

FCC Part 22/24 Compliance Test Report

Test Report no.:	FCC22&24_RM-431_09.doc	Date of Report:	09-Sep-2009
Number of pages:	16	Customer's Contact person:	Jyrki Juvani
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FCC listing no.:	94436		
IC recognition no.:	661AK-1		
Tested devices/ accessories:	Phone RM-431 / AC-Charger AC-10 E, Battery BL-4CT, Audio Adapter AD-54, Headset HS-45, Flash Adapter FS-90R		
FCC ID:	LJPRM-431X	IC:	661E-RM431
Supplement reports:	-		
Testing has been carried out in accordance with:	CFR 47, FCC rules Parts 22 and 24, TIA-603-C-2004 and IC standards RSS-GEN (Issue 2, June 2007), RSS-132 (Issue 2, September 2005) and 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:			

Jari Jantunen, Test System Manager

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

Date of receipt	18-Nov-2008
Testing completed	26-Nov-2008
The customer's contact person	Jyrki Juvani
Test Plan referred to	T:\Projects\RM-431\TestPlan_RS\RS_Testplan_RM-431.xls
Notes	-
Document name	T:\Projects\RM-431\EMC\Results\FCC\Tre_FCC_0847_02.doc

1.1. EUT and Accessory Information

The EUT is a 6-band (GSM850/900/1800/1900 and WCDMA Band I/VIII) 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-431	004401104171869	0412	-	v002.002	41710
Phone	RM-431	004401104172545	0412	-	v002.002	41709
Battery	BL-4CT	-	-	-	-	41713
Battery	BL-4CT	-	-	-	-	41712
AC-Charger	AC-10E	-	-	-	-	41700
AC-Charger	AC-10E	-	-	-	-	41701
Audio Adapter	AD-54	-	0.5	2.4	0.2	41703
Audio Adapter	AD-54	-	0.5	2.4	0.2	41704
Headset	HS-45	-	-	-	-	41706
Headset	HS-45	-	-	-	-	41705
Flash Adapter	FS-90R	-	v.0.1	-	-	41699

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

GSM 1900:

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	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	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 Tampere Laboratory.

The test results of LJPRM-431 are re-used for certification of the LJPRM-431X. The table above indicates the results, which will be re-used.

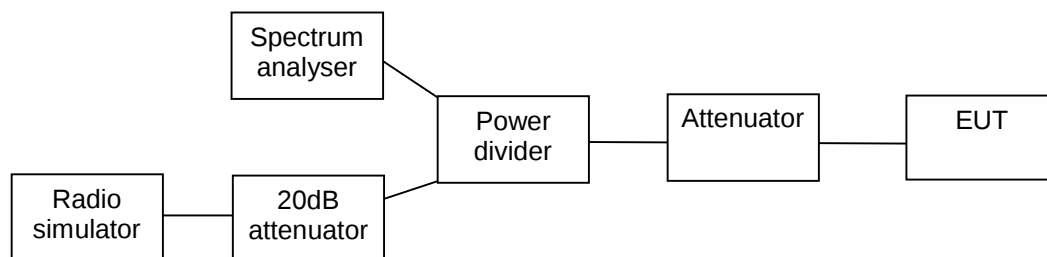
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2. 99 % occupied bandwidth (FCC §2.1049(h), RSS-GEN 4.6.1)

EUT with DUT number	RM-431 DUT 41710
Accessories with DUT numbers	AC-10 E DUT 41700 / BL-4CT DUT 41713 / AD-54 DUT 41703 / HS-45 DUT 41706
Operation Voltage [V] / [Hz]	115/60
Result	PASSED
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	21 / 50 / 99.9
Date of measurements	25-Nov-2008
Measured by	Petteri Suni

2.1. Test setup



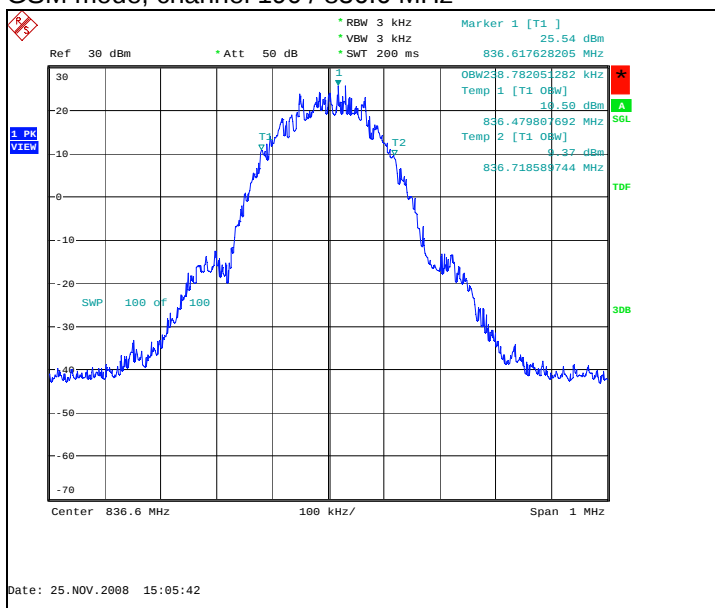
2.2. Test method and limit

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

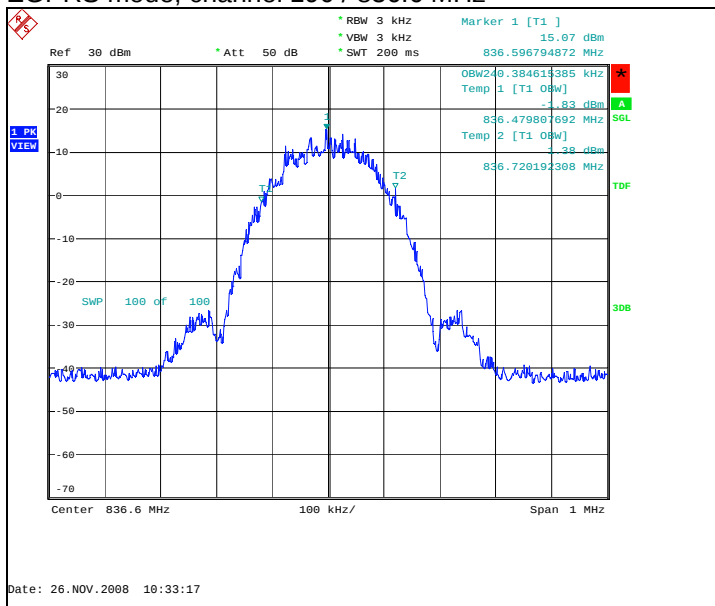
2.3. GSM 850 Test results

Operation mode (TX on)	99% occupied bandwidth [kHz]
GSM	238.782
EGPRS	240.385

GSM mode, channel 190 / 836.6 MHz



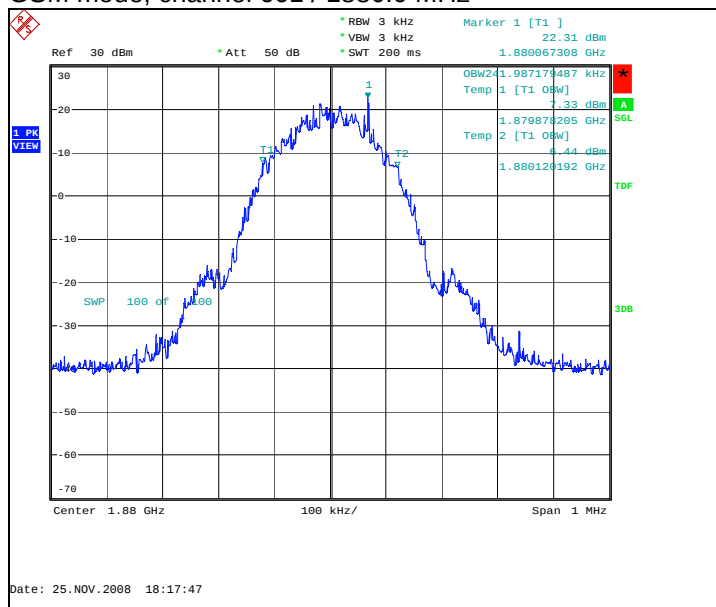
EGPRS mode, channel 190 / 836.6 MHz



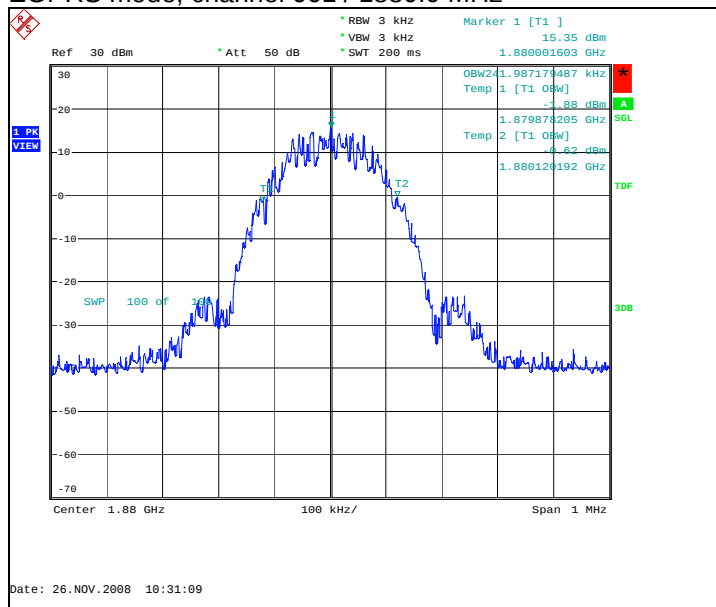
2.4. GSM 1900 Test results

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

GSM mode, channel 661 / 1880.0 MHz



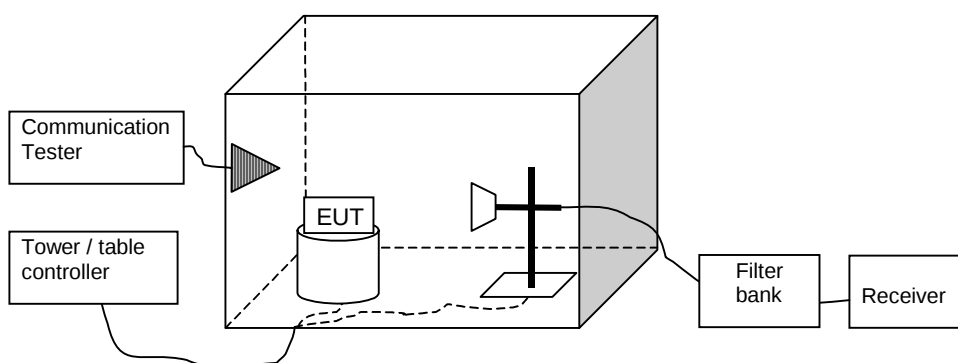
EGPRS mode, channel 661 / 1880.0 MHz



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

EUT with DUT number	RM-431 DUT 41709
Accessories with DUT numbers	BL-4CT DUT 41712 / AD-54 DUT 41704 / HS-45 DUT 41705 / AC-10E DUT 41701
Operation Voltage [V] / [Hz]	115/60
Result	PASSED
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	24 / 45 / 99.4
Date of measurements	26-Nov-2008
Measured by	Jari Jantunen

3.1. 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. 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]
WCDMA 850	30 - 8500	-13
GSM 1900	30 - 18000	-13

3.3. GSM 850 Test results

GSM mode, channel 190 / 836.6 MHz

Frequency [MHz]	P [dBm]	P [μW]	P _{MEAS} [dBm]	A _{TOT} [dB]	Polarisation	Result
1673.143287	-46.60	0.02188	- 40.30	- 6.30	HORIZONTAL	PASSED
2509.820641	-39.90	0.10233	- 41.10	1.20	VERTICAL	PASSED
3346.689379	-45.10	0.03090	- 49.60	4.50	VERTICAL	PASSED

EGPRS mode, channel 190 / 836.6 MHz

Frequency [MHz]	P [dBm]	P [μW]	P _{MEAS} [dBm]	A _{TOT} [dB]	Polarisation	Result
1673.143287	-53.60	0.00437	- 47.30	- 6.30	HORIZONTAL	PASSED
2507.820641	-55.80	0.00263	- 57.00	1.20	VERTICAL	PASSED
3344.689379	-57.80	0.00166	- 62.30	4.50	VERTICAL	PASSED

3.4. GSM 1900 Test results

GSM mode, channel 661 / 1880.0 MHz

Frequency [MHz]	P [dBm]	P [μW]	P _{MEAS} [dBm]	A _{TOT} [dB]	Polarisation	Result
3760.023046	-36.00	0.25119	- 45.20	9.20	HORIZONTAL	PASSED
5640.282565	-46.70	0.02138	- 57.40	10.70	VERTICAL	PASSED
5655.810621	-51.90	0.00646	- 62.60	10.70	VERTICAL	PASSED
7524.542084	-50.10	0.00977	- 65.10	15.00	VERTICAL	PASSED

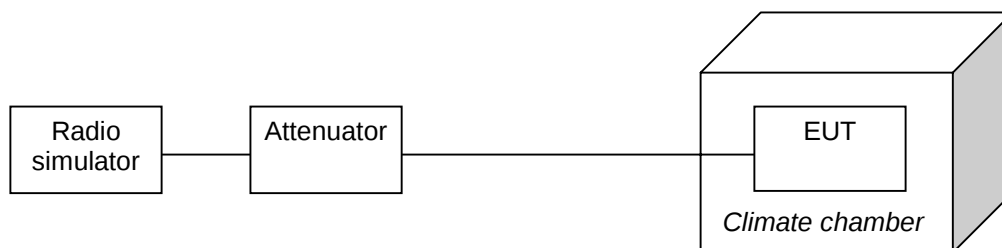
GSM mode, channel 661 / 1880.0 MHz

Frequency [MHz]	P [dBm]	P [μ W]	P _{MEAS} [dBm]	A _{TOT} [dB]	Polarisation	Result
3760.023046	-43.70	0.04266	- 52.90	9.20	HORIZONTAL	PASSED
5623.246493	-53.20	0.00479	- 64.00	10.80	HORIZONTAL	PASSED
5640.282565	-52.10	0.00617	- 62.80	10.70	VERTICAL	PASSED
5651.310621	-52.40	0.00575	- 63.10	10.70	VERTICAL	PASSED
7522.042084	-50.50	0.00891	- 65.50	15.00	VERTICAL	PASSED

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

EUT with DUT number	RM-431 DUT 41710
Accessories with DUT numbers	AC-10 E DUT 41700 / BL-4CT DUT 41713 / AD-54 DUT 41703 / HS-45 DUT 41706
Operation Voltage [V] / [Hz]	115/60
Result	PASSED
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	21 / 50 / 99.9
Date of measurements	25-Nov-2008
Measured by	Petteri Suni

4.1. Test setup



4.2. Test method and limit

The measurement is made according to FCC rules parts 22 and 24 and IC standards 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

4.3. GSM 850 Test results

GSM mode, channel 190 / 836.6 MHz

Temperature [°C]	Deviation [Hz]	Deviation [ppm]
50	-18	-0.0215
40	-22	-0.0263
30	-24	-0.0287
20	-20	-0.0239
10	9	0.0108
0	34	0.0406
-10	16	0.0191
-20	-17	-0.0203
-30	-22	-0.0263

4.4. GSM 1900 Test results

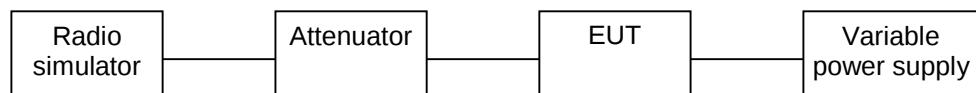
GSM mode, channel 661 / 1880.0 MHz

Temperature [°C]	Deviation [Hz]	Deviation [ppm]
50	29	0.0154
40	-30	-0.0160
30	-43	-0.0229
20	-15	-0.0080
10	30	0.0160
0	30	0.0160
-10	38	0.0202
-20	-30	-0.0160
-30	-33	-0.0176

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

EUT with DUT number	RM-431 DUT 41710
Accessories with DUT numbers	FS-90R DUT 41703
Operation Voltage [V] / [Hz]	115/60
Result	PASSED
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	21 / 50 / 99.9
Date of measurements	25-Nov-2008
Measured by	Petteri Suni

5.1. Test setup



5.2. Test method and limit

The measurement is made according to FCC rules parts 22 and 24 and IC standards 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

5.3. GSM 850 Test results

GSM mode, channel 190 / 836.6 MHz

Voltage level [V]	Deviation [Hz]	Deviation [ppm]
Battery cut-off point / 3.40	-29	-0.0347
Nominal / 3.70	-18	-0.0215

5.4. GSM 1900 Test results

GSM mode, channel 661 / 1880.0 MHz

Voltage level [V]	Deviation [Hz]	Deviation [ppm]
Battery cut-off point / 3.40	-38	-0.0202
Nominal / 3.70	-35	-0.0186

6. Test Equipment

6.1. Conducted measurements

Eq. No	Equipment	Type	Manufacturer	Used in
TM30597	Power splitter	11667A	Agilent	22/24/27, 15C
TM37499	Power splitter	11667A	Agilent	22/24/27, 15C
TM38111	Multimeter	34401A	Agilent	22/24/27, 15C
TM38112	DC power supply	6632A	Agilent	22/24/27, 15C
TM22901	Attenuator	8496A	Agilent	22/24/27, 15C
TM30636	Artificial mains net	L2-16	PMM	15C, 15B
TM37678	Radio communication tester	CMU-200	R&S	22/24/27, 15C, 15B
TM37773	Radio communication tester	CMU-200	R&S	22/24/27, 15C, 15B
TM30600	Pulse Limiter	ESH3-Z2	R&S	15C, 15B
TM26490	LISN 50 μ H	ESH3-Z5	R&S	15C, 15B
TM37610	Spectrum analyzer	FSU	R&S	22/24/27, 15C
TM22835	Multimeter	87	Fluke	15C, 15B
TM37500	Microwave switch system	7116-MSW	Keithley	22/24/27, 15C, 15B
TM22638	Power supply	OL63743-901	Transmatic	22/24/27, 15C, 15B
	Temperature chamber	VT4002	Vötsch	22/24/27, 15C
2058	EMI Test receiver	ESPC	R&S	15C, 15B
2001	Bluetooth tester	CBT	R&S	22/24/27, 15C, 15B
2002	Radio communication tester	CMU-200	R&S	22/24/27, 15C, 15B

6.2. Radiated measurements

Eq. No	Equipment	Type	Manufacturer	Used in
TM30599	3m semi-anechoic chamber		TDK	22/24/27, 15C, 15B
TM38845	EMI receiver	ESI 40	R&S	22/24/27, 15C, 15B
TM37498	Preamplifier	AMF-5D-020180-26-10P	MITEQ	22/24/27, 15C, 15B
TM37523	Preamplifier	AMF-4D-10M-3G-25-20P	MITEQ	22/24/27, 15C, 15B
TM37516	Biconilog antenna	HL562	R&S	22/24/27, 15C, 15B
TM26496	Double ridged waveguide antenna	3115	EMCO	22/24/27, 15C, 15B
TM39158	Horn antenna	3116	EMCO	22/24/27, 15C, 15B
TM26492	Reference dipole set	UHAP/VHAP	Schwarzbeck	22/24/27, 15C, 15B
TM37501	Dipole antenna	3125-870	EMCO	22/24/27
TM37502	Dipole antenna	3125-1880	EMCO	22/24/27
TM37773	Radio communication tester	CMU-200	R&S	22/24/27, 15C, 15B
TM38631	Signal generator	83640L	Agilent	22/24/27, 15C, 15B
TM38066	High pass filter	4HC3000/18000-3-KK	Trilithic	22/24/27, 15C, 15B
TM26511	Tunable notch filter	WRCA870	Wainwright	22/24/27
TM38215	Tunable notch filter	WRCD1850/1910-0.2/40	Wainwright	22/24/27
TM38214	Band reject filter	WRCT 2402/2480-2400/2483.5-30	Wainwright	15C
TM30642	Mast/Turntable controller	HD-100	Deisel	22/24/27, 15C, 15B
TM26500	Turntable	DS412	Deisel	22/24/27, 15C, 15B
TM38842	Antenna mast controller	2090	EMCO	22/24/27, 15C, 15B
TM38843	Antenna mast	2075	EMCO	22/24/27, 15C, 15B
TM38114	DC power supply	6632A	Agilent	22/24/27, 15C, 15B
TM38323	Preamplifier	PA-02 18-26 GHz	EMC Automation	22/24/27, 15C, 15B
TM37678	Radio communication tester	CMU-200	R&S	22/24/27, 15C, 15B
TM22638	Power supply	OL63743-901	Transmatic	22/24/27, 15C, 15B
TM23892	Yaesu controller	G-1000SDX	Yaesu	22/24/27, 15C, 15B
2001	Bluetooth tester	CBT	R&S	22/24/27, 15C, 15B

Eq. No	Equipment	Type	Manufacturer	Used in
2002	Radio communication tester	CMU-200	R&S	22/24/27, 15C, 15B