

# Test Report

Report Number:

**F160344E4**

Equipment under Test (EUT):

**RFID110-L1**

Applicant:

**Bender GmbH & Co. KG**

Manufacturer:

**Bender GmbH & Co. KG**



Deutsche  
Akkreditierungsstelle  
D-PL-17186-01-01  
D-PL-17186-01-02  
D-PL-17186-01-03

## References

- [1] **ANSI C63.10: 2013** American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices
- [2] **FCC CFR 47 Part 15 (October 2015)** Radio Frequency Devices
- [3] **RSS-210 Issue 8 (December 2010)** Licence-exempt Radio Apparatus (All Frequency Bands): Category I Equipment
- [4] **RSS-Gen Issue 4 (November 2014)** General Requirements for Compliance of Radio Apparatus

## Test result

The requirements of the tests performed as shown in the overview (chapter 4 of this test report) were fulfilled by the equipment under test.

The complete test results are presented in the following.

Test engineer:	Thomas KÜHN		06/27/2016
	Name	Signature	Date
Authorized reviewer:	Bernd SELCK		06/27/2016
	Name	Signature	Date

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The test results herein refer only to the tested sample. PHOENIX TESTLAB GmbH is not responsible for any generalisations or conclusions drawn from these test results concerning further samples. Any modification of the tested samples is prohibited and leads to the invalidity of this test report. Each page necessarily contains the PHOENIX TESTLAB Logo and the TEST REPORT NUMBER.

<b>Contents:</b>	<b>Page</b>
1 Identification .....	4
1.1 Applicant .....	4
1.2 Manufacturer .....	4
1.3 Test Laboratory .....	4
1.4 EUT (Equipment Under Test) .....	5
1.5 Technical data of equipment .....	5
1.6 Dates .....	5
2 Operational states and test setup .....	6
3 Additional information .....	7
4 Overview .....	7
5 Results .....	8
5.1 Conducted emissions on power supply lines .....	8
5.1.1 Test method .....	8
5.1.2 Results conducted emission measurement on AC mains .....	9
5.2 Radiated emissions .....	11
5.2.1 Method of measurement (radiated emissions) .....	11
5.2.2 Results preliminary measurement 9 kHz to 1 GHz .....	18
5.2.3 Result final measurement from 9 kHz to 30 MHz .....	21
5.2.4 Result final measurement from 30 MHz to 1 GHz .....	22
5.3 99 % BANDWIDTH .....	24
5.3.1 Method of measurement .....	24
5.3.2 Test results .....	25
6 Test equipment .....	26
7 Report history .....	27
8 List of annexes .....	27

## 1 Identification

### 1.1 Applicant

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Applicant represented during the test by the following person:	Mr. Sven SCHÄFER

### 1.2 Manufacturer

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Country:	Germany
Name for contact purposes:	Mr. Edmund SCHNEIDER
Phone:	+49 64 01 807 - 340
Fax:	+49 64 01 807 - 29340
eMail Address:	edmund.schneider@bender.de
Applicant represented during the test by the following person:	Mr. Sven SCHÄFER

### 1.3 Test Laboratory

The tests were carried out at:

**PHOENIX TESTLAB GmbH**  
Königswinkel 10  
32825 Blomberg  
Germany

accredited by Deutsche Akkreditierungsstelle GmbH (DAkkS) in compliance with DIN EN ISO/IEC 17025 under Reg. No. D-PL-17186-01-02, FCC Test Firm Accreditation with the registration number 469623, designation number DE0004 and Industry Canada Test site registration SITE# IC3469A-1.

## 1.4 EUT (Equipment Under Test)

Type object: *	RFID module
Model name / HVIN: *	RFID110-L1
Model number: *	B94060110
Serial No.:	1603508385
FCC ID: *	2AHQO-RFID
IC: *	21240-RFID
PCB identifier:	A 346586
Hardware version: *	01-CC
Software version: *	N/A
Lowest internal frequency: *	13.56 MHz
Highest internal frequency: *	27.12 MHz

## 1.5 Technical data of equipment

Channel 1	RX:	13.560 MHz		TX:	13.560 MHz					
Rated RF output power: *	<250 mW									
Duty cycle: *	100 %									
Antenna type: *	PCB Loop Antenna with 0.002 m <sup>2</sup>									
Number of channels: *	1									
Antenna connector: *	No									
Modulation: *	ASK									
Data rate: *	424 kbit/s									
Supply Voltage: *	U <sub>nom</sub> = 5.0 V DC	3.3 VDC 5.0 V DC	U <sub>min</sub> = 4.75 V DC	3.135 VDC 4.75 V DC	U <sub>max</sub> = 5.25 V DC	3.465 VDC 5.25 V DC				
Temperature range: *	-30 °C to +70 °C									
Ancillary used for test:	Friwo AC/DC adaptor type 3288 for the conducted emission measurement on supply line, metal charging station housing, USB to fibre optics converter type Opto USB2.0 Transceiver- Hub, Laptop PC with test software.									

\* declared by the applicant.

Ports / Connectors			
Identification	Connector		Length during test
	EUT	Ancillary	
DC and data	RJ45	RJ45	0.4 m
-	-	-	-

## 1.6 Dates

Date of receipt of test sample:	04/11/2016
Start of test:	04/14/2016
End of test:	04/27/2016

## 2 Operational states and test setup

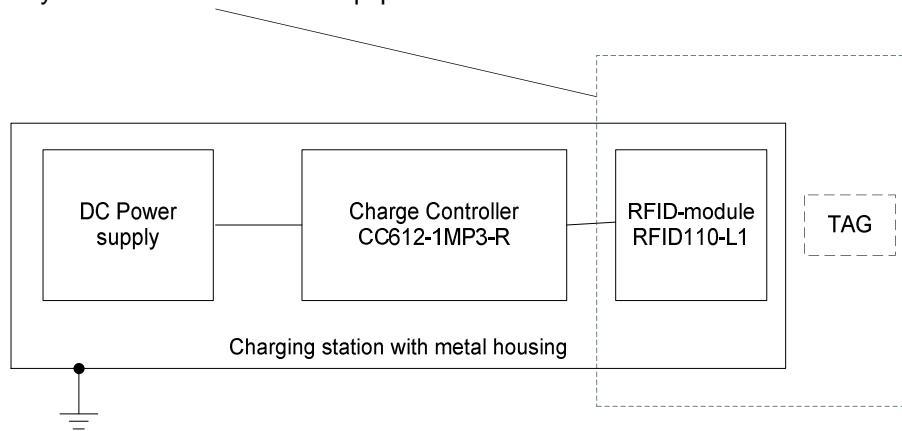
All measurements were carried out with an unmodified sample operating with a test-software. With this software the EUT was able to read the same TAG continuously.

During the tests the RFID module was connected to the charge controller CC612-1MP3-R, which was powered by 12 V DC. The charge controller and the RFID module were mounted inside grounded metal housing of a charging station (host). During all test the charge controller was connected to a laptop PC with control software, which shows the TAG data via an USB to fibre optics converter.

The conducted emission measurement on the power supply line was carried out on the AC/DC adapter type Friwo AC/DC adaptor type 3288, which supplies the charge controller. The AC/DC adaptor was powered by an AC mains network with 120 V AC / 60 Hz.

No spurious emission measurement of the receiver was carried out, because the co located transmitter transmits continuously.

Physical boundaries of the Equipment Under Test



### 3 Additional information

The EUT was not labeled as required by FCC / IC.

### 4 Overview

Application	Frequency range [MHz]	FCC 47 CFR Part 15 section [2]	RSS-Gen, Issue 4 [4] and RSS 210, Issue 8 [3]	Status	Refer page
Conducted emissions on supply line	0.15 – 30	15.207 (a)	8.8 [4]	Passed	8 et seq.
Radiated emissions	0.009 – 1.000	15.205 (a) 15.209 (a)	8.9 [4] A 2.6 [3]	Passed	11 et seq.
99 % bandwidth	13.56	-	6.6 [4]	-	24 et seq.

## 5 Results

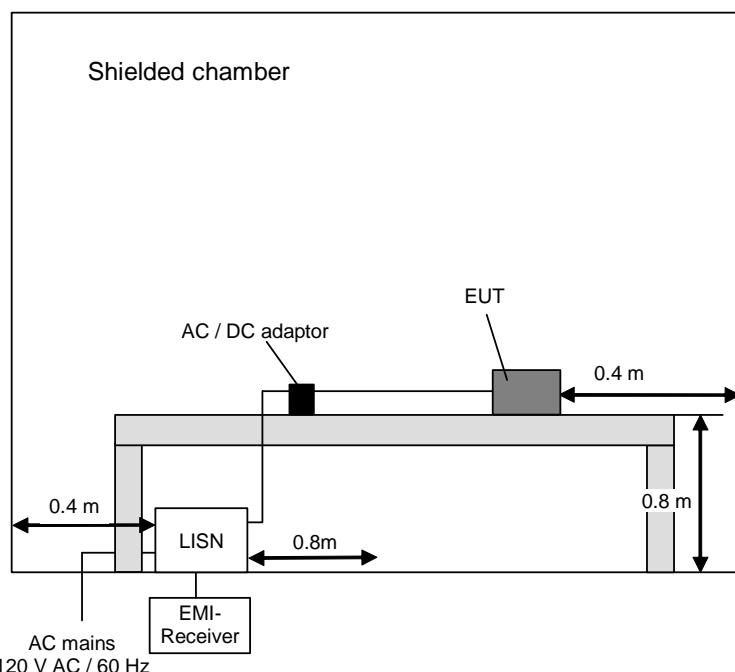
### 5.1 Conducted emissions on power supply lines

#### 5.1.1 Test method

This test will be carried out in a shielded chamber. 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 above the ground plane. Floor-standing devices will be placed directly on the ground plane. The setup of the Equipment under test will be in accordance to [1].

The frequency range 150 kHz to 30 MHz will be measured with an EMI Receiver set to MAX Hold mode with peak and average detector and a resolution bandwidth of 9 kHz. A scan will be carried out on the phase (or plus pole in case of DC powered devices) of the AC mains network. If levels detected 10 dB below the appropriate limit, this emission will be measured with the average and quasi-peak detector on all lines.

Frequency range	Resolution bandwidth
150 kHz to 30 MHz	9 kHz



### 5.1.2 Results conducted emission measurement on AC mains

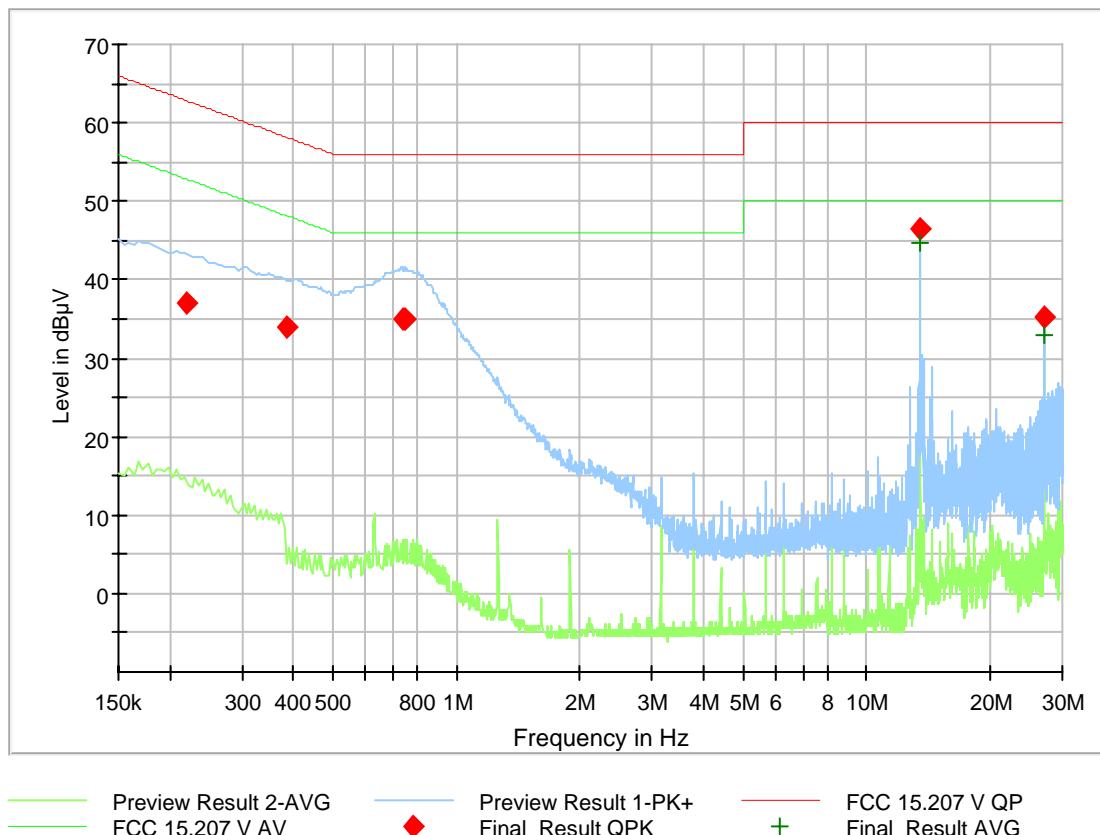
Ambient temperature:	22 °C	Relative humidity:	29 %
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#### EUT Information

Test description: Conducted emission measurement  
 EUT: CC612-1MP3-R with RFID110-L1  
 Manufacturer: Bender GmbH & Co. KG  
 Operating conditions: Reading TAG, mounted inside metal host  
 Test site: Phoenix TESTLAB GmbH, shielded room M4  
 Operator: Th. KÜHN  
 Comment: Supplied by Friwo AC/DC adaptor type 3288,  
 powered with 120 V AC / 60 Hz

#### Full Spectrum

Full Spectrum



## Final\_Result

Frequency (MHz)	QuasiPeak (dB $\mu$ V)	Average (dB $\mu$ V)	Limit (dB $\mu$ V)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	PE	Corr. (dB)
0.219300	37.06	---	62.85	25.79	5000.0	9.000	N	GND	9.8
0.384000	33.87	---	58.19	24.32	5000.0	9.000	N	FLO	9.9
0.744000	35.10	---	56.00	20.90	5000.0	9.000	N	FLO	9.9
0.753000	35.07	---	56.00	20.93	5000.0	9.000	N	FLO	9.9
13.559100	46.58	---	60.00	13.42	5000.0	9.000	L1	GND	10.7
13.560000	---	44.69	50.00	5.31	5000.0	9.000	L1	FLO	10.7
27.119400	---	32.97	50.00	17.03	5000.0	9.000	L1	GND	11.1
27.119400	35.21	---	60.00	24.79	5000.0	9.000	L1	FLO	11.1

Test: Passed

Test equipment (refer chapter 6):

1 - 3, 5 - 6

## 5.2 Radiated emissions

### 5.2.1 Method of measurement (radiated emissions)

The radiated emission measurement is subdivided into six stages.

- A preliminary measurement carried out in a fully anechoic chamber with a fixed antenna height in the frequency range 9 kHz to 1 GHz.
- A final measurement carried out on an outdoor test side without reflecting ground plane and a fixed antenna height in the frequency range 9 kHz to 30 MHz.
- A preliminary measurement carried out in a fully anechoic chamber with a fixed antenna height in the frequency range 30 MHz to 1 GHz.
- A final measurement carried out on an open area test side with reflecting ground plane and various antenna heights in the frequency range 30 MHz to 1 GHz.
- A preliminary measurement carried out in a fully anechoic chamber with a fixed antenna height in the frequency range 1 GHz to 5 GHz.
- A final measurement carried out in a fully anechoic chamber with a fixed antenna height in the frequency range 1 GHz to 5 GHz.

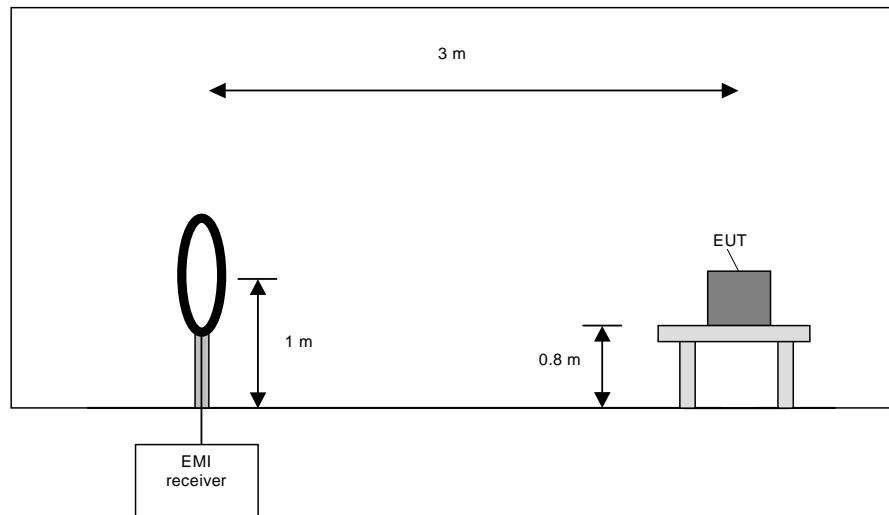
#### Preliminary measurement (9 kHz to 30 MHz):

In the first stage a preliminary measurement will be performed in a shielded room with a measuring distance of 3 meters. Table-top 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 [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 5) with the other orthogonal axes of the EUT (because of EUT is a module and might be used in a handheld equipment application).
- 7) Rotate the measuring antenna and repeat steps 1) to 5).

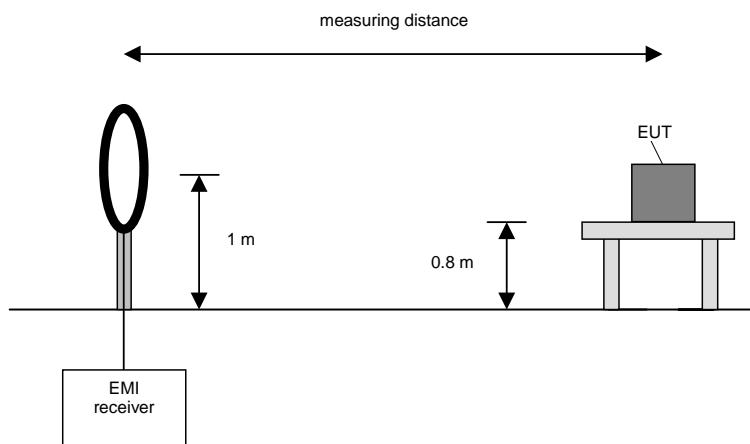
Final measurement (9 kHz to 30 MHz):

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 frequencies, which were detected during the preliminary measurements, 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 the EUT is a module and might be used in a handheld equipment application).

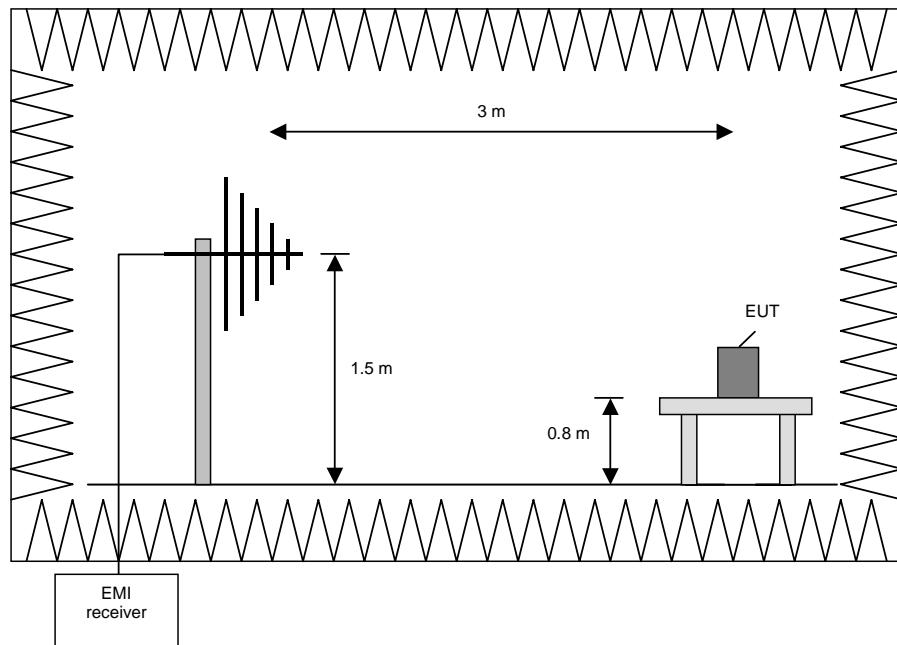
Preliminary measurement (30 MHz to 1 GHz)

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 [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 120 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	120 kHz



### Procedure preliminary measurement:

Prescans were performed in the frequency range 30 MHz to 1 GHz.

The following procedure will be used:

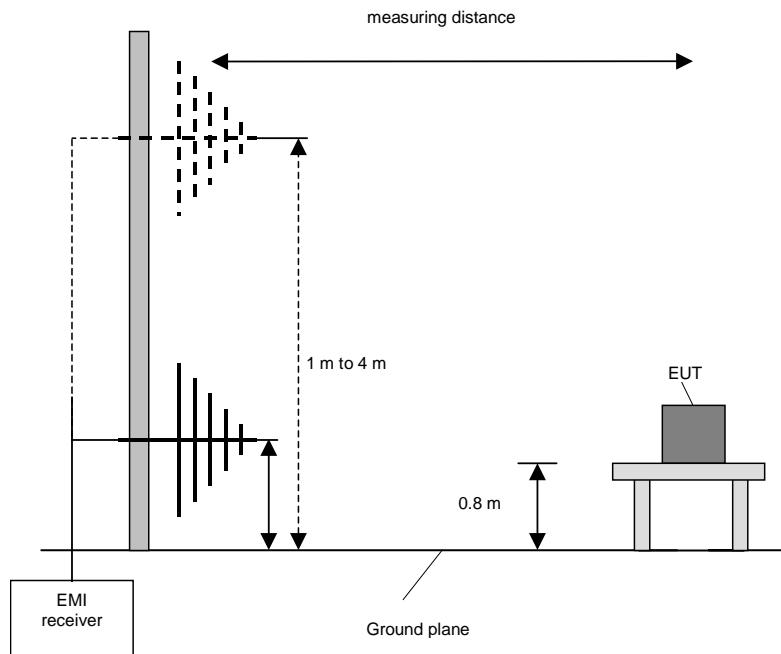
1. Monitor the frequency range at horizontal polarisation and a EUT azimuth of 0 °.
2. Manipulate the system cables within the range to produce the maximum level of emission.
3. Rotate the EUT by 360 ° to maximize the detected signals.
4. Make a hardcopy of the spectrum.
5. Measure the frequency of the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

### **Final measurement (30 MHz to 1 GHz)**

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 and 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.

### Preliminary and final measurement (1 GHz to 5 GHz)

This measurement will be performed in a fully anechoic chamber. Floor-standing devices will be placed directly on the turntable/ground plane. The setup of the Equipment under test will be in accordance to [1]. The resolution bandwidth of the EMI Receiver will be set to the following values:

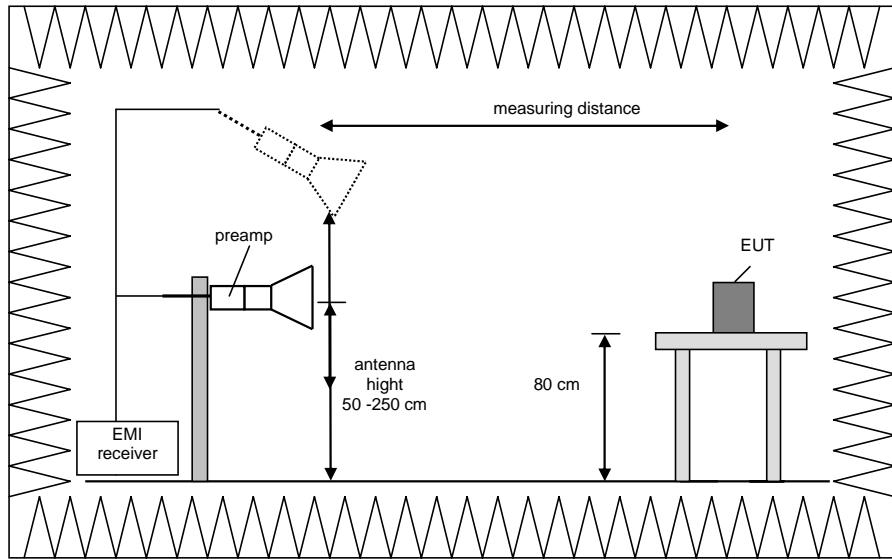
Frequency range	Resolution bandwidth (preliminary)	Resolution bandwidth (final)
1 GHz to 5 GHz	1 MHz	1 MHz

### Preliminary measurement (1 GHz to 5 GHz)

The frequency range will be divided into different sub ranges depending of the frequency range of the used horn antenna. The spectrum analyser set to MAX Hold mode and a resolution bandwidth of 1MHz. The measurement will be performed in horizontal and vertical polarisation of the measuring antenna in a measuring distance of 1.9 m.

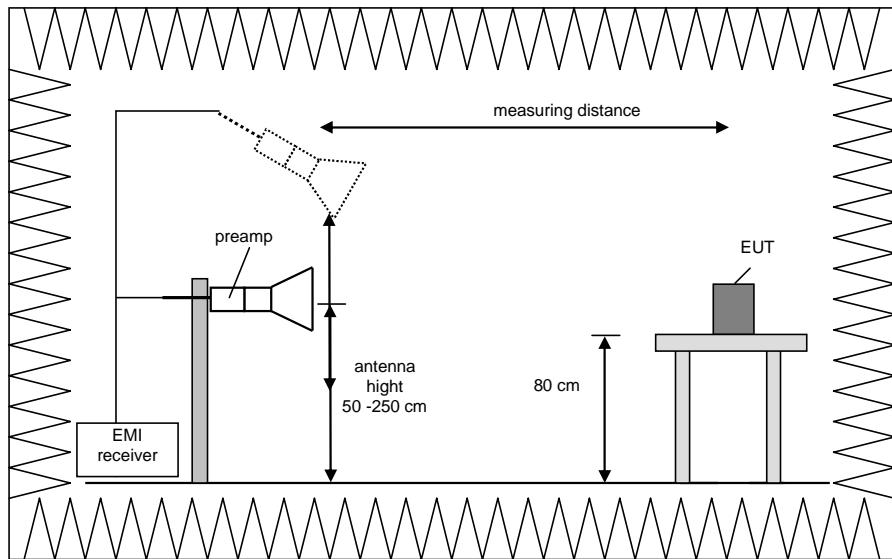
The antenna high was varied from 50 cm up to 250 cm.

The EUT was turned around 360 ° at each antenna high and polarisation and the plots were stored. After comparing the plots the antenna was set to the position where the maximum value for each emission was found for the final measurement.



### Final measurement (1 GHz to 5 GHz)

The frequency range will be divided into different sub ranges depending of the frequency range of the used horn antenna. The EMI Receiver set to peak and average mode and a resolution bandwidth of 1 MHz. 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 ° in order to have the antenna inside the cone of radiation.



Procedure of measurement:

The measurements were performed in the frequency range 1 to 5 GHz.

The following procedure will be used:

- 1) Monitor the frequency range at horizontal and vertical polarisation and turn the EUT 360°.
- 2) Change the antenna high and repeat 1) with 50, 100, 150, 200 and 250 cm high and an elevation pointing towards the EUT.
- 3) Make a hardcopy of the spectrum with each antenna high.
- 4) Measure the frequency of the detected emissions with a lower span and resolution bandwidth to increase the accuracy and note the frequency value.
- 5) Compare the spectrum plots and take for each frequency the antenna high with the maximum emission.
- 6) Change the analyser mode to Clear / Write and found the maximum emission by rotating the EUT.
- 7) Measure the level of the detected frequency with the correct resolution bandwidth, with the antenna polarisation and azimuth and the peak and average detector, which causes the maximum emission.
- 8) Repeat steps 1) to 7) for the next antenna spot if the EUT is larger than the antenna beam width.

Step 1) to 6) are defined as preliminary measurement.

### 5.2.2 Results preliminary measurement 9 kHz to 1 GHz

Ambient temperature	21 °C	Relative humidity	37 %
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Position of EUT: The EUT was set-up on a non-conducting table.

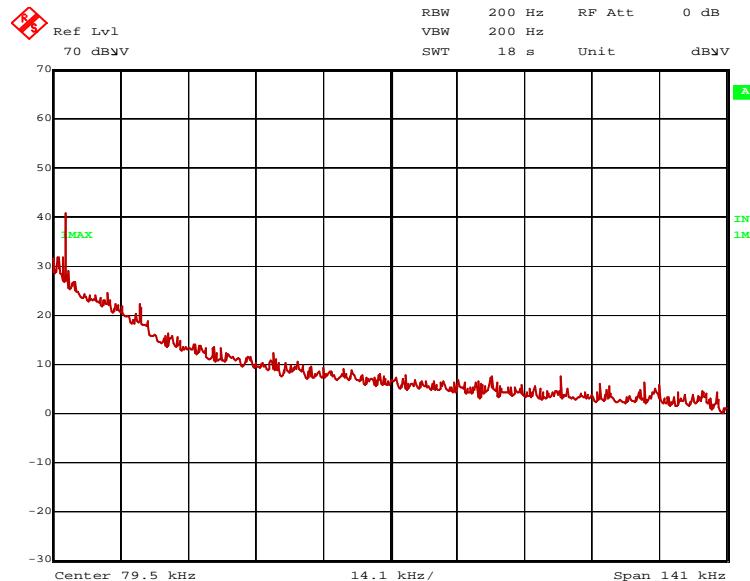
Cable guide: The cable of the EUT was fixed on the wooden table. For further information of the cable guide refer to the pictures in annex A of this test report.

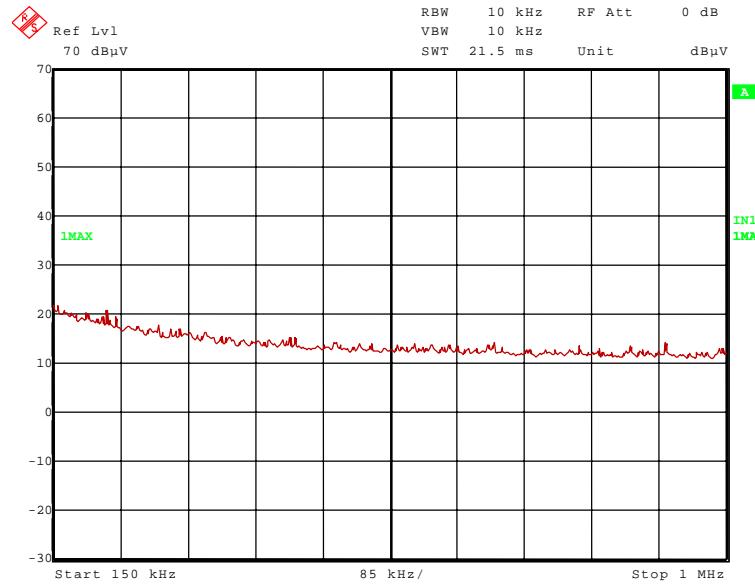
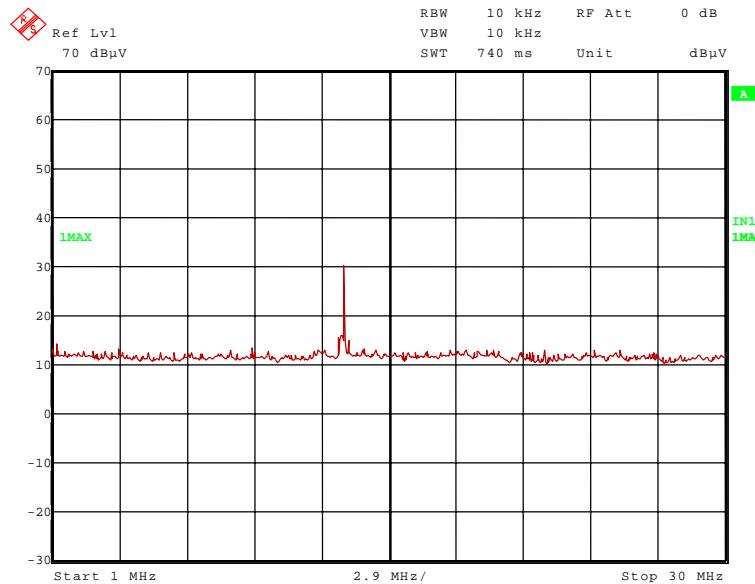
Test record: The test was carried out in normal operation mode of the EUT (reading a TAG). All results are shown in the following.

Power supply: During this test the EUT was powered by the CC612-1MP3-R.

Frequency range: According to [2] from 9 kHz to 1 GHz.

#### 160344\_206.wmf: Spurious emissions from 9 kHz to 150 kHz

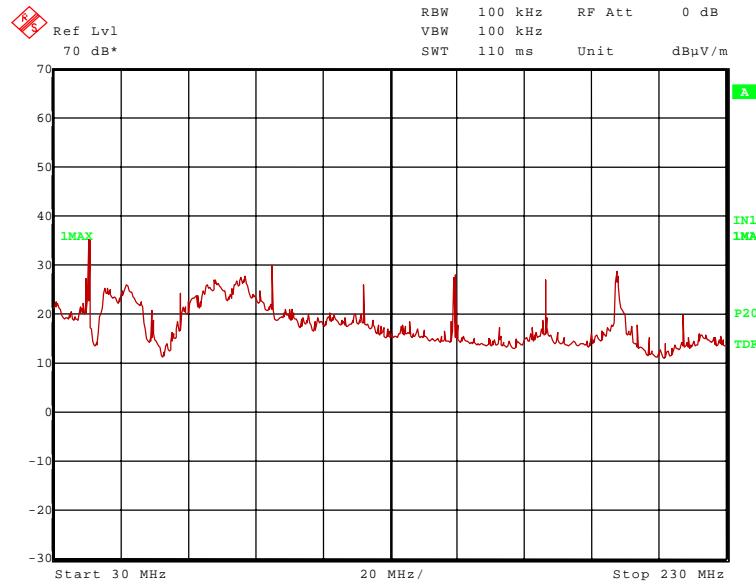
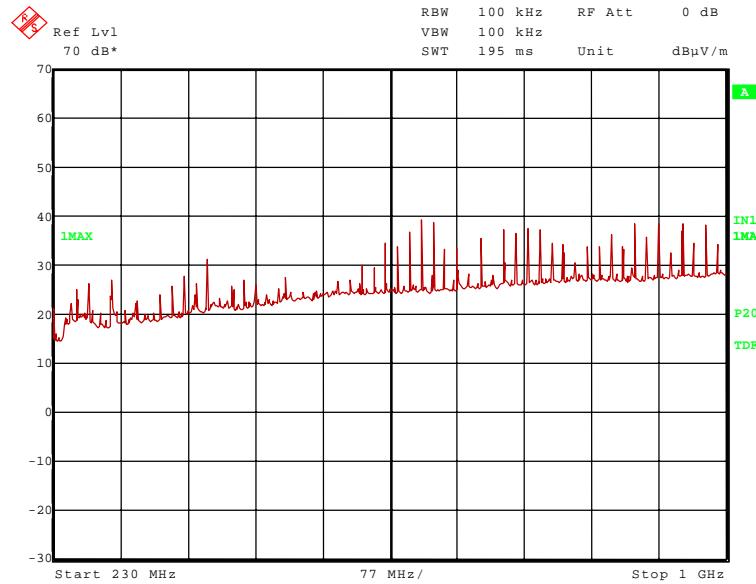


130344\_207.wmf: Spurious emissions from 150 kHz to 1 MHz

160344\_208.wmf: Spurious emissions from 1 MHz to 30 MHz


The following emissions were found according to [2] and [3].

11.6 kHz and 13.560 MHz

These frequencies have to be measured on the outdoor test site. The results were presented in the following.

160344\_209.wmf: Spurious emissions from 30 MHz to 230 MHz

160344\_210.wmf: Spurious emissions from 230 MHz to 1 GHz


The following frequencies were found emission test outside restricted bands during the preliminary radiated:

- 40.680 MHz, 94.920 MHz, 149.160 MHz, 197.757 MHz, 650.880 MHz, 664.440 MHz, 745.800 MHz and 922.080 MHz.

The following frequency was found inside the restricted bands during the preliminary radiated.

- 406.800 MHz.

These frequencies have to be measured on the open area test site. The results were presented in the following.

Test equipment used (see chapter 6)

30 – 35, 51

### 5.2.3 Result final measurement from 9 kHz to 30 MHz

Ambient temperature	16 °C	Relative humidity	53 %
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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, 10 m and 30 m.

Cable guide: The cable of the EUT was fixed on the non-conducting support. 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 normal operation mode of the EUT (awaiting a TAG). All results are shown in the following.

Power supply: During this test the EUT was powered by the CC612-1MP3-R.

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

$$\text{Result [dB}\mu\text{V/m]} = \text{reading [dB}\mu\text{V]} + \text{antenna factor [dB/m]}$$

<b>Results with measuring distance of 3 m</b>						
Frequency MHz	Result dB $\mu$ V/m	Limit <sup>2)</sup> dB $\mu$ V/m	Margin dB	Detector	Readings dB $\mu$ V	Antenna factor <sup>1)</sup> dB/m
0.0116	50.2	126.3	76.1	AV	30.2	20.0
13.560 <sup>3)</sup>	49.6	69.5	19.9	QP	29.6	20.0
<b>Results with measuring distance of 10 m</b>						
Frequency MHz	Result dB $\mu$ V/m	Limit <sup>2)</sup> dB $\mu$ V/m	Margin dB	Detector	Readings dB $\mu$ V	Antenna factor <sup>1)</sup> dB/m
0.0116	27.3	86.3	59.0	AV	7.3	20.0
13.560 <sup>3)</sup>	35.9	49.5	13.6	QP	15.9	20.0
<b>Results with measuring distance of 30 m</b>						
Frequency MHz	Result dB $\mu$ V/m	Limit <sup>2)</sup> dB $\mu$ V/m	Margin dB	Detector	Readings dB $\mu$ V	Antenna factor <sup>1)</sup> dB/m
0.0116	Signal was below the noise floor of the measuring system at 30 m distance					
13.560 <sup>3)</sup>	Signal was below the noise floor of the measuring system at 30 m distance					
Measurement uncertainty: +2.2 dB / -3.6 dB						

<sup>1)</sup>: Cable loss included

<sup>2)</sup>: Limits according to [2] and [3] extrapolated with a factor of 40dB/decade according to [2]

<sup>3)</sup>: Wanted signal

Test: Passed

Test equipment used for the test:

51 - 53

### 5.2.4 Result final measurement from 30 MHz to 1 GHz

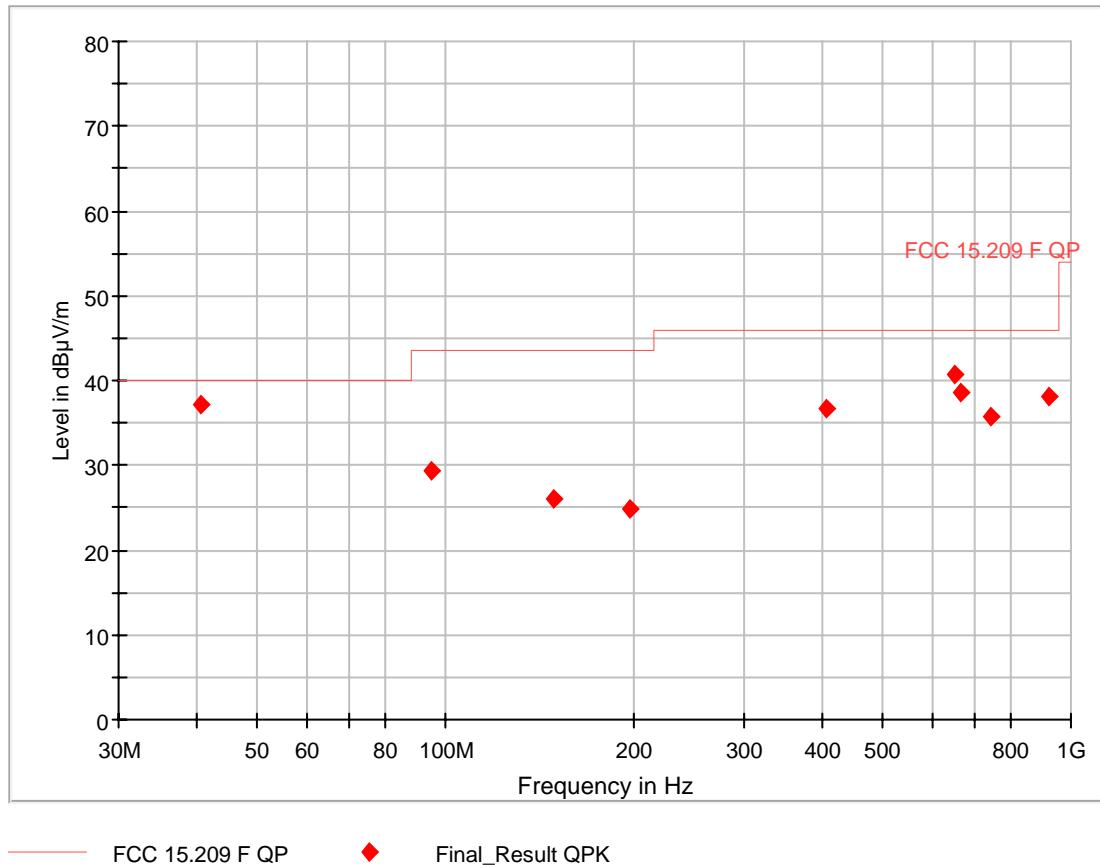
Ambient temperature	21 °C	Relative humidity	33 %
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Test description: Radiated emission measurement  
 EUT: CC612-1MP3-R with RFID110-L1  
 Manufacturer: Bender GmbH & Co. KG  
 Operating conditions: Reading TAG, metal host  
 Test site: Phoenix TESTLAB GmbH, OATS M6  
 Operator: Th. KÜHN  
 Comment:

The test results were calculated with the following formula:

Result [dB $\mu$ V/m] = reading [dB $\mu$ V] + antenna factor [dB/m] + cable attenuation (incl. the 6 dB attenuator)

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 are the measured results of the standard subsequent measurement on the open area test site.



The results of the standard subsequent 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.

**Result measured with the quasi-peak detector:**

Frequency MHz	Result dB $\mu$ V/m	Limit dB $\mu$ V/m	Margin dB	Readings dB $\mu$ V	Antenna factor dB/m	Cable loss (incl. 6 dB atten.) dB	Height cm	Azimuth deg	Pol.	Restr. Band
40.680	37.1	40.0	2.9	16.1	14.3	6.7	107.0	180.0	Vert.	No
94.920	29.4	43.5	14.1	11.8	10.5	7.1	150.0	120.0	Hor.	No
149.160	26.1	43.5	17.4	7.1	11.7	7.3	103.0	323.0	Vert.	No
197.757	24.9	43.5	18.6	8.5	8.9	7.5	139.0	166.0	Hor.	No
406.800	36.8	46.0	9.2	10.8	15.8	8.2	180.0	100.0	Hor.	Yes
650.880	40.6	46.0	5.4	10.1	19.6	8.9	229.0	4.0	Hor.	No
664.440	38.5	46.0	7.5	9.9	19.7	8.9	197.0	5.0	Hor.	No
745.800	35.9	46.0	10.1	5.1	21.7	9.1	107.0	336.0	Hor.	No
922.080	38.1	46.0	7.9	5.5	23.2	9.4	237.0	358.0	Hor.	No
Measurement uncertainty				+2.2 dB / -3.6 dB						

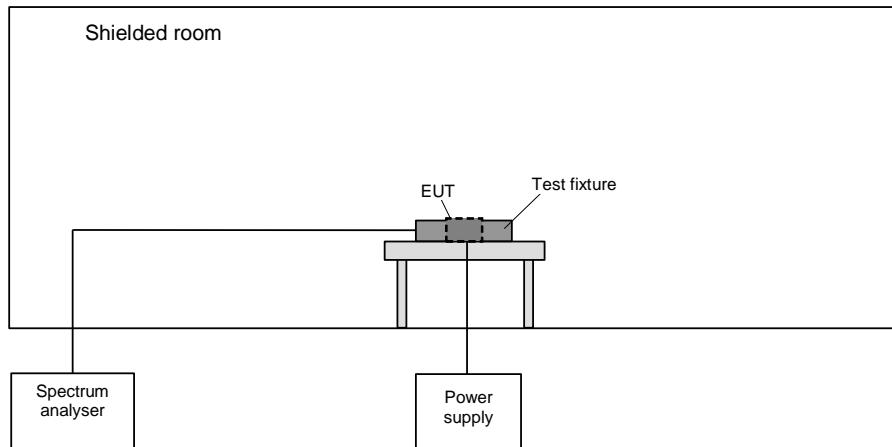
Test result: Passed

Test equipment (refer chapter 6):

14 - 21

## 5.3 99 % BANDWIDTH

### 5.3.1 Method of measurement



The following procedure will be used for the occupied bandwidth measurement according to [1]:

The span of the analyzer shall be set to capture all products of the modulation process, including the emission skirts. The resolution bandwidth shall be set to as close to 1% of the selected span as is possible without being below 1%. The video bandwidth shall be set to 3 times the resolution bandwidth. Video averaging is not permitted. Where practical, a sampling detector shall be used since a peak or, peak hold, may produce a wider bandwidth than actual.

The trace data points are recovered and are directly summed in linear terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached and that frequency recorded. The process is repeated for the highest frequency data points. This frequency is recorded.

The span between the two recorded frequencies is the occupied bandwidth.

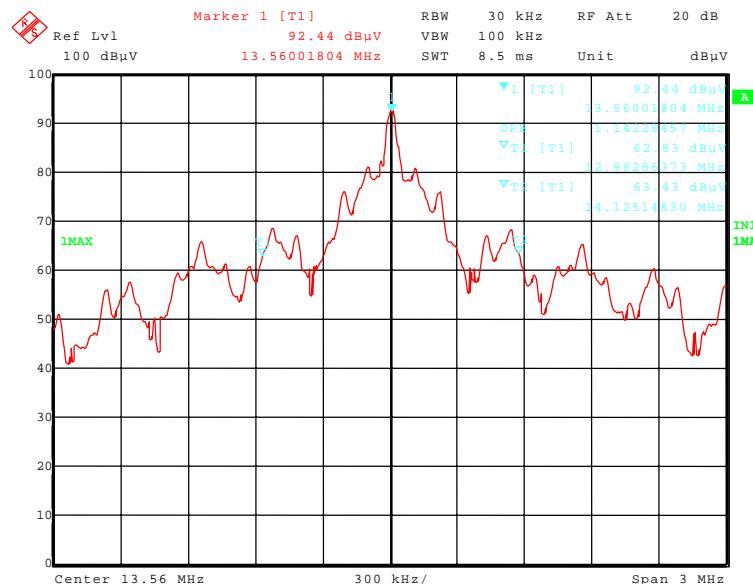
### 5.3.2 Test results

Ambient temperature:	22 °C	Relative humidity:	52 %
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Supply voltage: During all measurements the EUT was supplied by the CC612-1MP3-R.

Test record: The test was carried out while the EUT was reading a TAG.

#### 160344\_211.wmf: 99 % bandwidth:



$F_L$	$F_U$	BW ( $F_U - F_L$ )
12.9829 MHz	14.1251 MHz	1.1423 MHz
Measurement uncertainty		$< 1 \cdot 10^{-7}$

Test equipment used (see chapter 6)

31, 54
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## 6 Test equipment

No.	Test equipment	Type	Manufacturer	Serial No.	PM. No.	Cal. Date	Cal. due
1	Shielded chamber M4	-	Siemens	B83117S1-X158	480088	Weekly verification (system cal.)	
2	Measuring receiver	ESIB 26	Rohde & Schwarz	100292	481182	02/15/2016	02/2018
3	LISN	NSLK8128	Schwarzbeck	8128155	480058	02/16/2016	02/2018
5	AC-filter	B84299-D87-E3	Siemens	930262292	480097	Weekly verification (system cal.)	
6	EMI-Software	EMC 32	Rohde & Schwarz	-	481022	-	-
14	Open area test site	-	Phoenix Test-Lab	-	480085	Weekly verification (system cal.)	
15	Measuring receiver	ESIB7	Rohde & Schwarz	100304	480521	02/18/2016	02/2018
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 D	Chase	25761	480894	09/18/2014	09/2017
20	EMI-Software	EMC 32	Rohde & Schwarz	-	481022	-	-
21	6 dB attenuator	R412706000	Radiall	9833	410082	Annual verification	
30	Fully anechoic chamber M20	-	Albatross Projects	B83107-E2439-T232	480303	Weekly verification (system cal.)	
31	Measuring receiver	ESI 40	Rohde & Schwarz	100064	480355	02/16/2016	02/2017
32	Controller	MCU	Maturo	MCU/043/971107	480832	-	-
33	Turntable	DS420HE	Deisel	420/620/80	480315	-	-
34	Antenna support	AS615P	Deisel	615/310	480187	-	-
35	Antenna	CBL6112 B	Chase	2688	480328	04/14/2014	04/2017
43	RF-cable No. 3	Sucoflex 106B	Suhner	0563/6B	480670	Weekly verification (system cal.)	
44	RF-cable No. 36	Sucoflex 106B	Suhner	0522/6B	480571	Weekly verification (system cal.)	
45	RF-cable No. 40	Sucoflex 106B	Suhner	0708/6B	481330	Weekly verification (system cal.)	
46	Antenna	HL050	Rohde & Schwarz	100438	481170	08/27/2014	08/2017
47	Preamplifier	JS3-00101200-23-5A	Miteq	681851	480337	02/18/2016	02/2018
48	EMI-Software	EMC 32	Rohde & Schwarz	-	481800	-	-
50	RF-cable No. 30	RTK 081	Rosenberger	-	410141	Weekly verification (system cal.)	
51	Loop antenna	HFH2-Z2	Rohde & Schwarz	832609/014	480059	02/29/2016	02/2018
52	EMI test receiver	ESPC	Rohde & Schwarz	843756/006	480150	02/17/2016	02/2018
53	Outdoor test site	-	Phoenix Testlab	-	480293	-	-
54	Loop Antenna Ø = 110 mm	-	Phoenix Test-Lab	-	410084	Weekly verification (system cal.)	

## 7 Report history

Report Number	Date	Comment
F160344E4	06/27/2016	Document created
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## 8 List of annexes

Annex A                    Test setup photos                    8 pages

160344\_201.jpg: RFID110-L1, test setup fully anechoic chamber  
 160344\_208.jpg: RFID110-L1, test setup fully anechoic chamber  
 160344\_202.jpg: RFID110-L1, test setup fully anechoic chamber  
 160344\_203.jpg: RFID110-L1, test setup fully anechoic chamber  
 160344\_204.jpg: RFID110-L1, test setup outdoor test site  
 160344\_205.jpg: RFID110-L1, test setup outdoor test site  
 160344\_206.jpg: RFID110-L1, test setup open area test site  
 160344\_207.jpg: RFID110-L1, test setup shielded room

Annex B                    External photographs                    5 pages

160344\_b.jpg: CC612-1MP3-R, 3D-view 1  
 160344\_c.jpg: CC612-1MP3-R, 3D-view 2  
 160344\_q.jpg: RFID110-L1, top view  
 160344\_p.jpg: RFID110-L1, bottom view  
 160344\_r.jpg: RFID110-L1, used RFID card

Annex C                    Internal photographs                    2 pages

160344\_q.jpg: RFID110-L1, top view  
 160344\_p.jpg: RFID110-L1, bottom view