

EMC REPORT (GPS)

Applicant: Shenzhen Concox Information Technology Co., Ltd
Address of Applicant: Floor 4th, Building B, Gaoxinqi Industrial Park, Liuxian 1st Road, District 67, Bao'an, Shenzhen, Guangdong
Equipment Under Test (EUT)
Product Name: GPS Vehicle tracker
Model No.: TR02, TR02N, TR02A, GT02A, GT02B, GT02D
Applicable standards: ETSI EN 301 489-3 V1.4.1 (2002-08)
ETSI EN 301 489-1 V1.9.2 (2011-09)
Date of sample receipt: 18 Jul., 2013
Date of Test: 19 Jul., to 22 Jul., 2013
Date of report issue: 23 Jul., 2013
Test Result : PASS *

*In the configuration tested, the EUT complied with the standards specified above.

The CE mark as shown below can be used, under the responsibility of the manufacturer, after completion of an EC Declaration of Conformity and compliance with all relevant EC Directives. The protection requirements with respect to electromagnetic compatibility contained in Directive 1999/5/EC are considered.



Bruce Zhang

Laboratory Manager

This report details the results of the testing carried out on one sample. The results contained in this test report do not relate to other samples of the same product and does not permit the use of the CCIS product certification mark. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report.

This report may only be reproduced and distributed in full. If the product in this report is used in any configuration other than that detailed in the report, the manufacturer must ensure the new system complies with all relevant standards.

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2 Version

| Version No. | Date | Description |
|-------------|---------------|-------------|
| 00 | 23 Jul., 2013 | Original |
| | | |
| | | |
| | | |
| | | |

Prepared By:



Date:

23 Jul., 2013

Report Clerk

Check By:



Date:

23 Jul., 2013

Project Engineer

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4 Test Summary

| EMI Test | | | | |
|--|------------------|---|-------------|--------|
| Test Item | Test Requirement | Test Method | Application | Result |
| Radiated Emission | ETSI EN301 489-3 | ETSI EN 301 489-1 V1.9.2 (2011-09) 8.2 | Enclosure | PASS |
| Conducted Emission | ETSI EN301 489-3 | ETSI EN 301 489-1 V1.9.2 (2011-09) 8.3 | DC port | PASS |
| EMS Test | | | | |
| Radiated Immunity | ETSI EN301 489-3 | ETSI EN 301 489-1 V1.9.2 (2011-09) 9.2 | Enclosure | PASS |
| Transients and surges in the vehicular environment | ETSI EN301 489-3 | ETSI EN 301 489-1 V1.9.2 (2011-09) 9.5 | DC port | PASS |
| Injected Currents | ETSI EN301 489-3 | ETSI EN 301 489-1 V1.9.2 (2011-09) 9.6 | DC port | PASS |

Remark:

- *Pass: The EUT complies with the essential requirements in the standard.*
- *N/A: The EUT is not belong to ancillary equipment.*

5 General Information

5.1 Client Information

| | |
|--------------------------|--|
| Applicant: | Shenzhen Concox Information Technology Co., Ltd |
| Address of Applicant: | Floor 4th, Building B, Gaoxinqi Industrial Park, Liuxian 1st Road, District 67, Bao'an, Shenzhen,Guangdong |
| Manufacturer: | Shenzhen Concox Information Technology Co., Ltd |
| Address of Manufacturer: | Floor 4th, Building B, Gaoxinqi Industrial Park, Liuxian 1st Road, District 67, Bao'an, Shenzhen,Guangdong |

5.2 General Description of E.U.T.

| | |
|---------------|---|
| Product Name: | GPS Vehicle tracker |
| Model No.: | TR02,TR02N,TR02A,GT02A,GT02B,GT02D |
| Remark: | The Model: TR02,TR02N,TR02A,GT02A,GT02B,GT02D were identical inside, the electrical circuit design, layout, components used and internal wiring, with only difference being different model number. |
| Power supply: | DC 12V |

| Ancillary equipment | Model | Manufacturer |
|---------------------|-------|--------------|
| DC power line | -- | -- |

5.3 Test mode

| | |
|-----------|--|
| GPS mode: | Keep the EUT in receiver mode on GPS function. |
|-----------|--|

5.4 Monitoring of EUT for the Immunity Test

| | |
|---------|------------------------------|
| Visual: | Monitored the display of EUT |
|---------|------------------------------|

5.5 Laboratory Facility

The test facility is recognized, certified, or accredited by the following organizations:

● **FCC - Registration No.: 817957**

Shenzhen Zhongjian Nanfang Testing Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration 817957, February 27, 2012.

● **IC - Registration No.: 10106A-1**

The 3m Semi-anechoic chamber of Shenzhen Zhongjian Nanfang Testing Co., Ltd. has been Registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 10106A-1.

● **CNAS - Registration No.: CNAS L6048**

Shenzhen Zhongjian Nanfang Testing Co., Ltd. is accredited to ISO/IEC 17025:2005 General Requirements for the Competence of Testing and Calibration laboratories for the competence of testing. The Registration No. is CNAS L6048.

5.6 Laboratory Location

Shenzhen Zhongjian Nanfang Testing Co., Ltd.
Address: No.B-C, 1/F., Building 2, Laodong No.2 Industrial Park, Xixiang Road,
Bao'an District, Shenzhen, Guangdong, China
Tel: 0755-23118282
Fax: 0755-23116366

5.7 Description of Support Units

The EUT has been tested as an independent unit.

5.8 Test Instruments list

| Radiated Emission: | | | | | | |
|--------------------|-------------------------------|-----------------------------------|-----------------------------|---------------|---------------------|-------------------------|
| Item | Test Equipment | Manufacturer | Model No. | Inventory No. | Cal.Date (mm-dd-yy) | Cal.Due date (mm-dd-yy) |
| 1 | 3m Semi- Anechoic Chamber | SAEMC | 9(L)*6(W)* 6(H) | CCIS0001 | June 09 2013 | June 08 2014 |
| 2 | Control Room | ZhongYu Electron | 6.2(L)*2.5(W)* 2.4(H) | CCIS0002 | N/A | N/A |
| 3 | BiConiLog Antenna | SCHWARZBECK MESS-ELEKTRONIK | VULB9163 | CCIS0005 | June 04 2013 | June 03 2014 |
| 4 | Double -ridged waveguide horn | SCHWARZBECK MESS-ELEKTRONIK | BBHA9120D | CCIS0006 | May 30 2013 | May 29 2014 |
| 5 | EMI Test Software | AUDIX | E3 | N/A | N/A | N/A |
| 6 | Coaxial Cable | CCIS | N/A | CCIS0016 | Apr. 01 2013 | Mar. 31 2014 |
| 7 | Coaxial Cable | CCIS | N/A | CCIS0017 | Apr. 01 2013 | Mar. 31 2014 |
| 8 | Coaxial cable | CCIS | N/A | CCIS0018 | Apr. 01 2013 | Mar. 31 2014 |
| 9 | Coaxial Cable | CCIS | N/A | CCIS0019 | Apr. 01 2013 | Mar. 31 2014 |
| 10 | Coaxial Cable | CCIS | N/A | CCIS0087 | Apr. 01 2013 | Mar. 31 2014 |
| 11 | Amplifier(10kHz-1.3GHz) | HP | 8447D | CCIS0003 | Apr. 01 2013 | Mar. 31 2014 |
| 12 | Amplifier(1GHz-18GHz) | Compliance Direction Systems Inc. | PAP-1G18 | CCIS0011 | June 09 2013 | June 08 2014 |
| 13 | Pre-amplifier (18-26GHz) | Rohde & Schwarz | AFS33-18002 650-30-8P-44 | GTS218 | Apr. 01 2013 | Mar. 31 2014 |
| 14 | Horn Antenna | ETS-LINDGREN | 3160 | GTS217 | Mar. 30 2013 | Mar. 29 2014 |
| 15 | Printer | HP | HP LaserJet P1007 | N/A | N/A | N/A |
| 16 | Positioning Controller | UC | UC3000 | CCIS0015 | N/A | N/A |
| 17 | Spectrum analyzer 9k-30GHz | Rohde & Schwarz | FSP | CCIS0023 | May. 29 2013 | May. 28 2014 |
| 18 | EMI Test Receiver | Rohde & Schwarz | ESPI | CCIS0022 | Apr 01 2013 | Mar. 31 2014 |
| 19 | Loop antenna | Laplace instrument | RF300 | EMC0701 | Aug. 12 2012 | Aug. 11 2013 |
| 20 | Artificial Network | Rohde & Schwarz | ESH3-Z6 | SEL0044 | Aug. 12 2012 | Aug. 11 2013 |
| 21 | Artificial Network | Rohde & Schwarz | ESH3-Z6 | SEL0045 | Aug. 12 2012 | Aug. 11 2013 |

| Conducted Emission: | | | | | | |
|---------------------|-------------------|--------------------|-----------------------|---------------|---------------------|--------------------------|
| Item | Test Equipment | Manufacturer | Model No. | Inventory No. | Cal.Date (mm-dd-yy) | Cal. Due date (mm-dd-yy) |
| 1 | Shielding Room | ZhongShuo Electron | 11.0(L)x4.0(W)x3.0(H) | CCIS0061 | June 09 2013 | June 08 2014 |
| 2 | EMI Test Receiver | Rohde & Schwarz | ESCI | CCIS0002 | May 25 2013 | May 24 2014 |
| 3 | LISN | CHASE | MN2050D | CCIS0074 | Apr 01 2013 | Mar. 31 2014 |

| | | | | | | |
|---|-------------------|-------|-----|----------|--------------|--------------|
| 4 | Coaxial Cable | CCIS | N/A | CCIS0086 | Apr. 01 2013 | Mar. 31 2014 |
| 5 | EMI Test Software | AUDIX | E3 | N/A | N/A | N/A |

Conducted Immunity:

| Item | Test Equipment | Manufacturer | Model No. | Inventory No. | Cal.Date (mm-dd-yy) | Cal.Due date (mm-dd-yy) |
|------|-----------------------------|--------------|-----------|---------------|---------------------|-------------------------|
| 1 | RF-Generator | SCHAFFNER | NSG 2070 | SEL0039 | Oct. 22 2012 | Oct. 21 2013 |
| 2 | Coupling/Decoupling Network | SCHAFFNER | CDN M016 | SEL0040 | Oct. 22 2012 | Oct. 21 2013 |
| 3 | EM CLAMP | SCHAFFNER | KEMZ 801 | SEL0041 | Oct. 22 2012 | Oct. 21 2013 |

Transients and surges:

| Item | Test Equipment | Manufacturer | Model No. | Inventory No. | Cal.Date (mm-dd-yy) | Cal.Due date (mm-dd-yy) |
|------|-------------------|--------------|-----------|---------------|---------------------|-------------------------|
| 1 | Generator EM TEST | EMTEST | UCS200-M | SEL0042 | Jul. 04 2013 | Jul. 03 2014 |
| 2 | Generator EM TEST | EMTEST | VDS200 | SEL0043 | Jul. 04 2013 | Jul. 03 2014 |

| Radiated Immunity: | | | | | | |
|--------------------|-----------------------------------|--------------------|-----------|---------------|---------------------|-------------------------|
| Item | Test Equipment | Manufacturer | Model No. | Inventory No. | Cal.Date (mm-dd-yy) | Cal.Due date (mm-dd-yy) |
| 1 | 3m Semi-Anechoic Chamber | ETS-LINDGREN | N/A | SEL0017 | June 16 2013 | June 15 2014 |
| 2 | Signal Generator | Rohde & Schwarz | SML03 | SEL0068 | June 23 2013 | June 22 2014 |
| 3 | RF Amplifier 30M-1GHz | Amplifier Research | 250W1000A | SEL0066 | Nov. 05 2012 | Nov. 04 2013 |
| 4 | RF Amplifier 0.8-3.0GHz | Amplifier Research | 60S1G3 | SEL0065 | Nov. 05 2012 | Nov. 04 2013 |
| 5 | Power Meter | Rohde & Schwarz | NRVD | SEL0069 | June 23 2013 | June 22 2014 |
| 6 | Power Sensor | Rohde & Schwarz | URV5-Z2 | SEL0071 | June 23 2013 | June 22 2014 |
| 7 | Power Sensor | Rohde & Schwarz | URV5-Z2 | SEL0072 | June 23 2013 | June 22 2014 |
| 8 | Software EMC32 | Rohde & Schwarz | EMC32-S | SEL0082 | N/A | N/A |
| 9 | Log-periodic Antenna | Amplifier Research | AT1080 | SEL0073 | June 23 2013 | June 22 2014 |
| 10 | Antenna Tripod | Amplifier Research | TP1000A | SEL0074 | N/A | N/A |
| 11 | High Gain Horn Antenna (0.8-5GHz) | Amplifier Research | AT4002A | SEL0075 | June 23 2013 | June 22 2014 |

| General used equipment: | | | | | | |
|-------------------------|---------------------------------|--------------|-----------|---------------|---------------------|-------------------------|
| Item | Test Equipment | Manufacturer | Model No. | Inventory No. | Cal.Date (mm-dd-yy) | Cal.Due date (mm-dd-yy) |
| 1 | Humidity/ Temperature Indicator | Shanghai | ZJ1-2B | GTS243 | Jul. 06 2013 | Jul. 05 2014 |
| 2 | Barometer | ChangChun | DYM3 | GTS255 | July 11 2013 | July 10 2014 |

6 EMC Requirements Specification in ETSI EN 301489-3

6.1 EUT type and class

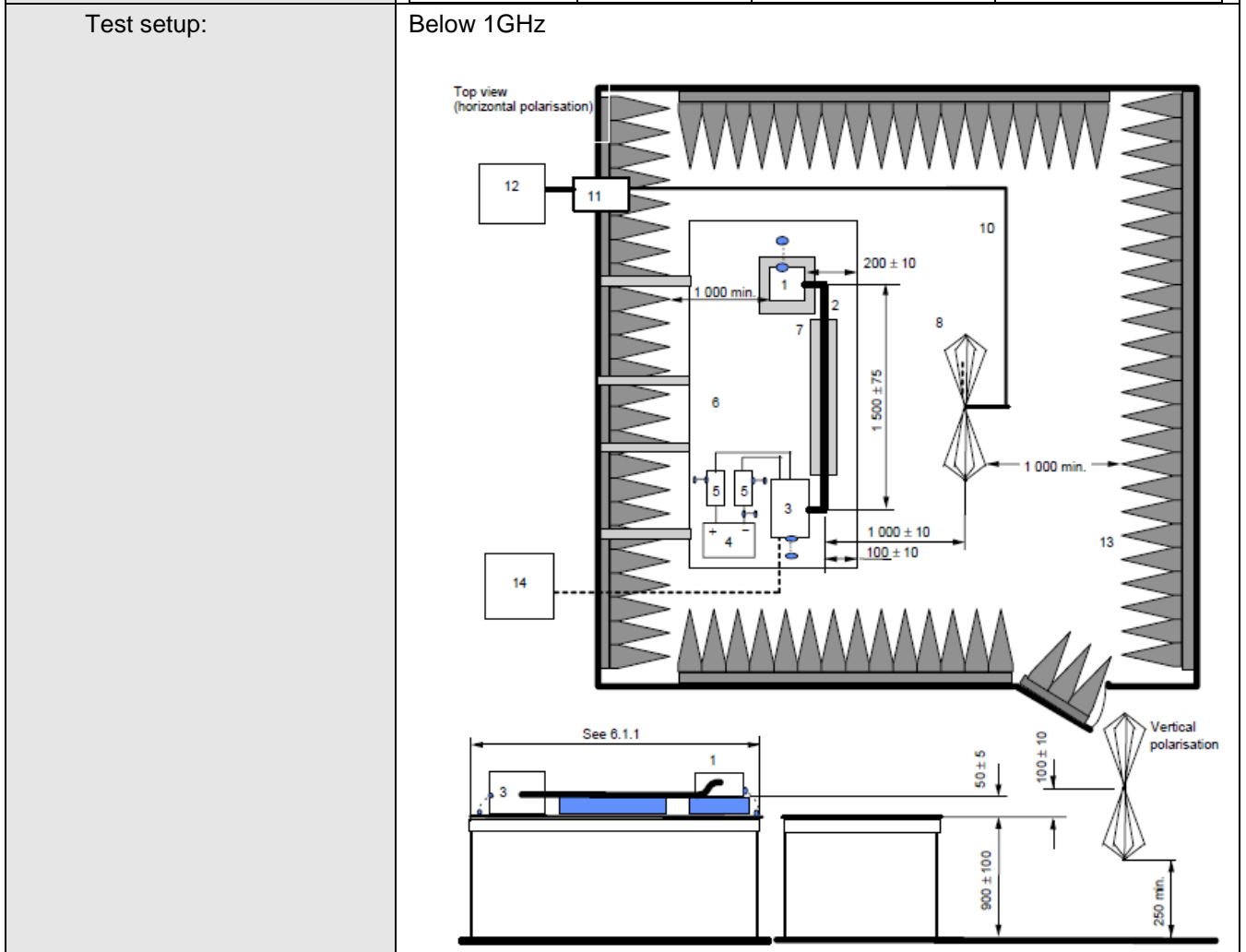
| Type of SRD Equipment in EN 301489-3, subclause 4.1 table 1 | |
|---|---|
| Equipment Type | Technical nature of the primary function |
| I | Transfer of messages (digital or analogue signals) |
| II | Transfer of audio (speech or music) |
| III | Others |
| Classification of SRD Equipment in EN 301489-3, subclause 6.1 table 3 | |
| Class of SRD Equipment | Risk assessment of Rx performance |
| 1 | Highly reliable SRD communication media; e.g. serving human life inherent system (may result in a physical risk to a person). |
| 2 | Medium reliable SRD communication media; e.g. causing inconvenience to persons, which cannot simply overcome by other means. |
| 3 | Standard reliable SRD communication media; e.g. causing inconvenience to persons, which can simply overcome by other means. |

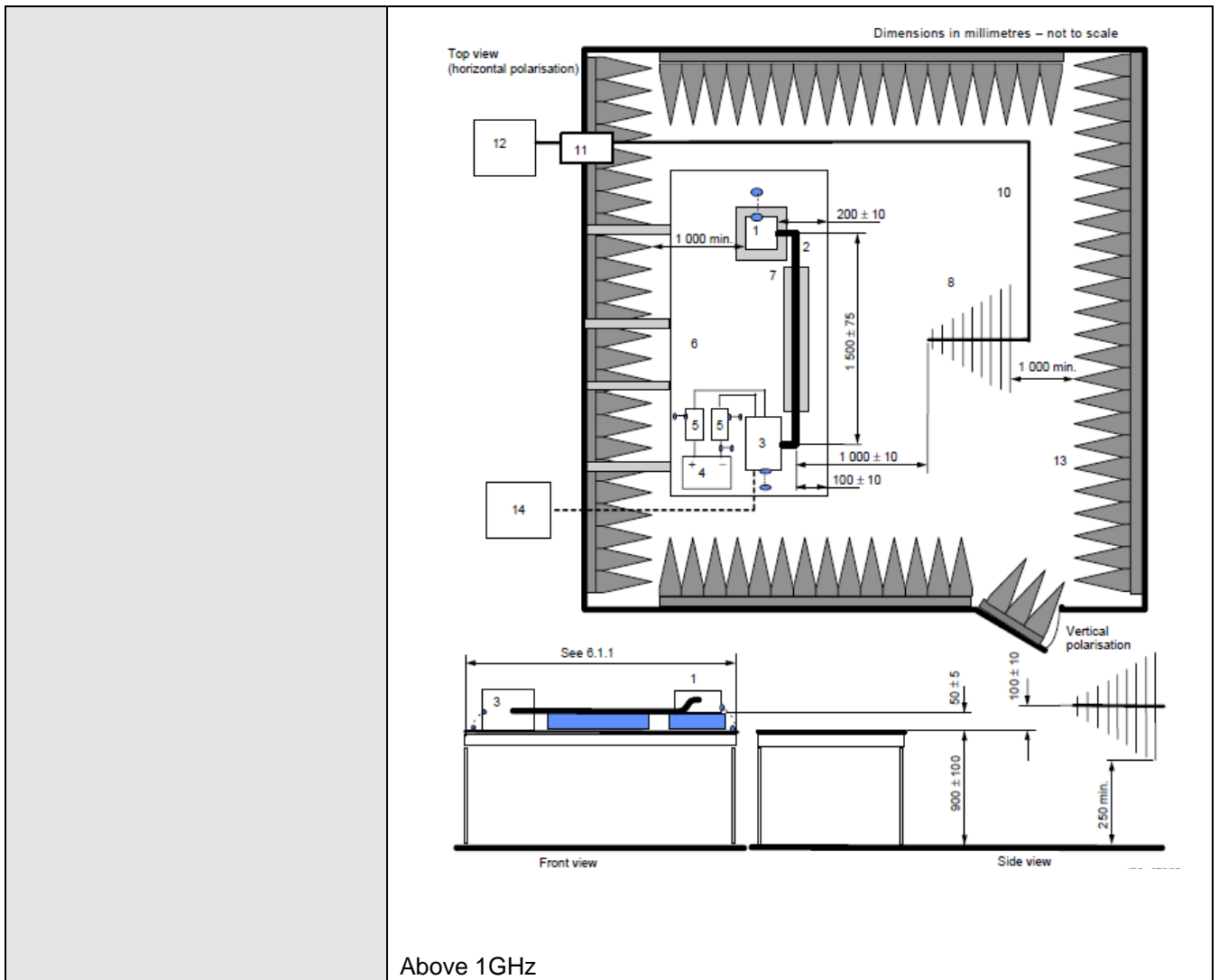
Remark: The EUT is belong to equipment type I, class 3.

6.2 EMI (Emission)

6.2.1 Radiated Emission

| | | | | |
|------------------------|--------------------------|----------------------------|-----------------------------|--------|
| Test Requirement: | ETSI EN 301 489-3 | | | |
| Test Method: | CISPR 25 | | | |
| Test Frequency Range: | 0.15MHz to 2.5GHz | | | |
| Test site: | Measurement Distance: 1m | | | |
| Test set-up and Limit: | Frequency | Broadband QP limit(dBuV/m) | Narrowband AV limit(dBuV/m) | RBW |
| | 30MHz-75MHz | 62-25, 13log(F/30) | 52-25, 13log(F/30) | 120kHz |
| | 75MHz-400MHz | 52+15, 13log(F/75) | 42+15, 13log(F/75) | 120kHz |
| | 400MHz-1GHz | 63 | 63 | 120kHz |





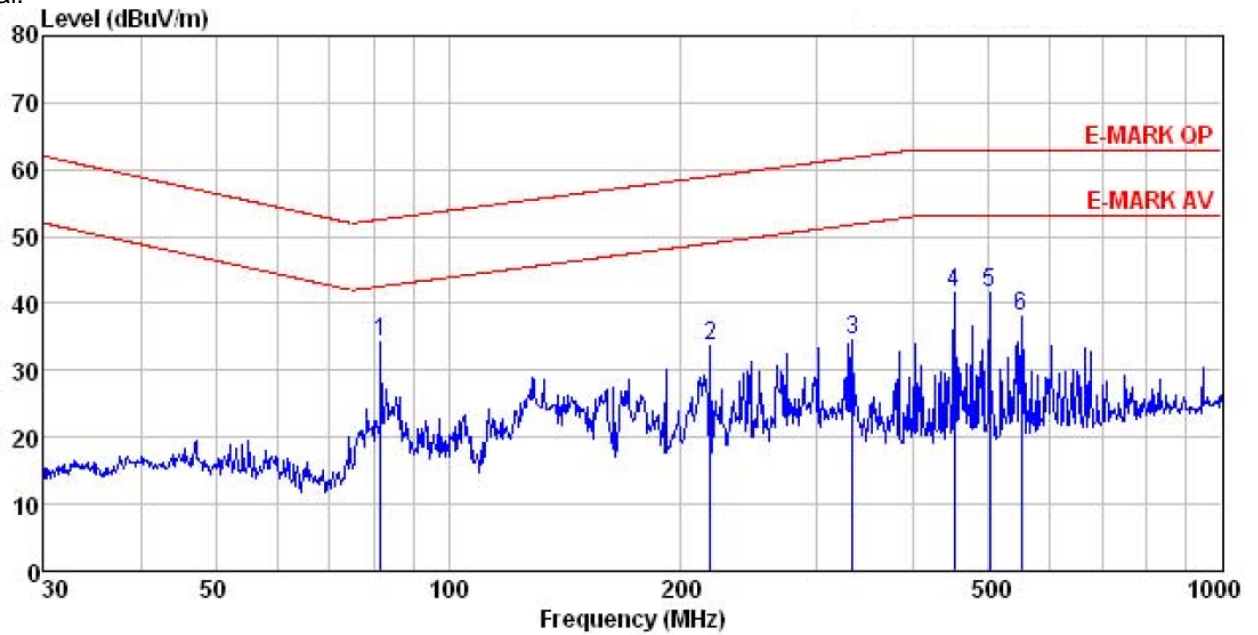
| | |
|----------------------------|--|
| | |
| <p>Test Procedure:</p> | <p>The general arrangement of the disturbance source and connecting harnesses, etc. represents a standardised test condition. Any deviations from the standard test harness length, etc. shall be agreed upon prior to testing and recorded in the test report.</p> <p>The EUT shall be made to operate under typical loading and other conditions as in the vehicle such that the maximum emission state occurs. These operating conditions shall be clearly defined in the test plan to ensure supplier and customer can perform identical tests. The orientation(s) of the EUT for radiated emission measurements shall be defined in the test plan.</p> <p>From 150 kHz to 30 MHz measurements shall be performed in vertical polarisation only.</p> <p>From 30 MHz to 2 500 MHz measurements shall be performed in vertical and horizontal polarisations.</p> |
| <p>Test environment:</p> | <p>Temp.: 25.5 °C Humid.: 55% Press.: 1 01kPa</p> |
| <p>Measurement Record:</p> | <p>Test site uncertainty: 4.88dB</p> |
| <p>Test Instruments:</p> | <p>Refer to section 5.8</p> |

| | |
|---------------|--|
| Test mode: | Refer to section 5.3 |
| Test results: | Passed |
| Remark: | The test data of below 30MHz and above 1GHz is too lower than the limit, so not show in this report. |

Measurement Data

Below 1GHz

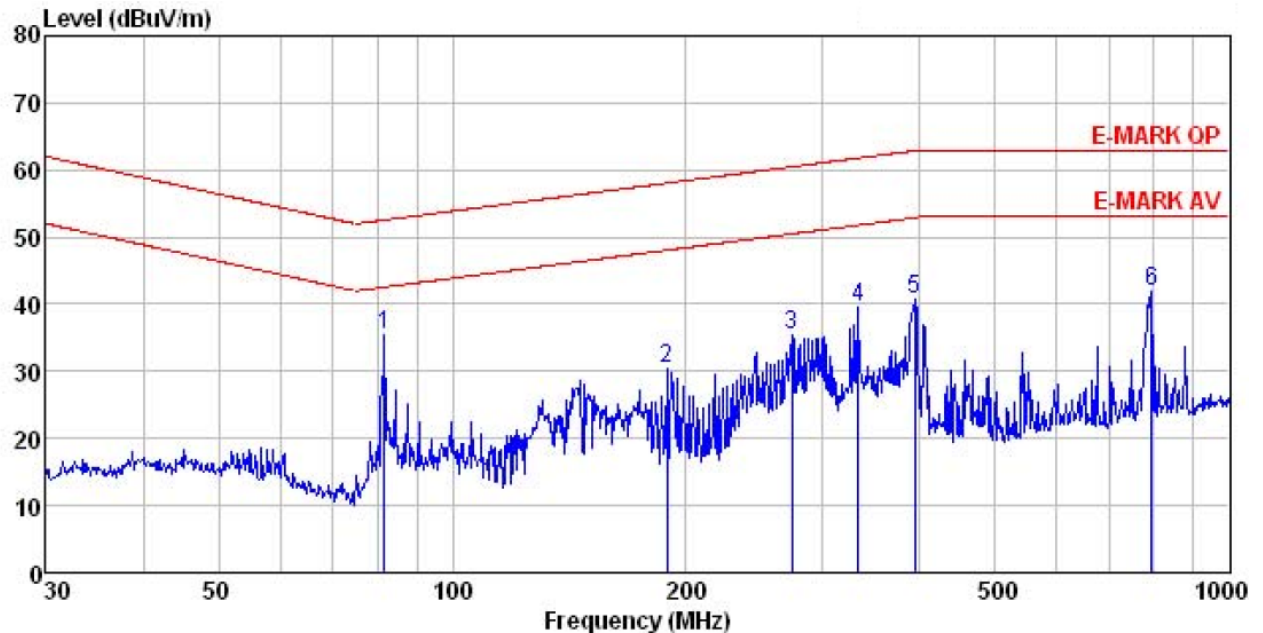
Vertical:



Site : 3m chamber
 Condition : E-MARK QP 3m VULB9163(30M1G) VERTICAL
 Job NO. : 225RF
 Test mode : gps mode
 Power Rating : DC 12V
 Environment : Temp:25.5°C Humi:55%
 Test Engineer: Joe

| | Freq | ReadAntenna | Cable | Preamp | Limit | Over | | | |
|---|---------|-------------|--------|--------|--------|--------|--------|--------|--------|
| | MHz | Level | Factor | Loss | Factor | Level | Line | Limit | Remark |
| | MHz | dBuV | dB/m | dB | dB | dBuV/m | dBuV/m | dB | |
| 1 | 81.783 | 53.40 | 9.28 | 1.72 | 30.12 | 34.28 | 52.57 | -18.29 | Peak |
| 2 | 218.309 | 49.27 | 11.13 | 2.85 | 29.73 | 33.52 | 59.02 | -25.50 | Peak |
| 3 | 332.519 | 47.20 | 13.86 | 3.04 | 29.60 | 34.50 | 61.79 | -27.29 | Peak |
| 4 | 451.135 | 53.45 | 15.58 | 3.21 | 30.52 | 41.72 | 63.00 | -21.28 | Peak |
| 5 | 501.179 | 51.85 | 16.63 | 3.63 | 30.52 | 41.59 | 63.00 | -21.41 | Peak |
| 6 | 550.948 | 47.03 | 17.57 | 3.89 | 30.54 | 37.95 | 63.00 | -25.05 | Peak |

Horizontal:



Site : 3m chamber
 Condition : E-MARK QP 3m VULB9163(30M1G) HORIZONTAL
 Job NO. : 225RF
 Test mode : gps mode
 Power Rating : DC 12V
 Environment : Temp:25.5°C Humi:55%
 Test Engineer: Joe

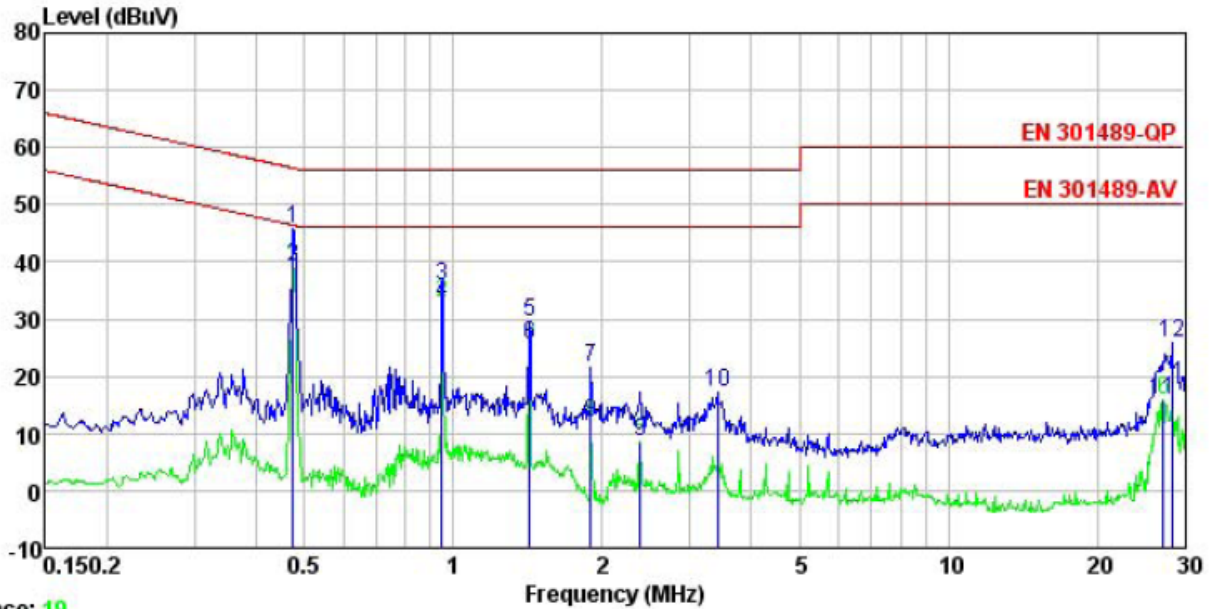
| | Read | Antenna | Cable | Preamp | Level | Limit | Over | |
|------|---------|---------|-------|--------|--------|--------|-------|-------------|
| Freq | Level | Factor | Loss | Factor | Level | Line | Limit | Remark |
| MHz | dBuV | dB/m | dB | dB | dBuV/m | dBuV/m | dB | |
| 1 | 81.783 | 54.48 | 9.28 | 1.72 | 30.12 | 35.36 | 52.57 | -17.21 Peak |
| 2 | 189.074 | 46.66 | 10.48 | 2.79 | 29.57 | 30.36 | 58.08 | -27.72 Peak |
| 3 | 273.234 | 49.70 | 12.46 | 2.87 | 29.52 | 35.51 | 60.50 | -24.99 Peak |
| 4 | 332.519 | 52.14 | 13.86 | 3.04 | 29.60 | 39.44 | 61.79 | -22.35 Peak |
| 5 | 393.472 | 52.71 | 14.92 | 3.08 | 29.87 | 40.84 | 62.89 | -22.05 Peak |
| 6 | 793.396 | 47.97 | 19.96 | 4.35 | 30.42 | 41.86 | 63.00 | -21.14 Peak |

6.2.2 Conducted Emission

| | | | |
|--|---|--------------|----------------|
| Test Requirement: | ETSI EN 301 489-3 | | |
| Test Method: | ETSI EN 301 489-1 | | |
| Test Frequency Range: | 150kHz to 30MHz | | |
| Class / Severity: | Class B | | |
| Receiver setup: | RBW=9KHz, VBW=30KHz | | |
| Limit: | Frequency range (MHz) | Limit (dBuV) | |
| | | Quasi-peak | Average |
| | 0.15-0.5 | 66 to 56* | 56 to 46* |
| | 0.5-5 | 56 | 46 |
| | 5-30 | 60 | 50 |
| * Decreases with the logarithm of the frequency. | | | |
| Test setup: | <p><i>Remark:</i> E.U.T: Equipment Under Test LISN: Line Impedance Stabilization Network Test table height=0.8m</p> | | |
| Test procedure | <p>The test method shall be in accordance with EN 55022 [1]. For radio and ancillary equipment for fixed use, the Artificial Mains Networks (AMN) as specified in EN 55022 [1] shall be used and be connected to a DC power source.</p> <p>For mobile radio and ancillary equipment intended to be connected to the vehicle's onboard DC mains, an Artificial Network (AN) as specified in CISPR 25 [10] shall be used and be connected to a DC power source.</p> <p>The measurement frequency range extends from 150 kHz to 30 MHz. When the EUT is a transmitter operating at frequencies below 30 MHz, then the exclusion band for transmitters applies (see clause 4.3) for measurements in the transmit mode of operation.</p> <p>For emission measurements on DC output ports the relevant port shall be connected via an AMN/AN to a load drawing the rated current of the source.</p> | | |
| Test Instruments: | Temp.: 23 °C | Humid.: 56% | Press.: 101kPa |
| Measurement Record: | Uncertainty: 3.28dB | | |
| Test Instruments: | Refer to section 5.8 for details | | |
| Test mode: | Refer to section 5.3 for details | | |
| Test results: | Passed | | |

Measurement Data

Positive:

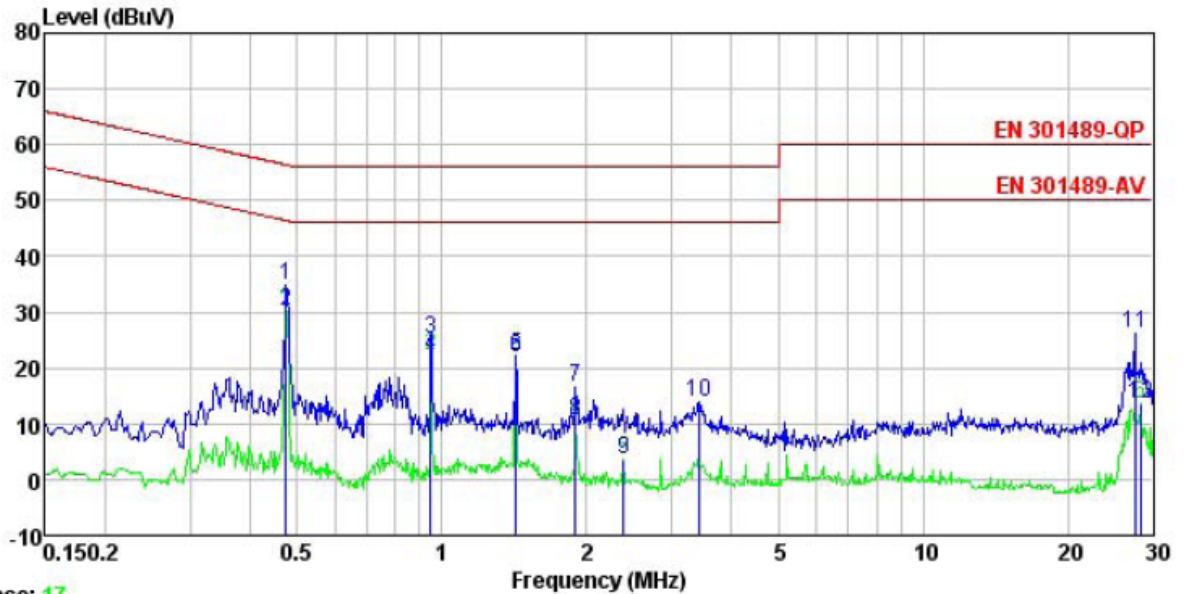


Trace: 19

Site : CCIS Conducted test Site
 Condition : EN 301489-QP LISN
 Job. no : 225RF
 Test Mode : GPS mode
 Power Rating : DC 12V
 Environment : Temp: 23 °C Humi:56% Atmos:101KPa
 Test Engineer: Joe
 Remark : +

| | Read | LISN | Cable | Limit | Over | |
|------|--------|--------|-------|-------|-------|----------------------|
| Freq | Level | Factor | Loss | Line | Limit | Remark |
| MHz | dBuV | dB | dB | dBuV | dB | |
| 1 | 0.474 | 45.14 | 0.00 | 0.75 | 45.89 | 56.45 -10.56 QP |
| 2 | 0.474 | 38.45 | 0.00 | 0.75 | 39.20 | 46.45 -7.25 Average |
| 3 | 0.948 | 34.90 | 0.00 | 0.85 | 35.75 | 56.00 -20.25 QP |
| 4 | 0.948 | 32.02 | 0.00 | 0.85 | 32.87 | 46.00 -13.13 Average |
| 5 | 1.426 | 28.66 | 0.00 | 0.92 | 29.58 | 56.00 -26.42 QP |
| 6 | 1.426 | 24.71 | 0.00 | 0.92 | 25.63 | 46.00 -20.37 Average |
| 7 | 1.898 | 20.47 | 0.00 | 0.95 | 21.42 | 56.00 -34.58 QP |
| 8 | 1.898 | 10.98 | 0.00 | 0.95 | 11.93 | 46.00 -34.07 Average |
| 9 | 2.384 | 7.75 | 0.00 | 0.94 | 8.69 | 46.00 -37.31 Average |
| 10 | 3.417 | 16.45 | 0.00 | 0.91 | 17.36 | 56.00 -38.64 QP |
| 11 | 27.127 | 14.92 | 0.00 | 0.87 | 15.79 | 50.00 -34.21 Average |
| 12 | 28.302 | 25.13 | 0.00 | 0.87 | 26.00 | 60.00 -34.00 QP |

Negative:



Trace: 17
 Site : CCIS Conducted test Site
 Condition : EN 301489-QP LISN
 Job. no : 225RF
 Test Mode : GPS mode
 Power Rating : DC 12V
 Environment : Temp: 23 °C Humi:56% Atmos:101KPa
 Test Engineer: Joe
 Remark : -

| | Read Freq | Level | LISN Factor | Cable Loss | Level | Limit Line | Over Limit | Remark |
|----|-----------|-------|-------------|------------|-------|------------|------------|---------|
| | MHz | dBuV | dB | dB | dBuV | dBuV | dB | |
| 1 | 0.474 | 33.97 | 0.00 | 0.75 | 34.72 | 56.45 | -21.73 | QP |
| 2 | 0.474 | 29.46 | 0.00 | 0.75 | 30.21 | 46.45 | -16.24 | Average |
| 3 | 0.948 | 24.22 | 0.00 | 0.85 | 25.07 | 56.00 | -30.93 | QP |
| 4 | 0.948 | 21.20 | 0.00 | 0.85 | 22.05 | 46.00 | -23.95 | Average |
| 5 | 1.426 | 21.25 | 0.00 | 0.92 | 22.17 | 56.00 | -33.83 | QP |
| 6 | 1.426 | 20.94 | 0.00 | 0.92 | 21.86 | 46.00 | -24.14 | Average |
| 7 | 1.898 | 15.58 | 0.00 | 0.95 | 16.53 | 56.00 | -39.47 | QP |
| 8 | 1.898 | 9.55 | 0.00 | 0.95 | 10.50 | 46.00 | -35.50 | Average |
| 9 | 2.384 | 2.79 | 0.00 | 0.94 | 3.73 | 46.00 | -42.27 | Average |
| 10 | 3.417 | 13.12 | 0.00 | 0.91 | 14.03 | 56.00 | -41.97 | QP |
| 11 | 27.562 | 25.48 | 0.00 | 0.87 | 26.35 | 60.00 | -33.65 | QP |
| 12 | 28.302 | 12.72 | 0.00 | 0.87 | 13.59 | 50.00 | -36.41 | Average |

6.3 Immunity

6.3.1 Performance Criteria of ETSI EN 301489-3, subclause 6.3 table 4.

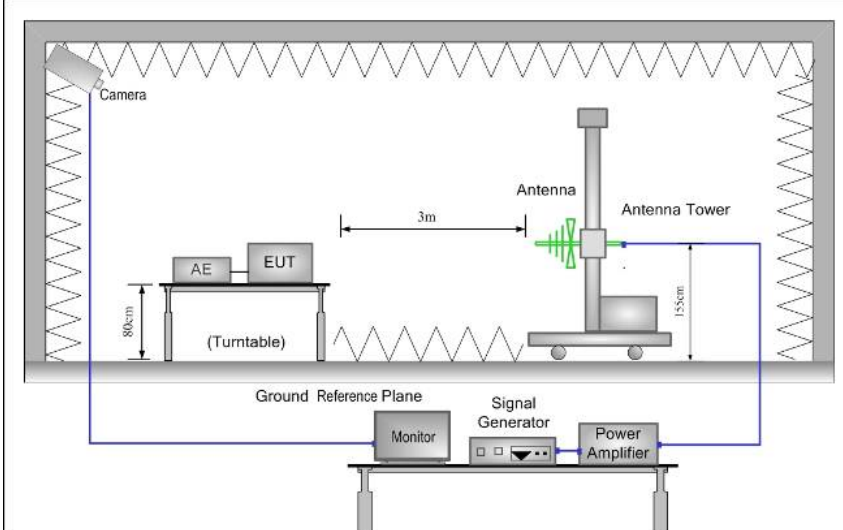
| Class 1 SRD Equipment | | |
|-----------------------|--|--|
| Criteria | During Test | After Test |
| A | Operate as intended No loss of function For equipment type II the minimum performance shall be 12 dB SINAD No unintentional responses | Operate as intended For equipment type II the communication link shall be maintained No loss of function No degradation of performance No loss of stored data or user programmable functions |
| B | May be loss of function (one or more) No unintentional responses | Operate as intended Lost function(s) shall be self-recoverable No degradation of performance No loss of stored data or user programmable functions |
| Class 2 SRD Equipment | | |
| Criteria | During Test | After Test |
| A | Operate as intended No loss of function For equipment type II the minimum performance shall be 6 dB SINAD No unintentional responses | Operate as intended For equipment type II the communication link shall be maintained No loss of function No degradation of performance No loss of stored data or user programmable functions |
| B | May be loss of function (one or more) No unintentional responses | Operate as intended Lost function(s) shall be self-recoverable No degradation of performance No loss of stored data or user programmable functions |
| Class 3 SRD Equipment | | |
| Criteria | During Test | After Test |
| A & B | May be loss of function (one or more) No unintentional responses | Operate as intended, for equipment type II the communication link may be lost, but shall be recoverable by user No degradation of performance Lost functions shall be self-recoverable |

Remark: The EUT belonged to Type I, class 3.

6.3.2 Special conditions for EMC immunity tests in ETSI EN 301489-3 table 6

| Reference to clauses in ETSI EN 301 489-1 | Special product-related conditions, additional to or modifying the test conditions in EN 301 489-1, clause 9 |
|---|--|
| 9.2.2: Test method; Radio frequency electromagnetic field | <p>Attention: The width of the steps for the test frequency increments is class-dependent:</p> <ul style="list-style-type: none"> ● for SRDs of class 1 or class 2, the stepped frequency increments shall be 1 % of the momentary used test frequency; ● for SRDs of class 3, the stepped frequency increments shall be 10% of the momentary used test frequency. |
| 9.5.2: Test method; Radio frequency, common mode | <p>Attention: The width of the steps for the test frequency increments is class-dependent:</p> <ul style="list-style-type: none"> ● for SRDs of class 1 or class 2, the stepped frequency increments shall be 1 % of the momentary used test frequency in the frequency range 5 MHz to 80 MHz; ● for SRDs of class 3, the stepped frequency increments shall be 10 % of the momentary used test frequency in the frequency range 5 MHz to 80 MHz. |
| 9.7.3: Performance criteria; Voltage dips and interruptions | <p>Attention: The performance criteria are equipment class dependent:</p> <p>For a voltage dip corresponding to a reduction of the supply voltage of 30 % for 10 ms the performance criteria CT or CR specified in clauses 6.4 or 6.6 shall apply as appropriate. For a voltage dip corresponding to a reduction of the supply voltage of 60 % for 100 ms the following class-dependent performance criteria shall apply: -for transmitters, belonging to class 1 equipment, the performance criteria CT (see clause 6.4);</p> <ul style="list-style-type: none"> ● for transmitters, belonging to class 2 or 3 equipment, the performance criteria TT (see clause 6.5); ● for receivers, belonging to class 1 equipment, the performance criteria CR (see clause 6.6); ● for receivers, belonging to class 2 or 3 equipment, the performance criteria TR (see clause 6.7). <p>For a voltage interruption corresponding to a reduction of the supply voltage of > 95 % for 5 000 ms the performance criteria TT or TR specified in clauses 6.5 or 6.7 shall apply as appropriate.</p> |

6.3.3 Radiated Immunity

| | |
|------------------------|--|
| Test Requirement: | ETSI EN 301 489-3 |
| Test Method: | EN 61000-4-3 |
| Frequency range: | 80MHz to 1GHz and 1.4GHz to 2.7GHz |
| Test Level: | 3V/m |
| Modulation: | 80%, 1kHz Amplitude Modulation |
| Performance Criterion: | Criteria A |
| Test setup: |  |
| Test Procedure: | <ol style="list-style-type: none"> 1. For table-top equipment, the EUT was placed in the chamber on a non-conductive table 0.8m high. For arrangement of floor-standing equipment, the EUT was mounted on a non-conductive support 0.1m above the supporting plane. For human body-mounted equipment, the EUT may be tested in the same manner as table top items. 2. If possible, a minimum of 1 m of cable is exposed to the electromagnetic field. Excess length of cables interconnecting units of the EUT shall be bundled low-inductively in the approximate center of the cable to form a bundle 30 cm to 40 cm in length. 3. The EUT was initially placed with one face coincident with the calibration plane. The EUT face being illuminated was contained within the UFA (Uniform Field Area). 4. The frequency ranges to be considered were swept with the signal modulated and pausing to adjust the RF signal level or to switch oscillators and antennas as necessary. Where the frequency range was swept incrementally, the step size was not exceed 1 % of the preceding frequency value. 5. The dwell time of the amplitude modulated carrier at each frequency was not be less than the time necessary for the EUT to be exercised and to respond, and was not less than 0,5 s. 6. The test normally was performed with the generating antenna facing |

| | |
|-------------------|--|
| | <p>each side of the EUT.</p> <p>7. The polarization of the field generated by each antenna necessitates testing each selected side twice, once with the antenna positioned vertically and again with the antenna positioned horizontally.</p> <p>8. The EUT was performed in a configuration to actual installation conditions, a video camera and/or a audio monitor were used to monitor the performance of the EUT.</p> |
| Test environment: | Temp.: 25 °C Humid.: 50% Press.: 101kPa |
| Test Instruments: | Refer to section 5.8 for details |
| Test mode: | Refer to section 5.3 for details |
| Test results: | Passed |

Measurement Record:

| Frequency | Level | Modulation | Antenna Polarization | EUT Face | Result / Observations |
|-----------------------------|-------|---|----------------------|----------|-----------------------|
| 80 MHz-1 GHz 1.4 -2.7GHz | 3 V/m | 1 kHz, 80 % Amp. Mod, 1 % increment, dwell time=3seconds | V | Front | A |
| | | | H | | A |
| | | | V | Rear | A |
| | | | H | | A |
| | | | V | Left | A |
| | | | H | | A |
| | | | V | Right | A |
| | | | H | | A |
| | | | V | Top | A |
| | | | H | | A |
| | | | V | Bottom | A |
| | | | H | | A |

Remarks:

A: No degradation in the performance of the E.U.T. was observed.

6.3.4 Transients and surges in the vehicular environment

| | |
|---------------------|---|
| Test Requirement: | ETSI EN 301 489-3 |
| Test Method: | EN 301 489-1 |
| Required Criterion: | Refer to test result below. |
| Test setup: | <p>The diagram illustrates the test setup. An EMC Tester and an EUT (Equipment Under Test) are positioned on a non-conducted table. The table is 80cm high and is grounded via a grounding cable. A ground reference plane is located 10cm above the table surface.</p> |
| Test Procedure: | The test method shall be in accordance with ISO 7637-2 [8], applying pulses 1, 2a, 2b, 3a, 3b, and 4, using immunity test level III. For the purpose of EMC testing it is sufficient to apply pulses 1, 2a, 2b and 4, 10 times each, and apply the test pulses 3a and 3b for 20 minutes each. |
| Test environment: | Temp.: 26 °C Humid.: 53% Press.: 101kPa |
| Test Instruments: | Refer to section 5.8 for details |
| Test mode: | Refer to section 5.3 for details |
| Test results: | Passed |

Measurement Record:

| | | |
|-----------|--------------------|--------|
| Pulse 1: | Level: | III |
| | Test level: | -75 V |
| | Number of pulses: | 10 |
| Pulse 2a: | Level: | III |
| | Test level: | +37 V |
| | Number of pulses: | 10 |
| Pulse 2b: | Level: | III |
| | Test level: | +10 V |
| | Number of pulses: | 10 |
| Pulse 3a: | Level: | III |
| | Test level: | -112 V |
| | Coupling duration: | 20 |
| Pulse 3b: | Level: | III |
| | Test level: | +75 V |
| | Coupling duration: | 20 |
| Pulse 4: | Level: | III |
| | Test level: | -6 V |
| | Number of pulses: | 10 |

Test results:

| Test pulse number | Immunity test level | Required functional status | Functional status of the systems | Tested phenomenon |
|-------------------|---------------------|----------------------------|----------------------------------|-------------------|
| 1 | III | D | A | Work as normally |
| 2a | III | D | A | Work as normally |
| 2b | III | D | A | Work as normally |
| 3a | III | D | A | Work as normally |
| 3b | III | D | A | Work as normally |
| 4 | III | D | A | Work as normally |

The requirements are **FULFILLED**.

6.3.5 Injected Currents susceptibility Test

| | |
|------------------------|--|
| Test Requirement: | ETSI EN 301 489-3 |
| Test Method: | EN 61000-4-6 |
| Frequency range: | 0.15MHz to 80MHz |
| Test Level: | 3V rms on DC Ports (unmodulated emf into 150 Ω) |
| Modulation: | 80%, 1kHz Amplitude Modulation |
| Performance Criterion: | Criteria A |
| Test setup: | |
| Test Procedure: | <ol style="list-style-type: none"> Let the EUT work in test mode and test it. The EUT are placed on an insulating support 0.1m high above a ground reference plane. CDN (coupling and decoupling device) is placed on the ground plane about 0.3m from EUT. Cables between CDN and EUT are as short as possible, and their height above the ground reference plane shall be between 30 and 50 mm (where possible). The disturbance signal described below is injected to EUT through CDN. The EUT operates within its operational mode(s) under intended climatic conditions after power on. The frequency range is swept from 0.150MHz to 80MHz using 3V signal level, and with the disturbance signal 80% amplitude modulated with a 1kHz sine wave. The rate of sweep shall not exceed 1.5*10⁻³decades/s. Where the frequency is swept incrementally; the step size shall not exceed 1% of the start and thereafter 1% of the preceding frequency value. Recording the EUT operating situation during compliance testing and decide the EUT immunity criterion. |
| Test environment: | Temp.: 24 °C Humid.: 51% Press.: 101kPa |
| Test Instruments: | Refer to section 5.8 for details |
| Test mode: | Refer to section 5.3 for details |
| Test results: | Passed |

Measurement Record:

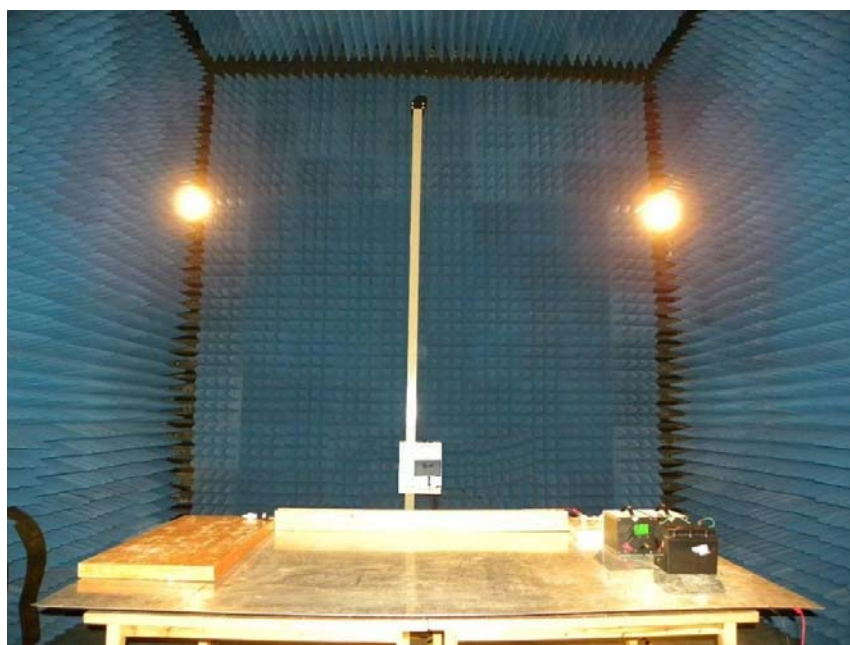
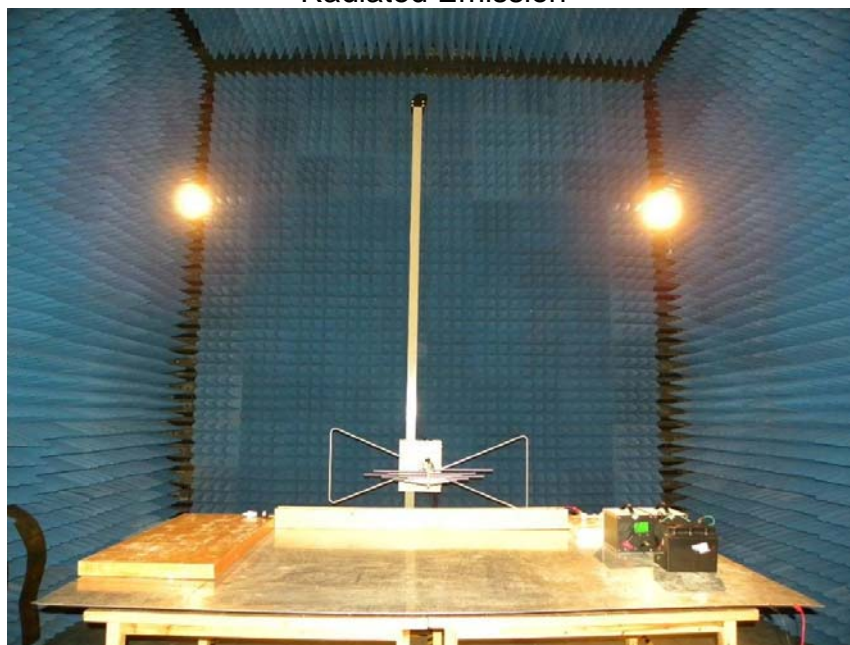
| Frequency | Injected Position | Test Level | Modulation | Step Size | Dwell Time | Observations (Performance Criterion) |
|--------------------|-------------------|------------|------------------------|-----------|------------|---|
| 150kHz to 80MHz | DC Main | 3Vrms | 80%, 1kHz Amp. Mod. | 1% | 2s | A |

Remark:

A: No loss of function was observed.

7 Test Setup Photo

Radiated Emission



Conducted Emission



Surge



RS



CS



8 EUT Constructional Details

Reference to the test report No. CCIS13070022501

-----End of report-----