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Test Report

Report Number:

F154295E6

Equipment under Test (EUT):

BCMevoC (Body Controller Module Evolution C)

Applicant:

Continental Automotive GmbH

Manufacturer:

Continental Automotive Systems SRL



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] **ANSI C63.4: 2014** American National Standard for Methods of measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
- [3] **FCC CFR 47 Part 15** Radio Frequency Devices (Subpart B and C)
- [4] **RSS-210 Issue 8 (December 2010)** Licence-exempt Radio Apparatus (All Frequency Bands): Category I Equipment
- [5] **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 (clause 4) were fulfilled by the equipment under test.
The complete test results are presented in the following.

Test engineer:	Manuel BASTERT		08/01/2016
	Name	Signature	Date
Authorized reviewer:	Holger BENTJE		08/01/2016
	Name	Signature	Date

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1 Identification

1.1 Applicant

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eMail Address:	Dagmar.kolar@continental-corporation.com
Applicant represented during the test by the following person:	-

1.2 Manufacturer

Name:	Continental Automotive Systems SRL
Address:	Street Salzburg 8 550018 Sibiu
Country:	Romania
Manufacturer represented during the test by the following person:	-

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 90877 and Industry Canada Test site registration SITE# IC3469A-1.

1.4 EUT (Equipment Under Test)

Test object: *	21.85 kHz transmitter part and 433 MHz receiver part of Body Controller Module
HVIN / PMN: *	BCMevoC
Serial number: *	Engineering sample
PCB identifier:*	A2C74645605
Hardware version: *	H010
Software version: *	SWX060
FCC ID: *	KR5-BCMEVOC
IC Number: *	7812D-BCMEVOC

1.5 Technical data of equipment

TX:	21.85 kHz
RX channel 1:	433.47 MHz
RX channel 2:	433.92 MHz
RX channel 3:	434.37 MHz

Data of LF part (transmitter part)

Rated RF output power: *	< 6 mA/m @ 3 m					
Antenna type: *	Serial capacity and inductivity resonance circuit up to 5 antennas					
Number of channels: *	1					
Antenna connector: *	Customized two pole connector					
Modulation: *	BPSK					
Supply Voltage: *	U _{nom} =	10.8 V _{DC}	U _{min} =	12.0 V _{DC}	U _{max} =	13.2 V _{DC}
Temperature range: *	-40 °C to +85 °C					
Ancillary used for test:	-					

* declared by the applicant.

Data of RF part (receiver part)

Antenna type: *	PCB antenna					
Number of channels: *	3 simplex channels					
Modulation: *	2-FSK					
Sensitivity: *	-100 dBm					
3 dB bandwidth: *	165 kHz					
Frequency deviation	± 20 kHz					
Supply Voltage: *	$U_{nom}=$	10.8 V _{DC}	$U_{min}=$	12.0 V _{DC}	$U_{max}=$	13.2 V _{DC}
Temperature range: *	-40 °C to +85 °C					
Ancillary used for test: *	-					

* declared by the applicant.

The following external I/O cables were used:

Identification	Connector		Length *
	EUT	Ancillary	
Connection cables	Customized multi pole connector	Customized two pole connector -	0.45 m
DC supply	DC jack	DC plug	2 m

*: Length during the test if no other specified.

1.6 Dates

Date of receipt of test sample:	02/05/2016
Start of test:	03/04/2016
End of test:	06/22/2016

2 Operational states

The BCMevoC (body controller module) is a component of a driving authorisation system of a car. It receives data from a dedicated RF key at 433.47 MHz, 433.92 MHz and 434.37 MHz and sends back acknowledge data at 21.85 kHz. A test mode was implemented for the measurement, which sets the EUT into periodic transmit mode at 21.85 kHz in a 1.3 second interval. The receiver emission measurement was carried out without test mode. If the EUT is powered up it receives continuously in the 433 MHz band.

3 Additional information

During the tests the EUT was not labeled as required by FCC / IC.

4 Overview

Application	Frequency range [MHz]	FCC 47 CFR Part 15 section [3]	RSS 210, Issue 8 [4] or RSS-Gen, Issue 4 [5]	Status	Refer page
Bandwidth	General	N.a.	6.6 [5]	Passed	8 et seq.
Radiated emissions (transmitter)	0.009 – 1,000	15.205 (a) 15.209 (a)	8.9 [5] 8.10 [5]	Passed	10 et seq.
Conducted emissions on supply line	0.15 - 30	15.207 (a)	8.8 [5]	N. a. *	-
Radiated emissions (receiver)	30 – 5,000	15.109 (a)	7.1 [5]	Passed	22 et seq.
Antenna requirement	-	15.203	-	Passed **	-

*: Not applicable because of vehicular environment.

**: Unique coupling to intentional radiator, requirement fulfilled.

5 Test results

5.1 Bandwidth

5.1.1 Method of measurement

The calibration of the spectrum analyzer has to be checked with the help of a known signal from a signal generator. The EUT has to be connected to the spectrum analyzer via a low loss cable. If the EUT is not equipped with an antenna connector, a temporary antenna connector has to be installed. The EUT has to be switched on, the transmitter shall work with its maximum data rate.

The measurement will be performed at the upper, the lower end and the middle of the assigned frequency band.

20 dB bandwidth:

The following spectrum analyzer settings according to [1] shall be used:

- Span: App. 2 to 5 times the 20 dB bandwidth, centered on the actual channel.
- Resolution bandwidth: 1 % to 5 % of the 20 dB bandwidth.
- Video bandwidth: three times the resolution bandwidth.
- Set the reference level of the instrument as required, keeping the signal from exceeding the maximum input mixer level for linear operation. In general, the peak of the spectral envelope shall be more than $[10 \log (OBW/RBW)]$ below the reference level.
- Sweep: Auto.
- Detector function: peak.
- Trace mode: Max hold.

After trace stabilization the marker shall be set on the signal peak. The first display line has to be set on this value. The second display line has to be set 20 dB below the first line (or the peak marker). The frequency lines shall be set on the intersection points between the second display line and the measured curve.

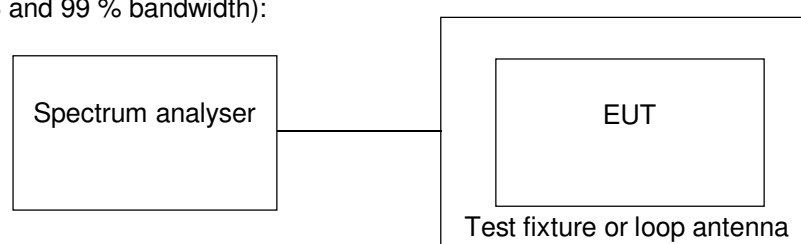
99 % bandwidth:

The following spectrum analyzer settings according to [1] shall be used:

- Span: The span of the analyzer shall be set to capture all products of the modulation process, including the emission skirts.
- Resolution bandwidth: The resolution bandwidth shall be in the range 1 % to 5 % of the occupied bandwidth.
- Video bandwidth: App. three times the resolution bandwidth.
- Sweep: Auto.
- Detector function: peak.
- Trace mode: Max hold.

After trace stabilization the marker shall be set on the signal peak and use the 99 % bandwidth measurement function of the analyzer.

Test set-up (20 dB and 99 % bandwidth):



5.2 Radiated emissions

5.2.1 General method of measurement

The radiated emission measurement is subdivided into five 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 site without reflecting ground plane and a fixed antenna height in the frequency range 9 kHz to 30 MHz.
- A final measurement carried out on an open area test site with reflecting ground plane and various antenna height in the frequency range 30 MHz to 1 GHz.
- A preliminary measurement carried out in a fully anechoic chamber with a variable antenna distance and height in the frequency range 1 GHz to 25 / 40 GHz.
- A final measurement carried out in a fully anechoic chamber with a fixed antenna height in the frequency range 1 GHz to 40 GHz.

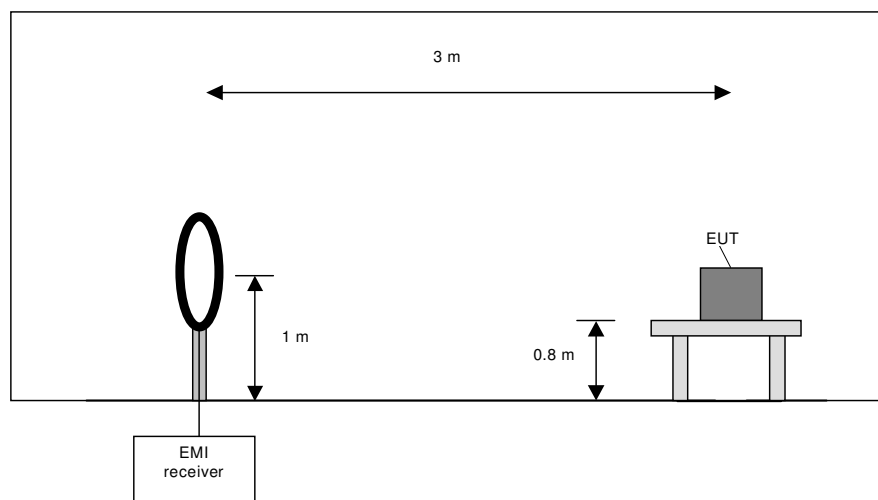
Preliminary measurement (9 kHz to 30 MHz):

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 setup 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 analyzer 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 analyzer 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 polarization 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).

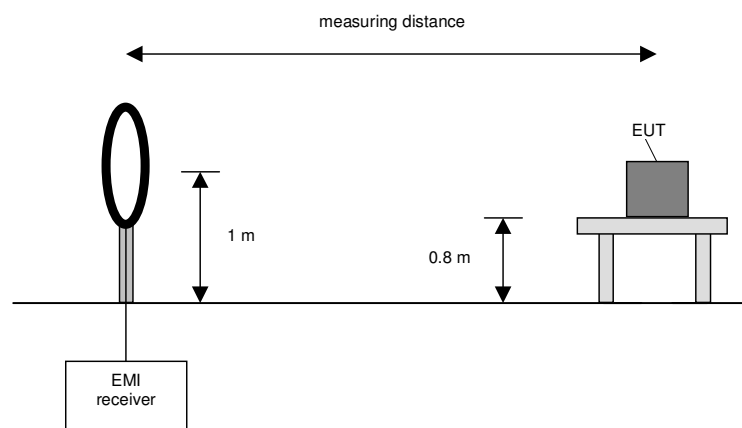
Final measurement (9 kHz to 30 MHz):

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) [3]. 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) [3].

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).

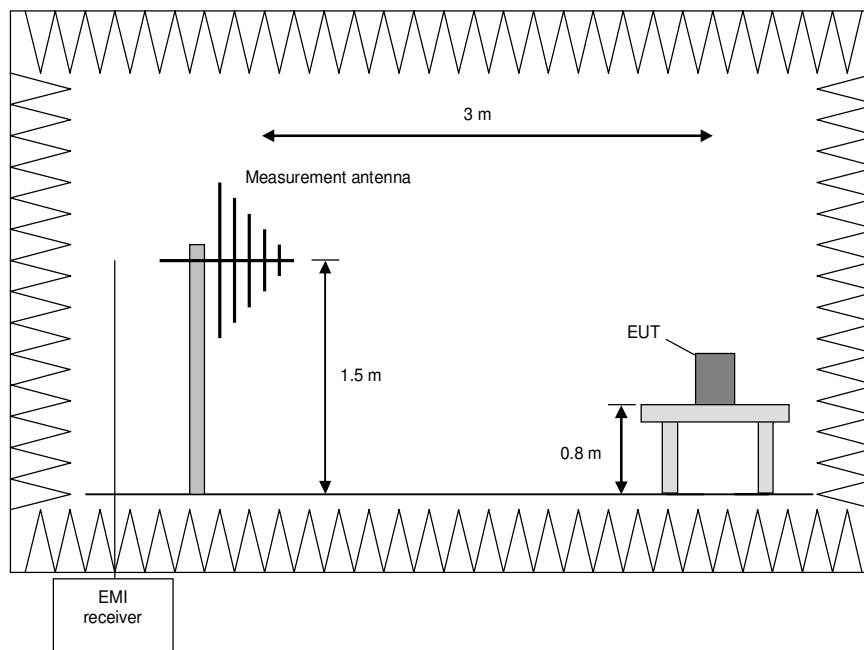
Preliminary measurement (30 MHz to 1 GHz)

In the first stage a preliminary measurement will be performed in a fully anechoic chamber with a measuring distance of 3 meter. Table top devices will set up on a non-conducting turn device on the height of 1.5 m. 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 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 polarization 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 230 MHz	100 kHz
230 MHz to 1 GHz	100 kHz



Procedure preliminary measurement:

Pre-scans were performed in the frequency range 30 MHz to 230 MHz and 230 MHz to 1 GHz.

The following procedure will be used:

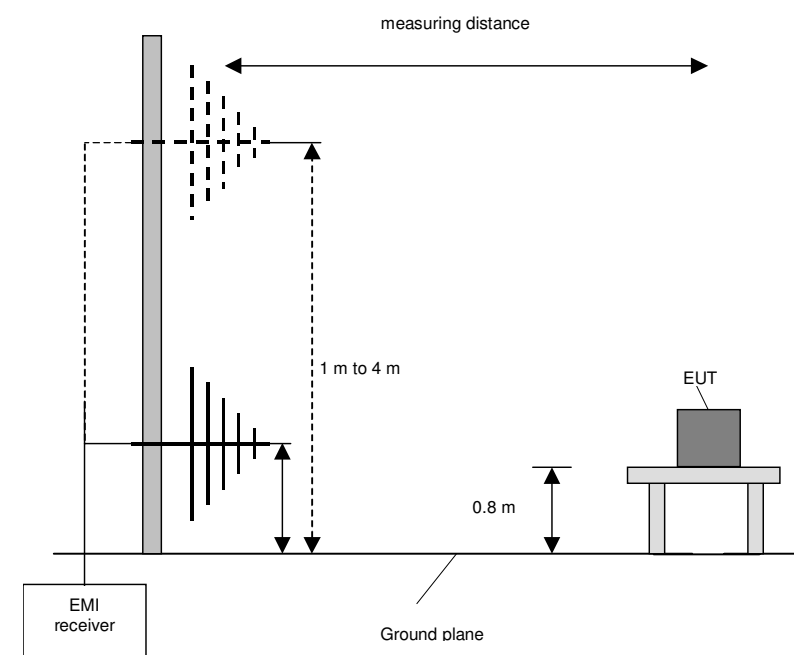
1. Monitor the frequency range at horizontal polarization and a EUT azimuth of 0 °.
2. Manipulate the system cables within the range to produce the maximum level of emission.
3. Rotate the EUT by 360 ° to maximize the detected signals.
4. Repeat 1) to 3) with the vertical polarization of the measuring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

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.

Preliminary and final measurement (1 GHz to 40 GHz)

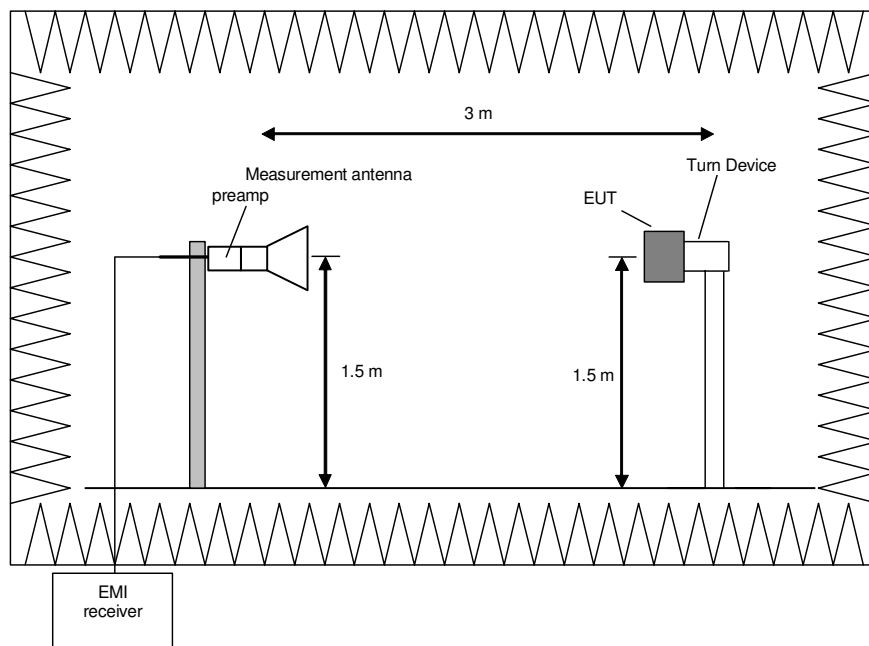
This measurement will be performed in a fully anechoic chamber. Table top devices will set up on a non-conducting turn device on the height of 1.5 m. The set-up of the Equipment under test will be in accordance to [1].

Preliminary measurement (1 GHz to 40 GHz)

The frequency range will be divided into different sub ranges depending of the frequency range of the used horn antenna. The spectrum analyzer set to MAX Hold mode and a resolution bandwidth of 100 kHz. The measurement will be performed in horizontal and vertical polarization of the measuring antenna and while rotating the EUT in its vertical axis in the range of 0 ° to 360 °. This measurement is repeated after raising the EUT in 30 ° steps according 6.6.5.4 in [1].

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

Frequency range	Resolution bandwidth
1 GHz to 4 GHz	100 kHz
4 GHz to 12 GHz	100 kHz
12 GHz to 18 GHz	100 kHz
18 GHz to 25 / 26.5 GHz	100 kHz
26.5 GHz to 40 GHz	100 kHz



Procedure preliminary measurement:

Pre-scans were performed in the frequency range 1 to 40 GHz.

The following procedure will be used:

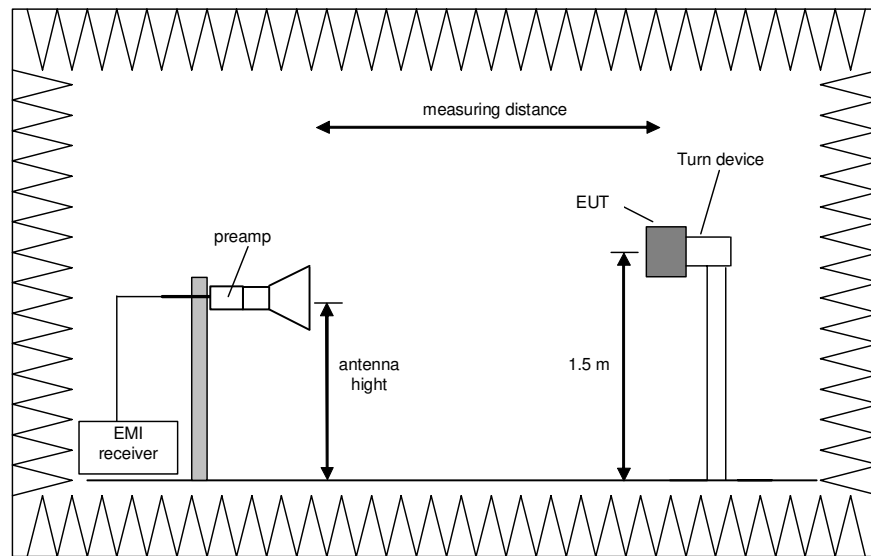
1. Monitor the frequency range at horizontal polarization and a EUT azimuth of 0 °.
2. Rotate the EUT by 360° to maximize the detected signals.
3. Repeat 1) to 2) with the vertical polarization of the measuring antenna.
4. Make a hardcopy of the spectrum.
5. Repeat 1) to 4) with the EUT raised by an angle of 30° (60°, 90°, 120° and 150°) according to 6.6.5.4 in [1].
6. Measure the frequency of the detected emissions with a lower span and resolution bandwidth to increase the accuracy and note the frequency value.
7. The measurement antenna polarization, with the according EUT position (Turntable and Turn device) which produces the highest emission for each frequency will be used for the final measurement. The six closest values to the applicable limit will be used for the final measurement.

Final measurement (1 GHz to 40 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 by rotating the turntable through 0 to 360° in the worst-case EUT orientation which was obtained during the preliminary measurements.

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

Frequency range	Resolution bandwidth
1 GHz to 4 GHz	1 MHz
4 GHz to 12 GHz	1 MHz
12 GHz to 18 GHz	1 MHz
18 GHz to 25 / 26.5 GHz	1 MHz
26.5 GHz to 40 GHz	1 MHz



Procedure of measurement:

The measurements were performed in the frequency ranges 1 GHz to 4 GHz, 4 GHz to 12 GHz, 12 GHz to 18 GHz, 18 GHz to 25 /26.5 GHz and 26.5 GHz to 40 GHz.

The following procedure will be used:

- 1) Set the turntable and the turn device to obtain the worst-case emission for the first frequency identified in the preliminary measurements.
- 2) Set the measurement antenna polarization to the orientation with the highest emission for the first frequency identified in the preliminary measurements.
- 3) Set the spectrum analyzer to EMI mode with peak and average detector activated.
- 4) Rotate the turntable from 0° to 360° to find the EUT angle that produces the highest emissions.
- 5) Note the highest displayed peak and average values
- 6) Repeat the steps 1) to 5) for each frequency detected during the preliminary measurements.

5.2.2 Test results 21.85 kHz transmitter

5.2.2.1 Preliminary radiated emission measurement (9 kHz to 1 GHz)

Ambient temperature	21 °C	Relative humidity	45 %
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Position of EUT: The EUT was set-up on a non-conducting table of a height of 0.8 m and 1.5 m. The distance between EUT and antenna was 3 m.

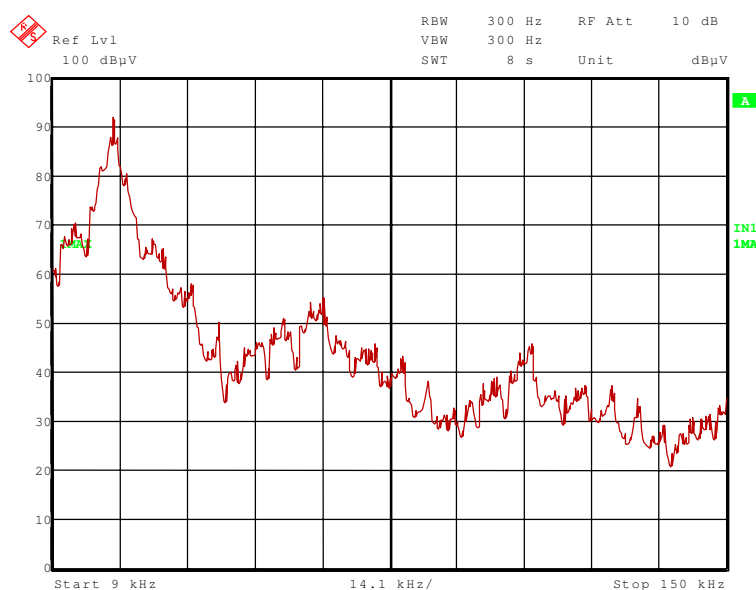
Cable guide: For detail information of test set-up and the cable guide refer to the pictures in annex A of this test report.

Test record: All results are shown in the following.

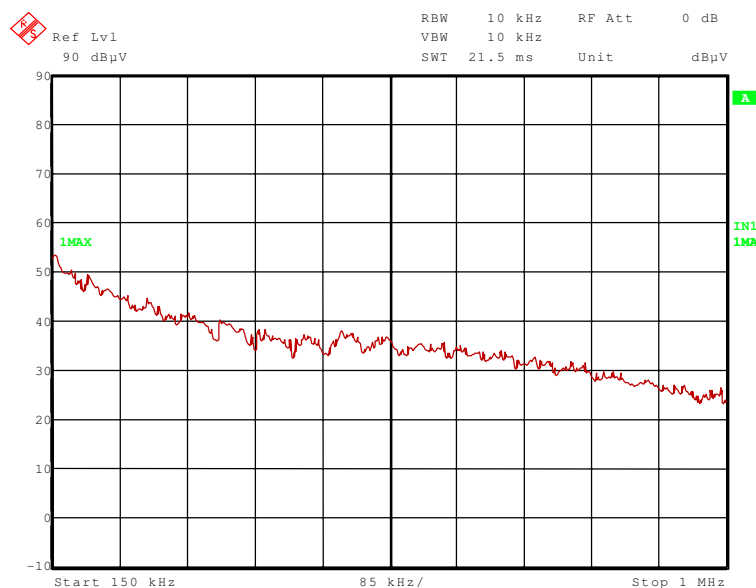
Supply voltage: During all measurements the EUT was supplied by a vehicle battery with 12 V_{DC}.

Frequency range: The preliminary measurement was carried out in the frequency range 9 kHz to 1 GHz according to [3].

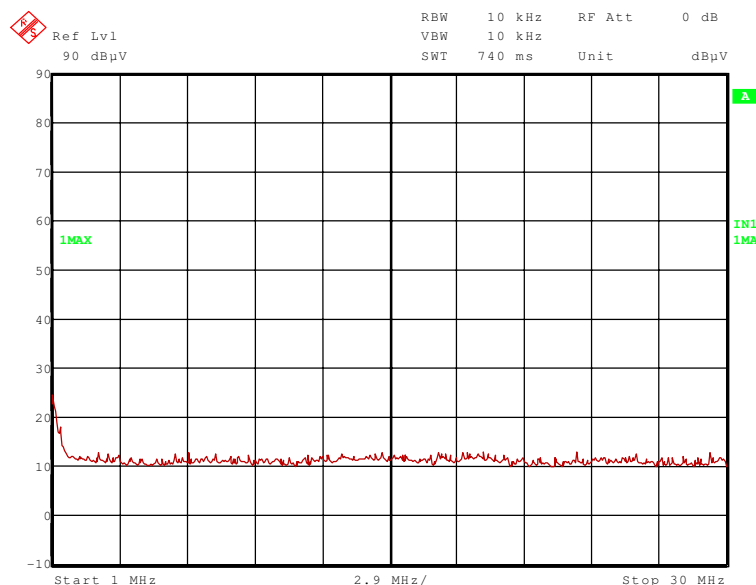
154295_7.wmf: Spurious emissions from 9 kHz to 150 kHz:



154295_8.wmf: Spurious emissions from 150 kHz to 1 MHz:



154295_9.wmf: Spurious emissions from 1 MHz to 30 MHz:



The following frequencies were found inside restricted bands during the preliminary emission measurement from 9 kHz to 30 MHz:

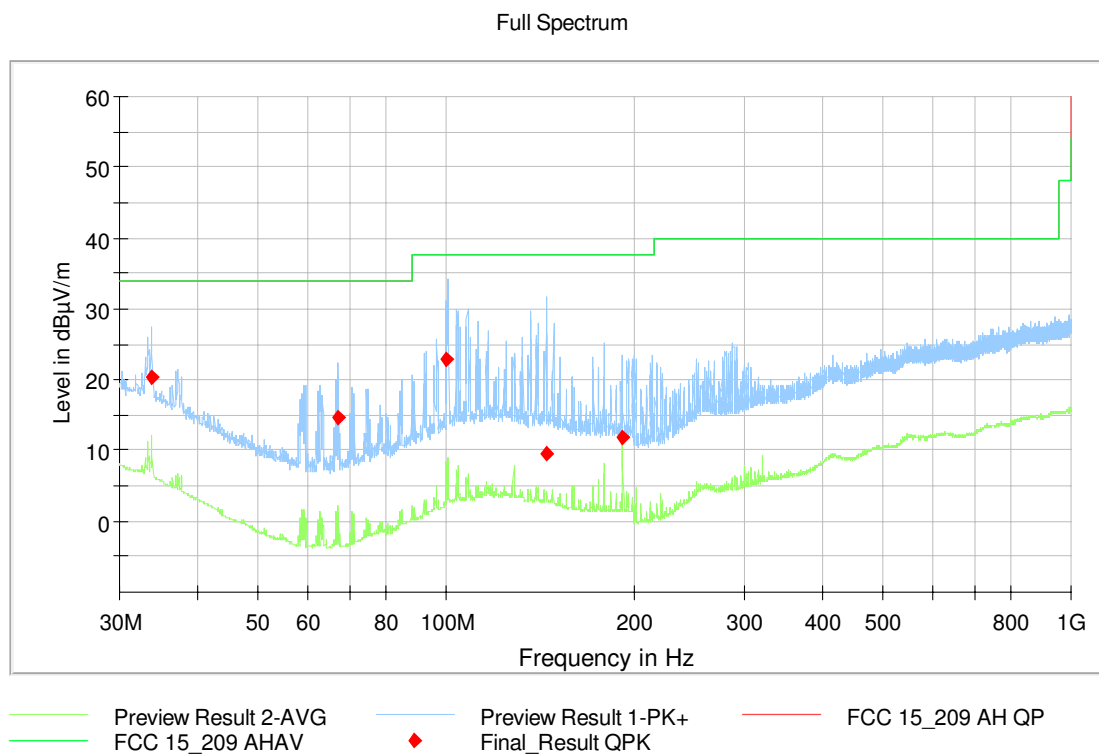
109.25 kHz

The following frequencies were found outside restricted bands during the preliminary emission measurement from 9 kHz to 30 MHz:

21.85 kHz (wanted signal), 65.55 kHz, 152.95 kHz, 196.65 kHz and 1005.1 kHz.

These frequencies have to be measured in a final measurement at the outdoor test site.

Preliminary spurious emission measurement from 30 MHz to 1 GHz:



No frequencies were found inside the restricted bands during the preliminary radiated emission test.

The following frequencies were found outside the restricted bands during the preliminary radiated emission test: 33.804 MHz, 67.26 MHz, 100.284 MHz, 144.432 MHz and 191.508 MHz.

These frequencies have to be measured in a final measurement. The results are presented in the following.

Test equipment used (refer clause 6):

1 - 6, 10 -12, 17, 25

5.2.2.2 Final radiated emission measurement (9 kHz to 30 MHz)

Ambient temperature	10 °C	Relative humidity	50 %
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Measurement result of wanted signal:

Radiated emission level (dB μ V/m) at 10 m distance					
f (kHz)	Bandwidth ¹⁾ (Hz)	Level ²⁾ (dB μ V/m)	Limit ³⁾ (dB μ V/m)	Margin (dB)	Result
21.85	200	74.6	100.8	26.2	Passed
Measurement uncertainty: < $\pm$ 4 dB					

¹⁾ The measuring receiver bandwidth

²⁾ Level measured with average detector.

³⁾ Limit calculated according to [3] §15.209 (a) and §15.31 (f)(2).

The measurement was carried out in 10 m distance to get a sufficient result.

Measurement result of unwanted emissions:

Radiated emission level (dB μ V/m) at 3 m distance					
f (kHz)	Bandwidth ¹⁾ (kHz)	Level (dB μ V/m)	Limit ⁴⁾ (dB μ V/m)	Margin (dB)	Result
65.55	0.2	69.8 ²⁾	111.3	41.5	Passed
109.25	0.2	56.7 ³⁾	106.8	50.1	Passed
152.95	0.2	56.8 ²⁾	103.9	47.1	Passed
196.65	0.2	61.9 ²⁾	101.7	39.8	Passed
1005.1	10	Below noise floor of the system	67.6	-	Passed
Measurement uncertainty: < $\pm$ 4 dB					

¹⁾ The measuring receiver bandwidth

²⁾ Levels measured with average detector.

³⁾ Levels measured with quasi peak detector.

⁴⁾ Limit calculated according to [3] §15.209 (a) and §15.31 (f)(2).

The measurement was carried out in a 3 m distance because the emissions are not measurable in a 10 m distance.

Test equipment used (refer clause 6):

2, 17, 28

5.2.2.3 Final radiated emission measurement (30 MHz to 1 GHz)

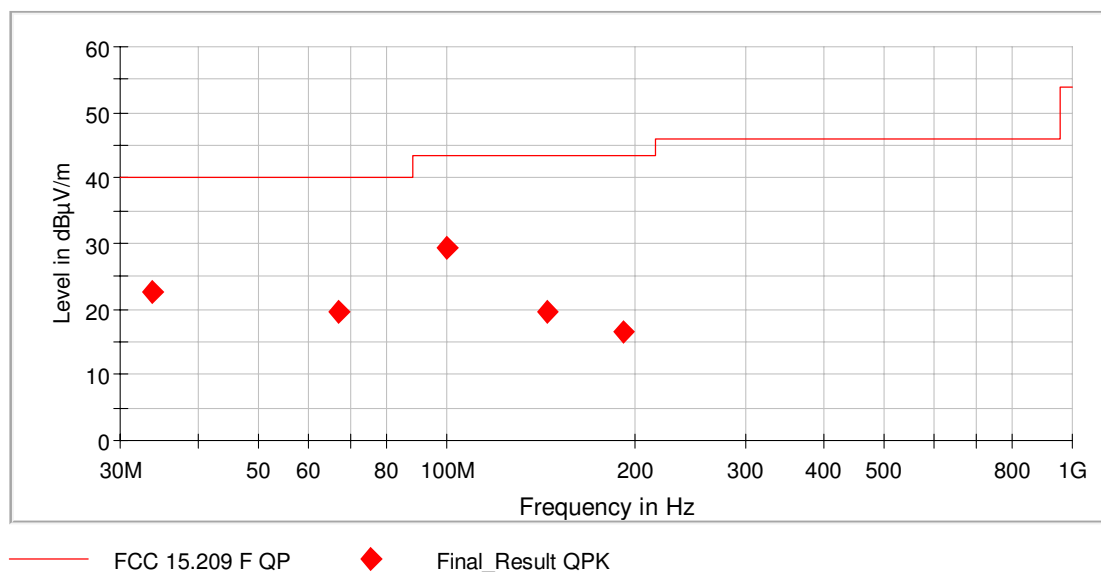
Ambient temperature	23 °C	Relative humidity	56 %
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Position of EUT: The EUT was set-up on a non-conducting table of a height of 0.8 m .The distance between EUT and antenna was 3 m.

Cable guide: For detail information of test set-up and the cable guide refer to the pictures in annex A of this test report.

Test record: All results are shown in the following.

Supply voltage: During all measurements the EUT was supplied by a vehicle battery with 12 V_{DC}.



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.

Final result measured with the Quasi-Peak detector:

Frequency MHz	Final result dBμV/m	Limit dBμV/m	Margin dB	Readings dBμV	Antenna factor 1/m	Cable loss dB	Height cm	Azim deg.	Pol.	Restr. Band
33.804	22.7	40.0	17.3	4.1	18.0	0.6	100	6	Hor.	No
67.260	19.5	40.0	20.5	12.4	6.2	0.9	103	354	Hor.	No
100.284	29.4	43.5	14.1	17.6	10.8	1.1	357	40	Vert.	No
144.432	19.7	43.5	23.8	6.5	11.8	1.3	103	345	Hor.	No
191.508	16.5	43.5	27.0	6.0	9.0	1.5	125	342	Hor.	No
Measurement uncertainty							+2.2 dB / -3.6 dB			

Test result: Passed.

Test equipment used (refer clause 6):

8, 21 - 25, 27

5.2.3 Test results 433 MHz receiver

5.2.3.1 Preliminary radiated emission measurement (30 MHz to 1 GHz)

The receiver measurements were carried out in accordance with [2].

Ambient temperature	21 °C	Relative humidity	45 %
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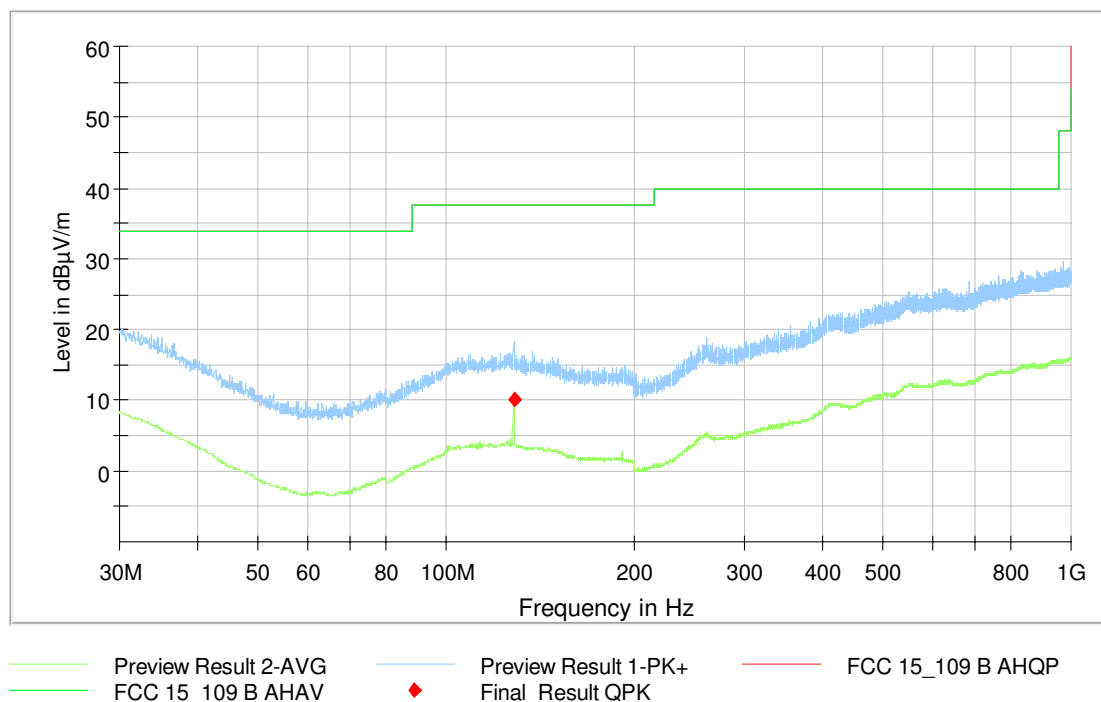
Position of EUT: The EUT was set-up on a non-conducting table of a height of 0.8 m. The distance between EUT and antenna was 3 m.

Cable guide: For detail information of test set-up and the cable guide refer to the pictures in annex A of this test report.

Test record: All results are shown in the following.

Supply voltage: During all measurements the EUT was supplied by a vehicle battery with 12 V_{DC}.

Frequency range: The preliminary measurement was carried out in the frequency range 30 MHz to 1 GHz according to [3].



The following frequency was found inside restricted bands during the preliminary emission measurement from 30 MHz to 1 GHz: 128.052 MHz

No frequency was found outside restricted bands during the preliminary emission measurement from 9 kHz to 30 MHz.

The frequency has to be measured in a final measurement at the open area test site.

Test equipment used (refer clause 6):

1 - 6, 10

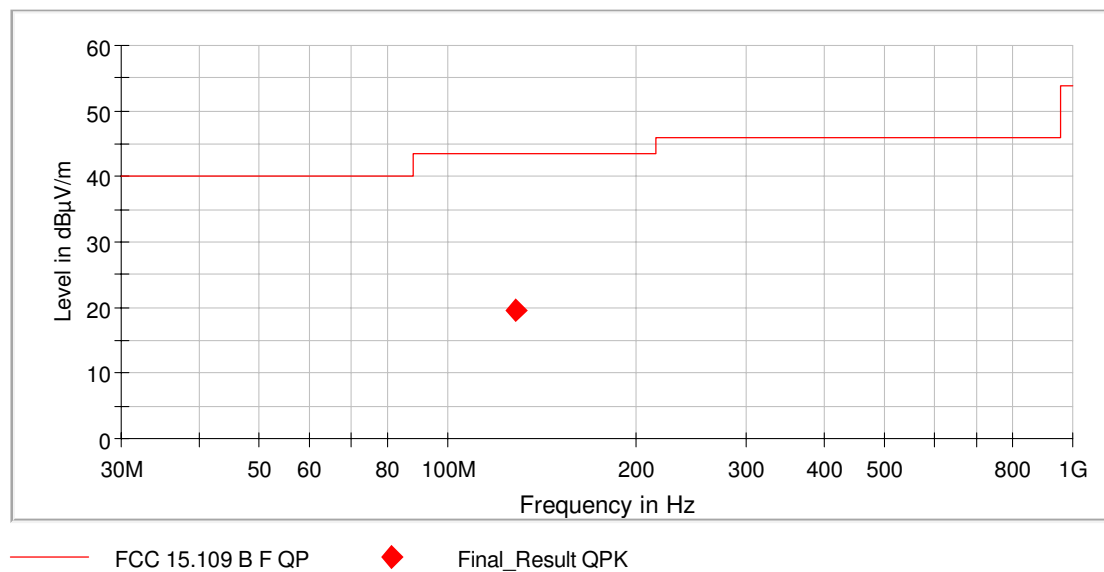
5.2.3.2 Final radiated emission measurement (30 MHz to 1 GHz)

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: For detail information of test set-up and the cable guide refer to the pictures in annex A of this test report.

Test record: All results are shown in the following.

Supply voltage: During all measurements the EUT was supplied by a vehicle battery with 12 V_{DC}.



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.

Final result measured with the Quasi-Peak detector:

Frequency MHz	Result dBμV/m	Limit dBμV/m	Margin dB	Readings dBμV	Antenna factor 1/m	Preamp dB	Cable loss dB	Height cm	Pol.	Restr. Band
128.052	19.44	43.5	24.1	5.9	12.3	1.3	238	257	Vert.	Yes
Measurement uncertainty							+2.2 dB / -3.6 dB			

Test result: Passed.

Test equipment used (refer clause 6):

8, 21 - 25, 27

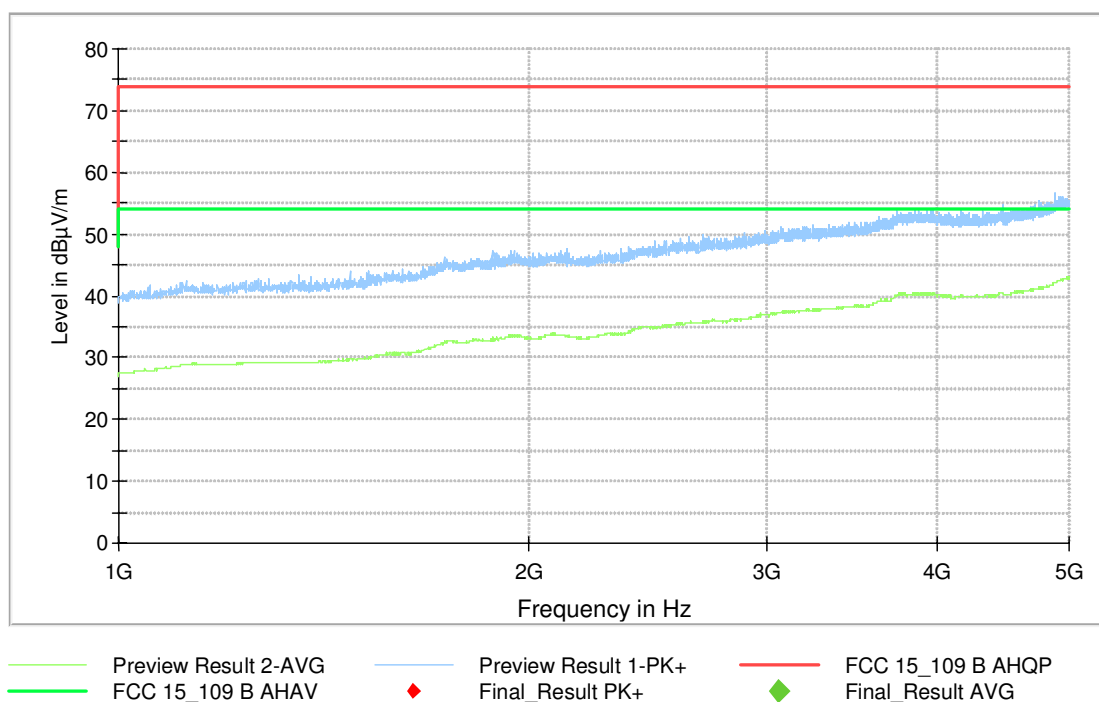
5.2.3.3 Final radiated emission measurement (1 GHz to 5 GHz)

Position of EUT: The EUT was setup on a positioner at a height of 1.5 m. The distance between EUT and antenna was 3 m.

Cable guide: For detail information of test set-up and the cable guide refer to the pictures in annex A of this test report.

Test record: All results are shown in the following.

Supply voltage: During all measurements the EUT was supplied by a vehicle battery with 12 V_{DC}.



No significant emission was found. The maximum peak noise level was measured at 4.876 GHz with a level of 56.5 dBμV/m results to a margin of 17.5 dB to the limit. The maximum average noise level was measured at 5.0 GHz with a level of 42.9 dBμV/m results to a margin of 11.1 dB.

Test result: Passed.

Test equipment used (refer clause 6):

1 - 5, 7, 11 - 14

6 Test equipment and ancillaries used for tests

No.	Test equipment	Type	Manufacturer	Serial No.	PM. No.	Cal. Date	Cal. due
1	Fully anechoic chamber M20	-	Albatross Projects	B83107-E2439-T232	480303	Weekly verification (system cal.)	
2	Measuring receiver	ESI 40	Rohde & Schwarz	100064	480355	02/16/2016	02/2017
3	Controller	MCU	Maturo	MCU/043/971107	480832	-	-
4	Turntable	DS420HE	Deisel	420/620/80	480315	-	-
5	Antenna support	AS615P	Deisel	615/310	480187	-	-
6	Antenna	CBL6112 B	Chase	2688	480328	04/14/2014	04/2017
7	Antenna	HL50	Rohde & Schwarz	100438	481170	08/27/2014	08/2017
8	Antenna	CBL6111D	Chase	25761	480894	09/18/2014	09/2017
10	RF-cable No. 36	Sucoflex 106B	Suhner	0587/6B	480865	Weekly verification (system cal.)	
11	RF-cable No. 3	Sucoflex 106B	Suhner	0563/6B	480670	Weekly verification (system cal.)	
12	RF-cable No. 40	Sucoflex 106B	Suhner	0708/6B	481330	Weekly verification (system cal.)	
13	Positioner	TDF 1.5- 10Kg	Maturo	15920215	482034	-	-
14	Preamplifier 100 MHz - 13 GHz	JS3-00101200-23-5A	MITEQ Hauppauge N.Y.	681851	480337	02/18/2016	02/2018
17	Loop antenna	HFH2-Z2	Rohde & Schwarz	100417	481912	09/15/2015	09/2016
20	Loop antenna	-	Phoenix Test-Lab	-	410085	-	-
21	Open area test site M6	-	PHOENIX TESTLAB	-	480085	Weekly verification (system cal.)	
22	Antenna mast	MA240-0	Inn-Co GmbH	MA240-0/030/6600603	480086	Calibration not necessary	
23	Turntable	DS412	Deisel	412/316	480087	Calibration not necessary	
24	Controller	HD100	Deisel	100/349	480139	Calibration not necessary	
25	Software	EMC32	Rohde & Schwarz	100061	481800	Calibration not necessary	
26	Software	EMC32	Rohde & Schwarz	100061	481022	Calibration not necessary	
27	Measuring receiver	ESIB 7	Rohde & Schwarz	100304	480521	02/18/2016	02/2018
28	Outdoor test site	-	-	-	480293	Weekly verification (system cal.)	

7 Report history

Report Number	Date	Comment
F154295E6	08/01/2016	Document created

8 List of annexes

Annex A Test setup photos 5 pages

154295_20.JPG: Test setup fully anechoic chamber (9 kHz to 30 MHz)
 154295_21.JPG: Test setup fully anechoic chamber (30 MHz to 1 GHz)
 154295_22.JPG: Test setup fully anechoic chamber (1 GHz to 5 GHz)
 154295_23.JPG: Test setup outdoor test site (9 kHz to 30 MHz)
 154295_24.JPG: Test setup open area test site (30 MHz to 1 GHz)

Annex B External photos 5 pages

154295_1.JPG: EUT with LF antennas and harness
 154295_2.JPG: EUT, bottom view (connector and type plate)
 154295_3.JPG: EUT, top view
 154295_8.JPG: LF antenna type 1
 154295_9.JPG: LF antenna type 2

Annex C Internal photos 4 pages

154295_4.JPG: EUT, PCB, top view, top cover removed
 154295_5.JPG: PCB, top view
 154295_6.JPG: EUT, PCB bottom view, bottom cover removed
 154295_7.JPG: EUT, PCB, bottom view