

FCC Part 22/24 Compliance Test Report

Test Report no.:	FCC22&24_RM-937_10.docx	Date of Report:	30-Sep-2013
Number of pages:	13	Customer's Contact person:	Lasse Vaattovaara
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FCC listing no.:	94436		
IC recognition no.:	661AK-1		
Tested devices/ accessories:	Phone RM-937 / AC charger AC-60E / Data Cable CA-190CD / Headset WH-208 / Battery BV-4BW Sony		
FCC ID:	PYAC	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:			
	Sami Lehtonen, Specialist, EMC		

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

Date of receipt	20-Aug-2013
Testing completed	09-Sep-2013
The customer's contact person	Lasse Vaattovaara
Test Plan referred to	T:\Projects\RM-937\TestPlan\RS_testplan_RM-937.xlsm
Notes	-
Document name	T:\Projects\RM-937\EMC\FCC22&24_RM-937_10.docx

1.1. EUT and Accessory Information

The EUT is a mobile phone with following features:
GSM/WCDMA/LTE/WLAN/Bluetooth
The EUT is tested with maximum rated TX power.

Devices under tests

Product	Type	SN	HW	MV	SW	DUT
Phone	RM-937	004402472888753	2010	-	1028.3200.1332.0000	43088
AC charger	AC-60E	4090493047580200187;0675677	B1.0 HW0.3 MW0.2 PV02	-	-	42975
Data Cable	CA-190CD	-	-	-	-	43034
Headset	WH-208	-	-	-	-	43035
Battery	BV-4BW Sony	-	6.0	-	-	43059
Phone	RM-937	004402472888654	2010	FAV7	1028.3500.1332.2000	43078

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	NP
§22.917(a)	4.5	Band edge compliance	NP
§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	NP
§2.1055(d)	4.3	Frequency stability, voltage variation	NP

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	NP
§22.917(a)	4.5	Band edge compliance	NP
§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	NP
§2.1055(d)	4.3	Frequency stability, voltage variation	NP

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	NP
§24.238(a)	6.5	Band edge compliance	NP
§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	NP
§2.1055(d)	6.3	Frequency stability, voltage variation	NP

WCDMA 1900 (Band II):

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	NP
§24.238(a)	6.5	Band edge compliance	NP
§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	NP
§2.1055(d)	6.3	Frequency stability, voltage variation	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 Laboratory.

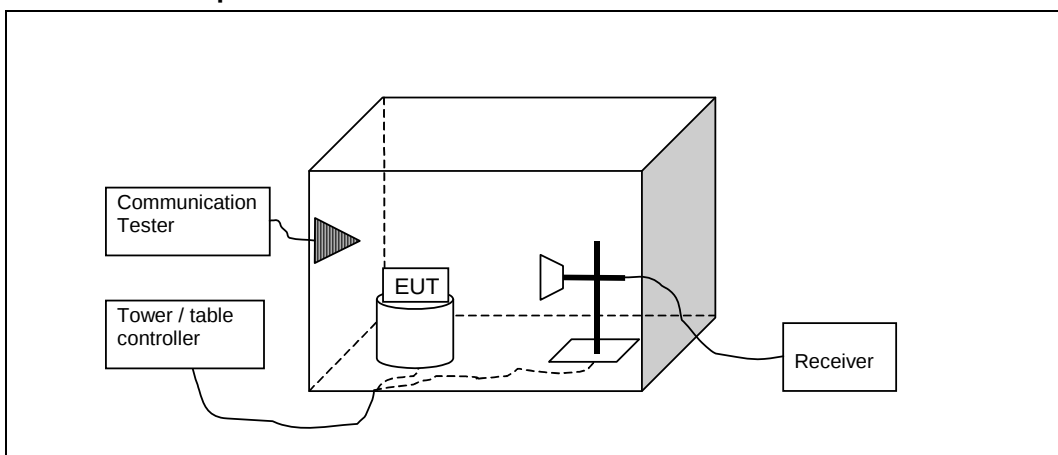
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2. Radiated RF output power (FCC §22.913(a), §24.232(b), RSS-132 4.4, RSS-133 6.4)

EUT with DUT number	RM-937, DUT 43078
Accessories with DUT numbers	BV-4BW Sony, DUT 43059
Operation Voltage [V] / [Hz]	Nominal
Results	PASSED
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	21 / 52 / 102.2
Date of measurements	09-Sep-2013
Measured by	Timo Raiskio

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

GSM mode

Channel / f _c [MHz]	ERP [dBm]	ERP [W]	P _{MEAS} [dBm]	P _{SUBST} TX [dBm]	P _{SUBST} RX [dBm]	G _{SUBST} TX ANT [dBd]	L _{SUBST} CABLE [dB]	Polarisation	Result
128 / 824.2	27.83	0.607	-5.53	10	-29.76	-2.7	3.7	VERTICAL	PASSED
190 / 836.6	28.5	0.708	-4.41	10	-29.41	-2.8	3.7	HORIZONTAL	PASSED
251 / 848.8	28.04	0.637	-4.1	10	-29.24	-3.4	3.7	HORIZONTAL	PASSED

2.4. GSM850-E1 TX test results

EGPRS mode, 1 TX Slot

Channel / f _c [MHz]	ERP [dBm]	ERP [W]	P _{MEAS} [dBm]	P _{SUBST} TX [dBm]	P _{SUBST} RX [dBm]	G _{SUBST} TX ANT [dBd]	L _{SUBST} CABLE [dB]	Polarisation	Result
128 / 824.2	26.44	0.441	-6.92	10	-29.76	-2.7	3.7	HORIZONTAL	PASSED
190 / 836.6	23.44	0.221	-9.47	10	-29.41	-2.8	3.7	VERTICAL	PASSED
251 / 848.8	23.87	0.244	-8.27	10	-29.24	-3.4	3.7	HORIZONTAL	PASSED

2.5. GSM1900 TX test results

GSM mode

Channel / f _c [MHz]	EIRP [dBm]	EIRP [W]	P _{MEAS} [dBm]	P _{SUBST} TX [dBm]	P _{SUBST} RX [dBm]	G _{SUBST} TX ANT [dBi]	L _{SUBST} CABLE [dB]	Polarisation	Result
512 / 1850.2	26.07	0.405	-17.64	10	-29.2	10.11	5.6	HORIZONTAL	PASSED
661 / 1880	25.95	0.394	-17.52	10	-28.95	10.22	5.7	HORIZONTAL	PASSED
810 / 1909.8	26.15	0.412	-17.42	10	-29.05	10.22	5.7	HORIZONTAL	PASSED

2.6. GSM1900-E1 TX test results

EGPRS mode, 1 TX Slot

Channel / f _c [MHz]	EIRP [dBm]	EIRP [W]	P _{MEAS} [dBm]	P _{SUBST} TX [dBm]	P _{SUBST} RX [dBm]	G _{SUBST} TX ANT [dBi]	L _{SUBST} CABLE [dB]	Polarisation	Result
512 / 1850.2	28	0.631	-15.71	10	-29.2	10.11	5.6	HORIZONTAL	PASSED
661 / 1880	28.43	0.697	-15.04	10	-28.95	10.22	5.7	HORIZONTAL	PASSED
810 / 1909.8	28.74	0.748	-14.83	10	-29.05	10.22	5.7	HORIZONTAL	PASSED

2.7. WCDMA 1900 (Band II) TX Test results

RMS Detector

Channel / f _c [MHz]	EIRP [dBm]	EIRP [W]	P _{MEAS} [dBm]	P _{SUBST TX} [dBm]	P _{SUBST RX} [dBm]	G _{SUBST TX ANT} [dBi]	L _{SUBST CABLE} [dB]	Polarisation	Result
9262 / 1852.4	20.88	0.122	-22.83	10	-29.2	10.11	5.6	HORIZONTAL	PASSED
9400 / 1880	21.39	0.138	-22.08	10	-28.95	10.22	5.7	HORIZONTAL	PASSED
9538 / 1907.6	21.51	0.142	-22.06	10	-29.05	10.22	5.7	HORIZONTAL	PASSED

2.8. WCDMA 850 (Band V) TX Test results

RMS Detector

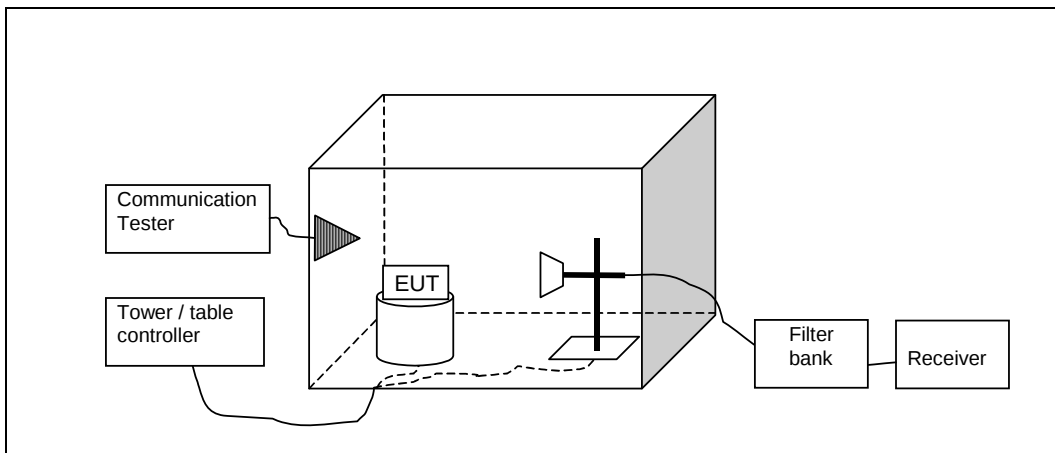
Channel / f _c [MHz]	ERP [dBm]	ERP [W]	P _{MEAS} [dBm]	P _{SUBST TX} [dBm]	P _{SUBST RX} [dBm]	G _{SUBST TX ANT} [dBd]	L _{SUBST CABLE} [dB]	Polarisation	Result
4132 / 826.4	18.14	0.065	-15.22	10	-29.76	-2.7	3.7	HORIZONTAL	PASSED
4183 / 836.6	17.97	0.063	-14.94	10	-29.41	-2.8	3.7	HORIZONTAL	PASSED
4233 / 846.6	18.08	0.064	-14.16	10	-29.24	-3.3	3.7	HORIZONTAL	PASSED

3. 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-937, DUT 43088
Accessories with DUT numbers	AC-60E, DUT 42975 ; CA-190CD, DUT 43034 ; WH-208, DUT 43035 ; BV-4BW Sony, DUT 43059
Operation Voltage [V] / [Hz]	Nominal
Results	PASSED
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	21 / 55 / 102.3
Date of measurements	06-Sep-2013
Measured by	Timo Raisio

3.1.1 Test setup



3.2. 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]
GSM850 / WCDMA850	30 - 8500	-13
GSM1900 / WCDMA1900	30 - 18000	-13

3.3. GSM850 TX test results

Peak detector

Frequency [MHz]	P [dBm]	P [μ W]	P _{MEAS} [dBm]	A _{TOT} [dB]	Polarization	Results
848.811	-57.59	0.00174	-43.07	-14.52	HORIZONTAL	PASSED
1673.347	-42.46	0.0567	-36.32	-6.14	HORIZONTAL	PASSED

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

3.4. GSM850-E1 TX Test results

EGPRS mode, Channel 190 / 836.6 MHz

Frequency [MHz]	P [dBm]	P [μ W]	P _{MEAS} [dBm]	A _{TOT} [dB]	Polarisation	Result
1673.14	-46.85	0.02065	-40.7	-6.15	HORIZONTAL	PASSED
2509.94	-45.13	0.03069	-46.88	1.75	HORIZONTAL	PASSED

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

3.5. GSM1900 TX Test results

GSM mode, Channel 661 / 1880.0 MHz

Frequency [MHz]	P [dBm]	P [μ W]	P _{MEAS} [dBm]	A _{TOT} [dB]	Polarisation	Result
3759.92	-46.64	0.02168	-55.03	8.39	VERTICAL	PASSED
5657.675	-51.27	0.00746	-61.72	10.45	HORIZONTAL	PASSED
7498.116	-49.55	0.01109	-63.3	13.75	HORIZONTAL	PASSED
8877.034	-46.62	0.02178	-64.48	17.86	VERTICAL	PASSED
9366.333	-46.38	0.02301	-65.56	19.18	VERTICAL	PASSED
9990.733	-45.66	0.02716	-65.31	19.65	VERTICAL	PASSED

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

3.6. GSM1900-E1 TX Test results

EGPRS mode, Channel 661 / 1880.0 MHz

Frequency [MHz]	P [dBm]	P [μ W]	P _{MEAS} [dBm]	A _{TOT} [dB]	Polarisation	Result
3759.98	-51.04	0.00787	-59.43	8.39	VERTICAL	PASSED
5636.012	-50.26	0.00942	-61.25	10.99	VERTICAL	PASSED

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

3.7. WCDMA 850 (Band V) test results

Channel 4175 / 835.0 MHz

FDD mode, Peak detector

Frequency [MHz]	P [dBm]	P [μ W]	P _{MEAS} [dBm]	A _{TOT} [dB]	Polarization	Results
848.563	-45.98	0.02525	-78.69	32.71	VERTICAL	PASSED
848.622	-46.17	0.02415	-78.89	32.72	VERTICAL	PASSED
1007.435	-62.6	0.00055	-52.28	-10.32	HORIZONTAL	PASSED
2515.331	-53.43	0.00454	-55.41	1.98	HORIZONTAL	PASSED
2517.735	-53.63	0.00434	-55.6	1.97	HORIZONTAL	PASSED
3342.625	-58.51	0.00141	-62.89	4.38	HORIZONTAL	PASSED

3.8. WCDMA 1900 (Band II) test results

Channel 9400 / 1880.0 MHz

FDD mode, Peak detector

Frequency [MHz]	P [dBm]	P [μ W]	P _{MEAS} [dBm]	A _{TOT} [dB]	Polarization	Results
3761.743	-52.43	0.00571	-60.81	8.38	VERTICAL	PASSED
5643.627	-49.16	0.01212	-60.13	10.97	VERTICAL	PASSED
7521.182	-49.63	0.0109	-63.84	14.21	VERTICAL	PASSED

4. Test Equipment

4.1. Conducted measurements

Eq. No	Equipment	Type	Manufacturer	Used in
TM38112	Power supply	6632A	Agilent	22/24/27, 15C, 15E
TM38631	Signal Generator	83640L	Agilent	22/24/27, 15C, 15E, 15B
TM37678	Communication Tester	CMU200	R&S	15C, 15B
TM30600	Impulse limiter	ESH3-Z2	R&S	15C, 15B
TM26490	LISN 50 µH	ESH3-Z5	R&S	15C, 15B
TM26491	LISN 50 µH	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
2058	Receiver	ESPC	R&S	15C, 15B
2001	Bluetooth tester	CBT	R&S	15C, 15B
2002	Communication Tester	CMU200	R&S	22/24/27, 15C
2009	LISN 50 µH	ENV216	R&S	15C, 15B
2010	LISN 50 µH	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
2023	Spectrum Analyzer	ESMI-RF	R&S	15B/15C
2024	Analyzer display unit	ESAI-D	R&S	15B/15C

4.2. Radiated measurements

Eq. No	Equipment	Type	Manufacturer	Used in
TM38114	Power supply	6632A	Agilent	22/24/27, 15C, 15B
TM38631	Signal Generator	83640L	Agilent	22/24/27, 15C, 15E, 15B
-	Antenna	BBHA 9120 D	Schwarzbeck	22/24/27, 15C
TM26497	Antenna	3115	Emco	22/24/27, 15C, 15B
TM37773	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	TS-RSP	R&S	22/24/27, 15C, 15E, 15B
-	RF system panel	TS-RSP	R&S	22/24/27, 15C, 15E, 15B
-	Mini mast	2075-2	ETS Lindgren	22/24/27, 15C, 15B

Eq. No	Equipment	Type	Manufacturer	Used in
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 chambre	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
-	Band reject filter	WRCG832/838-825/848-40/5SS	Wainwright	22
TM23892	Controller	G-1000SDX	Yaesu	22/24/27
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