PHOENIX TESTLAB

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TEST REPORT

Test Report Reference: R52017_C Edition 1

Equipment under Test: AIR200

Serial Number: 7141200216

FCC-ID: QG2AIR200

Applicant: agrident GmbH

Manufacturer: agrident GmbH

Test Laboratory
(CAB)
accredited by
DATech e.V.
in compliance with DIN EN ISO/IEC 17025
under the
Reg. No. DAT-P-105/99-21,
FCC Test site registration number 90877
and
Industry Canada Test site registration IC3469

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1 IDENTIFICATION

1.1 APPLICANT

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1.2 MANUFACTURER

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Country:	Germany
Name for contact purposes:	Mr. Helmut Ruppert
Tel:	+49 51 05 52 06 14
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e-mail address:	mail@agrident.com

1.3 DATES

Date of receipt of test sample:	22 May 2006
Start of test:	09 June 2006
End of test:	12 June 2006

1.4 TEST LABORATORY

The tests were carried out at: **PHOENIX TESTLAB GmbH**
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D-32825 Blomberg **Phone:** **+49 (0) 52 35 / 95 00-0**
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accredited by DATech e.V. in compliance with DIN EN ISO/IEC 17025 under Reg. No. DAT-P-105/99-21, listed by FCC Test site registration number 90877 and Industry Canada Test site registration IC3469.

Test engineer:	Thomas KÜHN		28 June 2006
	Name	Signature	Date
Test report checked:	Bernd STEINER		28 June 2006
	Name	Signature	Date

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Stamp

1.5 RESERVATION

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1.6 NORMATIVE REFERENCES

[1] **ANSI C63.4-2003** American National Standard for Methods of Measuring of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.

[2] **FCC 47 CFR Part 15 (February 2006)** Radio Frequency Devices

[3] **RSS-210 Issue 6 September 2005** Low power Licence-Exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment

[4] **RSS-Gen Issue 1 September 2005** General Requirements and Information for the Certification of Radiocommunication Equipment

1.7 TEST RESULTS

The requirements of this test document are fulfilled by the equipment under test. The complete test results are presented in the following.

2 TECHNICAL DATA OF EQUIPMENT

2.1 DEVICE UNDER TEST

Type of equipment:	134.2 kHz Reader
Type designation:	AIR200
Serial No.:	7141200216
FCC-ID:	QG2AIR200
Highest internal frequency:	15.56 MHz
Antenna type:	Integral and external (AEA080 and AEA120)

The following external I/O cables were used:

No cables can be connected to the EUT.

2.2 PERIPHERY DEVICES

The following equipment was used as control unit and ancillary equipment:

During all measurements the EUT was reading a 134.2 kHz transponder chip (HDX or FDX-B compatible (ISO 11784/5), whichever causes higher emissions). As external antenna the AEA120 was used, because this antenna causes higher emission than the AEA080.

2.3 SPECIAL EMC MEASURES

The following EMC measures were necessary to reach the documented results:

None

3 OPERATIONAL STATES AND PHYSICAL BOUNDARIES

The AIR200 is intended to be used in combination with a handheld PC (PSION TEKLOGIX Workabout PRO), but for the measurements the handheld PC is not necessary to set the EUT in operation mode. Nevertheless the EUT is intended to be use only in combination with this battery-powered device. As declared by the applicant, the reader functionality will be disabled in case of charging the handheld PC. For the connection of the EUT to the PSION TEKLOGIX Workabout PRO an adapter board is required which was not used during the tests.

The EUT is equipped with an additional interface connector, which will be used for service purposes or for connection of the external antenna. In case of an external antenna is connected, the internal antenna is switched off. The antenna connector type (Binder series 712) is regarded to be unique. The reader is able to communicate with different TAGs (HDX or FDX-B compatible (ISO 11784/5). For each test it was preliminary checked, which TAG causes the higher emissions.

During all tests the EUT was used without the PSION TEKLOGIX Workabout PRO and was supplied by an 3 V battery pack, which was supplied by the applicant. If not otherwise stated, the tests were carried out with the EUT in the in the following operation mode: Fixed field operation on 134.2 kHz and placing a passive 134.2 kHz TAG in front of the EUT.

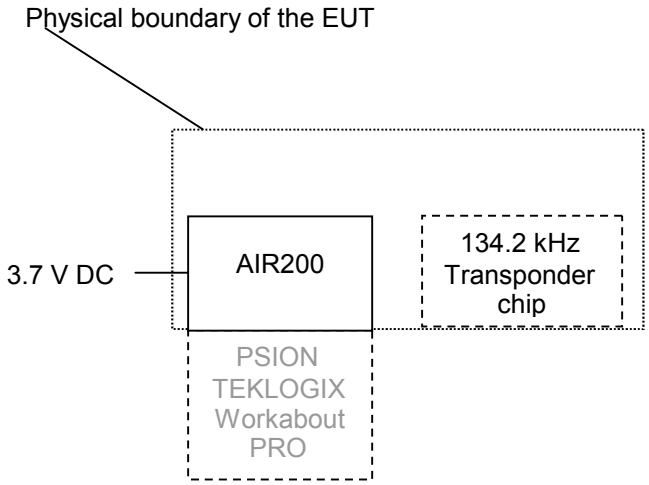
For the whole frequency range a preliminary measurement in a fully anechoic chamber with a measuring distance of 3 m was carried out to determine the frequencies, which were radiated by the EUT. The final measurements on the detected frequencies were carried out on an outdoor test site without ground plane (for the frequency range 9 kHz to 30 MHz) and on an open area test site with ground plane (for the frequency range 30 MHz to 1 GHz).

During the tests, the EUT was not labelled with a FCC-label.

Because the EUT is intended to be used in combination with handheld equipment, radiated emission measurements were carried out with the EUT in three orthogonal directions with and without external antenna. During all measurements the position of the external antenna was fixed to the EUT (for details refer also the photographs in annex A of this test report). The three positions were defined as follows:

Position	Description of the position
Pos. 1	EUT lies flatly on the table and the read-LED points upwards.
Pos. 2	EUT lies horizontal on the table and the read-LED points side wards.
Pos. 3	EUT stands vertically on the table and the read-LED points side wards.

The physical boundaries of the Equipment Under Test are shown below.



4 LIST OF TEST MODULES

4.1 EMISSION

Conducted emissions FCC 47 CFR Part 15 section 15.207 (a) [2] and RSS-Gen section 7.2.2 [4]					
Application	Frequency range	Limits	Reference standard	Remark	Status
On AC supply line	0.15 to 0.5 MHz 0.5 to 5 MHz 5 to 30 MHz	66 to 56 dBµV (QP) * 56 to 46 dBµV (AV) * 56 dBµV (QP) 46 dBµV (AV) 60 dBµV (QP) 50 dBµV (AV)	ANSI C63.4 (2003)	Not applicable, because of battery powered device	-
*: Decreases with the logarithm of the frequency					
Radiated emissions FCC 47 CFR Part 15 section 15.209 [2] and RSS-210 section 2.6 [3]					
Application	Frequency range	Limits (microvolts/meter)	Reference standard	Remark	Status
Intentional radiator	0.009 to 0.49 MHz 0.490 to 1.705 MHz 1.705 to 30.0 MHz 30 to 88 MHz 88 to 216 MHz 216 to 960 MHz 960 to 1000 MHz	2400/f(kHz) at 300 m 24000/f(kHz) at 30 m 30.0 dBµV/m at 30 m 40.0 dBµV/m at 3 m 43.5 dBµV/m at 3 m 46.0 dBµV/m at 3 m 54.0 dBµV/m at 3 m	ANSI C63.4 (2003)	-	Passed
Antenna requirement FCC 47 CFR Part 15 section 15.203 [2]					
					Status
The EUT has an integrated antenna, which is directly soldered to the EUT's PCB. In case of connection to an external antenna via the unique antenna connector, the internal antenna is switched off.					Fulfilled

5 METHOD OF MEASUREMENT

5.1 RADIATED EMISSIONS 9 kHz to 30 MHz

The radiated emission measurement is divided into two stages.

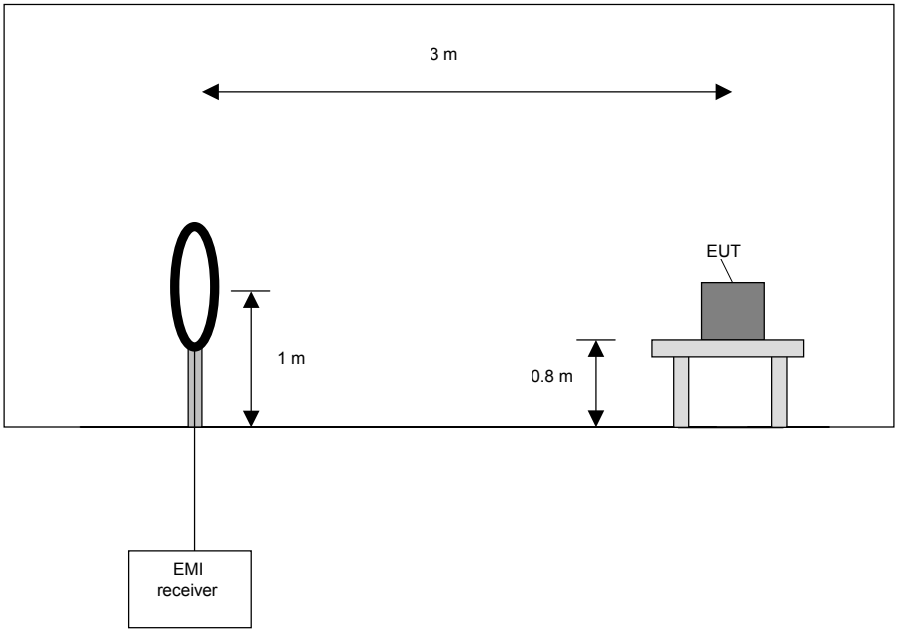
Preliminary measurement:

In the first stage a preliminary measurement will be performed in a shielded room with a measuring distance of 3 meters. Tabletop devices will set up on a non-conducting support with a size of 1 m by 1.5 m and a height of 80 cm. Floor-standing devices will be placed directly on the turntable/ground plane. The set up of the Equipment under test will be in accordance to ANSI C63.4-2003 [1].

The frequency range 9 kHz to 30 MHz will be monitored with a spectrum analyser while the system and its cables will be manipulated to find out the configuration with the maximum emission levels if applicable. The EMI Receiver will be set to MAX Hold mode. The EUT and the measuring antenna will be rotated around their vertical axis to found the maximum emissions.

The resolution bandwidth of the spectrum analyser will be set to the following values:

Frequency range	Resolution bandwidth
9 kHz to 150 kHz	200 Hz
150 kHz to 30 MHz	10 kHz



Preliminary measurement procedure:

Prescans were performed in the frequency range 9 kHz to 150 kHz and 150 kHz to 30 MHz.

The following procedure will be used:

1) Monitor the frequency range at horizontal polarisation and a EUT azimuth of 0 °.
2) Manipulate the system cables within the range to produce the maximum level of emission.
3) Rotate the EUT by 360 ° to maximize the detected signals.
4) Make a hardcopy of the spectrum.
5) Measure the frequencies of highest detected emission with a lower span and resolution bandwidth to increase the accuracy and note the frequency value.
6) Repeat steps 1) to 4) with the other orthogonal axes of the EUT.
7) Rotate the measuring antenna and repeat steps 1) to 5).

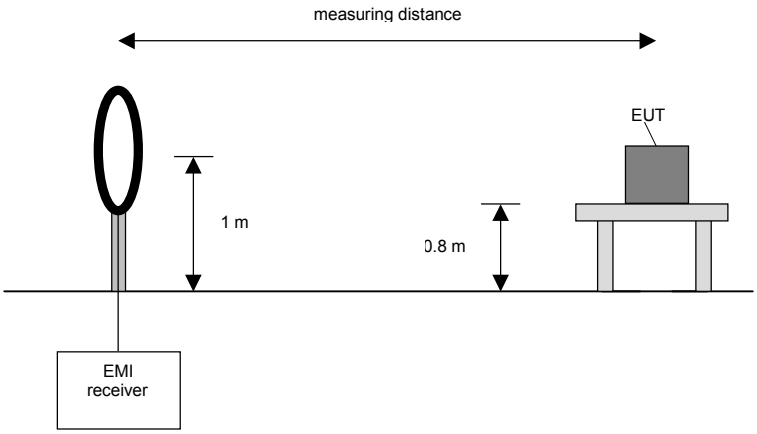
Final measurement:

In the second stage a final measurement will be performed on an open area test site with no conducting ground plane in a measuring distances of 3 m, 10 m and 30 m. In the case where larger measuring distances are required the results will be extrapolated based on the values measured on the closer distances according to Section 15.31 (f) (2) [2]. The final measurement will be performed with a EMI Receiver set to Quasi Peak detector except for the frequency bands 9 kHz to 90 kHz and 110 kHz to 490 kHz where an average detector will be used according Section 15.209 (d) [2].

On the during the preliminary measurement detected frequencies the final measurement will be performed while rotating the EUT and the measuring antenna in the range of 0 ° to 360 ° around their vertical axis until the maximum value is found.

The resolution bandwidth of the EMI Receiver will be set to the following values:

Frequency range	Resolution bandwidth
9 kHz to 150 kHz	200 Hz
150 kHz to 30 MHz	9 kHz



Final measurement procedure:

The following procedure will be used:

1) Monitor the frequency range with the measuring antenna at vertical orientation parallel to the EUT at an azimuth of 0 °.
2) Rotate the EUT by 360 ° to maximize the detected signals and note the azimuth and orientation.
3) Rotate the measuring antenna to find the maximum and note the value.
4) Rotate the measuring antenna and repeat steps 1) to 3) until the maximum value is found.
5) Repeat steps 1) to 4) with the other orthogonal axes of the EUT if applicable (handheld equipment).

5.2 RADIATED EMISSIONS 30 MHz to 1 GHz

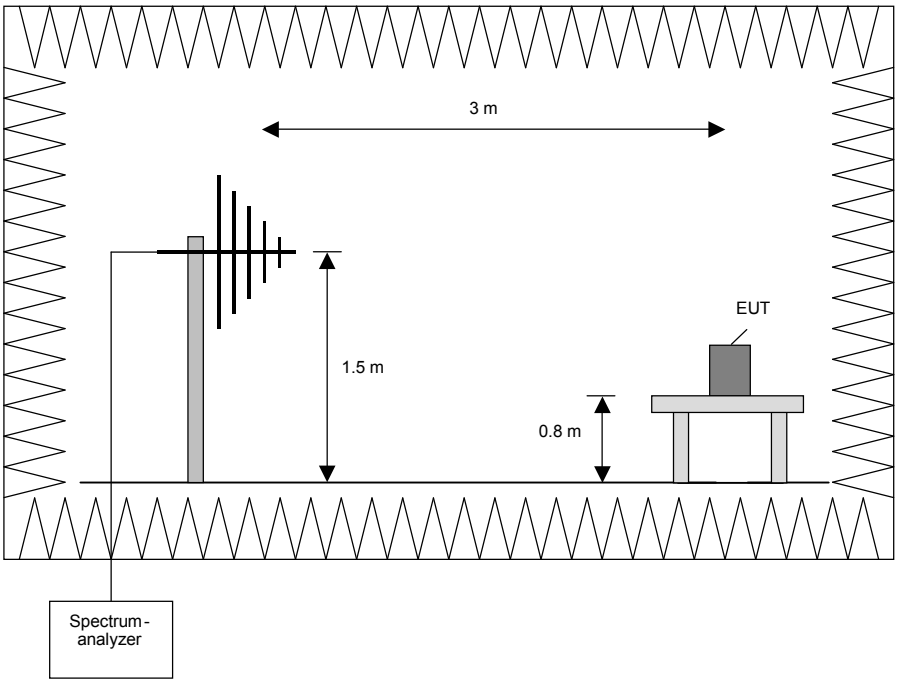
The radiated emission measurement is divided into two stages.

Preliminary measurement:
In the first stage a preliminary measurement will be performed in a fully anechoic chamber with a measuring distance of 3 meter. Tabletop devices will set up on a non-conducting support with a size of 1 m by 1.5 m and a height of 80 cm. Floor-standing devices will be placed directly on the turntable/ground plane. The set up of the Equipment under test will be in accordance to ANSI C63.4-2003 [1].

The frequency range 30 MHz to 1 GHz will be measured with an EMI Receiver set to MAX Hold mode and a resolution bandwidth of 100 kHz. The measurement will be performed in horizontal and vertical polarisation of the measuring antenna and while rotating the EUT in its vertical axis in the range of 0 ° to 360 °.

The resolution bandwidth of the EMI Receiver will be set to the following values:

Frequency range	Resolution bandwidth
30 MHz to 1 GHz	100 kHz



Procedure preliminary measurement:

Prescans were performed in the frequency range 30 MHz to 200 MHz and 200 MHz to 1 GHz.
The following procedure will be used:

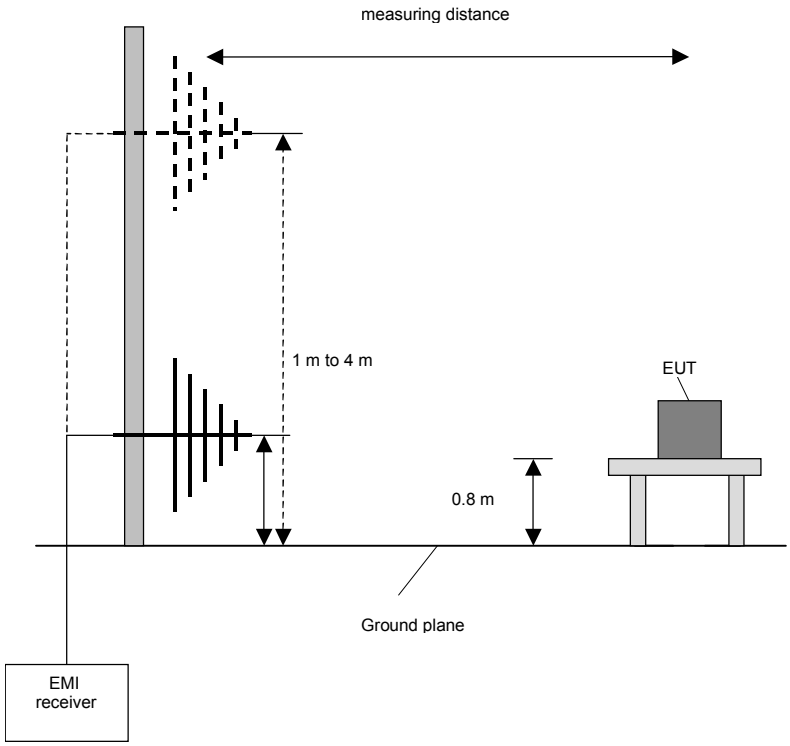
1. Monitor the frequency range at horizontal polarisation and a EUT azimuth of 0 °.
2. Manipulate the system cables within the range to produce the maximum level of emission.
3. Rotate the EUT by 360 ° to maximize the detected signals.
4. Make a hardcopy of the spectrum.
5. Measure the frequency of 3 highest detected emissions with a lower span and resolution bandwidth to increase the accuracy and note the frequency value.
6. Repeat steps 1) to 4) with the other orthogonal axes of the EUT.
7. Repeat steps 1) to 5) with the vertical polarisation of the measuring antenna.

Final Measurement:

In the second stage a final measurement on an open area test site will be performed on selected frequencies found in the preliminary measurement. During this test the EUT will be rotated in the range of 0 ° to 360 °, the measuring antenna will be set to horizontal and vertical polarisation and raised and lowered in the range from 1 m to 4 m to find the maximum level of emissions.

The resolution bandwidth of the EMI Receiver will be set to the following values:

Frequency range	Resolution bandwidth
30 MHz to 1 GHz	120 kHz



Procedure final measurement:

The following procedure will be used:

1) Measure on the selected frequencies at an antenna height of 1 m and a EUT azimuth of 23 °.
2) Move the antenna from 1 m to 4 m and note the maximum value at each frequency.
3) Rotate the EUT by 45 ° and repeat 2) until an azimuth of 337 ° is reached.
4) Repeat 1) to 3) for the other orthogonal antenna polarization.
5) Move the antenna and the turntable to the position where the maximum value is detected.
6) Measure while moving the antenna slowly +/- 1 m.
7) Set the antenna to the position where the maximum value is found.
8) Measure while moving the turntable +/- 45 °.
9) Set the turntable to the azimuth where the maximum value is found.
10) Measure with Final detector (QP or AV) and note the value.
11) Repeat 5) to 10) for each frequency.
12) Repeat 1) to 11) for each orthogonal axes of the EUT if handheld equipment.

6 TEST RESULTS EMISSION TEST

6.1 PRELIMINARY RADIATED EMISSION TEST WITH INTERNAL ANTENNA (9 kHz to 30 MHz)

Ambient temperature:	20 °C	Relative humidity:	45 %

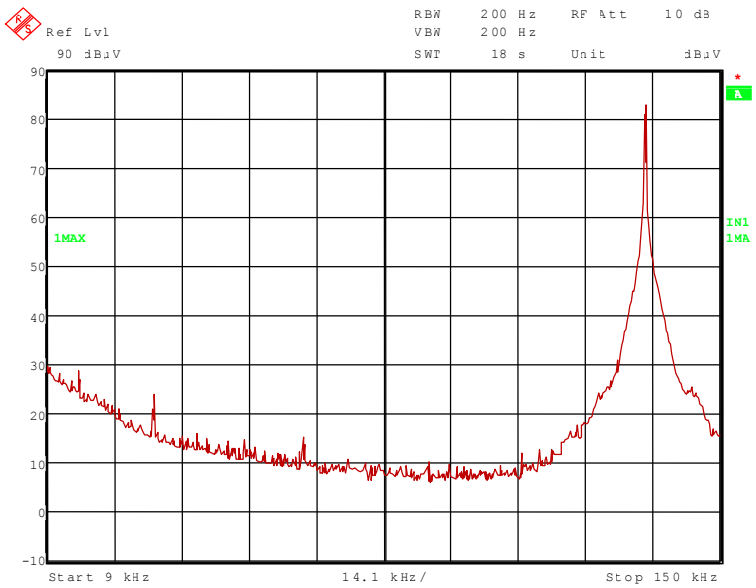
Position of EUT: The EUT was set-up on a non-conducting table of a height of 0.8 m. The distance between EUT and antenna was 3 m.

Cable guide: The cable of the EUT was fixed on the wooden table. For further information of the cable guide refer to the pictures in annex A of this test report.

Test record: The test was carried out in fixed field operation mode of the EUT (with a 134.2 kHz TAG in front of the EUT). Because the EUT is intended to be used in a handheld application, it was tested in three orthogonal directions. The results below are showing the maximum of all three measurements.

Remark: The emissions found around 16 kHz, 32 kHz, 48 and 62 kHz caused by the measuring system and not from the EUT.

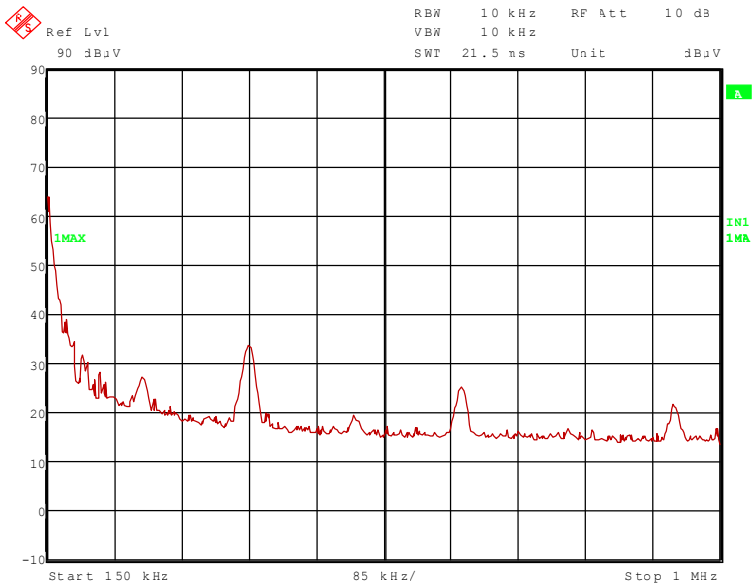
52017a: Spurious emissions with internal antenna from 9 kHz to 150 kHz:



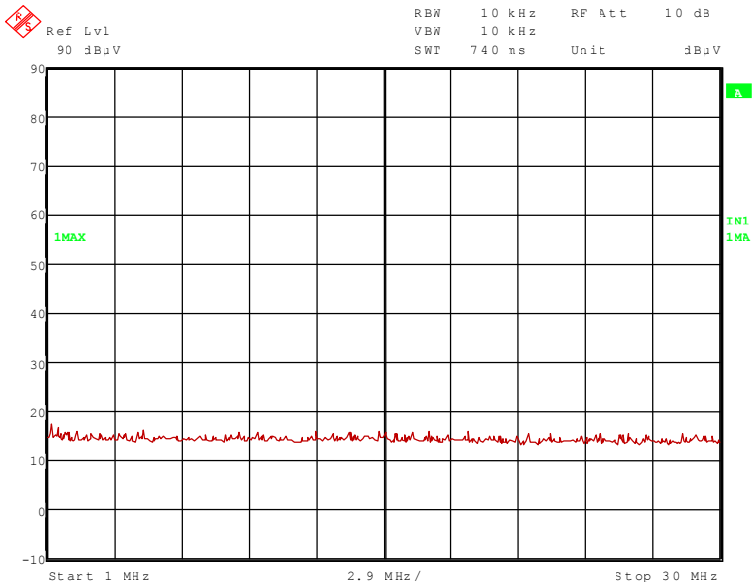
TEST EQUIPMENT USED THE TEST:

29, 31 – 33, 56

52017b: Spurious emissions with internal antenna from 150 kHz to 1 MHz:



52017c: Spurious emissions with internal antenna from 1 MHz to 30 MHz:



The following emission was found according to FCC 47 CFR Part 15 section 15.209 (a) with internal antenna:

- 134.255 kHz, 402.645 kHz, 671.065 kHz, and 939.476 kHz.

These frequencies have to be measured on the outdoor test site. The result of this final measurement is shown in subclause 6.3 of this test report.

6.2 PRELIMINARY RADIATED EMISSION TEST WITH INTERNAL ANTENNA (30 MHz to 1 GHz)

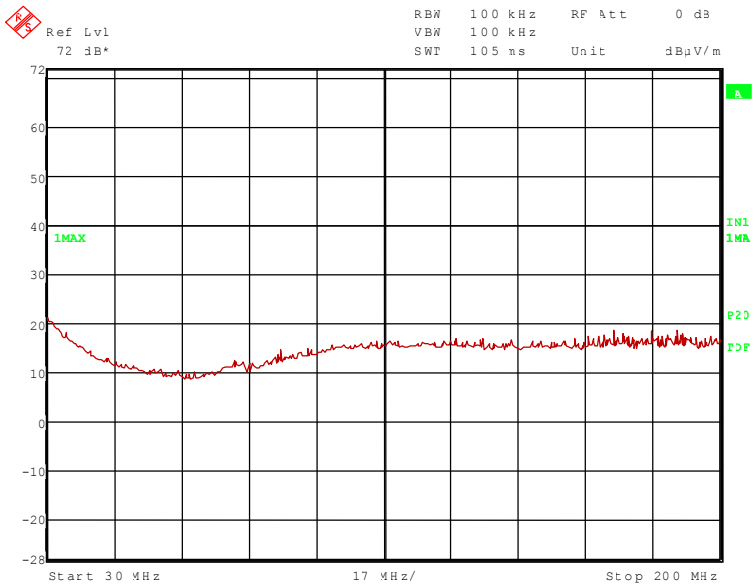
Ambient temperature:	20 °C	Relative humidity:	45 %

Position of EUT: The EUT was set-up on a non-conducting table of a height of 0.8 m. The distance between EUT and antenna was 3 m.

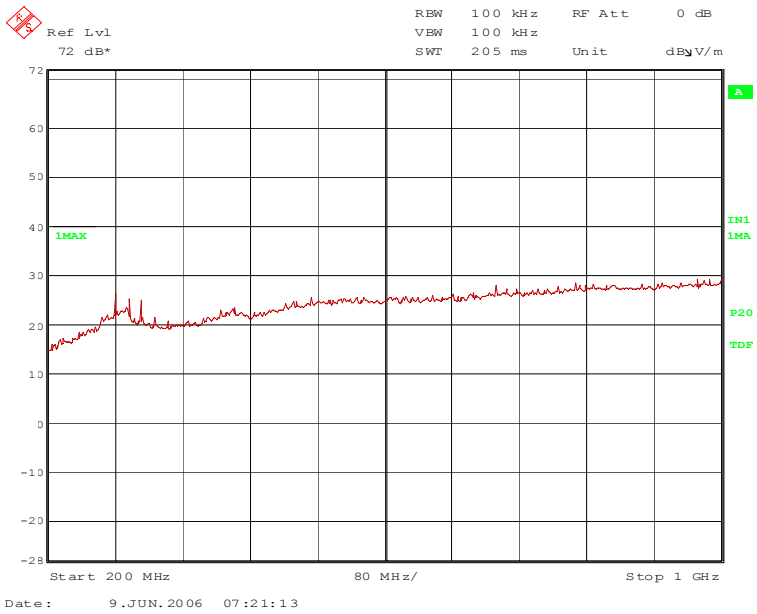
Cable guide: The cable of the EUT was fixed on the wooden table. For further information of the cable guide refer to the pictures in annex A of this test report.

Test record: The test was carried out in fixed field operation mode of the EUT (with a 134.2 kHz TAG in front of the EUT). Because the EUT is intended to be used in a handheld application, it was tested in three orthogonal directions. The results below are showing the maximum of all three measurements.

52017d.wmf: Spurious emissions with internal antenna from 30 MHz to 200 MHz:



52017e.wmf: Spurious emissions with internal antenna from 200 MHz to 1 GHz:



The following emissions were found according to FCC 47 CFR Part 15 section 15.209:

- 280.229 MHz, 295.930 MHz and 311.368 MHz.

These frequencies have to be measured on the open area test site. The result of this final measurement is shown in subclause 6.4 of this test report.

TEST EQUIPMENT USED FOR THE TEST:

29, 31 - 35, 43

6.3 FINAL RADIATED EMISSION TEST WITH INTERNAL ANTENNA (9 kHz to 30 MHz)

Ambient temperature:	18 °C	Relative humidity:	46 %

Position of EUT: The EUT was set-up on a non-conducting table of a height of 0.8 m. The distance between EUT and antenna was 3 m.

Cable guide: The cable of the EUT was fixed on the wooden table. For further information of the cable guide refer to the pictures in annex A of this test report.

Test record: The test was carried out in fixed field operation mode of the EUT (with a 134.2 kHz TAG in front of the EUT). All results are shown in the following.

Test results: The test results were calculated with the following formula:

Result [dBµV/m] = reading [dBµV] + antenna factor [dB/m]

Results with measuring distance of 3 m							
Frequency kHz	Result dBµV/m	Limit dBµV/m	Margin dB	Detector	Readings dBµV	Antenna factor * dB/m	Pos.
134.255	104.0	105.0	1.0	QP	84.0	20.0	1
402.645	64.7	95.5	30.8	QP	44.7	20.0	3
671.065	53.6	71.1	17.5	QP	33.6	20.0	1
939.476	Emission was below the noise floor of the measuring system (45.0 dBµV/m)						
Results with measuring distance of 10 m							
Frequency kHz	Result dBµV/m	Limit dBµV/m	Margin dB	Detector	Readings dBµV	Antenna factor * dB/m	Pos.
134.255	74.0	85.0	11.0	QP	54.0	20.0	1
402.645	Emission was below the noise floor of the measuring system (50.0 dBµV/m)						
671.065	Emission was below the noise floor of the measuring system (55.0 dBµV/m)						

*: Cable loss included

Test: Passed

TEST EQUIPMENT USED FOR THE TEST:

55 – 57

6.4 FINAL RADIATED EMISSION TEST WITH INTERNAL ANTENNA (30 MHz to 1 GHz)

Ambient temperature:	21 °C	Relative humidity:	46 %

Position of EUT: The EUT was set-up on a non-conducting table of a height of 0.8 m. The distance between EUT and antenna was 3 m. The EUT was tested in three orthogonal directions.

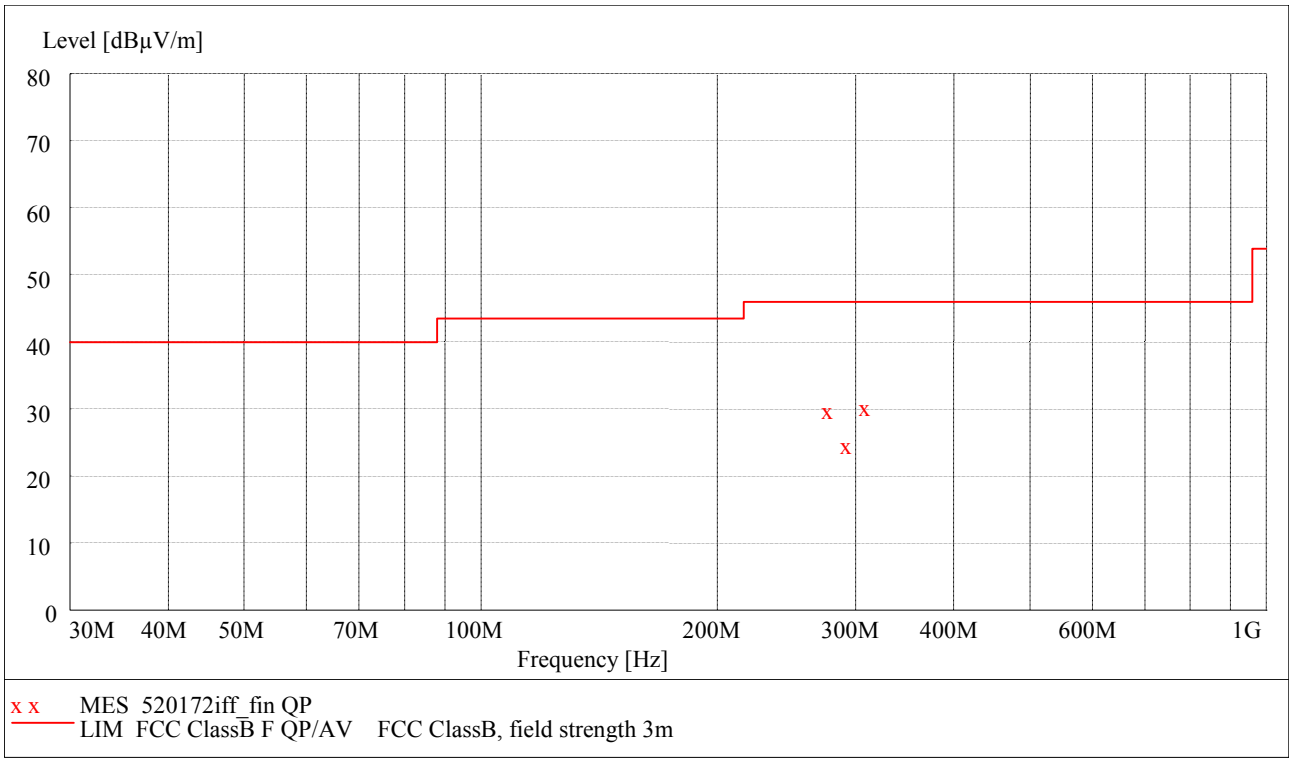
Cable guide: The cable of the EUT was fixed on the wooden table. For further information of the cable guide refer to the pictures in annex A of this test report.

Test record: The test was carried out in fixed field operation mode of the EUT (with a 134.2 kHz TAG in front of the EUT). All results are shown in the following.

Test results: The test results were calculated with the following formula:

Result [dBµV/m] = reading [dBµV] + cable loss [dB] + antenna factor [dB/m]

The measured points and the limit line in the following diagram refer to the standard measurement of the emitted interference in compliance with the above-mentioned standard. The measured points marked with x are the measured results of the standard final measurement on the open area test site.



Data record name: 520172iff

The results of the standard final measurement on the open area test site are indicated in the table below. The limits as well as the measured results (levels) refer to the above-mentioned standard while taking account of the specified requirements for a 3 m measuring distance.

The measurement time with the quasi-peak measuring detector is 1 second.

Spurious emissions outside restricted bands										
Frequency MHz	Result dBµV/m	Limit dBµV/m	Margin dB	Readings dBµV	Antenna factor dB/m	Cable loss dB	Height cm	Azimuth deg	Pol.	Max. at Pos.
295.930	25.3	46.0	20.7	11.4	12.8	1.1	100.0	239.0	Hor.	1
311.364	30.9	46.0	15.1	16.4	13.4	1.1	100.0	268.0	Hor.	1
Spurious emissions in restricted bands										
Frequency MHz	Result dBµV/m	Limit dBµV/m	Margin dB	Readings dBµV	Antenna factor dB/m	Cable loss dB	Height cm	Azimuth deg	Pol. -	Max. at Pos.
280.229	30.4	46.0	15.6	16.8	12.6	1.0	100.0	233.0	Hor.	1

Data record name: 520172iff_fin QP

The test results were calculated with the following formula:

Result [dBµV/m] = reading [dBµV] + cable loss [dB] + antenna factor [dB/m]

Test: Passed

TEST EQUIPMENT USED FOR THE TEST:

14 – 20

6.5 PRELIMINARY RADIATED EMISSION TEST WITH EXTERNAL ANTENNA (9 kHz to 30 MHz)

Ambient temperature:	20 °C	Relative humidity:	45 %

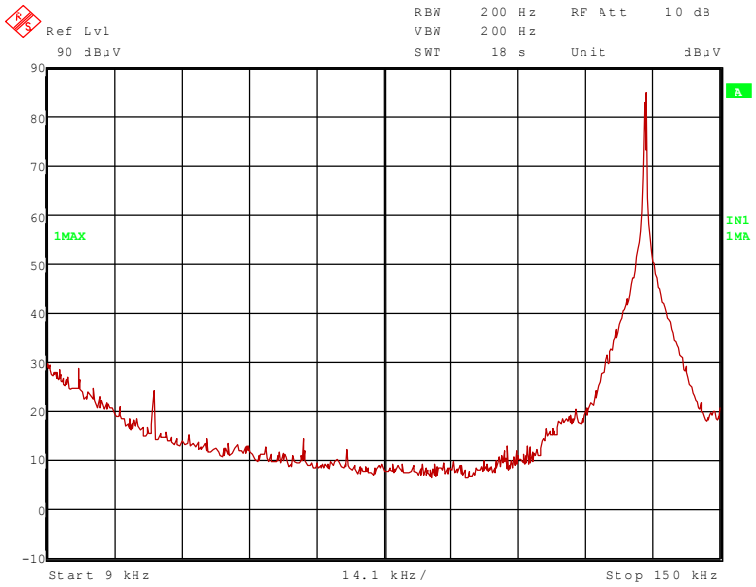
Position of EUT: The EUT was set-up on a non-conducting table of a height of 0.8 m. The distance between EUT and antenna was 3 m.

Cable guide: The cable of the EUT was fixed on the wooden table. For further information of the cable guide refer to the pictures in annex A of this test report.

Test record: The test was carried out in fixed field operation mode of the EUT (with a 134.2 kHz TAG in front of the EUT). Because the EUT is intended to be used in a handheld application, it was tested in three orthogonal directions. The results below are showing the maximum of all three measurements.

Remark: The emissions found around 16 kHz, 32 kHz, 48 and 62 kHz caused by the measuring system and not from the EUT.

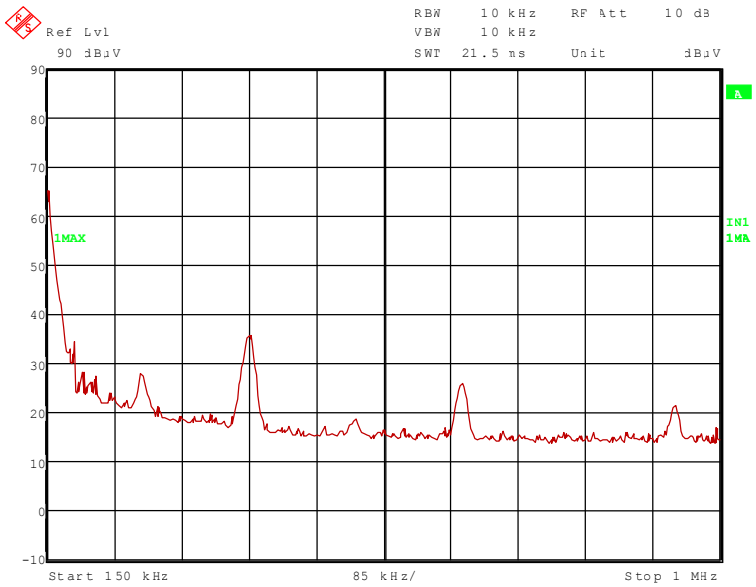
52017f: Spurious emissions with external antenna from 9 kHz to 150 kHz:



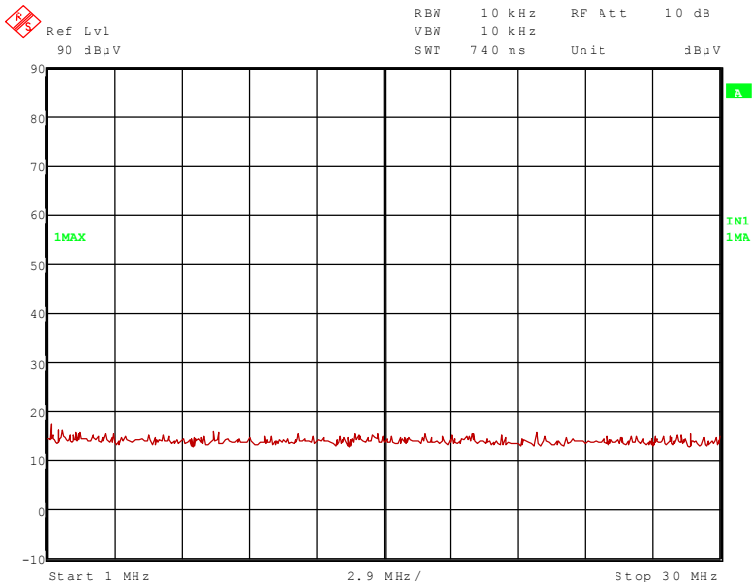
TEST EQUIPMENT USED THE TEST:

29, 31 – 33, 56

52017g: Spurious emissions with external antenna from 150 kHz to 1 MHz:



52017h: Spurious emissions with external antenna from 1 MHz to 30 MHz:



The following emission was found according to FCC 47 CFR Part 15 section 15.209 (a) with external antenna:

- 134.255 kHz, 402.645 kHz, 671.065 kHz and 939.476 kHz.

These frequencies have to be measured on the outdoor test site. The result of this final measurement is shown in subclause 6.7 of this test report.

6.6 PRELIMINARY RADIATED EMISSION TEST WITH EXTERNAL ANTENNA (30 MHz to 1 GHz)

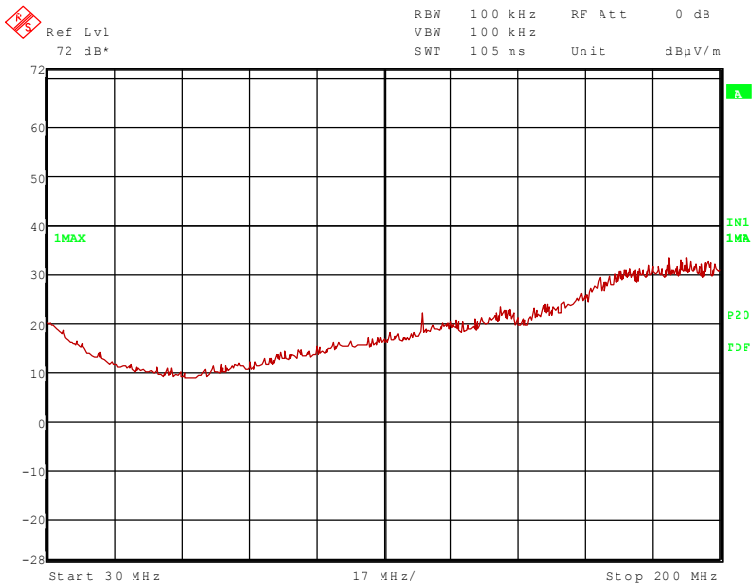
Ambient temperature:	21 °C	Relative humidity:	45 %

Position of EUT: The EUT was set-up on a non-conducting table of a height of 0.8 m. The distance between EUT and antenna was 3 m.

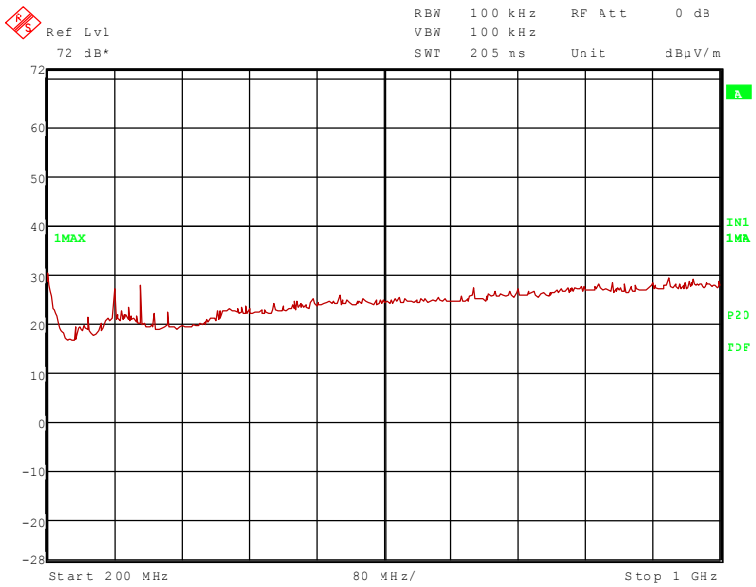
Cable guide: The cable of the EUT was fixed on the wooden table. For further information of the cable guide refer to the pictures in annex A of this test report.

Test record: The test was carried out in fixed field operation mode of the EUT (with a 134.2 kHz TAG in front of the EUT). Because the EUT is intended to be used in a handheld application, it was tested in three orthogonal directions. The results below are showing the maximum of all three measurements.

52017i.wmf: Spurious emissions with external antenna from 30 MHz to 200 MHz:



52017j.wmf: Spurious emissions with internal antenna from 200 MHz to 1 GHz:



The following emissions were found according to FCC 47 CFR Part 15 section 15.209:

- 124.547 MHz, 186.818 MHz, 280.229 MHz, 295.930 MHz and 311.368 MHz

These frequencies have to be measured on the open area test site. The result of this final measurement is shown in subclause 6.8 of this test report.

TEST EQUIPMENT USED FOR THE TEST:

29, 31 - 35, 43

6.7 FINAL RADIATED EMISSION TEST WITH EXTERNAL ANTENNA (9 kHz to 30 MHz)

Ambient temperature:	18 °C	Relative humidity:	46 %

Position of EUT: The EUT was set-up on a non-conducting table of a height of 0.8 m. The distance between EUT and antenna was 3 m.

Cable guide: The cable of the EUT was fixed on the wooden table. For further information of the cable guide refer to the pictures in annex A of this test report.

Test record: The test was carried out in fixed field operation mode of the EUT (with a 134.2 kHz TAG in front of the EUT). All results are shown in the following.

Test results: The test results were calculated with the following formula:

Result [dBµV/m] = reading [dBµV] + antenna factor [dB/m]

Results with measuring distance of 3 m							
Frequency kHz	Result dBµV/m	Limit dBµV/m	Margin dB	Detector	Readings dBµV	Antenna factor * dB/m	Pos.
134.255	104.6	105.0	0.4	QP	84.6	20.0	1
402.645	67.0	95.5	28.5	QP	47.0	20.0	3
671.065	54.0	71.1	17.1	QP	34.0	20.0	1
939.476	Emission was below the noise floor of the measuring system (45.0 dBµV/m)						
Results with measuring distance of 10 m							
Frequency kHz	Result dBµV/m	Limit dBµV/m	Margin dB	Detector	Readings dBµV	Antenna factor * dB/m	Pos.
134.255	74.1	85.0	10.9	QP	54.1	20.0	1
402.645	Emission was below the noise floor of the measuring system (50.0 dBµV/m)						
671.065	Emission was below the noise floor of the measuring system (55.0 dBµV/m)						

*: Cable loss included

Test: Passed

TEST EQUIPMENT USED FOR THE TEST:

55 – 57

6.8 FINAL RADIATED EMISSION TEST WITH EXTERNAL ANTENNA (30 MHz to 1 GHz)

Ambient temperature:	21 °C	Relative humidity:	46 %

Position of EUT: The EUT was set-up on a non-conducting table of a height of 0.8 m. The distance between EUT and antenna was 3 m. The EUT was tested in three orthogonal directions.

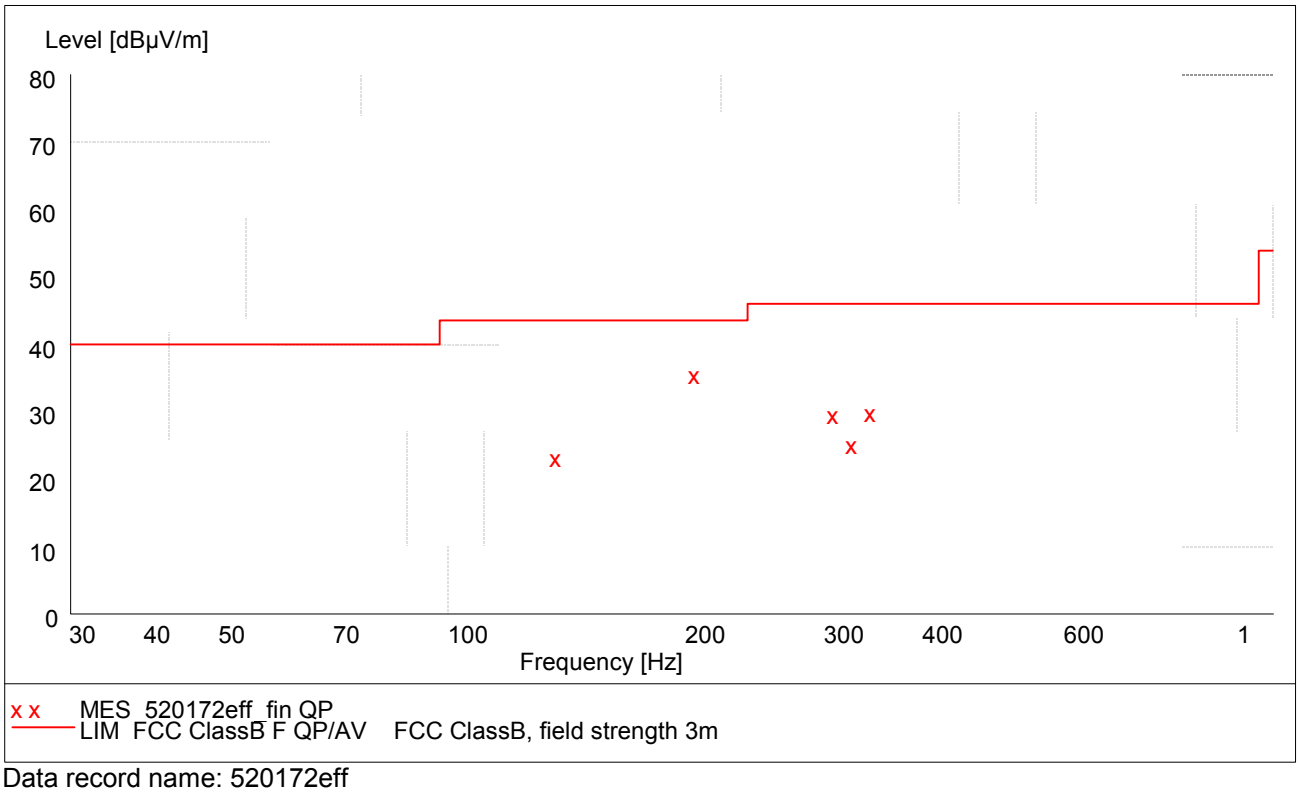
Cable guide: The cable of the EUT was fixed on the wooden table. For further information of the cable guide refer to the pictures in annex A of this test report.

Test record: The test was carried out in fixed field operation mode of the EUT (with a 134.2 kHz TAG in front of the EUT). All results are shown in the following.

Test results: The test results were calculated with the following formula:

Result [dBµV/m] = reading [dBµV] + cable loss [dB] + antenna factor [dB/m]

The measured points and the limit line in the following diagram refer to the standard measurement of the emitted interference in compliance with the above-mentioned standard. The measured points marked with x are the measured results of the standard final measurement on the open area test site.



Data record name: 520172eff

The results of the standard final measurement on the open area test site are indicated in the table below. The limits as well as the measured results (levels) refer to the above-mentioned standard while taking account of the specified requirements for a 3 m measuring distance.

The measurement time with the quasi-peak measuring detector is 1 second.

Spurious emissions outside restricted bands										
Frequency MHz	Result dBµV/m	Limit dBµV/m	Margin dB	Readings dBµV	Antenna factor dB/m	Cable loss dB	Height cm	Azimuth deg	Pol.	Max. at Pos.
186.818	35.8	43.5	7.7	26.0	9.0	0.8	135.0	88.0	Hor.	1
295.930	25.5	46.0	20.5	11.6	12.8	1.1	101.0	239.0	Hor.	1
311.364	30.4	46.0	15.6	15.9	13.4	1.1	101.0	268.0	Hor.	1
Spurious emissions in restricted bands										
Frequency MHz	Result dBµV/m	Limit dBµV/m	Margin dB	Readings dBµV	Antenna factor dB/m	Cable loss dB	Height cm	Azimuth deg	Pol. -	Max. at Pos.
124.547	23.7	43.5	19.8	10.6	12.4	0.7	242.0	113.0	Hor.	1
280.229	30.0	46.0	16.0	16.4	12.6	1.0	100.0	235.0	Hor.	1

Data record name: 520172eff_fin QP

The test results were calculated with the following formula:

Result [dBµV/m] = reading [dBµV] + cable loss [dB] + antenna factor [dB/m]

Test: Passed

TEST EQUIPMENT USED FOR THE TEST:

14 – 20

6.9 OCCUPIED BANDWIDTH

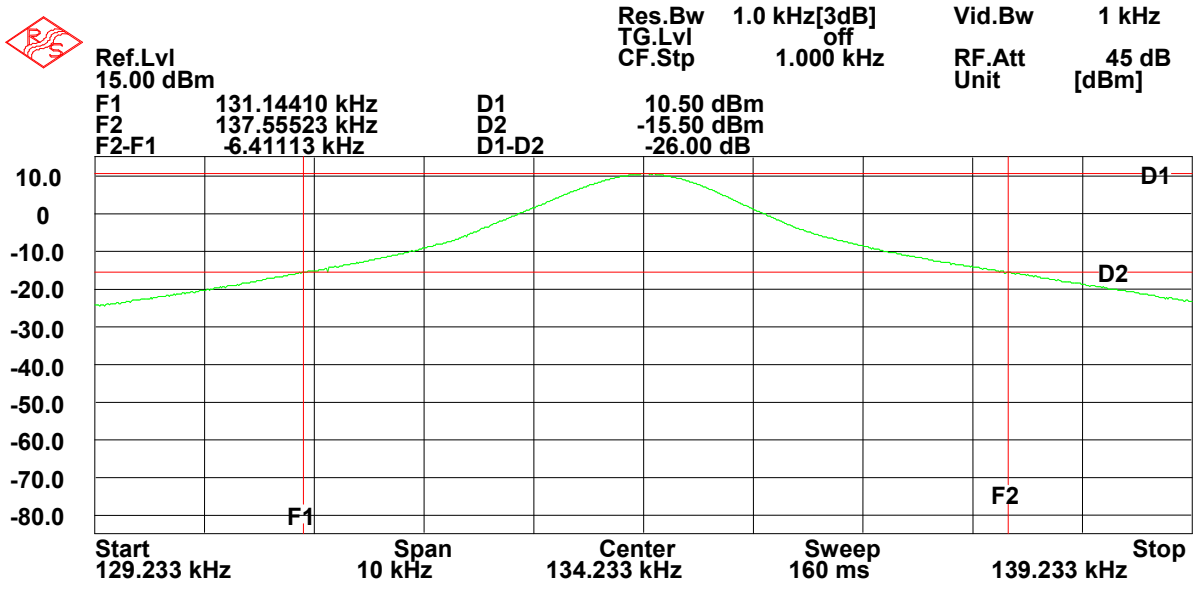
Ambient temperature:	21 °C

Relative humidity:	31 %

Test set-up: For this test the EUT was placed on a test fixture, which was connected to a spectrum analyser. Because as external and internal antenna the same antenna coil is used and the modulation is only generated by the TAG, the occupied bandwidth was measured with the internal antenna.

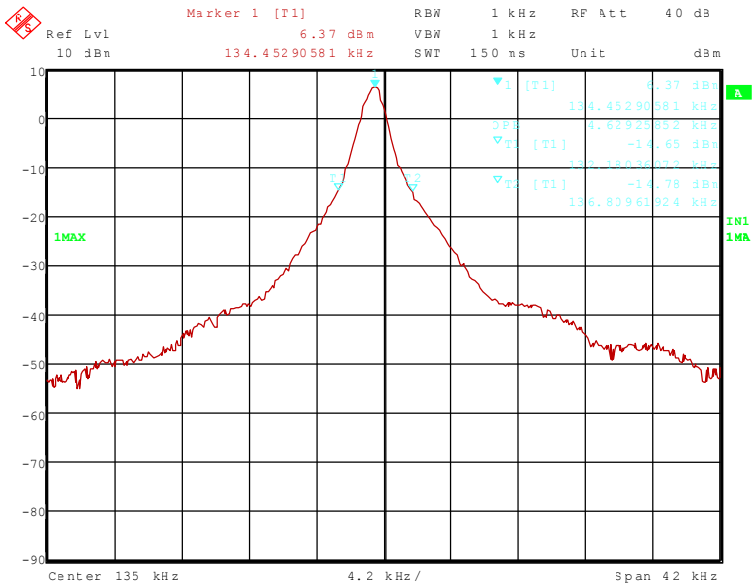
Test record: The test was carried out in fixed field operation mode of the EUT (with a 134.2 kHz TAG in front of the EUT). All results are shown in the following.

5201726db.hgl: 26 dB bandwidth:



F_L	F_U	26 dB BW (F_U - F_L)
131.144 kHz	137.555 kHz	6.411 kHz

52017k.wmf.hgl: 99 % bandwidth:



F_L	F_U	99 % BW (F_U - F_L)
132.180 kHz	136.810 kHz	4.630 kHz

TEST EQUIPMENT USED THE TEST:

22, 54, 58, 59

7 TEST EQUIPMENT AND ANCILLARIES USED FOR TESTS

Emission measurement at AC mains and DC in / out ports at M4					
No.	Test equipment	Type	Manufacturer	Serial No.	PM-No
1	Shielded chamber M4	-	Siemens	B83117S1-X158	480088
2	Measuring receiver	ESAI	Rohde & Schwarz	831953/001 833181/018	480025 480026
3	LISN	NSLK8128	Schwarzbeck	8128155	480058
4	LISN	NSLK 8128-	Schwarzbeck	8128161	480138
5	AC-filter	B84299-D87-E3	Siemens	930262292	480097
6	EMI-Software	ES-K1	Rohde & Schwarz	-	480111

Radiated emission measurement at M5					
No.	Test equipment	Type	Manufacturer	Serial No.	PM-No
7	Fully anechoic chamber M5	-	Siemens	B83177-S1-X156	480073
8	Measuring receiver	ESVS30	Rohde & Schwarz	829673/012	480024
9	Controller	HD100	Deisel	100/324	480067
10	Antenna support	MA240	Deisel	228/314	480069
11	Turntable	DS412	Deisel	412/317	480070
12	Antenna	CBL6112C	Chase	2689	480327
13	EMI Software	ES-K1	Rohde & Schwarz	-	480111

Radiated emission measurement at M6					
No.	Test equipment	Type	Manufacturer	Serial No.	PM-No
14	Open area test site	-	Phoenix Test-Lab	-	480085
15	Measuring receiver	ESVS30	Rohde & Schwarz	829673/012	480024
16	Controller	HD100	Deisel	100/670	480139
17	Turntable	DS420HE	Deisel	420/620/80	480087
18	Antenna support	AS615P	Deisel	615/310	480086
19	Antenna	CBL6111 A	Chase	1643	480147
20	EMI Software	ES-K1	Rohde & Schwarz	-	480111

Radiated emission measurement at M8					
No.	Test equipment	Type	Manufacturer	Serial No.	PM-No
21	Fully anechoic chamber M8	-	Siemens	B83117-E7019-T231	480190
22	Measuring receiver	ESMI	Rohde & Schwarz	843977/001 843530/018	480179 480180
23	Measuring receiver	ESCS 30	Rohde & Schwarz	828985/014	480270
24	Controller	HD100	Deisel	100/427	480181
25	Turntable	DS420	Deisel	420/435/97	480186
26	Antenna support	AS615P	Deisel	615/310	480187
27	Antenna	CBL6112 A	Chase	2034	480185
28	EMI Software	ES-K1	Rohde & Schwarz	-	480111

Radiated emission measurement at M20					
No.	Test equipment	Type	Manufacturer	Serial No.	PM-No
29	Fully anechoic chamber M20	-	Albatross Projects	B83107-E2439-T232	480303
30	Measuring receiver	ESMI	Rohde & Schwarz	843977/001 843530/018	480179 480180
31	Measuring receiver	ESI 40	Rohde & Schwarz	100064	480355
32	Controller	HD100	Deisel	100/670	480326
33	Turntable	DS420HE	Deisel	420/620/80	480315
34	Antenna support	AS615P	Deisel	615/310	480187
35	Antenna	CBL6112 B	Chase	2688	480328
36	Antenna	3115 A	EMCO	9609-4918	480183
37	Standard Gain Horn 11.9GHz – 18GHZ	18240-20	Flann Microwave	483	480294
38	Standard Gain Horn 11.9GHz – 18GHZ	18240-20	Flann Microwave	482	480295
39	Standard Gain Horn 17.9GHz – 26.7GHZ	20240-20	Flann Microwave	411	480297
40	Standard Gain Horn 17.9GHz – 26.7GHZ	20240-20	Flann Microwave	410	480296
41	Standard Gain Horn 26.4GHz – 40.1GHZ	22240-20	Flann Microwave	469	480299

No.	Test equipment	Type	Manufacturer	Serial No.	PM-No
42	Standard Gain Horn 26.4GHz – 40.1GHZ	22240-20	Flann Microwave	468	480298
43	RF-cable No. 30	RTK 081	Rosenberger	-	410141
44	RF-cable No. 31	RTK 081	Rosenberger	-	410142
45	RF-cable 1m	KPS-1533-400-KPS	Insulated Wire	-	480300
46	RF-cable 1m	KPS-1533-400-KPS	Insulated Wire	-	480301
47	RF-cable 2m	KPS-1533-400-KPS	Insulated Wire	-	480302
48	RF-cable No. 5	RTK 081	Rosenberger		410097
49	Preamplifier	JS3-00101200-23-5A	Miteq	681851	480337
50	Preamplifier	JS3-12001800-16-5A	Miteq	571667	480343
51	Preamplifier	JS3-18002600-20-5A	Miteq	658697	480342
52	Preamplifier	JS3-26004000-25-5A	Miteq	563593	480344
53	EMI Software	ES-K1	Rohde & Schwarz	-	480111

Ancillary equipment used for testing					
No.	Test equipment	Type	Manufacturer	Serial No.	PM-No
54	Power supply	TOE 8852	Toellner	51712	480233
55	Outdoor test site	-	Phoenix Test-Lab	-	480293
56	Loop antenna	HFH2-Z2	Rohde & Schwarz	832609/014	480059
57	EMI test receiver	ESPC	Rohde & Schwarz	843756/006	480150
58	Test fixture	-	Phoenix Test-Lab	-	410160
59	RF-cable No. 10	RG223	Phoenix-Test-Lab	-	410102
60	AC power source / analyser	6813A	Hewlett Packard	3524A-00484	480155
61	Climatic chamber	GTS500.40	GTS	1660	490073

All used measurement equipment was calibrated (if necessary). The calibration intervals and the calibration history will be given out on request.

8 LIST OF ANNEXES

ANNEX A	**PHOTOGRAPHS OF THE TEST SET-UPS**:	**6 pages**
	AIR200 with internal antenna (Pos. 3), test set-up fully anechoic chamber	52017_3.jpg
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	AIR200 with internal antenna (Pos.1), test set-up outdoor test site	52017_24.jpg
	AIR200 with external antenna (Pos.1), test set-up outdoor test site	52017_12.jpg
	AIR200 with internal antenna (Pos. 2), test set-up open area test site	52017_1.jpg
	AIR200 with external antenna (Pos. 1), test set-up open area test site	52017_6.jpg
ANNEX B	**INTERNAL PHOTOGRAPHS OF THE TEST SAMPLE**:	**2 pages**
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ANNEX C	**EXTERNAL PHOTOGRAPHS OF THE TEST SAMPLE**:	**5 pages**
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