


REPORT: Electromagnetic Compatibility (EMC) test report

PRODUCT:

Test item description:	Heart Rate Monitor data tranceiver
Trade Mark:	Polar
Model/Type reference:	Flowlink
Serial number:	-
Customer:	Polar Electro Oy Professorintie 8 90440 Kemple FINLAND
Contact person:	Jouni Savolainen
Manufacturer:	Polar Electro Oy Professorintie 5 90440 Kempele FINLAND

DATE: 10.6.2008

TESTED BY: 
Matti Virkki ; Test engineer

APPROVED BY: 
Tuomo Hahl ; Test engineer

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LABORATORY INFORMATION

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FCC registration number: IC file number:	910391 (January 27, 2003) IC 4616A-1 (May 14, 2003)

1 CUSTOMER INFORMATION

Client	Jouni Savolainen Polar Electro Oy Professorintie 5 90440 Kempele FINLAND
Contact person:	Jouni Savolainen Polar Electro Oy Professorintie 5 90440 Kempele FINLAND
Receipt of EUT:	May 3. 2008
Testing date:	May 5. - June 4. 2008
Report date:	June 4. 2008

The tests listed in this report have been done to demonstrate compliance to the FCC rules section §15.107, §15.109, §15.209, §15.225 and IC standard RSS-GEN, RSS-210, ICES-003

2 SUMMARY OF TEST RESULTS

Section in CFR 47	Section in RSS-210	Test	Result
§ 15.225 (a)	Annex 2.6	Field strength of fundamental	PASS
§ 15.209 (a) (d)	2.6	Spurious radiated emissions	PASS
§ 15.225 (e)	Annex 2.6	Frequency tolerance	PASS
§ 15.107	ICES-003 5.3	Conducted emissions to AC-power lines	PASS
§ 15.109	ICES-003 5.5	Radiated emissions	PASS

PASS Pass
 FAIL Fail
 X Measured, but there is no applicable performance criteria
 Na Not applicable

3 EUT INFORMATION

Table 1: The EUT and accessories used in the tests are listed below. Later in this report only EUT numbers are used as reference.

	Device	Type	S/N	EUT number
EUT	FlowLink	FlowLink	-	58501
Accessories	Wrist computer	FA20F	F810Q10200057	58502
	Laptop Pc	Dell		58503
	Printer	HP		58504
	Mouse	Logitec		58505

Notes: The EUT was not modified during the tests.

3.1 EUT description

The EUT is a USB powered fixed frequency transmitter, operating in 13,56 MHz frequency, for transferring measurement data in short distance.

4 EUT TEST SETUPS

For each test the EUT was exercised to find out the worst case of operation modes and device configuration.

The test setup photographs are in the document referenced in section 12, Test setup photographs.

5 APPLICABLE STANDARDS

The tests were performed in guidance of

CFR 47 part:

§15.107

§15.109

§15.209

§15.225

ANSI C63.4, 2003

IC standard:

RSS-GEN, Issue 1

RSS-210, Issue 7

ICES-003, Issue 4

CISPR 22, 2002

Deviations, modifications or clarifications (if any) to above mentioned documents are written in each section under "Test method" for each test case.

6 FIELD STRENGTH OF FUNDAMENTAL

EUT	58501		
Accessories	58502, 58503		
Temp, Humidity, Air Pressure	22 °C	46 RH%	987 hPa
Date of measurement	May 27, 2008		
FCC rule part	§15.225 (a)		
RSS-210 section	Annex 2.6		
Measured by	Matti Virkki		

6.1 Test setup and measurement method

The EUT was set on a non-conductive turntable in a semi-anechoic chamber. The EUT was set at 0,8m height.

The measurements were repeated in three EUT orientations and two antenna polarizations.

The measured signal was routed from the measuring antenna to the spectrum analyzer.

The measurement was made using 1 MHz resolution bandwidth and 1 MHz video bandwidth and maximum hold function to record the maximum peak output power.

6.2 EUT operation mode

EUT operation mode	Continuous transmission
EUT frequency	13,56 MHz

6.3 Limit

Table 2: Field strength of fundamental

Frequency (MHz)	mV/m (@3m)	dBµV/m (@3m)
13,56	1,5848	64

6.4 Results

Table 3: Maximum field strength of fundamental

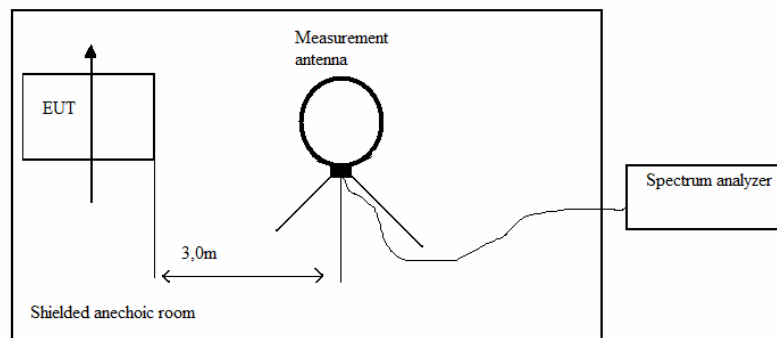
Freq MHz	Measured Value dBµV	EUT orientation	Antenna Pol.	Antenna height m	Turntable angle deg
13,56	35,7	Pos 2	Ver	1	31

7 RADIATED SPURIOUS EMISSIONS

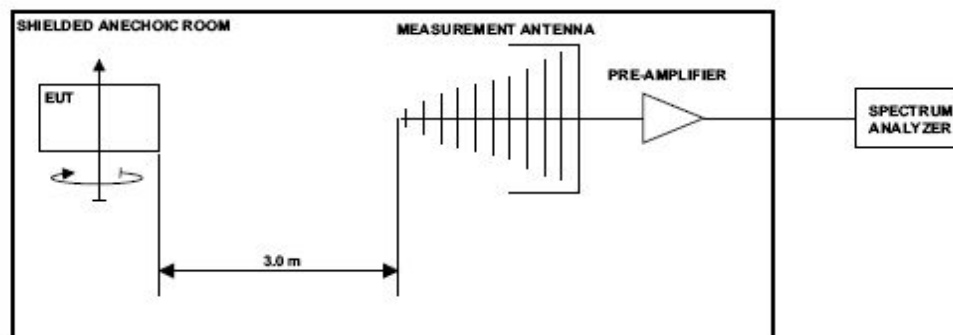
EUT	58501		
Accessories	58502, 58503		
Temp, Humidity, Air Pressure	24 °C	21 RH%	1012 hPa
Date of measurement	May 06, 2008		
FCC rule part	§15.209 (a) (d)		
RSS-210 section	2.6		
Measured by	Matti Virkki		

7.1 Test setup

The test was done using an automated test system, where a computer controlled the measurement equipments.



Picture 1: Test setup for radiated spurious emissions measurement
9 kHz - 30 MHz frequencies



Picture 2: Test setup for radiated spurious emissions measurement
30 MHz - 140 MHz frequencies

7.2 Test method

1. The emissions were searched and maximized by moving the turntable, changing the measuring antenna polarization and manipulating the EUT.
2. Levels of suspicious signals and levels of EUT transmitter harmonics were recorded.
3. The recorded levels were corrected in the automated test system with the measurement antenna factor, cable attenuations and filter attenuation.
4. The corrected values, giving the EUT radiated spurious emission levels as dB μ V/m at 3 m distance, are reported.

7.3 EUT operation mode

EUT operation mode	Continuous transmission
EUT frequency	13,56 MHz

7.4 Limit

Table 4: Radiated spurious emission limits at measurement distance of 3m

Frequency band (MHz)	3m Limit (μ V/m)	3m Limit (dB μ V/m)	Detector
0,009-0,490	2660725-48977,9	128,5-93,8*	QP
0,49-1,705	4897,8-1412,5	73,8-63*	QP
1,705-30	2985,4	69,5	QP
30 – 88	100	40	QP
88 -140	150	43,5	QP

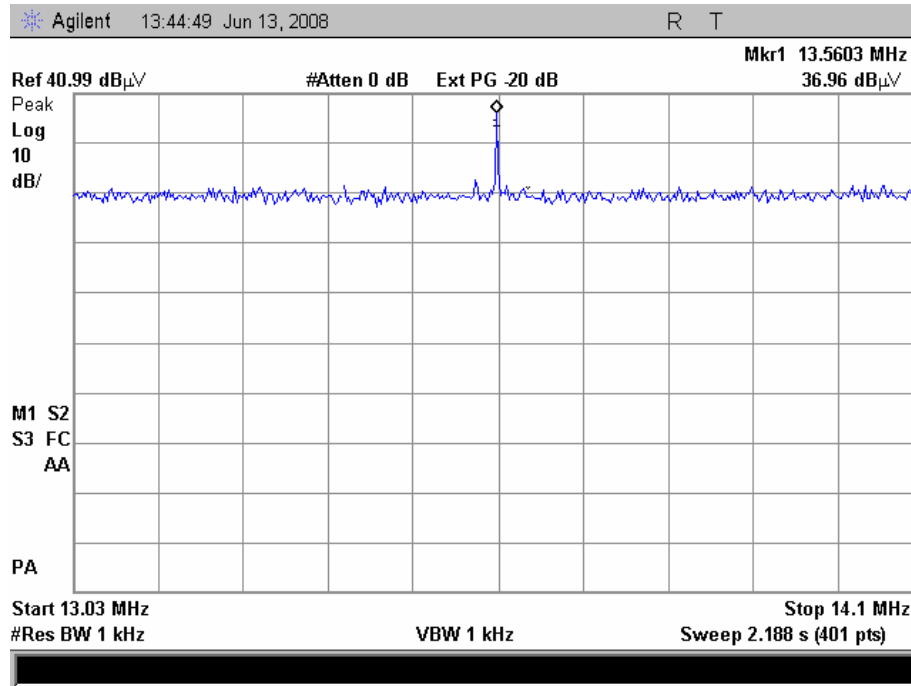
* The limit decreases linearly with the logarithm of the frequency

7.5 Results

Measurement system noise level was least 20 dB below the spurious emission limit. Only levels of suspicious signals and transmitter harmonic frequencies, which were above the measurement system noise, are reported.

Table 5: Emission levels

Freq MHz	Measured Value dB μ V	Marginal dB	EUT Position	Ant Pol.	Ant height	TT angle
67,8	27,4	12,6	1	Hor	2,9	348
94,92	34,8	8,7	1	Hor	2,2	352
108,48	32,9	10,6	1	Hor	2,8	351
122,04	34,5	9,0	1	Hor	3	354



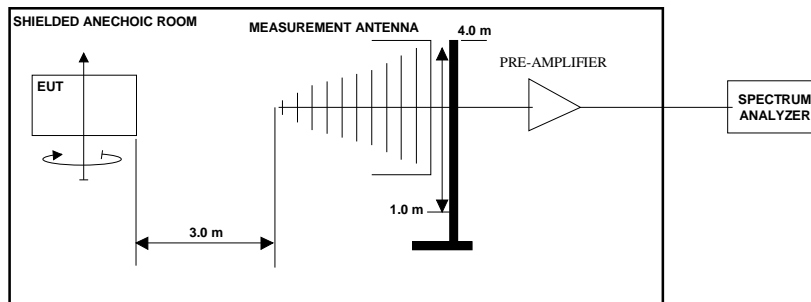
Picture 3: Band edge measurement, peak

8 RADIATED EMISSIONS

EUT	58501		
Accessories	58502, 58503, 58504 58505		
Temp, Humidity, Air Pressure	22 °C	46 RH%	991 hPa
Date of measurement	May 07, 2008		
FCC rule part	§15.109		
RSS-GEN section	7.2.3		
ICES-003 section	5.5		
Measured by	Matti Virkki		

8.1 Test setup

The test was done using an automated test system, where a computer controlled the measurement equipments.



Picture 4: Test setup for radiated spurious emissions measurement
30 MHz - 1 GHz frequencies

8.2 Test method

1. The emissions were searched and maximized by moving the turntable, changing the measuring antenna polarization and height and manipulating the EUT.
2. Levels of suspicious signals and levels of EUT transmitter harmonics were recorded.
3. The recorded levels were corrected in the automated test system with the measurement antenna factor, cable attenuations and filter attenuation.
4. The corrected values, giving the EUT radiated spurious emission levels as dB μ V/m at 3 m distance, are reported.

8.3 EUT operation mode

EUT was connected to Laptop pc USB connector. 13,56 MHz transmitter was disabled during the test

EUT operation mode	idle
EUT frequency	13,56 MHz
EUT TX power level	N/A

8.4 Limit

Table 6: Radiated emission limits at measurement distance 3m

Frequency band (MHz)	3m Limit ($\mu\text{V/m}$)	3m Limit ($\text{dB}\mu\text{V/m}$)	Detector
30 – 88	100	40	QP
88 -216	150	43,5	QP
216 - 960	200	46	QP
960 - 1000	500	54,0	QP

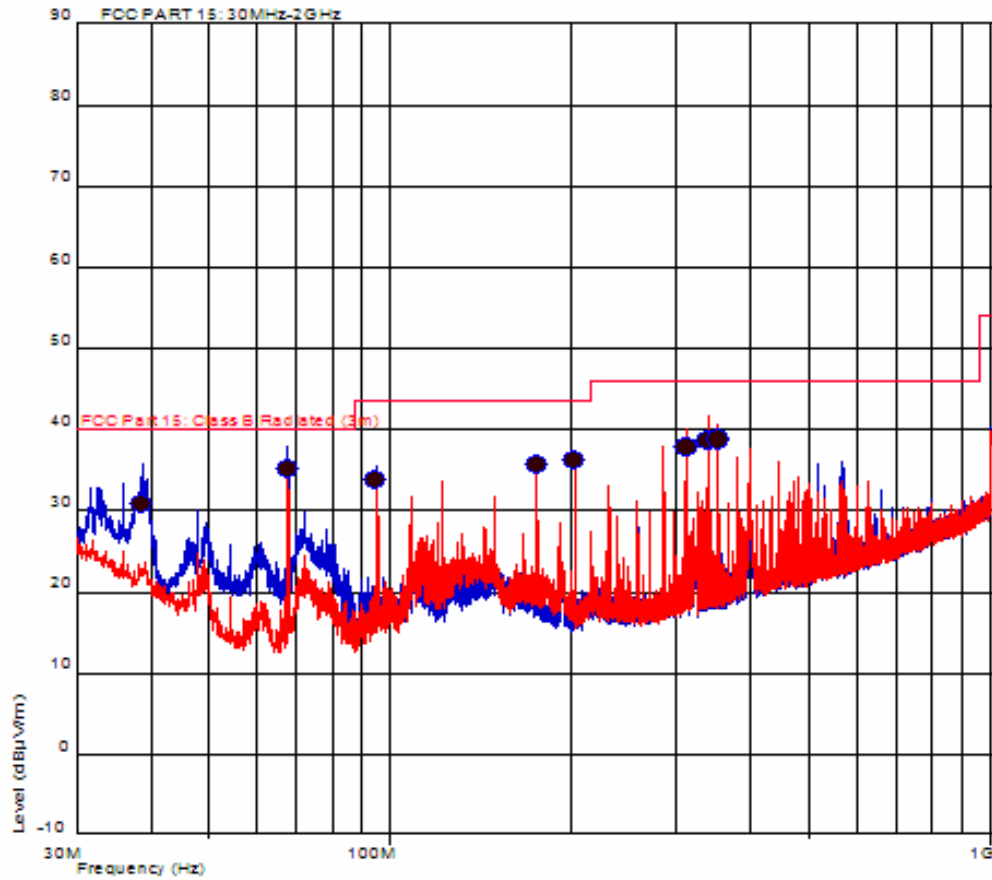
8.5 Results

The measured interference values using peak detector is shown in the pictures below.

All signals closer than 6 dB to the limit below 1 GHz have been measured using quasi peak detector and reported in the table 7.

Table 7: Radiated emission results at measurement distance 3m

Freq MHz	Measured Value $\text{dB}\mu\text{V}$	Marginal dB	EUT Position	Ant Pol.	Ant height	TT angle
67,8	27,4	12,6	1	Hor	2,9	348
94,92	34,8	8,7	1	Hor	2,2	352
108,48	32,9	10,6	1	Hor	2,8	351
122,04	34,5	9,0	1	Hor	3	354



Picture 5: Radiated emission results, 30 – 1000 MHz,
Red= horizontal polarization, Blue = vertical polarization

9 CONDUCTED EMISSIONS TO AC-MAINS

EUT	58501		
Accessories	58502, 58503, 58504 58505		
Temp, Humidity, Air Pressure	22 °C	49 RH%	997 hPa
Date of measurement	May 6, 2008		
FCC rule part	§15.107		
RSS-GEN section	7.2.2		
ICES-003 section	5.3		
Measured by	Matti Virkki		

9.1 Test setup

Charger was connected to line impedance stabilization network and conducted emissions to AC-mains were measured using measurement receiver.

9.2 EUT operation mode

EUT was connected to Laptop pc USB connector. 13,56 MHz transmitter was disabled during the test

9.3 Limits

Table 8: AC port conducted emission

Frequency of emission [MHz]	FCC / IC	
	Limit [dBµV] Quasi peak	Limit [dBµV] Average
0,15 – 0,50	66 – 56*	56 – 46*
0,50 – 5	56	46
5 – 30	60	50

* The limit decreases linearly with the logarithm of the frequency

9.4 Results

The measured interference values using peak and average detectors are shown in the pictures 6 and 7 below.

All signals closer than 6 dB to the limit have been measured using quasi peak and average detectors and reported in the tables 9 - 12.

Table 9: Quasi peak detector measurement results, AC live

Frequency [MHz]	Measured value [dB μ V]	Limit [dB μ V]	Margin to limit [dB]
N/A			

Table 10: Average detector measurement results, AC live

Frequency [MHz]	Measured value [dB μ V]	Limit [dB μ V]	Margin to limit [dB]
4,01	27,1	46,0	18,9
4,07	26,1	46,0	19,9
4,13	26,0	46,0	20,0

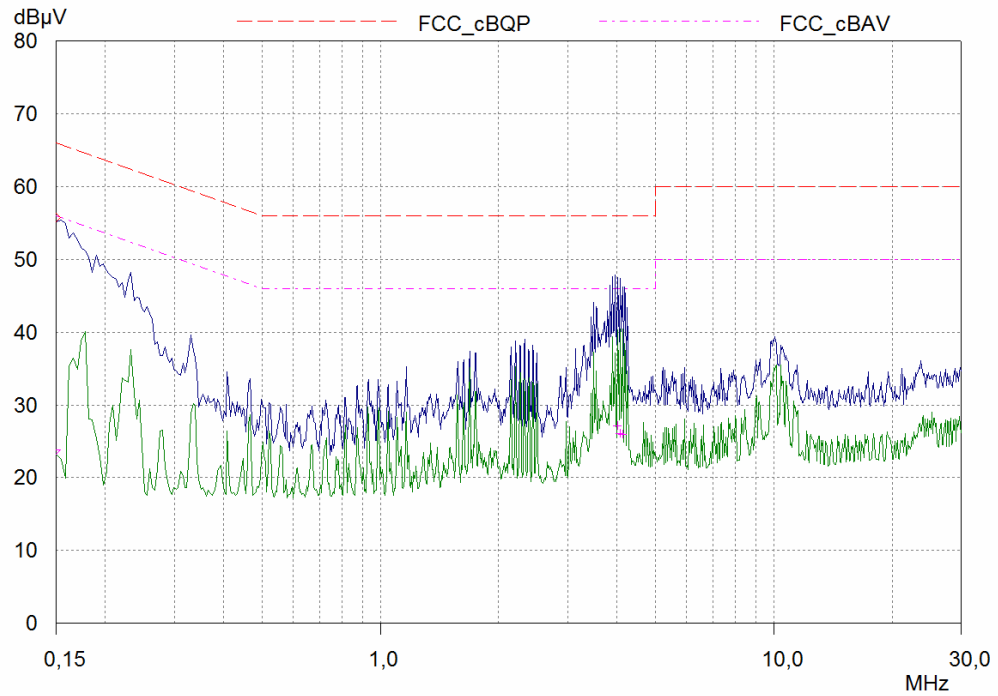
Table 11: Quasi peak detector measurement results, AC neutral

Frequency [MHz]	Measured value [dB μ V]	Limit [dB μ V]	Margin to limit [dB]
N/A			

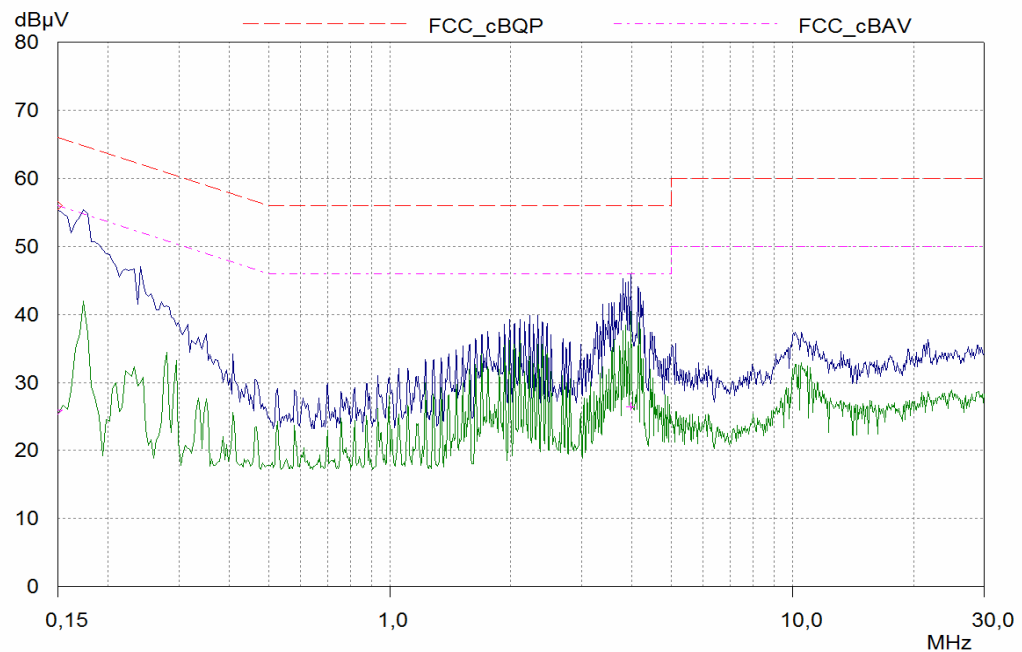
Table 12: Average detector measurement results, AC neutral

Frequency [MHz]	Measured value [dB μ V]	Limit [dB μ V]	Margin to limit [dB]
3,97	26,4	46,0	19,6

9.5 Screen shots



Picture 6: AC-mains conducted emission measurement results, AC live

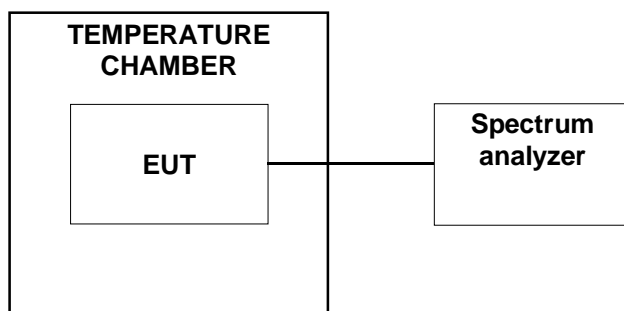


Picture 7: AC-mains conducted emission measurement results, AC neutral

10 FREQUENCY TOLERANCE

EUT	58501		
Accessories	58502, 58503		
Temp, Humidity, Air Pressure	- °C	- RH%	1003 hPa
Date of measurement	May 16, 2008		
FCC rule part	§15.225 (e)		
RSS-210 section	Annex 2.6		
Measured by	Matti Virkki		

10.1 Test setup and measurement method



Picture 9: Frequency tolerance test setup

1. The climate chamber temperature was set to the maximum value and the temperature was allowed to stabilize
2. The EUT was placed in the chamber at active mode
3. The EUT temperature was allowed to stabilize for 30 minute
4. Transmitter peak frequency was measured with spectrum analyzer
5. The steps 3 - 4 were repeated for each temperature

10.2 EUT operation mode

EUT operation mode	Continuous transmission
EUT channel	13,56 MHz

10.3 Results

Table 14 : Frequency tolerance limit

Frequency tolerance	+/- 0,01%
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Table 15: Frequency tolerance measurement results

Temperature (°C)	Transmitter frequency (MHz)
50	13,56100
40	13,56100
30	13,56100
20	13,56100
10	13,56100
0	13,56100
-10	13,56100
-20	13,56100

11 TEST EQUIPMENT

Measurement equipment, radiated emission measurement

DEVICE	MANUFACTURER	SPKTT	SERIAL
Spectrum analyser	Agilent E7405A	131	MY42000072
Biconical antenna	Rohde & Schwarz HUF-Z2	042	860941
Bilog antenna	Chase CBL6141	022	4027
3 dB attenuator	Suhner 3dB/50W	098	753175
3m Semi-anechoic chamber	ETS Euroshield	081	-

Measurement equipment, Frequency stability measurement

DEVICE	MANUFACTURER	SPKTT	SERIAL
Spectrum analyser	Agilent E7405A	131	MY42000072
Weather cabin	Vötsch VCS 7100-5	401	59566073010010

Measurement equipment, conducted emission

DEVICE	MANUFACTURER	SPKTT	SERIAL
EMI test receiver	Rohde & Schwarz ESCS30	020	849650/0016
LISN	Rohde & Schwarz ESH3-Z5	049	833874/029
10dB trans.limiter	Chase CFL9206	004	1105

12 TEST SETUP PHOTOGRAPHS

Test setup photograph can be found in a separate document T08-585B-EMC_PHOTOS