

## FCC Part 15C Compliance Test Report

<b>Test Report no.:</b>	FCC15CWLAN_RM-1116_03.docx	<b>Date of Report:</b>	21-Sep-2015
<b>Number of pages:</b>	11	<b>Customer's Contact person:</b>	Tia Melava
<b>Testing laboratory:</b>	TCC Microsoft Tampere Laboratory P.O.Box 403 Visiokatu 3 FIN-33101 TAMPERE, FINLAND Tel. +358 71 800 8000 Fax. +358 71 804 6880	<b>Customer:</b>	Microsoft P.O.Box(86) Joensuunkatu 7E FIN-24101 SALO, FINLAND Tel. +358 (0) 7180 08000 Fax. +358 71 80 44122
<b>FCC listing no.:</b>	94436		
<b>IC recognition no.:</b>	661AK-1		
<b>Tested devices/ accessories:</b>	<b>Phone RM-1116 / Battery BV-T4D / Charger AC-100E / Headset WH-308</b>		
<b>FCC ID:</b>	PYARM-1116	<b>IC:</b>	661X-RM1116
<b>Supplement reports:</b>	-		
<b>Testing has been carried out in accordance with:</b>	<b>CFR 47, FCC rules Part 15 Subpart C, ANSI C63.4 (2014), DTS procedures KDB 558074, IC standards, RSS-210 (Issue 8, December 2010). Deviations, modifications or clarifications (if any) to above mentioned documents are written in each section under "Test method and limit".</b>		
<b>Documentation:</b>	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 Microsoft.		
<b>Test Results:</b>	<b>The EUT complies with the requirements in respect of all parameters subject to the test.</b> The test results relate only to devices specified in this document		
<b>Date and signature for the contents:</b>			

Hannu Söderholm, Engineer, EMC

# 1. Summary for FCC Part 15C Compliance Test Report

Date of receipt	17-Jul-2015
Testing completed	02-Sep-2015
The customer's contact person	Tia Melava
Test Plan referred to	T:\Projects\RM-1116\TestPlan\RS_TestPlan_RM-1116.xlsm
Notes	-
Document name	T:\Projects\RM-1116\EMC\FCC15CWLAN_RM-1116_03.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-1116	004402742362886	2030	-	01066.00001.15267.14000	400029
Battery	BV-T4D	4955405174010300359;0670771	LG v3.0	-	-	400025
Charger	AC-100E	40904951255803017590675758	0.3	-	-	400013
Headset	WH-308	-	-	-	-	400014

## 1.2. Summary of Test Results

Bluetooth Low Energy:

Section in CFR 47	Section in RSS-GEN or RSS-210	Name of the test	Result
15.247(b)(1)	A8.4(4)	Conducted peak output power	-
15.247(d), 15.205(b)	A8.5	Band edge compliance of RF emissions	PASSED
15.247(d)	A8.5	Spurious RF conducted emissions	-
15.247(d), 15.209	A8.5	Spurious radiated emissions	PASSED
15.207	7.2.4	AC powerline conducted emissions	-
15.247(a)(2)	A8.2(a)	6dB(bandwidth)	-
15.247(e)	A8.2(b)	Power spectral density	-

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 Microsoft Laboratory.

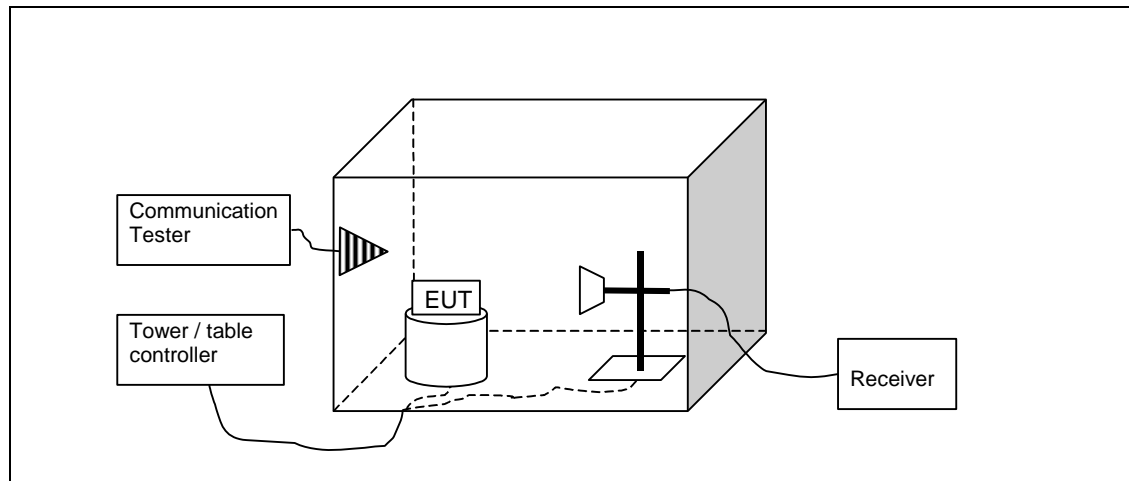
## CONTENTS

<b>1. Summary for FCC Part 15C Compliance Test Report.....</b>	<b>2</b>
1.1. EUT and Accessory Information.....	2
1.2. Summary of Test Results .....	2
<b>2. Band edge compliance of RF emissions (FCC 15.247(d), 15.205(b), RSS-210 A8.5) .....</b>	<b>4</b>
2.2. Test method and limit .....	4
2.3. Bluetooth Low Energy test results .....	5
<b>3. Spurious radiated emissions (FCC 15.247(d), 15.209, RSS-210 A8.5) .....</b>	<b>7</b>
3.2. Test method and limit .....	8
3.3. Bluetooth Low Energy test results .....	9
<b>4. Test Equipment.....</b>	<b>10</b>
4.1. Conducted measurements .....	10
4.2. Radiated measurements .....	11

## 2. Band edge compliance of RF emissions (FCC 15.247(d), 15.205(b), RSS-210 A8.5)

<b>EUT with DUT number</b>	RM-1116, DUT 400029
<b>Accessories with DUT numbers</b>	BV-T4D, DUT 400025 ; AC-100E, DUT 400013 ; WH-308, DUT 400014
<b>Operation Voltage [V] / [Hz]</b>	Nominal
<b>Results</b>	PASSED
<b>Remarks</b>	-
<b>Temp [°C] / Humidity [%RH] / Air Pressure [kPa]</b>	20 / 47 / 101.3
<b>Date of measurements</b>	02-Sep-2015
<b>Measured by</b>	Timo Raisio

### 2.1.1 Test setup



### 2.2. Test method and limit

The measurement is made according to DTS procedures KDB 558074 and IC standard RSS-210.

The measurement results are obtained as described below:

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

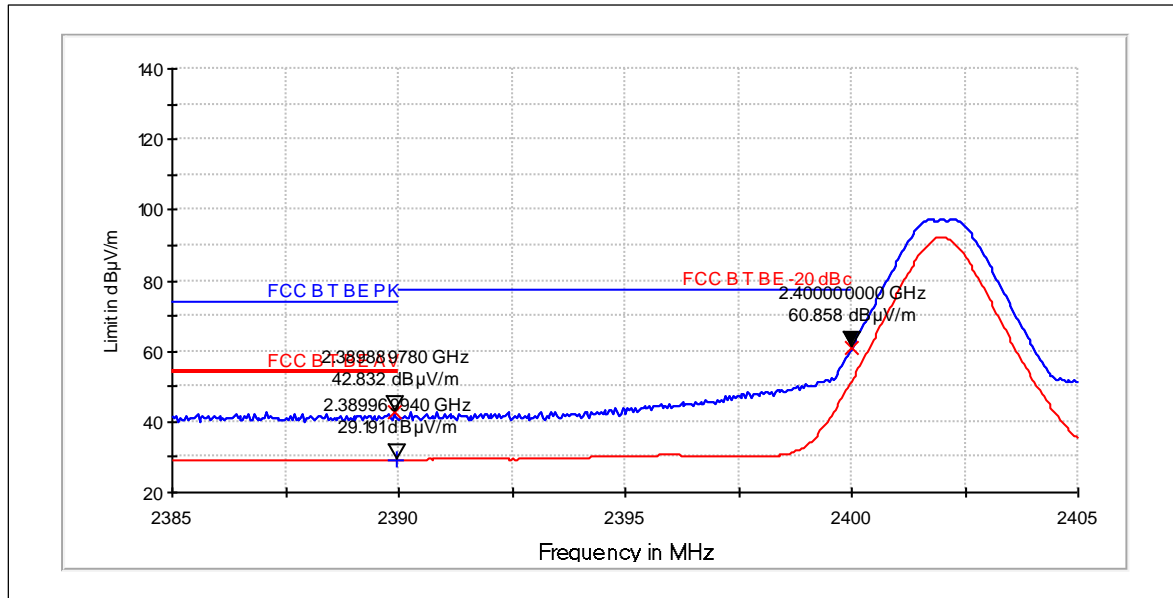
Where  $U_{RX}$  is receiver reading and  $A_{TOT}$  is total correction factor including cable loss, antenna factor and preamplifier gain ( $A_{TOT} = L_{CABLES} + A_F - G_{PREAMP}$ ).

Limits for band edge compliance of RF emissions measurements (3 m measurement distance)

Frequency range [MHz]	Limit
Below 2390 and above 2483.5	54 dBuV/m (avg) and 74 dBuV/m (pk)
2390 - 2400	-20 dBc (pk)

### 2.3. Bluetooth Low Energy test results

Channel 0 / 2402 MHz



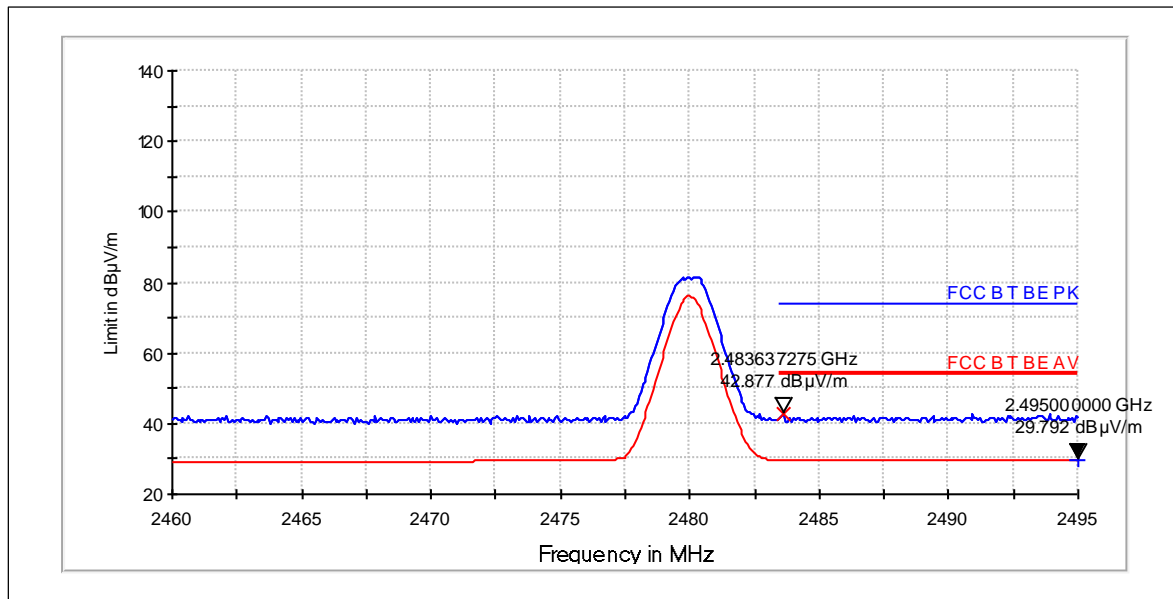
Peak (RBW: 1 MHz, VBW: 1 MHz)

Frequency [MHz]	E [dBµV/m]	E [µV/m]	U <sub>RX</sub> [dBµV]	A <sub>TOT</sub> [dB]	Results
2390	42.83	138.548	52.84	-10.01	PASSED
2400	60.86	1103.824	70.87	-10.01	PASSED

Average (RBW: 1 MHz, VBW: 1 MHz)

Frequency [MHz]	E [dBµV/m]	E [µV/m]	U <sub>RX</sub> [dBµV]	A <sub>TOT</sub> [dB]	Results
2390	29.19	28.81	39.2	-10.01	PASSED

Channel 39 / 2480 MHz



Peak (RBW: 1 MHz, VBW: 1 MHz)

Frequency [MHz]	E [dBµV/m]	E [µV/m]	U <sub>RX</sub> [dBµV]	A <sub>TOT</sub> [dB]	Results
2484	42.88	139.268	52.39	-9.51	PASSED

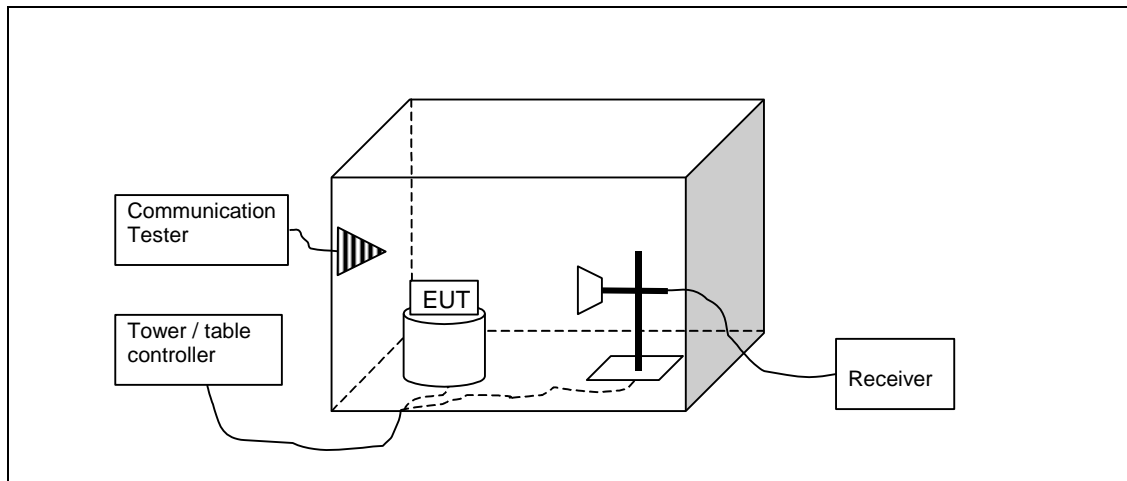
Average (RBW: 1 MHz, VBW: 1 MHz)

Frequency [MHz]	E [dBµV/m]	E [µV/m]	U <sub>RX</sub> [dBµV]	A <sub>TOT</sub> [dB]	Results
2495	29.79	30.875	39.3	-9.51	PASSED

### 3. Spurious radiated emissions (FCC 15.247(d), 15.209, RSS-210 A8.5)

<b>EUT with DUT number</b>	RM-1116, DUT 400029
<b>Accessories with DUT numbers</b>	BV-T4D, DUT 400025 ; AC-100E, DUT 400013 ; WH-308, DUT 400014
<b>Operation Voltage [V] / [Hz]</b>	Nominal
<b>Results</b>	PASSED
<b>Remarks</b>	-
<b>Temp [°C] / Humidity [%RH] / Air Pressure [kPa]</b>	20 / 47 / 101.3
<b>Date of measurements</b>	02-Sep-2015
<b>Measured by</b>	Timo Raiskio

#### 3.1.1 Test setup



### 3.2. Test method and limit

The measurement is made according to DTS procedures KDB 558074 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 is made up to 10th harmonic of the EUT highest TX channel.

The measurement results are obtained as described below:

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

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

Limits for spurious radiated emissions measurements (3 m measurement distance)

Frequency range [MHz]	Limit [ $\mu V/m$ ]	Limit [dB $\mu V/m$ ]	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



### 3.3. Bluetooth Low Energy test results

Channel 0 / 2402 MHz

Peak (RBW: 1 MHz, VBW: 1 MHz)

Frequency [MHz]	E [dB $\mu$ V/m]	E [ $\mu$ V/m]	U <sub>RX</sub> [dB $\mu$ V]	A <sub>TOT</sub> [dB]	Limit [dB $\mu$ V/m]	Margin	Results
4825.8	40.27	103.157	44.87	-4.6	74	33.71	PASSED
7236.3	44.74	172.584	43.84	0.9	95	50.49	PASSED

Average (RBW: 1 MHz, VBW: 1 MHz)

Frequency [MHz]	E [dB $\mu$ V/m]	E [ $\mu$ V/m]	U <sub>RX</sub> [dB $\mu$ V]	A <sub>TOT</sub> [dB]	Limit [dB $\mu$ V/m]	Margin	Results
4825.8	27.06	22.542	31.66	-4.6	54	26.92	PASSED
7236.3	31.92	39.446	31.02	0.9	---	---	PASSED

Channel 20 / 2442 MHz

Quasi peak (RBW: 100 kHz, VBW: 100 kHz)

Frequency [MHz]	E [dB $\mu$ V/m]	E [ $\mu$ V/m]	U <sub>RX</sub> [dB $\mu$ V]	A <sub>TOT</sub> [dB]	Limit [dB $\mu$ V/m]	Margin	Results
30.45	27.87	24.746	48.67	-20.8	40	12.13	PASSED
32.518	27.53	23.796	49.23	-21.7	40	12.47	PASSED

Peak (RBW: 1 MHz, VBW: 1 MHz)

Frequency [MHz]	E [dB $\mu$ V/m]	E [ $\mu$ V/m]	U <sub>RX</sub> [dB $\mu$ V]	A <sub>TOT</sub> [dB]	Limit [dB $\mu$ V/m]	Margin	Results
4881.5	40.84	110.154	45.04	-4.2	74	33.14	PASSED
7318.7	45.99	199.297	44.69	1.3	74	27.99	PASSED

Average (RBW: 1 MHz, VBW: 1 MHz)

Frequency [MHz]	E [dB $\mu$ V/m]	E [ $\mu$ V/m]	U <sub>RX</sub> [dB $\mu$ V]	A <sub>TOT</sub> [dB]	Limit [dB $\mu$ V/m]	Margin	Results
4881.5	27.71	24.294	31.91	-4.2	54	26.27	PASSED
7318.7	32.3	41.21	31	1.3	54	21.68	PASSED

Channel 39 / 2480 MHz

Peak (RBW: 1 MHz, VBW: 1 MHz)

Frequency [MHz]	E [dB $\mu$ V/m]	E [ $\mu$ V/m]	U <sub>RX</sub> [dB $\mu$ V]	A <sub>TOT</sub> [dB]	Limit [dB $\mu$ V/m]	Margin	Results
4922.2	41.07	113.11	45.17	-4.1	74	32.91	PASSED
7384.2	46.15	203.002	44.65	1.5	74	27.83	PASSED

Average (RBW: 1 MHz, VBW: 1 MHz)

Frequency [MHz]	E [dB $\mu$ V/m]	E [ $\mu$ V/m]	U <sub>RX</sub> [dB $\mu$ V]	A <sub>TOT</sub> [dB]	Limit [dB $\mu$ V/m]	Margin	Results
4922.2	27.86	24.717	31.96	-4.1	54	26.12	PASSED
7384.2	32.29	41.162	30.79	1.5	54	21.69	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
TM38114	Power supply	6632A	Agilent	22/24/27, 15C, 15E
TM210233	Communication Tester	CMU200	R&S	22/24/27
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
2001	Bluetooth tester	CBT	R&S	15C, 15B
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
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
-	Bluetooth tester	CBT	R&S	15C, 15B
-	Communication Tester	CMU200	R&S	22/24/27, 15B

## 4.2. Radiated measurements

Eq. No	Equipment	Type	Manufacturer	Used in
-	Antenna	BBHA 9120 D	Schwarzbeck	22/24/27, 15C
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
2002	Communication Tester	CMU200	R&S	22/24/27, 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
-	Bluetooth tester	CBT	R&S	15C, 15B