

FCC Part 22/24 Compliance Test Report

Test Report no.:	Salo_FCC_0544_06.doc	Date of Report:	04.11.2005
Number of pages:	15	Customer's Contact person:	Stefan Emery
Testing laboratory:	TCC Nokia Salo Laboratory P.O. Box 86 Joensuunkatu 7H / Kiila 1B FIN-24101 SALO, FINLAND Tel. +358 (0) 7180 08000 Fax. +358 (0) 7180 45220	Client:	Nokia Corporation Frederikskaj 1790 COPENHAGEN V DENMARK Tel. +45 33 292929 Fax. +45 33 292934
FCC listing no.:	533467		
IC recognition no.:	5385		
Tested devices/ accessories:	Phone RM-91 / Battery BL-5B, AC- Charger AC-4, Headset HS-28 and Dummy battery		
FCC ID:	QTKRM-91	IC:	661AD-RM91
Supplement reports:	-		
Testing has been carried out in accordance with:	CFR 47, FCC rules Parts 22 and 24, TIA-603-B-2002 and IC standards RSS-GEN, RSS-132 and RSS-133. 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:			
	Tomi Lipponen, System Manager		

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

Date of receipt	13.10.2005
Testing completed	14.10.2005
The customer's contact person	Stefan Emery
Test Plan referred to	T:\Projects\RM-91\TestPlan_RS\RM-91_EMC testplan.xls
Notes	-
Document name	T:\Projects\RM-91\EMC\Results\FCC\Salo_FCC_0544_06.doc

1.1. EUT and Accessory Information

The EUT is a single band (WCDMA1900) mobile phone. 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-91	004400/68/162313/6	4002	-	1.0536.0.6	10825
Phone	RM-91	004400/68/162182/5	4002	-	1.0536.0.6	10856
Battery	BL-5B	0670455363807L291C30324834	-	-	-	10599
AC-Charger	AC-4E	3997915196061102099;0675384	-	-	-	10797
Headset	HS-23	-	-	-	-	10755
Dummy battery	SF-62T	-	-	-	-	-

1.2. Summary of Test Results

WCDMA 1900 (Band II):

Section in CFR 47	Section in RSS-133	Name of the test	Result
§2.1046(a)	6.2	Conducted RF output power	NP
§24.232(b)	6.2	Radiated RF output power	NP
§2.1049(h)	5.6	99 % occupied bandwidth	PASSED
§24.238(a)	6.3	Band edge compliance	PASSED
§24.238(a), §2.1051	6.3	Spurious emissions at antenna terminals	NP
§24.238(a), §2.1053	6.3	Spurious radiated emissions	PASSED
§2.1055(a)	7	Frequency stability, temperature variation	PASSED
§2.1055(d)	7	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 Salo Laboratory.

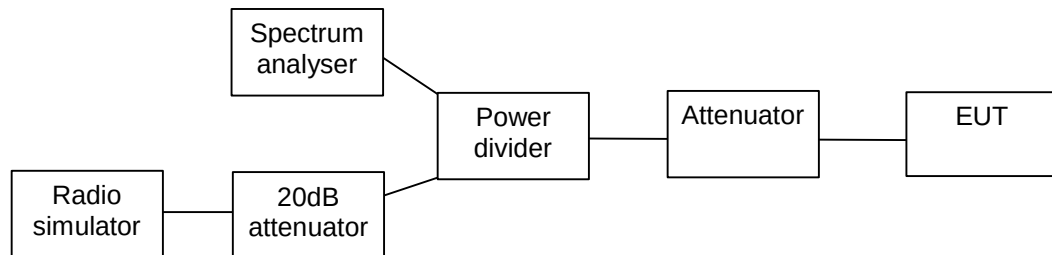
CONTENTS

1. Summary for FCC Part 22/24 Compliance Test Report	2
1.1. EUT and Accessory Information	2
1.2. Summary of Test Results	2
2. 99 % occupied bandwidth (FCC §2.1049(h), RSS-132 4.2, RSS-133 5.6)	4
2.1. Test setup	4
2.2. Test method and limit	4
2.3. WCDMA 1900 Test results	5
3. Band edge compliance (FCC §22.917(a), 24.238(a), RSS-132 4.5, RSS-133 6.3)	6
3.1. Test setup	6
3.2. Test method and limit	6
3.3. WCDMA 1900 Test results	7
4. Spurious radiated emissions (FCC §22.917(a), §24.238(a), §2.1053, RSS-132 4.5, RSS-133 6.3)	8
4.1. Test setup	8
4.2. Test method and limit	8
4.3. WCDMA 1900 Test results	9
5. Frequency stability, temperature variation (FCC §2.1055(a), §2.1055(a), RSS-132 4.3, 6.3, RSS-133 7)	10
5.1. Test setup	10
5.2. Test method and limit	10
5.3. WCDMA 1900 Test results	11
6. Frequency stability, voltage variation (FCC §2.1055(d), RSS-132 4.3, 6.3, RSS-133 7) ...	12
6.1. Test setup	12
6.2. Test method and limit	12
6.3. WCDMA 1900 Test results	13
7. Test Equipment	14
7.1. Conducted measurements	14
7.2. Radiated measurements	14

2. 99 % occupied bandwidth (FCC §2.1049(h), RSS-132 4.2, RSS-133 5.6)

EUT with DUT number	RM-91, DUT 10825
Accessories with DUT numbers	Dummy battery
Operation Voltage [V] / [Hz]	3.8 DC
Result	Passed
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	21/45/102.9
Date of measurements	14.10.2005
Measured by	Kai Uusitalo

2.1. Test setup



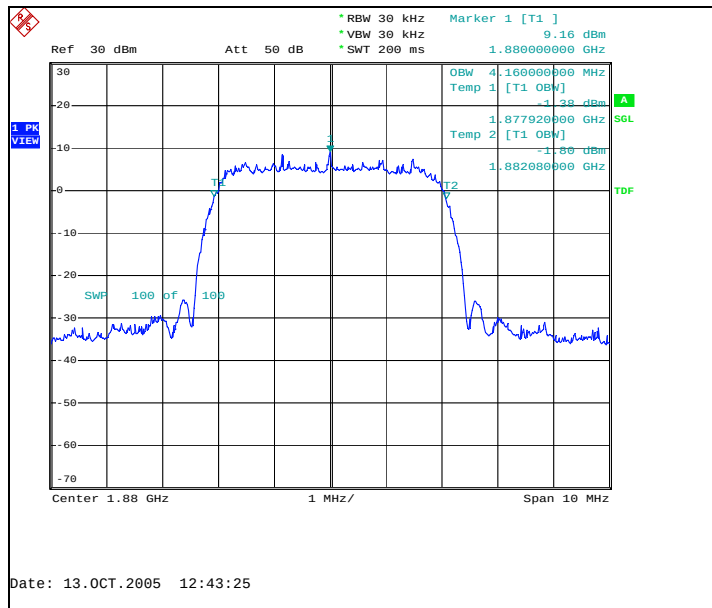
2.2. Test method and limit

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

2.3. WCDMA 1900 Test results

Operation mode (TX on)	99% occupied bandwidth [kHz]
FDD	4160.000

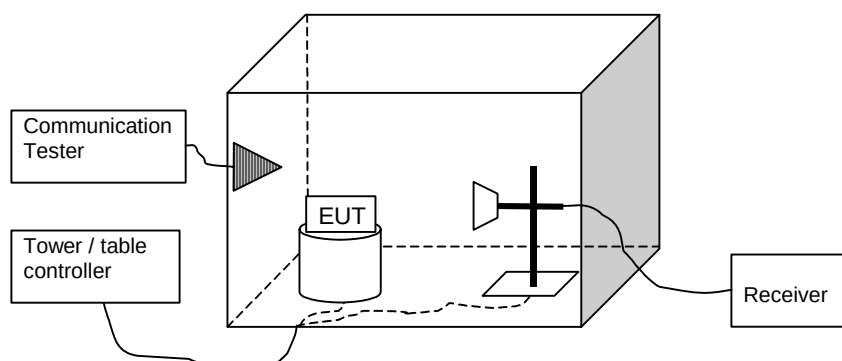
Channel 9400



3. Band edge compliance (FCC §22.917(a), 24.238(a), RSS-132 4.5, RSS-133 6.3)

EUT with DUT number	RM-91, DUT 10856
Accessories with DUT numbers	BL-5B DUT 10599, AC-4E DUT 10797, HS-23 DUT 10755
Operation Voltage [V] / [Hz]	115 / 60
Result	Passed
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	22/42/102.9
Date of measurements	13.10.2005
Measured by	Kai Uusitalo

3.1. Test setup



3.2. Test method and limit

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

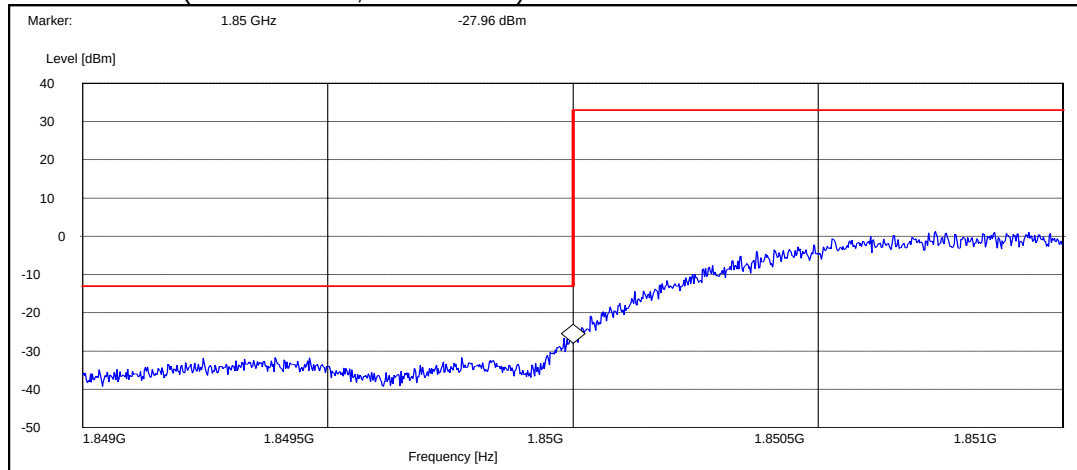
Limits for band edge compliance measurements

Operation band	Frequency range [MHz]	Limit [dBm]
GSM 850 / WCDMA 850	Below 824 and above 849	-13
GSM 1900 / WCDMA 1900	Below 1850 and above 1910	-13

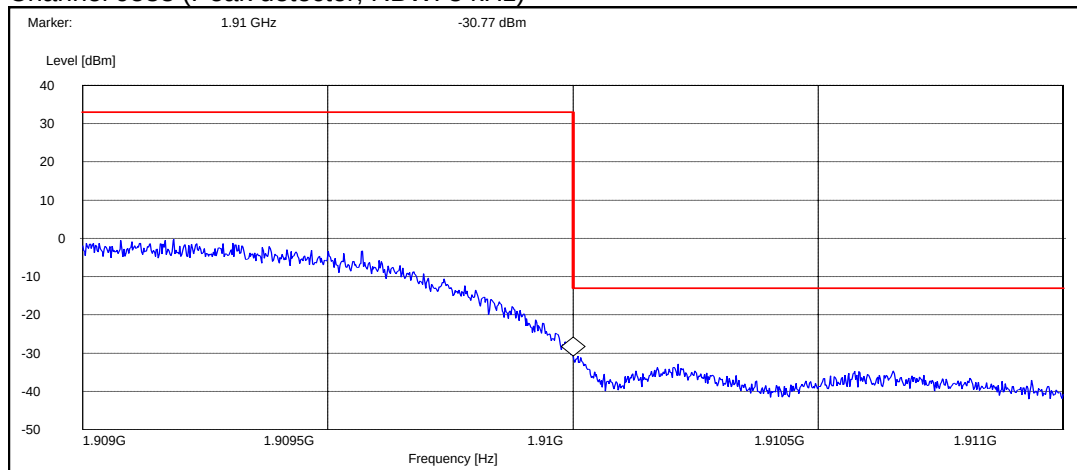
3.3. WCDMA 1900 Test results

Operation mode (TX on)	Channel	Level [dBm]
FDD	9262	-27.96
FDD	9538	-30.77

Channel 9262 (Peak detector, RBW: 3 kHz)



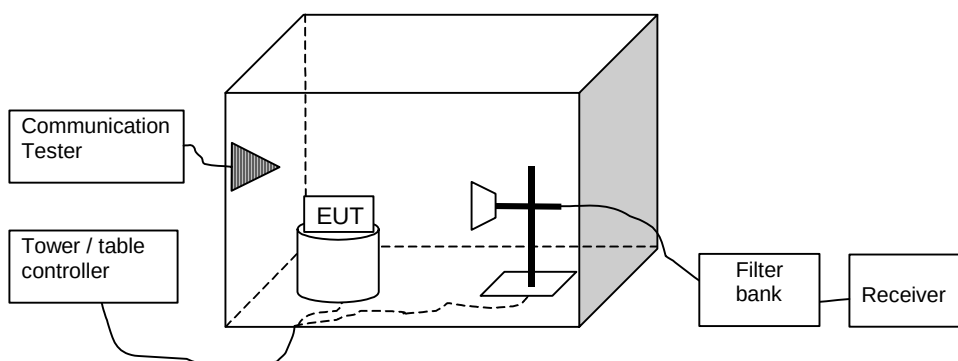
Channel 9538 (Peak detector, RBW: 3 kHz)



4. Spurious radiated emissions (FCC §22.917(a), §24.238(a), §2.1053, RSS-132 4.5, RSS-133 6.3)

EUT with DUT number	RM-91, DUT 10856
Accessories with DUT numbers	BL-5B DUT 10599, AC-4E DUT 10797, HS-23 DUT 10755
Operation Voltage [V] / [Hz]	115 / 60
Result	Passed
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	22/42/102.9
Date of measurements	13.10.2005
Measured by	Kai Uusitalo

4.1. Test setup



4.2. Test method and limit

The measurement is made according to TIA-603-B-2002 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]
GSM 850 / WCDMA 850	30 - 8500	-13
GSM 1900 / WCDMA 1900	30 - 18000	-13

4.3. WCDMA 1900 Test results

Channel 9400, Slide open

Frequency [MHz]	P [dBm]	P [μW]	P _{MEAS} [dBm]	A _{TOT} [dB]	Polarisation	Result
3758.015030	-37.80	0.16596	- 44.60	6.80	HORIZONTAL	PASSED
5637.282565	-36.90	0.20417	- 48.40	11.50	HORIZONTAL	PASSED

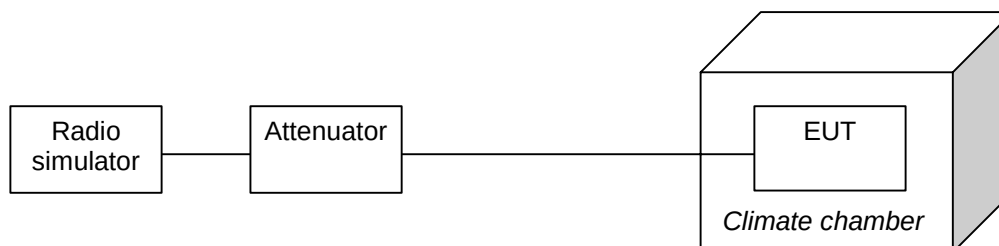
Channel 9400, Slide closed

Frequency [MHz]	P [dBm]	P [μW]	P _{MEAS} [dBm]	A _{TOT} [dB]	Polarisation	Result
3758.015030	-38.30	0.14791	- 45.10	6.80	HORIZONTAL	PASSED
5642.782565	-39.00	0.12589	- 50.40	11.40	HORIZONTAL	PASSED

5. Frequency stability, temperature variation (FCC §2.1055(a), §2.1055(a), RSS-132 4.3, 6.3, RSS-133 7)

EUT with DUT number	RM-91, DUT 10825
Accessories with DUT numbers	Dummy battery
Operation Voltage [V] / [Hz]	3.8 DC
Result	Passed
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	21/45/102.9
Date of measurements	14.10.2005
Measured by	Kai Uusitalo

5.1. Test setup



5.2. Test method and limit

The measurement is made according to FCC rules part 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

5.3. WCDMA 1900 Test results

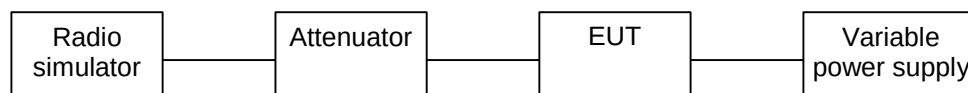
Channel 9400

Temperature [°C]	Deviation [Hz]	Deviation [ppm]
50	-29	- 0.0154
40	-31	- 0.0165
30	-34	- 0.0181
20	-42	- 0.0223
10	-42	- 0.0223
0	-30	- 0.0160
-10	-41	- 0.0218
-20	-38	- 0.0202
-30	-33	- 0.0176

6. Frequency stability, voltage variation (FCC §2.1055(d), RSS-132 4.3, 6.3, RSS-133 7)

EUT with DUT number	RM-91, DUT 10825
Accessories with DUT numbers	Dummy battery
Operation Voltage [V] / [Hz]	3.8 DC
Result	Passed
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	21/45/102.9
Date of measurements	14.10.2005
Measured by	Kai Uusitalo

6.1. Test setup



6.2. Test method and limit

The measurement is made according to FCC rules part 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

6.3. WCDMA 1900 Test results

Channel 9400

Voltage level [V]	Deviation [Hz]	Deviation [ppm]
Battery cut-off point / 3.40	-44	- 0.0234
Nominal / 3.80	-46	- 0.0245

7. Test Equipment

7.1. Conducted measurements

Eq. No	Equipment	Type	Manufacturer	Used in
1742	EMI Test Receiver	ESMI	R&S	15C, 15B
1759	LISN 50 µH	ESH3-Z5	R&S	15C, 15B
1872	Thermo- Hygrograph	00.02520.150700	Lambrecht	15C, 15B
1916	Radio Communication tester	CMTA84	R&S	15C, 15B
2039	Power Supply	PL330QMD	THURLBY	15C, 15B
2060	LISN 50 µH	ESH3-Z5	R&S	15C, 15B
2068	CDN-Antenna line	S1	NMP	15C, 15B
2097	Pulse Limiter	ESH3-Z2	R&S	15C, 15B
2111	Multimeter	TX3	Tektronix	15C, 15B
2156	Digital Radio Communication Tester	CMU200	R&S	15C, 15B
2206	Signal generator	SMX	R&S	15C, 15B
2335	GPIB Switch 2 to 1	-	National Instruments	15C, 15B
2347	Digital Radio Communication Tester	CMU200	R&S	22/24, 15C, 15B
2352	Spectrum Analyzer	FSP	R&S	22/24, 15C
2359	Temperature Test system	VT4002	Vötsch Industrietechnik	22/24
2360	Serial Bus Converter	Serial 488A	IO Tech	22/24
2362	Power Supply	NGPX 70/5	R&S	22/24
-	RF Emission Software	ES-K1 v.1.60	R&S	15C, 15B

7.2. Radiated measurements

Eq. No	Equipment	Type	Manufacturer	Used in
1748	Log. per. Antenna	HL025	R&S	22/24, 15C
1749	Log. per. Antenna	HL025	R&S	22/24, 15C
1875	Thermo- Hygrograph	00.02520.150700	Lambrecht	22/24, 15C, 15B
1917	Radio Communication tester	CMTA84	R&S	22/24, 15C, 15B
1933	Precision half-wave dipole antennas	HZ-13	R&S	22/24, 15C
1938	Precision half-wave dipole antennas	HZ-12	R&S	22/24, 15C
2004	Relay Switch Unit	RSU	R&S	22/24, 15C, 15B
2006	Radiation Reference Source	VSQ	MEB	22/24, 15C, 15B
2009	Signal generator	SMP 22	R&S	22/24, 15C, 15B
2019	Multimeter	34401A	HP	22/24, 15C, 15B
2027	Coupling and Decoupling Network	M2 (modified) DC1	MEB	22/24, 15C, 15B
2028	Coupling and Decoupling Network	M3 (modified) DC2	MEB	22/24, 15C, 15B
2029	Power Supply	PL330	THURLBY	22/24, 15C
2043	Band Reject Filter	WRCA824/849-0,2-6SS	Wainwright	22/24, 15C, 15B
2047	Band Reject Filter	WRCC1800/2000-0.2-10SS	Wainwright	22/24, 15C, 15B
2051	High Pass Filter	4HC1700-1-KK	R&S	22/24, 15C
2057	Log. per. Antenna	HL025	R&S	22/24, 15C

Eq. No	Equipment	Type	Manufacturer	Used in
2109	Power Supply	PL330QMD	THURLBY	22/24, 15C, 15B
2110	Multimeter	34401A	HP	22/24, 15C, 15B
2112	Multimeter	TX3	Tektronix	22/24, 15C, 15B
2116	Controller	EMCO MODEL 2090	ETS	22/24, 15C, 15B
2133	Power Meter	NRVS	R&S	22/24, 15C
2134	Power Sensor	NRV-Z32	R&S	22/24, 15C
2135	Coupling and Decoupling Network	CDN 801-M3	LÜTHI	22/24, 15C, 15B
2138	Ultra Broadband Antenna	HL562	R&S	22/24, 15C, 15B
2140	Biconical Antenna	EMCO93110B	EMCO	22/24, 15C
2142	Log.-per.-dipol Antenna	3146	EMCO	22/24, 15C
2144	Attenuator	6803.17B	Huber-Suhner	22/24, 15C, 15B
2150	High Pass Filter	F-15041	RLC ELECTRONICS	22/24, 15C
2176	Coupling and Decoupling Network	CDN 801-M3	LÜTHI	22/24, 15C, 15B
2180	Digital Radio Communication Tester	CMU200	R&S	22/24, 15C, 15B
2188	Preamplifier	AFS4-00100300-20-23P-6	MITEQ	22/24, 15C, 15B
2330	EMI Test receiver	ESIB26	R&S	22/24, 15C, 15B
2334	GPIB Switch 2 to 1	-	National Instruments	22/24, 15C, 15B
2348	Yaesu controller	G-1000DXC	YAESU	22/24, 15C, 15B
2349	Computer controller (Yaesu)	GS-232B	YAESU	22/24, 15C, 15B
2350	Preamplifier	AMF-6D-020180-29-20P	MITEQ	22/24, 15C
2361	Anechoic chamber	3 meter semi/full anechoic chamber	Euroshield	22/24, 15C, 15B
2398	Horn antenna	HF906	R&S	22/24, 15C
-	RF Emission Software	ES-K1 v.1.71	R&S	22/24, 15C, 15B