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TEST: Testing laboratory (DS/EN ISO/IEC 17025)
FCC reg. no.: DK0003
ISED CAB identifier.: DK0001

Date	Reference	Page
2022-04-19	P22-0049-2	1 (15)

FCC and ISED Test Report

of

Curo

according to

FCC 47 CFR, Part 15 Subpart B, Class B
ICES-003, Issue 7:2020, Class B

Performed by



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Examined by



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Date	Reference	Page
2022-04-19	P22-0049-2	2 (15)

Report no.:	P22-0049-2	Report date:	2022-04-19
Test started:	2022-04-12	Test ended:	2022-04-12
Test laboratory:	EKTOS TRS A/S Peter Bangs Vej 17 7600 Struer Denmark	Client:	Enhanced Communication Technology A/S Sintrupvej 23 8220 Brabrand Denmark
Contact person:	Henrik Brosbøl	Contact person:	Henrik Mikkelsen
Facility reg. no.	FCC registration number: DK0003 ISED CAB identifier: DK0001		
Test specimens:	Model: Curo		
Test specifications:	FCC 47 CFR Part 15 Subpart B ICES-003, Issue 7:2020 The tests relevant for the test specimens are listed in <i>section 1.1</i> .		
Documentation:	This test report shall not be reproduced except in full, without written approval of the laboratory. The complete test documentation is archived for 10 years at the testing laboratory.		
Test results:	The test specimen complies with relevant parts of the test specifications. The test results relate only to the specimen tested.		
Test personnel:	Volodymyr Hraivoronskyi		

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1 SUMMARY

1.1 Test plan

Test method	Name of the test	Results
FCC 47 CFR Part 15 Subpart B, Class B ICES-003, Issue 7:2020, Class B	Radiated emission	PASSED
FCC 47 CFR Part 15 Subpart B, Class B ICES-003, Issue 7:2020, Class B	Conducted emission	NR ¹

PASSED The test was performed and the test specimen complies with the essential requirements in the standard.
FAILED The test was performed and the test specimen does not comply with the essential requirements in the standard.
REF The test is covered by a test in another report and/or on a similar test specimen.
NR The test is not relevant for the test specimen or has been waived by the manufacturer.

Note 1: The test specimen is a battery powered device and has no power port.

1.2 Test Specimen

Manufacturer	Enhanced Communication Technology A/S
Model	Curo
Serial no.	-
Part no.	V0.6.1
Software	V0.5.1
Details	-
Supply voltage	Powered by battery, charged via wireless charging
Operational mode	Wireless Bluetooth



Photo 1. Test specimen.

1.3 Auxiliary Equipment

1.3.1 AC/DC adaptor

Manufacturer	Goobay
Model	43652
Serial no.	-
Details	-
Supply voltage	100 – 240 VAC
Output voltage	5 VDC / 2100 mA
Operational mode	Dedicated power supply for the auxiliary charger



Photo 2. AC/DC adaptor with the Charging station.

1.3.2 Wooden charging station

Manufacturer	Enhanced Communication Technology A/S
Model	Curo
Serial no.	-
Details	Charger to charge 4x "Curo" wirelessly
Supply voltage	5 VDC from Micro-USB

1.3.3 Mobile phone

Manufacturer	Huawei
Model	AMN-LX9
Serial no.	WNPNU20104314260
Software	Android v. 9, EMUI v. 9.1.0, Curo Prosus Demo 0.1
Details	-
Supply voltage	Battery powered, charging from Micro-USB 5 VDC
Operational mode	Connected to the test specimen

1.4 I/O ports / cables to test specimens

I/O Port Cable	Type	Shielding	Max Cable length
Sensor port	3 wire	Unshielded	<3 m

1.5 Test set-up

The Test specimen is connected to an auxiliary mobile phone via Bluetooth link.

An app installed on a smartphone shows the data sent from the test specimen via Bluetooth link.

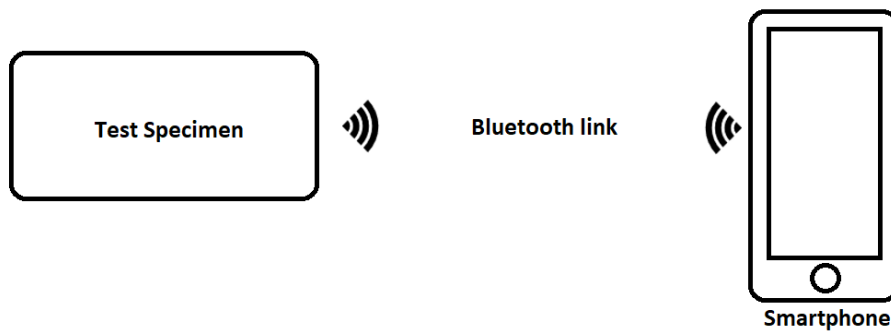


Figure 1. Test set-up.

2 TESTS

2.1 Radiated emission

Test specimen	Curo
Test specification	FCC 47 CFR Part 15 Subpart B ICES-003, Issue 7:2020
Test method	ANSI C63.4:2014
Frequency range	30-13000 MHz
Limits	FCC 47 CFR §15.109 (a), Class B, Distance 3 m
Comments	Maximum internal frequency is 2472 MHz
Temperature / Humidity	22°C / 38%RH
Date of measurements	2022-04-12
Test personnel	Volodymyr Hraivoronskyi

2.1.1 Test setup

A measuring distance of 3 m was used during the tests.

The EUT was placed 80 cm above ground on a non-conductive table.

The auxiliary equipment was positioned near the wall behind absorbers.

Exploratory radiated emission measurements in the frequency range 30 – 1000 MHz with reflective floor were made by rotating the turntable between 0-360° and varying the antenna height between 1-4 m, in both horizontal and vertical antenna polarization.

Exploratory radiated emission measurements in the frequency range 1 - 13 GHz with absorbers on the floor were made by rotating the turntable between 0-360° and an antenna height of 1.0 m, in both horizontal and vertical antenna polarization.

Based on the preliminary measurements the frequencies with the highest emissions are selected for final radiated emission measurements. Final measurements were made by rotating the turntable and changing the height of the antenna to maximize the emission level.

The smallest beamwidth (θ_{3dB}) used between 1-6 GHz was 32.4° at 4 GHz. This resembles a beamwidth (w) of 1.74 m at a distance of 3 m.

1 GHz High-Pass filter is used during the measurements at 1 – 3 GHz;

3 GHz High-Pass filter is used during the measurements at 3 – 13 GHz.



Photo 3. Radiated emission test setup for 30 - 1000 MHz.

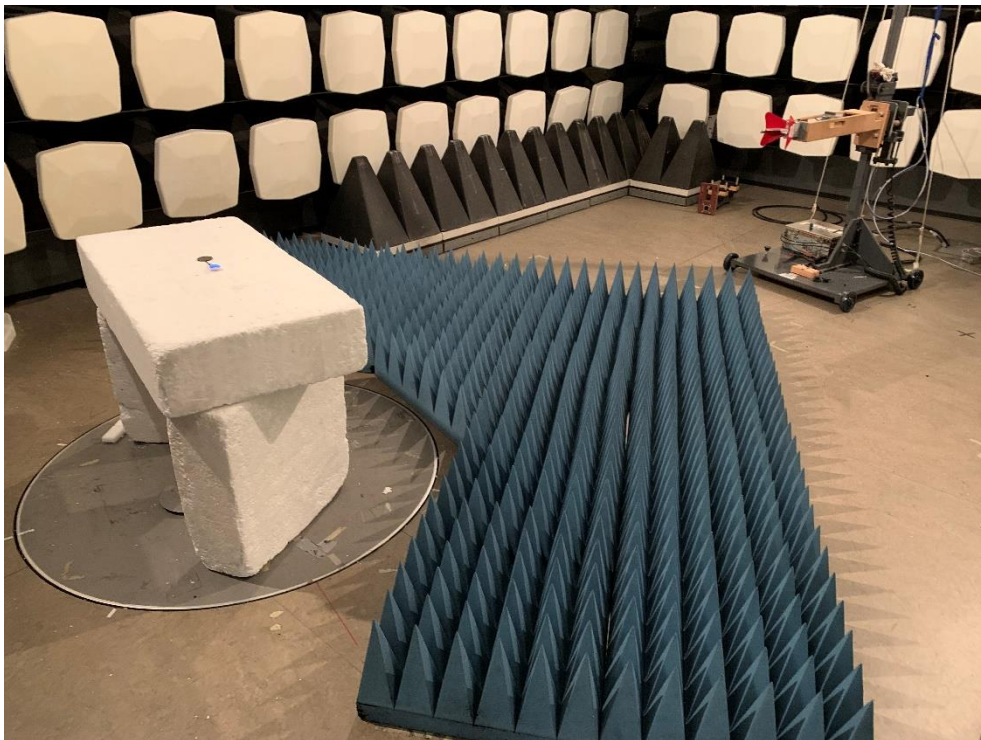


Photo 4. Radiated emission test setup for 1 - 13 GHz.

2.1.2 Test limits Class B

Frequency range [MHz]	Field strength limit [$\mu\text{V/m}$]	Field strength limit [dB $\mu\text{V/m}$]
30 – 88	100	40.0
88 – 216	150	43.5
216 – 960	200	46.0
Above 960	500	54.0
Above 1000	500	Avg: 54.0 dB $\mu\text{V/m}$ Peak: 74.0 dB $\mu\text{V/m}$

Table 1. Radiated emission limits. FCC 47 CFR §15.109 (a), Class B.

The field strength limit in $\mu\text{V/m}$ is converted to limit in dB $\mu\text{V/m}$.

Frequency range [MHz]	Field strength limit [dB $\mu\text{V/m}$]
30 – 88	40.0
88 – 216	43.5
216 – 230	46.0
230 - 960	47.0
960 - 1000	54.0
Above 1000	Avg: 54.0 dB $\mu\text{V/m}$ Peak: 74.0 dB $\mu\text{V/m}$

Table 2. Radiated emission limits. ICES-003, Issue 7:2020, Class B.

Because the FCC 47 CFR §15.109 (b), Class B limit is more stringent compared to ICES-003, Issue 7:2020, Class B limit, the FCC limit is used in the measurements.

2.1.3 Test results

The measured test results were below the limits.

The measurement time during final measurements were 15 s.

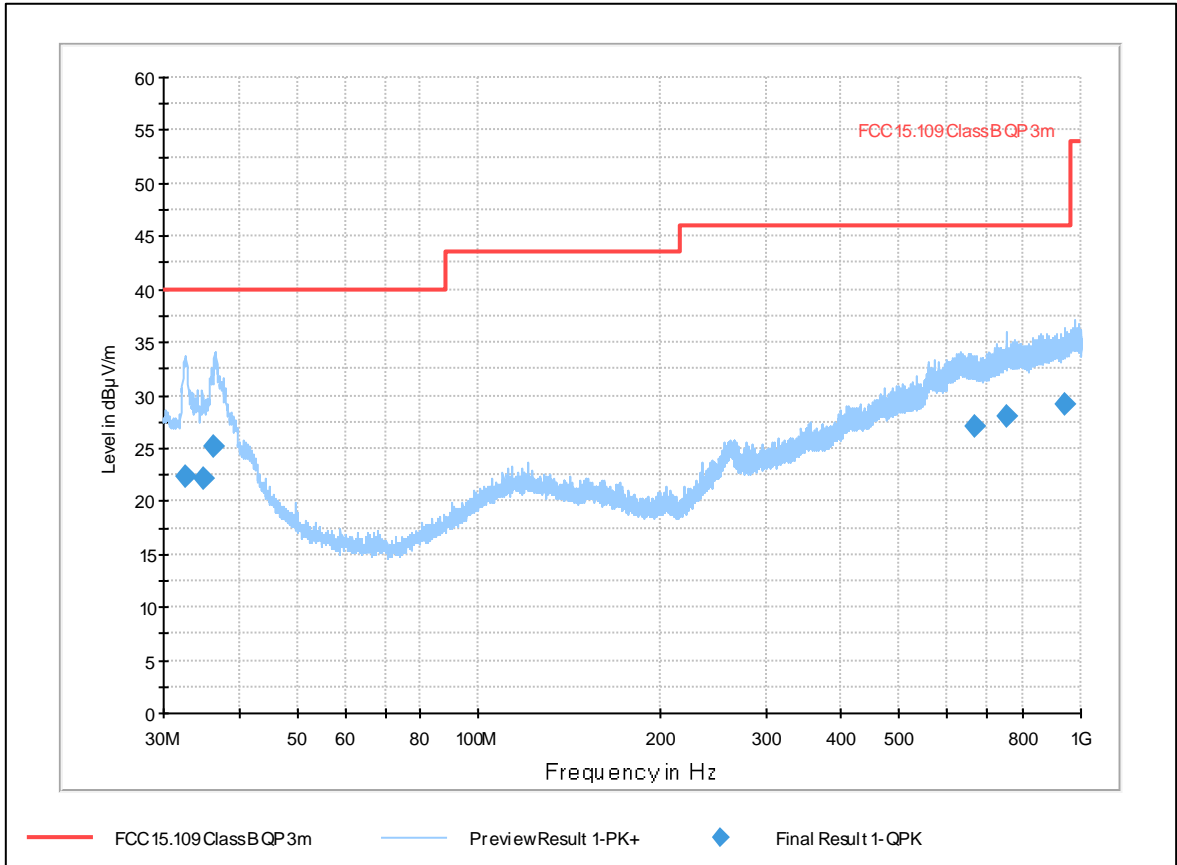


Figure 2. Radiated emission test results. 30 - 1000 MHz.

Frequency [MHz]	QP [dBµV/m]	BW [kHz]	Height [cm]	Pol.	Azimuth [deg]	Margin [dB]	Limit [dBµV/m]	Result
32.610000	22.4	120.0	143.0	V	31.0	17.6	40.0	PASSED
34.910000	22.1	120.0	343.0	V	90.0	17.9	40.0	PASSED
36.390000	25.3	120.0	288.0	V	90.0	14.7	40.0	PASSED
667.780000	27.0	120.0	273.0	V	145.0	19.0	46.0	PASSED
755.450000	28.1	120.0	197.0	H	156.0	17.9	46.0	PASSED
939.630000	29.2	120.0	212.0	H	135.0	16.8	46.0	PASSED

Table 3. Radiated emission test results. 30 - 1000 MHz.

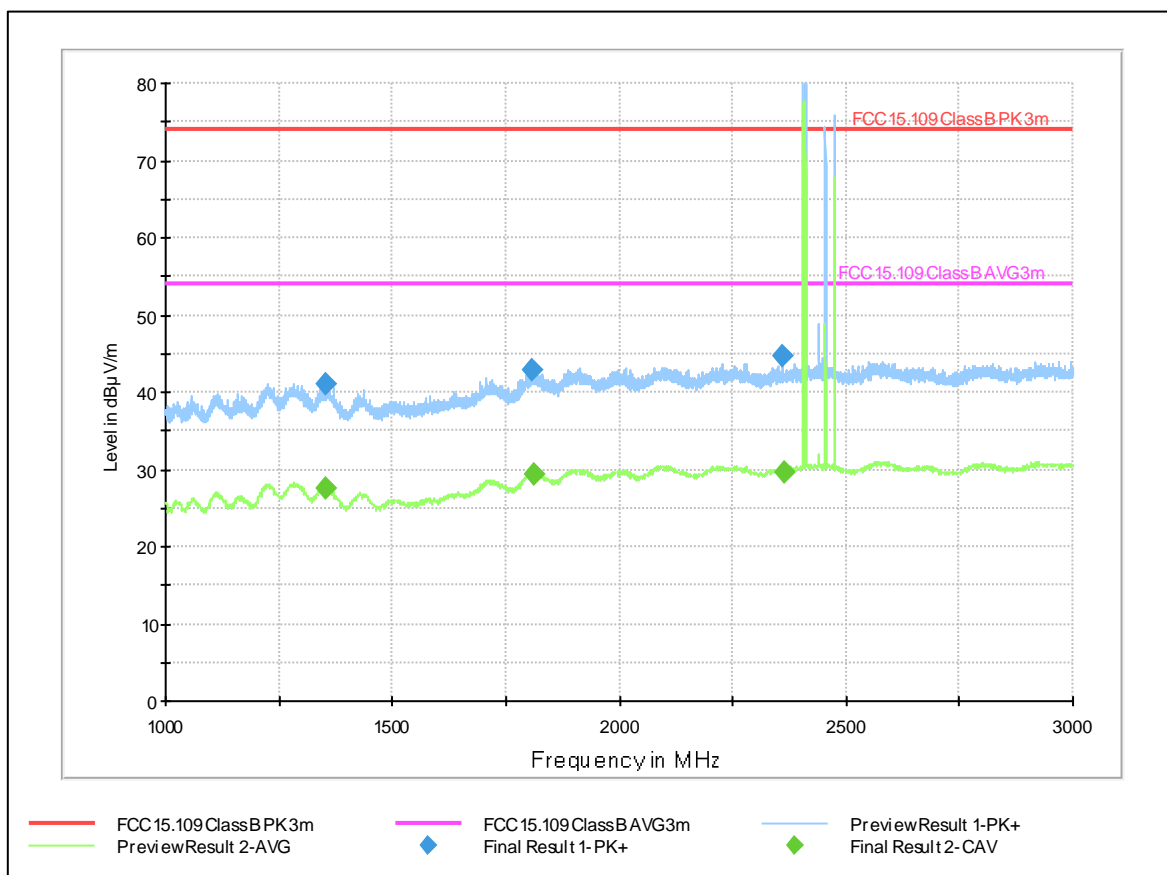


Figure 3. Radiated emission test results 1 - 3 GHz.

Emissions at 2.4-2.48 GHz are caused by Bluetooth communication between the test specimen and auxiliary equipment and are excluded from the final measurement list.

Frequency [MHz]	Peak [dBµV/m]	BW [kHz]	Height [cm]	Pol.	Azimuth [deg]	Margin [dB]	Limit [dBµV/m]	Result
1351.700000	41.0	1000	259.0	V	191.0	33.0	74.0	PASSED
1808.800000	42.9	1000	245.0	H	285.0	31.1	74.0	PASSED
2359.950000	44.7	1000	100.0	H	173.0	29.3	74.0	PASSED

Table 4. Radiated emission test results 1 - 3 GHz. Peak detector.

Frequency [MHz]	Average [dBµV/m]	BW [kHz]	Height [cm]	Pol.	Azimuth [deg]	Margin [dB]	Limit [dBµV/m]	Result
1351.550000	27.4	1000	186.0	V	7.0	26.6	54.0	PASSED
1810.200000	29.3	1000	213.0	V	105.0	24.7	54.0	PASSED
2362.900000	29.6	1000	306.0	V	99.0	24.4	54.0	PASSED

Table 5. Radiated emission test results- 1 - 3 GHz. Average detector.

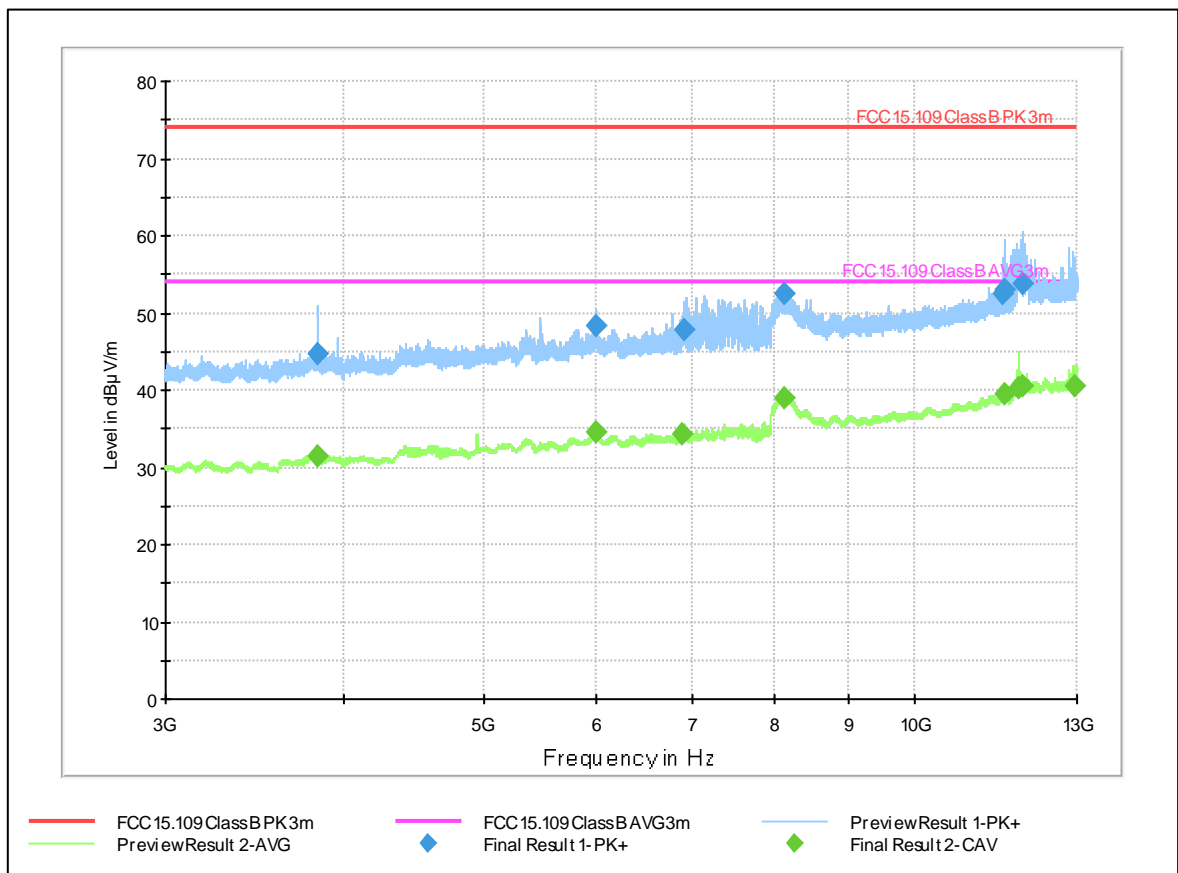


Figure 4. Radiated emission test results 3 - 13 GHz.

Frequency [MHz]	Peak [dBµV/m]	BW [kHz]	Height [cm]	Pol.	Azimuth [deg]	Margin [dB]	Limit [dBµV/m]	Result
3830.450000	44.8	1000	100.0	V	126.0	29.2	74.0	PASSED
6000.750000	48.2	1000	213.0	V	54.0	25.8	74.0	PASSED
6916.800000	47.9	1000	293.0	V	48.0	26.1	74.0	PASSED
8121.450000	52.5	1000	340.0	V	4.0	21.5	74.0	PASSED
11532.300000	52.6	1000	181.0	V	16.0	21.4	74.0	PASSED
11589.550000	53.0	1000	119.0	V	65.0	21.0	74.0	PASSED
11913.050000	53.7	1000	289.0	V	-25.0	20.3	74.0	PASSED

Table 6. Radiated emission test results. 3 - 13 GHz. Peak detector.

Frequency [MHz]	Average [dBµV/m]	BW [kHz]	Height [cm]	Pol.	Azimuth [deg]	Margin [dB]	Limit [dBµV/m]	Result
3830.100000	31.4	1000	158.0	V	56.0	22.6	54.0	PASSED
5999.950000	34.6	1000	211.0	V	35.0	19.4	54.0	PASSED
6900.150000	34.2	1000	186.0	V	65.0	19.8	54.0	PASSED
8129.950000	39.0	1000	100.0	V	-17.0	15.0	54.0	PASSED
11589.250000	39.4	1000	100.0	V	35.0	14.6	54.0	PASSED
11846.750000	40.2	1000	350.0	V	-25.0	13.8	54.0	PASSED
11917.300000	40.4	1000	171.0	V	54.0	13.6	54.0	PASSED
12941.200000	40.6	1000	308.0	V	0.0	13.4	54.0	PASSED

Table 7. Radiated emission test results 3 - 13 GHz. Average detector.

2.1.4 Test equipment

Description	Supplier	Model	Tag no.	Cal. due date
Antenna, Bilog, 30 MHz-2 GHz	Chase	CBL6112A	30113668	2024-06-21
Antenna Horn	ETS Lindgren	3117	30090254	2025-02-14
Amplifier 0.5GHz – 26.5GHz	Agilent	83017A	30090219	2022-12-01
EMI Test Receiver 20 Hz-26.5 GHz	Rohde&Schwarz	ESU26	30090172	2022-11-01

Table 8. Radiated emission test equipment.

3 MEASURING UNCERTAINTIES

Compliance evaluation is based on a shared risk principle with respect to the measurement uncertainty.

3.1 EMC

<i>EMC tests</i>	Frequency [MHz]	Polarization	Expanded Uncertainty [dB] (k=2)
Radiated emission	30 - 200	Vertical	4.72
	200 - 1000	Vertical	4.07
	1000 - 13000	Vertical	3.99
	30 - 200	Horizontal	3.60
	200 - 1000	Horizontal	4.15
	1000 - 13000	Horizontal	4.00