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Electromagnetic Compatibility Test Report

Test results of a Generic remote sensor, model ED1608

Customer	:	1M2M B.V. Korne 7 3453 MJ De Meern The Netherlands
Customer's representative	:	Mr. J.P. Hoefnagel
In the capacity of	:	Manufacturer
Reference number	:	15C01844RPT01
Status test report	:	Final

Test engineers:	Author:	Released:
A.S. Diks / C.G. Nobel / C. Gur	M.J. Rommen	D. van der Vlugt
Senior test engineers / Test engineer	Administrative assistant	Director

1 Summary

A summary of the test results gained from testing the Generic remote sensor is shown in the table below.

	Standard	Class / level	Result (Pass/Fail)
Emission	EN 301 489-01 V1.9.2 & EN 301 489-03 V1.4.1	B	Pass
Immunity	EN 301 489-01 V1.9.2 & EN 301 489-03 V1.4.1	Industrial	Pass
Emission	EN 61000-3-2 (2006) + A1 (2009) + A2 (2009)	A	Not applicable
Emission	EN 61000-3-3 (2008)	--	Not applicable
Immunity	EN 61000-6-2 (2005) + AC (2005)	Industrial	Pass

Note 1: The test results presented in this report relate only to the tested sample(s).

Note 2: The test results are based on the tested mode of operation(s), the applicable performance criteria and the acceptance criteria as specified by the customer.

The following table gives a summary of the results of the tests that have been carried out on the Generic remote sensor.

Test sequence / ref.nr.	Test Description	Basic standard	EUT Modified during test (yes/no)	Result (Pass/Fail)
--	Conducted emission, test with a LISN	EN 55022 (2010) + AC (2011)	--	Not applicable
--	Conducted emission, test with a Current Probe	EN 55022 (2010) + AC (2011)	--	Not applicable
1/ 15C01844	Radiated emission up to 1 GHz (SAC)	EN 55022 (2010) + AC (2011)	No	Pass
5/ 16C00267	Radiated emission above 1 GHz (FAC)	EN 55016-2-3 (2010) + A1 (2010) + A2 (2014) + C1 (2013)	Yes[3]	Pass
--	Harmonics	EN-IEC 61000-3-2 (2006) + A1 (2009) + A2 (2009)	--	Not applicable
--	Flicker	EN-IEC 61000-3-3 (2008)	--	Not applicable
3/ 15C01844	ESD	EN-IEC 61000-4-2 (2009)	No	Pass
2/ 15C01844	Radiated Immunity	EN-IEC 61000-4-3 (2006) + A1 (2008) + A2 (2010)	No	Pass
--	EFT	EN-IEC 61000-4-4 (2012)	--	Not applicable
--	Surge	EN-IEC 61000-4-5 (2014)	--	Not applicable
--	Conducted Immunity	EN-IEC 61000-4-6 (2014)	--	Not applicable
4/ 15C01844	Power frequency magnetic field [1]	EN-IEC 61000-4-8 (2010)	No	Not applicable [2]
--	Voltage Dips and Interruptions[1]	EN-IEC 61000-4-11 (2004)	--	Not applicable
--	Transients and surges in the vehicular environment (12 V)	ISO 7637-2 (2004)	--	Not applicable
--	Transients and surges in the vehicular environment (24 V)	ISO 7637-2 (2004)	--	Not applicable

1 Tests are excluded from accreditation.

2 The EUT contains a magneto meter. However the intended use is to measure the magnetic field, therefore this test is not applicable (intended use). However it is tested and the magnetic sensors show the magnetic field in X, Y and Z polarisation.

3 Modification: output power reduced by 2dB and in the antenne matching circuit the capacitors are removed and the inductor is changed from 22 to 12mH].

The table below shows details about tests that are not applicable.

Phenomenon	Comment
Conducted emission, mains terminals, continue (LISN)	The EUT is not AC supplied. The EUT is internal battery operated.
Conducted emission, telecommunications/network port (Current Probe)	The EUT doesn't have multi-user telecommunications / network ports such as ISDN or Ethernet.
Harmonics	The EUT is not AC supplied. The EUT is internal battery operated.
Flicker	The EUT is not AC supplied. The EUT is internal battery operated.
EFT	The EUT is not AC supplied. The EUT is internally battery operated. The EUT doesn't have I/O cables longer than 3 m.
Surge	The EUT is not AC supplied. The EUT is internally battery operated. The EUT doesn't have I/O cables longer than 30 m.
Conducted Immunity	The EUT is internally battery operated. The EUT doesn't have I/O cables longer than 3 m.
Voltage Dips and Voltage Variations	The EUT is internally battery operated. The EUT is not AC supplied.
Transients and surges in the vehicular environment (12 V)	The EUT is not used in vehicles. The EUT is internal battery operated.
Transients and surges in the vehicular environment (24 V)	The EUT is not used in vehicles. The EUT is internal battery operated.

2 Table of Contents

3 Introduction

DARE!! Measurements is requested by 1M2M B.V., to perform EMC tests.

The objective of the test was to assess the Generic remote sensor in accordance with the standards as mentioned in chapter 5 of this report, within the framework of the CE marking process. This report may only be used for this purpose.

At request of 1M2M B.V., the EMC tests are carried out in order to find out whether the product complies with the harmonised European standards under the R&TTE directive 1999/5/EC (assessment of the conformity in accordance with Article3.2).

Besides the R&TTE directive 1999/5/EC, the following directives are applicable to the EUT:
- EMC 2004/108/EC (article 3.1b of the 1999/5/EC)
- Low Voltage 2006/95/EC (article 3.1a of the 1999/5/EC)

The test sample(s) were received at 2016 January, 12 and on March, 3. Testing was performed at 2016 January, 12 (tested under ref.nr. 15C01844) and on March, 15 (tested under ref.nr.16N00267). The test report is issued at 2016 March, 30.

The tests are carried out at our facilities located in Woerden, The Netherlands.

The test results presented in this report relate only to the product tested.

In this report, the sample tested will be referred to as Equipment Under Test (EUT).

This report is in conformity with ISO 17025.

Opinions or interpretations mentioned in this report are excluded from accreditation.

All tests as described in the applied standard(s) are carried out, unless otherwise specified in this report.

4 Explanation Status Report

- Final : Formally signed report, with a final conclusion. Changes in the report will lead to a new report with a new report number.
- Preliminary : Interim signed report, with a temporary conclusion. Test is not completed, for example due to missing information. Changes in the report will lead to an updated report with a new report number.

5 Standards and test plan

The EUT is assessed against the following requirements.

- Emission : EN 301 489-01 V1.9.2 & EN 301 489-03 V1.4.1
- Immunity : EN 301 489-01 V1.9.2 & EN 301 489-03 V1.4.1
- Immunity : EN 61000-6-2 (2005) + AC (2005)
- Test plan : Not available

If available, a test plan is used as a supplement.

5.1 Test plan deviations

Not applicable.

5.2 Basic standards

In deviation to the product standards, the latest versions of the basic standards are applied.

6 Measurement Uncertainties

The reported expanded uncertainty of measurement is based on a standard uncertainty of measurement multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95%, but excluding the contribution of the EUT. For Emission tests, the expanded uncertainty of measurement has been determined in accordance with EN 55016-4-2 (2011). For Immunity tests, the expanded uncertainty of measurement has been determined in accordance with either the basic standard, or UKAS publication LAB34.

7 EUT details

7.1 Condition of EUT on receipt

The condition of the EUT during reception was undamaged and fully functional.

7.2 Purpose, functional and physical description

The EUT is a generic remote sensor (GPS and temperature) tracker for containers, railway environments etc.

The details for the EUT that is supplied for test, were as follows.

Description	Sample
Name	Generic remote sensor
Manufacturer	1M2M B.V.
Brand	1M2M
Model number	ED1608
Serial number	Not available
Rating voltage	3.8Vdc
Rating power	Not specified
Rating amperage	<80mA
Rating frequency	DC
Dimensions (L*W*H [m])	90 x 73 x 37 mm
Software release	1.0
Hardware release	5406 (Hardware ID)
Environment to be used	Licht industrial / industrial, outdoors, railway etc.

7.3 Potential sources of emission

The highest generated or used frequency of the EUT is 868MHz (+12dBm).

7.4 Interfaces to external objects

The cable connections to EUT and peripheral equipment during testing are displayed in the table below.

No cables connected.

7.5 Test configuration

The EUT is tested as table top equipment.
According the information of the customer, the class of emission is B.

8 Operating conditions during test

8.1 Test considerations

The base station is standing outside the Semi Anechoic Chamber.
Because the largest EUT dimension is less than 90mm, the radiated immunity tests between 80MHz and 1000MHz are carried out for two EUT surfaces towards the antenna (front side & 90 degrees rotated). Between 1GHz and 2.7GHz four EUT surfaces are tested. This is in accordance with section 8.2 of EN-IEC 61000-4-3 (2006).

The EUT is tested at 2016 January, 12 under reference number 15C01844. And on March, 15 under reference number 16N00267 for the Radiated emission above 1 GHz tests.
Between these testsessions the EUT has left the premisses.

8.2 Mode(s) of operation

The test mode(s) during testing were defined as:

Mode of operation	Description
Mode 1	The Generic remote sensor is continuously connected with the base station (sending packages each 7 seconds (= dwell time)).

8.3 Acceptance criteria

The criteria for recording a malfunction of operating which can occur during the immunity tests, are shown in the table below.

Mode of operation	Acceptance criterion
Mode 1	Performance criterion A: During the test no data messages may be lost. Performance criterion B: During the test the EUT may stop sending, however after the test the sending has to recover automatically. Performance criterion C: Not applicable.

8.4 EUT monitoring

During immunity testing, the behavior and performance of the EUT will be monitored by means of: the base station is connected to a peripheral laptop, where the received packages are monitored.

The applicant's representative was present to witness the testing.

The Appendixes of this report shows pictures of the test configuration during the tests.

8.5 Minimum dwell time

The minimum dwell time is determined prior to immunity testing. Besides the requirement of the applied standard(s), the applicant states that the minimum dwell time must be 7 seconds.

8.6 Performance criteria during immunity tests

The applied immunity standard specifies both, general performance criteria and particular performance criteria. The particular performance criteria, which are specified in the normative annexes of the applied immunity standard, take precedence over the corresponding parts of the general performance criteria.
Where particular performance criteria for specific functions are not given, then the general performance criteria shall apply.
Appendix A of this report describes the general performance criteria.

9 Possible test case verdicts

- NA or not applicable : test does not apply to the EUT
- P(ass) : EUT does meet the requirement
- F(ail) : EUT does not meet the requirement
- U(ndetermined) : Pass or Fail could not be established
- NR or not requested : test is not requested by customer

During pass or fail decisions, the measurement uncertainty is not taken into account.

10 Test equipment

The instruments used to perform the tests are displayed in the Appendix.

11 Test results

11.1 Radiated emission up to 1 GHz (SAC)

11.1.1 Test method

The radiated emission tests are carried out in a Semi Anechoic Chamber (SAC). The tests are recorded with a Spectrum Analyzer / EMI Receiver. The test method is in accordance with the applied standard(s) (see chapter 5) and with the basic standard EN 55022 (2010) + AC (2011), where the first standard takes precedence.

11.1.2 Measurement Uncertainty

The measurement uncertainty during testing is displayed in the table below.

Frequency	U
30 MHz – 200 MHz:	± 5.0 dB
200 MHz – 1000 MHz:	± 6.4 dB

11.1.3 Requirements

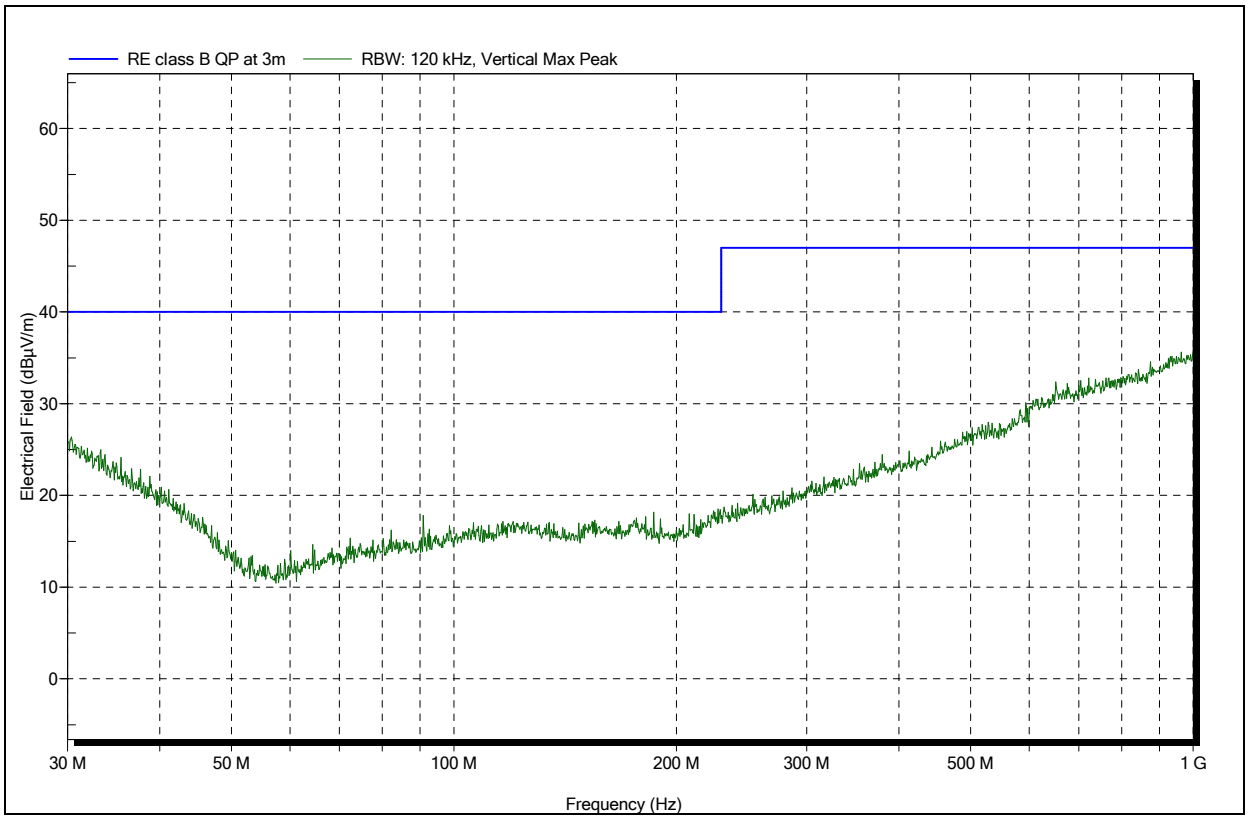
The requirements are laid down in the table below.

Frequency band	QP class A[1] @ 3m [dBµV/m]	QP class B @ 3m [dBµV/m]
30 MHz - 230 MHz	50	40
230 MHz - 1 GHz	57	47

[1] For ancillary equipment intended to be used in telecommunication centers only.

Result Radiated Emission Semi Anechoic Chamber 30 MHz to 1 GHz Vertical

PIN number:	15C01844	Bandwidth:	120 kHz
Test ID:	1	Antenna Distance:	3 m
		Antenna Height:	1 - 4 m
Mode of operation:	Ambient		

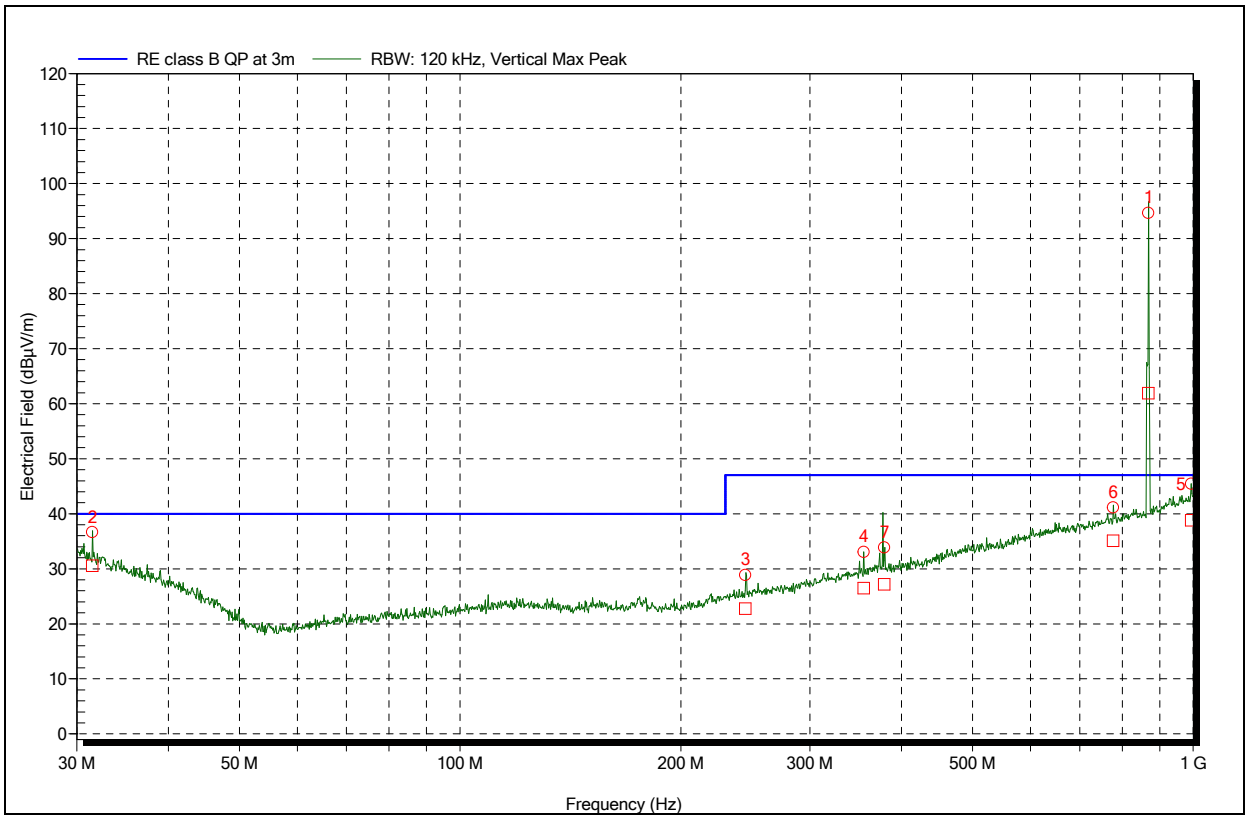


Remarks

Ambient

Result Radiated Emission Semi Anechoic Chamber 30 MHz to 1 GHz Vertical

PIN number:	15C01844	Bandwidth:	120 kHz
Test ID:	4	Antenna Distance:	3 m
		Antenna Height:	1 - 4 m
Mode of operation:	Mode 1		



Detected Peaks

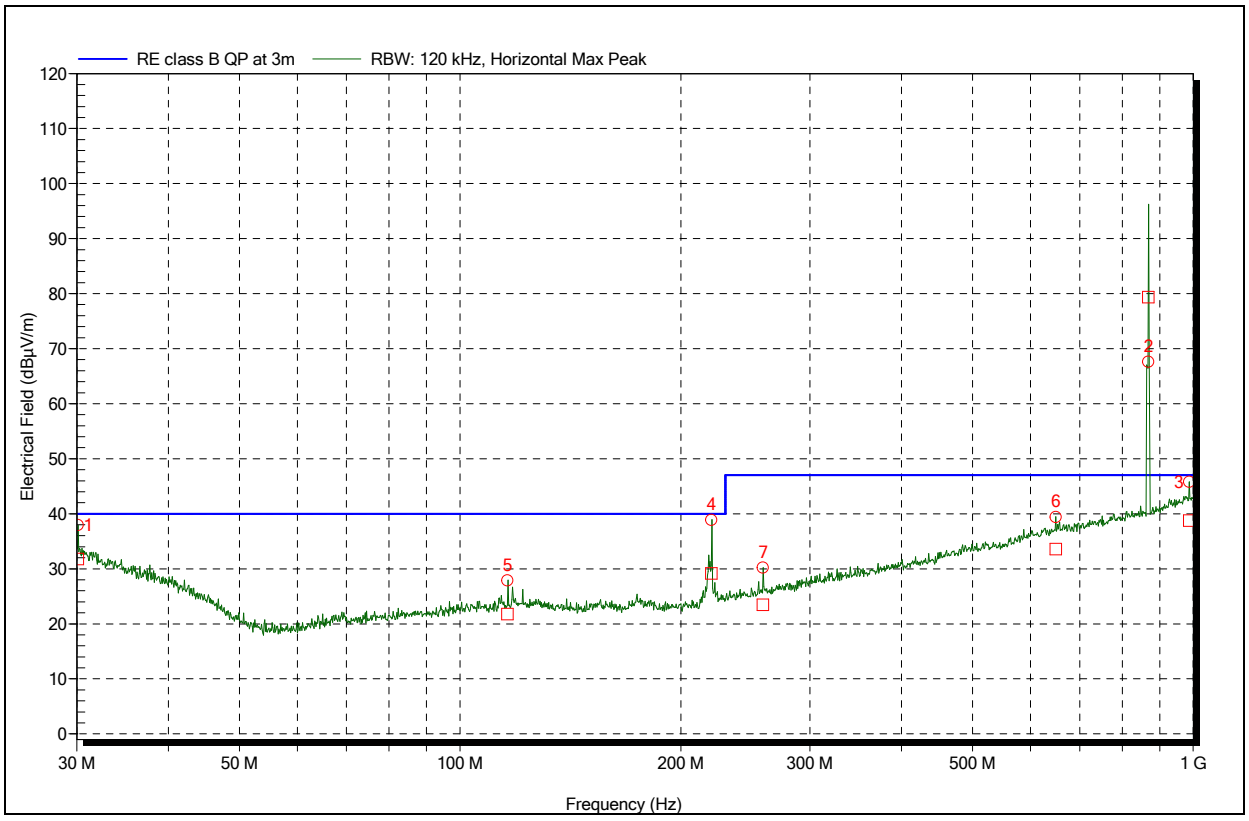
Peak Number	Frequency	Quasi-Peak	Quasi-Peak Limit	Angle	Height	Status
1	868.086 MHz	61.9 dBµV/m	47 dBµV/m	40 Degree	2.3 m	*)
2	31.508 MHz	30.6 dBµV/m	40 dBµV/m	218 Degree	3.5 m	Pass
3	244.969 MHz	22.7 dBµV/m	47 dBµV/m	23 Degree	3.5 m	Pass
4	355.080 MHz	26.5 dBµV/m	47 dBµV/m	-70 Degree	2.2 m	Pass
5	993.429 MHz	38.8 dBµV/m	47 dBµV/m	311 Degree	2.7 m	Pass
6	777.221 MHz	35.1 dBµV/m	47 dBµV/m	198 Degree	3.8 m	Pass
7	378.969 MHz	27.2 dBµV/m	47 dBµV/m	41 Degree	3 m	Pass

Remarks

Pass Class B (*) 868.086MHz is excluded (exclusion band 863 - 870MHz))

Result Radiated Emission Semi Anechoic Chamber 30 MHz to 1 GHz Horizontal

PIN number:	15C01844	Bandwidth:	120 kHz
Test ID:	5	Antenna Distance:	3 m
		Antenna Height:	1 - 4 m
Mode of operation:	Mode 1		



Detected Peaks

Peak Number	Frequency	Quasi-Peak	Quasi-Peak Limit	Angle	Height	Status
1	30.095 MHz	31.8 dBµV/m	40 dBµV/m	317 Degree	1.7 m	Pass
2	868.482 MHz	79.4 dBµV/m	47 dBµV/m	35 Degree	1.5 m	*)
3	987.174 MHz	38.8 dBµV/m	47 dBµV/m	-41 Degree	3.5 m	Pass
4	220.241 MHz	29.1 dBµV/m	40 dBµV/m	91 Degree	1.5 m	Pass
5	116.055 MHz	21.8 dBµV/m	40 dBµV/m	251 Degree	1.8 m	Pass
6	649.037 MHz	33.6 dBµV/m	47 dBµV/m	-47 Degree	1.2 m	Pass
7	258.708 MHz	23.5 dBµV/m	47 dBµV/m	-19 Degree	1.5 m	Pass

Remarks

Pass Class B (*) 868.482MHz is excluded (exclusion band 863 - 870MHz))

11.2 Radiated emission above 1 GHz (FAC)

11.2.1 Test method

The radiated emission tests above 1 GHz are carried out in a Fully Anechoic Chamber (FAC). The tests are recorded with a Spectrum Analyzer / EMI Receiver. The tests are carried out in accordance with the applied standard(s) (see chapter 5) and the basic standard EN 55016-2-3 (2010) + A1 (2010) + A2 (2014) + C1 (2013), where the first standard takes precedence.

11.2.2 Measurement Uncertainty

The measurement uncertainty during testing is displayed in the table below.

Frequency	U
1 GHz – 8 GHz:	± 5.9 dB

Prior to the test, the frequency range of measurement has to be established. EN 55022 (2010) + AC (2011) describes the frequency range to be measured of a digital device:

Highest frequency generated or used in the device or on which the device operates or tunes [MHz]	Upper frequency of measurement range [MHz]
Below 108	1000
108 – 500	2000
500 – 1000	5000
Above 1000	5th harmonic of the highest frequency or 6 GHz, whichever is less

11.2.3 Requirements

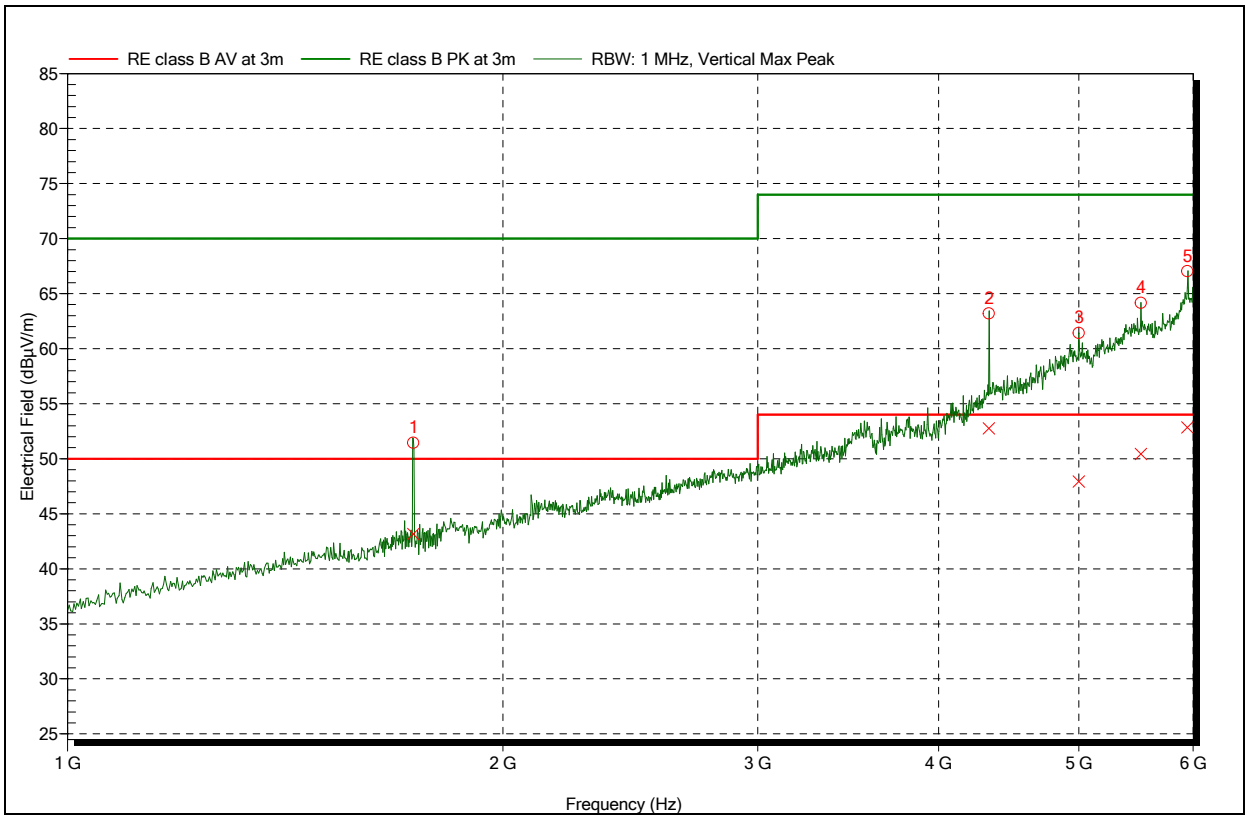
The requirements are laid down in the table below.

Frequency band	Class A[1] @ 3m [dBµV/m]		Class A[1] @ 1m [dBµV/m]		Class B @ 3m [dBµV/m]		Class B @ 1m [dBµV/m]	
	AV	PK	AV	PK	AV	PK	AV	PK
1 GHz - 3 GHz	56	76	66	86	50	70	60	80
3 GHz - 6 GHz	60	80	70	90	54	74	64	84

[1] For ancillary equipment intended to be used in telecommunication centers only.

Result Radiated Emission Full Anechoic Chamber 1 GHz to 6 GHz Vertical

PIN number:	16C00267	Bandwidth:	1 MHz
Test ID:	5	Antenna Distance:	3 m
		Antenna Height:	1.3 m
Mode of operation:	Mode 1		



Detected Peaks

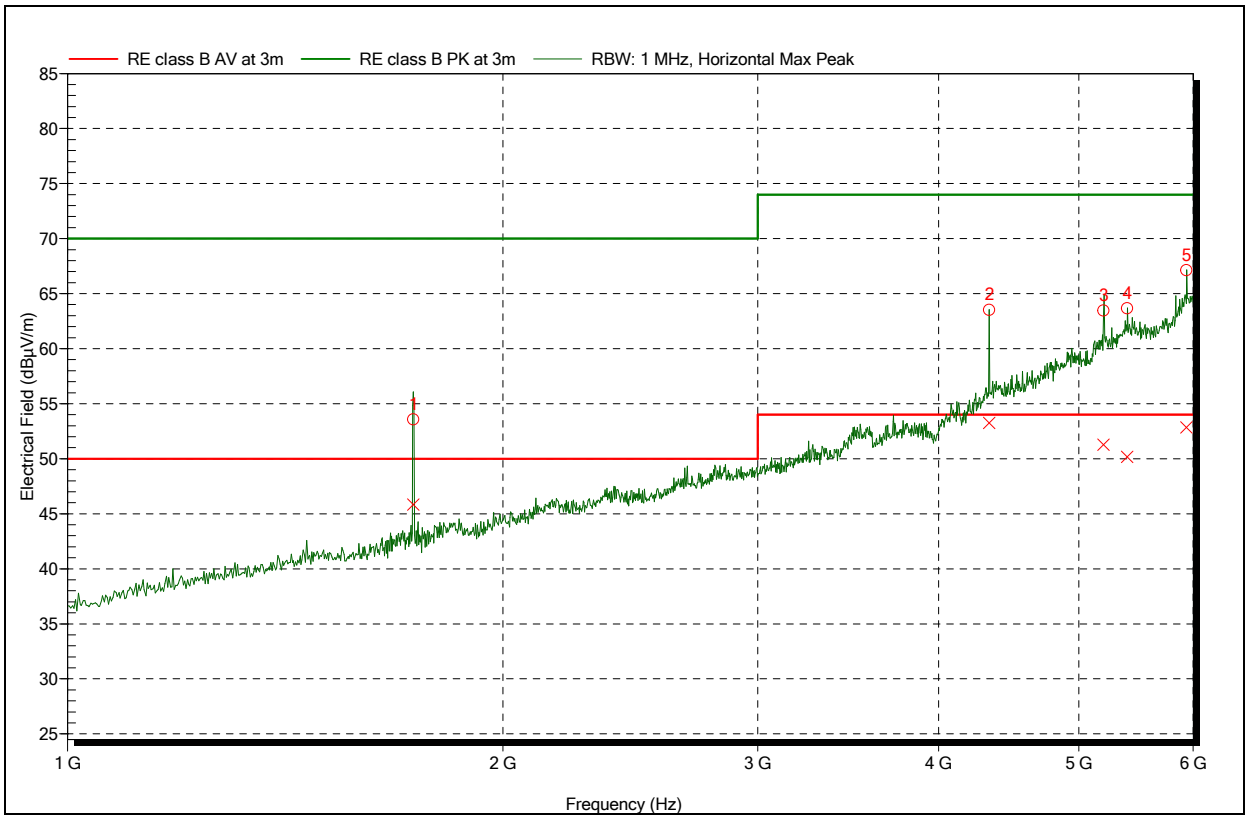
Peak Number	Frequency	Peak	Peak Limit	Average	Average Limit	Angle	Status
1	1.734 GHz	51.5 dBµV/m	70 dBµV/m	43.2 dBµV/m	50 dBµV/m	45 Degree	Pass
2	4.335 GHz	63.2 dBµV/m	74 dBµV/m	52.7 dBµV/m	54 dBµV/m	183 Degree	Pass
3	5.000 GHz	61.4 dBµV/m	74 dBµV/m	47.9 dBµV/m	54 dBµV/m	103 Degree	Pass
4	5.520 GHz	64.2 dBµV/m	74 dBµV/m	50.4 dBµV/m	54 dBµV/m	148 Degree	Pass
5	5.945 GHz	67 dBµV/m	74 dBµV/m	52.9 dBµV/m	54 dBµV/m	284 Degree	Pass

Remarks

Pass [Modification: output power reduced by 2dB and in the antenne matching circuit the capacitors are removed and the inductor is changed from 22 to 12mH]

Result Radiated Emission Full Anechoic Chamber 1 GHz to 6 GHz Horizontal

PIN number:	16C00267	Bandwidth:	1 MHz
Test ID:	4	Antenna Distance:	3 m
		Antenna Height:	1.3 m
Mode of operation:	Mode 1		



Detected Peaks

Peak Number	Frequency	Peak	Peak Limit	Average	Average Limit	Angle	Status
1	1.734 GHz	53.6 dBµV/m	70 dBµV/m	45.8 dBµV/m	50 dBµV/m	15 Degree	Pass
2	4.335 GHz	63.5 dBµV/m	74 dBµV/m	53.3 dBµV/m	54 dBµV/m	-65 Degree	Pass
3	5.202 GHz	63.5 dBµV/m	74 dBµV/m	51.3 dBµV/m	54 dBµV/m	-103 Degree	Pass
4	5.400 GHz	63.7 dBµV/m	74 dBµV/m	50.2 dBµV/m	54 dBµV/m	-120 Degree	Pass
5	5.936 GHz	67.1 dBµV/m	74 dBµV/m	52.9 dBµV/m	54 dBµV/m	147 Degree	Pass

Remarks

Pass [Modification: output power reduced by 2dB and in the antenne matching circuit the capacitors are removed and the inductor is changed from 22 to 12mH].

11.3 Electro Static Discharges (ESD)

11.3.1 Test method

The immunity tests to ESD are carried out in accordance with the applied standard(s) (see chapter 5) and the basic standard EN-IEC 61000-4-2 (2009), where the first standard takes precedence. Beside the test levels as described in the standard EN 301 489-01 V1.9.2 & EN 301 489-03 V1.4.1, all voltages of the lower test levels as described in the basic standard are tested.

11.3.2 Measurement Uncertainty

It has been demonstrated that the test generator meets the specified requirements in the standard with at least 95% confidence.

11.3.3 Requirements

The requirements are laid down in the table below.
EN 61000-6-2 and EN 301 489-01 V1.9.2 & EN 301 489-03 V1.4.1

Type of discharge	Test level	Performance Criterion
Air discharge	0 - ± 8 kV	See product standard
Contact discharge	0 - ± 4 kV	See product standard

Test Results of Electro Static Discharge test

PIN number	15C01844
Test ID	20
Temperature	16.7 °Celsius
Humidity	44 %
Mode of operation	Mode 1
Remarks	Pass. The lower levels were tested also, no influence is observed.

Settings

Number of single discharges at each spot	10
Time interval between discharges	1 sec.

Test Results air discharge

Discharge location	Testlevel	Note	Result
Enclosure (See ESD discharge points)	8 kV	See remarks	Pass
Enclosure (See ESD discharge points)	-8 kV	See remarks	Pass

Test Results contact discharge

Discharge location	Testlevel	Note	Result
Enclosure (See ESD discharge points)	4 kV	See remarks	Pass
Enclosure (See ESD discharge points)	-4 kV	See remarks	Pass

Test Results at Horizontal Coupling Plane

Discharge location	Testlevel	Note	Result
Enclosure (See ESD discharge points)	4 kV	See remarks	Pass
Enclosure (See ESD discharge points)	-4 kV	See remarks	Pass

Test Results at Vertical Coupling Plane

Discharge location	Testlevel	Note	Result
Enclosure (See ESD discharge points)	4 kV	See remarks	Pass
Enclosure (See ESD discharge points)	-4 kV	See remarks	Pass

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VAT number: NL8056.13.468.B01

11.4 Radiated Immunity

11.4.1 Test method

The radiated immunity tests are carried out in a full anechoic room, in accordance with the applied standard(s) (see chapter 5) and the basic standard EN-IEC 61000-4-3 (2006) + A1 (2008) + A2 (2010), where the first standard takes precedence.

11.4.2 Measurement Uncertainty

The measurement uncertainty during testing is displayed in the table below.

Frequency	U (log)	U (lin)
26 MHz – 4 GHz	± 2.1 dB	+27.2 % / -21.4 %

11.4.3 Requirements

The requirements are laid down in the tables below.

EN 301 489-01 V1.9.2 & EN 301 489-03 V1.4.1

Antenna polarization	Test level	Frequency range	Performance Criterion
Horizontal	3 V/m	80 – 1000 MHz	See product standard
Vertical	3 V/m	80 – 1000 MHz	See product standard
Horizontal	3 V/m	1.4 – 2.7 GHz	See product standard
Vertical	3 V/m	1.4 – 2.7 GHz	See product standard

EN 61000-6-2

Antenna polarisation	Test level	Frequency range	Performance Criterion
Horizontal	10 V/m	80 – 1000 MHz	A
Vertical	10 V/m	80 – 1000 MHz	A
Horizontal	3 V/m	1,4 – 2,0 GHz	A
Vertical	3 V/m	1,4 – 2,0 GHz	A
Horizontal	1 V/m	2,0 – 2,7 GHz	A
Vertical	1 V/m	2,0 – 2,7 GHz	A

Test Results of Radiated Immunity test 80 MHz to 1 GHz Vertical

PIN number	15C01844
Test ID	13
Mode of operation	Mode 1
Angle, observation and result	Front side: Pass: No influence observed

Settings

Frequency step	logarithmic step of 1%	Modulation	1000 Hz. 80% AM
Dwell time	7 s	Test level	10 V/m
Distance	3 m		

Test Results of Radiated Immunity test 80 MHz to 1 GHz Horizontal

PIN number	15C01844
Test ID	14
Mode of operation	Mode 1
Angle, observation and result	Front side: Pass: No influence observed

Settings

Frequency step	logarithmic step of 1%	Modulation	1000 Hz. 80% AM
Dwell time	7 s	Test level	10 V/m
Distance	3 m		

Test Results of Radiated Immunity test 80 MHz to 1 GHz Vertical

PIN number	15C01844
Test ID	16
Mode of operation	Mode 1
Angle, observation and result	90 degrees rotated: Pass: No influence observed

Settings

Frequency step	logarithmic step of 1%	Modulation	1000 Hz. 80% AM
Dwell time	7 s	Test level	10 V/m
Distance	3 m		

Test Results of Radiated Immunity test 80 MHz to 1 GHz Horizontal

PIN number	15C01844
Test ID	15
Mode of operation	Mode 1
Angle, observation and result	90 degrees rotated: Pass: No influence observed

Settings

Frequency step	logarithmic step of 1%	Modulation	1000 Hz. 80% AM
Dwell time	7 s	Test level	10 V/m
Distance	3 m		

Test Results of Radiated Immunity test 1.4 GHz to 2.7 GHz Vertical

PIN number	15C01844
Test ID	18
Mode of operation	Mode 1
Angle, observation and result	(000 degrees): Pass, no influence

Settings

Frequency step	logarithmic step of 1%	Modulation	1000 Hz. 80% AM
Dwell time	7 s	Test level	3 V/m
Distance	3 m		

Test Results of Radiated Immunity test 1.4 GHz to 2.7 GHz Horizontal

PIN number	15C01844
Test ID	26
Mode of operation	Mode 1
Angle, observation and result	(000 degrees): Pass, no influence

Settings

Frequency step	logarithmic step of 1%	Modulation	1000 Hz. 80% AM
Dwell time	7 s	Test level	3 V/m
Distance	3 m		

Test Results of Radiated Immunity test 1.4 GHz to 2.7 GHz Vertical

PIN number	15C01844
Test ID	19
Mode of operation	Mode 1
Angle, observation and result	(090 degrees): Pass, no influence

Settings

Frequency step	logarithmic step of 1%	Modulation	1000 Hz. 80% AM
Dwell time	7 s	Test level	3 V/m
Distance	3 m		

Test Results of Radiated Immunity test 1.4 GHz to 2.7 GHz Horizontal

PIN number	15C01844
Test ID	25
Mode of operation	Mode 1
Angle, observation and result	(090 degrees): Pass, no influence

Settings

Frequency step	logarithmic step of 1%	Modulation	1000 Hz. 80% AM
Dwell time	7 s	Test level	3 V/m
Distance	3 m		

Test Results of Radiated Immunity test 1.4 GHz to 2.7 GHz Vertical

PIN number	15C01844
Test ID	21
Mode of operation	Mode 1
Angle, observation and result	(180 degrees): Pass, no influence

Settings

Frequency step	logarithmic step of 1%	Modulation	1000 Hz. 80% AM
Dwell time	7 s	Test level	3 V/m
Distance	3 m		

Test Results of Radiated Immunity test 1.4 GHz to 2.7 GHz Horizontal

PIN number	15C01844
Test ID	24
Mode of operation	Mode 1
Angle, observation and result	(180 degrees): Pass, no influence

Settings

Frequency step	logarithmic step of 1%	Modulation	1000 Hz. 80% AM
Dwell time	7 s	Test level	3 V/m
Distance	3 m		

Test Results of Radiated Immunity test 1.4 GHz to 2.7 GHz Vertical

PIN number	15C01844
Test ID	22
Mode of operation	Mode 1
Angle, observation and result	(270 degrees): Pass, no influence

Settings

Frequency step	logarithmic step of 1%	Modulation	1000 Hz. 80% AM
Dwell time	7 s	Test level	3 V/m
Distance	3 m		

Test Results of Radiated Immunity test 1.4 GHz to 2.7 GHz Horizontal

PIN number	15C01844
Test ID	23
Mode of operation	Mode 1
Angle, observation and result	(270 degrees): Pass, no influence

Settings

Frequency step	logarithmic step of 1%	Modulation	1000 Hz. 80% AM
Dwell time	7 s	Test level	3 V/m
Distance	3 m		

11.5 Power frequency magnetic field

11.5.1 Test method

The power frequency magnetic field tests are carried out in accordance with the applied standard(s) (see chapter 5) and the basic standard EN-IEC 61000-4-8 (2010) where the first standard takes precedence.

11.5.2 Requirements

The requirements are laid down in the table below.

EN 61000-6-2

Field direction	Test level	Performance Criterion
X, Y, Z	30 A/m	A

Test Results of Power frequency magnetic field immunity test

PIN number	15C01844
Remarks	1) The EUT contains a magneto meter. However the intended use is to measure the magnetic field, therefore this test is not applicable (intended use). However it is tested and the magnetic sensors show the magnetic field in X, Y and Z polarisation.

Settings

Test level [A/m]:	30	Dwell time [sec]:	30 sec

Test specifications	Antenna polarization	Mode of operation	Observation	Performance criterion required	Performance criterion attained	Pass/Fail
50 Hz & 60Hz	X	Mode 1	1)	A	Not Applicable 1)	Not Applicable 1)
	Y	Mode 1	1)	A	Not Applicable 1)	Not Applicable 1)
	Z	Mode 1	1)	A	Not Applicable 1)	Not Applicable 1)

12 Conclusion

The Generic remote sensor meeta the class B emission limits as described in EN 301 489-01 V1.9.2 & EN 301 489-03 V1.4.1, if the modifications as described in this report are applied.

The Generic remote sensor meets the industrial immunity levels as described in EN 301 489-01 V1.9.2 & EN 301 489-03 V1.4.1 and in EN 61000-6-2 (2005) + AC (2005), if the modifications as described in this report are applied. This is based on the tested mode of operation(s), the applicable performance criteria and the acceptance criteria as specified by the customer.

Thus the Generic remote sensor is in compliance with the harmonised standards under the R&TTE directive 1999/5/EC, as mentioned above.

It is the responsibility of the customer to implement the modifications in a correct way.

12.1 Remarks

It is the responsibility of the manufacturer to ensure, that all of the following products are equal to the measured sample. And as such ensure, that all manufactured Generic remote sensors are in compliance with the harmonised standards under the R&TTE directive 1999/5/EC, as mentioned above.

Furthermore, in order to fulfil the European CE-legislation, it is the responsibility of the manufacturer of the equipment to draw up a declaration of conformity and to have technical file documentation containing information to demonstrate the conformity of the product to the applicable requirements. At the same time, every unit brought to the market or put into service has to be marked with the CE-mark.

13 Appendix A: General performance criteria

CT (performance criteria for Continuous phenomena applied to Transmitters)

If the EUT is of type I or II including ancillary equipment tested on a stand-alone basis, the performance criteria A of the applicable class as given in the table below shall apply.

For EUT of type II or type III that requires a communication link that is maintained during the test, it shall be verified by appropriate means supplied by the manufacturer that the communication link is maintained during each individual exposure in the test sequence.

If the EUT is a transmitter, tests shall be repeated with the EUT in standby mode to ensure that unintentional transmission does not occur.

TT (Performance criteria for Transient phenomena applied to Transmitters)

If the EUT is of the type I or II, including ancillary equipment tested on a stand alone basis, the performance criteria B of the applicable class as given in the table below shall apply, except for power interruptions exceeding a certain time the performance criteria deviations are specified in this Appendix.

For EUT of the type II or type III that requires a communication link that is maintained during the test, it shall be verified by appropriate means supplied by the manufacturer during each individual exposure in the test sequence.

If the EUT is a transmitter, tests shall be repeated with the EUT in standby mode to ensure that unintentional transmission does not occur.

CR (Performance criteria for Continuous phenomena applied to Receivers)

If the EUT is of the type I or II, including ancillary equipment tested on a stand-alone basis, the performance criteria A of the applicable class as given in the table below shall apply.

For EUT of the type II or III that requires a communication link that is maintained during the test, it shall be verified by appropriate means supplied by the manufacturer that the communication link is maintained during each individual exposure in the test sequence.

If the EUT is a transceiver, under no circumstances shall the transmitter operate unintentionally during the test.

TR (Performance criteria for Transient phenomena applied to Receivers)

If the EUT is of the type I or II, including ancillary equipment tested on a stand alone basis, the performance criteria B of the applicable class as given in the table below shall apply, except for power interruptions exceeding a certain time the performance criteria deviations are specified in this Appendix.

For EUT of the type II or type III that requires a communication link that is maintained during the test, it shall be verified by appropriate means supplied by the manufacturer during each individual exposure in the test sequence.

Where the EUT is a transceiver, under no circumstances shall the transmitter operate unintentionally during the test.

Voltage dips and interruptions performance criteria

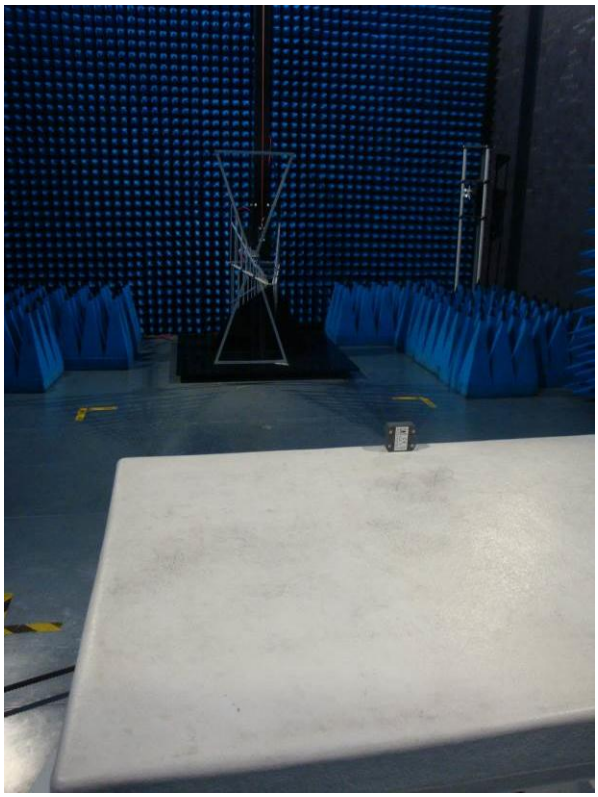
For a voltage dip corresponding to a reduction of the supply voltage of 30 % for 10 ms the following performance criteria shall apply:
For transmitters the performance criteria CT
For receivers the performance criteria CR
For ancillary the pass/failure criteria supplied by the manufacturer shall apply, unless the ancillary equipment is tested in connection with receivers, transmitters or transceivers in which case the corresponding performance criteria above shall apply.
For a voltage dip corresponding to a reduction of the supply voltage of 60 % for 100 ms the following performance criteria shall apply:
For transmitters, belonging to class 1 equipment, the performance criteria CT
For transmitters, belonging to class 2 or 3 equipment, the performance criteria TT
For receivers, belonging to class 1 equipment, the performance criteria CR
For receivers, belonging to class 2 or 3 equipment, the performance criteria TR
For ancillary the pass/failure criteria supplied by the manufacturer shall apply, unless the ancillary equipment is tested in connection with receivers, transmitters or transceivers in which case the corresponding performance criteria above shall apply.
For a voltage interruption corresponding to a reduction of the supply voltage of > 95 % for 5000 ms the following performance criteria shall apply:
In the case where the EUT is fitted with or connected to a battery back-up, the performance criteria TT or TR shall apply as appropriate
In the case where the EUT is powered solely from the AC mains supply (without the use of a parallel battery back-up) volatile user data may have been lost and if applicable the communication link does not need to be maintained and lost functions shall be recoverable by user or operator
No unintentional responses shall occur at the end of the test.

Class 1 equipment		
Criteria	During the test	After the test
A	Operate as intended No loss of function For equipment type II the minimum performance shall be 12 dB SINAD No unintentional responses	Operate as intended For equipment type II the communication link shall be maintained No loss of function No degradation of performance No loss of stored data or user programmable function
B	May be loss of function (one or more) No unintentional responses	Operate as intended Lost function(s) shall be self-recoverable No degradation of performance No loss of stored data or user programmable function

Class 2 equipment		
Criteria	During the test	After the test
A	Operate as intended No loss of function For equipment type II the minimum performance shall be 6 dB SINAD No unintentional responses	Operate as intended For equipment type II the communication link shall be maintained No loss of function No degradation of performance No loss of stored data or user programmable function
B	May be loss of function (one or more) No unintentional responses	Operate as intended Lost function(s) shall be self-recoverable No degradation of performance No loss of stored data or user programmable function

Class 3 equipment		
Criteria	During the test	After the test
A, B	May be loss of function (one or more) No unintentional responses	Operate as intended, for equipment type II the communication link may be lost, but shall be recoverable by the user Lost functions shall be self-recoverable No degradation of performance

14 Appendix B: Pictures of EUT



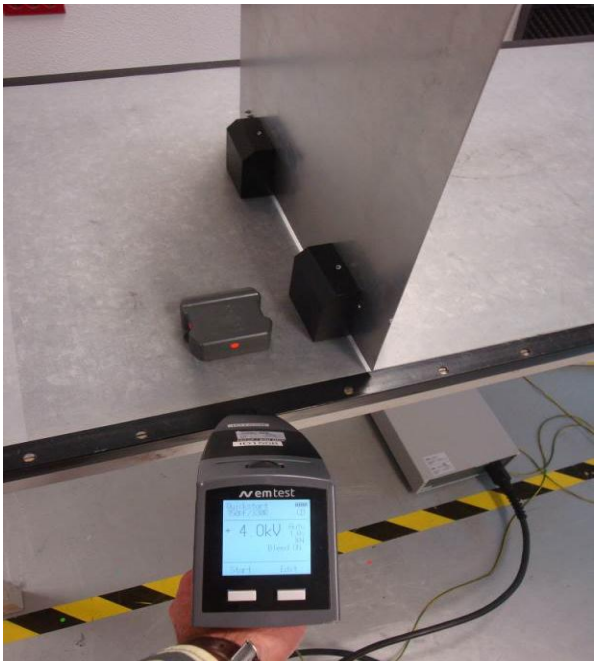
Picture 1: Radiated emission up to 1 GHz

Picture 2: Radiated emission test setup detail

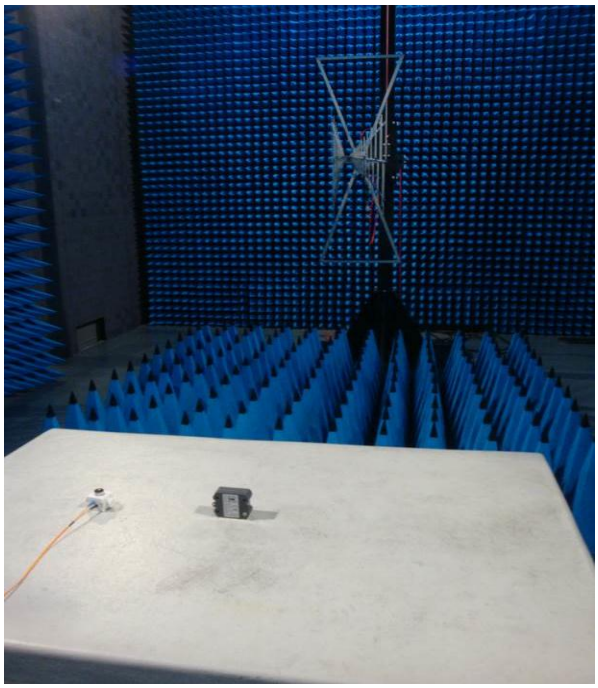
Picture 3: Radiated emission above 1 GHz

Picture 4: Some ESD discharge points (1)

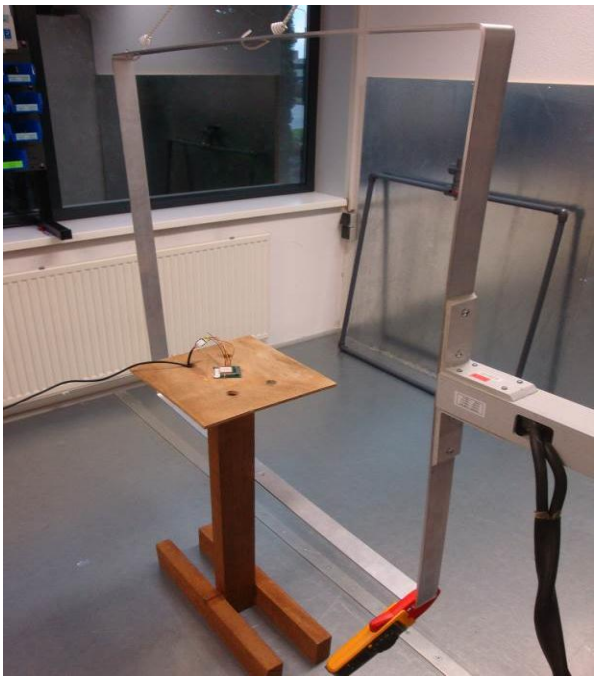
Picture 5: Some ESD discharge points (2)



Picture 6: Some ESD discharge points (3)



Picture 7: Radiated immunity



Picture 8: Power frequency magnetic field

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Eori-number: NL805613468
VAT number: NL8056.13.468.B01

15 Appendix C: Equipment List

Radiated Emission Semi Anechoic Chamber 30 MHz to 1000 MHz

Device Type	Brand	Type	ID
Cable antenna -> preamp	Pasternack / Huber & Suhner	RG217 / Sucofeed_1/2	1478
Antenna	Rohde & Schwarz	HL 562	1527
Spectrum analyser	Rohde & Schwarz	ESU 8 Input 2 (LAN)	1556
Antenna tower	D.A.R.E!! Instruments	RadiTower (RadiCentre)	1569+1496
Turn table	D.A.R.E!! Instruments	RadiTurn (RadiCentre)	1569+1367
Cable preamp -> analyser	Schwarzbeck	Ecoflex 15	1585

Radiated Emission Full Anechoic Room 1 GHz to 8 GHz

Device Type	Brand	Type	ID
Turn table	D.A.R.E!! Instruments	RadiTurn (RadiCentre)	1569+1367
Antenna	Schwarzbeck	ESLP 9145	7298
Spectrum analyser	Rohde & Schwarz	ESU 8 Input 1 (LAN)	1556
Cable antenna -> preamp	Pasternack / Huber & Suhner	RG217 / Sucofeed_1/2	1478

ESD

Device Type	Brand	Type	ID
ESD gun	EM-Test	ESD 30N	1558

Radiated Immunity 80 MHz to 1000 MHz

Device Type	Brand	Type	ID
Amplifier	Prâna	MT 200 SC	1537
Field sensor 1	D.A.R.E!! Development	RadiSense IV (RadiCentre)	1404
Signal generator	D.A.R.E!! Instruments	RGN6000B	1570
Antenna	Rohde & Schwarz	HL 562	1527
Turn table	D.A.R.E!! Development	Raditurn	1367
Coupler	Prana	MT 200 SC	1537
Forward power meter	D.A.R.E!! Instruments	RPR1006A	1648+1498
Switch matrix	DARE!! Instruments	RSW1024S	ID1648
Cable SG -> amplifier	Huber & Suhner	RG142	1228
Cable coupler -> antenna	Huber & Suhner	Sucofeed_1/2	1225
Antenna tower	D.A.R.E!! Instruments	RTW1004B	1496

Radiated Immunity 1 GHz to 2.7 GHz

Device Type	Brand	Type	ID
Amplifier	DARE!! Instruments	RadiField RFS1006B	1647
Field sensor 1	D.A.R.E!! Development	RadiSense IV (RadiCentre)	1404
Signal generator	D.A.R.E!! Instruments	RGN6000B	1570
Antenna	DARE!! Instruments	RadiField RFS1006B	1647
Turn table	D.A.R.E!! Development	RadiTurn	1367
AD convertor	D.A.R.E!! Development	RadiMate IV	1378
Coupler	DARE!! Instruments	RadiField RFS1006B	1647
Forward power meter	DARE!! Instruments	RadiField RFS1006B	1647
Reflected power meter	DARE!! Instruments	RadiField RFS1006B	1647
Switch matrix	DARE!! Instruments	RSW1024S	ID1648
Cable SG -> amplifier	Pasternack / Huber & Suhner	RG217 / Sucofeed_1/2	1478
Antenna tower	D.A.R.E!! Instruments	RadiTower (RadiCentre)	1569+1496

Magnetic fields

Description	Brand	Type no	I.D.
Power Source	California Instruments.	5001iX	1324
Induction Coil	D.A.R.E!! development	IC1	1103
Induction Coil	D.A.R.E!! development	IC2	1480
EM Field Analyzer	Wandel & Goltermann	EFA-2 BN 2245	1152
B-Field Sensor	Wandel & Goltermann	BN 2245/90.10	1153