

FCC Part 22/24 Compliance Test Report

Test Report no.:	FCC22&24_RM-987_05.docx	Date of Report:	20-Dec-2013
Number of pages:	18	Customer's Contact person:	Zhang David
Testing laboratory:	TCC Nokia Beijing Laboratory Beijing Economic and Technological Development Area No.5 Donghuan Zhonglu Beijing PRC China 100176 Tel. +86 10 8711 8888 Fax. +86 10 8711 4550	Customer:	Nokia Corporation Beijing Economic and Technological Development Area No.5 Donghuan Zhonglu Beijing PRC China 100176 Tel. +86 10 8711 8888 Fax. +86 10 8711 4550
FCC listing no.:	975940		
IC recognition no.:	661AH-1		
Tested devices/ accessories:	Phone RM-987 / Battery BL-5C / AC-Charger AC-18E / Headset WH-108 / Dummy battery		
FCC ID:	QTLRM-987	IC:	
Supplement reports:	-		
Testing has been carried out in accordance with:	CFR 47, FCC rules Parts 22/24 , TIA-603-C-2004 and IC standards, RSS-GEN (Issue 3, December 2010), RSS-132 (Issue 2, September 2005), RSS-133 (Issue 5, February 2009). 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:			

Gao Sherina, Engineer, EMC

1. Summary for FCC Part 22/24 Compliance Test Report

Date of receipt	01-Dec-2013
Testing completed	19-Dec-2013
The customer's contact person	Zhang David
Test Plan referred to	T:\Projects\RM-986\TestPlan\RS_testplan_RM-986.xlsm
Notes	-
Document name	FCC22&24_RM-987_05.docx

1.1. EUT and Accessory Information

The EUT is a mobile phone with following features:

GSM/Bluetooth

The EUT is tested with maximum rated TX power.

Devices under tests

Product	Type	SN	HW	MV	SW	DUT
Phone	RM-986	SIM1:004402476702026;SIM2:004402476702034	0110	-	1.1347.1	54229
Battery	BL-5C	0670400417535U285L17702815	-	-	-	54232
AC-Charger	AC-18E	4090493443750400988;0675695	-	-	-	54241
Headset	WH-108	3293L71	-	-	-	54233
Phone	RM-986	SIM1:004402476700467;SIM2:004402476700476	0110	-	1.1347.1	54239
Battery	BL-5C	0670400417535U285L17702803	-	-	-	54231
AC-Charger	AC-18E	4090493443750400987;0675695	-	-	-	54217
Headset	WH-108	305213R	-	-	-	54187
Dummy battery	SD-4MOD	03618				54225

1.2. Summary of Test Results

GSM850:

Section in CFR 47	Section in RSS-GEN or RSS-132	Name of the test	Result
§2.1046(a), 22.913(a)	4.4	Conducted RF output power	NP
§22.913(a)	4.4	Radiated RF output power	NP
§2.1049(h)	4.6.1	99 % occupied bandwidth	PASSED
§22.917(a)	4.5	Band edge compliance	PASSED
§22.917(a), §2.1051	4.5	Spurious emissions at antenna terminals	NP
§22.917(a), §2.1053	4.5	Spurious radiated emissions	NP
§2.1055(a)	4.3	Frequency stability, temperature variation	PASSED
§2.1055(d)	4.3	Frequency stability, voltage variation	PASSED

GSM1900:

Section in CFR 47	Section in RSS-GEN or RSS-133	Name of the test	Result
§2.1046(a)	6.4	Conducted RF output power	NP
§24.232(b)	6.4	Radiated RF output power	NP
§2.1049(h)	4.6.1	99 % occupied bandwidth	PASSED
§24.238(a)	6.5	Band edge compliance	PASSED
§24.238(a), §2.1051	6.5	Spurious emissions at antenna terminals	NP
§24.238(a), §2.1053	6.5	Spurious radiated emissions	PASSED
§2.1055(a)	6.3	Frequency stability, temperature variation	PASSED
§2.1055(d)	6.3	Frequency stability, voltage variation	PASSED

PASSED	The EUT complies with the essential requirements in the standard.
FAILED	The EUT does not comply with the essential requirements in the standard.
NP	The test was not performed by the TCC Nokia Laboratory.

The test results of QTLRM-986 are re-used for certification of the QTLRM-987. The table above indicates the results, which will be re-used.

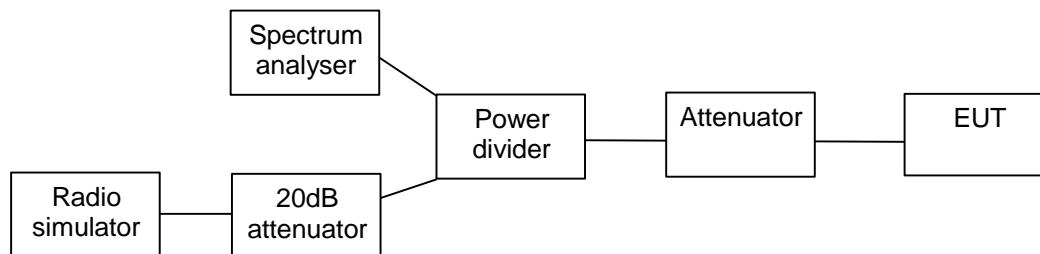
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2. 99% occupied bandwidth (FCC §2.1049(h), RSS-GEN 4.6.1)

EUT with DUT number	RM-986, DUT 54229
Accessories with DUT numbers	BL-5C, DUT 54232 ; AC-18E, DUT 54241 ; WH-108, DUT 54233
Operation Voltage [V] / [Hz]	Nominal
Results	PASSED
Remarks	Both SIMs was installed during testing, and testing was done with call SIM1.
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	18/31/101.4 to 19/35/101.5
Date of measurements	02-Dec-2013 to 04-Dec-2013
Measured by	Gao Sherina

2.1. Test Setup



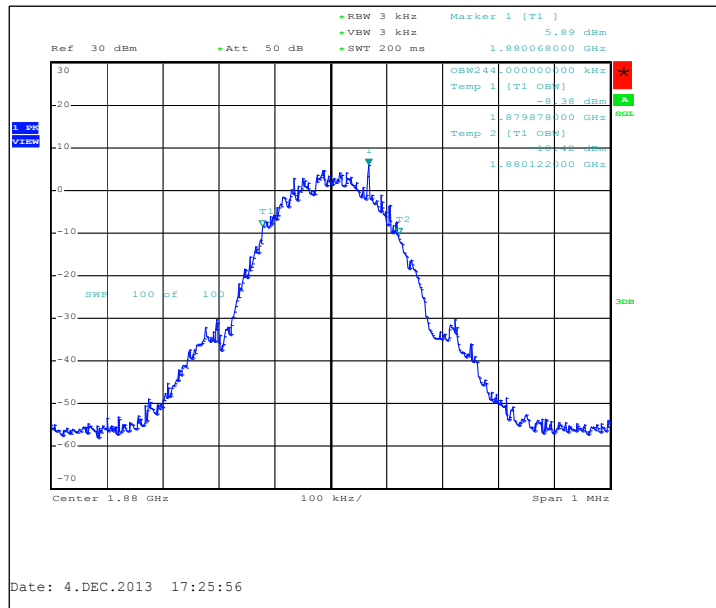
2.2. Test method and limit

The measurement is made according to FCC rules parts 22, 24 and IC standard RSS-GEN.

2.3. GSM 1900 Test results

Operation mode (TX on)	99% Occupied bandwidth [kHz]
GSM	244

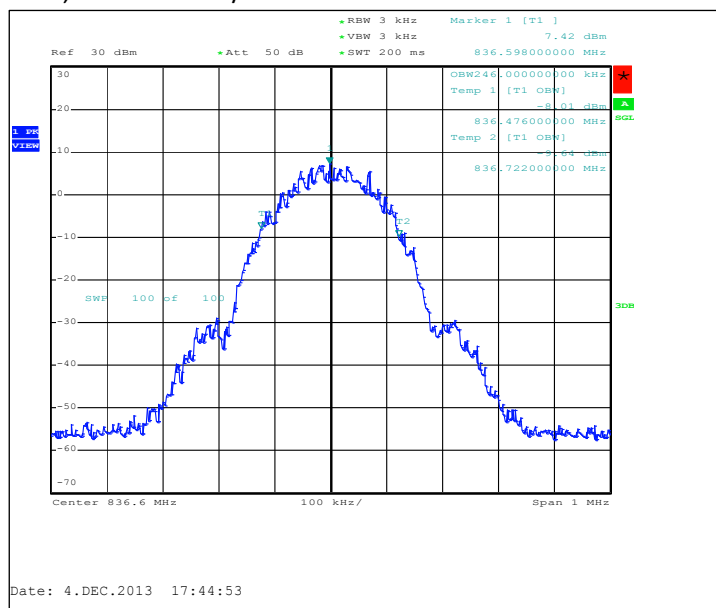
GSM, Channel 661 / 1880.0 MHz



2.4. GSM 850 Test results

Operation mode (TX on)	99% Occupied bandwidth [kHz]
GSM	246

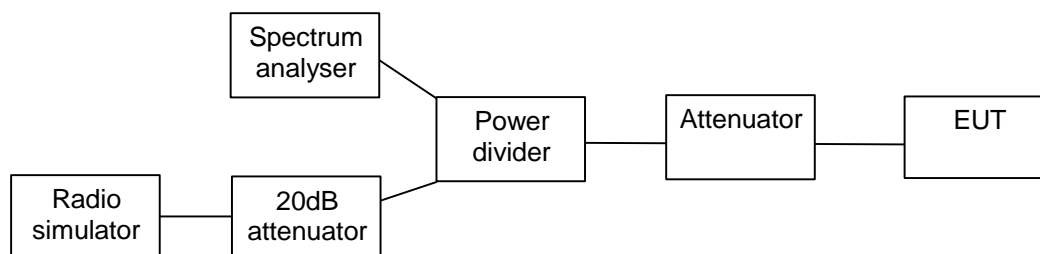
GSM, Channel 190 / 836.6 MHz



3. Band edge compliance (FCC §22.917(a), §24.238(a), RSS-132 4.5, RSS-133 6.5)

EUT with DUT number	RM-986, DUT 54229
Accessories with DUT numbers	BL-5C, DUT 54232 ; AC-18E, DUT 54241 ; WH-108, DUT 54233
Operation Voltage [V] / [Hz]	Nominal
Results	PASSED
Remarks	Both SIMs was installed during testing, and testing was done with call SIM1.
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	18/31/101.4 to 19/35/101.5
Date of measurements	02-Dec-2013 to 04-Dec-2013
Measured by	Gao Sherina

3.1. Test Setup



3.2. Test method and limit

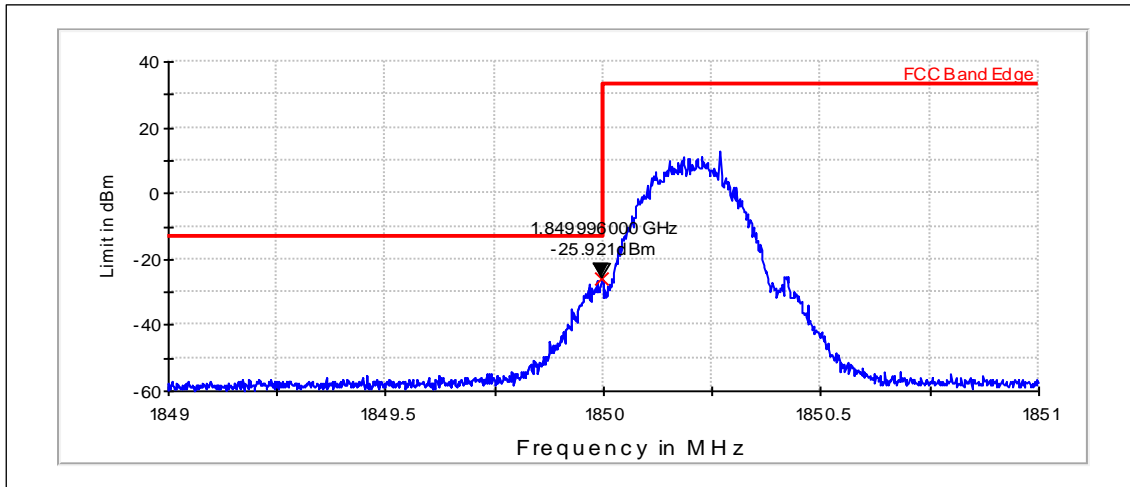
The measurement is made according to FCC rules parts 22, 24 and IC standards , RSS-132, RSS-133.

Limits for band edge compliance measurements

Operation band	Frequency range [MHz]	Limit [dBm]
GSM850	Below 824 and above 849	-13
GSM1900	Below 1850 and above 1910	-13

3.3. GSM 1900 Test results

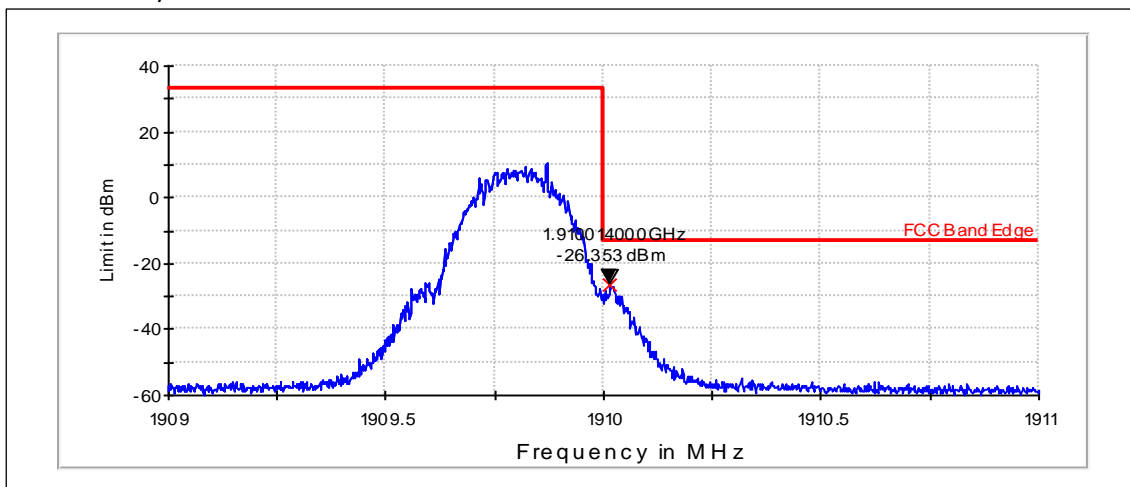
Channel 512 / 1850.2 MHz



RMS (RBW: 3 kHz, VBW: 3 kHz, Max hold)

Operation mode (TX on)	Frequency [MHz]	Level [dBm]	Result
GSM	1849.996	-25.92	PASSED

Channel 810 / 1909.8 MHz

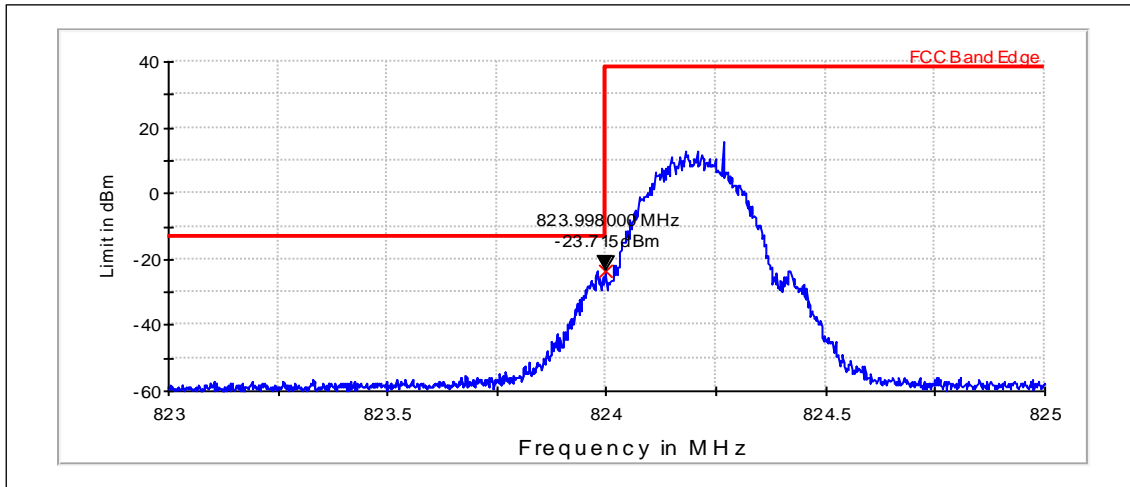


RMS (RBW: 3 kHz, VBW: 3 kHz, Max hold)

Operation mode (TX on)	Frequency [MHz]	Level [dBm]	Result
GSM	1910.014	-26.35	PASSED

3.4. GSM 850 Test results

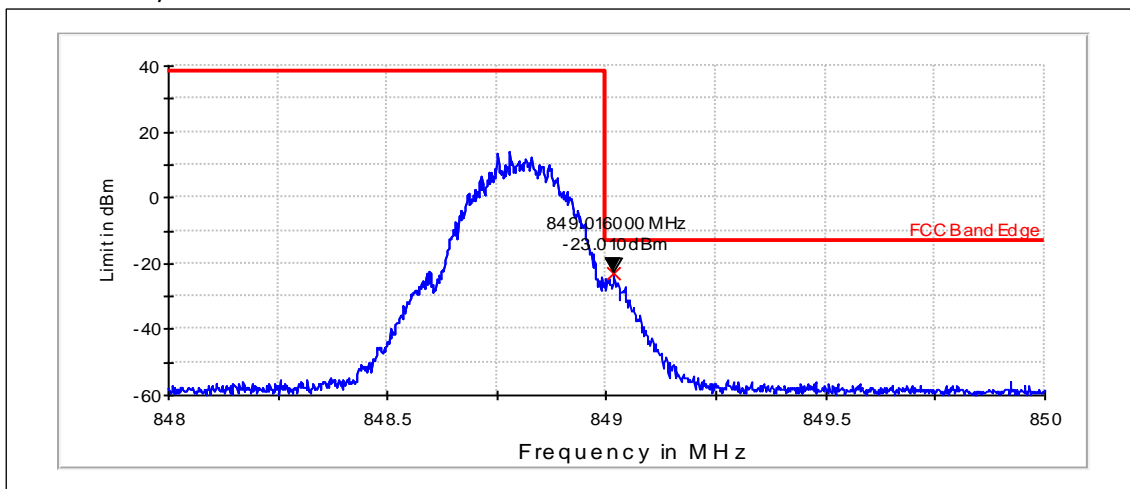
Channel 128 / 824.2 MHz



RMS (RBW: 3 kHz, VBW: 3 kHz, Max hold)

Operation mode (TX on)	Frequency [MHz]	Level [dBm]	Result
GSM	823.998	-23.72	PASSED

Channel 251 / 848.8 MHz



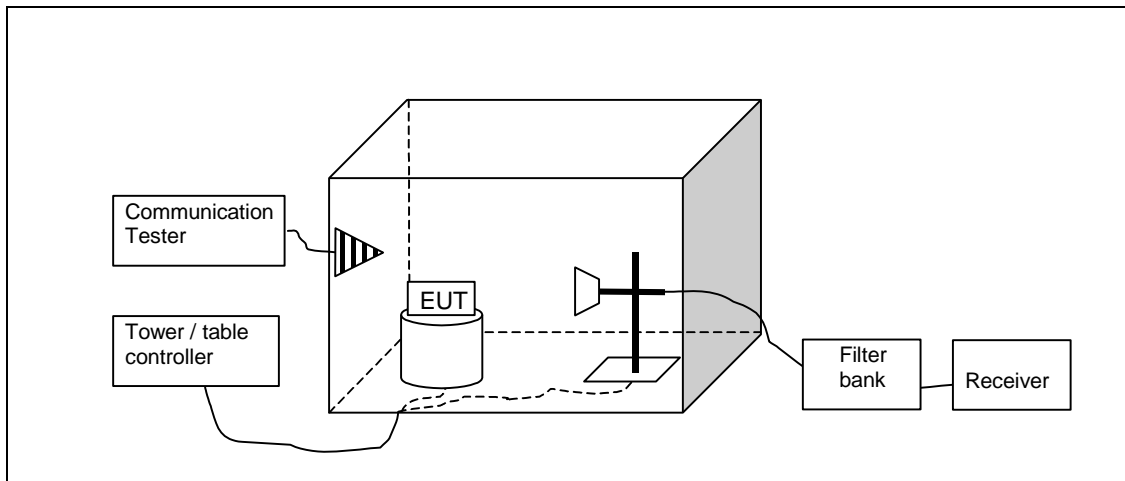
RMS (RBW: 3 kHz, VBW: 3 kHz, Max hold)

Operation mode (TX on)	Frequency [MHz]	Level [dBm]	Result
GSM	849.016	-23.01	PASSED

4. Spurious radiated emissions (FCC §22.917(a), §2.1053, §24.238(a), §2.1053, RSS-132 4.5, RSS-133 6.5)

EUT with DUT number	RM-986, DUT 54239
Accessories with DUT numbers	BL-5C, DUT 54231 ; AC-18E, DUT 54217 ; WH-108, DUT 54187
Operation Voltage [V] / [Hz]	Nominal
Results	PASSED
Remarks	Both SIMs was installed during testing, and testing was done with call SIM1.
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	19/32/102.9
Date of measurements	16-Dec-2013
Measured by	Zou Ming

4.1.1 Test setup



4.2. Test method and limit

The measurement is made according to TIA-603-C-2004 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 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:

$$ASUBST = PSUBST TX - PSUBST RX - LSUBST CABLES + GSUBST TX ANT$$

Where ASUBST is the final substitution correction including receive antenna gain. PSUBST TX is

signal generator level, PSUBST RX is receiver level, LSUBST CABLES is cable losses including both TX and RX cables and GSUBST TX ANT is substitution antenna gain.

The measurement results are obtained as described below:

$$P[\text{dBm}] = \text{PMEAS} + \text{ATOT}$$

Where PMEAS is receiver reading in dBm and ATOT is total correction factor including cable loss and substitution correction (ATOT = LCABLES - GPREAMP + ASUBST).

Limits for spurious radiated emissions measurements

Operation band	Frequency range [MHz]	Limit [dBm]
GSM850	30 - 8500	-13
GSM1900	30 - 18000	-13

4.3. GSM1900 TX test results

Peak detector

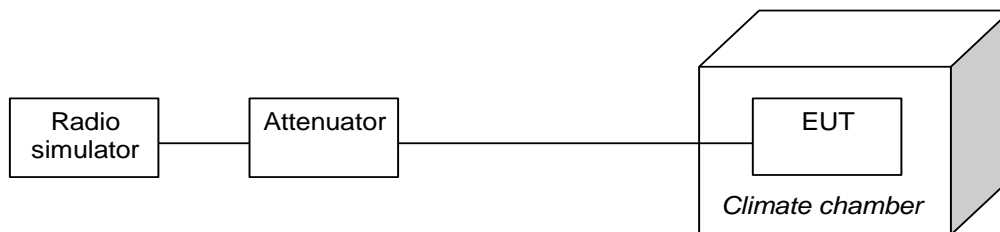
Frequency [MHz]	P [dBm]	P [μ W]	P _{MEAS} [dBm]	A _{TOT} [dB]	Polarization	Results
9580.601	-43.54	0.04422	-67.63	24.09	VERTICAL	PASSED
9668.457	-43.36	0.04618	-68.17	24.81	VERTICAL	PASSED
9793.307	-42.5	0.05629	-67.52	25.02	VERTICAL	PASSED
9851.022	-42.73	0.05331	-67.93	25.2	VERTICAL	PASSED
9888.497	-42.97	0.05045	-68.04	25.07	HORIZONTAL	PASSED
10006.14	-42.35	0.05818	-67.27	24.92	HORIZONTAL	PASSED

*Substitution method could not be utilized as no emissions above noise floor were found during measurements.

5. Frequency stability, temperature variation (FCC §2.1055(a), RSS-132 4.3, RSS-133 6.3)

EUT with DUT number	RM-986, DUT 54229
Accessories with DUT numbers	BL-5C, DUT 54232 ; AC-18E, DUT 54241 ; WH-108, DUT 54233
Operation Voltage [V] / [Hz]	Nominal
Results	PASSED
Remarks	Both SIMs was installed during testing, and testing was done with call SIM1.
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	19/35/101.5
Date of measurements	04-Dec-2013
Measured by	Gao Sherina

5.1. Test Setup



5.2. Test method and limit

The measurement is made according to FCC rules parts 22, 24 and IC standard RSS-132, 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, Channel 190 / 836.6 MHz

Temperature [°C]	Frequency [MHz]	Deviation [Hz]	Deviation [ppm]	Result
50	836.60	-2.91000	-0.0035	PASSED
40	836.60	-6.65000	-0.0079	PASSED
30	836.60	-4.58000	-0.0055	PASSED
20	836.60	-8.07000	-0.0096	PASSED
10	836.60	-25.12000	-0.03	PASSED
0	836.60	-3.55000	-0.0042	PASSED
-10	836.60	4.58000	0.0055	PASSED
-20	836.60	6.20000	0.0074	PASSED
-22	836.60	-1.03000	-0.0012	PASSED
-24	836.60	-6.01000	-0.0072	PASSED
-26	836.60	-30.35000	-0.0363	PASSED

*The EUT stopped working below -26°C.

5.4. GSM 1900 Test results

GSM, Channel 661 / 1880.0 MHz

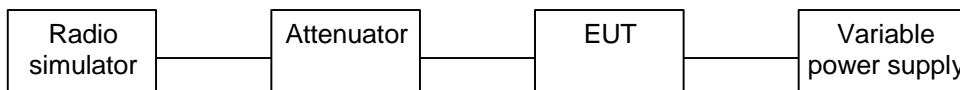
Temperature [°C]	Frequency [MHz]	Deviation [Hz]	Deviation [ppm]	Result
50	1880.00	-27.38000	-0.0146	PASSED
40	1880.00	0.71000	0.0004	PASSED
30	1880.00	-10.78000	-0.0057	PASSED
20	1880.00	-28.99000	-0.0154	PASSED
10	1880.00	-9.43000	-0.005	PASSED
0	1880.00	-10.07000	-0.0054	PASSED
-10	1880.00	-18.53000	-0.0099	PASSED
-20	1880.00	-6.33000	-0.0034	PASSED
-22	1880.00	-7.10000	-0.0038	PASSED
-24	1880.00	-5.17000	-0.0028	PASSED
-26	1880.00	-10.46000	-0.0056	PASSED

*The EUT stopped working below -26°C.

6. Frequency stability, voltage variation
(FCC §2.1055(d), RSS-132 4.3, RSS-133 6.3, RSS-130 4.3 (a))

EUT with DUT number	RM-986, DUT 54229
Accessories with DUT numbers	SD-4MOD, DUT 54225
Operation Voltage [V] / [Hz]	Nominal
Results	PASSED
Remarks	Both SIMs was installed during testing, and testing was done with call SIM1.
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	18/27/102.8
Date of measurements	19-Dec-2013
Measured by	Gao Sherina

6.1. Test Setup



6.2. Test method and limit

The measurement is made according to FCC rules parts 22, 24 and IC standard RSS-132, 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 1900 Test results

GSM, Channel 661 / 1880.0 MHz

Voltage level [V]	Frequency [MHz]	Deviation [Hz]	Deviation [ppm]	Result
Nominal / 3.7	1880.00	-10.65000	-0.0057	PASSED
Battery cut-off point / 3.3	1880.00	-9.75000	-0.0052	PASSED
Max / 4.3	1880.00	-16.53000	-0.0088	PASSED

6.4. GSM 850 Test results

GSM, Channel 190 / 836.6 MHz

Voltage level [V]	Frequency [MHz]	Deviation [Hz]	Deviation [ppm]	Result
Nominal / 3.7	836.60	14.14000	0.0169	PASSED
Battery cut-off point / 3.3	836.60	-4.00000	-0.0048	PASSED
Max / 4.3	836.60	-5.23000	-0.0063	PASSED

7. Test Equipment

7.1. Conducted measurements

Eq. No	Equipment	Type	Manufacturer	Used in
-	RF Emission Software	EMC32 Test Software	R&S	22/24/27, 15C, 15B
BJPCHW0020	DC Power supply	Hp6632B	HP	22/24/27, 15C
BJPCPT0040	Receiver	ESCS30	R&S	15C,15B
BJPCPT0069	LISN 50 µH	ESH3-Z5	R&S	15C,15B
BJPCTC0323	Signal Generator	SMR 27	R&S	22/24/27, 15C, 15B
BJPCPT0073	Signal Generator	SMR 20	R&S	22/24/27, 15C, 15B
BJPCPT0191	Pulse Limiter	ESH3-Z2	R&S	15C,15B
BJPCPT0208	UPS	PULSAR RX10	Merlin gerin	15C.15B
BJPCTC0001	DIGITAL CAMERA	PC1015	CANON	15C.15R
BJPCTC0017	Communication Tester	CMU200	R&S	22/24/27, 15C, 15B
BJPCTC0062	AC Power source	6812B	Hp	15C.15B
BJPCTC0067	Bluetooth Tester	CBT	R&S	22/24/27, 15C
BJPCTC0082	Humidity and Temperature Sensor	175-H2	Testo	15B,15C
BJPCTC0088	Absolut pressure meter	testo 511	Testo	22/24/27, 15B,15C
BJPCTC0089	Tempreture Test chamber	VT4002	Votsch industrietechnik	22/24/27, 15C
BJPCTC0090	FSP spectrum analyzer	FSP30	R&S	22/24/27, 15C
BJPCTC0094	GPIO-RS232 convertor	GPIO-RS232	NI	22/24/27, 15C
BJPCTC0112	Power Splitter	11667B	Agilent	22/24/27, 15C
BJPCTC0115	Communication Tester	CMU200	R&S	22/24/27, 15B, 15C
BJPCTC0127	AC Power source	SOYI-500VA	SOYI	15B 15C
BJPCTC0128	Communication antenna	JXTXLB-10180	A-INFOMW	22/24/27 15B 15C
BJPCTC0129	Communication antenna	JXTXLB-10180	A-INFOMW	22/24/27 15B 15C
BJPCTC0131	Communication tester	CMW500	R&S	22/24/27 15B 15C
BJPCTC0136	Communication antenna	JXTXLB-880-NF	A-INFOMW	15B 15C
BJPCTC0306	Power Splitter	11667B	Agilent	22/24/27, 15C
BJPCTC0305	GPIO converter	GPIO-RS232	NI	22/24/27, 15C
BJPCTC0304	Spectrum Analyser	FSV30	R&S	22/24/27, 15C
BJPCTC0309	GPIO-RS232 convertor	RS232	NI	22/24/27, 15C
BJPCTC0307	Dual channel battery/charger simulator	2306	KEITHLEY	22/24/27, 15C
BJPCTC0308	Dual channel battery/charger simulator	2306	KEITHLEY	22/24/27, 15C
BJPCHW0571	Signal Generator 20GHz	MG3692B	Anritsu	22/24/27, 15C
BJBDATC0169	Tempreture Test chamber	VT4002	Votsch	22/24/27, 15C

7.2. Radiated measurements

Eq. No	Equipment	Type	Manufacturer	Used in
-	BT / WLAN Antenna	SPA 2400/75/9/0/V	Huber-Suhner	15C, 15B
-	BT / WLAN Antenna	SPA 2400/75/9/0/V	Huber-Suhner	15C, 15B
-	RF Emission Software	EMC32 Test Software	R&S	22/24/27, 15C, 15B
BJPCPT0072	Receiver	ESI B26	R&S	22/24/27, 15C, 15B
BJPCPT0150	High Pass Filter	WHKS1200-10SS	Wainwright	22/24/27, 15C, 15B
BJPCPT0151	Band Reject Filter	WRCD1880/2000-0.2/40-5SSK	Wainwright	24, 15B
BJPCPT0154	Band Reject Filter	WRCT2402/2480-2400/2483.5-30-20SS	Wainwright	15C, 15B
BJPCPT0166	Antenna	VUBA 9117	Swarzbeck	22/24/27
BJPCPT0208	UPS	PULSAR RX10	Merlin gerin	15C.15B
BJPCTC0001	DIGITAL CAMERA	PC1015	CANON	15C.15R
BJPCTC0007	Antenna	HL562	R&S	22/24/27, 15C, 15B
BJPCTC0029	Antenna	HF906	R&S	22/24/27, 15C, 15B

Eq. No	Equipment	Type	Manufacturer	Used in
BJPCTC0034	Band Reject Filter	WRCT 800/880-0.2/40-5SSK	Wainwright	22, 15B
BJPCTC0049	Preamplifier	Blma 0118-1A-Bt	Bonn	22/24/27, 15C, 15B
BJPCTC0055	Communication Tester	CMU200	R&S	22/24/27, 15C, 15B
BJPCTC0058	Bluetooth Tester	CBT	R&S	15C, 15B
BJPCTC0062	AC Power source	6812B	Hp	15C, 15B
BJPCTC0064	Band Reject Filter	WRCG1877/1883-1870/1890-40/6SS	Wainwright	24, 15B
BJPCTC0071	Multi-Device Controller	2090	EMCO	22/24/27, 15C, 15B
BJPCTC0072	Anechoic Chamber	3 m Semi / Full Anechoic Chamber	ETS	22/24/27, 15C, 15B
BJPCTC0073	MAST	Model-TR/POL	ETS	22/24/27, 15C, 15B
BJPCTC0074	MAST	Model 2070-2	ETS	22/24/27, 15C, 15B
BJPCTC0075	Turntable	Model 2188	ETS-EMCO	22/24/27, 15C, 15B
BJPCTC0081	Humidity and Temperature Sensor	175-H2	Testo	15B, 15C
BJPCTC0088	Absolut pressure meter	testo 511	Testo	22/24/27, 15B, 15C
BJPCTC0113	Receiver	ESI B26	R&S	22/24/27, 15B, 15C
BJPCTC0115	Communication Tester	CMU200	R&S	22/24/27, 15B, 15C
BJPCTC0124	Attenuator	SA18N200W-40	Fairview Microwave	-
BJPCTC0125	Loop Antenna	HFH2-Z2	R&S	15C
BJPCTC0126	Tripod	FHU-Z	R&S	15C
BJPCTC0128	Communication antenna	JXTXLB-10180	A-INFOMW	22/24/27 15B 15C
BJPCTC0129	Communication antenna	JXTXLB-10180	A-INFOMW	22/24/27 15B 15C
BJPCTC0131	Communication tester	CMW500	R&S	22/24/27 15B 15C
BJPCTC0133	Open Swith and contril unit	OSP 150	R&S	15B, 15C
BJPCTC0134	Open Swith and contril unit	OSP 150	R&S	15B, 15C
BJPCTC0135	Open Swith and contril unit	OSP 130	R&S	15B, 15C
BJPCTC0136	Communication antenna	JXTXLB-880-NF	A-INFOMW	15B 15C
BJPCTC0171	Broad-band Horn Antenna	BBHA9120 D	SCHWARZBECK MESS - ELEKTRONIK	22/24/27, 15C, 15B
BJPCTC0310	Horn Antenna	QSH20SMA	Q-par	22/24/27, 15C, 15B
BJPCTC0311	Horn Antenna	QSH18SMA	Q-par	22/24/27, 15C, 15B
BJPCTC0312	Relay Switch Unit	-	-	22/24/27, 15C, 15B
BJPCTC0313	High Pass Filter	WHKX1.0/15G-12SS	Wainwright	22/24/27, 15C, 15B
BJPCTC0314	High Pass Filter	WHKX8.0/18G-88SS	Wainwright	22/24/27, 15C, 15B
BJPCTC0315	High Pass Filter	WHKX3.0/18G-12SS	Wainwright	22/24/27, 15C, 15B
BJPCTC0316	Preamplifier	AMT-5F-18002550-25-108	-	22/24/27, 15C, 15B
BJPCTC0317	Preamplifier	AMF-6D-02001800-29-20P	-	22/24/27, 15C, 15B
BJPCTC0318	Preamplifier	AFS42-00101500-25-10P-42	-	22/24/27, 15C, 15B
BJPCTC0324	Preamplifier	AFS4-00100300-20-23P-6	Miteq	22/24/27, 15C, 15B
BJPCTC0329	Relay Switch Unit	-	-	22/24/27, 15C, 15B