

FCC Part 15C Compliance Test Report

Test Report no.:	FCC15C_RM-691_34.docx	Date of Report:	9-Feb-2011
Number of pages:	18	Customer's Contact person:	Alison Lenaghan
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FCC listing no.:	99059		
IC recognition no.:	661AL-1		
Tested devices/ accessories:	Phone RM-691; Battery BL-5K; AC-Charger AC-15; Headset WH-102		
FCC ID:	QFXRM-691	IC:	661Z-RM691
Supplement reports:	-		
Testing has been carried out in accordance with:	CFR 47, FCC rules Part 15 Subpart C, ANSI C63.4 (2009), Public Notice DA 00-705, DTS procedures KDB 558074, IC standards RSS-GEN and RSS-210. 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:			

Ruben Hansen, System Manager, EMC

1. Summary for FCC Part 15C Compliance Test Report

Date of receipt	31-Jan-2011
Testing completed	9-Feb-2011
The customer's contact person	Lenaghan Alison
Test Plan referred to	T:\Projects\RM-691\TestPlan\RS_testplan_RM-691.xls
Notes	-
Document name	T:\Projects\RM-691\EMC\FCC15C_RM-691_34.docx

1.1. EUT and Accessory Information

The EUT is a NFC device. The NFC module is tested with maximum rated TX power.

Product	Type	SN	HW	MV	SW	DUT
Phone	RM-691	004402/13/404084/3	5000	-	020.022	23790
Battery	BL-5K	4620400321K10100594;0670580	-	-	-	23791
Charger	AC-15E	4090499512230700762;0675463	-	-	-	23789
Dummy Battery	SD-77 V.2	21.12.2009/03618	3001			24160

1.2. Summary of Test Results

Section in CFR 47	Section in RSS-210		Result
15.209	2.7	Radiated Emission	PASSED
15.225 (a)	A2.6	Radiated Emission	PASSED
		Occupied Bandwidth	PASSED
15.225 (e)	A2.6	Frequency Stability	PASSED

PASSED
FAILED
NP

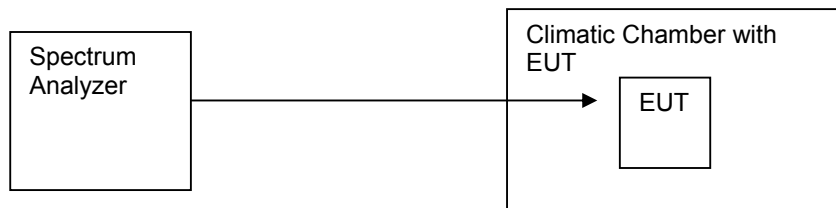
The EUT complies with the essential requirements in the standard.
The EUT does not comply with the essential requirements in the standard.
The test was not performed by the TCC Nokia Copenhagen Laboratory.

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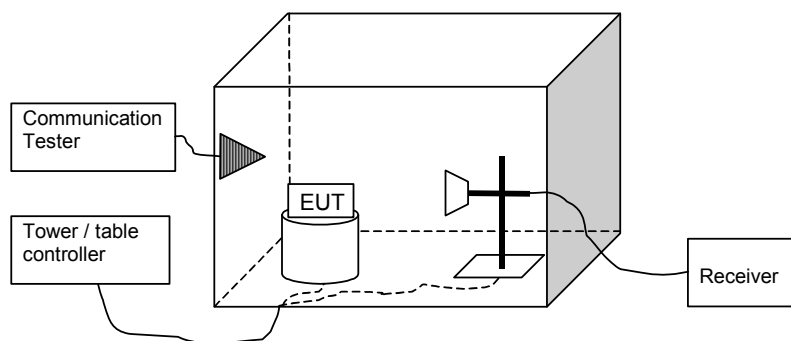
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2. Test setups

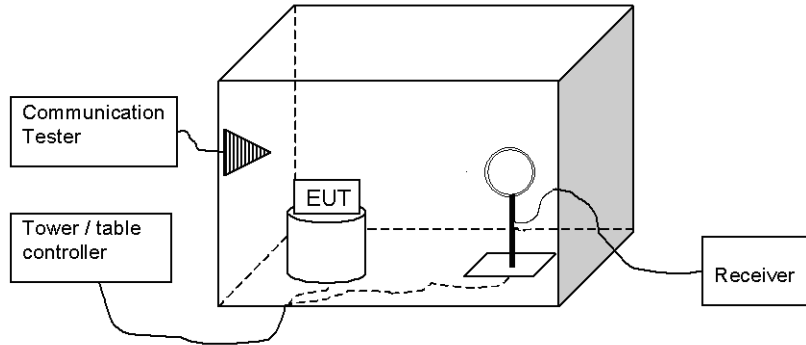
2.1. Voltage Stability test setup



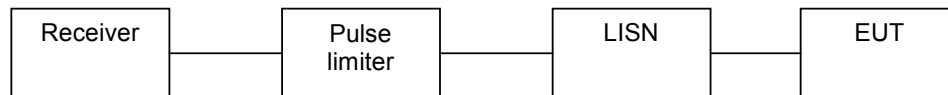
2.2. Radiated Emission 30 to 1000 MHz



2.3. Radiated Emission 9 kHz to 30 MHz



2.4. AC power line conducted emissions test setup



3. Radiated Emissions 9 KHz – 30 MHz

EUT with DUT number	RM-691 DUT 23790
Accessories with DUT numbers	BL-5K DUT 23791, AC-15 DUT 23789
Operation Voltage [V] / [Hz]	115 VAC / 60 Hz
Result	Passed
Remarks	EUT measured in 3 orthogonal positions
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	22 / 38 / 1017
Date of measurements	1-Feb-2011
Measured by	Ruben Hansen

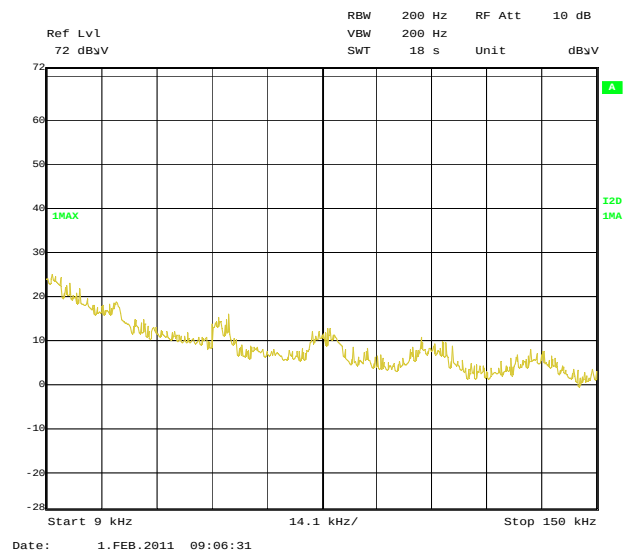
3.1. Test method and limit

The measurement is made according to FCC rules part 15.225 and IC standard RSS-210 Section 2.7

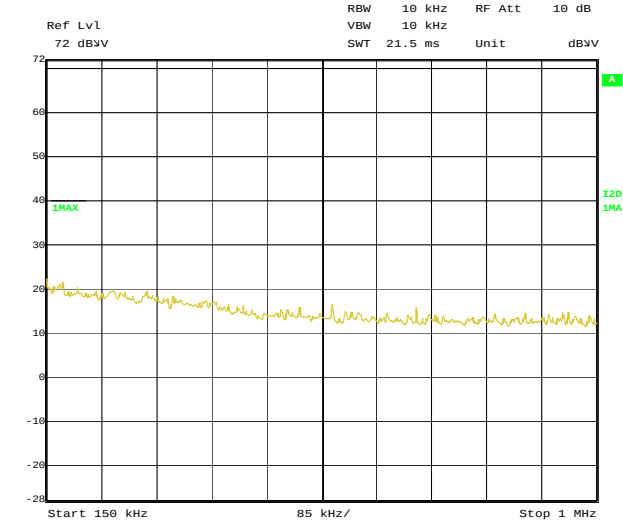
3.2. NFC Test results

Radiated Emission 9 kHz – 30 MHz, 3 meter distance

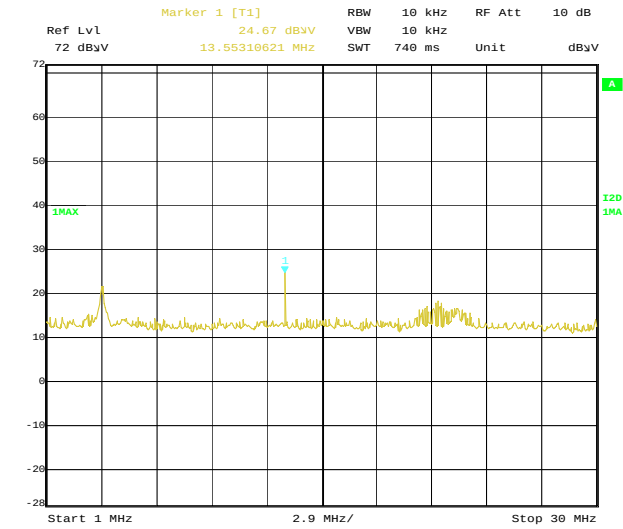
Frequency [MHz]	Reading [dBμV]	Correction [dB]	Result [dBμV/m]	Limit [dBμV/m]	Margin [dB]
13.56	24.67	20.0	44.67	124	79.33



Radiated Emission 9 – 150 kHz

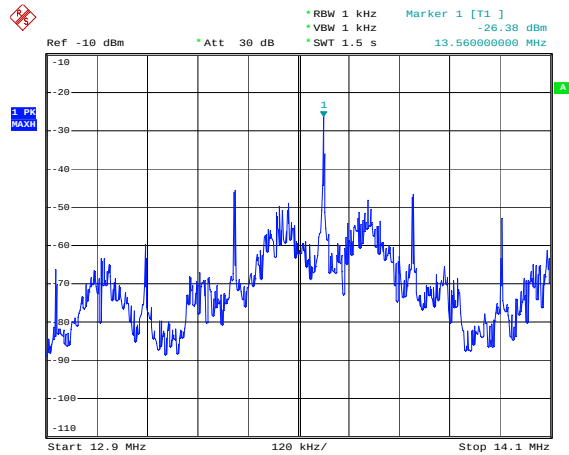


Date: 1.FEB.2011 09:08:29
Radiated Emission 150 – 1000 kHz



Date: 1.FEB.2011 09:17:16
Radiated Emission 1 - 30 MHz

3.3. Frequency Mask 12.9 to 14.1 MHz



Date: 9.FEB.2011 09:59:14

Marker 13.56 MHz is 44.67 dB/uV corrected, see 3.2

3.4. Radiated emissions 30 – 1000 MHz

EUT with DUT number	RM-691 DUT 23790
Accessories with DUT numbers	BL-5K DUT 23791; AC-15 DUT 23789
Operation Voltage [V] / [Hz]	115 V / 60 Hz
Results	PASSED
Remarks	None
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	22 / 38 / 1017
Date of measurements	
Measured by	Ruben Hansen

3.5. Test method and limit

The measurement is made according to FCC rules part 15.225 and IC standard RSS-210_Section 2.7:

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 results are obtained as described below:

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

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

3.6. NFC Test results

TX on 13.56 MHz

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

Frequency [MHz]	E [dB μ V/m]	E [μ V/m]	U _{RX} [dB μ V]	A _{TOT} [dB]	Polarisation	Result
40.88	29.26	29.037	42.83	-13.57	VERTICAL	Passed
40.922	29.18	28.774	42.77	-13.59	VERTICAL	Passed
41.032	29.39	29.478	43.05	-13.66	VERTICAL	Passed
41.051	29.18	28.784	42.86	-13.68	VERTICAL	Passed
41.091	29.28	29.111	42.98	-13.7	VERTICAL	Passed

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

Frequency [MHz]	E [dB μ V/m]	E [μ V/m]	U _{RX} [dB μ V]	A _{TOT} [dB]	Polarisation	Result
2846.492	49.12	285.891	42.78	6.34	HORIZONTAL	Passed
11561.824	57.08	714.661	38.23	18.85	VERTICAL	Passed
11724.753	56.53	670.27	36.9	19.63	VERTICAL	Passed

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

Frequency [MHz]	E [dB μ V/m]	E [μ V/m]	U _{RX} [dB μ V]	A _{TOT} [dB]	Polarisation	Result
2846.492	36.16	64.276	29.82	6.34	HORIZONTAL	Passed
11561.824	43.31	146.302	24.46	18.85	VERTICAL	Passed
11724.753	43.91	156.892	24.28	19.63	VERTICAL	Passed

4. AC power line conducted emissions (FCC §15.207, RSS-GEN 7.2.2)

EUT with DUT number	RM-691 DUT 23790
Accessories with DUT numbers	BL-5K DUT 23791, AC-15 DUT 23789
Operation Voltage [V] / [Hz]	115 VAC / 60 Hz
Result	Passed
Remarks	EUT measured in 3 orthogonal positions
Temp [°C] / Humidity [%RH] / Air Pressure [mBar]	22 / 37 / 998
Date of measurements	7-Feb-2011
Measured by	Christian Andersen

4.1. Test method and limit

The measurement is made according to Public notice DA 00-705 and IC standard RSS-GEN as follows:

The EUT is placed on a wooden table 80 cm above the reference groundplane.

The EUT is connected via LISN to a test power supply.

The measurement results are obtained as described below:

$$U [dB\mu V] = U_{RX} + A_{TOT}$$

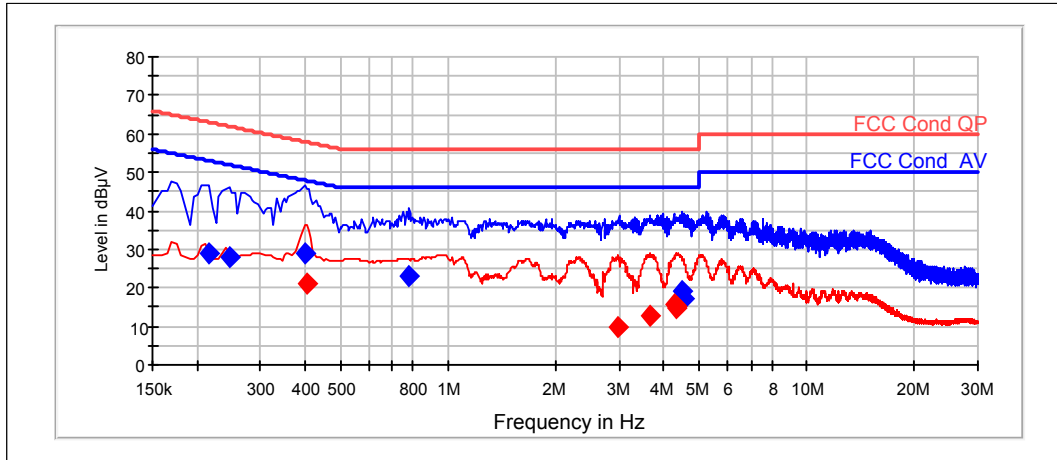
Where U_{RX} is receiver reading and A_{TOT} is total correction factor including cable and pulse limiter attenuations.

CISPR 22 Class B limits

Frequency range [MHz]	Quasi peak limit [dBμV]	Average limit [dBμV]
0.15 - 0.5	66 - 56	56 - 46
0.5 - 5	56	46
5 - 30	60	50

4.1.1 NFC Test Results

IDLE Mode



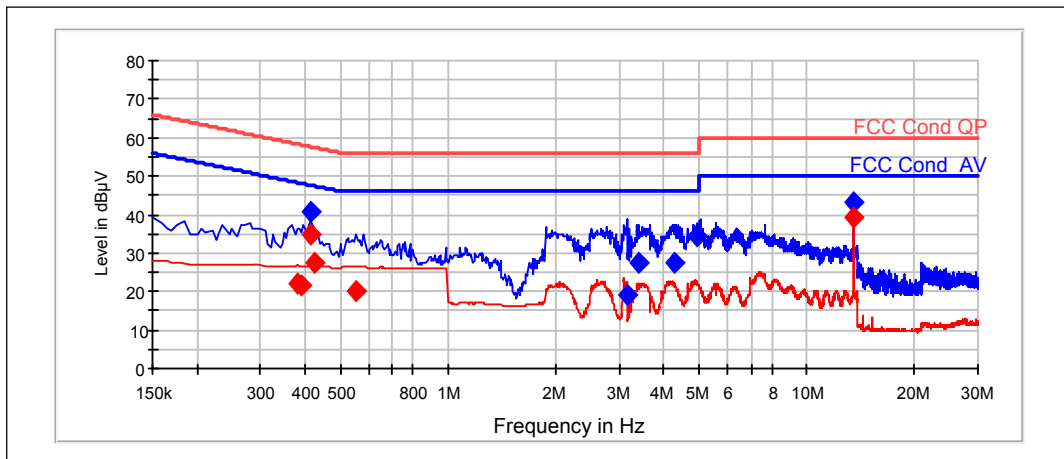
Quasi peak

Frequency [MHz]	U [dBμV]	IF-BW[kHz]	Line	Margin	Result
0.215	28.78	10	N	34.21	Passed
0.245	27.9	10	L1	34.02	Passed
0.4	28.78	10	N	29.05	Passed
0.78	22.94	10	N	33.1	Passed
4.485	18.92	10	L1	37.1	Passed
4.565	17.19	10	L1	38.8	Passed

Average

Frequency [MHz]	U [dBμV]	IF-BW[kHz]	Line	Margin	Result
0.405	20.96	10	N	26.75	Passed
2.975	9.82	10	N	36.2	Passed
3.66	12.95	10	N	33.1	Passed
4.29	15.61	10	N	30.4	Passed
4.325	15.23	10	N	30.8	Passed
4.355	14.56	10	N	31.4	Passed

TX Mode



Quasi peak

Frequency [MHz]	U [dBμV]	IF-BW[kHz]	Line	Margin	Result
0.415	40.97	10	N	16.55	Passed
3.15	19.23	10	N	36.8	Passed
3.415	27.27	10	N	28.7	Passed
4.28	27.66	10	N	28.3	Passed
4.92	34.3	10	N	21.7	Passed
13.56	42.99	10	L1	17	Passed

Average

Frequency [MHz]	U [dBμV]	IF-BW[kHz]	Line	Margin	Result
0.38	22.14	10	N	26.18	Passed
0.39	21.64	10	N	26.46	Passed
0.415	34.65	10	N	12.95	Passed
0.425	27.26	10	N	20.05	Passed
0.555	20.3	10	N	25.7	Passed
13.56	39.46	10	N	10.5	Passed

4.2. Occupied bandwidth

EUT with DUT number	RM-691 DUT 23790
Accessories with DUT numbers	BL-5K DUT 23791; AC-15 DUT 23789
Operation Voltage [V] / [Hz]	115 V / 60 Hz
Result	PASSED
Remarks	None
Temp [°C] / Humidity [%RH] / Air Pressure [mBar]	22 / 37 / 1010
Date of measurements	9-Feb-2011
Measured by	Ruben Hansen

4.3. Test setup

A small whip antenna was placed close to the EUT, and connected to the measuring Spectrum Analyzer.

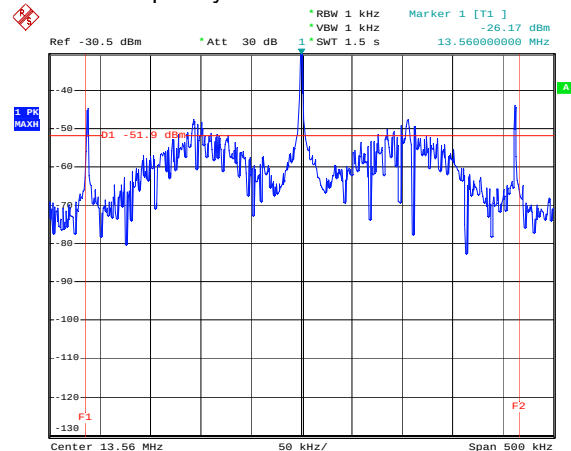
4.4. Test method and limit

The Test was carried out with the EUT in Test mode with modulation on.

4.5. NFC Test results

Operation mode (TX on)	occupied bandwidth [kHz]
NFC, modulated	431

NFC TX Frequency = 13.56 MHz



Date: 9.FEB.2011 09:54:49

5. Frequency stability, temperature variation

FCC 47 CFR Part 15 section 15.225 (e) [2] and RSS-210 A2.6

EUT with DUT number	RM-691 DUT
Accessories with DUT numbers	BL-5K DUT 24166; AC-15 DUT 24195; WH-102 DUT 24189
Operation Voltage [V] / [Hz]	115 V / 60 Hz
Result	PASSED
Remarks	None
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	25 / 53 / 101.8
Date of measurements	7-Feb-2011
Measured by	Ruben Hansen

5.1. Test setup

The EUT was placed in a Climatic Chamber. A small whip antenna was placed close to the EUT, and connected to the measuring Spectrum Analyzer. Measurement performed without modulation on TX.

5.2. Test method and limit

The measurement is made according to FCC rules FCC 47 CFR Part 15 section 15.225 (e) [2] and RSS-210 A2.6

- The EUT is placed in the chamber in transmit mode.
- The climate chamber temperature is set to the maximum value and allowed to stabilize.
- The transmit frequency is measured.
- Temperature is lowered to the next temperature value and allowed to stabilize.
- The steps c - d is repeated for each temperature.

Limits for frequency stability, temperature variation measurements

Frequency deviation [%]
± 0.01

5.3. NFC Test results

Continuous transmission 13.56 MHz

Temperature [°C]	Frequency [MHz]	Deviation [KHz]	Deviation [%]
50	13.55979	-0.21	-0.00155
40	13.55981	-0.19	-0.00140
30	13.55986	-0.14	-0.00103
20	13.55992	-0.08	-0.00059
10	13.56008	0.08	0.00059
0	13.56029	0.29	0.00214
-10	13.56029	0.29	0.00214
-20	13.5599	-0.1	-0.00074

6. Frequency stability, voltage variation

FCC 47 CFR Part 15 section 15.225 (e) [2] and RSS-210 A2.6

EUT with DUT number	RM-691 DUT 23790
Accessories with DUT numbers	SF-227T DUT 24032
Operation Voltage [V] / [Hz]	3.5 / 3.7 / 4.1 VDC
Result	PASSED
Remarks	None
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	23 / 53 / 101.8
Date of measurements	31-Jan-2011
Measured by	Ruben Hansen

6.1. Test method and limit

The EUT battery was replaced with an adjustable power supply. The frequency stability was measured at nominal voltage and at +5% and -15%. Measurement performed without modulation on TX.

Limits for frequency stability, voltage variation measurements

Frequency deviation [%]
± 0.01

6.2. NFC Test results

Continuous transmission at 13.560 MHz

Voltage level [V]	Deviation [Hz]	Deviation [%]
Battery cut-off point / 3.50	-18	-0.00133
Nominal / 3.70	-20	-0.00147

7. Test Equipment

7.1. Conducted measurements

Eq. No	Equipment	Type	Manufacturer	Used in
13037	Power Supply 0-15V 10A	EA3012	LP Instruments	15C, 15B
13513	Pulse Limiter 9KHz-30MHz	ESH3Z2	Rohde&Schwarz	15C, 15B
13666	EMI Test Receiver 9KHz-2,5GHz	ESPC	Rohde&Schwarz	15C, 15B
13935	Two Lines Artificial Mains Network	ESH3-Z5	Rohde&Schwarz	15C, 15B
16995	Directional Coupler 20dB 0,5-2,0 GHz SMA Conn.	1538RA-20	Weinschel	15C, 15B
18772	Shielded Chamber	RFD-100	ETS-Lindgren	15C, 15B
19171	Universal Radio Communication Tester	CMU200	Rohde&Schwarz	15C, 15B
11386	System DC Power Supply	HP6632A	Hewlett Packard	22/24, 15C, 15B
19678	Spectrum Analyzer 26 GHz	FSP	Rohde&Schwarz	22/24, 15C, 15B
16601	Universal Radio Communication Tester	CMU200	Rohde&Schwarz	22/24, 15C, 15B
19625	Vötsch Climatic Chamber	VT4002EMC	Vötsch	22/24, 15C, 15B
13357	Rohde & Schwartz Signal Generator	SMP02	Rohde&Schwarz	22/24, 15C, 15B

7.2. Radiated measurements

Eq. No	Equipment	Type	Manufacturer	Used in
18416	Universal Radio Communication Tester	CMU200	Rohde&Schwarz	22/24, 15C, 15B
	Programmable Relay Switching System	-----	Pickering	22/24, 15C, 15B
15742	Programmable Relay Switching System	-----	Pickering	22/24, 15C, 15B
14020	Power Supply Module Relay Switching System 45W	10-910-002	Pickering	22/24, 15C, 15B
15743	Power Supply Module Relay Switching System 50W	10-910L-001	Pickering	22/24, 15C, 15B
16490	RS-232/IEEE-488.2 Interface	10-921-001	Pickering	22/24, 15C, 15B
	RS-232/IEEE-488.2 Interface	10-921-001	Pickering	22/24, 15C, 15B
20078	Relay 2x6 Chnl μ Wave Mux	10-785B-522	Pickering	22/24, 15C, 15B
14021	Relay Dual 6 Chnl μ Wave Mux	10-785-522		22/24, 15C, 15B
	Relay Dual 6 Chnl μ Wave Mux	10-785-522		22/24, 15C, 15B
17644	Dual 6 Channel MUX Microwave Relay SMA 50 Ohm	10-785-522	Pickering	22/24, 15C, 15B
16948	Dual 6 Channel MUX Microwave Relay SMA 50 Ohm	10-785-522	Pickering	22/24, 15C, 15B
16949	Dual 6 Channel MUX Microwave Relay SMA 50 Ohm	10-785-522	Pickering	22/24, 15C, 15B
18792	Multi Device Controller	2090	ETS-EMCO	22/24, 15C, 15B
14963	RF Preamplifier 100MHz-4GHz (Metal Chassis)	AFS3-00100400	Miteq/NMP Cph	22/24, 15C, 15B
18861	EMI Test Receiver 20Hz-26,5GHz	ESI	Rohde&Schwarz	22/24, 15C, 15B
18860	Ultra Broadband Antenna Ultralog 30-3000MHz	HL562	Rohde&Schwarz	22/24, 15C, 15B
19830	Ultra Broadband Antenna Ultralog 30-3000MHz	HL562	Rohde&Schwarz	22/24, 15C, 15B

Eq. No	Equipment	Type	Manufacturer	Used in
18773	Shielded Chamber	RFD-100	ETS-Lindgren	22/24, 15C, 15B
18774	Shielded Chamber	RFSD-F/A-100	ETS-Lindgren	22/24, 15C, 15B
19151	High Pass Filter 3GHz WHK3.0/18G-10ss	WHJS3000-10SS	Wainwright	22/24, 15C, 15B
13937	Ultra Stable Notch Filter 850MHz	WRCA902.4-0.2/40-6SS	Wainwright Instruments	22/24, 15C, 15B
13936	Ultra Stable Notch Filter 1747,5MHz	WRCD1747.5-0.2/40- 10SS	Wainwright Instruments	22/24, 15C, 15B
13917	Highpass Filter 1000-3000MHz 50OHM SMA Conn	WHKS1000-10SS	Wainwright Instruments	22/24, 15C, 15B
14188	Ultra Stable Notch Filter 902,4MHz	WRCA902.4-0.2/40-6SS	Wainwright	22/24, 15C, 15B
14187	Ultra Stable Notch Filter 1747,5MHz	WRCD1747.5-0.2/40- 10SS	Wainwright	22/24, 15C, 15B
16633	Ultra Stable Notch Filter 1880,0MHz	WRCD1880.0-0.2/40- 10SS	Wainwright	22/24, 15C, 15B
19587	BT/WLAN Band Reject Filter	WRCG2400/2483- 2390/2493-35/10SS	Wainwright	22/24, 15C, 15B
	WDCMA Band 4 filter	WRCG1737/1743- 1733/1747-40/6SS	Wainwright	22/24, 15C, 15B
	WDCMA Band 5&6 filter	WRCG832/83/-825/845- 40/5SS	Wainwright	22/24, 15C, 15B
	WDCMA Band 8 filter	WRCG894.6/900.6- 890.6/904.6-40/80SS	Wainwright	22/24, 15C, 15B
18323	Band reject filter 1947-1953MHz 40dB	WRCG1947/1953- 1940/1960-40/6SS	Wainwright	22/24, 15C, 15B
20031	Double Ridged Broadband Horn	BBHA 9120 D	SCHWARZBECK	22/24, 15C, 15B
15190	Infra Red Remote Control Unit	4630	Emco	22/24, 15C, 15B
14993	EMI Test Receiver 9KHz- 2750MHz	ESCS30	Rohde&Schwarz	22/24, 15C, 15B
15191	Turntable Contoller Unit	G-800SDX	YAESU	22/24, 15C, 15B
14900	Antenna Controller	HD100	HD GmbH	22/24, 15C, 15B
15105	Attenuator 30dB DC-1000MHz 50 Ohm Nf - Nm	NAT-30	Mini-Circuits	22/24, 15C, 15B
13302	Spectrum Analyzer 9KHz- 12.8GHz	HP8596E	Hewlett Packard	22/24, 15C, 15B
11584	Spectrum analyzer 50Hz- 6,5GHz	HP8561B	Hewlett Packard	22/24, 15C, 15B
13134	Tracking generator	HP85645A	Hewlett Packard	22/24, 15C, 15B
19374	Resonant Dipole Antenna 850MHz SMA m Conn.	-----	NMP Cph	22/24, 15C, 15B
19375	Resonant Dipole Antenna 1900MHz SMA m Conn.	-----	NMP Cph	22/24, 15C, 15B
11487	Network analyzer 300KHz- 3,0GHz	HP8753A	Hewlett Packard	22/24, 15C, 15B
14807	S - Parameter Test Set 300KHz- 6GHz	HP85047A	Hewlett Packard	22/24, 15C, 15B
17277	Multimeter Digital 6 1/2 Digit	AT34401A	Agilent Technologies	22/24, 15C, 15B