

FCC Part 22/24/27 Compliance Test Report

Test Report no.:	FCC22&24&27_RM-974_16.docx	Date of Report:	08-May-2014
Number of pages:	37	Customer's Contact person:	Juha Paukku
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FCC listing no.:	94436		
IC recognition no.:	661AK-1		
Tested devices/ accessories:	Phone RM-974 / Battery BL-5H / AC charger AC-20E / Headset WH-108		
FCC ID:	PDNRM-974	IC:	661R-RM974
Supplement reports:	-		
Testing has been carried out in accordance with:	CFR 47, FCC rules Parts 22/24/27 , TIA-603-C-2004 and IC standards, RSS-GEN (Issue 3, December 2010), RSS-132 (Issue 2, September 2005). 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:			

Timo Raiskio, Specialist, EMC & SAR

1. Summary for FCC Part 22/24/27 Compliance Test Report

Date of receipt	21-Mar-2014
Testing completed	08-May-2014
The customer's contact person	Juha Paukku
Test Plan referred to	T:\Projects\RM-974\TestPlan\RS_Testplan_RM-974.xlsm
Notes	-
Document name	T:\Projects\RM-974\EMC\FCC22&24&27_RM-974_16.docx

1.1. EUT and Accessory Information

The EUT is a mobile phone with following features:

GSM/WCDMA/WLAN/Bluetooth

The EUT is tested with maximum rated TX power.

Devices under tests

Product	Type	SN	HW	MV	SW	DUT
Phone	RM-974	004402478003183	2010	-	01061.00014.14112.00000	43151
Phone	RM-974	004402478002516	2010	-	01061.00014.14112.00000	43153
Battery	BL-5H	4955403494010119163;0670699	V3.0	-	-	43154
Battery	BL-5H Samsung	-	PWB v2.5	-	-	43147
Charger	AC-20E	4868673411351126865;0675628	-	-	-	43140
Charger	AC-20E Phihong	-	-	-	-	43135
Headset	WH-108	2376171	-	-	-	43142
Headset	WH-108	-	-	-	-	43136

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	PASSED
§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	PASSED
§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	PASSED
§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

WCDMA 850 (Band V):

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	PASSED
§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	PASSED
§2.1055(a)	4.3	Frequency stability, temperature variation	PASSED
§2.1055(d)	4.3	Frequency stability, voltage variation	PASSED

LTE7:

Section in CFR 47	Section in RSS-GEN or RSS-139	Name of the test	Result
§2.1046(a)	6.4	Conducted RF output power	NP
§27.50(h)(2)	6.4	Radiated RF output power	PASSED
§2.1049(h)	4.6.1	99 % occupied bandwidth	PASSED
§27.53(l)	6.5	Band edge compliance	PASSED
§27.53(h), §2.1051	6.5	Spurious emissions at antenna terminals	NP
§27.53(l), §2.1053	6.5	Spurious radiated emissions	PASSED
§27.54	6.3	Frequency stability, temperature variation	PASSED
§27.54	6.3	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 Laboratory.

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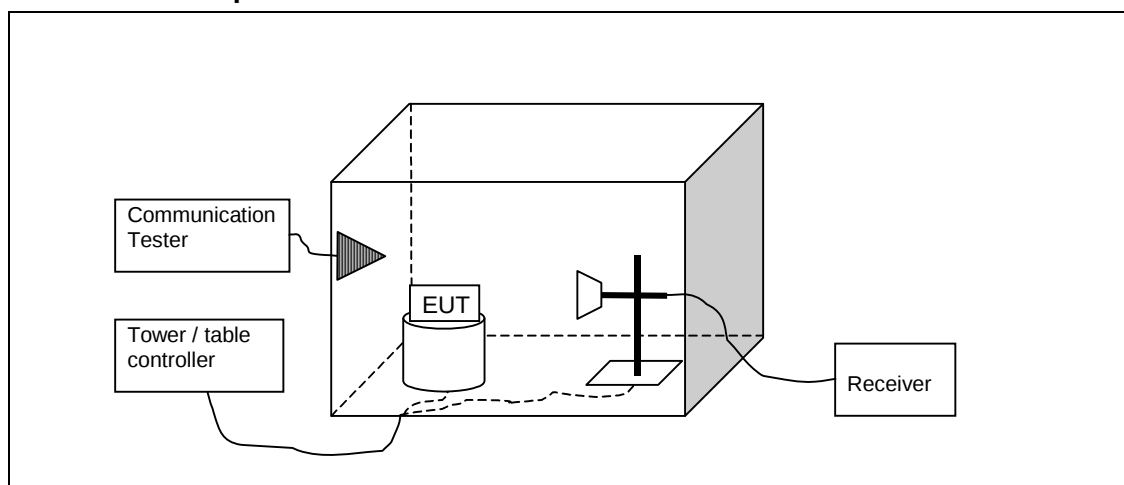
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2. Radiated RF output power

(FCC §22.913(a), §24.232(b), §27.50(d)(2), §27.53(h), §27.53(g), RSS-132 4.4, RSS-133 6.4)

EUT with DUT number	RM-974, DUT 43151
Accessories with DUT numbers	BL-5H, DUT 43154
Operation Voltage [V] / [Hz]	115 / 60
Results	PASSED
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	22 / 47 / 103.1
Date of measurements	25-Mar-2014
Measured by	Hannu Söderholm

2.1.1 Test setup



2.2. Test method and limit

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

The measurement is performed in the Anechoic Chamber with absorbers on the floor and measuring antenna at fixed height using 2-axis EUT position system. The turntable is rotated 360 degrees and this is repeated for both horizontal and vertical receive antenna polarizations.

The EUT is placed on a nonconductive plate at 170 cm height.

The substitution method is used. The measurement results are obtained as described below:

$$P[\text{dBm}] = P_{\text{SUBST TX}} + P_{\text{MEAS}} - P_{\text{SUBST RX}} - L_{\text{SUBST CABLES}} + G_{\text{SUBST TX ANT}}$$

Where $P_{\text{SUBST TX}}$ is signal generator level. P_{MEAS} is measured power level from the EUT. $P_{\text{SUBST RX}}$ is measured power level in substitute measurement. $L_{\text{SUBST CABLE}}$ is the loss of the cable between the signal generator and the substitution antenna and $G_{\text{SUBST TX ANT}}$ is substitution antenna gain.

Limits for radiated RF output power measurements

Frequency range [MHz]	Limit [W]	Limit [dBm]
824 - 849	7 ERP	38.5
1850 - 1910	2 EIRP	33

2.3. GSM850 TX test results

RMS detector

Channel / f _c [MHz]	ERP [dBm]	ERP [W]	P _{MEAS} [dBm]	A _{TOT} [dB]	Polarisation	Results
128 / 824.2	29.56	0.904	-2.73	32.29	VERTICAL	PASSED
190 / 836.6	30.42	1.101	-1.7	32.12	VERTICAL	PASSED
251 / 848.8	29.7	0.933	-1.64	31.34	VERTICAL	PASSED

2.4. GSM850-E1 TX test results

Channel / f _c [MHz]	ERP [dBm]	ERP [W]	P _{MEAS} [dBm]	A _{TOT} [dB]	Polarisation	Results
128 / 824.2	25.27	0.336	-7.02	32.29	VERTICAL	PASSED
190 / 836.6	25.19	0.331	-6.93	32.12	VERTICAL	PASSED
251 / 848.8	28.79	0.757	-2.55	31.34	VERTICAL	PASSED

2.5. GSM1900 TX test results

RMS detector

Channel / f _c [MHz]	EIRP [dBm]	EIRP [W]	P _{MEAS} [dBm]	A _{TOT} [dB]	Polarisation	Results
512 / 1850.2	31.95	1.567	-10.67	42.62	HORIZONTAL	PASSED
661 / 1880	32.58	1.81	-9.9	42.48	HORIZONTAL	PASSED
810 / 1909.8	32.58	1.809	-9.96	42.54	HORIZONTAL	PASSED

2.6. GSM1900-E1 TX test results

RMS detector

Channel / f _c [MHz]	EIRP [dBm]	EIRP [W]	P _{MEAS} [dBm]	A _{TOT} [dB]	Polarisation	Results
512 / 1850.2	29.98	0.994	-12.64	42.62	HORIZONTAL	PASSED
661 / 1880	28.68	0.737	-13.8	42.48	HORIZONTAL	PASSED
810 / 1909.8	28.13	0.65	-14.41	42.54	HORIZONTAL	PASSED

2.7. WCDMA 850 (Band V) test results

RMS detector

Channel / f _c [MHz]	ERP [dBm]	ERP [W]	P _{MEAS} [dBm]	A _{TOT} [dB]	Polarisation	Results
4132 / 826.4	18.51	0.071	-14.12	32.63	VERTICAL	PASSED
4183 / 836.6	18.66	0.073	-13.46	32.12	VERTICAL	PASSED
4233 / 846.6	18.12	0.065	-13.23	31.35	VERTICAL	PASSED

2.8. LTE7 TX test results, Antenna 1

FDD, CBW 5MHz, QPSK, 1RB mid, RMS detector

Channel / f _c [MHz]	EIRP [dBm]	EIRP [W]	P _{MEAS} [dBm]	A _{TOT} [dB]	Polarisation	Results
0 / 2502.5	21.27	0.134	-25.23	46.5	HORIZONTAL	PASSED
0 / 2535	21.24	0.133	-25.62	46.86	HORIZONTAL	PASSED
0 / 2567.5	22.31	0.17	-24.58	46.89	HORIZONTAL	PASSED

FDD, CBW 5MHz, 16QAM, 1RB mid, RMS detector

Channel / f _c [MHz]	EIRP [dBm]	EIRP [W]	P _{MEAS} [dBm]	A _{TOT} [dB]	Polarisation	Results
0 / 2502.5	21.27	0.134	-25.23	46.5	HORIZONTAL	PASSED
0 / 2535	21.73	0.149	-25.13	46.86	HORIZONTAL	PASSED
0 / 2567.5	21.95	0.157	-24.94	46.89	HORIZONTAL	PASSED

2.9. LTE7 TX test results, Antenna 2

FDD, CBW 5MHz, QPSK, 1RB mid, RMS detector

Channel / f _c [MHz]	EIRP [dBm]	EIRP [W]	P _{MEAS} [dBm]	A _{TOT} [dB]	Polarisation	Results
0 / 2502.5	24.38	0.274	-22.12	46.5	HORIZONTAL	PASSED
0 / 2535	23.58	0.228	-23.28	46.86	HORIZONTAL	PASSED
0 / 2567.5	24.78	0.3	-22.11	46.89	HORIZONTAL	PASSED

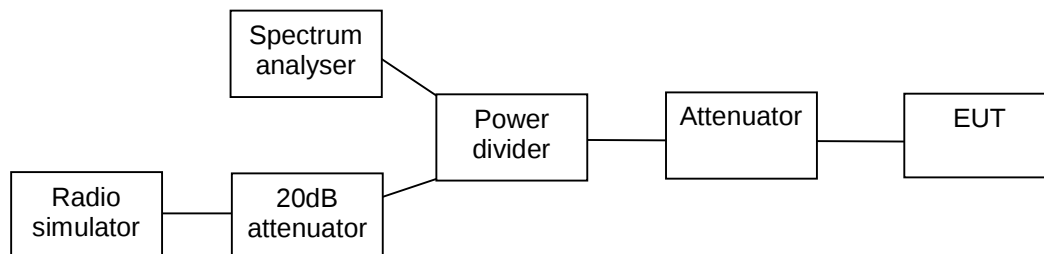
FDD, CBW 5MHz, 16QAM, 1RB mid, RMS detector

Channel / f _c [MHz]	EIRP [dBm]	EIRP [W]	P _{MEAS} [dBm]	A _{TOT} [dB]	Polarisation	Results
0 / 2502.5	24.11	0.257	-22.39	46.5	HORIZONTAL	PASSED
0 / 2535	23.64	0.231	-23.22	46.86	HORIZONTAL	PASSED
0 / 2567.5	24.37	0.274	-22.52	46.89	HORIZONTAL	PASSED

3. 99% occupied bandwidth (FCC §2.1049(h), RSS-GEN 4.6.1)

EUT with DUT number	RM-974, DUT 43153
Accessories with DUT numbers	BL-5H Samsung, DUT 43147 ; AC-20E Pihong, DUT 43135 ; WH-108, DUT 43136
Operation Voltage [V] / [Hz]	Nominal
Results	PASSED
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	21 / 44 / 101.9
Date of measurements	08-May-2014
Measured by	Timo Raiskio

3.1. Test Setup



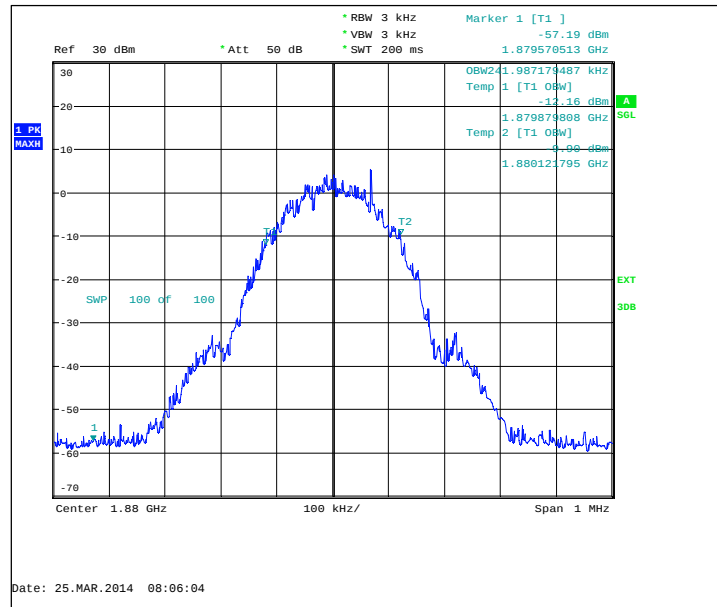
3.2. Test method and limit

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

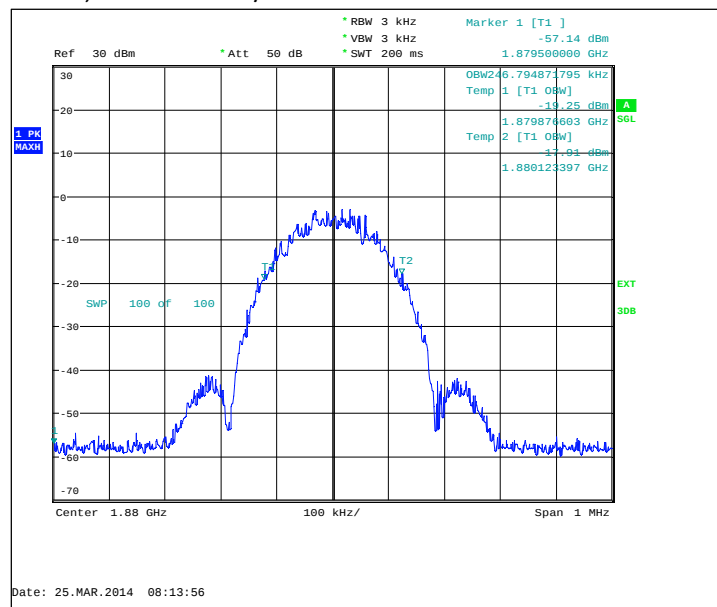
3.3. GSM 1900 Test results

Operation mode (TX on)	99% Occupied bandwidth [kHz]
GSM	242.0
EGPRS	246.8

GSM, Channel 661 / 1880.0 MHz



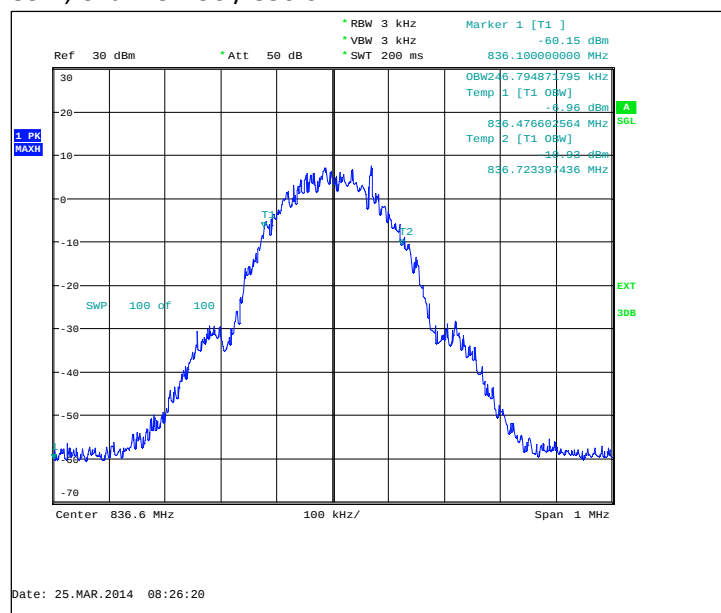
EGPRS, Channel 661 / 1880.0 MHz



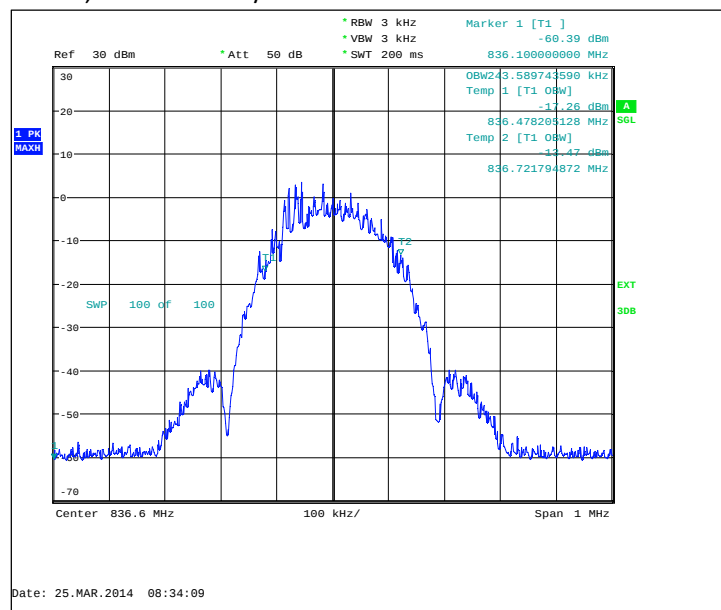
3.4. GSM 850 Test results

Operation mode (TX on)	99% Occupied bandwidth [kHz]
GSM	246.8
EGPRS	243.6

GSM, Channel 190 / 836.6 MHz



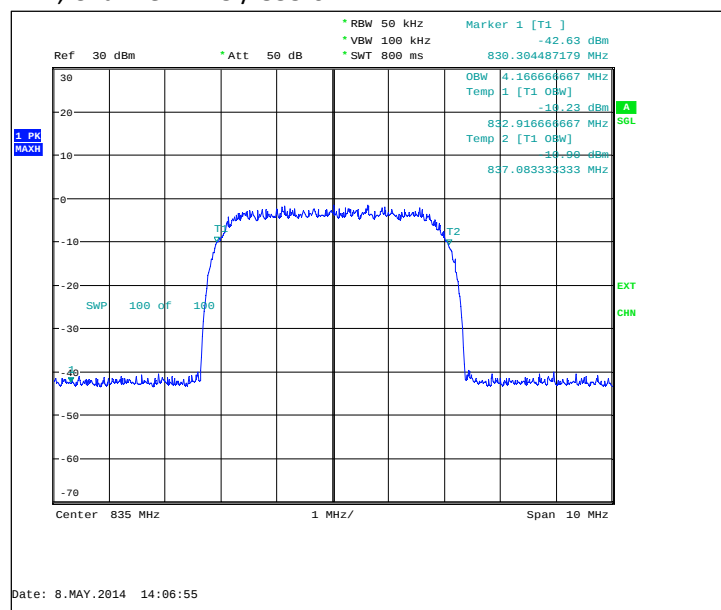
EGPRS, Channel 190 / 836.6 MHz



3.5. WCDMA 850 Test results

Operation mode (TX on)	99% Occupied bandwidth [kHz]
FDD	4166.7

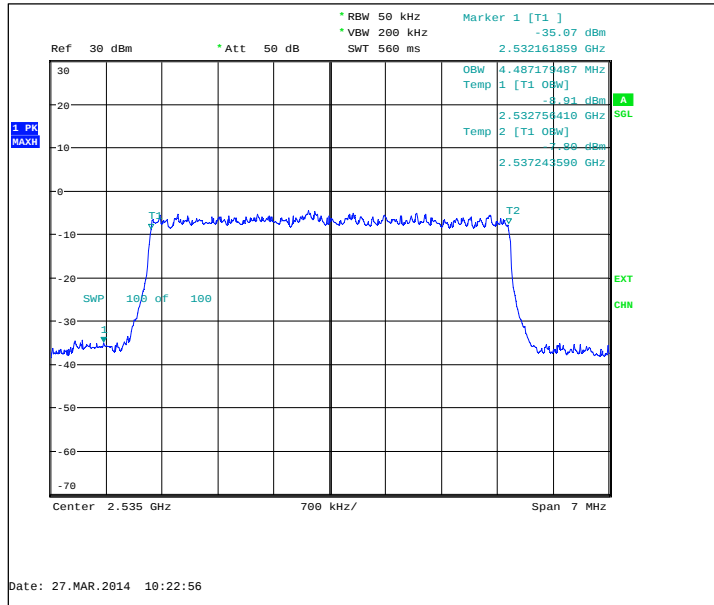
FDD, Channel 4175 / 835.0 MHz



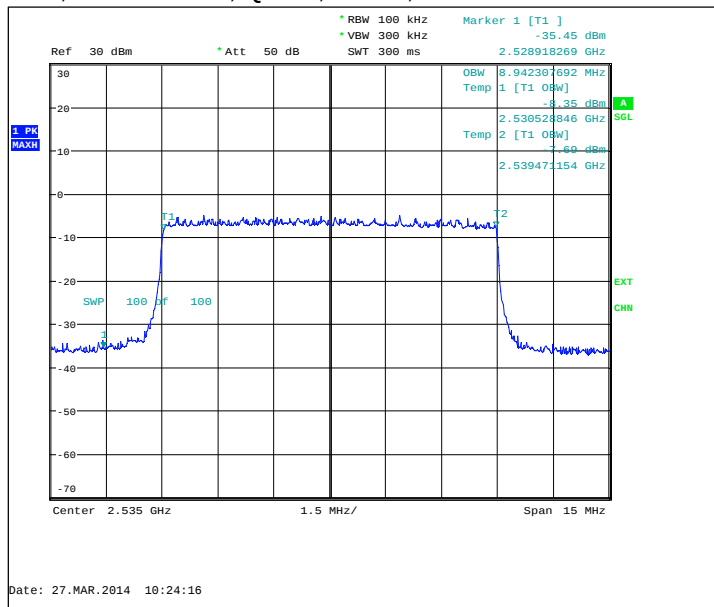
3.6. LTE7 Test results

Operation mode (TX on)	99% Occupied bandwidth [kHz]
FDD, CBW 5MHz, QPSK, 25 RB	4487.2
FDD, CBW 10MHz, QPSK, 50 RB	8942.3
FDD, CBW 15MHz, QPSK, 75 RB	13461.5
FDD, CBW 20MHz, QPSK, 100 RB	17868.6
FDD, CBW 5MHz, 16QAM, 25 RB	4476.0
FDD, CBW 10MHz, 16QAM, 50 RB	8942.3
FDD, CBW 15MHz, 16QAM, 75 RB	13429.5
FDD, CBW 20MHz, 16QAM, 100 RB	17908.7

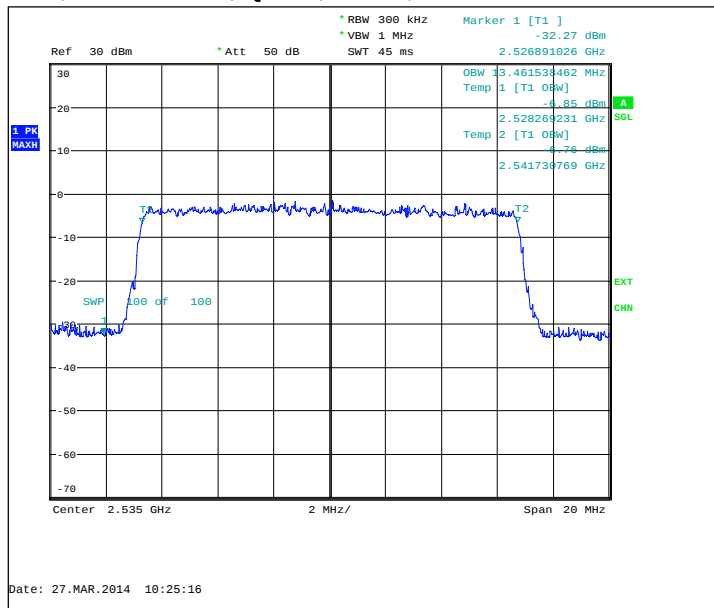
FDD, CBW 5MHz, QPSK, 25 RB, Channel 21100 / 2535.0 MHz



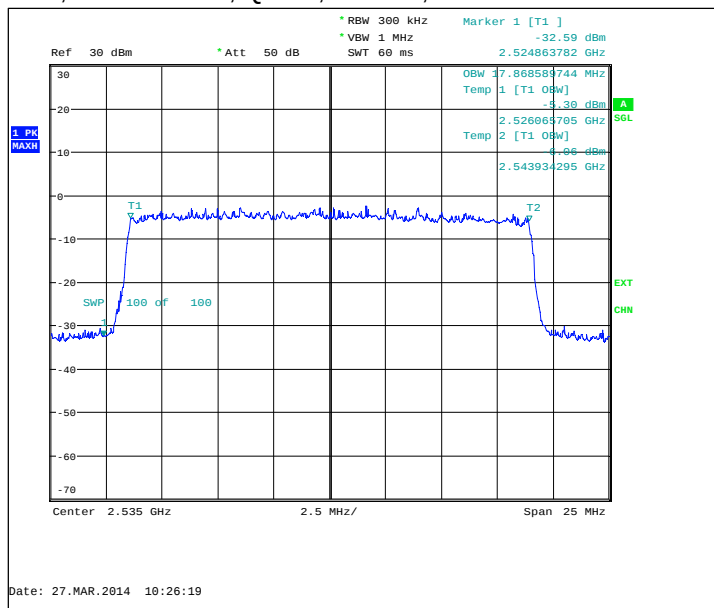
FDD, CBW 10MHz, QPSK, 50 RB, Channel 21100 / 2535.0 MHz



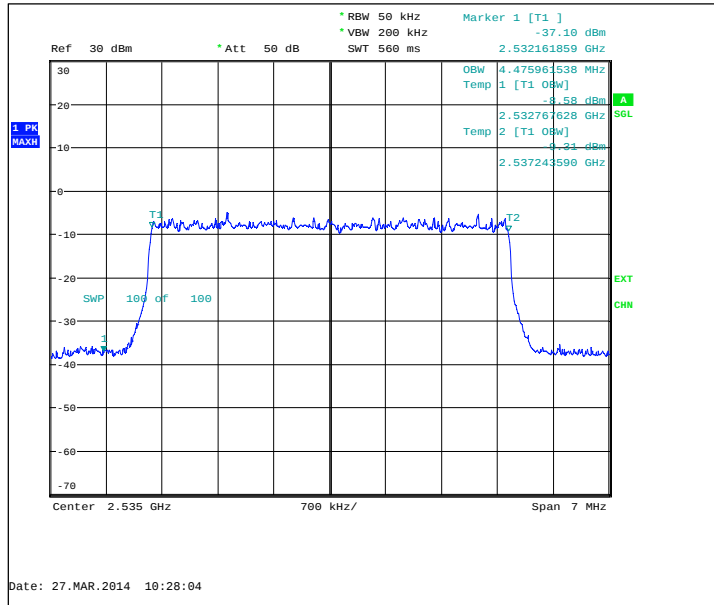
FDD, CBW 15MHz, QPSK, 75 RB, Channel 21100 / 2535.0 MHz



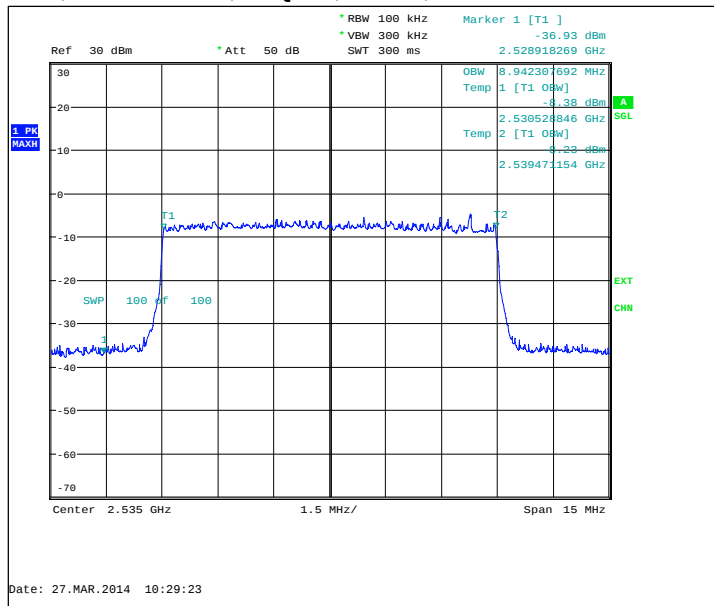
FDD, CBW 20MHz, QPSK, 100 RB, Channel 21100 / 2535.0 MHz



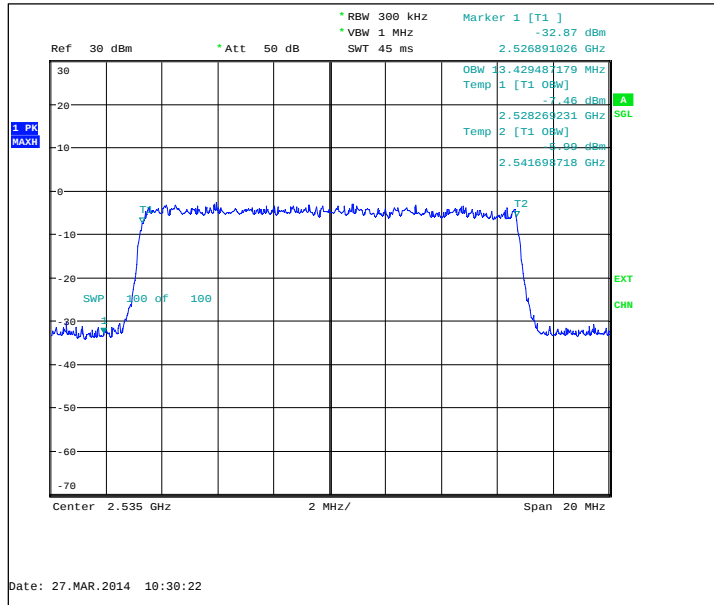
FDD, CBW 5MHz, 16QAM, 25 RB, Channel 21100 / 2535.0 MHz



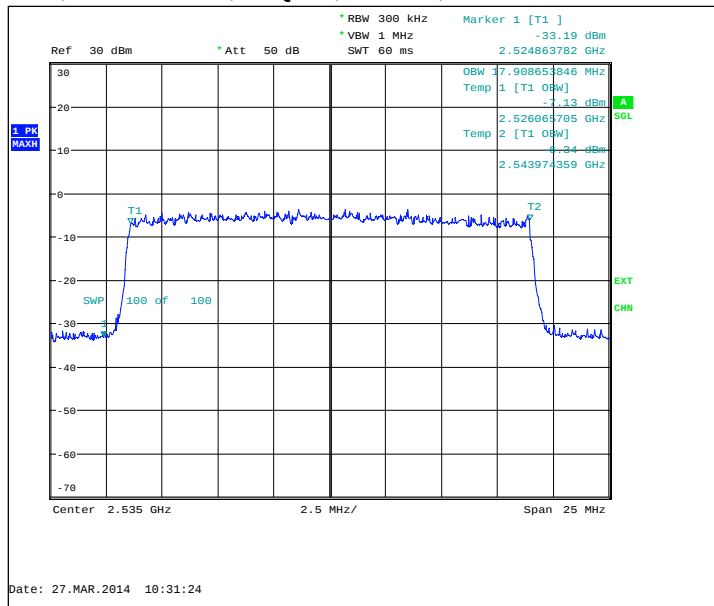
FDD, CBW 10MHz, 16QAM, 50 RB, Channel 21100 / 2535.0 MHz



FDD, CBW 15MHz, 16QAM, 75 RB, Channel 21100 / 2535.0 MHz



FDD, CBW 20MHz, 16QAM, 100 RB, Channel 21100 / 2535.0 MHz

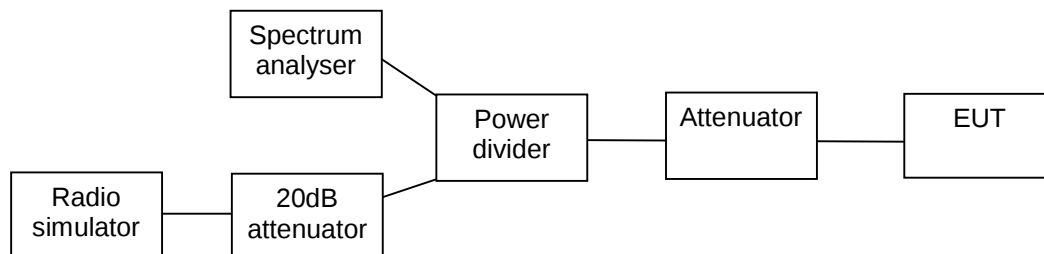


4. Band edge compliance

(FCC §22.917(a), §24.238(a), §27.50(d)(2), §27.53(h), §27.53(g), RSS-132 4.5, RSS-133 6.5)

EUT with DUT number	RM-974, DUT 43153
Accessories with DUT numbers	BL-5H Samsung, DUT 43147 ; AC-20E Pihong, DUT 43135 ; WH-108, DUT 43136
Operation Voltage [V] / [Hz]	Nominal
Results	PASSED
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	21 / 44 / 100.6
Date of measurements	08-May-2014
Measured by	Timo Raiskio

4.1. Test Setup



4.2. Test method and limit

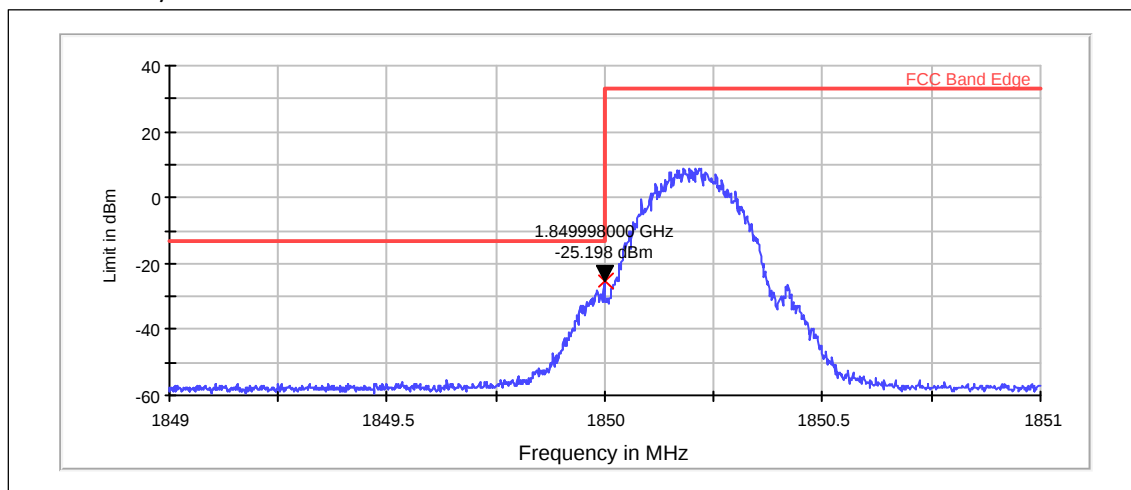
The measurement is made according to FCC rules parts 22, 24 and IC standards , RSS-132, RSS-133.

Limits for band edge compliance measurements

Operation band	Frequency range [MHz]	Limit [dBm]
GSM850 / WCDMA850	Below 824 and above 849	-13
GSM1900	Below 1850 and above 1910	-13

4.3. GSM 1900 Test results

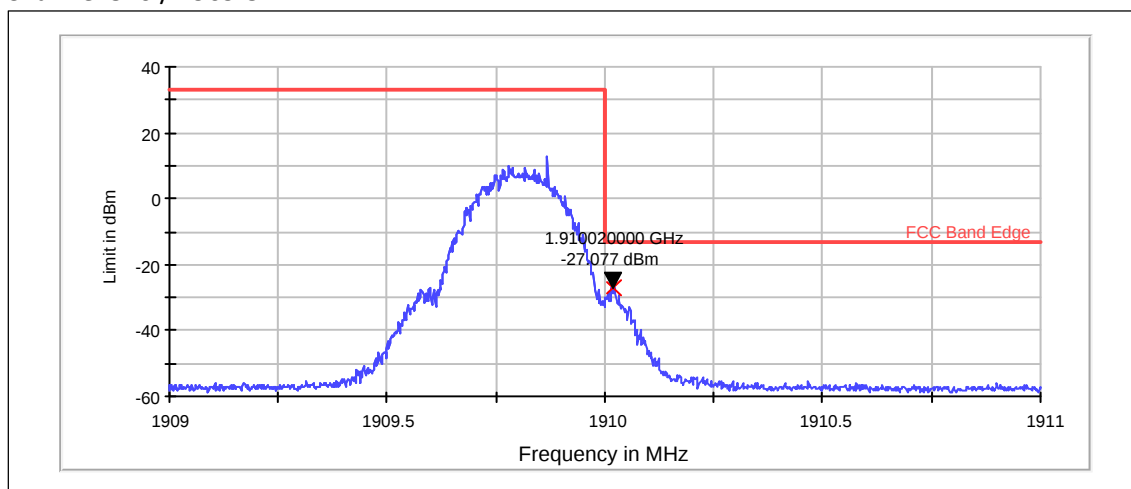
Channel 512 / 1850.2 MHz



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

Operation mode (TX on)	Frequency [MHz]	Level [dBm]	Result
GSM	1849.998	-25.20	PASSED

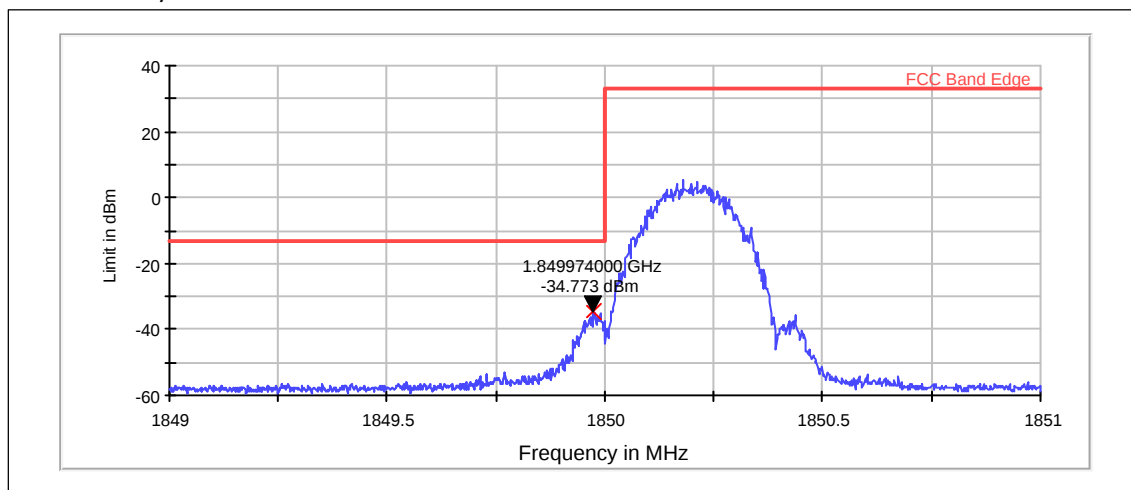
Channel 810 / 1909.8 MHz



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

Operation mode (TX on)	Frequency [MHz]	Level [dBm]	Result
GSM	1910.020	-27.08	PASSED

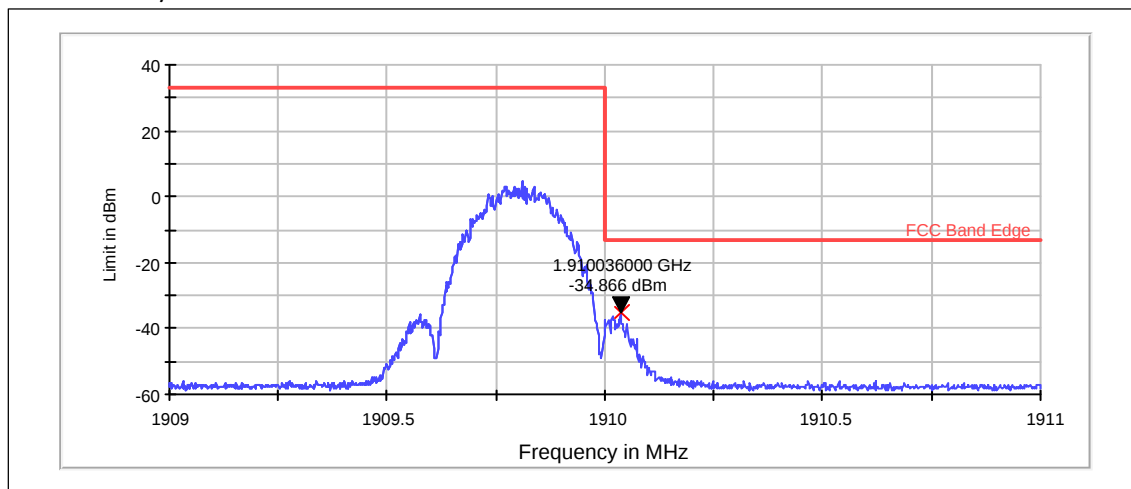
Channel 512 / 1850.2 MHz



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

Operation mode (TX on)	Frequency [MHz]	Level [dBm]	Result
EGPRS	1849.974	-34.77	PASSED

Channel 810 / 1909.8 MHz

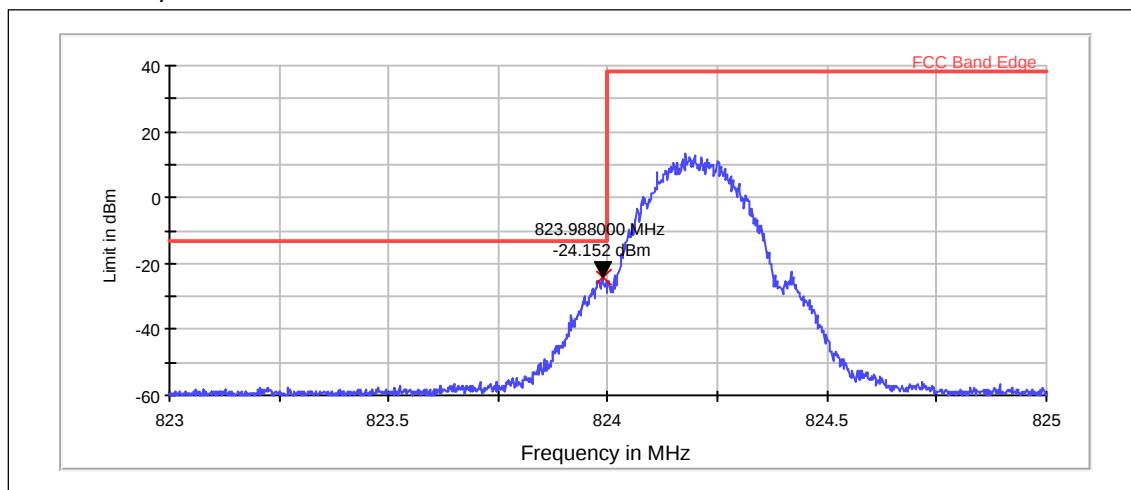


RMS (RBW: 3 kHz, VBW: 3 kHz, Max hold)

Operation mode (TX on)	Frequency [MHz]	Level [dBm]	Result
EGPRS	1910.036	-34.87	PASSED

4.4. GSM 850 Test results

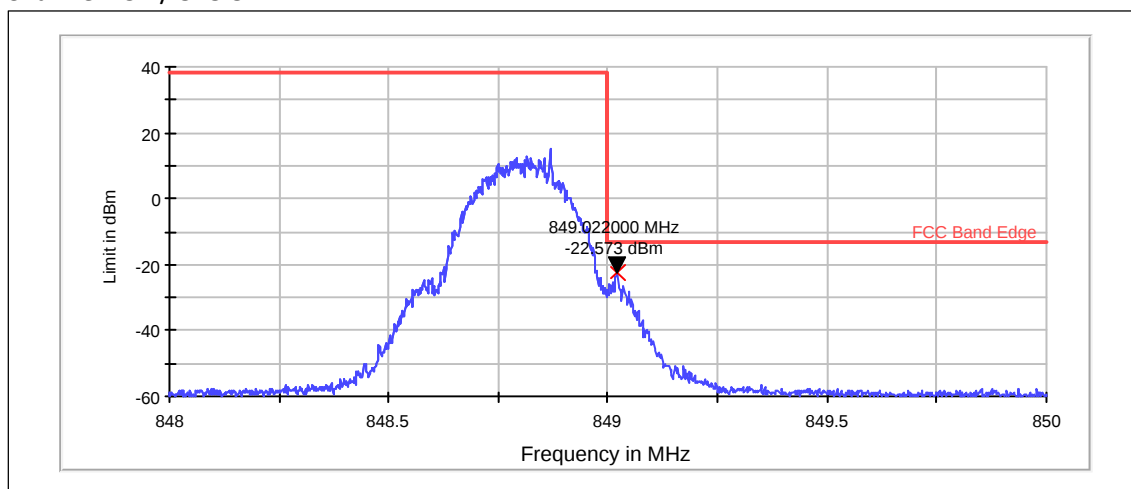
Channel 128 / 824.2 MHz



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

Operation mode (TX on)	Frequency [MHz]	Level [dBm]	Result
GSM	823.988	-24.15	PASSED

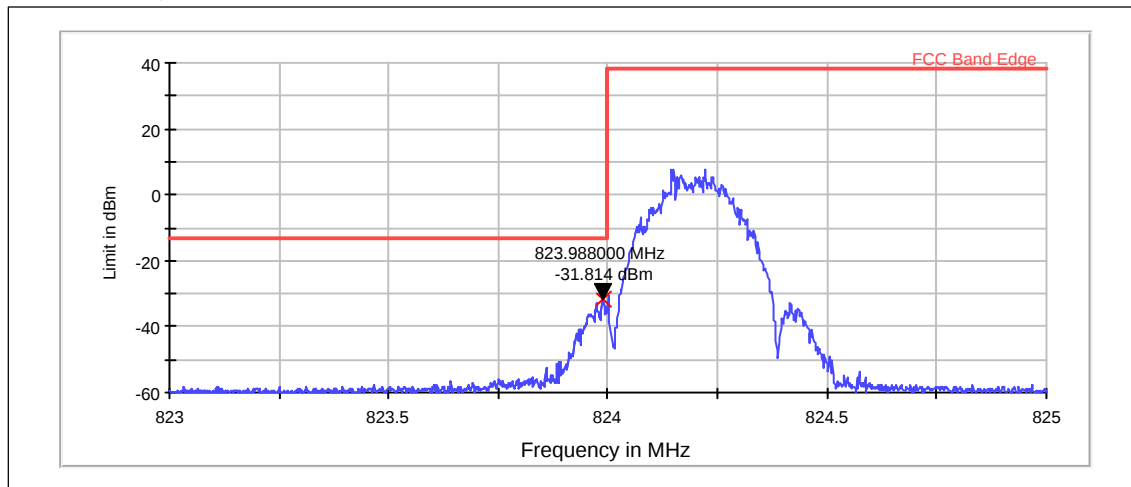
Channel 251 / 848.8 MHz



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

Operation mode (TX on)	Frequency [MHz]	Level [dBm]	Result
GSM	849.022	-22.57	PASSED

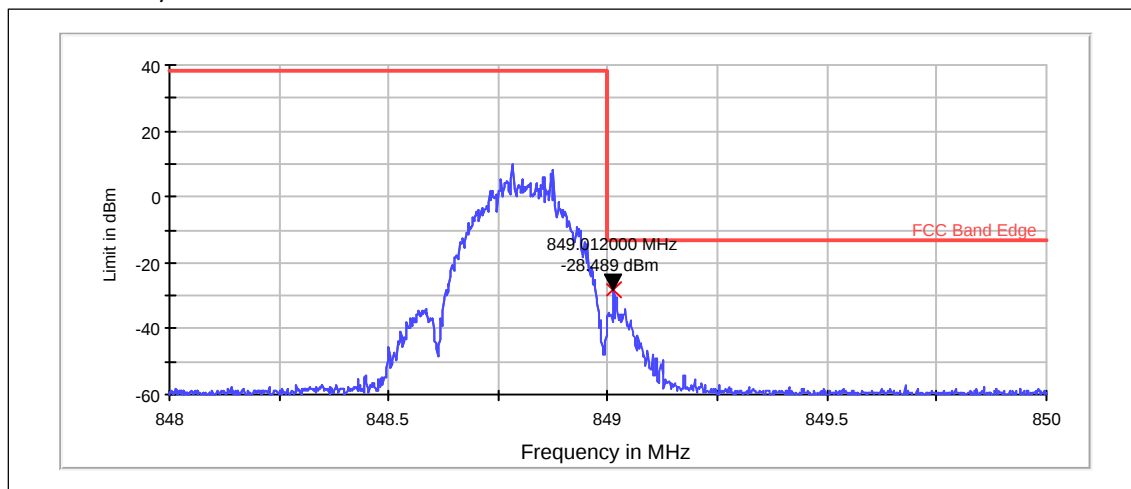
Channel 128 / 824.2 MHz



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

Operation mode (TX on)	Frequency [MHz]	Level [dBm]	Result
EGPRS	823.988	-31.81	PASSED

Channel 251 / 848.8 MHz

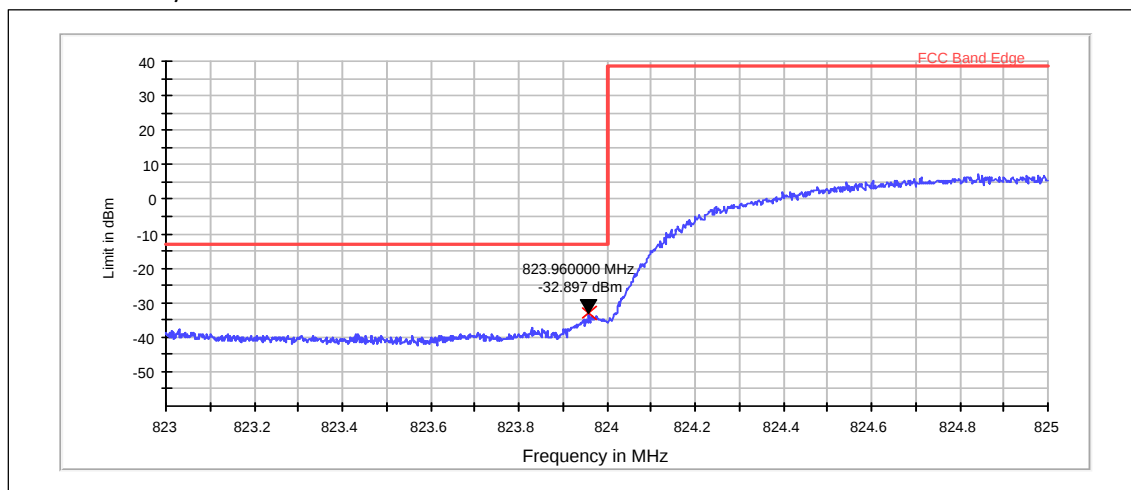


RMS (RBW: 3 kHz, VBW: 3 kHz, Max hold)

Operation mode (TX on)	Frequency [MHz]	Level [dBm]	Result
EGPRS	849.012	-28.49	PASSED

4.5. WCDMA 850 Test results

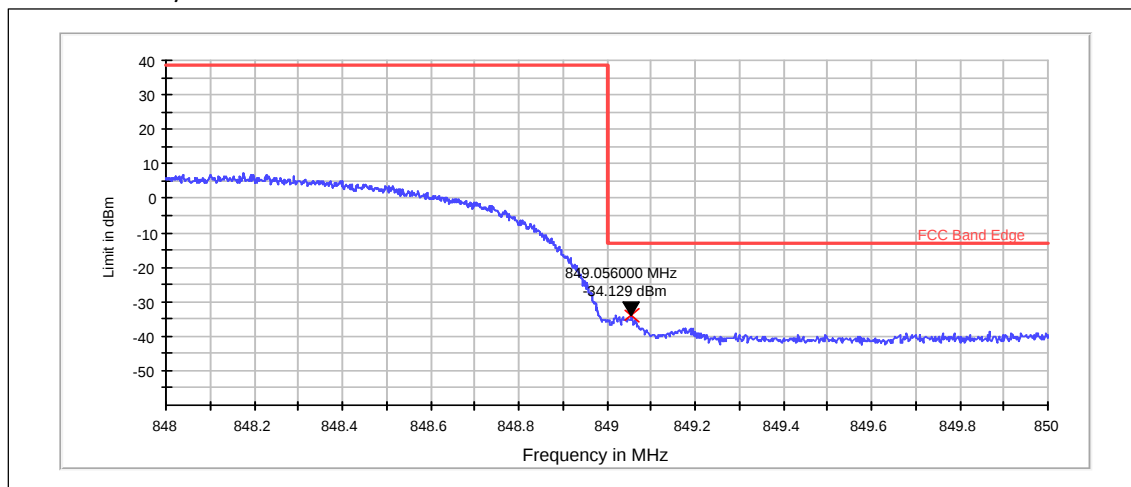
Channel 4132 / 826.4 MHz



RMS (RBW: 50 kHz, VBW: 50 kHz, Max hold)

Operation mode (TX on)	Frequency [MHz]	Level [dBm]	Result
FDD	823.960	-32.90	PASSED

Channel 4233 / 846.6 MHz

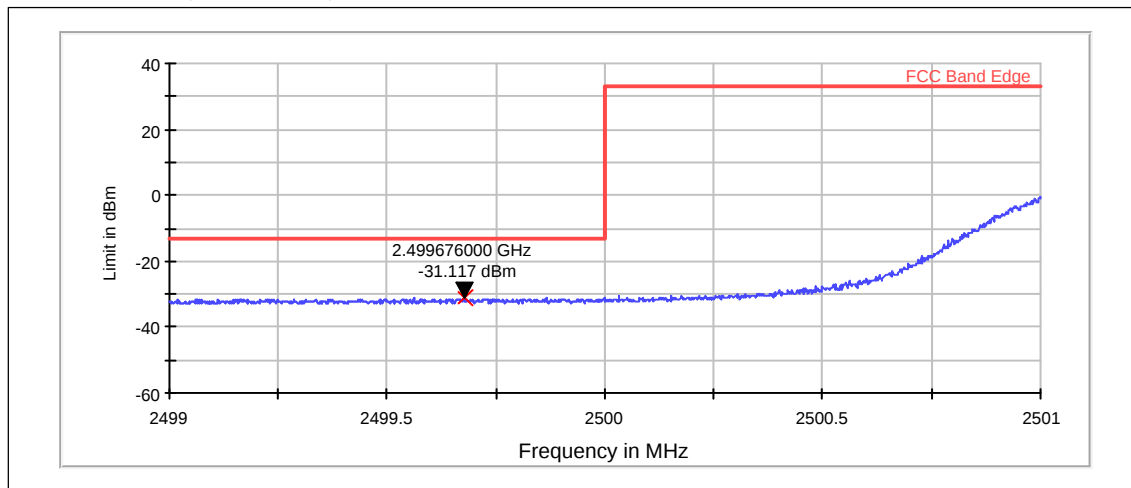


RMS (RBW: 50 kHz, VBW: 50 kHz, Max hold)

Operation mode (TX on)	Frequency [MHz]	Level [dBm]	Result
FDD	849.056	-34.13	PASSED

4.6. LTE7 Test results, Antenna 1

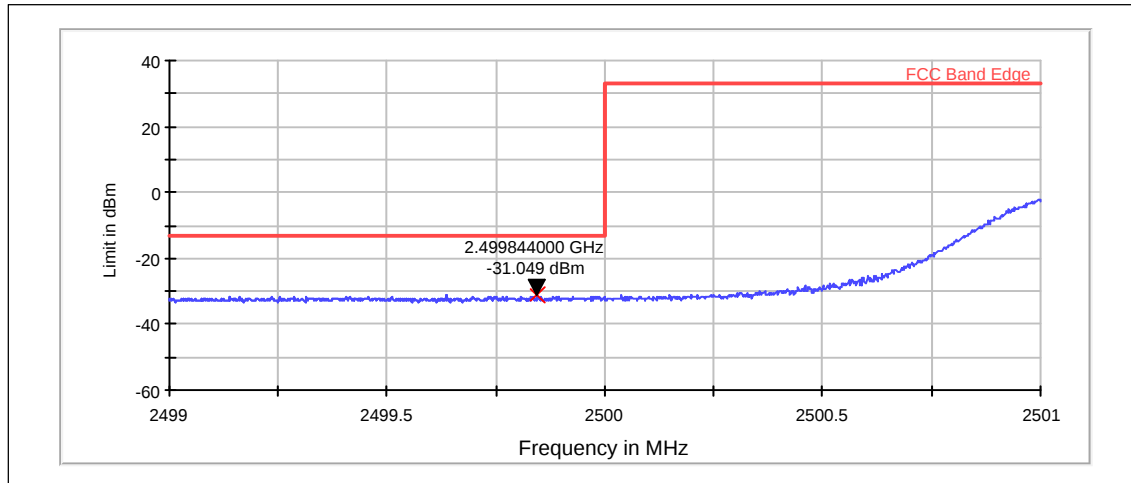
Channel 20850 / 2510 MHz, measured from antenna 1



RMS (RBW: 200 kHz, VBW: 200 kHz, Max hold)

Operation mode (TX on)	Frequency [MHz]	Level [dBm]	Result
FDD, CBW 20MHz, QPSK, 100 RB	2499.676	-31.12	PASSED

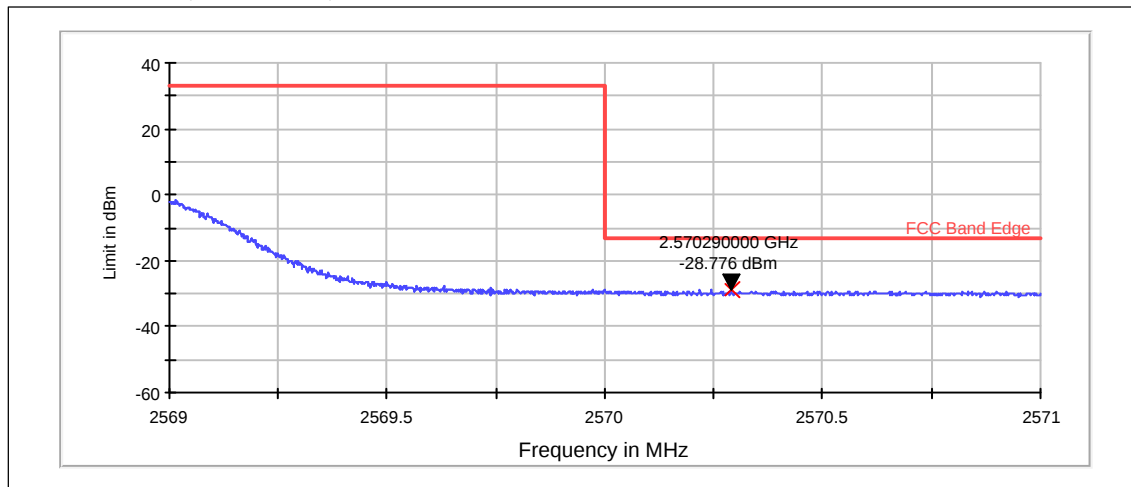
Channel 20850 / 2510 MHz, measured from antenna1



RMS (RBW: 200 kHz, VBW: 200 kHz, Max hold)

Operation mode (TX on)	Frequency [MHz]	Level [dBm]	Result
FDD, CBW 20MHz, 16QAM, 100 RB	2499.844	-31.05	PASSED

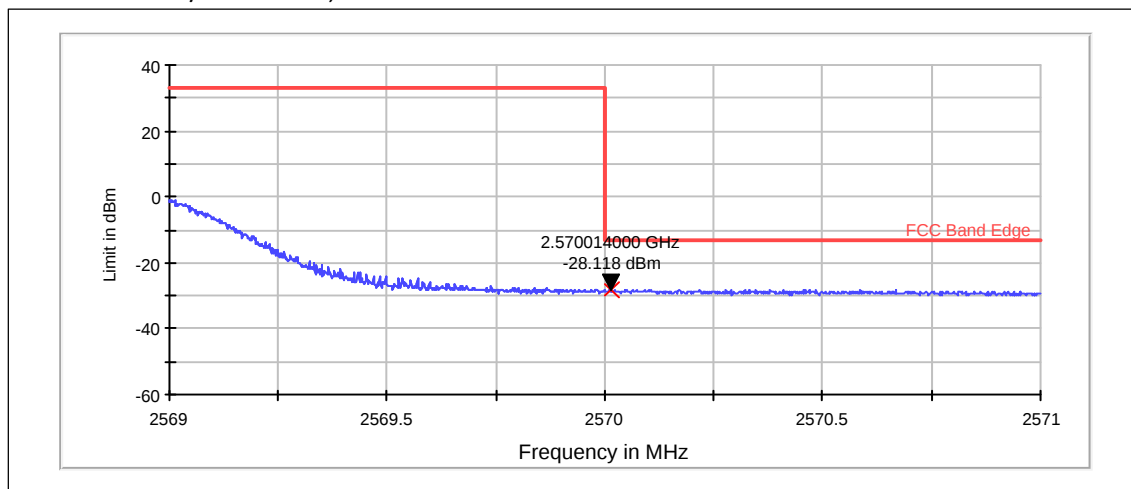
Channel 21350 / 2560 MHz, measured from antenna 1



RMS (RBW: 200 kHz, VBW: 200 kHz, Max hold)

Operation mode (TX on)	Frequency [MHz]	Level [dBm]	Result
FDD, CBW 20MHz, 16QAM, 100 RB	2570.290	-28.78	PASSED

Channel 21350 / 2560 MHz, measured from antenna 1

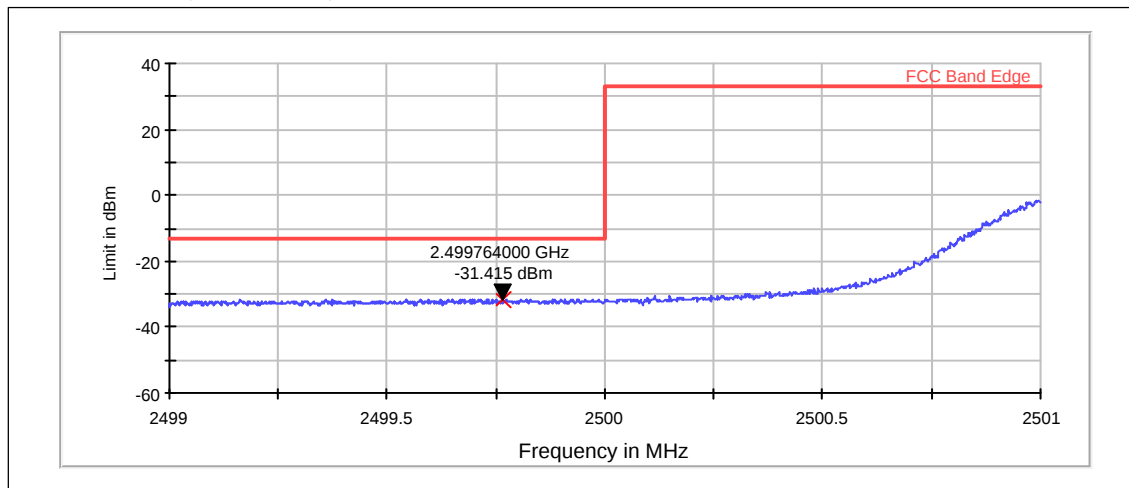


RMS (RBW: 200 kHz, VBW: 200 kHz, Max hold)

Operation mode (TX on)	Frequency [MHz]	Level [dBm]	Result
FDD, CBW 20MHz, QPSK, 100 RB	2570.014	-28.12	PASSED

4.7. LTE7 Test results, Antenna 2

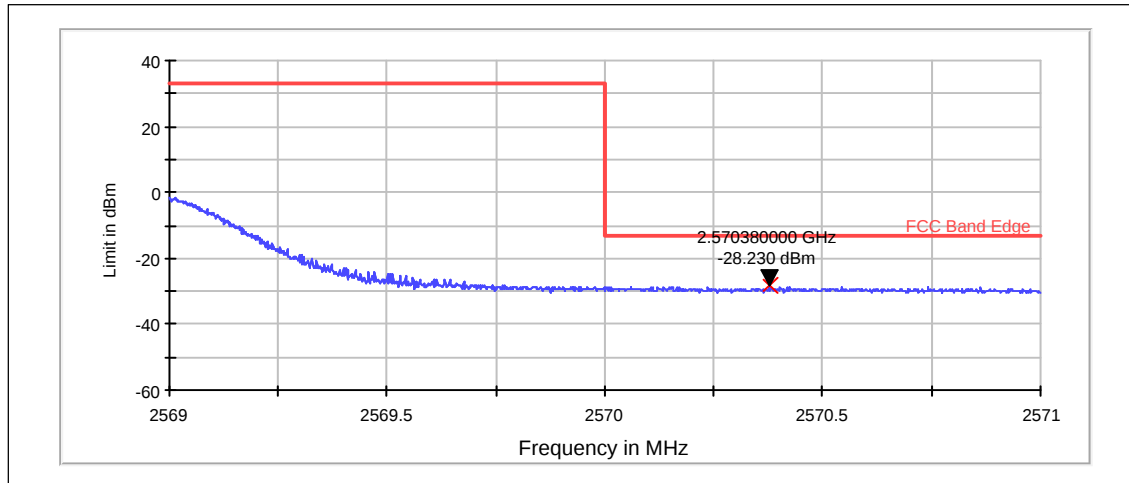
Channel 20850 / 2510 MHz, measured from antenna 2



RMS (RBW: 200 kHz, VBW: 200 kHz, Max hold)

Operation mode (TX on)	Frequency [MHz]	Level [dBm]	Result
FDD, CBW 20MHz, QPSK, 100 RB	2499.764	-31.42	PASSED

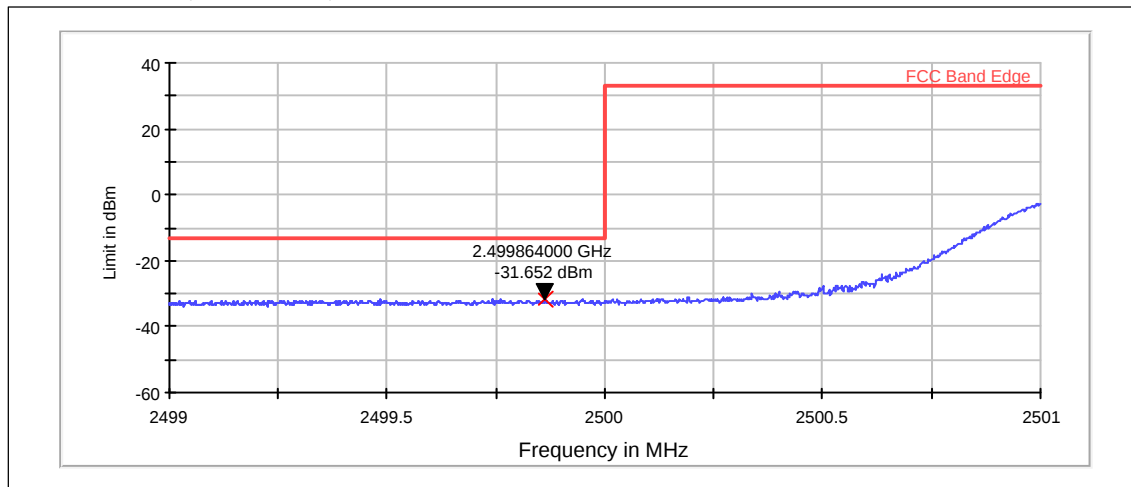
Channel 21350 / 2560 MHz, measured from antenna 2



RMS (RBW: 200 kHz, VBW: 200 kHz, Max hold)

Operation mode (TX on)	Frequency [MHz]	Level [dBm]	Result
FDD, CBW 20MHz, QPSK, 100 RB	2570.380	-28.23	PASSED

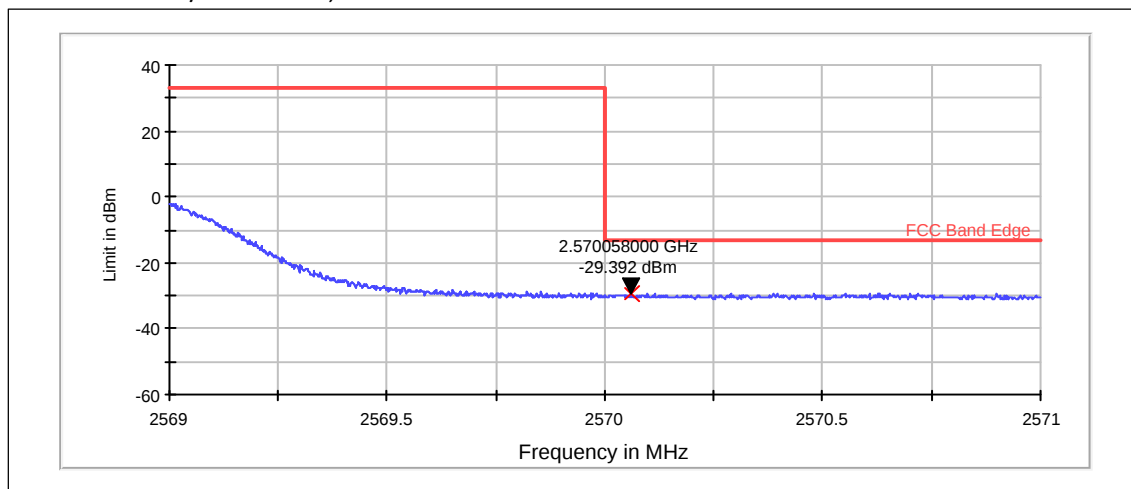
Channel 20850 / 2510 MHz, measured from antenna 2



RMS (RBW: 200 kHz, VBW: 200 kHz, Max hold)

Operation mode (TX on)	Frequency [MHz]	Level [dBm]	Result
FDD, CBW 20MHz, 16QAM, 100 RB	2499.864	-31.65	PASSED

Channel 21350 / 2560 MHz, measured from antenna 2



RMS (RBW: 200 kHz, VBW: 200 kHz, Max hold)

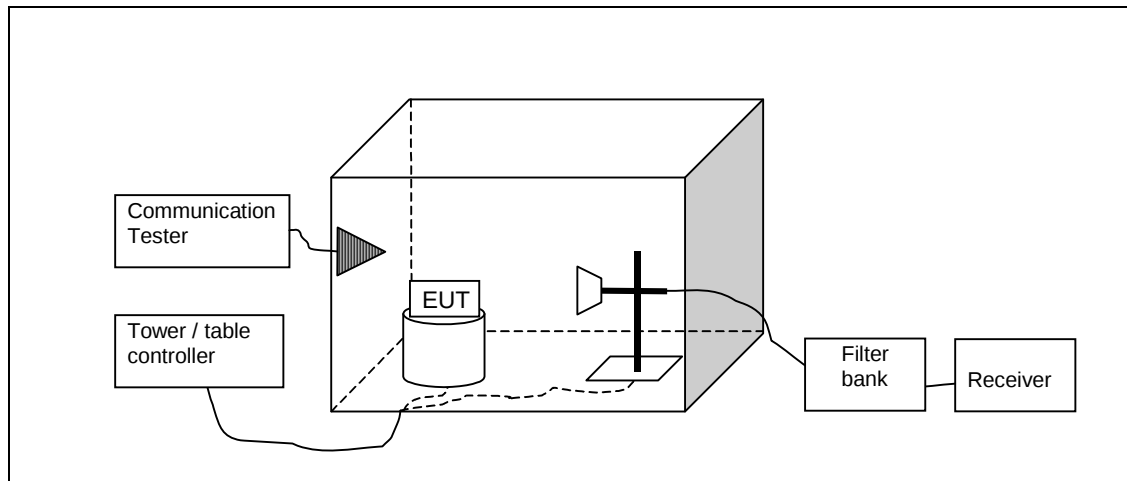
Operation mode (TX on)	Frequency [MHz]	Level [dBm]	Result
FDD, CBW 20MHz, 16QAM, 100 RB	2570.058	-29.39	PASSED

5. Spurious radiated emissions

(FCC §22.917(a), §2.1053, §24.238(a), §27.50(d)(2), §27.53(h), §27.53(g), §2.1053, RSS-132 4.5, RSS-133 6.5)

EUT with DUT number	RM-974, DUT 43155
Accessories with DUT numbers	BL-5H, DUT 43154 ; AC-20E, DUT 43140 ; WH-108, DUT 43142
Operation Voltage [V] / [Hz]	115 / 60
Results	PASSED
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	22 / 46 / 101.3
Date of measurements	08-Apr-2014
Measured by	Hannu Söderholm

5.1.1 Test setup



5.2. 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 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.

The measurement results are obtained as described below:

$$P [dBm] = P_{SUBST\ TX} + G_{SUBST\ TX\ ANT} - L_{SUBST\ CABLE}$$

Where $P_{SUBST\ TX}$ is signal generator level, which produces the same receiver reading P_{MEAS} in dBm as EUT. $G_{SUBST\ TX\ ANT}$ is substitution antenna gain and $L_{SUBST\ CABLE}$ is the loss of the cable between the signal generator and the substitution antenna.

Limits for spurious radiated emissions measurements

Operation band	Frequency range [MHz]	Limit [dBm]
GSM 850	30 - 8500	-13
GSM 1900	30 - 19100	-13
WCDMA 850	30 - 8500	-13
LTE7	30 - 25700	-13

5.3. GSM 850 test results

Peak detector

Frequency [MHz]	P [dBm]	P [μ W]	P _{MEAS} [dBm]	A _{TOT} [dB]	Polarisation	Results
1644.689	-59.54	0.00111	-52.94	-6.6	VERTICAL	PASSED
1653.146	-59.26	0.00119	-52.56	-6.7	VERTICAL	PASSED
1654.95	-59.52	0.00112	-52.52	-7	HORIZONTAL	PASSED
2509.82	-44.74	0.03357	-45.14	0.4	HORIZONTAL	PASSED
2509.94	-44.97	0.03184	-45.37	0.4	HORIZONTAL	PASSED
3353.747	-59.55	0.00111	-59.85	0.3	VERTICAL	PASSED

5.4. GSM 850-E test results

Peak detector

Frequency [MHz]	P [dBm]	P [μ W]	P _{MEAS} [dBm]	A _{TOT} [dB]	Polarisation	Results
1672.98	-58.49	0.00142	-51.69	-6.8	VERTICAL	PASSED
2509.86	-50.85	0.00822	-51.25	0.4	HORIZONTAL	PASSED

5.5. GSM 1900 test results

Peak detector

Frequency [MHz]	P [dBm]	P [μ W]	P _{MEAS} [dBm]	A _{TOT} [dB]	Polarisation	Results
1909.8	-40.98	0.0798	-37.98	-3	HORIZONTAL	PASSED
1909.864	-34.65	0.34277	-31.65	-3	HORIZONTAL	PASSED
1909.88	-35.31	0.29444	-32.31	-3	HORIZONTAL	PASSED
1910.575	-39.58	0.11015	-36.58	-3	HORIZONTAL	PASSED
1911.167	-38.16	0.15276	-35.26	-2.9	HORIZONTAL	PASSED
9338.036	-45.67	0.0271	-63.77	18.1	HORIZONTAL	PASSED

5.6. GSM 1900-E test results

Peak detector

Frequency [MHz]	P [dBm]	P [μ W]	P _{MEAS} [dBm]	A _{TOT} [dB]	Polarisation	Results
3760.02	-50.77	0.00838	-54.87	4.1	VERTICAL	PASSED
5639.98	-50.67	0.00857	-58.37	7.7	HORIZONTAL	PASSED

5.7. WCDMA 850 test results

Channel 4175 / 835.0 MHz

FDD mode, Peak detector

Frequency [MHz]	P [dBm]	P [μ W]	P _{MEAS} [dBm]	A _{TOT} [dB]	Polarisation	Results
847.901	-50.14	0.00968	-80.44	30.3	HORIZONTAL	PASSED
848.239	-47.58	0.01746	-78.98	31.4	VERTICAL	PASSED
1009.359	-61.96	0.00064	-51.46	-10.5	VERTICAL	PASSED
1671.423	-55.96	0.00254	-49.26	-6.7	HORIZONTAL	PASSED
1672.405	-55.82	0.00262	-49.12	-6.7	HORIZONTAL	PASSED
2501.984	-50.62	0.00867	-50.62	0	VERTICAL	PASSED
2502.255	-50.83	0.00826	-50.83	0	VERTICAL	PASSED
2502.425	-49.86	0.01033	-49.86	0	VERTICAL	PASSED
3347.315	-60.24	0.00095	-60.34	0.1	HORIZONTAL	PASSED
4176.182	-57.49	0.00178	-60.59	3.1	VERTICAL	PASSED
5011.784	-55.01	0.00316	-60.31	5.3	HORIZONTAL	PASSED
5848.788	-54.49	0.00356	-59.99	5.5	HORIZONTAL	PASSED
6688.397	-50.86	0.0082	-58.56	7.7	VERTICAL	PASSED
7522.515	-50.38	0.00916	-61.88	11.5	HORIZONTAL	PASSED
8353.547	-49.35	0.01161	-62.35	13	VERTICAL	PASSED

5.8. LTE7 test results, Antenna 1

Channel 21100 / 2535.0 MHz

FDD, CBW 5MHz, QPSK, 1 RB, RMS detector

Frequency [MHz]	P [dBm]	P [μ W]	P _{MEAS} [dBm]	A _{TOT} [dB]	Polarisation	Results
2580.1	-64.27	0.00037	-65.27	1	HORIZONTAL	PASSED
2655.411	-41.49	0.07096	-42.89	1.4	HORIZONTAL	PASSED
5070.301	-57.59	0.00174	-65.49	7.9	HORIZONTAL	PASSED
7595.681	-60.05	0.00099	-73.65	13.6	HORIZONTAL	PASSED
10138.978	-56.95	0.00202	-73.05	16.1	HORIZONTAL	PASSED
12675.501	-56.77	0.0021	-74.27	17.5	HORIZONTAL	PASSED

Channel 21100 / 2535.0 MHz

FDD, CBW 5MHz, 16QAM, 1 RB, RMS detector

Frequency [MHz]	P [dBm]	P [μ W]	P _{MEAS} [dBm]	A _{TOT} [dB]	Polarisation	Results
2587.675	-64.36	0.00037	-65.46	1.1	HORIZONTAL	PASSED
2653.743	-41.46	0.07145	-42.76	1.3	HORIZONTAL	PASSED
5070.14	-57.59	0.00174	-65.49	7.9	HORIZONTAL	PASSED
7608.186	-60.01	0.001	-73.61	13.6	HORIZONTAL	PASSED
10130.2	-56.88	0.00205	-72.98	16.1	HORIZONTAL	PASSED
12667.926	-56.81	0.00208	-74.31	17.5	HORIZONTAL	PASSED

5.9. LTE7 test results, Antenna 2

Channel 21100 / 2535.0 MHz

FDD, CBW 5MHz, QPSK, 1 RB, RMS detector

Frequency [MHz]	P [dBm]	P [μ W]	P _{MEAS} [dBm]	A _{TOT} [dB]	Polarisation	Results
2580.253	-62.59	0.00055	-63.59	1	HORIZONTAL	PASSED
2653.8	-43.31	0.04667	-44.61	1.3	HORIZONTAL	PASSED
5070.301	-58.36	0.00146	-66.26	7.9	HORIZONTAL	PASSED
7598.567	-60.09	0.00098	-73.59	13.5	HORIZONTAL	PASSED
10139.299	-56.96	0.00201	-73.06	16.1	HORIZONTAL	PASSED
12668.848	-56.8	0.00209	-74.3	17.5	HORIZONTAL	PASSED

Channel 21100 / 2535.0 MHz

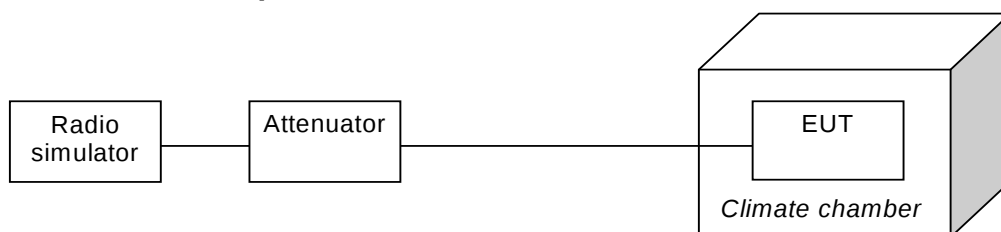
FDD, CBW 5MHz, 16QAM, 1 RB, RMS detector

Frequency [MHz]	P [dBm]	P [μ W]	P _{MEAS} [dBm]	A _{TOT} [dB]	Polarisation	Results
2655.491	-42.78	0.05272	-44.18	1.4	HORIZONTAL	PASSED
5070.381	-62.15	0.00061	-70.05	7.9	HORIZONTAL	PASSED
7610.952	-59.94	0.00101	-73.64	13.7	HORIZONTAL	PASSED
10135.812	-56.93	0.00203	-73.03	16.1	HORIZONTAL	PASSED
12666.002	-56.49	0.00224	-73.89	17.4	HORIZONTAL	PASSED

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

EUT with DUT number	RM-974, DUT 43153
Accessories with DUT numbers	BL-5H Samsung, DUT 43147 ; AC-20E Pihong, DUT 43135 ; WH-108, DUT 43136
Operation Voltage [V] / [Hz]	Nominal
Results	PASSED
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	21 / 44 / 100.6
Date of measurements	24-Mar-2014
Measured by	Timo Raiskio

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 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

6.3. GSM 1900 Test results

GSM, Channel 661 / 1880.0 MHz

Temperature [°C]	Frequency [MHz]	Deviation [Hz]	Deviation [ppm]	Result
50	1880.00	51.21000	0.0272	PASSED
40	1880.00	50.69000	0.027	PASSED
30	1880.00	47.07000	0.025	PASSED
20	1880.00	41.52000	0.0221	PASSED
11	1880.00	42.29000	0.0225	PASSED
0	1880.00	40.94000	0.0218	PASSED
-10	1880.00	46.49000	0.0247	PASSED
-20	1880.00	47.59000	0.0253	PASSED
-30	1880.00	48.04000	0.0256	PASSED

6.4. GSM 850 Test results

GSM, Channel 190 / 836.6 MHz

Temperature [°C]	Frequency [MHz]	Deviation [Hz]	Deviation [ppm]	Result
50	836.60	6.46000	0.0077	PASSED
40	836.60	6.33000	0.0076	PASSED
30	836.60	5.42000	0.0065	PASSED
20	836.60	3.29000	0.0039	PASSED
10	836.60	4.52000	0.0054	PASSED
0	836.60	2.97000	0.0036	PASSED
-10	836.60	2.97000	0.0036	PASSED
-20	836.60	0.97000	0.0012	PASSED
-30	836.60	2.26000	0.0027	PASSED

6.5. LTE7 Test results

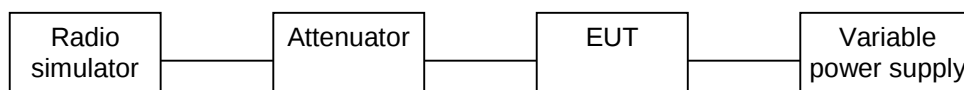
FDD, CBW 20MHz, QPSK, 100 RB, Channel 21100 / 2535.0 MHz

Temperature [°C]	Frequency [MHz]	Deviation [Hz]	Deviation [ppm]	Result
50	2535.00	-0.40054	-0.0002	PASSED
40	2535.00	8.05378	0.0032	PASSED
30	2535.00	-0.77248	-0.0003	PASSED
20	2535.00	2.28882	0.0009	PASSED
10	2535.00	-0.15736	-0.0001	PASSED
0	2535.00	-0.20027	-0.0001	PASSED
-10	2535.00	1.25885	0.0005	PASSED
-20	2535.00	-1.14441	-0.0004	PASSED
-30	2535.00	3.03268	0.0012	PASSED

7. 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-974, DUT 43153
Accessories with DUT numbers	BL-5H Samsung, DUT 43147 ; AC-20E Pihong, DUT 43135 ; WH-108, DUT 43136
Operation Voltage [V] / [Hz]	3.5 / 3.7 / 4.2
Results	PASSED
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	21 / 44 / 100.6
Date of measurements	24-Mar-2014
Measured by	Timo Raiskio

7.1. Test Setup



7.2. 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

7.3. GSM 1900 Test results

GSM,

Voltage level [V]	Frequency [MHz]	Deviation [Hz]	Deviation [ppm]	Result
Nominal / 3.7	1880.00	41.71000	0.0222	PASSED
Battery cut-off point / 3.5	1880.00	43.72000	0.0233	PASSED
Max / 4.2	1880.00	45.52000	0.0242	PASSED

7.4. GSM 850 Test results

GSM,

Voltage level [V]	Frequency [MHz]	Deviation [Hz]	Deviation [ppm]	Result
Max / 4.2	836.60	8.33000	0.01	PASSED
Battery cut-off point / 3.5	836.60	3.75000	0.0045	PASSED
Nominal / 3.7	836.60	5.10000	0.0061	PASSED

7.5. LTE7 Test results

FDD, CBW 20MHz, QPSK, 100 RB, Channel 21100 / 2535.0 MHz

Voltage level [V]	Frequency [MHz]	Deviation [Hz]	Deviation [ppm]	Result
Max / 4.2	2535.00	1.34468	0.0005	PASSED
Battery cut-off point / 3.5	2535.00	0.05722	0	PASSED
Nominal / 3.7	2535.00	-0.22888	-0.0001	PASSED

8. Test Equipment

8.1. Conducted measurements

Eq. No	Equipment	Type	Manufacturer	Used in
TM38112	Power supply	6632A	Agilent	22/24/27, 15C, 15E
TM38114	Power supply	6632A	Agilent	22/24/27, 15C, 15E
TM37773	Communication Tester	CMU200	R&S	22/24/27, 15B
TM30600	Impulse limiter	ESH3-Z2	R&S	15C, 15B
TM26490	LISN 50 μ H	ESH3-Z5	R&S	15C, 15B
TM26491	LISN 50 μ H	ESH3-Z5	R&S	15C, 15B
TM37610	Spectrum Analyzer	FSU26	R&S	22/24/27, 15C, 15E
TM23007	Oscilloscope	TDS684B	Tektronix	15E
TM22806	Battery	BAT 20/E	Fiskars	15C, 15B
TM22805	UPS	PS 20/1.2	Fiskars	15C, 15B
-	Temperature and humidity logger	175-H2	Testo	15C, 15B
-	Temperature and humidity logger	175-H2	Testo	22/24/27, 15C
-	Air pressure and temperature logger	635-2	Testo	22/24/27, 15C, 15B
-	Air pressure sensor	0638-1835	Testo	22/24/27, 15C, 15B
-	Temperature test chamber	VT 4002	Vötsch	22/24/27
2001	Bluetooth tester	CBT	R&S	15C, 15B
2009	LISN 50 μ H	ENV216	R&S	15C, 15B
2010	LISN 50 μ H	ENV216	R&S	15C, 15B
2012	Power splitter	11667B	Agilent	22/24/27, 15C
2013	Attenuator	8493C	Agilent	22/24/27, 15C
2014	Attenuator	8493C	Agilent	22/24/27, 15C
2019	Power splitter	ZN2PD-9G-S+	Mini-Circuits	15E
2020	Power splitter	ZN2PD-9G-S+	Mini-Circuits	15E
2021	Communication Tester	CMW500	R&S	22/24/27
2022	Communication Tester	CMU200	R&S	22/24/27
2023	Spectrum Analyzer	ESMI-RF	R&S	15B/15C
2024	Analyzer display unit	ESAI-D	R&S	15B/15C
2026	Signal Generator	SMF 100A	R&S	22/24/27, 15C, 15E, 15B

8.2. Radiated measurements

Eq. No	Equipment	Type	Manufacturer	Used in
-	Antenna	BBHA 9120 D	Schwarzbeck	22/24/27, 15C
TM37678	Communication Tester	CMU200	R&S	22/24/27, 15B
TM38845	Receiver	ESIB 26	R&S	22/24/27, 15C, 15E, 15B
-	Antenna	HL562	R&S	22/24/27, 15C, 15E, 15B
-	Turntable	2188	EMCO	22/24/27, 15C, 15E, 15B
-	Turntable controller	2090	EMCO	22/24/27, 15C, 15E, 15B
-	RF system panel	OSP130	R&S	22/24/27, 15C, 15E, 15B
-	Mini mast	2075-2	ETS Lindgren	22/24/27, 15C, 15B
TM38843	Mini mast	2075	Emco	22/24/27, 15C, 15B
TM38842	Antenna mast controller	2090	Emco	22/24/27, 15C, 15B
TM30643	LISN 50 µH	LISN-5-20-2	FCC	22/24/27, 15C, 15B
TM30644	LISN 50 µH	LISN-5-20-2	FCC	22/24/27, 15C, 15B
-	Temperature and humidity logger	175-H2	Testo	22/24/27, 15C, 15B
-	Air pressure and temperature logger	635-2	Testo	22/24/27, 15C, 15B
-	Air pressure sensor	0638-1835	Testo	22/24/27, 15C, 15B
TM37523	Preamplifier	AMF-4D-10M-3G-25-20P	Miteq	22/24/27, 15C, 15B
TM37498	Preamplifier	AMF-5D-020180-26-10P	Miteq	22/24/27, 15C, 15B
TM30599	Semi anechoic chamber	UNKNOWN	TDK	22/24/27, 15C, 15B
TM22638	Power supply	OL63743-901	-	22/24/27, 15C, 15E, 15B
TM38066	High pass filter	WHKX3.0/18G-12SS	Wainwright	22/24/27, 15C, 15E, 15B
2028	High pass filter	WHKX 1.0/15G-12SS	Wainwright	22/24/27, 15C, 15E, 15B
TM37545	Tunable notch filter	800.0/960.0-0.2/40-8SSK	Wainwright	22
TM26512	Tunable notch filter	WRCD1850/1910-0.2/40-10SSK	Wainwright	24
-	Band reject filter	WRCG1877/1883-1870/1890-40/6EE	Wainwright	24
-	Band reject filter	WRCG1729.4/1735.4-1722.4/1742.4-40/6SS	Wainwright	27
TM23892	Controller	G-1000SDX	Yaesu	22/24/27, 15C, 15E
2001	Bluetooth tester	CBT	R&S	15C, 15B
6023	Antenna	VUBA 9117	Schwarzbeck	22/24/27
2021	Communication Tester	CMW500	R&S	22/24/27
2025	Antenna	HFH2-Z2	R&S	15C
2026	Signal Generator	SMF 100A	R&S	22/24/27, 15C, 15E, 15B
2052	Antenna	BBHA 9120 D	Schwarzbeck	22/24/27, 15C, 15B, 15E
-	Antenna	QSH18S20	Q-Par	22/24/27, 15C, 15B, 15E
-	Antenna	QSH20S20	Q-Par	22/24/27, 15C, 15B, 15E
-	Antenna	QSH20S20	Q-Par	22/24/27, 15C, 15B, 15E