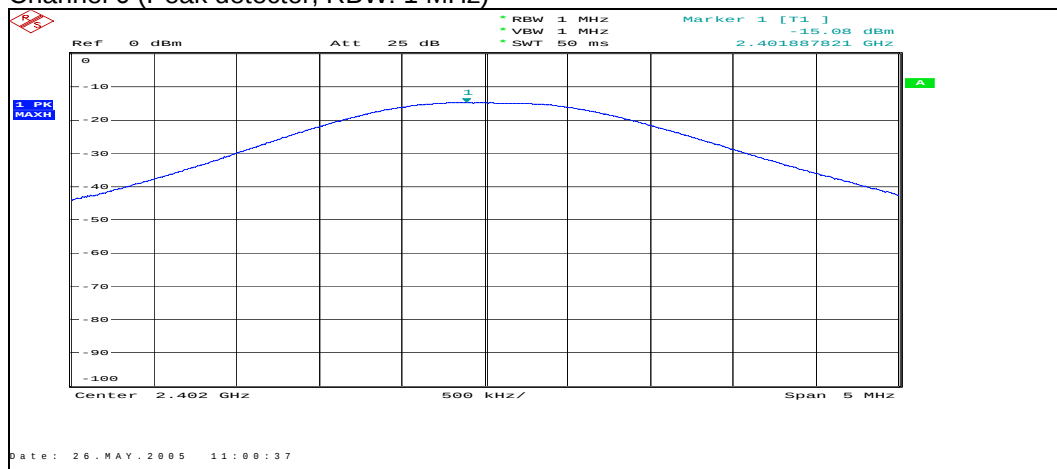
Frequency range / MHz	Limit / W	Limit / dBm
2400 – 2483.5	≤ 1	≤ 30

3.2. Bluetooth Test results

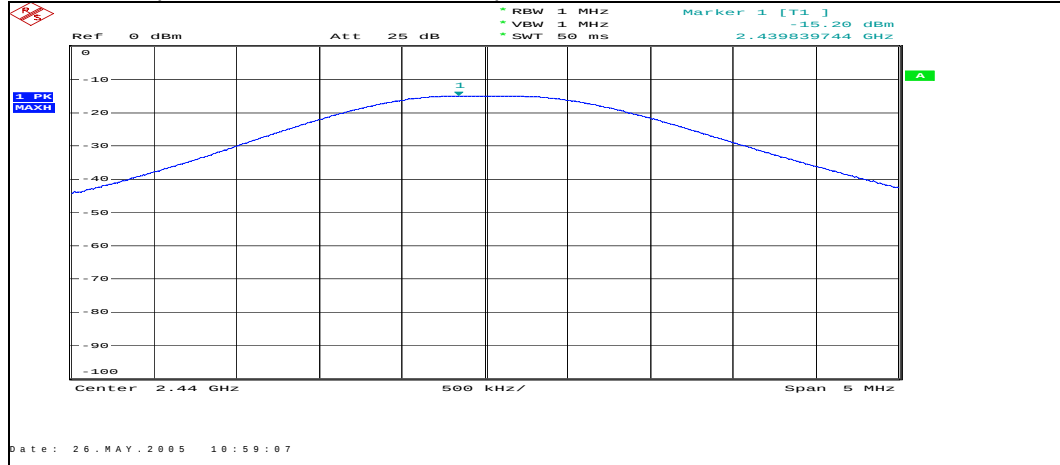
3.2.1 GSKF modulation, PRBS packet type

Channel	Frequency / MHz	Level / dBm	Level / W	A _{CORRECTION} / dB	Result
0	2402	-1.99	0.00063	13.09	Passed
38	2440	-2.03	0.00063	13.17	Passed
78	2480	-1.51	0.00071	12.74	Passed

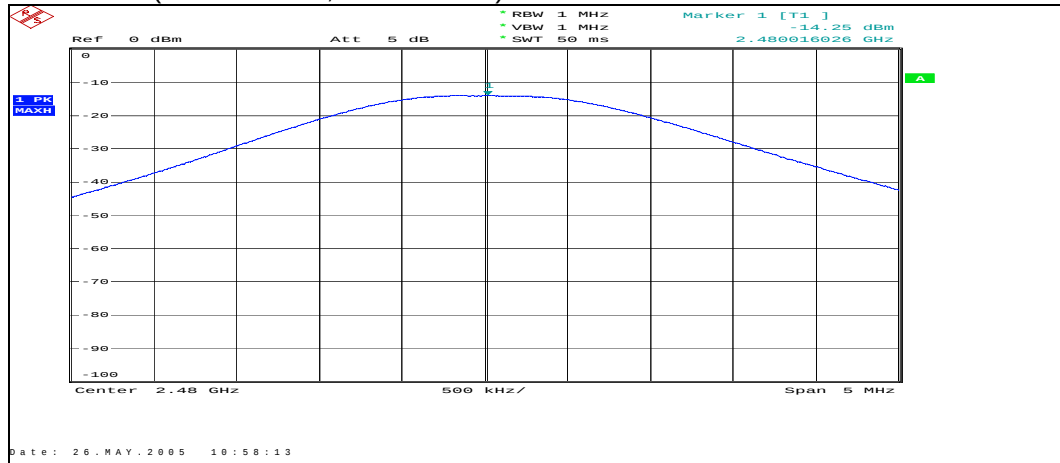
Channel 0 (Peak detector, RBW: 1 MHz)



Channel 38 (Peak detector, RBW: 1 MHz)



Channel 78 (Peak detector, RBW: 1 MHz)



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

EUT with DUT number	RM-33: DUT 40257
Accessories with DUT numbers	BL-5X: DUT 40260, HS-15: DUT 40262, ACP-12: DUT 40263
Operation Voltage V / Hz	115 / 60
Result	PASS
Remarks	-
Temp °C / Humidity RH % / Air Pressure kPa	22 / 42 / 101.7
Date of measurements	26.5.2004
Measured by	Jari Jantunen

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 GFSK modulation, PRBS packet type

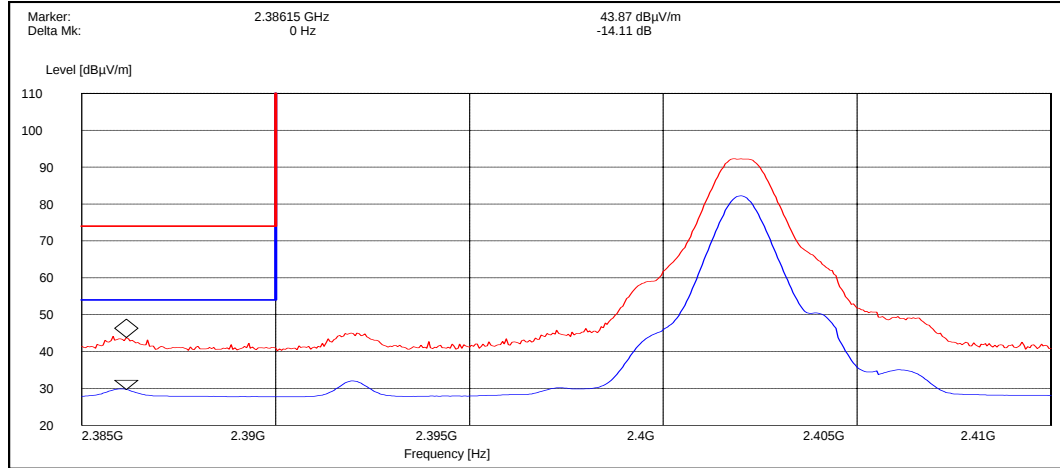
Average (RBW: 1 MHz)

Channel	Level / dBμV/m	Result
0	29.76	Passed
78	33.68	Passed
Hopping on, low end	27.70	Passed
Hopping on, high end	37.34	Passed

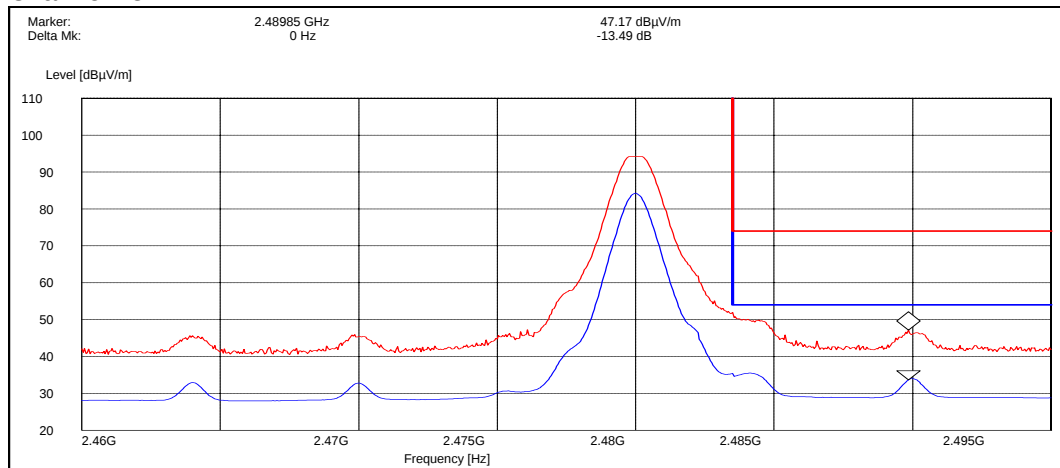
Peak (RBW: 1 MHz)

Channel	Level / dBμV/m	Result
0	43.87	Passed
78	47.17	Passed
Hopping on, low end	49.71	Passed
Hopping on, high end	64.76	Passed

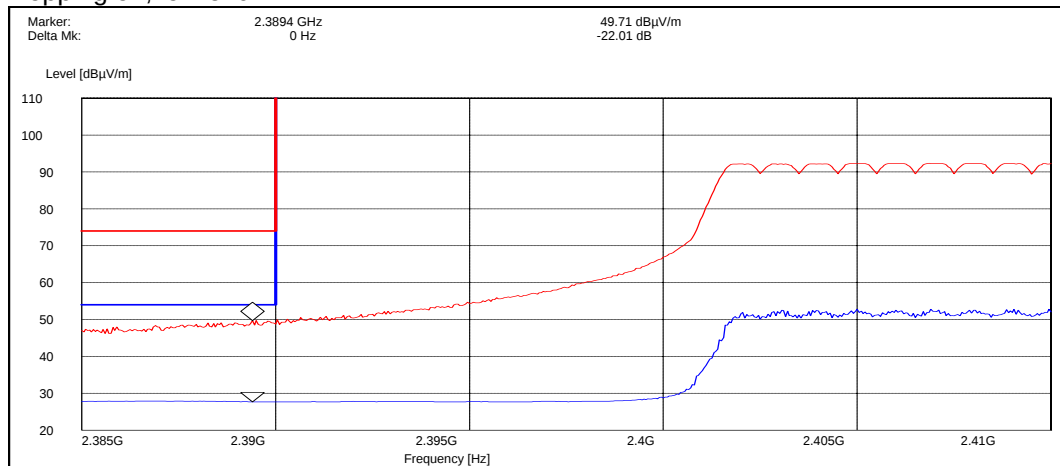
Channel 0



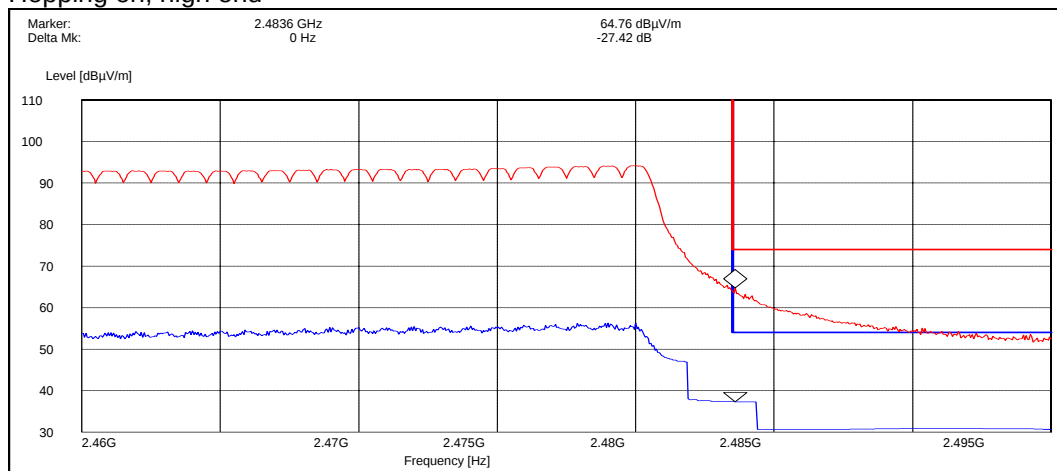
Channel 78



Hopping on, low end



Hopping on, high end



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

EUT with DUT number	RM-33: DUT 40258
Accessories with DUT numbers	BL-5X: DUT 40259
Operation Voltage V / Hz	-
Result	Passed
Remarks	-
Temp °C / Humidity RH % / Air Pressure kPa	21.5/40/101.7
Date of measurements	26.5.2005
Measured by	Jan-Erik Lilja

5.1. Test method and limit

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

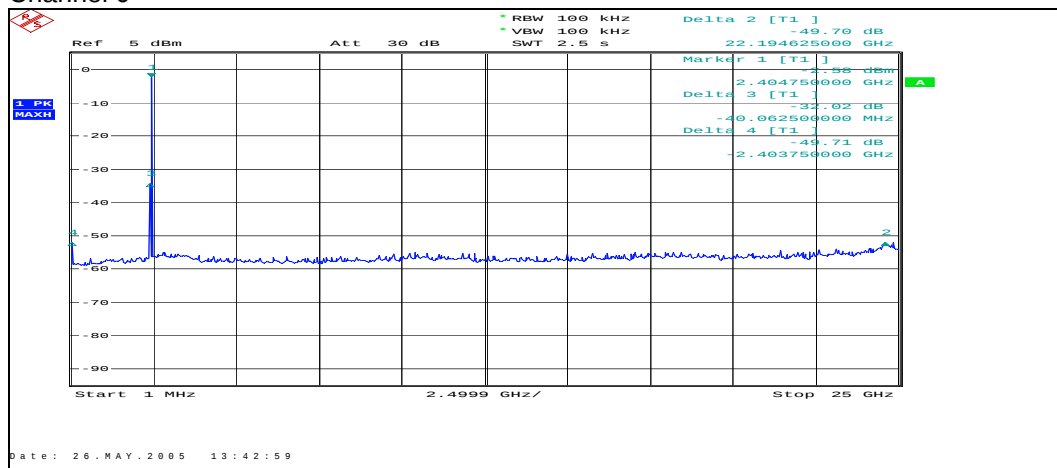
Limits for spurious RF conducted emissions measurements

Frequency range / MHz	Limit / dBc
1 – 25000	≤ -20

5.2. Bluetooth Test results

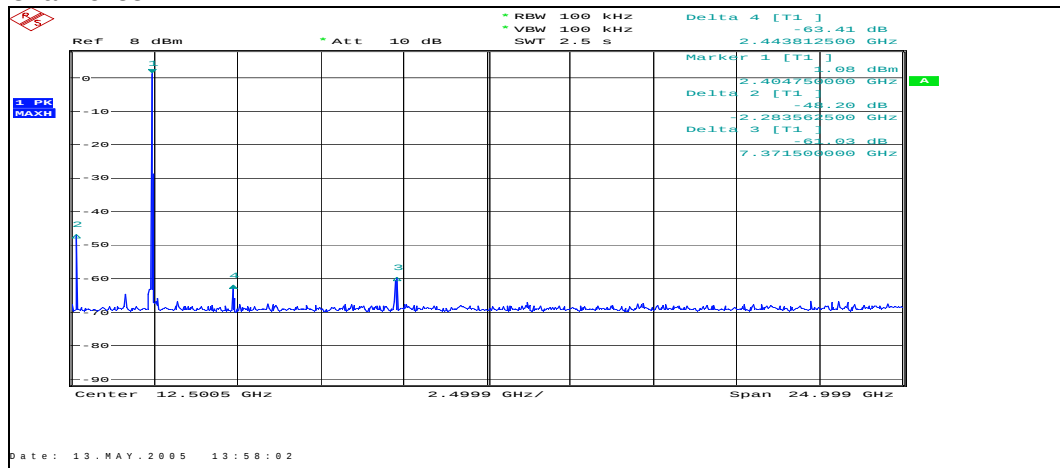
5.2.1 GFSK modulation, PRBS packet type

Channel 0



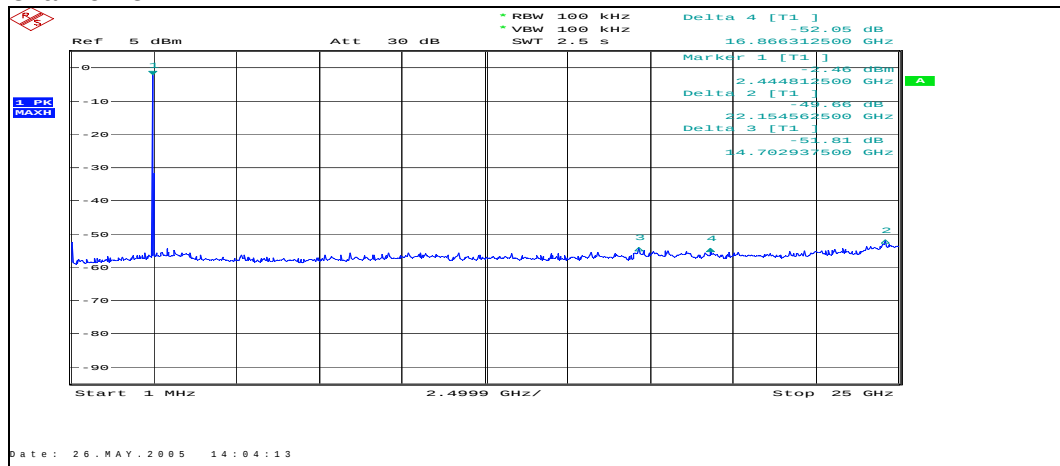
Frequency / MHz	Level / dBc	Result
1.000	-49.7	Passed
2364.688	-32.0	Passed
24599.375	-49.7	Passed

Channel 38



Frequency / MHz	Level / dBc	Result
24679.500	-50.0	Passed
1.000	-49.0	Passed

Channel 78



Frequency / MHz	Level / dBc	Result
17147.750	-51.8	Passed
19311.125	-52.1	Passed
24599.375	-49.7	Passed

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

EUT with DUT number	RM-33: DUT 40257
Accessories with DUT numbers	BL-5X: DUT 40260, HS-15: DUT 40262, ACP-12: DUT 40263
Operation Voltage V / Hz	115 / 60
Result	PASS
Remarks	-
Temp °C / Humidity RH % / Air Pressure kPa	23/45/100.7
Date of measurements	1.6.2005
Measured by	Jari Jantunen

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:

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

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

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

Average (RBW: 1 MHz)

Frequency / MHz	Level / dBμV/m	Level / μV/m	A _{CORRECTION} / dB	Polarisation	Result
4804.000000	28.10	25.41	-2.00	VERTICAL	PASS
7206.000000	31.60	38.02	1.80	VERTICAL	PASS

Peak (RBW: 1 MHz)

Frequency / MHz	Level / dBμV/m	Level / μV/m	A _{CORRECTION} / dB	Polarisation	Result
4804.000000	40.70	108.39	-2.00	VERTICAL	PASS
7206.000000	45.00	177.83	1.80	VERTICAL	PASS

Channel 40

Average (RBW: 1 MHz)

Frequency / MHz	Level / dBμV/m	Level / μV/m	A _{CORRECTION} / dB	Polarisation	Result
4882.000000	28.30	26.00	-2.40	VERTICAL	PASS
7323.000000	32.20	40.74	2.40	VERTICAL	PASS

Peak (RBW: 1 MHz)

Frequency / MHz	Level / dBμV/m	Level / μV/m	A _{CORRECTION} / dB	Polarisation	Result
4882.000000	41.30	116.14	-2.40	VERTICAL	PASS
7323.000000	44.60	169.82	2.40	VERTICAL	PASS

Channel 78

Average (RBW: 1 MHz)

Frequency / MHz	Level / dBμV/m	Level / μV/m	A _{CORRECTION} / dB	Polarisation	Result
4960.000000	29.90	31.26	-1.40	VERTICAL	PASS
7440.000000	32.00	39.81	2.40	VERTICAL	PASS

Peak (RBW: 1 MHz)

Frequency / MHz	Level / dBμV/m	Level / μV/m	A _{CORRECTION} / dB	Polarisation	Result
4960.000000	43.10	142.89	-1.40	VERTICAL	PASS
7440.000000	44.70	171.79	2.40	VERTICAL	PASS

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

EUT with DUT number	RM-33: DUT 40257
Accessories with DUT numbers	BL-5X 40260, ACP-12: DUT 40262, HS-15: DUT 40263
Operation Voltage V / Hz	115 / 60
Result	PASS
Remarks	-
Temp °C / Humidity RH % / Air Pressure kPa	19 / 51 / 101.6
Date of measurements	31.5.2005
Measured by	Jari Jantunen

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.

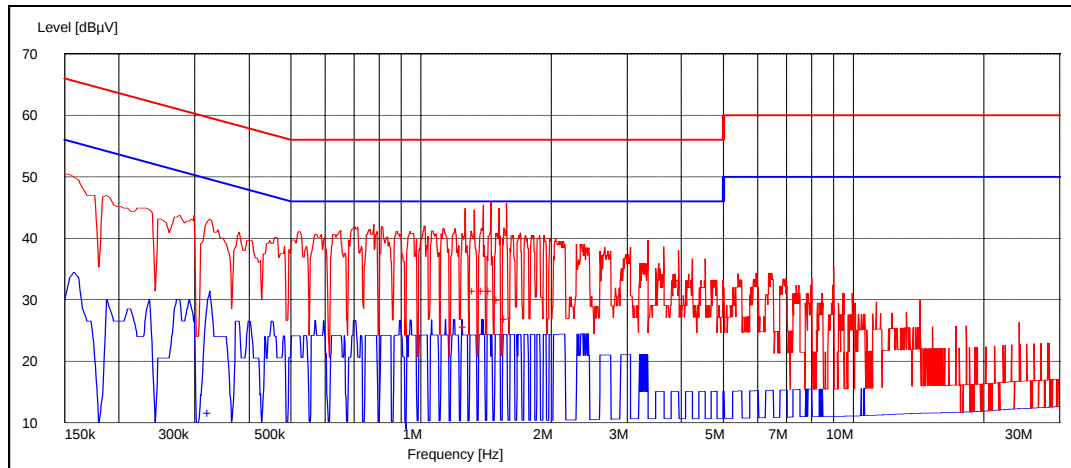
CISPR 22 Class B limits

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

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
1.265932	25.60	L1	PASS
1.328958	31.40	N	PASS
1.391984	31.40	N	PASS
1.451303	31.40	N	PASS
1.514329	30.00	N	PASS
1.577355	26.80	N	PASS

Average (RBW: 9 kHz)

Frequency / MHz	Level / dBμV	Line	Result
0.324248	11.50	N	PASS
1.058317	7.20	N	PASS
1.139880	5.00	N	PASS
1.195491	5.50	N	PASS
1.243687	6.30	N	PASS
1.388277	5.60	N	PASS

8. 20 dB bandwidth (FCC §15.247(a)(1), RSS-210 6.2.2(o)(a3))

EUT with DUT number	RM-33: DUT 40258
Accessories with DUT numbers	BL-5X: DUT 40259
Operation Voltage V / Hz	-
Result	Passed
Remarks	-
Temp °C / Humidity RH % / Air Pressure kPa	21.5/40/101.7
Date of measurements	26.5.2005
Measured by	Jan-Erik Lilja

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

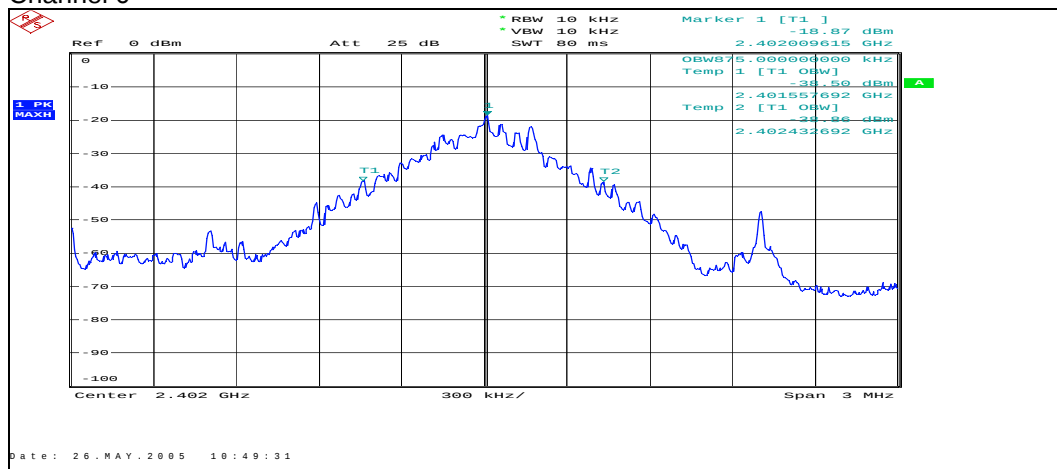
Limit / MHz
≤ 1

8.2. Bluetooth Test results

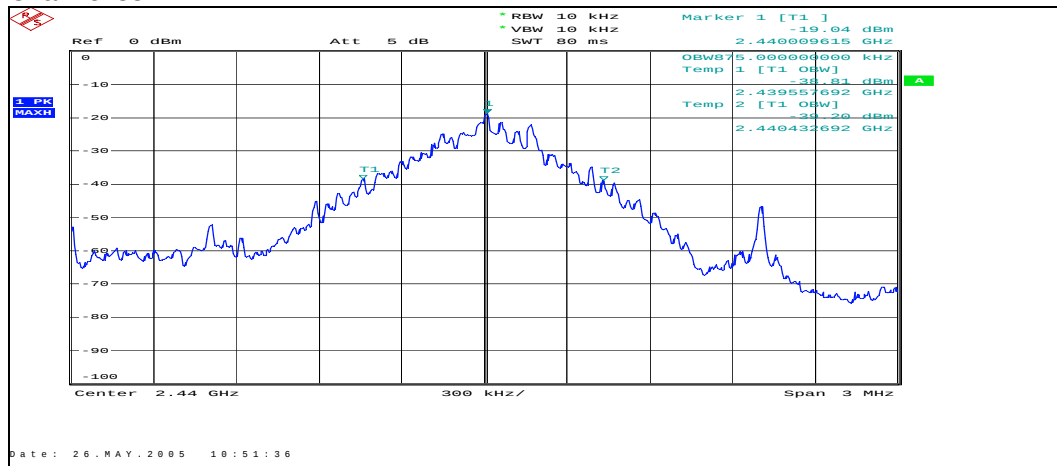
8.2.1 GFSK modulation, PRBS packet type

Channel	20 dB bandwidth / kHz	Result
0	875.0	Passed
38	875.0	Passed
78	879.8	Passed

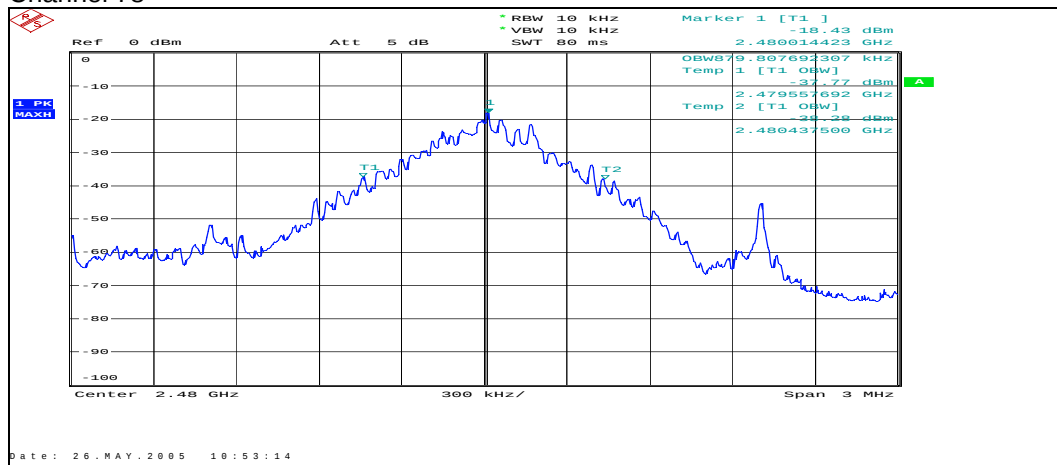
Channel 0



Channel 38



Channel 78



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

EUT with DUT number	RM-33: DUT 40258
Accessories with DUT numbers	BL-5X: DUT 40259
Operation Voltage V / Hz	-
Result	Passed
Remarks	
Temp °C / Humidity RH % / Air Pressure kPa	22/40/101.7
Date of measurements	25.05.2005
Measured by	Jan-Erik Lilja

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

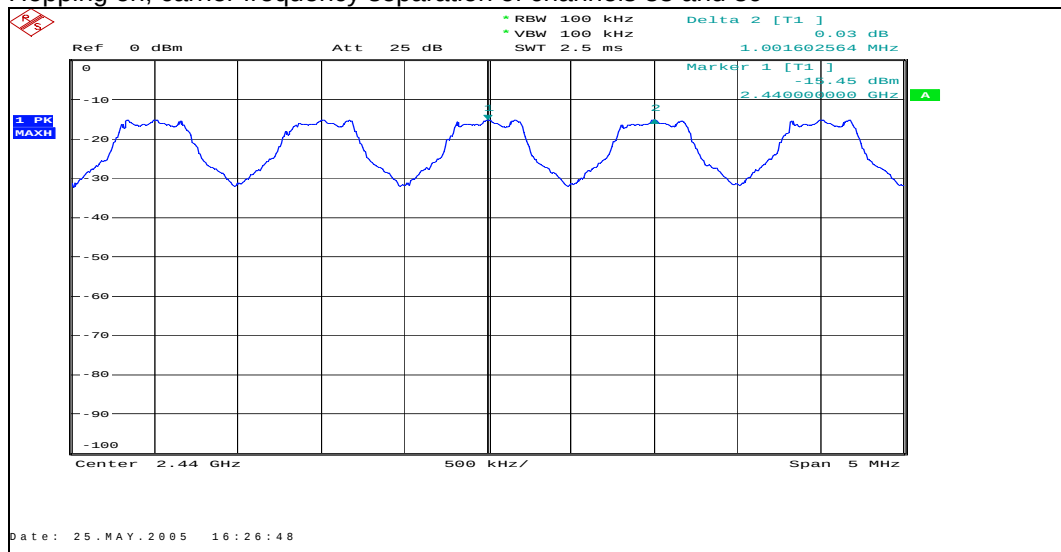
Limit / MHz
≥ 0.025 or 20 dB bandwidth

9.2. Bluetooth Test results

9.2.1 GFSK modulation, PRBS packet type

Carrier frequency separation / kHz	Result
1001.6	Passed

Hopping on, carrier frequency separation of channels 38 and 39



10. Number of hopping frequencies (FCC §15.247(a)(1)(iii), RSS-210 Amend I(ii))

EUT with DUT number	RM-33: DUT 40258
Accessories with DUT numbers	BL-5X: DUT 40259
Operation Voltage V / Hz	-
Result	Passed
Remarks	-
Temp °C / Humidity RH % / Air Pressure kPa	21.5/40/101.7
Date of measurements	26.5.2005
Measured by	Jan-Erik Lilja

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

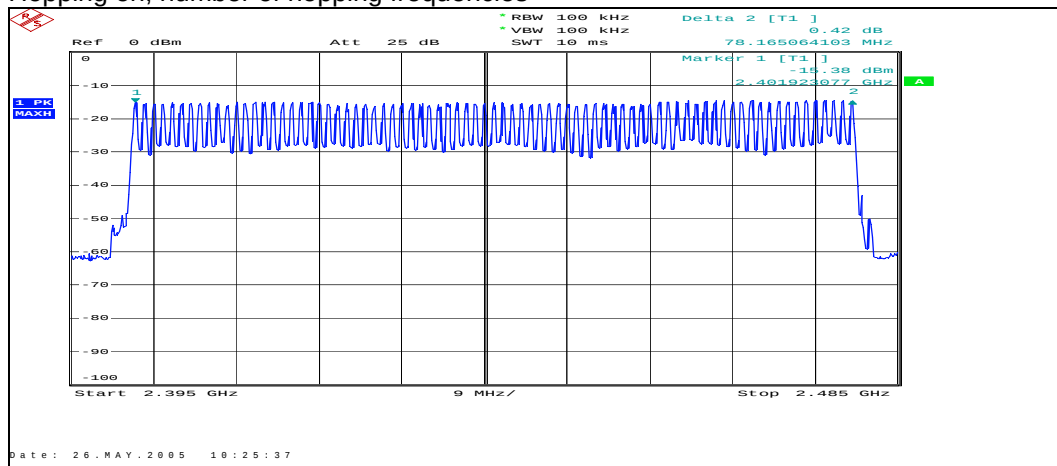
Limit / number
≥ 75

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



11. Time of occupancy (FCC §15.247(a)(1)(iii), RSS-210 Amend I(ii))

EUT with DUT number	RM-33: DUT 40258
Accessories with DUT numbers	BL-5X: DUT 40259
Operation Voltage V / Hz	-
Result	Passed
Remarks	-
Temp °C / Humidity RH % / Air Pressure kPa	21.5/40/101.7
Date of measurements	26.5.2005
Measured by	Jan-Erik Lilja

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

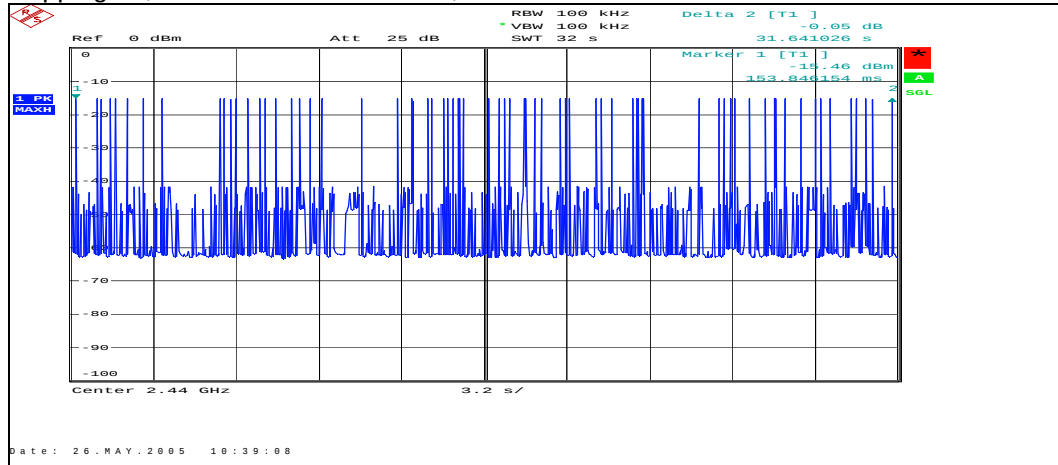
Limit / s
≤ 0.4

11.2. Bluetooth test results

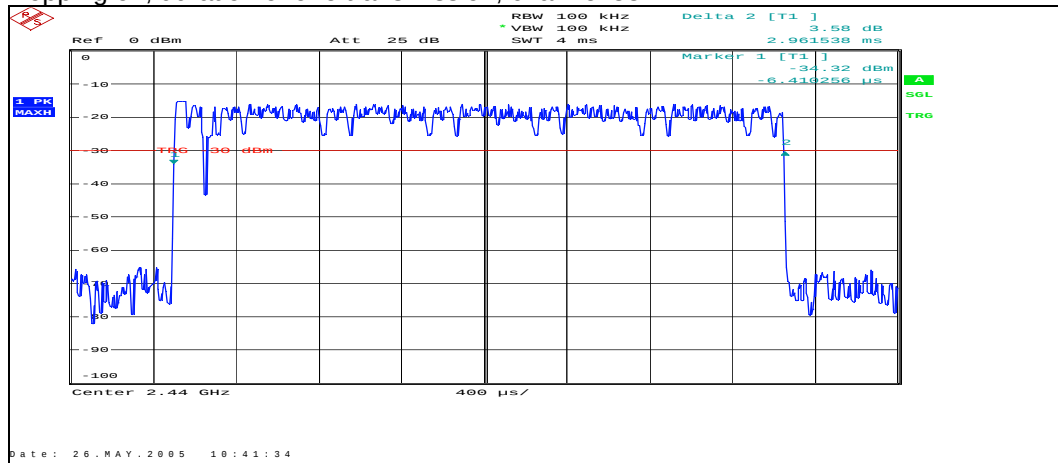
11.2.1 GFSK modulation, PRBS packet type

Measured number of transmissions	Duration of one transmission / ms	Time of occupancy /s	Result
69	2.961538	0.284	Passed

Hopping on, number of transmissions, channel 38



Hopping on, duration of one transmission, channel 38



12. Test Equipment

12.1. Conducted measurements

Eq. No	Equipment	Type	Manufacturer	Used in
TM37610	Spectrum analyzer	FSU	R&S	15C,22/24
TM37678	Radio communication tester	CMU-200	R&S	15C,22/24
	Attenuator 10 dB	6251.17.A	Huber+Suhner AG	15C,22/24
TM22901	Step attenuator 110dB	8496A	Agilent	15C,22/24
TM37499	Power splitter	11667A	Agilent	15C,22/24
	Temperature chamber	VT4002	Vötsch	15C,22/24
TM38112	DC power supply	6632A	Agilent	15C,22/24
TM38111	Multimeter	34401A	Agilent	15C,22/24
TM38845	EMI receiver	ESI 40	R&S	15B,15C
TM37773	Radio communication tester	CMU-200	R&S	15B,15C
TM38631	Signal generator	83640L	Agilent	15B,15C
TM38114	DC power supply	6632A	Agilent	15B,15C
TM22835	Multimeter	87	Fluke	15B,15C
TM30600	Pulse Limiter	ESH3-Z2	R&S	15B,15C
TM26490	LISN 50 µH	ESH3-Z5/	R&S	15B,15C
TM30636	LISN 50 µH	L2-16/	PMM	15B,15C

12.2. Radiated measurements

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