| | | |
|---|---|---|
| **Prüfbericht - Nr.:**<br>*Test Report No.:* | **1609191618-001** | **Seite 1 von 30**<br>*Page 1 of 29* |
| **Auftraggeber:**<br>*Client:* | AutoDiagnostic Engineering S.L.<br>Avda. López Peñalver, 21<br>29590 Campanillas (Málaga) - SPAIN | |
| **Gegenstand der Prüfung:**<br>*Test item:* | Portable Tire Pressure Monitor | |
| **Bezeichnung:**<br>*Identification:* | TPM-NK01 | **Eingangsdatum:**<br>*Date of receipt:* 2016-06-24 until 2017-04-14 |
| **Prüfort:**<br>*Testing location:* | Italy | |
| **Prüfgrundlage:**<br>*Test specification:* | **CFR 47, Chapter I, Subchapter A - Part 15, Subpart C**<br>**e-CFR data is current as of November 25, 2016** | |
| **Prüfergebnis:**<br>*Test Result:* | **Der Prüfgegenstand entspricht oben genannter Prüfgrundlage(n).**<br>*The test item passed the test specification(s).* | |
| **Prüflaboratorium:**<br>*Testing Laboratory:* | GSD S.r.l. Via Marmiceto, 8 I-56121 Ospedaletto (PI)<br>with FCC registration Site# 424037, ALSE at 3 meters | |

*This FCC template was created accordingly with the Guidelines for the presentation of Test Results UNI CEI 70011 (1990-03) correlated to the ISO/IEC Guide No. 45 (1985-10). According to its par.4.14 the signature can be present by an only Expert if he has the complete Competence necessary to define appropriately test remarks and a good skill to review the report.*

**geprüft/** *tested by:*
**kontrolliert/** *reviewed by:*

2017.06.27 Francesco Barbierato

| **Datum**<br>*Date* | **Name/Stellung**<br>*Name/Position* | **Unterschrift**<br>*Signature* |
|---|---|---|

**Sonstiges/** *Other Aspects:*

Type : TPM-NK01 (model by ADE)
Models of commercial distribution:

a. HC1000 IntelliSens ( brand name: Huf Hülsbeck & Fürst GmbH & Co. KG)
b. EZ-Sensor PAD (brand name: Schrader International, Inc.)

The EUT has only an internal battery pack, no external AC connection is available.
Conducted emission test acc. §15.207, performed through the USB port like interconnection via a Laptop.

Certification of the Inductive transmitter tuned at 125 kHz is required under part 15C, tests accordance with §15.207 and §15.209 and §15.215.

Verification regarding RF receiver 315-915 MHz and 2.4 GHz Bluetooth is evaluated on Test Report 1609191619-001 and on the Label of the apparatus need to insert the following text: “Contains FCC ID: QOQBT121”.
Verification test acc. with FCC KDB No. 996369 D01.

| *Abkürzungen:* | | | | *Abbreviations:* | | | |
|---|---|---|---|---|---|---|---|
| | *P(ass)* | = | *entspricht Prüfgrundlage* | | *P(ass)* | = | *passed* |
| | *F(ail)* | = | *entspricht nicht Prüfgrundlage* | | *F(ail)* | = | *failed* |
| | *N/A* | = | *nicht anwendbar* | | *N/A* | = | *not applicable* |
| | *N/T* | = | *nicht getestet* | | *N/T* | = | *not tested* |

# Contents



***REVISION HISTORY***

| *Rev. Index* | *Issued on date* | *History note* |
|---|---|---|
| 001 | 2016.09.14 | Initial issue |
| 002 | 2017.02.13 | Adjustment after FCC review |
| 003 | 2017.02.25 | Adjustment after FCC review and integration of measures btw. 9k-30MHz |
| 004 | 2017.03.16 | Adjustment on pages 14-16 after FCC review |
| 005 | 2017.03.31 | New plot for measures 20dB and Occupied Bw, see page 15 |
| 006 | 2017.04.14 | Includes new plots acc. with §15.209 d), see pages 14-18 |
| 007 | 2017.04.23 | Includes orthogonal plot on pages 15 |
| 008 | 2017.05.05 | New explanations requested by the TCB Reviewer, see on pages 16-20 |
| 009 | 2017.05.26 | Update FCC ID for 125kHz on page 5; updated plot on page 15 and 22 |
| 010 | 2017.06.02 | Photo of AC conducted setup to be added to test report |
| 011 | 2017.06.27 | New definition of Type and Models of commercial distribution |

# 1 Test Sites

## 1.1 Test Facilities

Laboratory: GSD S.r.l.
Address: Via Marmiceto, 8 56121 Ospedaletto (PI) – Italy

FCC tests have been performed by GSD S.r.l. as FCC lab listed ref. no. 424037.

During the EMI test session was present a DFB Global Certification expert engineer that has supervised, coordinated all test set-up and operative conditions.

The test site shall comply with the requirements in CISPR 16-1-4:2007 referenced in the ANSI C63.4:2014 and/or ANSI C63.10:2013 depending on which test method was followed.

***Limits using ANSI C63.4 (2014)***
American National Standard for Methods of Measuring of Radio-Noise Emissions from Low Voltage Electrical and Electronic Equipment in the Range of 9 kHz – 40 GHz Compliance with the limits set out in this Section shall be demonstrated using only the method of measurement described in the publication referenced in Section 3(b) ANSI C63.4:2014.

***Limits using ANSI C63.10 (2013)***
American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices

# 1.2 List of Test and Measurement Instruments

## Table 1: List of Test and Measurement Equipment

Radiated emission (acc. with FCC Part 15, Subpart C §15.209)

| *Equipment* | *Manufacturer* | *Model* | *ID lab ref.* | *Cal. Due (*)* |
|---|---|---|---|---|
| Shielded Semi-anechoic chamber | Comtest | RFD-60 | CSA01 | Jan.2017 |
| EMI Receiver | HP | 8542E | REC002 | Jan.2017 |
| EMI Receiver | HP | 8546A | REC002 | Jan.2017 |
| RF filter section | HP | 85460A | REC003 | Jan.2017 |
| MXE EMI Receiver | Agilent | N9038A | REC020 | Jan.2017 |
| Loop Antenna | EMCO | 6512 | ANT019 | Jan.2017 |
| Bi-Log antenna 30M-2GHz | Schaffner | CBL6112B | ANT003 | Jan.2017 |
| Controller Mast/TT | Deisel | HD100 | ACC001 | Jan.2017 |
| MAST antenna | Deisel | MA240 | ACC002 | Jan.2017 |
| Spectrum Analyzer (***) | Agilent | E4440A | REC015 | Jan.2018 |
| Loop Antenna (***) | Solar Electronics | 7334-1 | ANT021 | Jan.2018 |
| Passive Loop Antenna (****) 9kHz-30MHz | EMCO | 6512 | ANT019 | Jan.2018 |
| RF pre-amplifier (****)<br>9 kHz – 1300 MHz<br>Gain 28dB 9kHz-50MHz<br>Gain 25dB 0.1-1300MHz | HP | 8447F OPT H64 | AMP021 | Jan.2018 |
| Horn antenna 1.0-2.3 GHz | EMCO | 3115 | ANT010 | Jan.2018 |

Conducted emission (acc. with FCC Part 15, Subpart C §15.207)

| *Equipment* | *Manufacturer* | *Model* | *ID lab ref.* | *Cal. Due (**)* |
|---|---|---|---|---|
| Shielded chamber | GSD | CSA02 | CSA02 | Jan. 2018 |
| EMI Receiver | HP | 8542E | REC002 | Jan.2018 |
| LISN | GSD | GSDA01 | NTW001 | Jan.2018 |

*Notes:*
(*) Calibration Due referred to the measures performed on 2016-06-24 and 2016-07-29
(**) Calibration Due referred to the measures performed on 2017-01-20 and 2017-02-24, 2017-03-16 and 03-31
(***) Instrument used for measure about 20dB and Occupied Bw, see description of the table for the index review at the Rev.5
(****) Calibration Due referred to the measures performed on 2017-04-14

# 2 General Product Information

## 2.1 Product Function, Intended Use and Description

The EUT (equipment under test) is a Portable Communicator for Tire Pressure Monitor use.

Type: TPM-NK01 (model by ADE)

Models of commercial distribution:

a. HC1000 IntelliSens ( brand name: Huf Hülsbeck & Fürst GmbH & Co. KG)
b. EZ-Sensor PAD (brand name: Schrader International, Inc.)


Comparison between HC1000 (left) and EZ-Sensor PAD (right)


HC1000

EZ-sensor PAD


For the further information, refer to the User's manual.

## 2.2 Ratings and System Details

| | | |
|---|---|---|
| EUT input voltage | : | 3.7 V DC input from battery pack |
| Rated input current | : | 950mAh (from Li-Ion internal battery pack) |
| Protection class | : | III (like internal battery) |
| Max. internal highest freq. | : | 125 kHz (Transmitter, FCC ID: 2AFXK-HUSH)<br>12 MHz (quarz µP)<br>2.4 GHz (Bluetooth, Contains FCC ID: QOQBT121) |
| Other frequencies | : | UHF broad-band Receiver 315-915 MHz,<br>for US settings for sensor tuned only at 315-433.92 MHz |

## 2.3 Independent Operation Modes

The basic operation mode is in communication via Bluetooth from a Laptop
Normally in this use the device is used powered by the internal battery pack.

When necessary the EUT can be upgraded by USB port only from Authorized Service, through a USB cable and its connection to a Laptop.

## 2.4 Noise Generating and Noise Suppressing Parts

None.

## 2.5 Submitted Documents

- Datasheet of the Bluetooth module BT121 made by Bluegiga (FCC ID: QOQBT121).
- Manuals of HC1000 (as representative of the commercial models)

# 3 Test Set-up and Operation Modes

## 3.1 Principle of Configuration Selection

**Emission:** The equipment under test (EUT) is configured to measure its highest possible emission level. The test conditions were adapted accordingly in reference to the instructions for use.

Refer to the related paragraph of this report.

## 3.2 Physical Configuration for Testing

Refer to the photographic paragraph of this report.

## 3.3 Test Operation and Test Software

Refer to the related paragraph of this report. No software with a test routine customized ad-hoc for this testing was used coupled with Laptop.

## 3.4 Special Accessories and Auxiliary Equipment

None.

## 3.5 Countermeasures to achieve EMC Compliance

No countermeasures implemented in this EUT.

# 4 Test Results E M I S S I O N

**Test generality**

**Sub-part C: Intentional radiator**

**Test and Measurement Data**
All tests and measurement data shown were performed in accordance with FCC Rules and Regulations, Volume II; Part 2 and the following individual Parts: 15.207, 15.209; Intentional Radiators

**Standard Test Conditions and Engineering Practices**
Except as noted herein, the following conditions and procedures were observed during the testing:
In accordance with ANSI C63.10, and unless otherwise indicated in the specific measurement results, the ambient temperature of the actual EUT was maintained within the range of 10° to 40°C (50° to 104 °F) unless the particular equipment requirements specify testing over a different temperature range. Also, unless otherwise indicated, the humidity levels were in the range of 10% to 90% relative humidity.
Prior to testing, the EUT was tuned-up in accordance with the manufacturer's alignment procedures. All external gain controls were maintained at the position of maximum and/or optimum gain throughout the testing.
Measurement results, unless otherwise noted, are worst-case measurements.

Summary of Test Results

Certification process regarding the Inductive Transmitter tuned at 125 kHz is required under part 15C, tests accordance with §15.207 and §15.209.

| *TEST* | *STANDARD* | *RESULT* |
|---|---|---|
| *Conducted Emissions on AC Power line* | FCC Rules and Regulations, Title 47 (2010) Part 15, Sub part C, Section 15.207 | *Passed* |
| *Radiated emissions* | FCC Rules and Regulations, Title 47 (2010) Part 15, Sub part C, Section 15.209 and 15.215 | *Passed* |

The results refer only to the sampled EUT and under the specified conditions.

# 5 Test Results E M I S S I O N

## 5.1 Mains Terminal Continuous Disturbance Voltage (§15.207)

| **Result:** | **Passed** |
|---|---|

| | | |
|---|---|---|
| Date of testing | : | 2017.01.20 |
| Test procedure | : | FCC Part15, Sub-Part C §15.207 |
| Frequency range | : | 0.15 – 30MHz |
| Limits | : | AC Mains Power port<br>0.15-0.5MHz, Quasi-peak: 66dB(µV); Average: 56dB(µV);<br>0.5-5MHz, Quasi-peak: 56dB(µV); Average: 46dB(µV);<br>5-30MHz, Quasi-peak: 60dB(µV); Average: 50dB(µV) |
| Kind of test site | : | Shielded Room |
| Input voltage | : | AC 110V, 60Hz |
| Operational mode | : | Use in Laboratory - download saved data via USB cable connected to a Laptop. Transmission at 125 kHz operates. During battery recharger when connected to an AC/DC adapter (worst case). |

The measurement setup was made according to ANSI C63.10 in a shielded room.

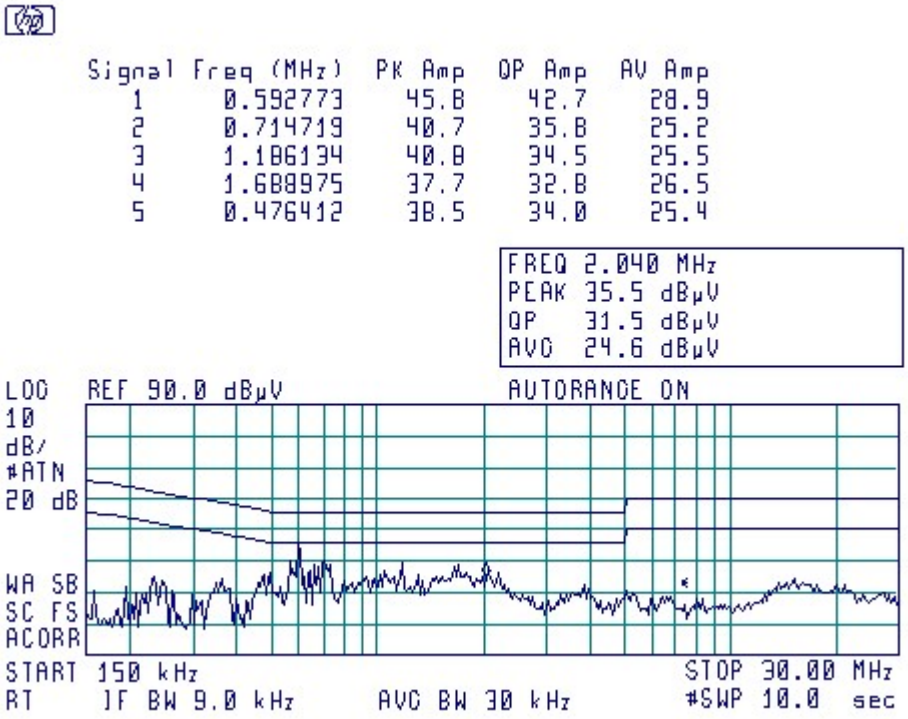
The measurement equipment like test receivers, quasi-peak detector and artificial mains network (AMN) are in compliance with CISPR 16-1 series standards.

The tested object was set-up on a wooden table. The EUT was set 0.8m away from the AMN. The cord longer than necessary to be connected to the AMN was folded forth and back parallel so as to form a bundle with a length between 0.3m and 0.4m.

The disturbance voltage test was performed on the neutral line and phase line of the power supply of the EUT respectively.

**Figure 1: Spectrum diagrams 0.15-30MHz, Line 1**

Job Number 17110 (GSD)
Test Name Conducted Emissions FCC part. 15.207
EUT Name HC1000



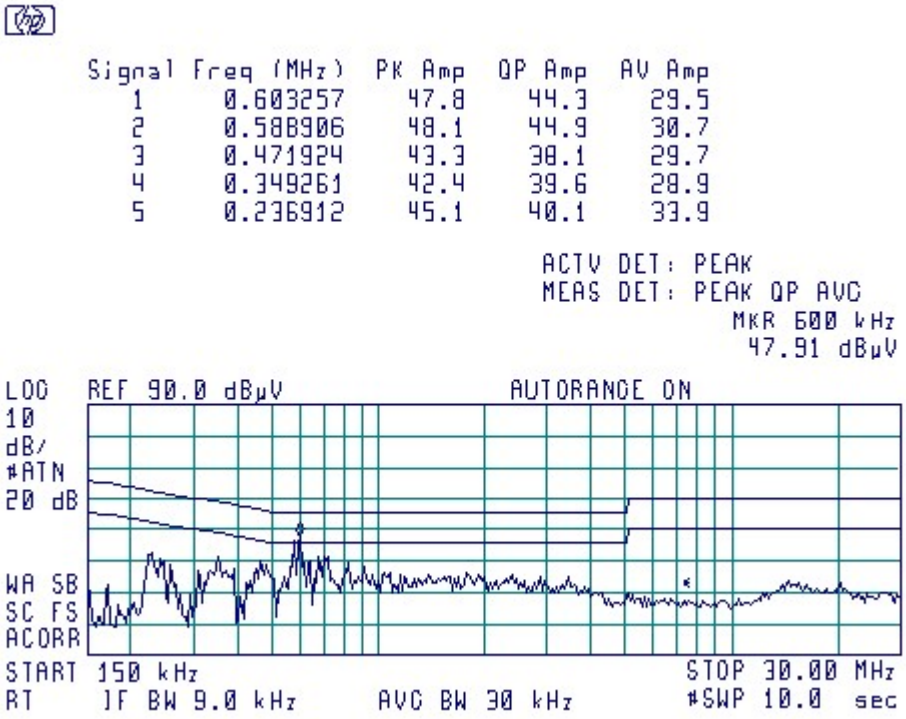

Settings:
Line 1 of Notebook Power Supply
EUT connected to USB notebook (AC powered)

## Final Result – QP & AVG detector

| Frequency (MHz) | QuasiPeak (dBµV) | Average (dBµV) | Bandwidth (kHz) | Tested Line | Margin (dB) | Limit (dBµV) | Verdict |
|---|---|---|---|---|---|---|---|
| 0.15-30 | See measures in the image before | See measures in the image before | 9 | Line 1 | >10dB | Ref. Table Limit §15.207 | PASS |

**Figure 2: Spectrum diagrams 0.15-30MHz, Line 2**

| | |
|---|---|
| Job Number | 17110 (GSD) |
| Test Name | Conducted Emissions FCC part. 15.207 |
| EUT Name | HC1000 |




Settings:
Line 2 of Notebook Power Supply
EUT connected to USB notebook (AC powered)

## Final Result – QP & AVG detector

| Frequency (MHz) | QuasiPeak (dBµV) | Average (dBµV) | Bandwidth (kHz) | Tested Line | Margin (dB) | Limit (dBµV) | Verdict |
|---|---|---|---|---|---|---|---|
| 0.15-30 | See measures in the image before | See measures in the image before | 9 | Line 2 | >10dB | Ref. Table Limit §15.207 | PASS |

## 5.2 Radiated Emission (§15.209 and §15.215)

| **Result:** | **Pass** |
|---|---|

Date of testing : 2016.06.24 until 2017.04.14
Test procedure : CFR47, Part 15 and CISPR 16-1 series standards
Frequency range : 9 kHz – 1000MHz (*)
Limits : Quasi-peak limit acc. par. 15.209 (b),

***FCC, § 15.209 Radiated emission limits; general requirements***

| ***DISTANCE*** *(m)* | ***FREQUENCY RANGE*** *(MHz)* | ***QUASI-PEAK LIMITS*** *[dB (µV/m)]* | ***AVERAGE LIMITS*** *[dB (µV/m)]* |
|---|---|---|---|
| 300 | 0.009-0.490 | 48,5 to 13,8 | -- |
| 30 | 0.490-1.705 | 33,8 to 23,0 | -- |
| 30 | 1.705-30.0 | 30 | -- |
| 3 | 30 ÷ 88 | 40 | -- |
| 3 | 88 ÷ 216 | 43,5 | -- |
| 3 | 216 ÷ 960 | 46 | -- |
| 3 | 960 ÷ 1000 | 54 | -- |

Kind of test site : Semi-anechoic chamber at 3 meters of distance btw. EUT-Antenna
Operation modes : (1) Normal use

Notes:
(*) Accordingly with FCC Part 15, Subpart C §15.209 (f) until 10th Harmonics of the intentional frequency of the LF Transmitter: 10 x 125 kHz = 1'250 kHz:
*In accordance with §15.33(a), in some cases the emissions from an intentional radiator must be measured to beyond the tenth harmonic of the highest fundamental frequency designed to be emitted by the intentional radiator because of the incorporation of a digital device. If measurements above the tenth harmonic are so required, the radiated emissions above the tenth harmonic shall comply with the general radiated emission limits applicable to the incorporated digital device, as shown in §15.109 and as based on the frequency of the emission being measured, or, except for emissions contained in the restricted frequency bands shown in §15.205, the limit on spurious emissions specified for the intentional radiator, whichever is the higher limit. Emissions which must be measured above the tenth harmonic of the highest fundamental frequency designed to be emitted by the intentional radiator and which fall within the restricted bands shall comply with the general radiated emission limits in §15.109 that are applicable to the incorporated digital device.*

The radiated disturbance test was carried out in a semi-anechoic chamber. The test distance from the receiving antenna to the EUT is 3m. The normalized site attenuation of the semi-anechoic chamber is regularly calibrated to ensure the radiated disturbance test results are valid. During the test, the EUT was placed on a wooden table, which is 0.8m high. The wooden table was rotated 360° around and the antenna was varied from 1m to 4m to find the maximum disturbance. The test was performed with the antenna both in its horizontal and vertical polarizations.

The following figures and tables were those measured by an automatic measurement system. A preview test was firstly performed with peak detector. The final test was performed with quasi-peak at those critical frequencies during the preview test. In the following figures, "x" means final measurement results with quasi-peak detector.

*Notes*
*Azimuth position EUT-Antenna corresponding to 0° identifies the rotating table orientation (TT) in which the instrument to be tested shows the front part turned towards the antenna. Positive grades individuate clockwise rotations of TT when this one is observed from the top. For negative degrees, TT rotation is anticlockwise.*
*Antenna height respect to the mass plane is conventionally individuated with: MA=XXX where XXX indicates the height (always positive for h>100) expressed in cm.*

Results and conclusions
In all the operative conditions, equipment complied with the standard limits. Graphics in following figures show the most significant registrations of the performed measurements.

Regarding the compliance of Fundamental frequency at 125 kHz the value was represented in the preview graph as H-field, but in the following table the value was measured in E-Field with the correct factor for conversion.

Accordingly 15.209 sub-clause (c):
The level of any unwanted emissions from an intentional radiator operating under these general provisions shall not exceed the level of the fundamental emission. For intentional radiators which operate under the provisions of other sections within this part and which are required to reduce their unwanted emissions to the limits specified in this table, the limits in this table are based on the frequency of the unwanted emission and not the fundamental frequency. However, the level of any unwanted emissions shall not exceed the level of the fundamental frequency.

The following measurements have been performed at 3 m of distance.
The envelope measured with +PK detector, in this condition was closed to the noise level of the semi-anechoic room.

Accordingly 15.209 sub-clause (d):
The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz.
Radiated emission limits in these three bands are based on measurements employing an average detector.

Accordingly with Limit table at the §15.209

| Freq. (MHz) | Field strength (microvolts/meter) | Measurement distance (meters) |
|---|---|---|
| 0.009 - 0.490 | 2400/F(kHz) | 300 |

Considering the tuned frequency at 125kHz we obtain a limit of 2400/125= 19,2 µV/m at distance of 300m.
Transforming the E-field in dB scale we have 20*log (19.2) = 25,6 dBµV/m
With a reduced distance from 300m to 3m it is necessary a factor of 40dB, more 40dB to compensate the H-field with E-field below 30MHz, so in this case we obtain a Fundamental limit at:
25,6 + 40 + 40 = 105,6 dBµV/m

This measurement have been performed at 3 m of distance in a semi-anechoic chamber.

The envelope measured with Average detector, in this condition was closed to the noise level of the semi-anechoic room.
Passive Loop antenna is positioned at 8cm over the height of the EUT, so comply with the clause 4.5.3 of the ANSI C63.4:2014.
Following measurements with Average detector are made using a 25dB preamplifier interconnected between Loop Antenna and EMI Receiver.

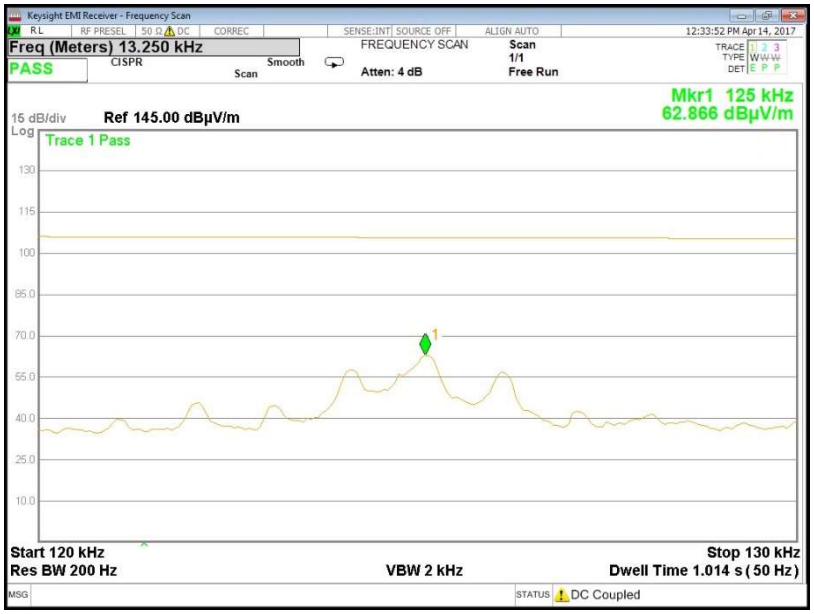



**Fig. 1 - Fundamental plot referred to Tab.1**

**Table 1 - Measurements referred to Fig. 1**

| Frequency range [kHz] | Measured level (AVG) [dBµV/m] | Limit (AVG) adj. for 3m [dBµV/m] | Test Result |
|---|---|---|---|
| 125.0 **(Fundamental)** | 62.866 dBµV/m | 105,6 dBµV/m | Within the limit |


**Fig. 2 - Plot referred to the Loop Antenna in Parallel polarization in the range 9-90 kHz**


**Fig. 3 - Plot referred to the Loop Antenna in Orthogonal polarization in the range 9-90 kHz**

*Note: The EUT Antenna tuned at 125kHz does not match with the Orthogonal polarization.*
*No any evidence of the 125kHz spurious signal is possible.*


**Fig. 4 - Plot referred to the Loop Antenna in Orthogonal polarization in the range 110-490 kHz**

*Note: The EUT Antenna tuned at 125 kHz does not match with the Orthogonal polarization.*
*No any evidence of the 125 kHz signal is possible.*

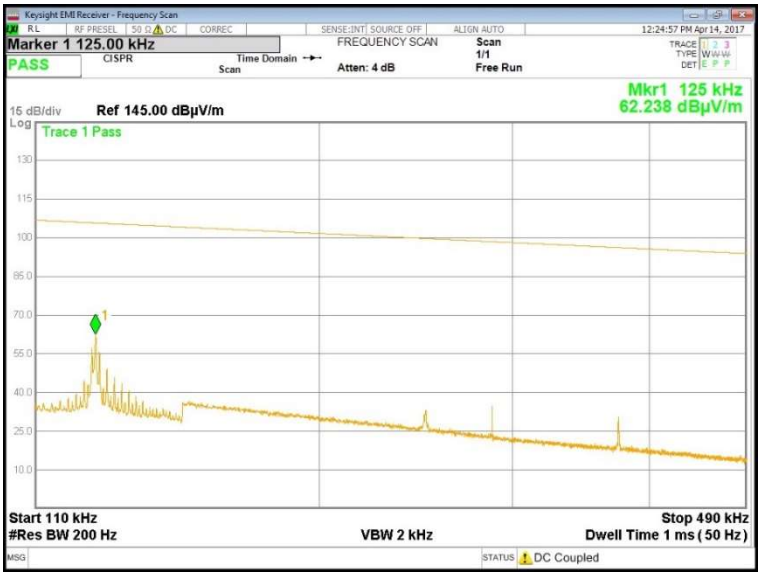
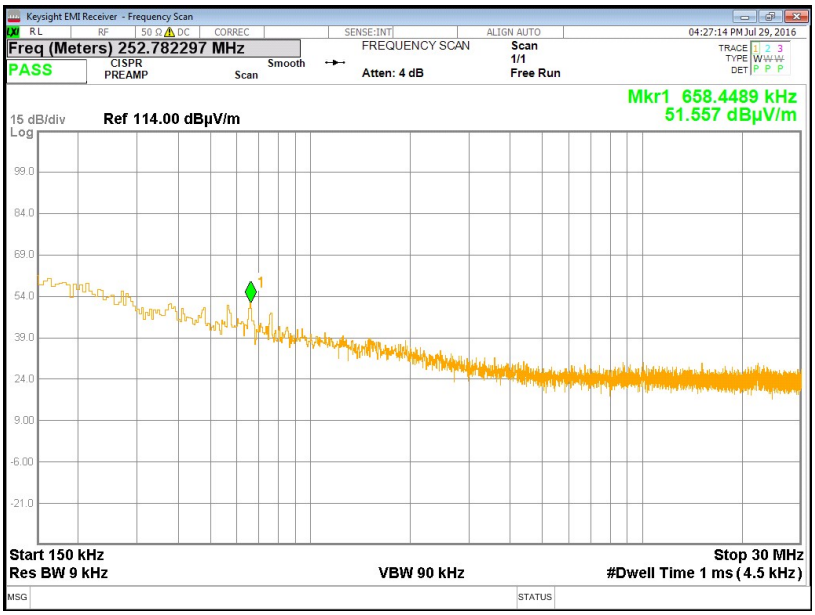



**Fig. 5 - Plot referred to the Loop Antenna in Parallel polarization in the range 110-490 kHz**

**Table 2 – Measurement Table referred Fig. 2 to Fig.5**

| Frequency range [kHz] | Antenna polarization | Measured level (AVG) [dBµV/m] | Limit (AVG) adj. for 3m [dBµV/m] | Test Result |
|---|---|---|---|---|
| 72.3 | Parallel | 48.546 | 110.42 | Within the limit (see plot Fig.2) |
| 72.3 | Orthogonal | 42.346 | 110.42 | Within the limit (see plot Fig.3) |
| 125 | Orthogonal | 32.425 | 105.6 | Within the limit (see plot Fig.4) |
| 125 | Parallel | 62.238 | 105.6 | Within the limit (see plot Fig.5) |



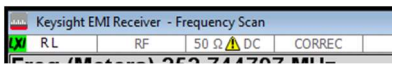

Notes:
Vertical Polarization (Loop antenna)
MAST: 100 cm
TT: 0°, 90°, 180° and 270°
EUT power: internal battery pack
EUT operating mode: LF transmission at 125 kHz operates.

*Fig.6*
*Record of the measurement of radiated emissions.*
*Envelope of the maximum disturbance determined in the frequency range 0.15 – 30 MHz.*

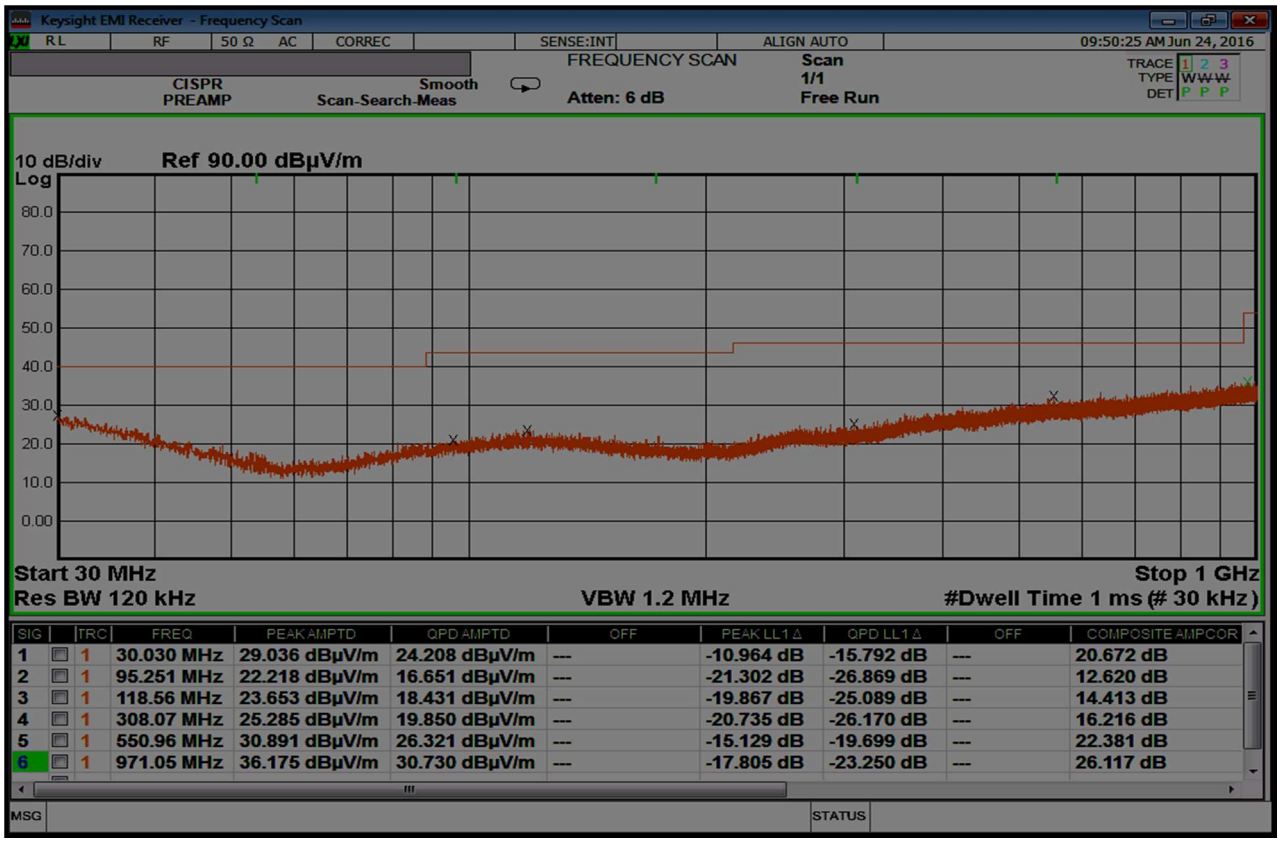
**Table of final test measurements referred to Fig. 6**
**Frequency range 150 kHz – 30 MHz**

| Frequency range (kHz) | Measured level (QP) | Limit (QP) adj. for 3m | Test Result |
|---|---|---|---|
| 658.448 | 50.857 | 51.233 | Within the limit |

Remarks




The Warning symbol on yellow triangle is not related to an Error of the measure but is the normal Warning when it used the DC input coupling on the EMI Receiver (example of Attention to use a Transient Limiter).
The measure was correctly performed.

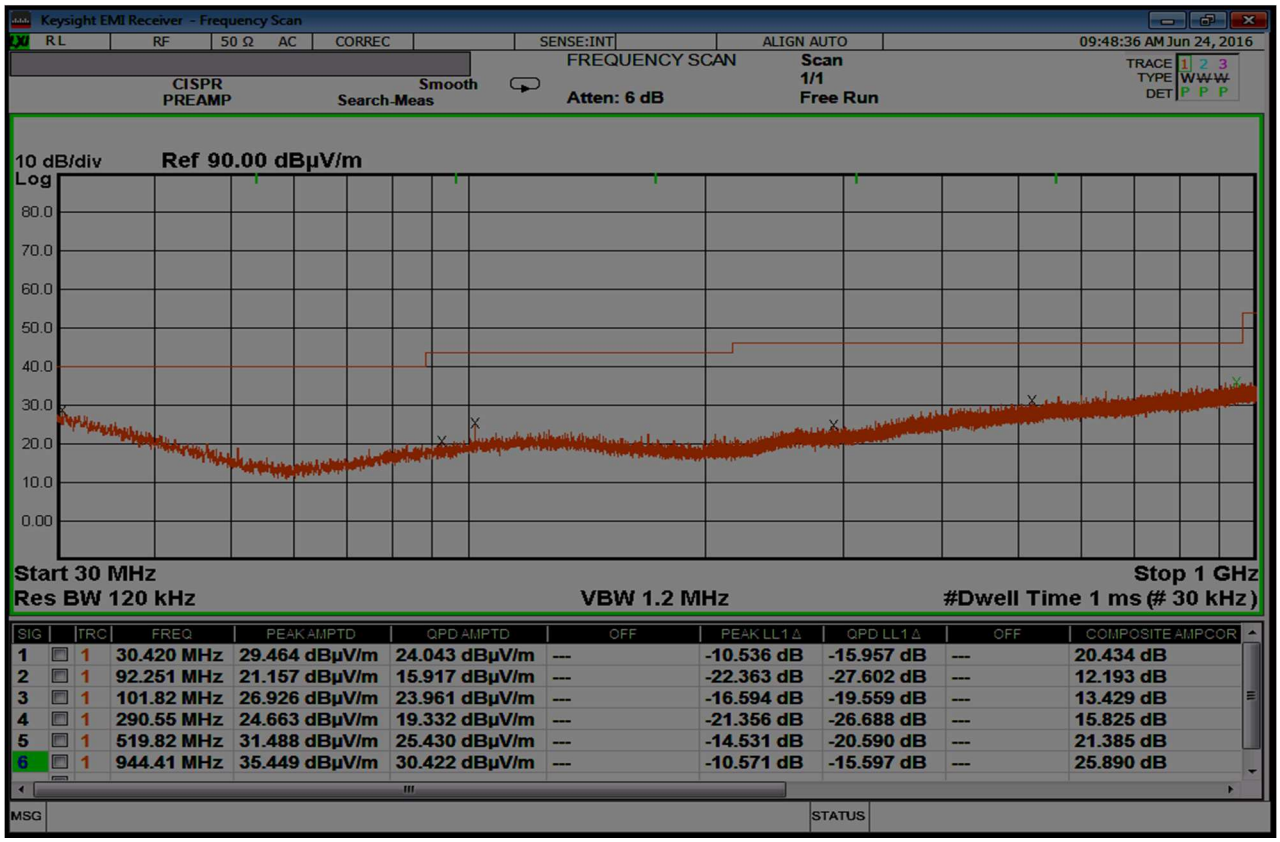



Notes:
Horizontal Polarization
MAST: 100 – 400 cm
TT: 0°, 90°, 180° and 270°
EUT power: internal battery pack
EUT operating mode: ready to use, LF Transmitter at 125 kHz operates

*Fig.7*
*Record of the measurement of radiated emissions.*
*Envelope of the maximum disturbance determined in the frequency range 30 – 1000 MHz.*

**Table of final test measurements referred to Fig. 7**

| Frequency (MHz) | Measured level (QP detector) dBµV/m | Limit (QP) at 3m dBµV/m | Test Result |
|---|---|---|---|
| 30.030 | 24.208 | 40,0 | Within the limit |
| 95.251 | 16.651 | 43.5 | Within the limit |
| 118.56 | 18.431 | 43.5 | Within the limit |
| 308.07 | 19.850 | 46.0 | Within the limit |
| 550.96 | 26.321 | 46.0 | Within the limit |
| 971.05 | 30.730 | 54.0 | Within the limit |




Notes:
Vertical Polarization
MAST: 100 – 400 cm
TT: 0°, 90°, 180° and 270°
EUT power: internal battery pack
EUT operating mode: ready to use, LF Transmitter at 125 kHz operates

*Fig. 8*
*Record of the measurement of radiated emissions.*
*Envelope of the maximum disturbance determined in the frequency range 30 – 1000 MHz.*

**Table of final test measurements referred to Fig. 8**

| Frequency (MHz) | Measured level (QP detector) dBµV/m | Limit (QP) at 3m dBµV/m | Test Result |
|---|---|---|---|
| 30.420 | 24.043 | 40,0 | Within the limit |
| 92.251 | 15.917 | 43.5 | Within the limit |
| 101.82 | 23.961 | 43.5 | Within the limit |
| 290.55 | 19.332 | 46.0 | Within the limit |
| 519.82 | 25.430 | 46.0 | Within the limit |
| 944.41 | 30.422 | 46.0 | Within the limit |

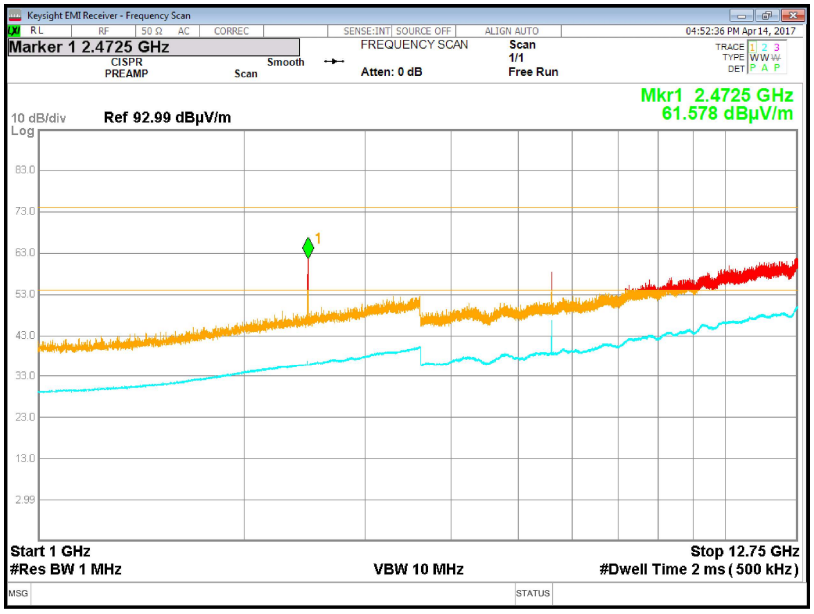



**Fig. 5 - Plot referred to the Average measure (cyan trace) in the range 1000-12750 MHz, Horizontal polarization Operating condition = 125 kHz and Bluetooth operates**

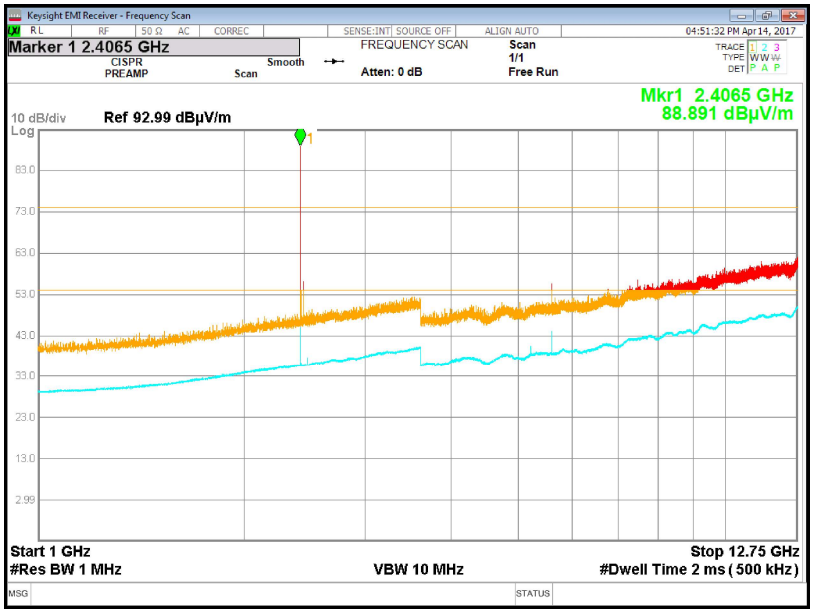



**Fig. 6 - Plot referred to the Average measure (cyan trace) in the range 1000-12750 MHz, Vertical polarization Operating condition = 125 kHz and Bluetooth operates**

### §15.215 Additional provisions to the general radiated emission limitations.

(c) Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§15.217 through 15.257 and in subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated. In the case of intentional radiators operating under the provisions of subpart E, the emission bandwidth may span across multiple contiguous frequency bands identified in that subpart. The requirement to contain the designated bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage. If a frequency stability is not specified in the regulations, it is recommended that the fundamental emission be kept within at least the central 80% of the permitted band in order to minimize the possibility of out-of-band operation.

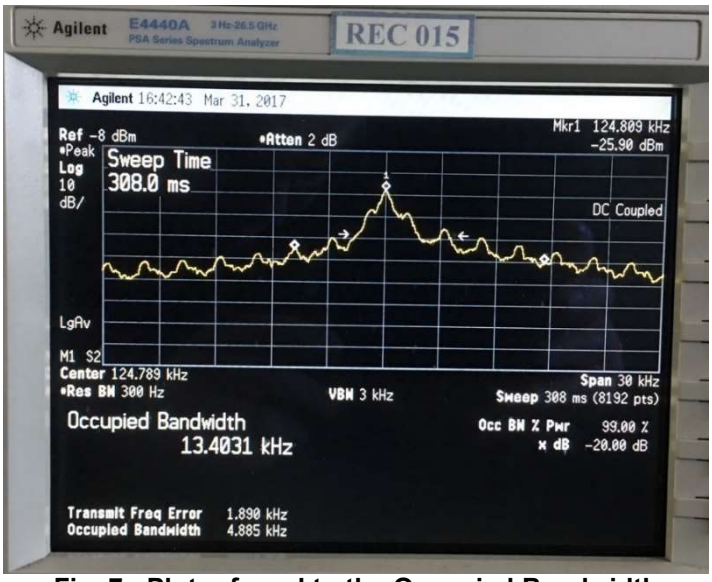



**Fig. 7 - Plot referred to the Occupied Bandwidth**

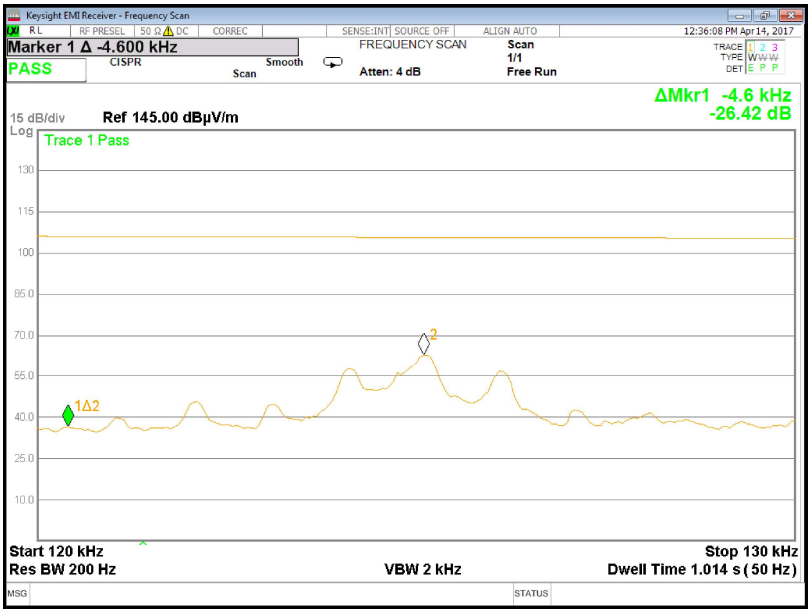



**Fig. 8 - Fundamental plot referred to 20dB btw. Fundamental and Noise**