# TEST REPORT

Secondo i seguenti Standard / *According to following Standards*

| | |
|---|---|
| **Test specification** | Test Plan : TP-13LA00054130409_K18_K19<br>FCC Rules: Code of Federal Regulations (CFR) no. 47<br>Part 15 Subpart C Section 15.209: 2012<br>RSS-210 Issue 8: 2010-12<br>RSS-Gen Issue 3: 2010-12 |

| | |
|---|---|
| Pulse train measurement for pulsed operational, FCC section 15.35 (c)<br>Pulsed Operation, RSS Gen par. 4.5 | **Measured** |
| Conducted Emission, section FCC 15.207 (a)<br>AC Power Line Conducted Emissions Limits, RSS Gen par. 7.2.4 | **N/A** |
| Restricted band of operation, FCC section 15.205 (a) (b)<br>Emissions Falling Within Restricted Frequency Bands, RSS Gen par.7.2.2<br>Radiated Emissions, FCC section 15.209<br>Transmitter Spurious Emission Limits, RSS Gen par. 7.2.5 | **Conforme/Compliant** |
| Occupied bandwidth, FCC section 2.202 (a)<br>Occupied bandwidth, RSS Gen par. 4.6.1 | **Measured** |
| Bandwidth of emission (20dB Bandwidth), FCC section 2.215 (c)<br>-20 dB Emission Bandwidth, RSS Gen par. 4.6.3 | **Conforme/Compliant** |
| Frequency Stability, FCC section 2.1055 (a)(1)<br>Transmitter Frequency Stability, RSS Gen par. 4.7 | **Conforme/Compliant** |
| RF exposure evaluation, FCC section 1.1307 (b)(1)<br>Exposure of Humans to RF Fields, RSS-Gen par. 5.6 | **Conforme/Compliant** |

| | |
|---|---|
| **Richiedente / *Applicant's name*** ....: | MTA S.p.A. |
| Indirizzo / *Address* .....: | Viale dell'Industria, 12 - 26845 Codogno (LO) - Italy |
| **Produttore / *Manufacturer*** .....: | MTA S.p.A. |
| Indirizzo / *Address* .....: | Viale dell'Industria, 12 - 26845 Codogno (LO) - Italy |
| **Dispositivo sottoposto ai test/ *Device Under Test*** .....: | BMW K18 km/mph |
| **Data di emissione/ *Date of issue*** | 27th May 2013 |
| **Validità/ *Validity*** | Vedi sezione 1.1 / *See section 1.1* |
| **Test report redatto da/ *Author of Test report* .....** | Loris Fruch |
| **Tecnico/i di prova *Engineer/s* .....** | Loris Fruch<br>Test manager: Giovanni Solari |
| **Approvato da (+ firma) *Approved by (+ signature)*.....** | Silvano Chialina<br>Responsabile del laboratorio/ *Head of the Laboratory*<br>Firmato digitalmente da Silvano Chialina<br>ND: c=IT, o=NON PRESENTE, sn=CHIALINA, givenName=SILVANO, serialNumber=IT:CHLSVN65L24L195V, dnQualifier=2008111628094, cn=Silvano Chialina<br>Data: 2013.06.10 10:01:42 +02'00' |
| **Laboratorio / *Testing Laboratory*** ..: | Emilab Srl |
| Indirizzo / *Address* .....: | Via F.lli Solari 5/A – 33020 Amaro (UD) - Italy |

# Index

# 1. Informazioni Generali / *General Information*

## 1.0 Laboratorio / Testing Laboratory

| **Luogo di Prova e partecipanti/ *Testing location and participants:*** | |
|---|---|
| **Testing Laboratory**: | |
| Testing location/ address ..... : | Emilab Srl<br>Via F.lli Solari 5/A – 33020 Amaro (UD) – Italy<br>Tel +39 0433 468625<br>Fax +39 0433 494739<br>Email: info@emilab.it |
| Partecipanti / *Participants*: | Loris Fruch |

## 1.1 Campionamento e Documentazione / *Sampling and Documentation*

I campioni sono stati consegnati dal Cliente. I risultati dei test contenuti in questo documento si riferiscono esclusivamente al modello e numero di serie provato. E' responsabilità del costruttore assicurare che la produzione dei modelli in serie rispetti i requisiti del presente documento. Questo documento non può essere riprodotto in parte senza il consenso scritto del responsabile del laboratorio EMILAB.

EMILAB non si assume nessuna responsabilità per danni derivanti da interpretazioni che esulano dal contesto e dall'applicazione del presente documento.

*The samples was delivered by customer. The results contained in this report reflect the results for this particular model and serial number. It is the responsibility of the manufacturer to ensure that all production models meet the intent of the requirements detailed within this report. This report shall not be reproduced, except in full, without the written approval of the Issuing testing Emilab laboratory.*

*EMILAB takes no responsibility for and will not assume liability for damages resulting from the reader's interpretation of the reproduced material due to its placement and context.*

## 1.2 Specifiche del test / *Test specifications*

| **Test performed according to:** | |
|---|---|
| Test plan | TP-13LA00054130409_K18_K19<br>Date: 09/04/2013<br>Author: Nunnari Rocco |
| Test specification | All compliance measurements have been carried out using the procedures described in the standard ANSI C63.4-2009, ANSI C63.10-2009, Section 15.31 of CFR47 Part 15 – Subpart A (General) and RSS-Gen Issue 3: 2010.<br><br>FCC Rules: Code of Federal Regulations (CFR) no. 47<br>Part 15 Subpart C Section 15.209: 2012 Radio Frequency Device<br><br>RSS-210 Issue 8: 2010-12 Licence-exempt Radio Apparatus (All Frequency Bands): Category I Equipment<br><br>RSS-Gen Issue 3: 2010-12 General Requirements and Information for the Certification of Radio Apparatus |
| Basic Specifications | RSS-102 Issue 4: 2010-03 Radio Frequency (RF) Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands)<br><br>ANSI C63.4: 2009-09 Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9KHz to 40GHz<br><br>ANSI C63.10: 2009 American National Standard for Testing Unlicensed Wireless Devices |

## 1.3 Svolgimento dei test e condizioni generali / *Test scheduling and general condition*

| | |
|---|---|
| **Svolgimento dei test / *Scheduling*** ..... : | |
| Data ricezione EUT<br>*Date of receipt of EUT* ..... : | 15/04/2013 |
| Data esecuzione test<br>*Date (s) of performance of tests* ..... : | 23/05/2013 – 27/05/2013 |
| **Condizioni ambientali**<br>***/ Environment Conditions*** | Se non diversamente specificato / *If not otherwise specified:*<br>Temperature: 18-28°C<br>Humidity: 20-90%<br>Pressure: 87-108.56 kPa |
| **Intervallo delle tarature/**<br>***Calibration Interval*** | Minimum 1 year |

## 1.4 Espressione dei risultati finali / *Test case of final verdicts*

| | |
|---|---|
| **I GIUDIZI NON SONO SOGGETTI AD ACCREDITAMENTO**<br>**/ *VERDICTS ARE NOT SUBJECT TO ACCREDITATION*** | |
| - test case does not apply to the test object.. : | N/A |
| - test object does meet the requirement..... : | Compliant |
| - test object does not meet the requirement.. : | Not Compliant |

## 1.5 Incertezza / *Uncertainty*

L'incertezza estesa riportata è espressa come l'incertezza tipo moltiplicata per il fattore di copertura k = 2, che per una distribuzione normale corrisponde ad una probabilità di copertura di circa il 95 %.

*The reported expanded uncertainty of measurements is stated as the standard uncertainty of measurement, multiplied by the coverage factor k=2, which for a normal distribution corresponding to a coverage probability of approximately 95%.*

## 1.6 Termini, Definizioni e Acronimi/ *Terms, definitions and abbreviations*

With reference to IEC 60050-161

| | |
|---|---|
| ALSE | absorber-lined shielded enclosure |
| AM | amplitude modulation |
| AN | artificial network |
| AV | Average Detector |
| BAN | broadband artificial network |
| BCI | Bulk Current Injection |
| CBCI | Common Mode BCI |
| CDN | Coupling Decoupling Network |
| DBCI | Differential Mode BCI |
| DUT | Device Under Test |
| EMC | electromagnetic compatibility |
| EMI | electromagnetic interference |
| EUT | Equipment Under test |
| FSP | Functional Performance Status |
| HCP | Horizontal Coupling Plate |
| LISN | Line Impedance Simulation Network |
| OM | Operating Modes |
| PM | pulse modulation |
| PK | Peak Detector |
| RE | Radiated Emission |
| RI | Radiated Immunity |
| QP | Quasi-peak Detector |
| SWR | standing wave ratio |
| VSWR | voltage standing wave ratio |
| TEM cell | transverse electromagnetic cell |

## 2.0 Apparecchiatura sottoposta a test/ *Device Under Test*

| | |
|---|---|
| **Descrizione** / D***escription*** **..... :** | Scooter display |
| Marchio commercial / *Trade Mark*..... : | / |
| Produttore / *Manufacturer* ..... : | MTA S.p.A |
| Modello / *Model/Type reference*..... : | BMW K18 km/mph |
| Voltage ..... : | 13.5V dc |
| Current..... : | 1A |
| Frequency ..... : | / |
| Power ..... : | / |
| Numero EUT / *EUT Number* ..... : | 13LA00053/01 (BMW K18 km), 13LA00053/02 (BMW K18 mph) |
| Serial Number ..... : | / |
| Numero di campioni testati / *Number of samples tested* ..... : | 2 |
| Numero EUT del produttore / *Internal customer EUT Number* ..... : | / |
| Sample stage/level..... : | / |
| Hardware stage/level..... : | Pcb d10c13r6 |
| Software stage/level..... : | BMWVAL07 |
| Modification stage ..... : | / |
| Operating Mode..... : | Mode 2 (see applicable cited test plan) |
| Wiring harness ..... : | Vehicle cable |
| Monitoring..... : | Visual check |
| Info..... : | All the tests are performed with the EUT connected to the Key lock model Q2874 with antenna limit model ELO277 (see applicable cited test plan).<br><br>For all measurements performed in the Semi-Anechoic Chamber the EUT was powered by a external power supply unit via a filter LINDGREN-RAYPROOF Model: EMI Protection Unit N6006, Sn: 202031. |

## 3.0 Pulse train measurement for pulsed operation - Condizioni di Prova / *Test Conditions*

| | | |
|---|---|---|
| Technician | Loris Fruch | |
| Table No. | TEST: Pulse train measurement for pulsed operational | \ |
| Method | FCC Rules: 47 CFR Part 15 Subpart C: 2012, section 15.35 (c);<br>RSS-Gen Issue 3: 2010-12, par. 4.5; | \ |

| | | |
|---|---|---|
| Parameters required prior to the test | Laboratory Ambient Temperature | 18 to 28 °C |
| | Relative Humidity | 20 to 90 % |
| Parameters recorded during the test | Laboratory Ambient Temperature | 20°C |
| | Relative Humidity | 62% |

Supplementary information:

- EUT operating mode 2, see the applicable cited test plan;
- The EUT is set to transmit with modulation in continuous mode;
- Test Requirement:
  According to CFR 47 Part 15, section 15.35(c) and par. 4.5 of RSS-Gen Issue 3: 2010-12,
  Guide ANSI C63.4: 2009-09
  Device transmitting pulse emissions and subject to a limit requiring an average detector function for radiated emissions shall initially be measured with an instrument that uses a peak detector.
  A radiated emission measured with a peak detector may then be corrected to a true average using the appropriate factor for emission duty cycle.
  This correction factor relates the measured peak level to the average limit and is derived by averaging absolute field strength over one complete pulse train that is 0.1s, or less, in length. If the pulse train is longer than 0.1s, the average shall be determined from the average absolute field strength during the 0.1s interval in which the field strength is at a maximum.

## 3.1 Apparecchiature utilizzate / *Test Equipment Used* – Pulse train measurement for pulsed operation

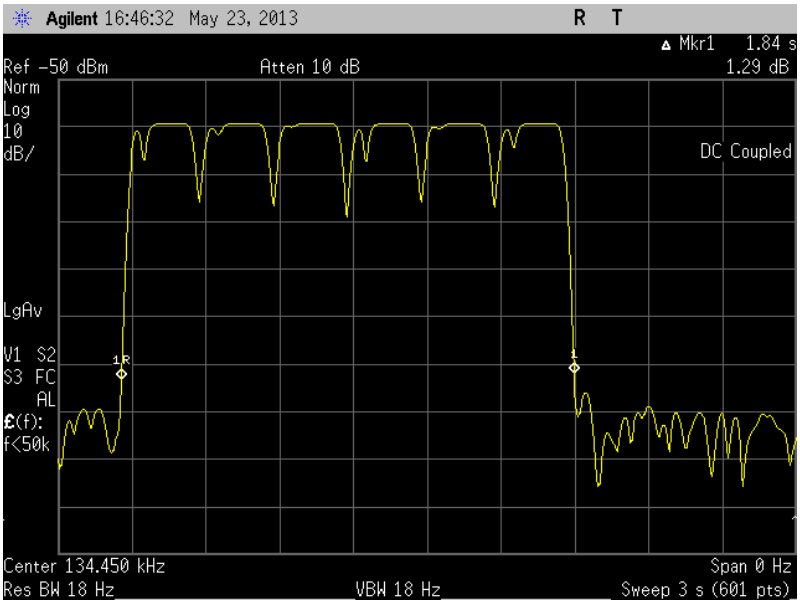
| ***Apparecchiature usate/Equipment Used*** | ***Modello/ Model*** | ***Costruttore/ Manufacturer*** | ***Numero di serie/Serial Number*** | ***Data Calibrazione/ Calibration Date*** |
|---|---|---|---|---|
| EMI Receiver | E4440A | Agilent Technologies | MY48250305 | 2012/11 (with due date 2013/11) |
| RF Preamplifier | HP8447F | Hewlett Packard | 3113A07568 | 2012/08 (with due date 2013/08) |
| RF Cable | S5LL-400 | Spin electronics | 01-053-12 | 2013/04 (with due date 2014/04) |
| RF Cable | S5LL-900 | Spin electronics | 02-053-12 | 2013/04 (with due date 2014/04) |
| Loop Antenna | ALR25M | Electro-Metrics | 813 | 2012/07 (with due date 2013/07) |
| DC Power Supply (*) | E3634A | Agilent | MY51070025 | - |
| Semi-Anechoic Chamber | - | ETS LINDGREN | 5207 | 2012/03 (with due date 2014/03) |

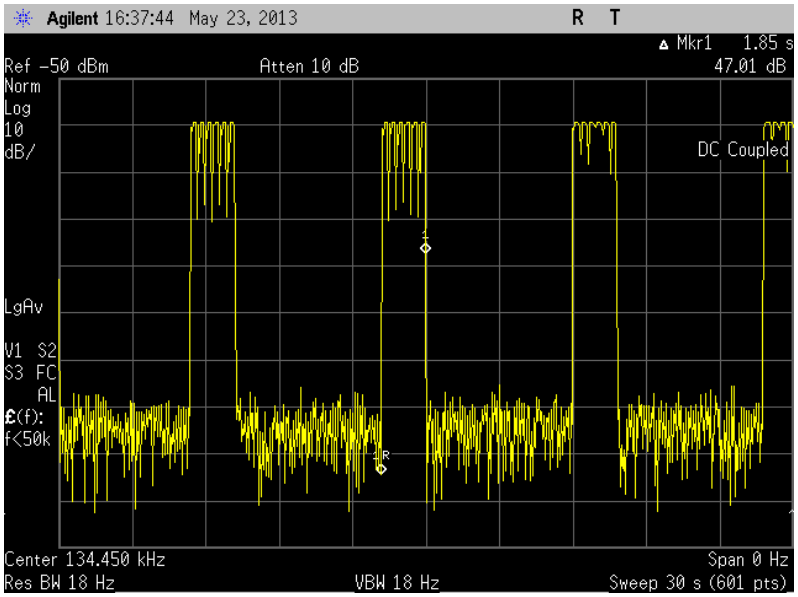
(*) auxiliary equipment

## 3.2 Risultati del test / *Test Results* - Pulse train measurement for pulsed operation

Ton (single pulse): 1.84s (>0.1s)
T period: 2.6s
Pulse train correction: 0dB

### 3.2.1 Grafici dei dati di prova / Graphical representation data - Pulse train measurement for pulsed operation



## 4.0 Conducted Emission - Condizioni di Prova / *Test Conditions*

| | | |
|---|---|---|
| Technician | / | |
| Table No. | TEST: Conducted Emission | \ |
| Method | FCC Rules: 47 CFR Part 15 Subpart C: 2012, section 15.207 (a);<br>RSS-Gen Issue 3: 2010-12, par. 7.2.4; | \ |

| | | |
|---|---|---|
| Parameters required prior to the test | Laboratory Ambient Temperature | 18 to 28 °C |
| | Relative Humidity | 20 to 90 % |
| Parameters recorded during the test | Laboratory Ambient Temperature | / |
| | Relative Humidity | / |

Supplementary information:

- This test is not applicable because the EUT is powered in DC by a battery on vehicle;

## 5.0 Radiated Emissions - Condizioni di Prova / Test Conditions

| | | |
|---|---|---|
| Technician | Loris Fruch | |
| Table No. | TEST: Restricted band of operation<br>Radiated Emissions | \ |
| Method | FCC Rules: 47 CFR Part 15 section § 15.209: 2012;<br>RSS-Gen Issue 3: 2010-12, par. 7.2.2 and par. 7.2.5; | \ |

| | | |
|---|---|---|
| Parameters required prior to the test | Laboratory Ambient Temperature | 18 to 28 °C |
| | Relative Humidity | 20 to 90 % |
| Parameters recorded during the test | Laboratory Ambient Temperature | 20 °C |
| | Relative Humidity | 62 % |

Supplementary information:

- EUT operating mode 2, see the applicable cited test plan;
- All measurements were conducted with EUT powered at nominal voltage (13.5Vdc);
- The EUT is set to transmit with modulation in continuous mode;
- The EUT was placed on turn table which is 0.8m above the ground plane. For frequency from 30MHz to 200MHz the turn table rotate from 0° to 360° and the receiving antenna varied from 1m to 4m to determine the position of maximum emission level;
- Test Requirement:
  - Test setup: ANSI C63.4: 2009-09;
  - Test facility Semi-anechoic chamber;
  - Test distance: 3 meters
  - Antenna polarisation: vertical from 9KHz to 30MHz, vertical and horizontal from 30MHz to 200MHz;
  - Detector: Peak (Max hold)
  - Frequency range: 9KHz to 200MHz;
  - IF bandwidth: 9KHz below 30MHz and 120KHz from 30MHz to 200MHz;
  - Limits: Sections 15.209 of 47 CFR Part 15 and Table 6 of par.7.2.5 of RSS-Gen Issue 3;
  - Remark: In accordance with part 15.31 (f) (2) of FCC and with par. 7.2.7 of RSS, where the measurement distance was specified to be 30 or 300meters, a correction factor was applied in order to permit measurement to be performed at a separation distance. The applied formula for limits at 3 meter is:
    Extrapolation (dB) = 40log (300meter / 3meter) = +80dB
    Extrapolation (dB) = 40log (30meter / 3meter) = +40dB

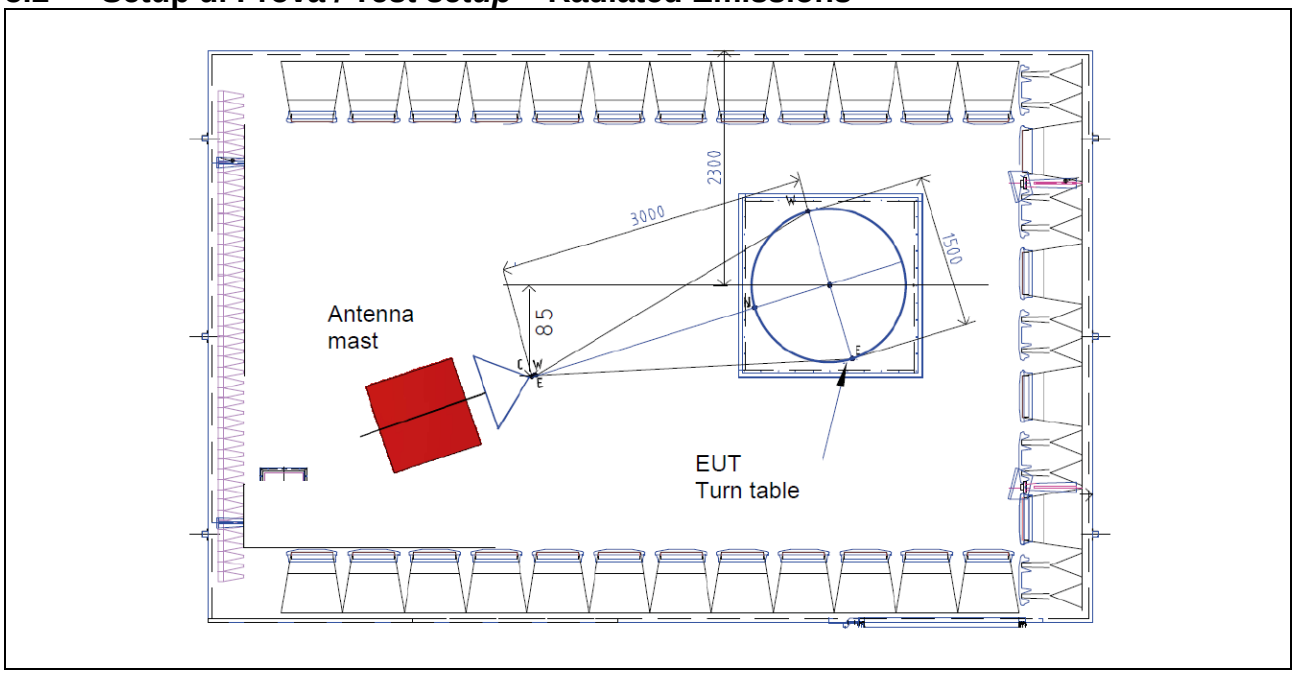
## 5.1 Apparecchiature utilizzate / *Test Equipment Used* – Radiated Emissions

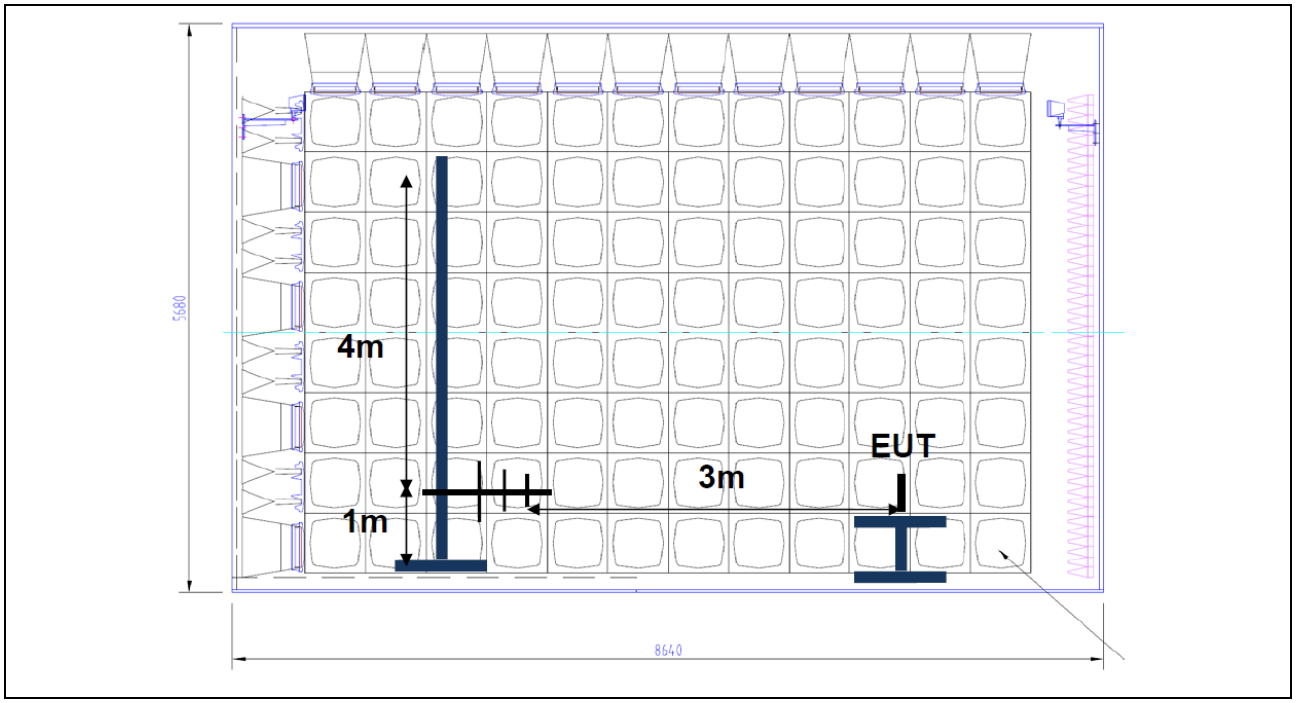
| ***Apparecchiature usate/Equipment Used*** | ***Modello/ Model*** | ***Costruttore/ Manufacturer*** | ***Numero di serie/Serial Number*** | ***Data Calibrazione/ Calibration Date*** |
|---|---|---|---|---|
| EMI Receiver | E4440A | Agilent Technologies | MY48250305 | 2012/11 (with due date 2013/11) |
| RF Pre-selector | N9039A | Agilent Technologies | MY48260010 | 2012/11 (with due date 2013/11) |
| RF Preamplifier | HP8447F | Hewlett Packard | 3113A07568 | 2012/08 (with due date 2013/08) |
| RF Cable | S5LL-400 | Spin electronics | 01-053-12 | 2013/04 (with due date 2014/04) |

| | | | | |
|---|---|---|---|---|
| RF Cable | S5LL-900 | Spin electronics | 02-053-12 | 2013/04 (with due date 2014/04) |
| Loop Antenna | ALR25M | Electro-Metrics | 813 | 2012/07 (with due date 2013/07) |
| Biconical Antenna | VHBB 9124 BBAK 9137 | Schwarzbeck | 9124-463 | 2012/11 (with due date 2013/11) |
| DC Power Supply (*) | E3634A | Agilent | MY51070025 | - |
| Semi-Anechoic Chamber | - | ETS LINDGREN | 5207 | 2012/03 (with due date 2014/03) |

(*) auxiliary equipment

## 5.2 Setup di Prova / T*est setup* – Radiated Emissions





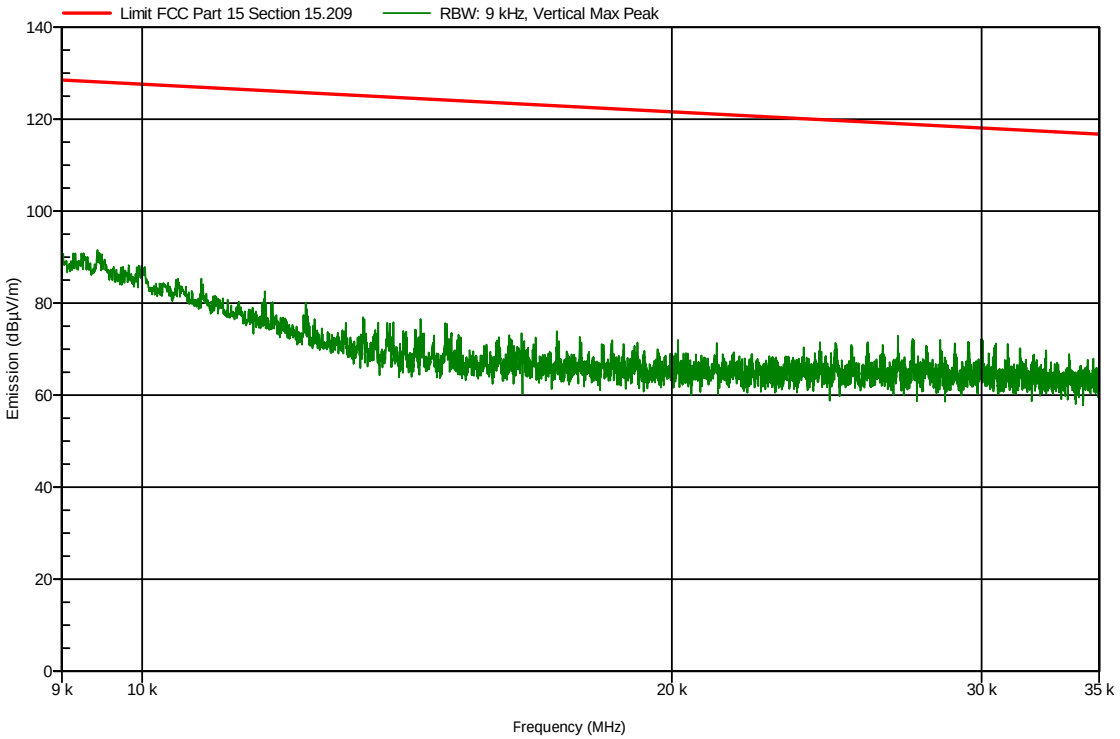

## 5.3 Risultati / *Results* – Radiated Emissions

| Frequency (MHz) | Peak (dBuV/m) | Quasi-Peak Limit (dBuV/m) |
|---|---|---|
| 0.134571 | 76.46 | 105.02 |
| 32.211 | 34.96 | 40 |
| 159.985 | 38.01 | 43.52 |

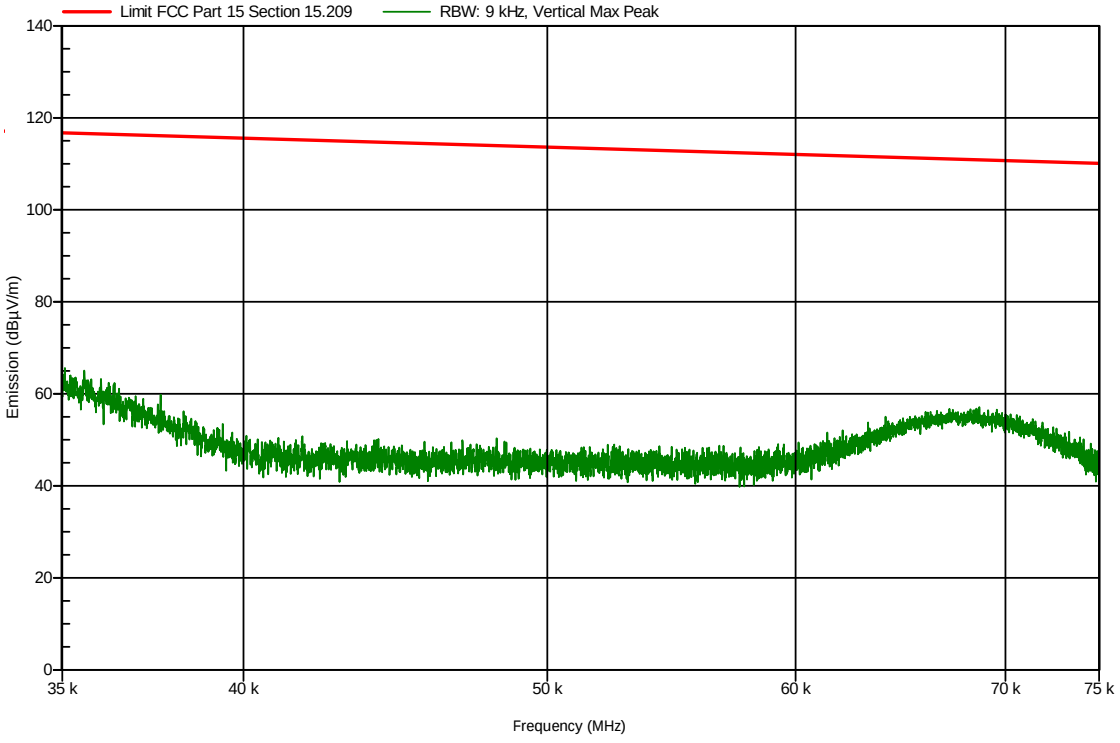
The EUT meets the requirements of sections 15.209 (2012) of. FCC Rules: 47 CFR Part 15 Subpart C: 2008.
The EUT meets the requirements of par. 7.2.5 of RSS-Gen Issue 3: 2010-12.

### 5.3.1 Grafici dei risultati / *Graphical representation data* – Radiated Emissions

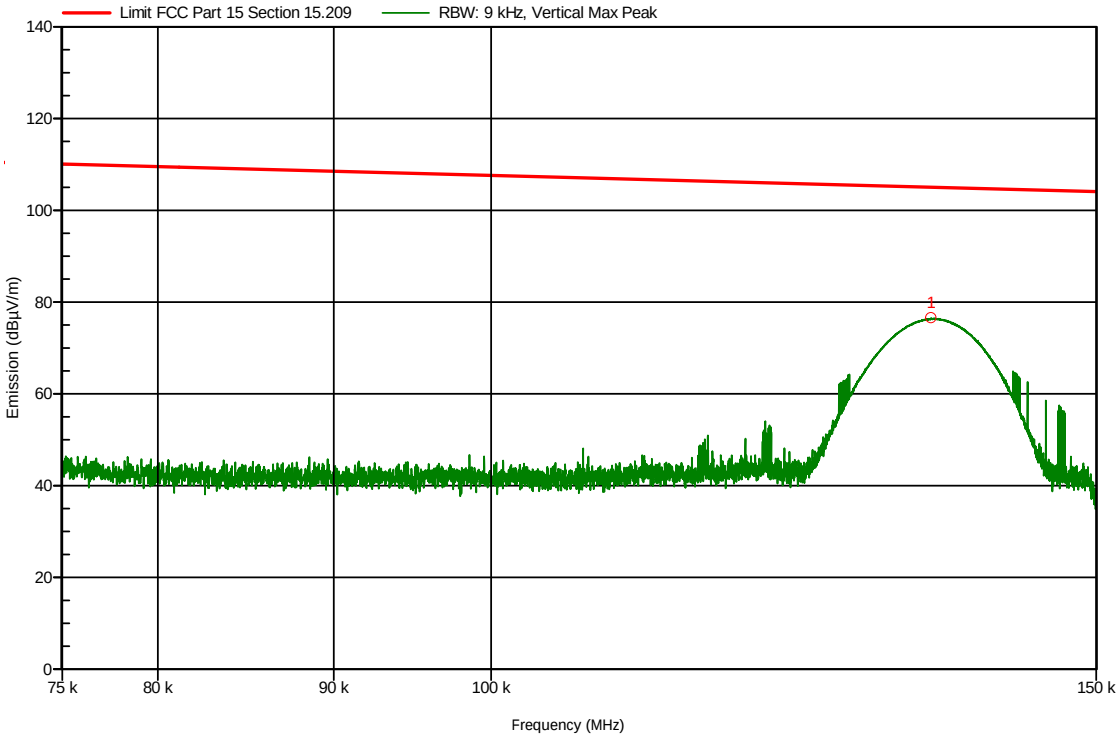
Emissions measured from 10KHz to 35KHz. Peak detector with IF=9KHz.




Emissions measured from 35KHz to 75KHz. Peak detector with IF=9KHz.



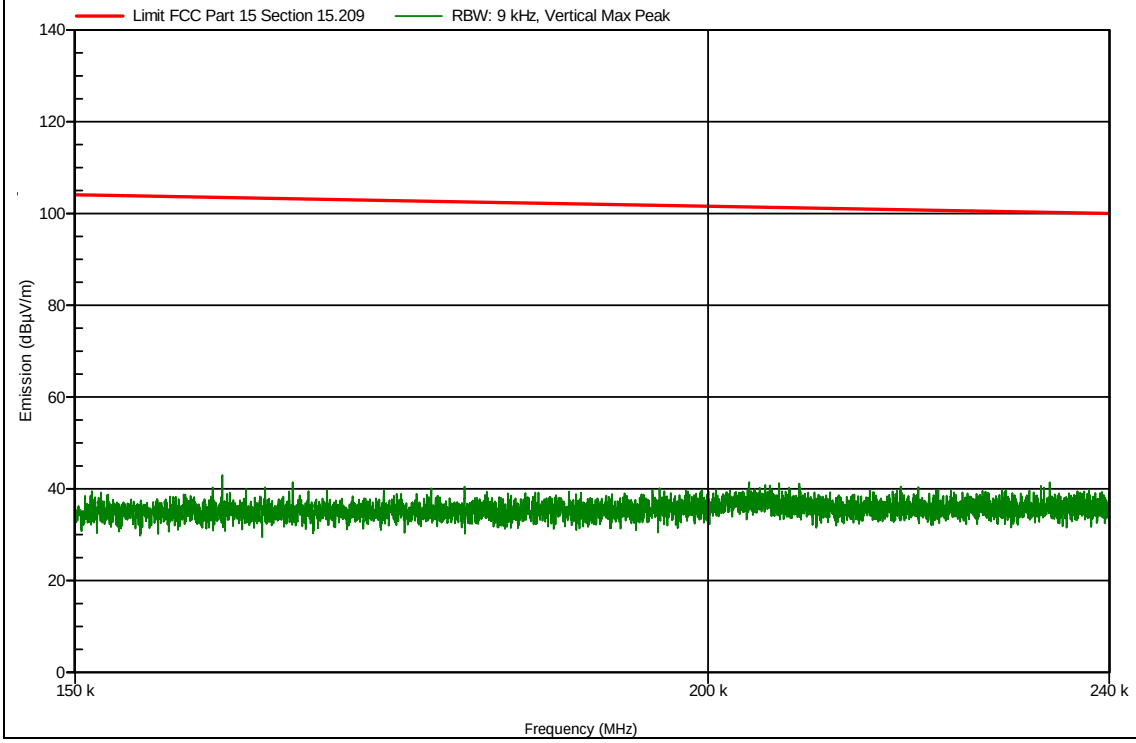
Emissions measured from 75KHz to 150KHz. Peak detector with IF=9KHz.



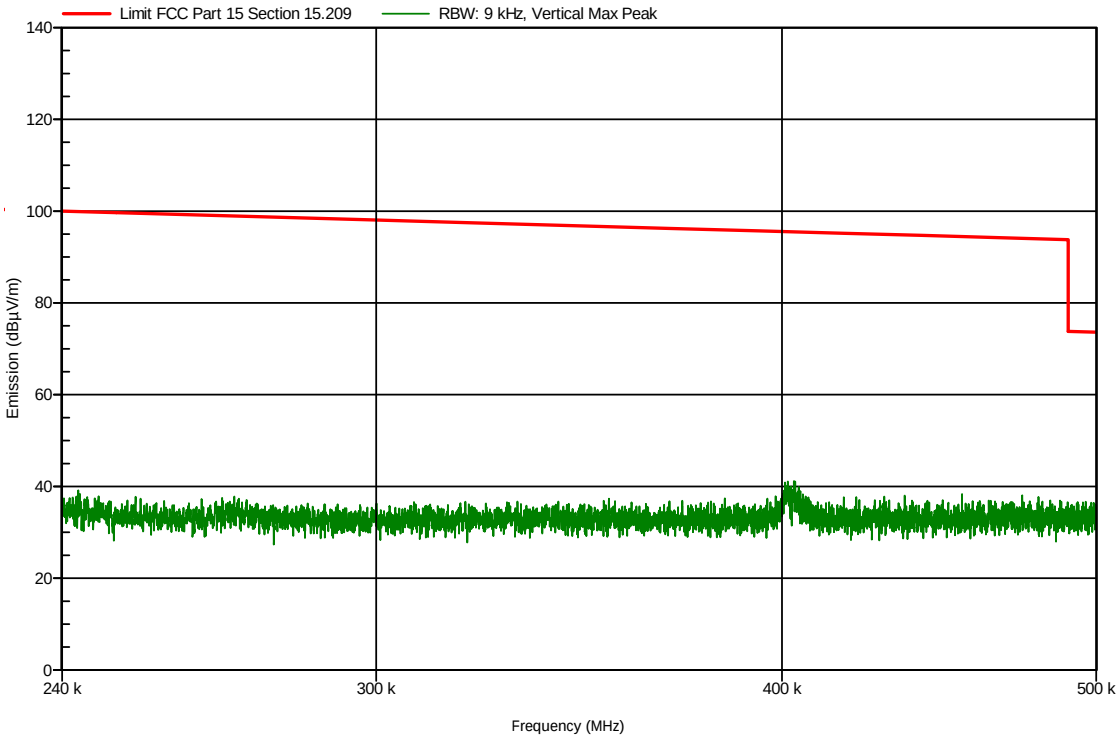

List of highest signals measured with peak detector

| Frequency | Peak | Quasi-Peak Limit | Status |
|---|---|---|---|
| 134.648 kHz | 76.46 dBµV/m | 105.01 dBµV/m | Pass |

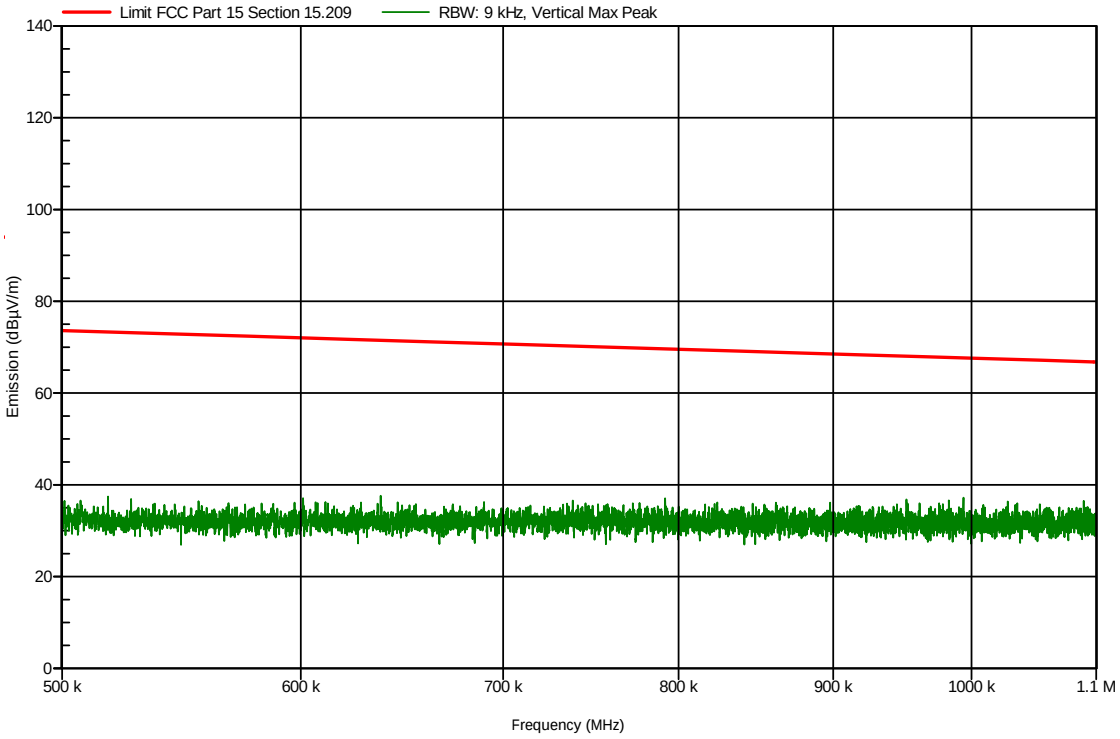
Emissions measured from 150KHz to 240KHz. Peak detector with IF=9KHz.



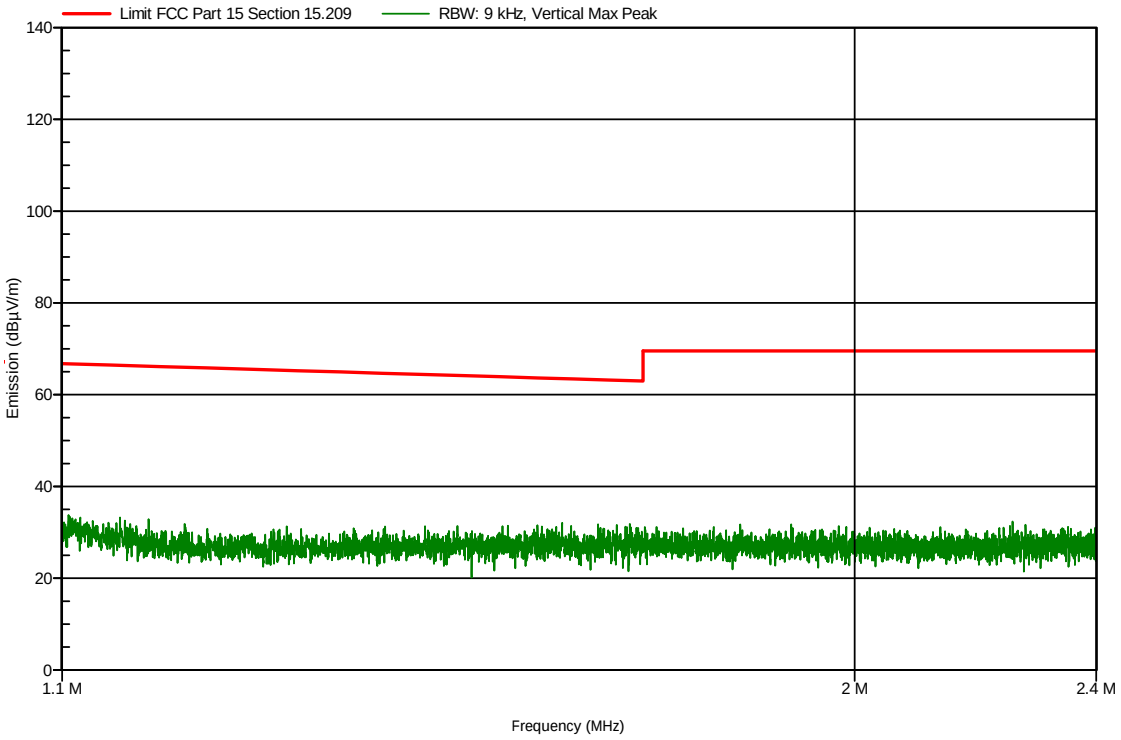
Emissions measured from 240KHz to 500KHz. Peak detector with IF=9KHz.



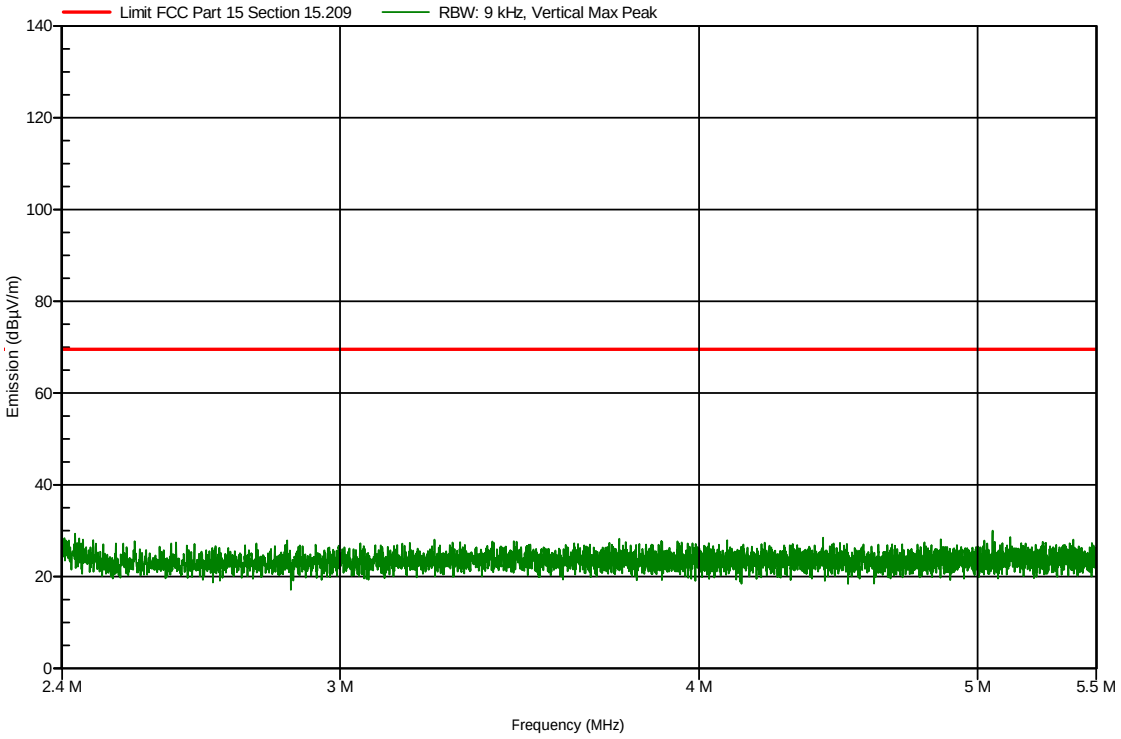

Emissions measured from 500KHz to 1.1MHz. Peak detector with IF=9KHz.



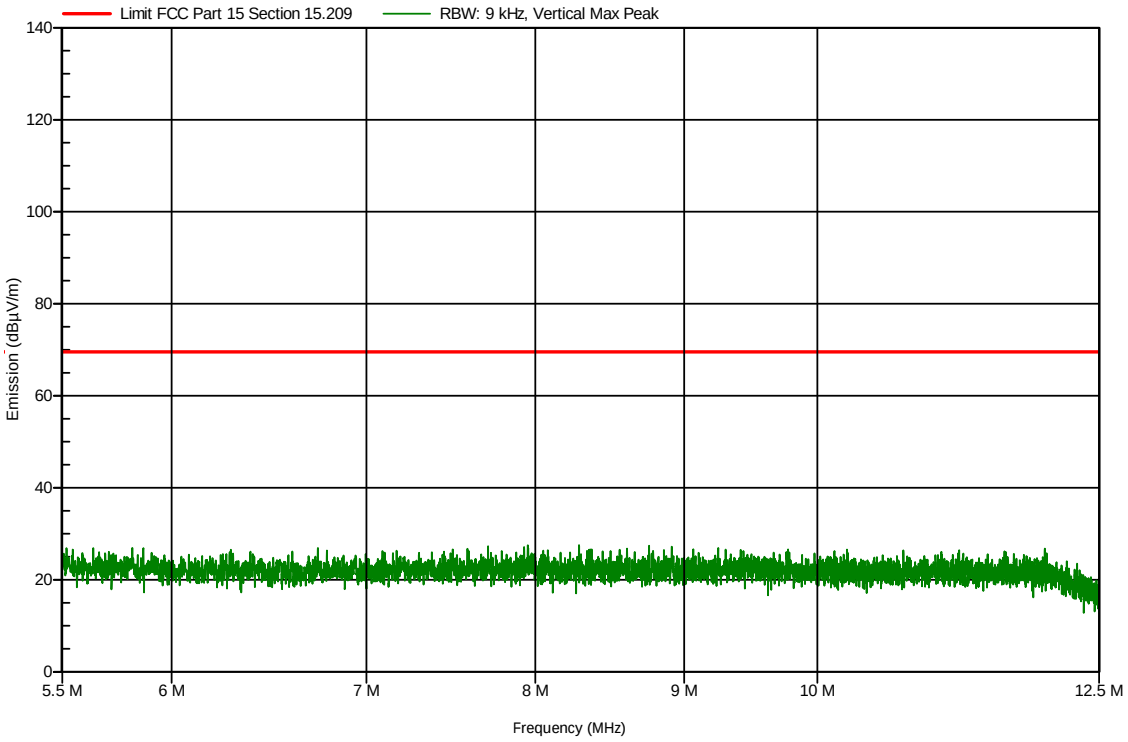
Emissions measured from 1.1MHz to 2.4MHz. Peak detector with IF=9KHz.



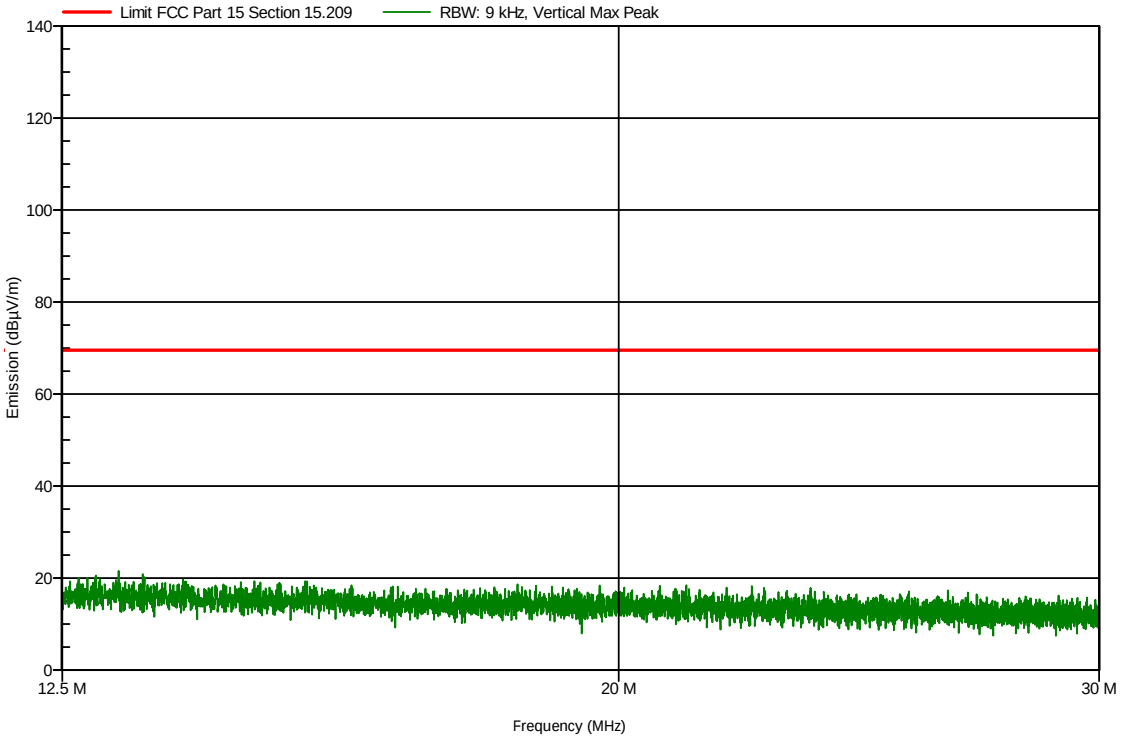

Emissions measured from 2.4MHz to 5.5MHz. Peak detector with IF=9KHz.



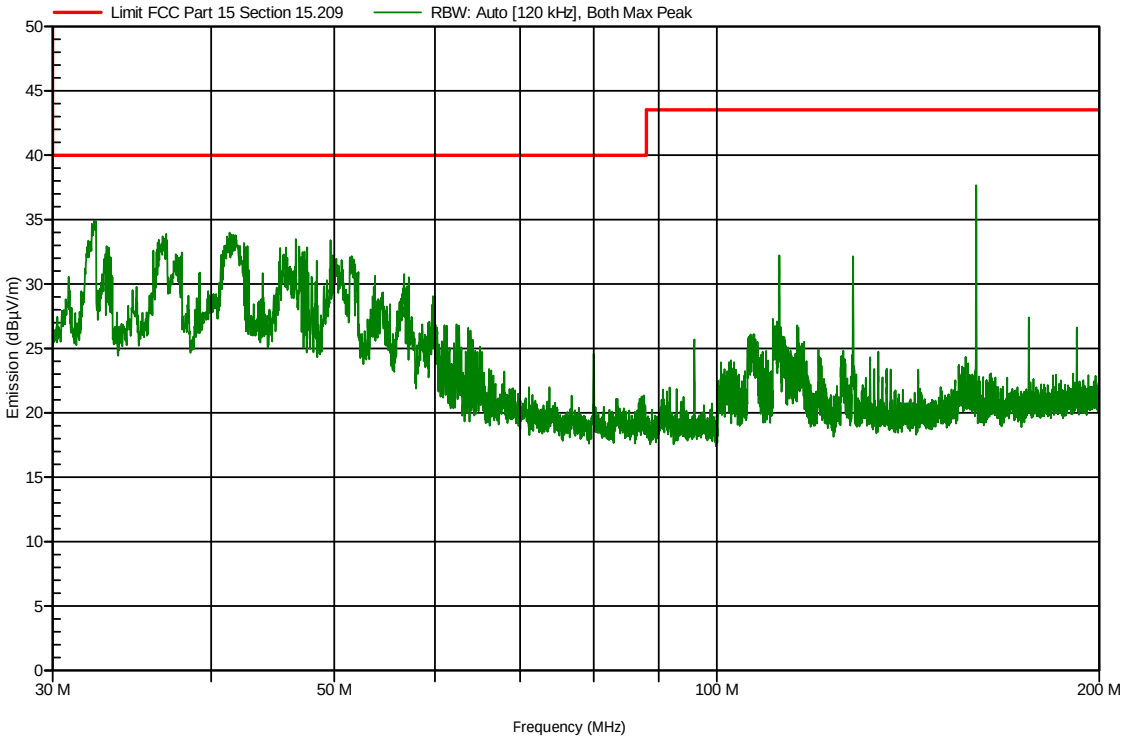
Emissions measured from 5.5MHz to 12.5MHz. Peak detector with IF=9KHz.




Emissions measured from 12.5MHz to 30MHz. Peak detector with IF=9KHz.



Emissions measured from 30MHz to 200MHz. Peak detector with IF=120KHz.




List of highest signals measured with peak detector

| Frequency | Peak | Quasi-Peak Limit | Status |
|---|---|---|---|
| 32.211 MHz | 34.96 dBµV/m | 40 dBµV/m | Pass |
| 159.985 MHz | 38.01 dBµV/m | 43.52 dBµV/m | Pass |

## 6.0 Occupied Bandwidth - Condizioni di Prova / *Test Conditions*

| | | |
|---|---|---|
| Technician | Loris Fruch | |
| Table No. | TEST: Occupied bandwidth | \ |
| Method | FCC Rules: 47 CFR Part 15 Subpart C: 2012, section 2.202 (a);<br>RSS-Gen Issue 3: 2010-12, par. 4.6.1; | \ |

| | | |
|---|---|---|
| Parameters required prior to the test | Laboratory Ambient Temperature | 18 to 28 °C |
| | Relative Humidity | 20 to 90 % |
| Parameters recorded during the test | Laboratory Ambient Temperature | 20°C |
| | Relative Humidity | 65% |

Supplementary information:

- EUT operating mode 2, see the applicable cited test plan;
- The EUT is set to transmit with modulation in continuous mode;
- The Requirement:
  The frequency bandwidth according to CFR 47 Part 2 section 2.202 (a) and par. 4.6.1 of RSS-Gen Issue 3: 2010-12, is measured as the 99% of emission bandwidth.
  The frequency bandwidth such that, below its lower and above its upper frequency limits, the mean power radiated are each equal to 0.5% of the total mean power radiated by a given emission.
  Guide ANSI C63.4: 2009-09
  In order to measure the modulated signal properly, a resolution bandwidth that is small compared with the bandwidth required by the procuring or regulatory agency shall be used on the measuring instrument. However, the resolution bandwidth of the measuring instrument shall be set to a value within 1% to 5% of the signal bandwidth requirements;

## 6.1 Apparecchiature utilizzate / *Test Equipment Used* – Occupied Bandwidth

| ***Apparecchiature usate/Equipment Used*** | ***Modello/ Model*** | ***Costruttore/ Manufacturer*** | ***Numero di serie/Serial Number*** | ***Data Calibrazione/ Calibration Date*** |
|---|---|---|---|---|
| EMI Receiver | E4440A | Agilent Technologies | MY48250305 | 2012/11 (with due date 2013/11) |
| RF Preamplifier | HP8447F | Hewlett Packard | 3113A07568 | 2012/08 (with due date 2013/08) |
| RF Cable | S5LL-400 | Spin electronics | 01-053-12 | 2013/04 (with due date 2014/04) |
| RF Cable | S5LL-900 | Spin electronics | 02-053-12 | 2013/04 (with due date 2014/04) |
| Loop Antenna | ALR25M | Electro-Metrics | 813 | 2012/07 (with due date 2013/07) |
| DC Power Supply (*) | E3634A | Agilent | MY51070025 | - |
| Semi-Anechoic Chamber | - | ETS LINDGREN | 5207 | 2012/03 (with due date 2014/03) |

(*) auxiliary equipment

## 6.2 Risultati del test / *Test Results* - Occupied Bandwidth

Occupied bandwidth (99%): 9.69kHz @134.45

## 6.3 Grafici dei dati di prova / Graphical representation data - Occupied Bandwidth

## 7.0 Bandwidth of emission (20dB Bandwidth) - Condizioni di Prova / *Test Conditions*

| | | |
|---|---|---|
| Technician | Loris Fruch | |
| Table No. | TEST: Bandwidth of emission (20dB Bandwidth) | \ |
| Method | FCC Rules: 47 CFR Part 15 Subpart C: 2012, section 2.215 (c);<br>RSS-Gen Issue 3: 2010-12, par. 4.6.3; | \ |

| | | |
|---|---|---|
| Parameters required prior to the test | Laboratory Ambient Temperature | 18 to 28 °C |
| | Relative Humidity | 20 to 90 % |
| Parameters recorded during the test | Laboratory Ambient Temperature | 20°C |
| | Relative Humidity | 65% |

Supplementary information:

- EUT operating mode 2, see the applicable cited test plan;
- The EUT is set to transmit with modulation in continuous mode;
- Spectrum analyser settings:
  - Span:15kHz
  - Resolution bandwidth (BW): 240Hz
  - Video bandwidth (VBW): 2.4kHz
  - Sweep time: 240ms
  - Detector: Peak
  - Trace: Max hold
  - Attenuation: 0dB
- Limits: 20dB below peak output power;
- ANSI C63-4: 2009-09 Specification:
  In order to measure the modulated signal properly, a resolution bandwidth that is small compared with the bandwidth required by the procuring or regulatory agency shall be used on the measuring instrument. However, the resolution bandwidth of the measuring instrument shall be set to a value greater than 5% of the bandwidth requirements. When no bandwidth requirements are specified, the minimum resolution bandwidth of the measuring instrument is given in the following table:

| **Fundamental frequency** | **Minimum resolution bandwidth** |
|---|---|
| 9 KHz to 30 MHz | 1 KHz |
| 30 MHz to 1000 MHz | 10 KHz |
| 1000 MHz to 40 GHz | 100 KHz |

## 7.1 Apparecchiature utilizzate / *Test Equipment Used* – Bandwidth of emission (20dB Bandwidth)

| ***Apparecchiature usate/Equipment Used*** | ***Modello/ Model*** | ***Costruttore/ Manufacturer*** | ***Numero di serie/Serial Number*** | ***Data Calibrazione/ Calibration Date*** |
|---|---|---|---|---|
| EMI Receiver | E4440A | Agilent Technologies | MY48250305 | 2012/11 (with due date 2013/11) |
| RF Preamplifier | HP8447F | Hewlett Packard | 3113A07568 | 2012/08 (with due date 2013/08) |
| RF Cable | S5LL-400 | Spin electronics | 01-053-12 | 2013/04 (with due date 2014/04) |

| | | | | |
|---|---|---|---|---|
| RF Cable | S5LL-900 | Spin electronics | 02-053-12 | 2013/04 (with due date 2014/04) |
| Loop Antenna | ALR25M | Electro-Metrics | 813 | 2012/07 (with due date 2013/07) |
| DC Power Supply (*) | E3634A | Agilent | MY51070025 | - |
| Semi-Anechoic Chamber | - | ETS LINDGREN | 5207 | 2012/03 (with due date 2014/03) |

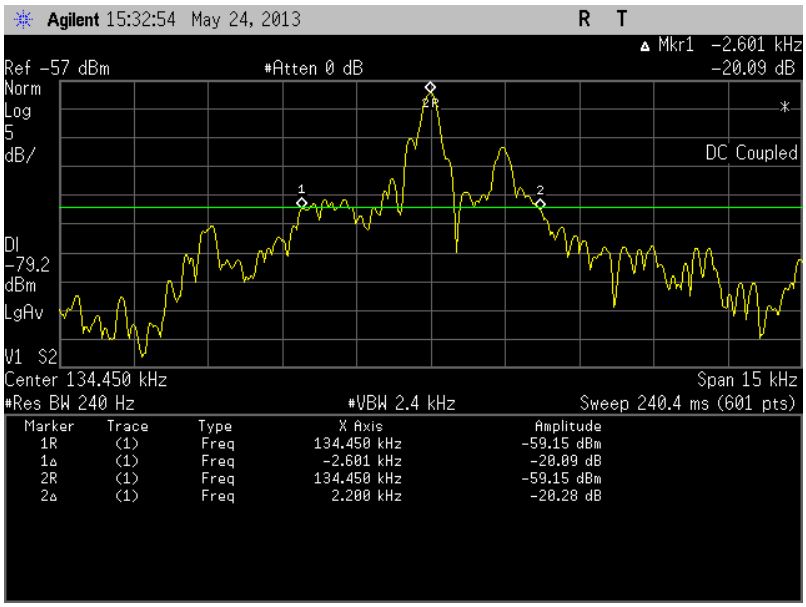
(*) auxiliary equipment

## 7.2 Risultati del test / *Test Results* - Bandwidth of emission (20dB Bandwidth)

The EUT meets the requirements of the section 2.1049 of FCC Rules: 47 CFR Part 15 Subpart C: 2008
The EUT meets the requirements of the RSS-Gen Issue 3: 2010-12, par. 4.6.3;

| Channel (No.) | Frequency (kHz) | Channel Bandwidth (kHz) |
|---|---|---|
| 01 | 134.45 | 4.8 |

## 7.3 Grafici dei dati di prova / Graphical representation data - Bandwidth of emission (20dB Bandwidth)



## 8.0 Frequency Stability - Condizioni di Prova / *Test Conditions*

| | | |
|---|---|---|
| Technician | Loris Fruch | |
| Table No. | TEST: Frequency Stability | \ |
| Method | FCC Rules: 47 CFR Part 15 Subpart C: 2008, section 2.1055 (a)(1);<br>RSS-Gen Issue 3: 2010-12, par. 4.7; | \ |

| | | |
|---|---|---|
| Parameters required prior to the test | Laboratory Ambient Temperature | 18 to 28 °C |
| | Relative Humidity | 20 to 90 % |
| Parameters recorded during the test | Laboratory Ambient Temperature | 20°C |
| | Relative Humidity | 64% |

Supplementary information:

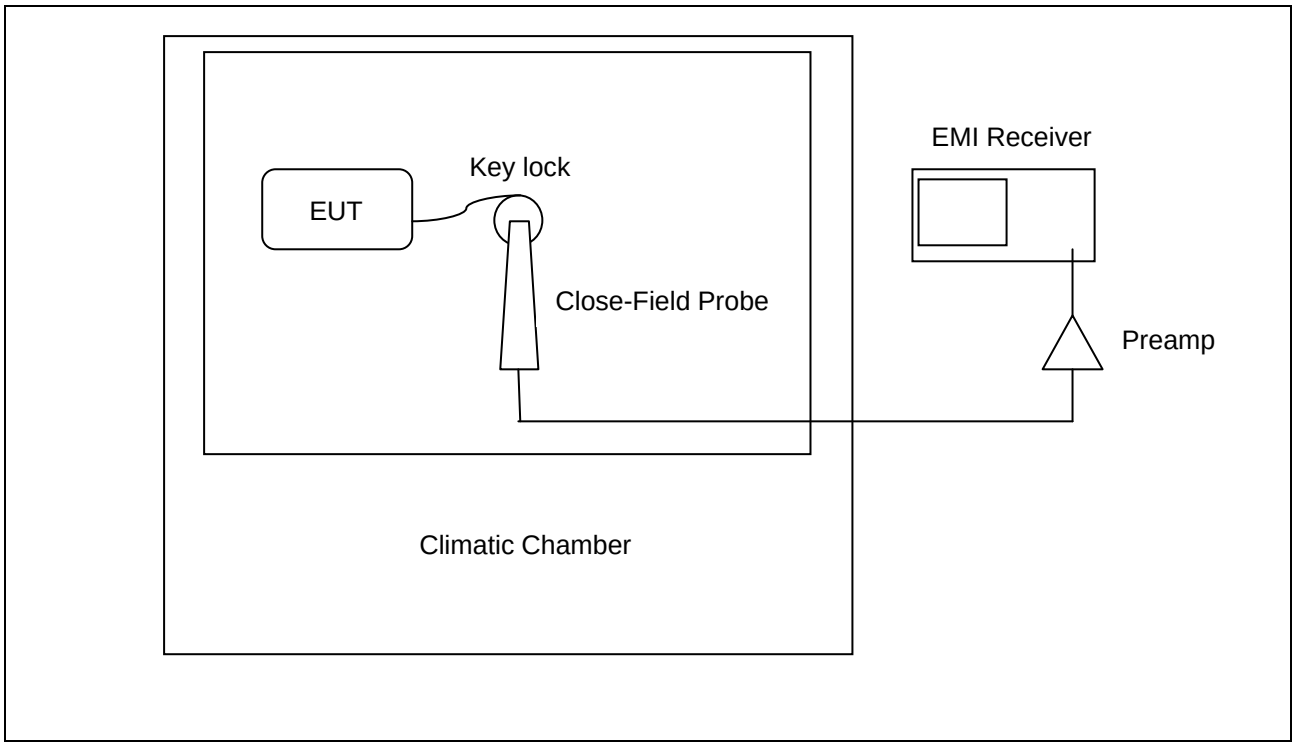
- EUT operating mode 2, see the applicable cited test plan;
- The EUT is set to transmit with modulation in continuous mode;
- The following temperatures and supply voltage ranges apply:.
  (a) at temperatures of -30°C, +20°C and +50°C, at the manufacturer's rated supply voltage (13.5V); and
  (b) at a temperature of +20°C, at minimum (9V) and maximum (16V) manufacturer's rated supply voltage.

## 8.1 Apparecchiature utilizzate / *Test Equipment Used* – Frequency Stability

| ***Apparecchiature usate/Equipment Used*** | ***Modello/ Model*** | ***Costruttore/ Manufacturer*** | ***Numero di serie/Serial Number*** | ***Data Calibrazione/ Calibration Date*** |
|---|---|---|---|---|
| Climatic Chamber | Challenge 1200 | Angelantoni | 10491 | 2013/01 (with due date 2014/01) |
| Close-Field Probe | 11941A | Hewlett/Packard | 2807A05682 | 2013/02 (with due date 2014/02) |
| RF Preamplifier | HP8447F | Hewlett Packard | 3113A07568 | 2012/08 (with due date 2013/08) |
| EMI Receiver | E4440A | Agilent Technologies | MY48250305 | 2012/11 (with due date 2013/11) |
| DC Power Supply (*) | E3634A | Agilent | MY51070025 | - |

(*) auxiliary equipment

## 8.2 Setup di Prova / T*est setup* - Frequency Stability




## 8.3 Risultati del test / *Test Results* - Frequency Stability

Measures of carrier frequency with the EUT at +20°C, powered at minimum and maximum operative voltages

| | Minimum operative voltage (9Vdc) | Nominal operative voltage (13.5Vdc) | Maximum operative voltage (16Vdc) | Difference |
|---|---|---|---|---|
| **Carrier Frequency [KHz]** | 134.447 | 134.447 | 134.447 | 0 [kHz] |

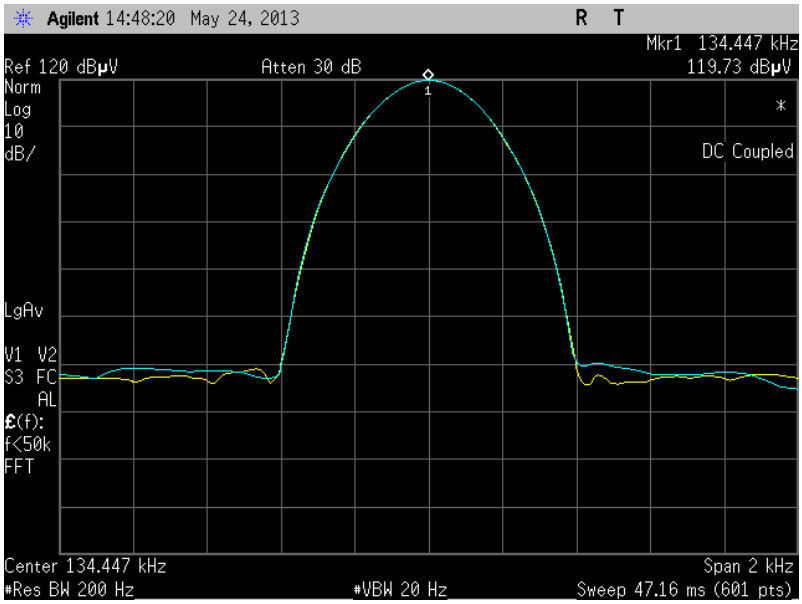
Measures of carrier frequency with the EUT at -30°C, +20°C and +50°C

| | Minimum operative temperature (-30°C) | Reference operative temperature (+20°C) | Maximum operative temperature (+50°C) | Difference |
|---|---|---|---|---|
| **Carrier Frequency [KHz]** | 134.447 | 134.447 | 134.447 | 0 [kHz] |

## 8.4 Grafici dei dati di prova / Graphical representation data - Frequency Stability

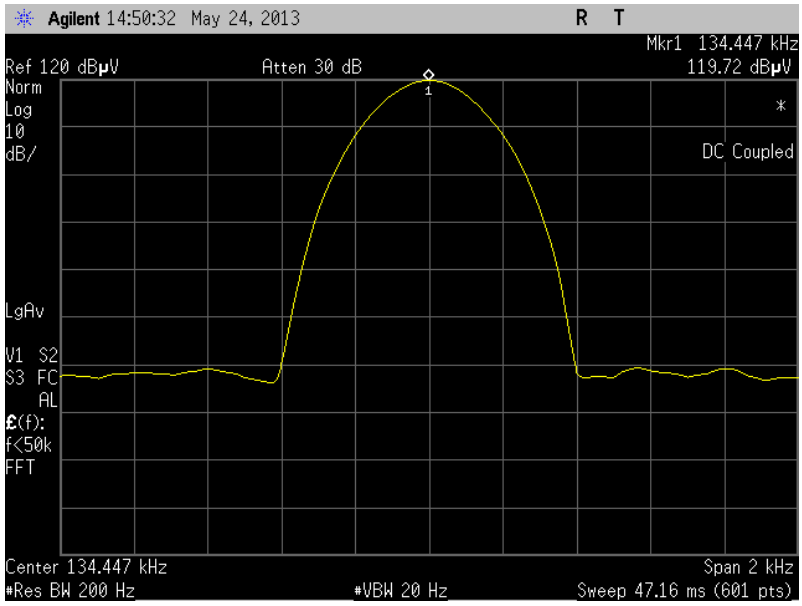
Measures of carrier frequency with the EUT at +20°C, powered at minimum and maximum operative voltages

Carrier frequency measured with EUT powered at 9Vdc (yellow line) and with EUT powered at 16Vdc (blue line)

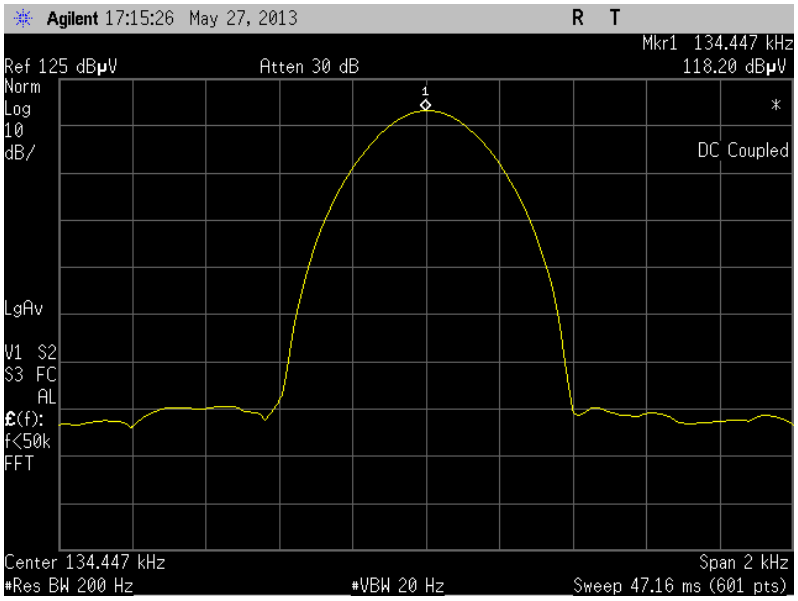



Measures of carrier frequency with the EUT powered at 13.5V at -30°C, +20°C and +50°C

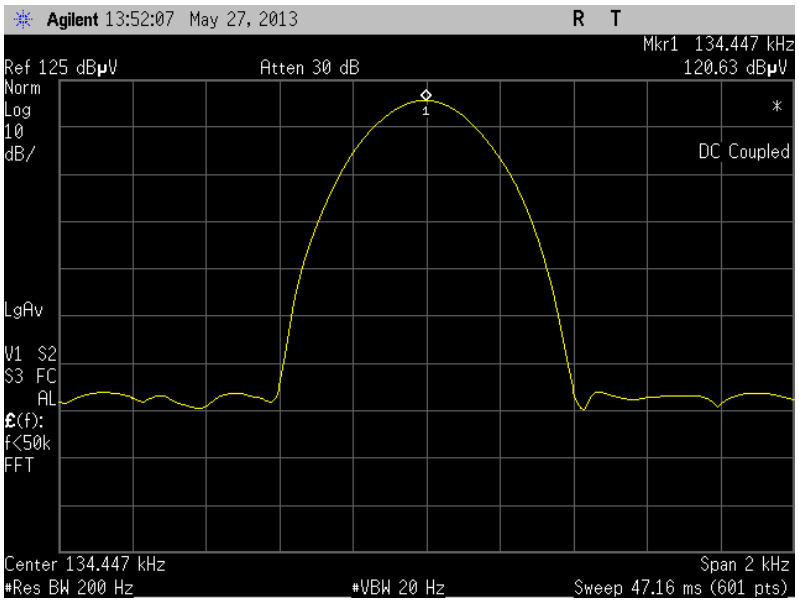
Carrier frequency measured with EUT at 20°C.



Carrier frequency measured with EUT at -30°C




Carrier frequency measured with EUT at +50°C



## 9.0 RF exposure evaluation - Condizioni di Prova / *Test Conditions*

| | | |
|---|---|---|
| Technician | Loris Fruch | |
| Table No. | TEST: RF exposure evaluation | \ |
| Method | FCC Rules: 47 CFR Part 1 Subpart I: 2008, section 1.1307 (b)(1);<br>RSS-Gen Issue 3: 2010-12, par. 5.6; | \ |

| | | |
|---|---|---|
| Parameters required prior to the test | Laboratory Ambient Temperature | 18 to 28 °C |
| | Relative Humidity | 20 to 90 % |
| Parameters recorded during the test | Laboratory Ambient Temperature | 20°C |
| | Relative Humidity | 65% |

Supplementary information:

- EUT operating mode 2, see the applicable cited test plan;
- The EUT is set to transmit with modulation in continuous mode;
- Measure executed with EUT powered at nominal voltage (+13.5Vdc);
- Test Requirement:
  FCC: System operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess of the:
  - Commission's guidelines section 1.1307 (b) (1) of FCC Rules: 47 CFR Part 1 Subpart I: 2008;
  - RSS-102 Issue 4: 2010-03;
- EUT Classification: mobile (vehicle on-board equipment);
- The measure was made with the Close-Field Probe, measuring the X, Y, and Z components and then calculating the total magnetic field (see par. 2.3);
- Time averaging: the field generated by the EUT isn't continuous and the maximum field value reported in par. 2.3 wasn't averaged in time, so it is the maximum value measured by the Close-Field Probe (Max Hold);
- The measures were taken in the maximum emission point: in front of the key lock, at 0.2m distance;
- The measurement distance was selected on the basis of par. 4.2 RSS-102 Issue 4: 2010-03 and FCC Rules: 47 CFR Part 2 Subpart J: 2008 section 2.1091 and of the nominal position of the final user;

## 9.1 Apparecchiature utilizzate / *Test Equipment Used* – RF exposure evaluation

| ***Apparecchiature usate/Equipment Used*** | ***Modello/ Model*** | ***Costruttore/ Manufacturer*** | ***Numero di serie/Serial Number*** | ***Data Calibrazione/ Calibration Date*** |
|---|---|---|---|---|
| EMI Receiver | E4440A | Agilent Technologies | MY48250305 | 2012/11 (with due date 2013/11) |
| RF Preamplifier | HP8447F | Hewlett Packard | 3113A07568 | 2012/08 (with due date 2013/08) |
| Close-Field Probe | 11941A | Hewlett/Packard | 2807A05682 | 2013/02 (with due date 2014/02) |
| DC Power Supply (*) | E3634A | Agilent | MY51070025 | - |
| Semi-Anechoic Chamber | - | ETS LINDGREN | 5207 | 2012/03 (with due date 2014/03) |

(*) auxiliary equipment

## 9.2 Risultati del test / *Test Results* - RF exposure evaluation

The measures were made with at the frequency of 134.447KHz (transmitter frequency carrier)

| Axis | Measured value [dBuV] | Probe Antenna Factor [dBuA/m] | Cable Attenuation [dB] | Pre-amplifier Gain [dB] | H field [dBuA/m] | H field [A/m] |
|---|---|---|---|---|---|---|
| X | 44.57 | 69 | 0.1 | 29.4 | 84.27 | 0.016 |
| Y | 41.57 | 69 | 0.1 | 29.4 | 81.27 | 0.012 |
| Z | 56.12 | 69 | 0.1 | 29.4 | 95.82 | 0.062 |
| | | | | | **Total max H field [A/m]** | **0.065** |

| Time Average Factor | Average Total H field [A/m] | H field Limit [A/m] | Result |
|---|---|---|---|
| 0.708 | **0.046** | 2.19 | Pass |

**Time average factor** = Ton / Tperiod = 1.84/2.60 (see par. 3.3 of this document)
H field Limit as specified in par 4.2 of RSS-102 Issue 4: 2010-03 and FCC Rules: 47 CFR Part 1 Subpart I: 2008, section 1.1310

**The value is less than the low threshold limit corresponding to the general population exposure category and therefore no SAR test is required.**