

FCC Part 15C Compliance Test Report

Test Report no.:	Cph_FCC_0642_04.doc	Date of Report:	20-10-2006
Number of pages:	17	Customer's Contact person:	Ari Havela
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FCC listing no.:	99059		
IC recognition no.:	4820 and 4820-1		
Tested devices/ accessories:	Phone; RM-216 (HW: 0400), Battery; BL-4C, AC-Charger; AC-3E		
FCC ID:	PYARM-216V	IC:	661V-RM216V
Supplement reports:			
Testing has been carried out in accordance with:	CFR 47, FCC rules Part 15 Subpart C, ANSI C63.4 (2003), 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:			

Allan F. Henriksen, Engineer

1. Summary for FCC Part 15C Compliance Test Report

Date of receipt	16-10-2006
Testing completed	20-10-2006
The customer's contact person	Ari Havela
Test Plan referred to	\\EMC\\TESTPLAN\\
Notes	None
Document name	T:\\Projects\\RM-216\\EMC\\Results\\FCC\\Cph_FCC_0642_04.doc

1.1. EUT and Accessory Information

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

Product	Type	SN	HW	MV	SW	DUT
Phone	RM-216	004400/92/171217/8	0400	-	Vp 02.00	27830
Phone	RM-216	004400/92/170565/1	0400	-	Vp 02.00	27809
AC-Charger	AC-3E	1103336192171308343;0675370	-	-	-	27811
Battery	BL-4C	0670386417535N073B11154787	-	-	-	27829

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
15.225 (e)	A2.6	Frequency Stability	Passed

PASSED
FAILED
NP

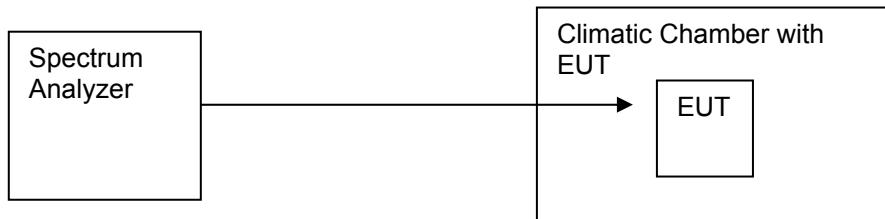
The EUT complies with the essential requirements in the standard.
The EUT does not comply with the essential requirements in the standard.
The test was not performed by the TCC Nokia Copenhagen Laboratory.

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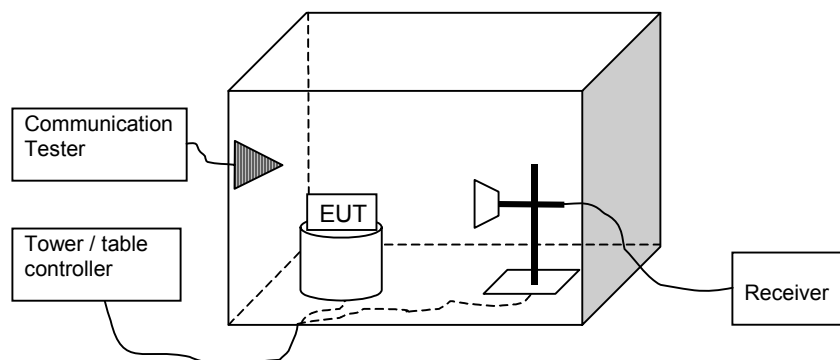
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2. Test setups

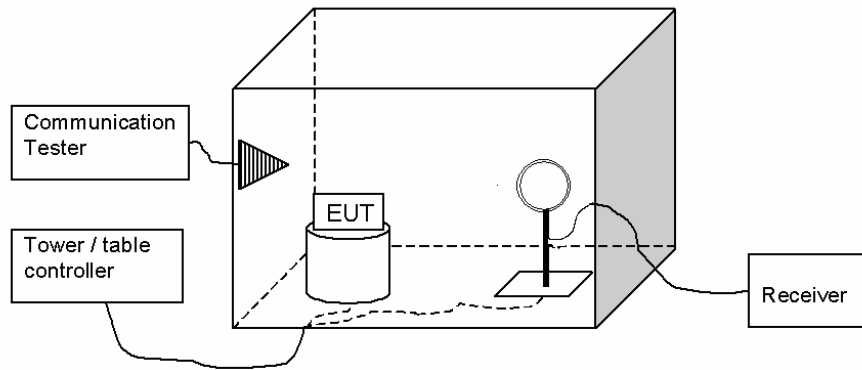
2.1. Voltage Stability test setup



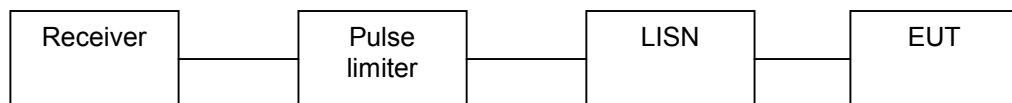
2.2. Radiated Emission 30 to 1000 MHz



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-216 dut # 27830
Accessories with DUT numbers	BL-4C dut # 28829
Operation Voltage [V] / [Hz]	-
Result	Passed
Remarks	None
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	24.1 / 42.5 1012,5
Date of measurements	17-10-2006
Measured by	Ruben Hansen & Christian Andersen

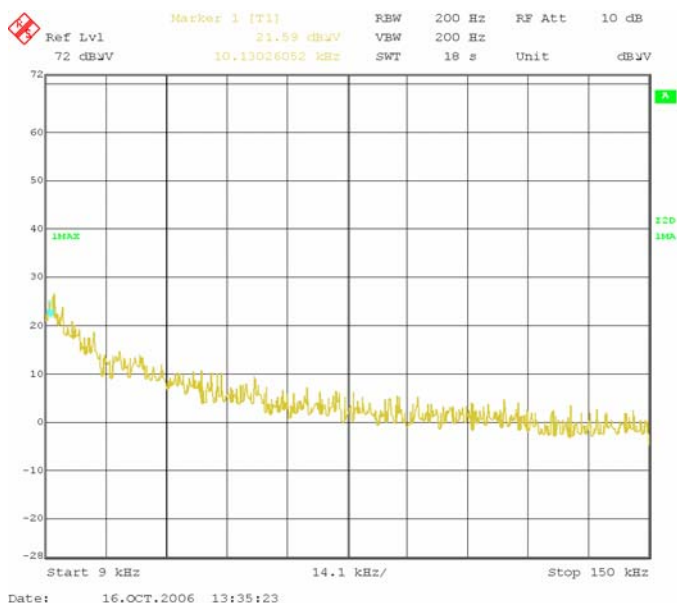
3.1. Test method and limit

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

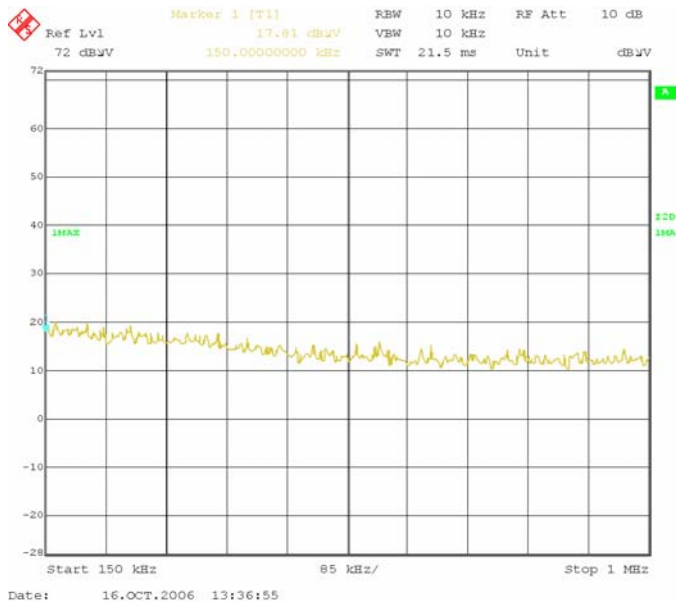
3.2. RFID Test results

Radiated Emission 9 kHz – 30 MHz, 3 meter distance

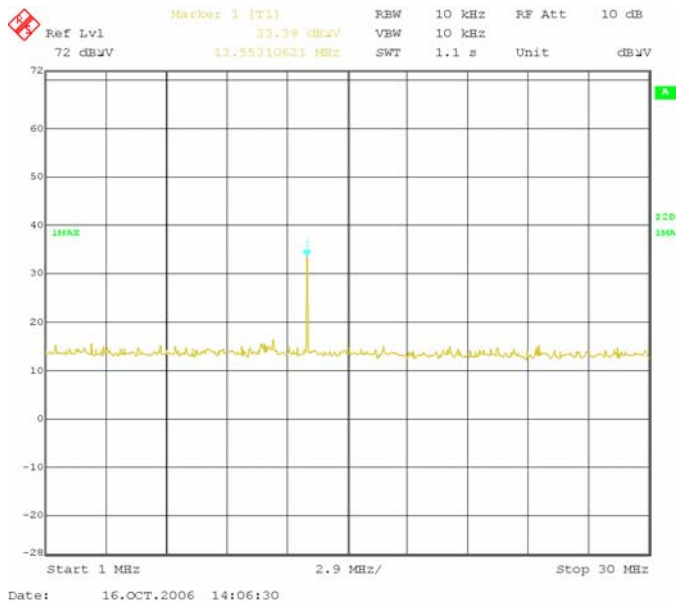
Frequency [MHz]	Reading [dBμV]	Correction [dB]	Result [dBμV/m]	Limit [dBμV/m]	Margin [dB]
13.56	33.39	20.0	53.39	124	69.81



Radiated Emission 9 – 150 kHz



Radiated Emission 150 – 1000 kHz



Radiated Emission 1 - 30 MHz

4. Radiated emissions 30 – 1000 MHz

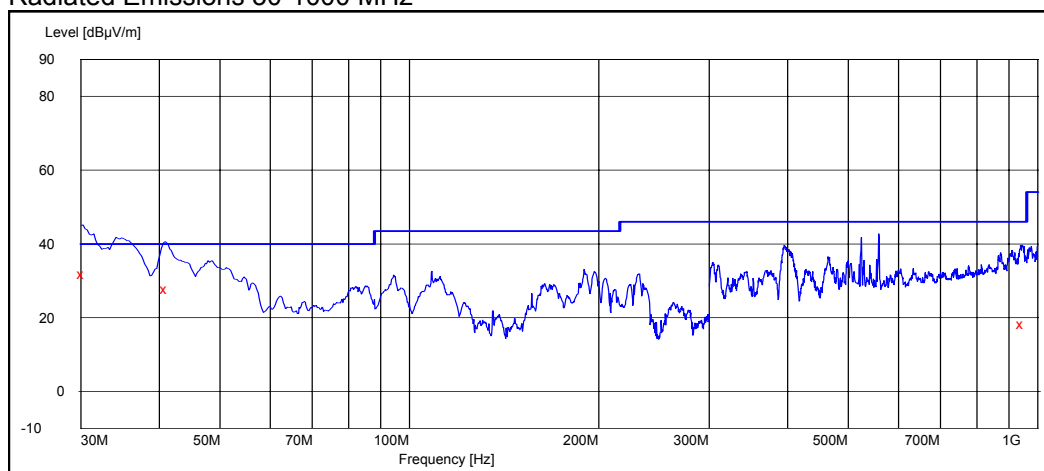
EUT with DUT number	RM-216 dut # 27830
Accessories with DUT numbers	BL-4C dut # 27829
Operation Voltage [V] / [Hz]	-
Result	Passed
Remarks	None
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	24.1 / 42.5 1012,5
Date of measurements	17-10-2006
Measured by	Ruben Hansen & Christian Andersen

4.1. Test method and limit

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

4.2. RFID Test results

Radiated Emissions 30-1000 MHz

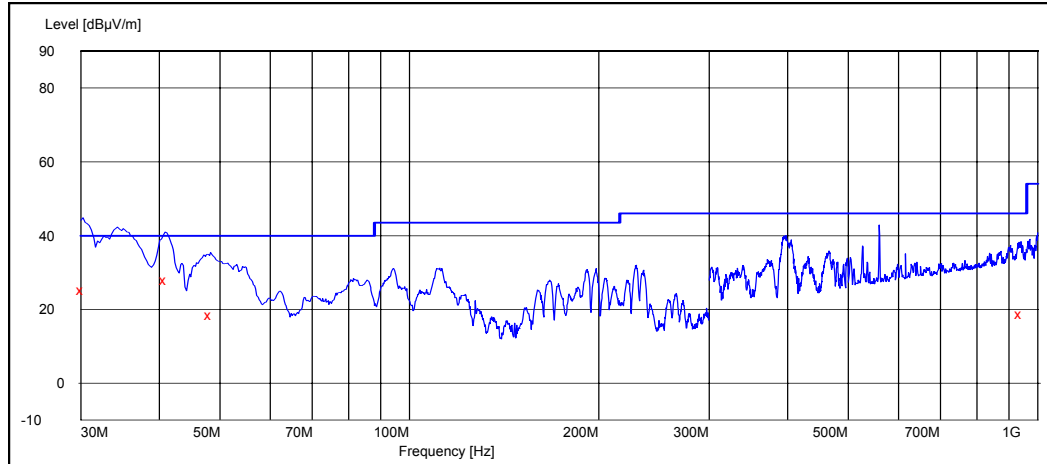


*Emissions exceeding the limit in 30...50 MHz frequency range are based on pre-sweep measurements. Pre-sweep uses wider IF-BW than specified in the standard. Final measurement was performed with correct IF-BW and the result was PASSED.

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Polarisation	Result
30.300000	31.80	38.90	44.90	-13.10	VERTICAL	Passed
41.021643	27.70	24.27	47.70	-20.00	VERTICAL	Passed
945.089780	18.30	8.22	29.80	-11.50	VERTICAL	Passed

4.3. Idle mode

Phone in Idle mode



*Emissions exceeding the limit in 30...50 MHz frequency range are based on pre-sweep measurements. Pre-sweep uses wider IF-BW than specified in the standard. Final measurement was performed with correct IF-BW and the result was PASSED.

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Polarisation	Result
30.200000	25.10	17.99	38.10	-13.00	VERTICAL	Passed
40.921643	28.00	25.12	47.90	-19.90	VERTICAL	Passed
48.276553	18.40	8.32	43.50	-25.10	VERTICAL	Passed
940.781764	18.80	8.71	30.30	-11.50	VERTICAL	Passed

5. AC powerline conducted emissions (FCC §15.207, RSS-GEN 7.2.2)

EUT with DUT number	RM-216 Dut # 27830
Accessories with DUT numbers	BL-4C Dut # 27829 + AC-3E Dut # 27811
Operation Voltage [V] / [Hz]	115 / 60
Result	Passed
Remarks	RFID in TX mode, Modulated and RFID in Idle mode
Temp [°C] / Humidity [%RH] / Air Pressure [mBar]	23.0 / 42.5 1010.9
Date of measurements	18-10-2006
Measured by	Allan F. Henriksen

5.1. 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:

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

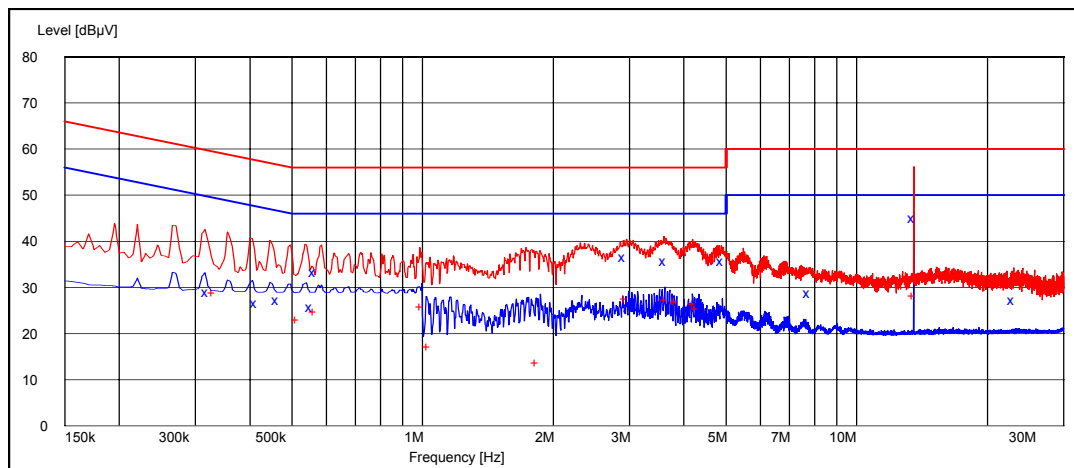
Where U_{RX} is receiver reading and A_{TOT} is total correction factor including cable and pulse limiter attenuations.

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

5.2. RFID Test results

5.2.1 Modulated State



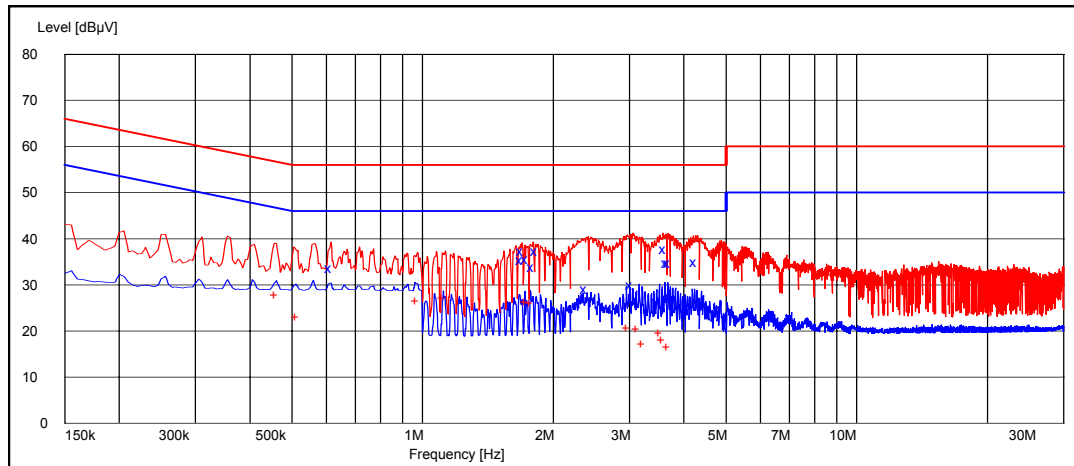
Quasi peak (RBW: 9 kHz)

Frequency [MHz]	U [dBμV]	Line	Result
0.320000	29.00	L1	Passed
0.415000	26.70	L1	Passed
0.465000	27.20	L1	Passed
0.555000	25.70	N	Passed
0.565000	33.30	L1	Passed
2.920000	36.60	N	Passed
3.625000	35.60	N	Passed
4.920000	35.60	N	Passed
7.785000	28.70	L1	Passed
13.555000	45.00	L1	Passed
23.025000	27.20	L1	Passed

Average (RBW: 9 kHz)

Frequency [MHz]	U [dBμV]	Line	Result
0.330000	28.70	L1	Passed
0.515000	23.00	N	Passed
0.565000	24.70	N	Passed
0.995000	25.80	N	Passed
1.035000	17.00	N	Passed
1.835000	13.60	N	Passed
2.950000	27.40	N	Passed
3.640000	27.30	N	Passed
3.840000	26.80	N	Passed
4.235000	26.50	N	Passed
4.280000	25.40	N	Passed
13.560000	28.20	L1	Passed

5.2.2 Idle State



Quasi peak (RBW: 9 kHz)

Frequency [MHz]	U [dBμV]	Line	Result
0.615000	33.50	L1	Passed
1.695000	35.30	N	Passed
1.700000	37.30	L1	Passed
1.745000	35.50	N	Passed
1.800000	33.90	L1	Passed
1.830000	37.40	N	Passed
2.390000	29.20	L1	Passed
3.040000	30.00	L1	Passed
3.625000	37.80	L1	Passed
3.670000	34.60	L1	Passed
3.710000	34.60	N	Passed
4.270000	34.90	N	Passed

Average (RBW: 9 kHz)

Frequency [MHz]	U [dBμV]	Line	Result
0.460000	27.80	N	Passed
0.515000	23.10	L1	Passed
0.975000	26.40	N	Passed
1.120000	27.10	N	Passed
1.735000	26.20	N	Passed
1.780000	26.00	N	Passed
2.985000	20.50	N	Passed
3.135000	20.40	N	Passed
3.230000	17.20	N	Passed
3.535000	19.60	N	Passed
3.585000	18.10	L1	Passed
3.690000	16.50	L1	Passed

6. Occupied bandwidth

EUT with DUT number	RM-216 Dut # 27809
Accessories with DUT numbers	BL-4C Dut # 27829
Operation Voltage [V] / [Hz]	-
Result	Passed
Remarks	None
Temp [°C] / Humidity [%RH] / Air Pressure [mBar]	22.7 / 51.0 1005.0
Date of measurements	19-10-2006
Measured by	Ruben Hansen

6.1. Test setup

The EUT was connected to a Spectrum analyzer

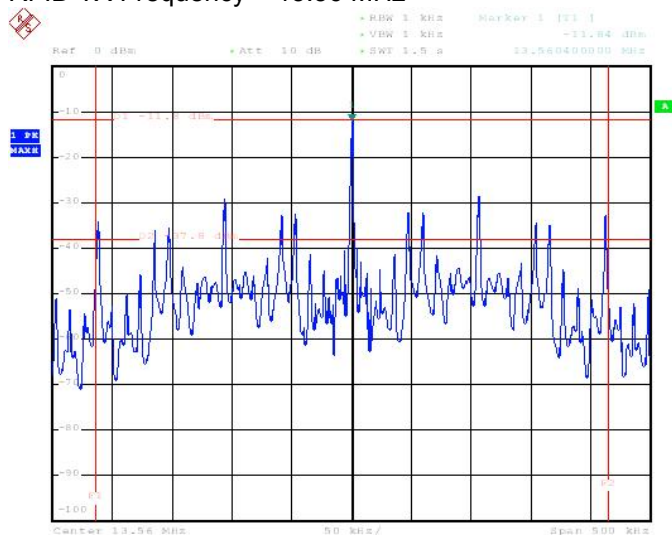
6.2. Test method and limit

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

6.3. RFID Test results

Operation mode (TX on)	occupied bandwidth [kHz]
RFID, modulated	426

RFID TX Frequency = 13.56 MHz



Date: 19.OCT.2006 12:42:37

7. Frequency stability, temperature variation

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

EUT with DUT number	RM-216 Dut # 27809
Accessories with DUT numbers	Dummy battery, DC power Supply
Operation Voltage [V] / [Hz]	-
Result	Passed
Remarks	None
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	22.7 / 51.0 1005.0
Date of measurements	19-10-2006
Measured by	Ruben Hansen

7.1. 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.

7.2. 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

7.3. RFID Test results

Continuous transmission 13.56 MHz

Temperature [°C]	Frequency [MHz]	Deviation [KHz]	Deviation [%]
50	13.56040	+ 0.40	0.00295
40	13.56024	+ 0.24	0.00177
30	13.56020	+ 0.20	0.00147
20	13.56036	+ 0.36	0.00265
10	13.56040	+ 0.40	0.00295
0	13.56036	+ 0.36	0.00265
-10	13.56032	+ 0.32	0.00236
-20	13.56028	+ 0.28	0.00206

8. Frequency stability, voltage variation

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

EUT with DUT number	RM-216 Dut # 27809
Accessories with DUT numbers	Dummy battery, DC power Supply
Operation Voltage [V] / [Hz]	NA
Result	Passed
Remarks	None
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	22.7 / 51.0 1005.0
Date of measurements	10/19/2006
Measured by	Ruben Hansen

8.1. 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 [ppm]
± 2.5

8.2. RFID Test results

Continuous transmission at 13.560 MHz

Voltage level [V]	Deviation [Hz]	Deviation [%]
Nominal + 5% / 4.2	+400	0.00294
Nominal / 4.0	+ 360	0.00265
Battery –15% / 3.4	+ 360	0.00265

9. Test Equipment

9.1. 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 Reciever 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

9.2. 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 Preampifier 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

Eq. No	Equipment	Type	Manufacturer	Used in
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
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