

FCC Part 22/24 Compliance Test Report

Test Report no.:	Document1	Date of Report:	30.11.2005
Number of pages:	20	Customer's Contact person:	Tero Huhtala
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FCC listing no.:	94436		
IC recognition no.:	3608		
Tested devices/ accessories:	GSM phone RM-24 / Battery BL-6C, AC charger ACP-12, Headset HS-5, Dummy battery SD-5ETR		
FCC ID:	PDNRM-24	IC:	661R-RM24
Supplement reports:	-		
Testing has been carried out in accordance with:	CFR 47, FCC rules Parts 22 and 24, TIA-603-B-2002 and IC standards RSS-GEN, RSS-132 and RSS-133. 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 22/24 Compliance Test Report

Date of receipt	14.11.2005
Testing completed	21.11.2005
The customer's contact person	Tero Huhtala
Test Plan referred to	\\EMC\\TESTPLAN\\
Notes	-
Document name	T:\\Projects\\RM-24\\EMC\\Results\\FCC\\Tre_FCC_0546_05.doc

1.1. EUT and Accessory Information

The EUT is a quadri band (GSM850/1800/1900 and WCDMA2100) mobile phone with GPRS, EGPRS, Bluetooth and WLAN. The EUT is tested with maximum rated TX power, modulated with pseudo random bit sequence (PRBS9).

Product	Type	SN	HW	MV	SW	DUT
Phone	RM-24	004400701628990	3150	-	200542_RnD_Zeus	40442
Phone	RM-24	004400701628941	3150	-	200542_RnD_Zeus	40444
Battery	BL-6C	-	4.2	-	-	40447
Dummy Battery	SD-5ETR	-	-	-	-	40448
Headset	HS-5	-	1.1	1.4	-	40450
Headset	HS-5	-	1.1	1.4	-	40451
AC charger	ACP-12	-	1.3	-	-	40452

1.2. Summary of Test Results

GSM 850:

Section in CFR 47	Section in RSS-GEN or RSS-132	Name of the test	Result
§2.1046(a), 22.913(a)	4.6, 4.4	Conducted RF output power	NP
§22.913(a)	4.6, 4.4	Radiated RF output power	NP
§2.1049(h)	4.4.1	99 % occupied bandwidth	PASSED
§22.917(a)	4.7, 4.5	Band edge compliance	PASSED
§22.917(a), §2.1051	4.7, 4.5	Spurious emissions at antenna terminals	NP
§22.917(a), §2.1053	4.7, 4.5	Spurious radiated emissions	PASSED
§2.1055(a)	4.5, 4.3	Frequency stability, temperature variation	PASSED
§2.1055(d)	4.5, 4.3	Frequency stability, voltage variation	PASSED

GSM 1900:

Section in CFR 47	Section in RSS-133	Name of the test	Result
§2.1046(a)	6.2	Conducted RF output power	NP
§24.232(b)	6.2	Radiated RF output power	NP
§2.1049(h)	5.6	99 % occupied bandwidth	PASSED
§24.238(a)	6.3	Band edge compliance	PASSED
§24.238(a), §2.1051	6.3	Spurious emissions at antenna terminals	NP
§24.238(a), §2.1053	6.3	Spurious radiated emissions	PASSED
§2.1055(a)	7	Frequency stability, temperature variation	PASSED
§2.1055(d)	7	Frequency stability, voltage variation	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.

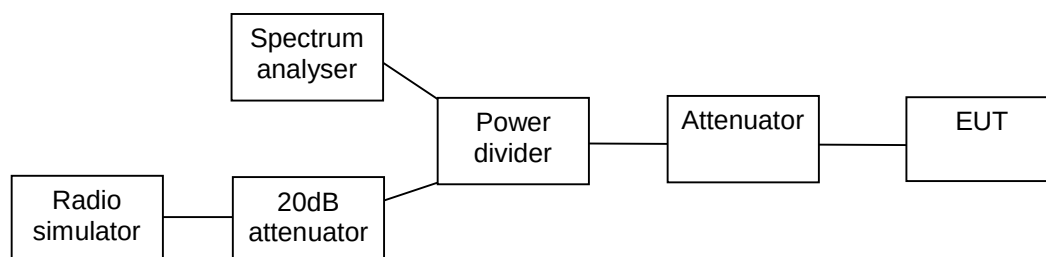
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2. 99 % occupied bandwidth (FCC §2.1049(h), RSS-GEN 4.4.1, RSS-133 5.6)

EUT with DUT number	Phone: DUT 40444
Accessories with DUT numbers	Dummy Battery: DUT 40448, Headset: DUT 40451
Operation Voltage [V] / [Hz]	Nominal
Result	Passed
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	22/55/100.6-102.9
Date of measurements	19.11, 21.11.2005
Measured by	Jan-Erik Lilja

2.1. Test setup



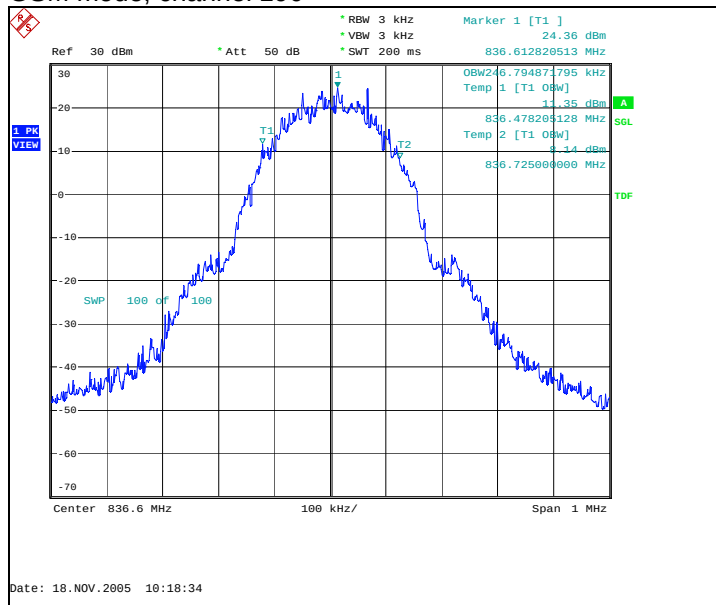
2.2. Test method and limit

The measurement is made according to FCC rules part 22 and 24 and IC standards RSS-GEN and RSS-133.

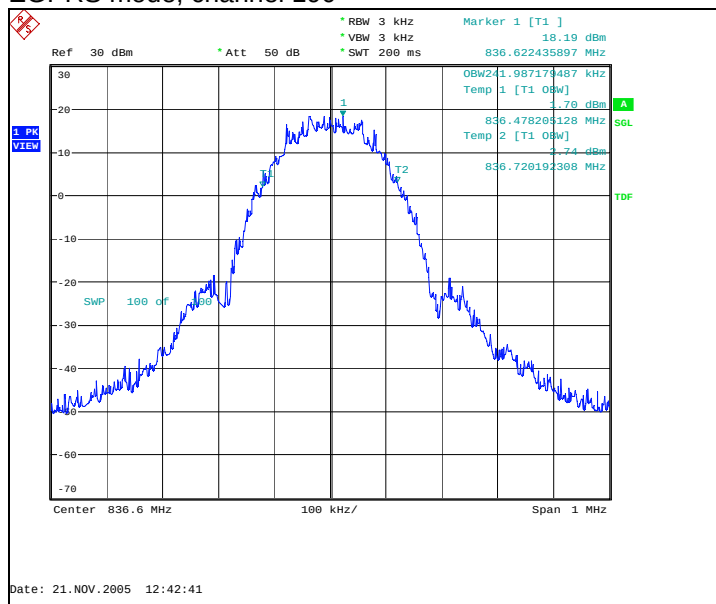
2.3. GSM 850 Test results

Operation mode (TX on)	99% occupied bandwidth [kHz]
GSM	246.795
EGPRS	241.987

GSM mode, channel 190



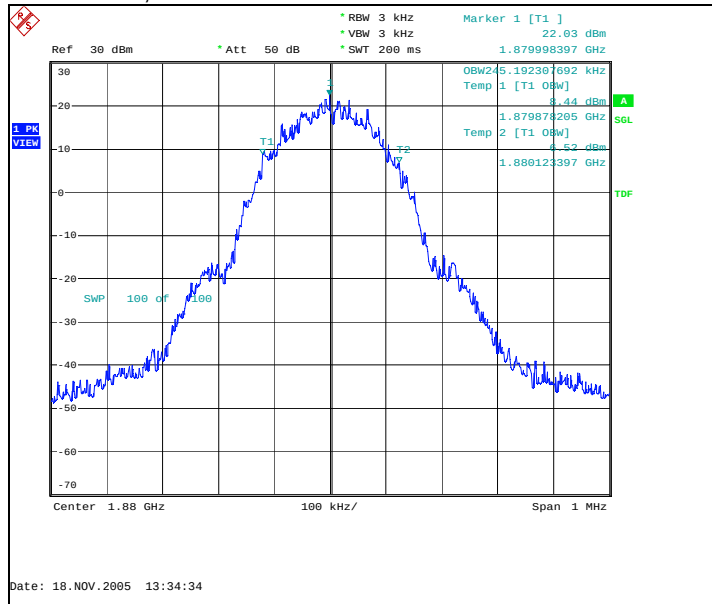
EGPRS mode, channel 190



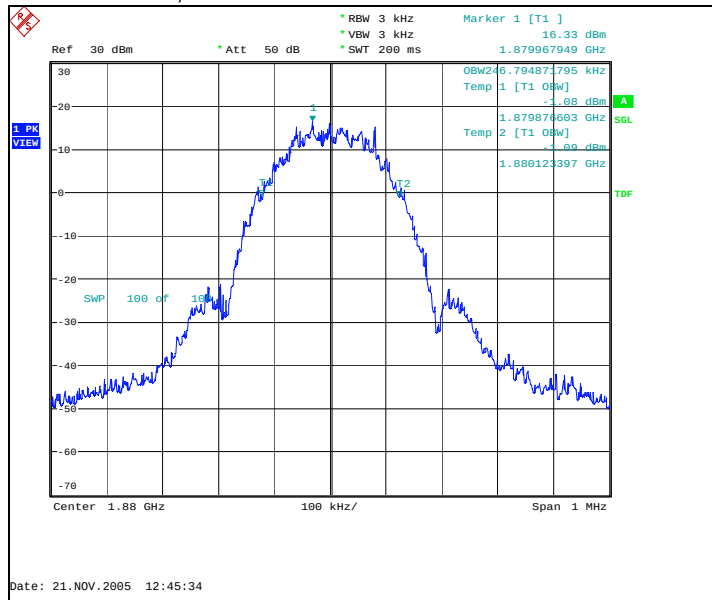
2.4. GSM 1900 Test results

Operation mode (TX on)	99% occupied bandwidth [kHz]
GSM	245.192
EGPRS	246.795

GSM mode, channel 661



EGPRS mode, channel 661

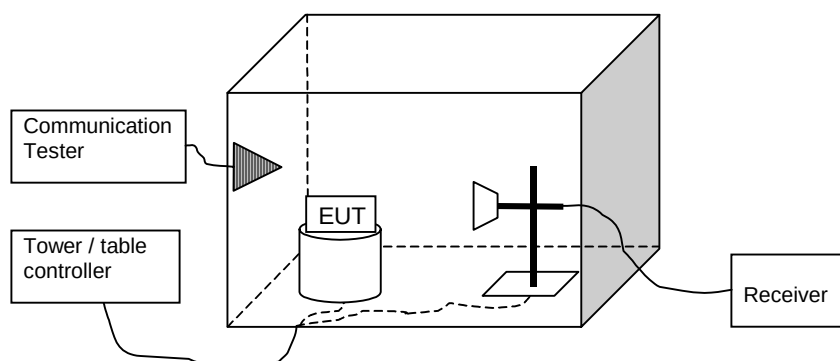


3. Band edge compliance

(FCC §22.917(a), 24.238(a), RSS-GEN 4.7, RSS-132 4.5, RSS-133 6.3)

EUT with DUT number	RM-24 DUT 40442
Accessories with DUT numbers	BL-6C DUT 40447, ACP-12 DUT 40452, HS-5 DUT 40450
Operation Voltage [V] / [Hz]	115 / 60
Result	PASSED
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	23 / 45 / 98.7
Date of measurements	16.11.2005
Measured by	Jari Jantunen

3.1. Test setup



3.2. Test method and limit

The measurement is made according to FCC rules part 22 and 24 and IC standards RSS-GEN, RSS-132 and RSS-133.

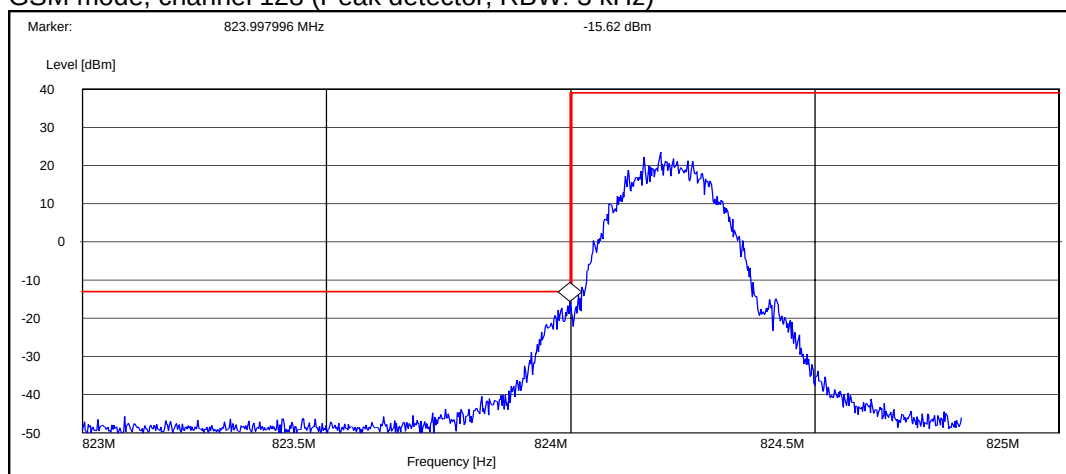
Limits for band edge compliance measurements

Operation band	Frequency range [MHz]	Limit [dBm]
GSM 850 / WCDMA 850	Below 824 and above 849	-13
GSM 1900 / WCDMA 1900	Below 1850 and above 1910	-13

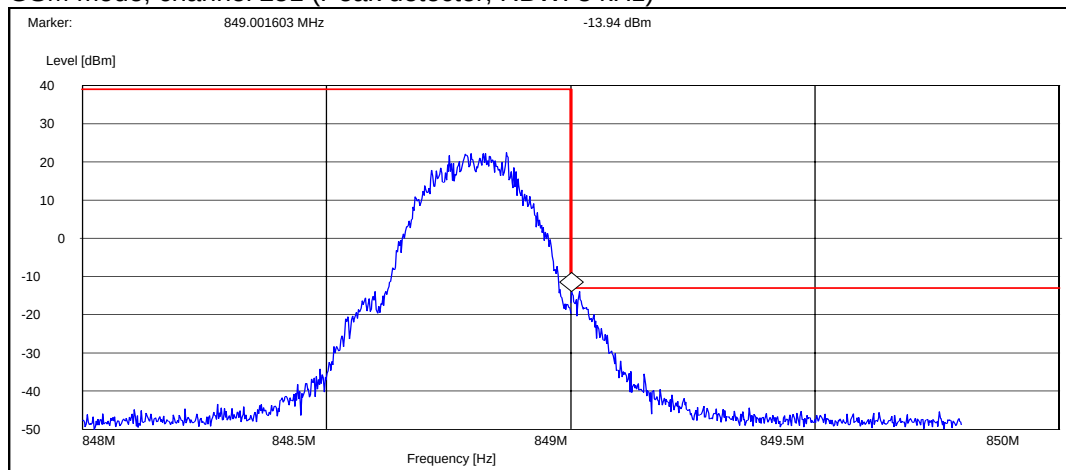
3.3. GSM 850 Test results

Operation mode (TX on)	Channel	Level [dBm]
GSM	128	-15.62
GSM	251	-13.94
EGPRS	128	-22.30
EGPRS	251	-20.38

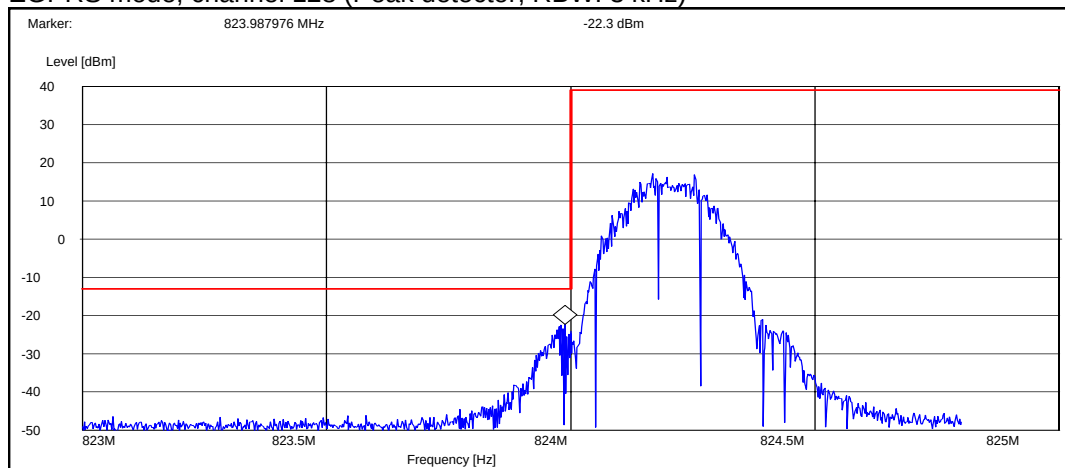
GSM mode, channel 128 (Peak detector, RBW: 3 kHz)



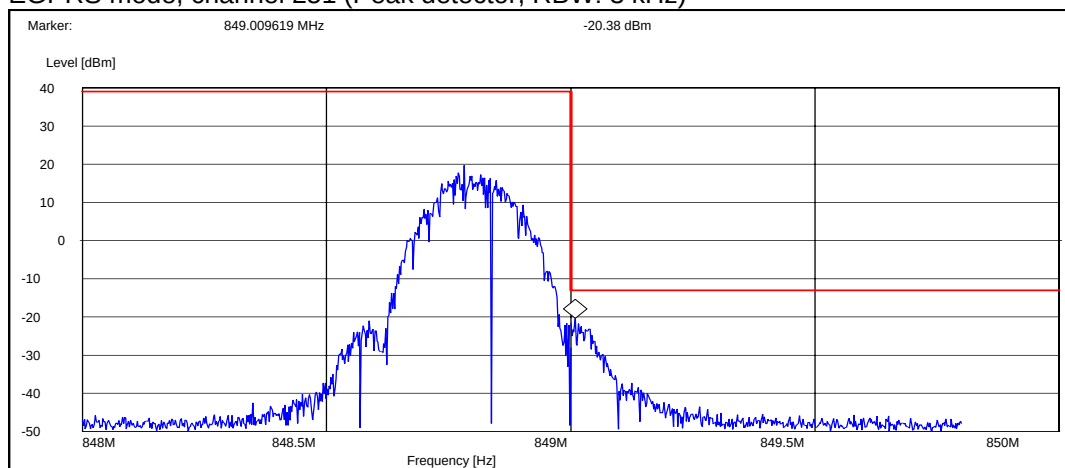
GSM mode, channel 251 (Peak detector, RBW: 3 kHz)



EGPRS mode, channel 128 (Peak detector, RBW: 3 kHz)



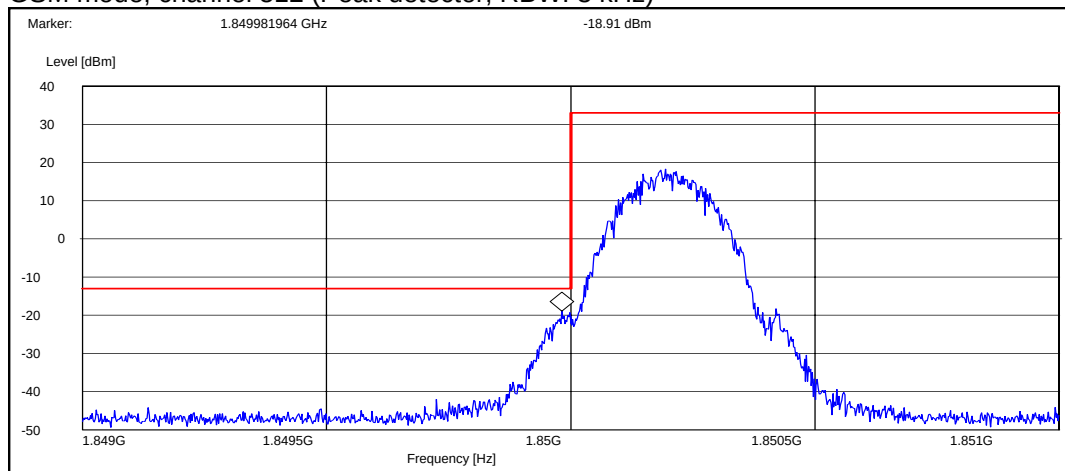
EGPRS mode, channel 251 (Peak detector, RBW: 3 kHz)



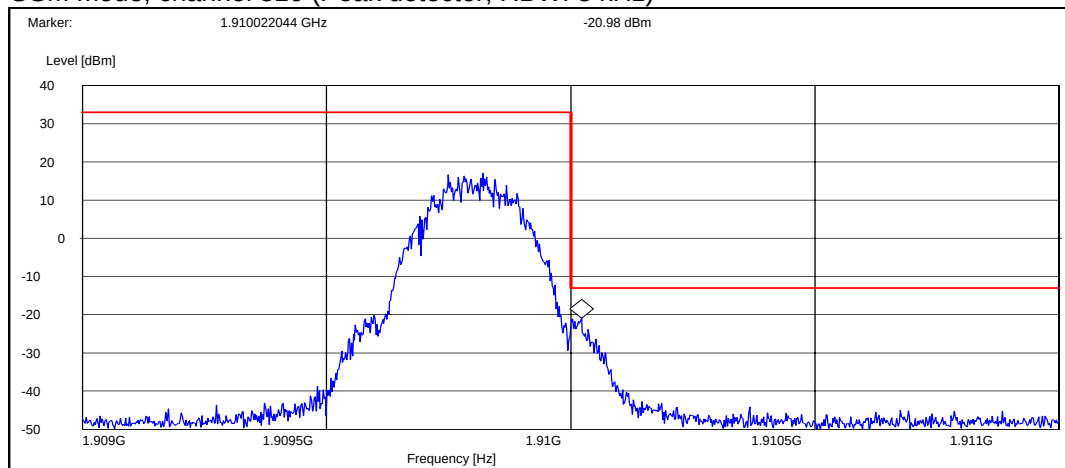
3.4. GSM 1900 Test results

Operation mode (TX on)	Channel	Level [dBm]
GSM	512	-18.91
GSM	810	-20.98
EGPRS	512	-26.89
EGPRS	810	-28.56

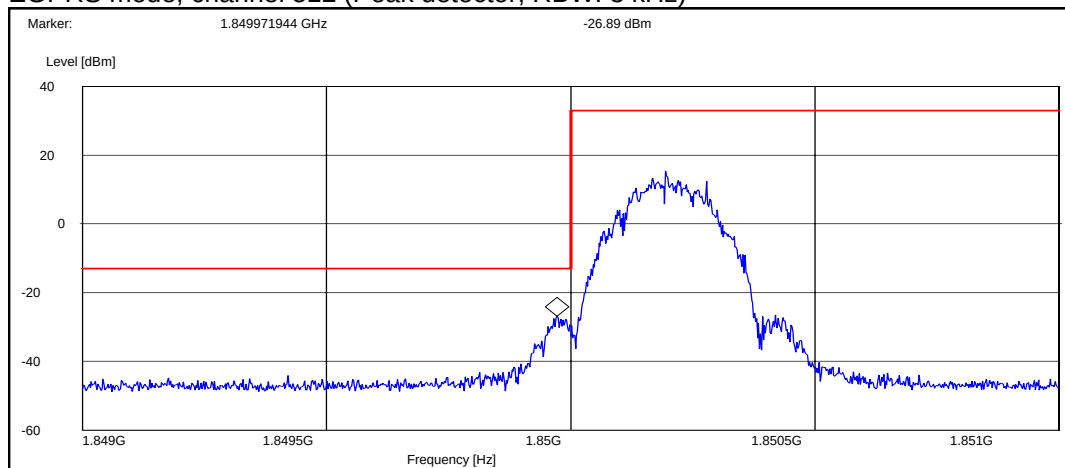
GSM mode, channel 512 (Peak detector, RBW: 3 kHz)



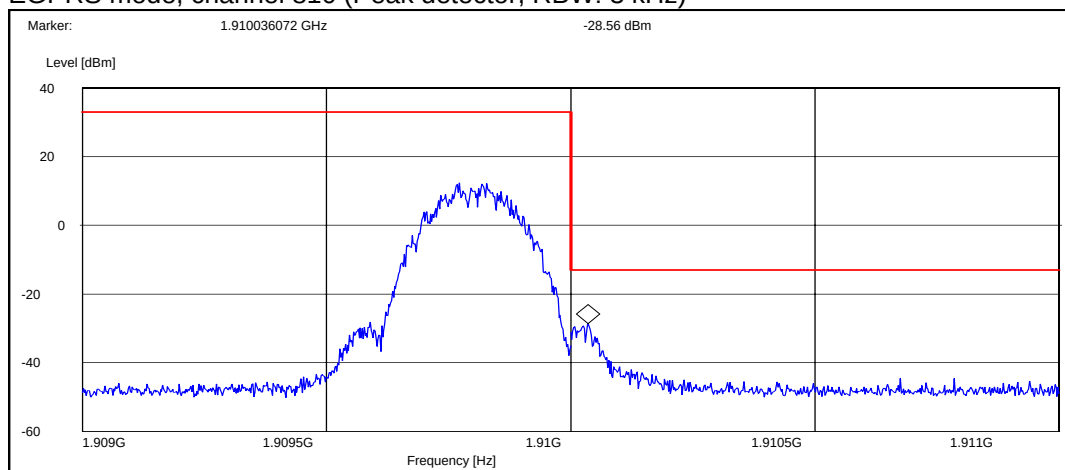
GSM mode, channel 810 (Peak detector, RBW: 3 kHz)



EGPRS mode, channel 512 (Peak detector, RBW: 3 kHz)



EGPRS mode, channel 810 (Peak detector, RBW: 3 kHz)

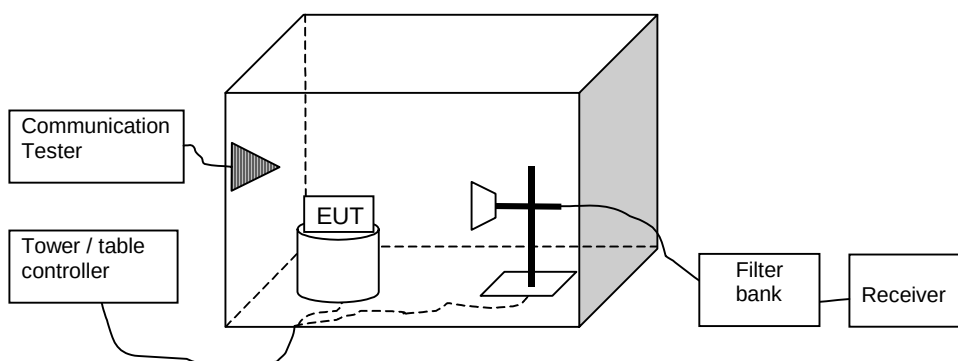


4. Spurious radiated emissions

(FCC §22.917(a), §24.238(a), §2.1053, RSS-GEN 4.7, RSS-132 4.5, RSS-133 6.3)

EUT with DUT number	RM-24 DUT 40442
Accessories with DUT numbers	BL-6C DUT 40447, ACP-12 DUT 40452, HS-5 DUT 40450
Operation Voltage [V] / [Hz]	115 / 60
Result	PASSED
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	23 / 45 / 98.7
Date of measurements	16.11.2005
Measured by	Jari Jantunen

4.1. Test setup



4.2. Test method and limit

The measurement is made according to TIA-603-B-2002 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 substitution method is used. Substitution values at each frequencies are measured beforehand and saved to the test software.

The substitution corrections are obtained as described below:

$$A_{SUBST} = P_{SUBST_TX} - P_{SUBST_RX} - L_{SUBST_CABLES} + G_{SUBST_TX_ANT}$$

Where A_{SUBST} is the final substitution correction including receive antenna gain. P_{SUBST_TX} is signal generator level, P_{SUBST_RX} is receiver level, L_{SUBST_CABLES} is cable losses including both TX and RX cables and $G_{SUBST_TX_ANT}$ is substitution antenna gain.

The measurement results are obtained as described below:

$$P [dBm] = P_{MEAS} + A_{TOT}$$

Where P_{MEAS} is receiver reading in dBm and A_{TOT} is total correction factor including cable loss, preamplifier gain and substitution correction ($A_{TOT} = L_{CABLES} - G_{PREAMP} + A_{SUBST}$).

Limits for spurious radiated emissions measurements

Operation band	Frequency range [MHz]	Limit [dBm]
GSM 850 / WCDMA 850	30 - 8500	-13
GSM 1900 / WCDMA 1900	30 - 18000	-13

4.3. GSM 850 Test results

GSM mode, channel 190

Frequency [MHz]	P [dBm]	P [μW]	P _{MEAS} [dBm]	A _{TOT} [dB]	Polarisation	Result
1673.143287	-41.70	0.06761	- 35.30	- 6.40	VERTICAL	PASSED
2509.820641	-41.00	0.07943	- 42.00	1.00	VERTICAL	PASSED
3346.697395	-48.80	0.01318	- 54.00	5.20	VERTICAL	PASSED

EGPRS mode, channel 190

Frequency [MHz]	P [dBm]	P [μW]	P _{MEAS} [dBm]	A _{TOT} [dB]	Polarisation	Result
1673.143287	-43.30	0.04677	- 36.90	- 6.40	VERTICAL	PASSED
2509.820641	-48.70	0.01349	- 49.70	1.00	VERTICAL	PASSED
3346.697395	-53.50	0.00447	- 58.70	5.20	VERTICAL	PASSED

4.4. GSM 1900 Test results

GSM mode, channel 661

Frequency [MHz]	P [dBm]	P [μ W]	P _{MEAS} [dBm]	A _{TOT} [dB]	Polarisation	Result
3758.515030	-53.90	0.00407	- 63.20	9.30	VERTICAL	PASSED
5647.286573	-50.60	0.00871	- 63.00	12.40	HORIZONTAL	PASSED
5650.798597	-49.50	0.01122	- 61.90	12.40	HORIZONTAL	PASSED

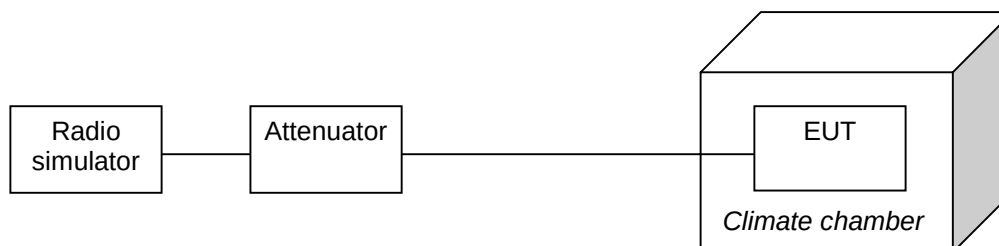
EGPRS mode, channel 661

Frequency [MHz]	P [dBm]	P [μ W]	P _{MEAS} [dBm]	A _{TOT} [dB]	Polarisation	Result
3760.015030	-49.90	0.01023	- 59.10	9.20	VERTICAL	PASSED
5644.286573	-49.80	0.01047	- 62.30	12.50	HORIZONTAL	PASSED
5647.298597	-50.40	0.00912	- 62.80	12.40	HORIZONTAL	PASSED

5. Frequency stability, temperature variation (FCC §2.1055(a), §2.1055(a), RSS-GEN 4.5, RSS-132 4.3, RSS-133 7)

EUT with DUT number	Phone: DUT 40444
Accessories with DUT numbers	Dummy Battery: DUT 40448, Headset: DUT 40451
Operation Voltage [V] / [Hz]	Nominal
Result	Passed
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	22/55/100.6
Date of measurements	18.11.2005
Measured by	Jan-Erik Lilja

5.1. Test setup



5.2. Test method and limit

The measurement is made according to FCC rules part 22 and 24 and IC standards RSS-GEN, RSS-132 and RSS-133 as follows:

- The climate chamber temperature is set to the maximum value and the temperature is allowed to stabilize.
- The EUT is placed in the chamber.
- The EUT is set in idle mode for 15 minutes.
- The EUT is set to transmit.
- The transmit frequency error was measured immediately.
- The steps c - e were repeated for each temperature.

Limits for frequency stability, temperature variation measurements

Frequency deviation [ppm]
± 2.5

5.3. GSM 850 Test results

GSM mode, channel 190

Temperature [°C]	Deviation [Hz]	Deviation [ppm]
50	-30	- 0.0359
40	-20	- 0.0239
30	-25	- 0.0299
20	-25	- 0.0299
10	-25	- 0.0299
0	-20	- 0.0239
-10	-25	- 0.0299
-20	-25	- 0.0299
-30	-26	- 0.0311

5.4. GSM 1900 Test results

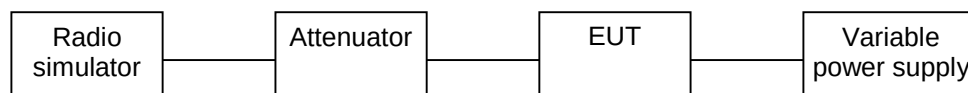
GSM mode, channel 661

Temperature [°C]	Deviation [Hz]	Deviation [ppm]
50	-30	- 0.0160
40	-30	- 0.0160
30	-43	- 0.0229
20	-44	- 0.0234
10	-44	- 0.0234
0	-39	- 0.0207
-10	-43	- 0.0229
-20	-41	- 0.0218
-30	-33	- 0.0176

6. Frequency stability, voltage variation (FCC §2.1055(d), RSS-GEN 4.5, RSS-132 4.3, RSS-133 7)

EUT with DUT number	Phone: DUT 40444
Accessories with DUT numbers	Dummy Battery: DUT 40448, Headset: DUT 40451
Operation Voltage [V] / [Hz]	-
Result	Passed
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	22/55/100.6
Date of measurements	18.11.2005
Measured by	Jan-Erik Lilja

6.1. Test setup



6.2. Test method and limit

The measurement is made according to FCC rules part 22 and 24 and IC standards RSS-GEN, RSS-132 and RSS-133 as follows:

The EUT battery was replaced with an adjustable power supply. The frequency stability was measured at nominal voltage and at the battery cut-off point.

Limits for frequency stability, voltage variation measurements

Frequency deviation [ppm]
± 2.5

6.3. GSM 850 Test results

GSM mode, channel 190

Voltage level [V]	Deviation [Hz]	Deviation [ppm]
Battery cut-off point / 3.45	-24	- 0.0287
Nominal / 4.10	-27	- 0.0323

6.4. GSM 1900 Test results

GSM mode, channel 661

Voltage level [V]	Deviation [Hz]	Deviation [ppm]
Battery cut-off point / 3.45	-41	- 0.0218
Nominal / 4.10	-37	- 0.0197

7. Test Equipment

7.1. 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

7.2. 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