

FCC Test Firm Designation Number: FR0014  
ISED Wireless Device Testing Laboratory CAB Number: FR0004

Matériel testé :  
*Equipment under test:*

**ENHANCIA - NEOVA (HUB)**  
(Trademark / Marketing name or product reference)

Client / Demandeur:  
*Customer / Applicant :* **ENHANCIA**  
3, Parvis Louis Néel  
38000 Grenoble – France

Rapport délivré à :  
*Issued to:* **ENHANCIA**  
*M. Mario Viola*  
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38000 Grenoble – France

Numéro d'affaire :  
*Work number :* 13199

Référence de la proposition :  
*Proposal number:* 072019-23699-1

Date de l'essai :  
*Date of test:* Du 4 au 5 novembre 2019  
*November 4<sup>th</sup> to 5<sup>th</sup>, 2019*

Objectif des essais :  
*Test purpose:* EMC qualification according to following standards:  
- CFR 47, FCC Part 15, Subpart C  
(Chapter 15.249 - Operation within the bands 902–928 MHz, 2400–2483.5 MHz, 5725–5875 MHz, and 24.0–24.25 GHz)  
- Industry Canada, RSS-Gen Issue 5 & RSS-210 Issue 9, section B.10  
(Bands 902–928, 2400–2483.5 and 5725–5875 MHz)  
Measurement standards : ANSI C63.10 (2013)

Lieu du test:  
*Test location:* SMEE, Rue de Taille  
38500 VOIRON - France

Test réalisé par :  
*Test realized by:* Laurent CHAPUS

Conclusion :  
*Conclusion:* L'équipement satisfait aux prescriptions et essais des normes citées en référence.  
*The appliance complies with requirements and tests of above mentioned standards.*

| Ed. | Date                             | Modifications<br>Pages | Written by :<br>Visa                       | Approved by:<br>Visa                  |
|-----|----------------------------------|------------------------|--------------------------------------------|---------------------------------------|
| 1   | February 18 <sup>th</sup> , 2020 | Initial Edition        | Laurent CHAPUS<br><i>Technical Manager</i> | Regis ANCEL<br><i>General Manager</i> |

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## COORDONNEES

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## 1. Normatives References

| FCC qualification according to: |         |                                                                                                                                                                      |
|---------------------------------|---------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Standards                       | Applied | Title                                                                                                                                                                |
| ANSI C63.4 (2014)               | X       | American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz. |
| ANSI C63.10 (2013)              | X       | American National Standard for Testing Unlicensed Wireless Devices                                                                                                   |
| CFR47, Part 15                  | X       | Telecommunication – Federal Communication Commission – Radio frequency devices,<br>Sections 15.207 / 15.209 / 15.249                                                 |

| Industry Canada qualification according to: |         |                                                                                                                                                          |
|---------------------------------------------|---------|----------------------------------------------------------------------------------------------------------------------------------------------------------|
| Standards                                   | Applied | Title                                                                                                                                                    |
| RSS-Gen (Issue 5/March 2019)                | X       | General Requirements and Information for the Certification of Radio Apparatus                                                                            |
| RSS-210 (Issue9/2016)                       | X       | License-exempt Radio Apparatus: Category I Equipment,<br>Section B.10: Devices Operating in Frequency Bands for Any Application,<br>Band 2400-2483.5MHz. |

Deviation from standards: None.

## 2. Test synthesis

| TEST                                                                  | Paragraph number<br>FCC Part 15<br>IC RSS-210                                      | Spec.<br>FCC Part 15<br>IC RSS-210                                                                                                                                                                                                                                                                                                                                                                                  | RESULTS<br>(comments) |
|-----------------------------------------------------------------------|------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|
| Conducted emissions test                                              | 15.207 (a)<br>RSS-Gen: Issue 5, §8.8                                               | 15.207 (a)<br>Table 4, §8.8                                                                                                                                                                                                                                                                                                                                                                                         | <b>PASS</b>           |
| Field Strength of fundamental                                         | 15.249 (a) (c)<br>RSS-210: Issue 9, §B.10 (a)                                      | 94dBµV/m @3m<br>(50mV/m @ 3m)                                                                                                                                                                                                                                                                                                                                                                                       | <b>PASS</b>           |
| Field Strength of harmonics                                           | 15.249 (a) (c) (e)<br>RSS-210: Issue 9, §B.10 (a)                                  | 54dBµV/m @3m<br>(0.5mV/m @ 3m)                                                                                                                                                                                                                                                                                                                                                                                      | <b>PASS</b>           |
| Unwanted emissions outside the specified frequency band and harmonics | 15.209 / 15.249 (d) (e)<br>RSS-210: Issue 9, §B.10 (b) /<br>RSS-Gen: Issue 5, §8.9 | Whichever is less stringent, either:<br>- 50dB below level of fundamental, or;<br>- General field strength limits, as follow:<br><u>Measure at 300m</u><br>9-490kHz: 2400µV/m/F(kHz)<br><u>Measure at 30m</u><br>0.490-1.705: 24000µV/m/F(kHz)<br>1.705-30MHz: 30µV/m<br><u>Measure at 3m</u><br>30MHz-88MHz : 40 dBµV/m<br>88MHz-216MHz : 43.5 dBµV/m<br>216MHz-960MHz : 46.0 dBµV/m<br>Above 960MHz : 54.0 dBµV/m | <b>PASS</b>           |
| Occupied Bandwidth                                                    | RSS-Gen: Issue 5, §6.7                                                             | BW at 99%                                                                                                                                                                                                                                                                                                                                                                                                           | <b>PASS</b>           |

- General conclusion:**

Measures and tests performed on the sample of the product **ENHANCIA - NEOVA (HUB)**, in configuration and description presented in this test report, show compliance with standards FCC CFR 47, PART 15, Subpart C and Industry Canada RSS-Gen & RSS-210.

## 3. Equipment Under Test (EUT)

Nom /  
Identification

**ENHANCIA - NEOVA (HUB)**  
(Trademark / Marketing name or product reference)

Sn: Sample #1

FCC ID:  
IC:  
Model:

FCC ID: 2AUJX-H1  
IC: 25446-H1  
NEOVA-H1

Alimentation /  
Power supply

HUB: 5V DC from USB port

Auxiliaires /  
Auxiliaries

- Customer laptop (ASUS)  
- Enhancia NEOVA Ring (Model NEOVA-R1)

Entrées-Sorties /  
Input / Output

|                        | Câbles pour essai /<br>Cables for test | Blindé /<br>Shielded | Prévu pour<br>>3m /<br>Intended for<br>>3m |
|------------------------|----------------------------------------|----------------------|--------------------------------------------|
| USB port on hub (2.0)  | 1.0m                                   | Yes                  | No                                         |
| Midi_In (jack on hub)  | 1..5m                                  | Yes (Audio)          | No                                         |
| Midi_Out (jack on hub) | 1.0m                                   | Yes (Audio)          | No                                         |

Mode de fonctionnement /  
Running mode

Equipment running modes are:  
The tested sample is able to be set in following modes:  
- Transmit a modulated carrier frequency on low, middle and high channels  
- Charging the ring (Ring plugged onto the hub)

Programme de test /  
Test program /

NEOVA Dashboard running on Windows PC

Informations supplémentaires /  
Additional informations

Declaration of the applicant:  
- Type of technology: Proprietary RF protocol  
- Emission bands: 2400-2483.5MHz  
- Frequency transmission band: 2402MHz to 2479MHz.  
- Equipment intended for use as a mobile station  
- Equipment designed for continuous operation  
- Antenna type: CMS (Peak gain: 2.2dBi)  
- Rated conducted output power: 4dBm  
- Max internal EUT frequency: 64MHz (Except intentional RF)

Dimensions de l'EST /  
Dimensions of EUT

100mm x 97 x 20

## 4. Test conditions

Power supply voltage:

Equipment under test:

Auxiliaries:

5V DC from USB port  
110V/60Hz (Conducted emission)

## 5. Modifications of the EUT

None

## 6. Measurement Uncertainty

| Test Description                                    | Expanded uncertainty |
|-----------------------------------------------------|----------------------|
| Conducted emissions test (150k-30MHz, AC mains)     | ± 3.5dB              |
| Radiated emission test (9kHz-30MHz, electric field) | ± 4.0dB              |
| Radiated emission test (30-300MHz, OATS)            | ± 5.6dB              |
| Radiated emission test (300-1000MHz, OATS)          | ± 5.3dB              |
| Radiated emission test (1-40GHz, OATS / FAC)        | ± 5.6dB              |
| Conducted RF output power at antenna port           | ± 1.6dB              |
| Radiated RF output power (Peak, Power density)      | ± 5.6dB              |
| DTS Bandwidth, 99% OBW                              | ±4%                  |
| Temperature                                         | ± 1°C                |
| Time and duty cycle calculation                     | ±1%                  |
| AC and DC voltage                                   | ±1%                  |

Note: Expanded uncertainty at 95% confidence (k=2)

## 7. Field Strength Calculation

The field strength (level) is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation is as follow:

$$FS = RA + AF + CF - AG$$

Where FS = Field Strength (Level)

RA = Receiver Amplitude (Meter Reading)

AF = Antenna Factor

CF = Cable Factor

AG = Amplifier Gain

Margin value = Emission level – Limit value

Example:

RA: 14.0dBμV / AF: 16.5 dBm<sup>-1</sup> / CF: 3.5dB / AG: 15dB

→ Total factor: 5dBm<sup>-1</sup>

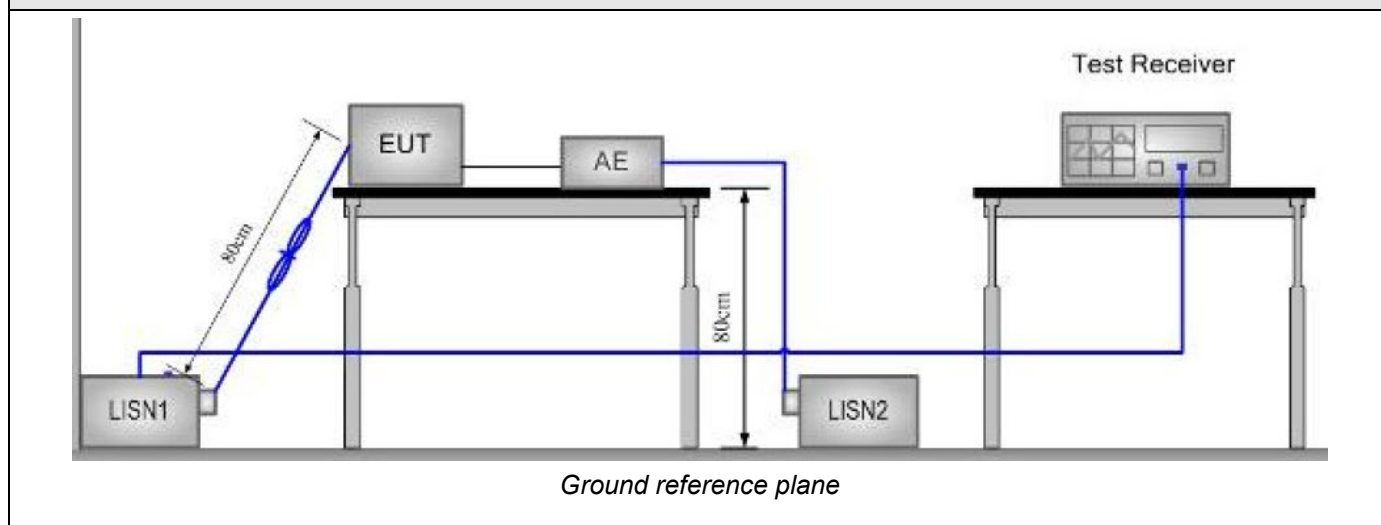
→ Field level: 19.0dBμV/m (-21.0dB for margin if limit is 40dBμV/m)

## 8. Conducted Emission Measurement (150kHz-30MHz)

| TEST: Limits for conducted disturbance 150kHz – 30MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |               |                                      |         | Verdict                                   |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|--------------------------------------|---------|-------------------------------------------|
| Method: The LISN is placed 0,8 m from the boundary of the unit under test and bonded to a ground reference plane. This distance was between the closest points of the AMN and the EUT. All other units of the EUT and associated equipment were at least 0,8 m from the AMN. All power was connected to the system through Artificial Mains Network (AMN). Conducted voltage measurements on lines were made at the output of the LISN. The EUT is 80cm above the ground reference plane and 40cm from the vertical ground plane. The AC power cable is 1m length. |               |                                      |         | Pass                                      |
| Laboratory Parameters:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |               | Required prior to the test           |         | During the test                           |
| Ambient Temperature                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |               | 20 to 30 °C                          |         | 23°C ± 2                                  |
| Relative Humidity                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |               | 25 to 70 %                           |         | 55% ± 5                                   |
| Fully configured sample scanned over the following frequency range                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |               | Frequency range on each side of line |         | Measurement Point                         |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |               | 150kHz to 30MHz                      |         | AC input port (110V)<br>Personal Computer |
| Limits                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |               |                                      |         |                                           |
| Frequency (MHz)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Limit dB (µV) |                                      |         |                                           |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Quasi-Peak    | Result                               | Average | Result                                    |
| 0.15 – 0.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 66 \ 56       | PASS                                 | 56 \ 46 | PASS                                      |
| 0.50 - 5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 56            | PASS                                 | 46      | PASS                                      |
| 5 – 30                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 60            | PASS                                 | 50      | PASS                                      |
| Supplementary information:<br>Test location: SMEE<br>Test date: November 4 <sup>th</sup> , 2019. Tested by L. Chapus<br>Power supply voltage: AC mains 110V/60Hz                                                                                                                                                                                                                                                                                                                                                                                                   |               |                                      |         |                                           |

| Test Equipment Used       |               |              |             |           |          |
|---------------------------|---------------|--------------|-------------|-----------|----------|
| Description               | Manufacturer  | Model        | Identifier  | Cal. Date | Cal. Due |
| AC power supply           | PACIFIC POWER | AMX-125      | ALI-101-002 | -         | -        |
| Attenuator / limiter      | SMEE          | ATT#2        | ATT-171-010 | 2019/6    | 2020/6   |
| Cable RF                  | Div           | 1m           | CAB-101-021 | 2019/4    | 2020/4   |
| Measuring receiver        | Rohde&Schwarz | ESRP         | REC-151-002 | 2019/9    | 2021/9   |
| LISN (50Ω / 50µH) (Meas.) | AFJ           | LS16C        | RSI-101-001 | 2019/6    | 2021/6   |
| EMC Software              | NEXIO         | BAT EMC V3.8 | SOF-101-001 | -         | -        |

## Test Setup for conducted emission

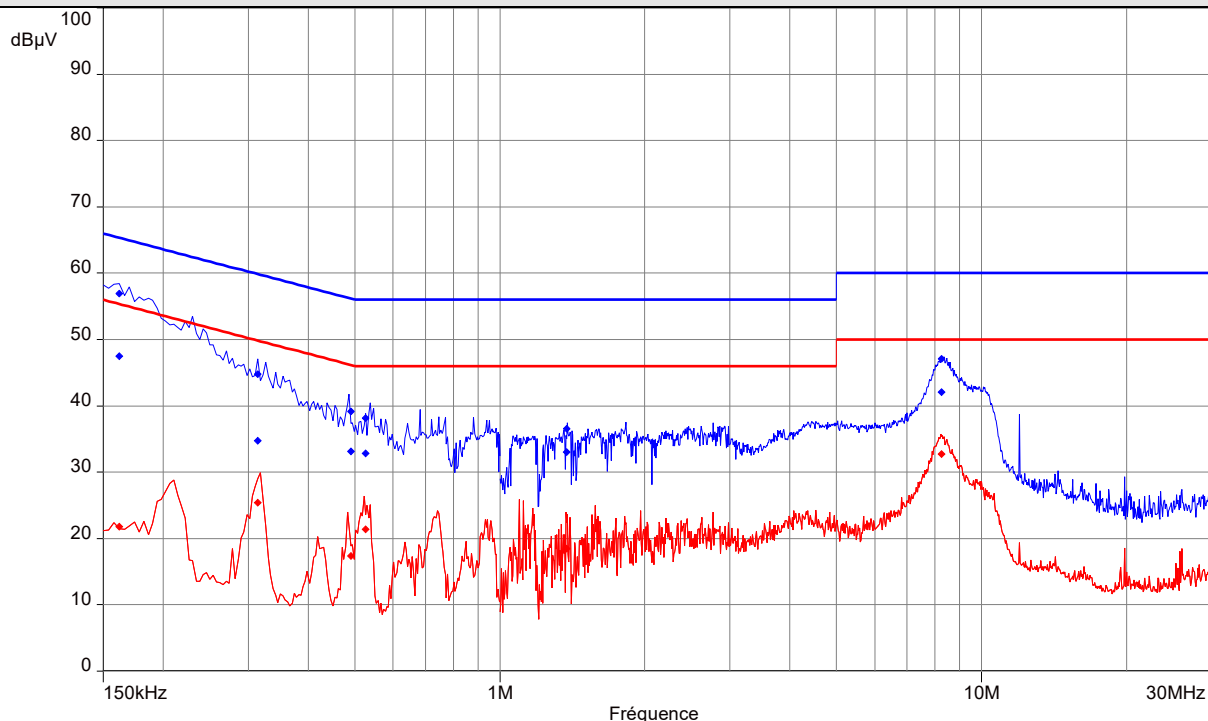


## Tabulated Results for Mains Terminal Disturbance Voltage on AC port

| FREQ<br>(MHz)                | Meas. PK<br>(dBμV) | Mes. QP<br>(dBμV) | LIMIT QP<br>(dBμV)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Margin QP<br>(dB) | Mes. AV<br>(dBμV) | LIMIT AV<br>(dBμV) | Margin AV<br>(dB) | Line |
|------------------------------|--------------------|-------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|-------------------|--------------------|-------------------|------|
| 0.162                        | 56.97              | 47.54             | 65.36                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | -17.82            | 21.83             | 55.36              | -33.53            | L1   |
| 0.314                        | 44.81              | 34.75             | 59.86                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | -25.12            | 25.43             | 49.86              | -24.44            | L1   |
| 0.49                         | 39.12              | 33.16             | 56.17                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | -23               | 17.39             | 46.17              | -28.78            | L1   |
| 0.526                        | 38.13              | 32.89             | 56                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | -23.11            | 21.43             | 46                 | -24.57            | L1   |
| 1.376                        | 36.57              | 32.99             | 56                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | -23.01            | 18.5              | 46                 | -27.5             | L1   |
| 8.268                        | 47.09              | 42.1              | 60                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | -17.9             | 32.71             | 50                 | -17.29            | L1   |
| 0.158                        | 57.78              | 47.88             | 65.57                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | -17.69            | 21.55             | 55.57              | -34.01            | N    |
| 0.318                        | 47.74              | 43.17             | 59.76                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | -16.59            | 33.95             | 49.76              | -15.81            | N    |
| 0.526                        | 45.45              | 42.83             | 56                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | -13.17            | 31.43             | 46                 | -14.57            | N    |
| 0.986                        | 45.44              | 40.92             | 56                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | -15.08            | 17.61             | 46                 | -28.39            | N    |
| 1.132                        | 45.15              | 41.72             | 56                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | -14.28            | 24.26             | 46                 | -21.74            | N    |
| 2.644                        | 44.81              | 40.61             | 56                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | -15.39            | 25.13             | 46                 | -20.87            | N    |
| 8.264                        | 49                 | 43.74             | 60                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | -16.26            | 34.04             | 50                 | -15.96            | N    |
| 0.158                        | 57.78              | 47.88             | 65.57                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | -17.69            | 21.55             | 55.57              | -34.01            | N    |
| Frequency band investigated: |                    |                   | 150kHz-30MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                   |                   |                    |                   |      |
| RBW:                         |                    |                   | 9kHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                   |                   |                    |                   |      |
| Voltage:                     |                    |                   | 110V/60Hz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                   |                   |                    |                   |      |
| Limit:                       |                    |                   | FCC Part 15.207 / RSS-Gen §8.8                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                   |                   |                    |                   |      |
| Final measurement detector:  |                    |                   | Quasi-Peak and CISPR Average (AV)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                   |                   |                    |                   |      |
| RESULT:                      |                    |                   | PASS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                   |                   |                    |                   |      |
| Measured value calculation:  |                    |                   | <p>The measured value (level) is calculated by adding the Cable Factor, the Transient suppressor attenuation and LISN attenuation from the receiver amplitude reading. The basic equation is as follow:</p> $\text{Meas.} = \text{RA} + \text{CF} + \text{ATT}_{\text{TRAN}} + \text{ATT}_{\text{LISN}}$ <p>Where    Meas. = Level (dBμV)<br/>                 RA = Receiver Amplitude<br/>                 CF = Cable Factor<br/>                 ATT<sub>TRAN</sub> = Transient suppressor attenuation<br/>                 ATT<sub>LISN</sub> = LISN attenuation</p> <p>Margin value = Emission level – Limit value (A negative margin shows compliance to limit)</p> |                   |                   |                    |                   |      |



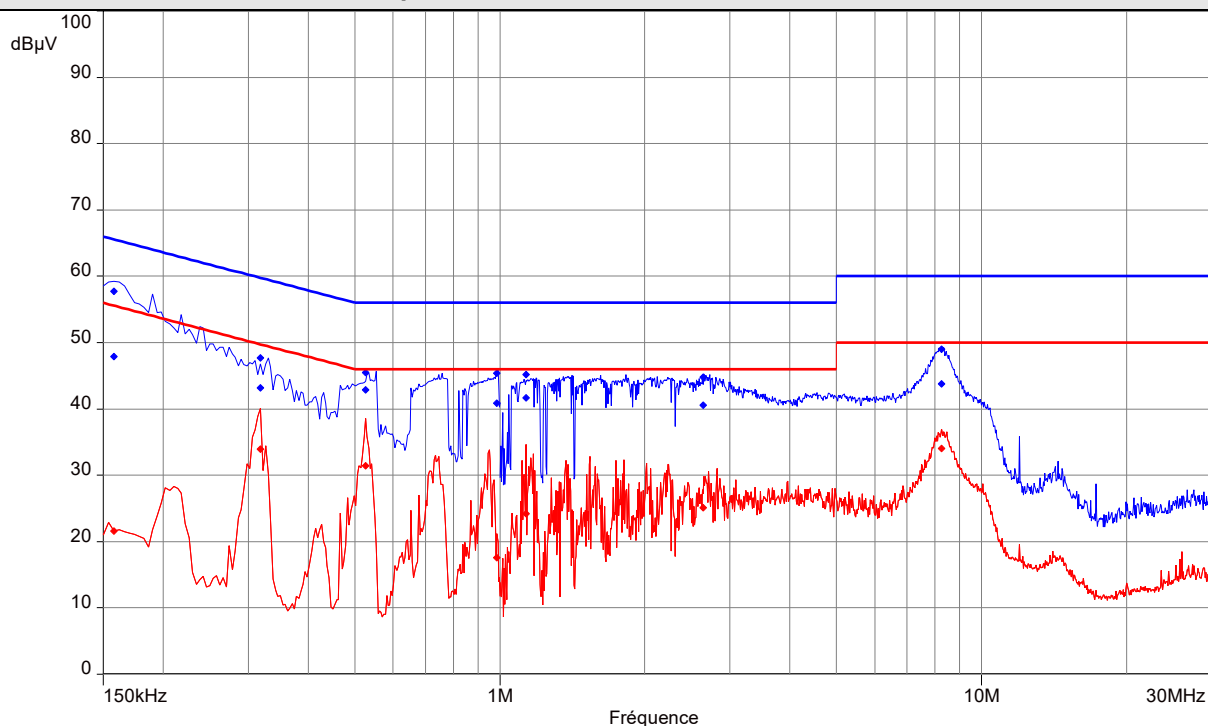
## Graphical representation of Conducted Disturbance Measurement (Peak and Average detection) AC port, Line L1 – Connected to PC



----: Peak

----: Average

## Graphical representation of Conducted Disturbance Measurement (Peak and Average detection) AC port, Line Neutral – Connected to PC



----: Peak

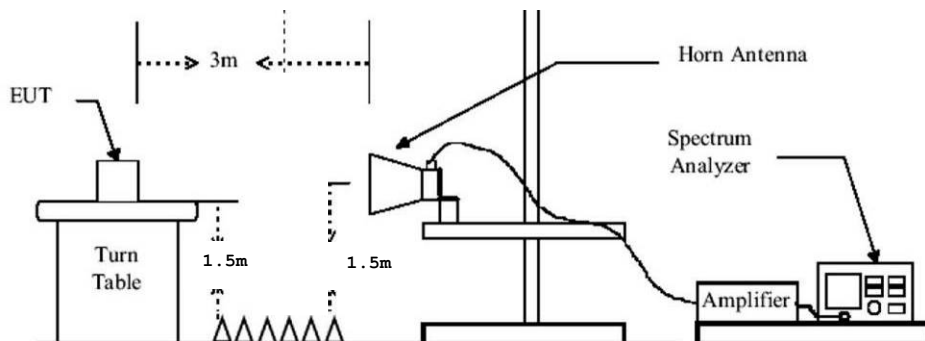
----: Average

## 9. Field Strength of fundamental

| TEST: Field strength of fundamental / FCC part 15.249 – RSS 210 §B.10                                                                                                                                                                                                                                                                                                                                                                                                     |                                                  |                 | Verdict |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------|-----------------|---------|
| <p>Method: Final measurements are made in a Full Anechoic Chamber (FAC) that complies with ANSI C63.10. Measurements were performed at an antenna to EUT separation distance of 3 meter. The EUT was rotated 360° about its azimuth with the receive antenna in horizontal and vertical polarities. Three orthogonal axis measurements on EUT are performed to obtain the maximum peak field strength, with 60° rotation on each axis. (Clause 6.6.5 of ANSI C63.10).</p> |                                                  |                 | Pass    |
| Laboratory Parameters:                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Required prior to the test                       | During the test |         |
| Ambient Temperature                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 10 to 40 °C                                      | 23°C ± 2        |         |
| Relative Humidity                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 10 to 90 %                                       | 55% ± 5         |         |
| Limits – FCC Part 15.249 (a) (c) / RSS-210 §B.10 (a)                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                  |                 |         |
| Frequency (MHz)                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Limits (dBµV/m)                                  |                 |         |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Level / Detector / Distance                      | Results         |         |
| 2402 to 2479 MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 94dBµV/m / Average / 3m<br>114dBµV/m / Peak / 3m | Pass            |         |
| Supplementary information:<br>Test location: SMEE<br>Test date: November 4 <sup>th</sup> , 2019. Tested by L. Chapus                                                                                                                                                                                                                                                                                                                                                      |                                                  |                 |         |

| Test Equipment Used |                |           |             |           |          |
|---------------------|----------------|-----------|-------------|-----------|----------|
| Description         | Manufacturer   | Model     | Identifier  | Cal. Date | Cal. Due |
| Horn antenna        | ETS-LINDGREN   | 3115      | ANT-141-013 | 2018/10   | 2021/10  |
| RF cable            | HUBER+SUHNER   | SF104     | CAB-141-030 | 2019/4    | 2020/4   |
| RF cable            | Pasternack     | PE302-120 | CAB-131-024 | 2019/4    | 2020/4   |
| Anechoic chamber    | COMTEST        | 214263    | CAG-141-001 | -         | -        |
| Turntable           | Innco- Systems | CT0800    | PLA-141-002 | -         | -        |
| Measuring Receiver  | Rohde&Schwarz  | ESRP      | REC-151-002 | 2019/9    | 2021/9   |

## Test Setup for radiated emission



*Test setup*

## Tabulated Results for Field Strength of fundamental

| FREQ<br>(MHz) | Field Strength<br>@ 3m<br>(dBμV/m) | Detector | Limit<br>(dBμV/m) | Margin<br>dBm | Result |
|---------------|------------------------------------|----------|-------------------|---------------|--------|
| 2402.0        | 93.9                               | Pk       | 114               | -20.1         | Pass   |
| 2402.0        | 93.5                               | Av       | 94                | -0.5          | Pass   |
| 2440.0        | 91.5                               | Pk       | 114               | -22.5         | Pass   |
| 2440.0        | 91.1                               | Av       | 94                | -2.9          | Pass   |
| 2479.0        | 91.6                               | Pk       | 114               | -22.4         | Pass   |
| 2479.0        | 91.2                               | Av       | 94                | -2.8          | Pass   |

**RBW:** 1MHz

**Measurement distance:** 3m

**Limit:** FCC Part 15.249 (a) (c) / RSS-210 §B.10

**Final measurement detector:** Peak / CISPR Average

**RESULT:** PASS

**Note:** (1): The field strength (level) is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation is as follow:

$$FS = RA + AF + CF - AG$$

Where FS = Field Strength  
RA = Receiver Amplitude  
AF = Antenna Factor  
CF = Cable Factor  
AG = Amplifier Gain

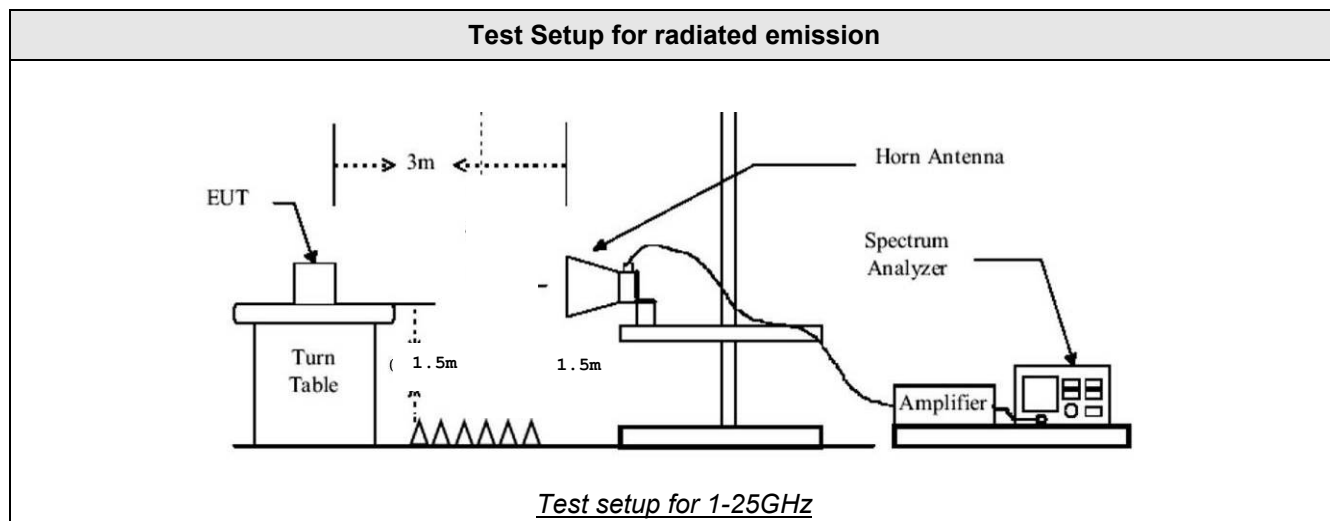
Total factor (dB) is AF + CF – AG

Margin value = Emission level – Limit value

## 10. Field Strength of harmonics

| TEST: Field Strength of harmonics / FCC part 15.249 – RSS-210 §B.10                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                      |                          | Verdict |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|--------------------------|---------|
| <p><u>Method:</u> For frequency above 1GHz, final measurements are made in a Full Anechoic Chamber (FAC) that complies with ANSI C63.10. Measurements were performed at an antenna to EUT separation distance of 3 meter. The EUT was rotated 360° about its azimuth with the receive antenna in horizontal and vertical polarities.</p> <p>Three orthogonal axis measurements on EUT are performed to obtain the maximum peak field strength, with 60° rotation on each axis.(Clause 6.6.5 of ANSI C63.10).</p> <p>A pre-scan frequency identification of the EUT has been performed in full anechoic chamber. The measured radiated field of the EUT is performed (or corrected) at 3-meters of distance. Antenna is 1.5-meters high.</p> <p>The pre-characterization graphs are obtained in PEAK and Average detection with 360° continuous rotation of the device under test.</p> |                                      |                          | Pass    |
| Laboratory Parameters:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Required prior to the test           | During the test          |         |
| Ambient Temperature                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 10 to 40 °C                          | 23°C ± 2                 |         |
| Relative Humidity                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 10 to 90 %                           | 55% ± 5                  |         |
| Fully configured sample scanned over the following frequency range                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Frequency range on each side of line | Measurement Point        |         |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 30MHz – 25GHz                        | 3 m measurement distance |         |
| Limits – FCC Part 15.249 (a) (c) (e) / RSS-210 §B.10 (a)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                      |                          |         |
| Frequency bands for harmonics (MHz)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Limits (dBµV/m)                      |                          |         |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Level / Detector / Distance          | Results                  |         |
| 4800 to 4967                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 54.0 / AV / 3m<br>74.0 / PK / 3m     | Pass                     |         |
| 7200 to 7450.5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 54.0 / AV / 3m<br>74.0 / PK / 3m     | Pass                     |         |
| 9600 to 9934                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 54.0 / AV / 3m<br>74.0 / PK / 3m     | Pass                     |         |
| 12000 to 12417.5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 54.0 / AV / 3m<br>74.0 / PK / 3m     | Pass                     |         |
| 14400 to 14901                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 54.0 / AV / 3m<br>74.0 / PK / 3m     | Pass                     |         |
| 16800 to 17384.5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 54.0 / AV / 3m<br>74.0 / PK / 3m     | Pass                     |         |
| 19200 to 19868                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 54.0 / AV / 3m<br>74.0 / PK / 3m     | Pass                     |         |
| 21600 to 22351.5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 54.0 / AV / 3m<br>74.0 / PK / 3m     | Pass                     |         |
| 24000 to 24835                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 54.0 / AV / 3m<br>74.0 / PK / 3m     | Pass                     |         |
| Supplementary information:<br>Test location: SMEE<br>Test date: November 4 <sup>th</sup> , 2019. Tested by L. Chapus                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                      |                          |         |

| Test Equipment Used |                |              |             |           |          |
|---------------------|----------------|--------------|-------------|-----------|----------|
| Description         | Manufacturer   | Model        | Identifier  | Cal. Date | Cal. Due |
| Horn antenna        | ETS-LINDGREN   | 3115         | ANT-141-013 | 2018/10   | 2021/10  |
| Horn antenna        | ETS-LINDGREN   | 3116         | ANT-161-014 | 2017/12   | 2022/12  |
| Spectrum analyzer   | Rohde&Schwarz  | FSV40        | ASP-171-004 | 2019/8    | 2021/8   |
| RF cable            | Pasternack RF  | PE302-120    | CAB-131-024 | 2019/4    | 2020/4   |
| RF cable            | HUBER+SUHNER   | SF104        | CAB-141-030 | 2019/4    | 2020/4   |
| RF cable            | HUBER+SUHNER   | SF102 (K/2m) | CAB-171-034 | 2019/4    | 2020/4   |
| RF cable            | HUBER+SUHNER   | SF102 (K/3m) | CAB-171-035 | 2019/4    | 2020/4   |
| Anechoic chamber    | COMTEST        | 214263       | CAG-141-001 | 2017/6    | 2020/6   |
| Antenna mast        | Innco- Systems | MA4000EP     | MAT-101-001 | -         | -        |
| Turntable           | Innco- Systems | DS1200S      | PLA-101-001 | -         | -        |
| Turntable           | Innco- Systems | CT0800       | PLA-141-001 |           |          |
| Pre-amplifier       | PE             | 1524         | PRE-101-002 | 2019/6    | 2020/6   |
| Pre-amplifier       | SMEE           | 18-40GHz     | PRE-171-004 | 2017/12   | 2019/12  |
| Measuring receiver  | Rohde&Schwarz  | ESRP         | REC-151-003 | 2019/9    | 2021/9   |
| EMC Software        | NEXIO          | BAT EMC V3.9 | SOF-101-001 | -         | -        |



| Tabulated Results for Field strength of harmonics<br>(1GHz-25GHz)                                                |                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                   |                    |        |
|------------------------------------------------------------------------------------------------------------------|-------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|--------------------|--------|
| FREQ<br>(MHz)                                                                                                    | Field Strength 3m<br>(dBμV/m) | Detector                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Limit<br>(dBμV/m) | Margin<br>(dBμV/m) | Result |
| Levels are at least 10dB below limits                                                                            |                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                   |                    |        |
| Supplementary information:<br>Frequency list has been created with pre-scan results. See pre-scan graphs in §12. |                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                   |                    |        |
| RBW:                                                                                                             |                               | 1MHz (CISPR)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                   |                    |        |
| Measurement distance:                                                                                            |                               | 3m                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                   |                    |        |
| Limit:                                                                                                           |                               | FCC Part 15.249 (a) (c) (e) / RSS-210 §B.10 (a)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                   |                    |        |
| Final measurement detector:                                                                                      |                               | Peak / CISPR Average                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                   |                    |        |
| RESULT:                                                                                                          |                               | PASS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                   |                    |        |
| Notes:                                                                                                           |                               | <p>(1): The field strength (level) is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation is as follow:<br/> <math>FS = RA + AF + CF - AG</math><br/>           Where FS = Field Strength<br/>           RA = Receiver Amplitude<br/>           AF = Antenna Factor<br/>           CF = Cable Factor<br/>           AG = Amplifier Gain<br/>           Total factor (dB) is <math>AF + CF - AG</math><br/>           Margin value = Emission level – Limit value</p> <p>(2): Peak pre-scans not performed at 3-meters distance are corrected as follow:<br/> <math>M@3m = M@Dm + 20 \times \log (Dm / 3m)</math><br/>           Where D is the measurement distance in meter</p> <p>(3): All frequencies not specified have margin &lt; -10dB (for peak and average detector)</p> |                   |                    |        |

## 11. Unwanted emissions

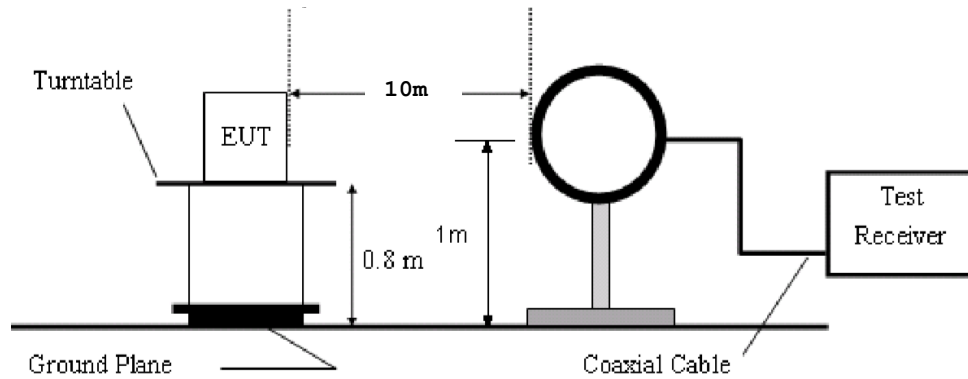
| TEST: Unwanted emissions outside fundamental and harmonics bands / FCC part 15.209, 15.249 - RSS-210 §B.10 / RSS-Gen §8.9                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                              | Verdict                   |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------|---------------------------|
| <p><b>Method:</b> Measurements were made in a 3-meter Open Area Test Site that complies to ANSI C63.10 for frequency below 1GHz. Measurements were made in a 3-meter Full Anechoic Chamber (FAC) that complies to ANSI C63.10 for frequency above 1GHz.</p> <p>The EUT was rotated 360° about its azimuth with the receive antenna located at various heights in horizontal and vertical polarities. Final measurements (Peak/Quasi-Peak/Average) were then performed by rotating the EUT 360° and adjusting the receive antenna height.</p> <p>The tested equipment is set to transmit operation with modulations on lowest, middle and highest channel. Three orthogonal axis measurements on EUT are performed to obtain the maximum peak field strength. A pre-scan frequency identification of the EUT has been performed in full anechoic chamber.</p> <p>The measured radiated field of the EUT is performed at 3-meters of distance for frequency 9k-1GHz. The measured radiated field of the EUT is performed at 1.6-meters of distance for frequency 1-25GHz. Antenna is 1.25m (Freq &lt; 1GHz) or 1.5m (Freq &lt; 1GHz) high in front of EUT.</p> |                                                                              | Pass                      |
| Laboratory Parameters:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Required prior to the test                                                   | During the test           |
| Ambient Temperature                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 10 to 40 °C                                                                  | 23°C ± 2                  |
| Relative Humidity                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 10 to 90 %                                                                   | 55% ± 5                   |
| Fully configured sample scanned over the following frequency range                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Frequency range on each side of line                                         | Measurement Point         |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 9kHz – 30MHz                                                                 | 10 m measurement distance |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 30MHz – 25GHz                                                                | 3 m measurement distance  |
| <b>Limits – FCC Part 15.209, 15.249 (d) (e) / RSS-Gen §8.9, RSS-210 §B.10 (b)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                              |                           |
| <b>Whichever is less stringent, either:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                              |                           |
| Frequency (MHz)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Limits (dBµV/m)                                                              |                           |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Level / Detector / Distance                                                  | Results                   |
| 30 to 1000                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 50dB below the fundamental / QP / 3m                                         | Not used                  |
| Above 1GHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 50dB below the fundamental / Av / 3m<br>30dB below the fundamental / Pk / 3m | Not used                  |
| <b>Or</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                              |                           |
| Frequency (MHz)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Limits (dBµV/m)                                                              |                           |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Level / Detector / Distance                                                  | Results                   |
| 0.009 to 0.090                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 107.6 – 87.6 / AV / 10m<br>127.6 – 107.6 / PK / 10m                          | Pass                      |
| 0.090 to 0.110                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 87.6 – 85.9 / QP / 10m                                                       | Pass                      |
| 0.110 to 0.490                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 85.7 – 72.9 / AV / 10m<br>105.7 – 92.9 / PK / 10m                            | Pass                      |
| 0.490 to 1.705                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 52.9 – 42.1 / QP / 10m                                                       | Pass                      |
| 1.705 to 30                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 48.6 / QP / 10m                                                              | Pass                      |
| 30 to 88                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 40.0 / QP / 3m                                                               | Pass                      |
| 88 to 216                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 43.5 / QP / 3m                                                               | Pass                      |
| 216 to 960                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 46.0 / QP / 3m                                                               | Pass                      |
| 960-1000                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 54.0 / QP / 3m                                                               | Pass                      |

|                                                                                                                      |                                  |      |
|----------------------------------------------------------------------------------------------------------------------|----------------------------------|------|
| Above 1GHz                                                                                                           | 54.0 / AV / 3m<br>74.0 / PK / 3m | Pass |
| Supplementary information:<br>Test location: SMEE<br>Test date: November 4 <sup>th</sup> , 2019. Tested by L. Chapus |                                  |      |

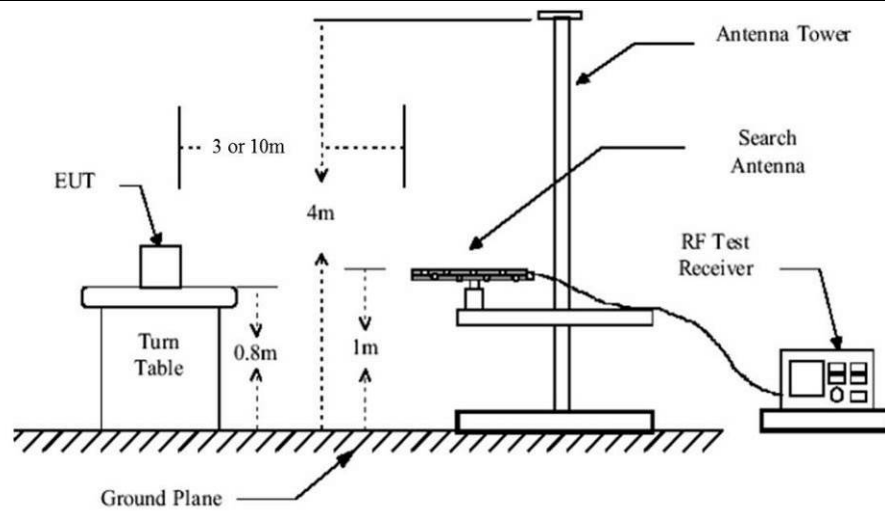
| Test Equipment Used  |                |              |             |           |          |
|----------------------|----------------|--------------|-------------|-----------|----------|
| Description          | Manufacturer   | Model        | Identifier  | Cal. Date | Cal. Due |
| Log-periodic antenna | EMCO           | 3146         | ANT-191-019 | 2019/6    | 2021/6   |
| Biconnic antenna     | COM-POWER      | AB- 900      | ANT-101-003 | 2019/6    | 2021/6   |
| Loop antenna         | EMCO           | 6502         | ANT-101-009 | 2019/8    | 2021/8   |
| BiConiLog antenna    | EMCO           | 3142B        | ANT-101-010 | 2019/8    | 2021/8   |
| Horn antenna         | ETS-LINDGREN   | 3115         | ANT-141-013 | 2018/10   | 2021/10  |
| Horn antenna         | ETS-LINDGREN   | 3116         | ANT-161-014 | 2017/12   | 2022/12  |
| Spectrum analyzer    | Rohde&Schwarz  | FSV40        | ASP-171-004 | 2019/8    | 2021/8   |
| RF cable             | Div            | OATS/25m     | CAB-101-017 | 2019/4    | 2020/4   |
| RF cable             | Pasternack RF  | PE302-120    | CAB-131-024 | 2019/4    | 2020/4   |
| RF cable             | HUBER+SUHNER   | RG214U       | CAB-141-026 | 2019/4    | 2020/4   |
| RF cable             | HUBER+SUHNER   | RG214U       | CAB-141-029 | 2019/4    | 2020/4   |
| RF cable             | HUBER+SUHNER   | SF104        | CAB-141-030 | 2019/4    | 2020/4   |
| RF cable             | HUBER+SUHNER   | SF102 (K/2m) | CAB-171-034 | 2019/4    | 2020/4   |
| RF cable             | HUBER+SUHNER   | SF102 (K/3m) | CAB-171-034 | 2019/4    | 2020/4   |
| Pre-amplifier        | Pasternack RF  | PE1524       | PRE-101-002 | 2019/6    | 2020/6   |
| Pre-amplifier        | SMEE           | 18-40GHz     | PRE-171-004 | 2017/12   | 2019/12  |
| Anechoic chamber     | COMTEST        | 214263       | CAG-141-001 | 2017/6    | 2020/6   |
| OATS                 | Div            | 10m          | SIT-101-001 | 2017/7    | 2020/7   |
| Antenna mast         | Innco- Systems | MA4000EP     | MAT-101-001 | -         | -        |
| Turntable            | Innco- Systems | DS1200S      | PLA-101-001 | -         | -        |
| Turntable            | Innco- Systems | CT0800       | PLA-141-001 | -         | -        |
| Measuring Rec        | Rohde&Schwarz  | ESRP         | REC-151-002 | 2019/9    | 2021/9   |
| EMC Software         | NEXIO          | BAT EMC V3.9 | SOF-101-001 | -         | -        |



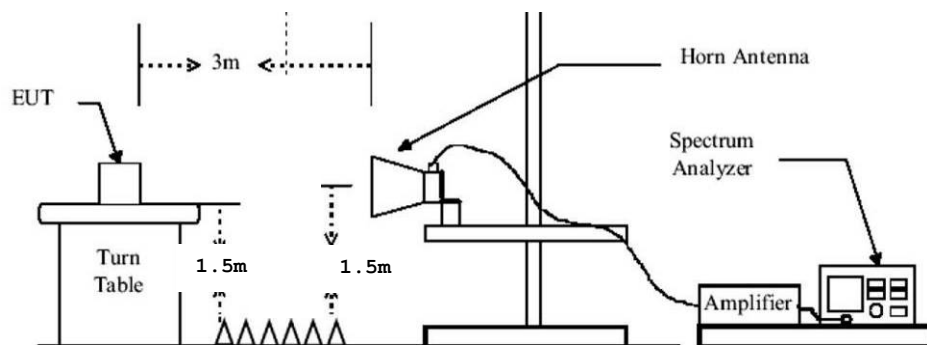
## Test Setup for radiated emission



Test setup for 9k-30MHz



Test setup for 30-1000MHz



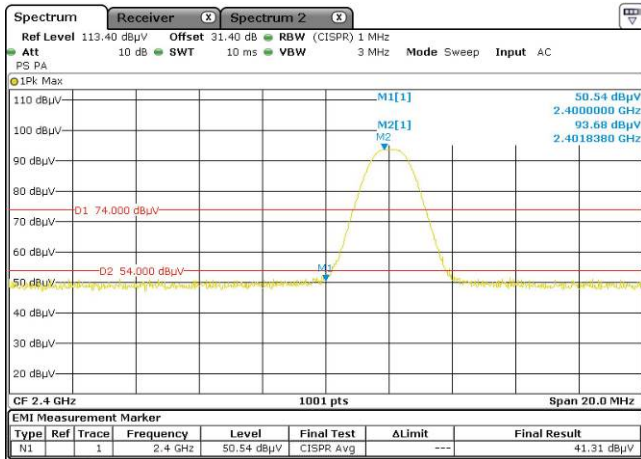
Test setup for 1-25GHz

| Tabulated Results for Unwanted emissions<br>(9kHz-30MHz)                                                                 |                   |                                                                                                                                                                                  |        |                   |          |                |                       |
|--------------------------------------------------------------------------------------------------------------------------|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|-------------------|----------|----------------|-----------------------|
| FREQ                                                                                                                     | RF field @<br>30m | Limit @<br>30m                                                                                                                                                                   | Margin | Antenna           |          | Table<br>angle | Correc. Fact.<br>(CF) |
| MHz                                                                                                                      | (QP)<br>dBμV/m    | (QP)<br>dBμV/m                                                                                                                                                                   | dB     | Angle<br>(Degree) | Position | Degree         | dB                    |
| Levels are at least 10dB below limits                                                                                    |                   |                                                                                                                                                                                  |        |                   |          |                |                       |
| Supplementary information:<br>Frequency list measured on the Open Area Test Site has been created with pre-scan results. |                   |                                                                                                                                                                                  |        |                   |          |                |                       |
| <b>Frequency band investigated:</b>                                                                                      |                   | 9kHz-30MHz                                                                                                                                                                       |        |                   |          |                |                       |
| <b>RBW:</b>                                                                                                              |                   | 200Hz (9kHz-150kHz)                                                                                                                                                              |        |                   |          |                |                       |
|                                                                                                                          |                   | 9kHz (150kHz-30MHz)                                                                                                                                                              |        |                   |          |                |                       |
| <b>Measurement distance:</b>                                                                                             |                   | 10m                                                                                                                                                                              |        |                   |          |                |                       |
| <b>Limit:</b>                                                                                                            |                   | FCC Part 15.209 – 15.249 / RSS-Gen §8.9 – RSS-210 §B.10 (b)                                                                                                                      |        |                   |          |                |                       |
| <b>Final measurement detector:</b>                                                                                       |                   | Peak / Quasi-Peak / Average                                                                                                                                                      |        |                   |          |                |                       |
| <b>Note:</b>                                                                                                             |                   | CF: Correction factor = Antenna factor + Cable loss<br>*1: Measure have been done at 10m distance and corrected according to requirements of 15.209.e)<br>(M@30m = M@10m-19.1dB) |        |                   |          |                |                       |

| Tabulated Results for Radiated Disturbance<br>(3m measurement on Open Area Test Site, 30MHz-1GHz)                                                                                                              |                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                 |                |                |     |                   |                |                |              |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|----------------|----------------|-----|-------------------|----------------|----------------|--------------|
| FREQ                                                                                                                                                                                                           | Meter<br>reading | Meter<br>reading                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Total<br>Factor | Field<br>level | Field<br>level | Pol | Antenna<br>height | Table<br>angle | Limit          | Margin       |
| MHz                                                                                                                                                                                                            | (QP)<br>dBμV     | (Pk)<br>dBμV                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | dB              | (QP)<br>dBμV/m | (Pk)<br>dBμV/m |     | cm                | Degré          | (QP)<br>dBμV/m | dB           |
| 38.810                                                                                                                                                                                                         | 26.4             | 32.9                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 10.3            | <b>36.7</b>    | 43.2           | V   | 100               | 30             | 40.0           | <b>-3.3</b>  |
| 44.766                                                                                                                                                                                                         | 25.6             | 32.5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 10.7            | <b>36.3</b>    | 43.2           | V   | 100               | 40             | 40.0           | <b>-3.7</b>  |
| 50.800                                                                                                                                                                                                         | 24.1             | 28.1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 11.0            | <b>35.1</b>    | 39.1           | V   | 100               | 55             | 40.0           | <b>-4.9</b>  |
| 144.009                                                                                                                                                                                                        | 24.2             | 25.3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 13.7            | <b>37.9</b>    | 39.0           | H   | 120               | 170            | 43.5           | <b>-5.6</b>  |
| 156.074                                                                                                                                                                                                        | 25.1             | 25.6                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 14.1            | <b>39.2</b>    | 39.7           | H   | 130               | 235            | 43.5           | <b>-4.3</b>  |
| 167.987                                                                                                                                                                                                        | 22.1             | 24.5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 15.9            | <b>38.0</b>    | 40.4           | H   | 120               | 85             | 43.5           | <b>-5.5</b>  |
| 479.973                                                                                                                                                                                                        | 14.1             | 17.3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 20.9            | <b>35.0</b>    | 38.2           | V   | 150               | 55             | 46.0           | <b>-11.0</b> |
| Supplementary information:<br>Frequency list measured on the Open Area Test Site is created with pre-scan results.<br>Worst case results for Tx continuous, USB connection to PC, ring battery charging modes. |                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                 |                |                |     |                   |                |                |              |
| <b>Frequency band investigated:</b>                                                                                                                                                                            |                  | 30MHz-1GHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                 |                |                |     |                   |                |                |              |
| <b>RBW:</b>                                                                                                                                                                                                    |                  | 120kHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                 |                |                |     |                   |                |                |              |
| <b>Measurement distance:</b>                                                                                                                                                                                   |                  | 3m                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                 |                |                |     |                   |                |                |              |
| <b>Limit:</b>                                                                                                                                                                                                  |                  | FCC Part 15.209 – 15.249 / RSS-Gen §8.9 – RSS-210 §B.10 (b)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                 |                |                |     |                   |                |                |              |
| <b>Final measurement detector:</b>                                                                                                                                                                             |                  | Quasi-Peak                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                 |                |                |     |                   |                |                |              |
| <b>RESULT:</b>                                                                                                                                                                                                 |                  | PASS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                 |                |                |     |                   |                |                |              |
| <b>Field Strength Calculation:</b>                                                                                                                                                                             |                  | <p>The field strength (level) is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation is as follow:</p> $FS = RA + AF + CF - AG$ <p>Where FS = Field Strength (Level)<br/>RA = Receiver Amplitude (Meter reading)<br/>AF = Antenna Factor<br/>CF = Cable Factor<br/>AG = Amplifier Gain</p> <p>Total factor (dB) is AF + CF – AG<br/>Margin value = Emission level – Limit value (A negative margin shows compliance to limit)<br/>Limits used are FCC part 15.209 / RSS-Gen.</p> |                 |                |                |     |                   |                |                |              |

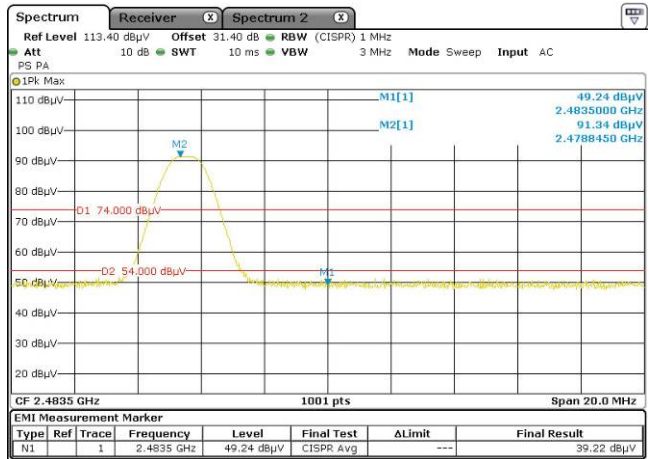
| Tabulated Results for Unwanted emissions<br>(1GHz-25GHz) |                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                   |        |
|----------------------------------------------------------|-----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|--------|
| FREQ<br>(MHz)                                            | Field level<br>dBμV/m | Detector                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Limit<br>(dBμV/m) | Result |
| 2400.000                                                 | 50.5                  | Pk                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 74 Pk             | Pass   |
| 2400.000                                                 | 41.3                  | Av                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 54 Av             | Pass   |
| 2483.274                                                 | 49.2                  | Pk                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 74 Pk             | Pass   |
| 2483.274                                                 | 39.2                  | Av                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 54 Av             | Pass   |
| RBW                                                      |                       | 1MHz (CISPR)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                   |        |
| Measurement distance:                                    |                       | 3m                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                   |        |
| Limit:                                                   |                       | FCC Part 15.209 – 15.249 / RSS-Gen §8.9 – RSS-210 §B.10 (b)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                   |        |
| Final measurement detector:                              |                       | Peak / CISPR Average                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                   |        |
| RESULT:                                                  |                       | PASS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                   |        |
| Notes:                                                   |                       | <p>(1): The field strength (level) is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation is as follow:<br/> <math>FS = RA + AF + CF - AG</math><br/>           Where FS = Field Strength<br/>                 RA = Receiver Amplitude<br/>                 AF = Antenna Factor<br/>                 CF = Cable Factor<br/>                 AG = Amplifier Gain<br/>           Total factor (dB) is <math>AF + CF - AG</math><br/>           Margin value = Emission level – Limit value<br/>           (2): Limits used are FCC part 15.209 / RSS-Gen §8.9<br/>           (3): Peak pre-scans not performed at 3-meters distance are corrected as follow:<br/> <math>M@3m = M@D_m + 20 \times \log(D_m / 3m)</math><br/>           Where D is the measurement distance in meter<br/>           (4): All frequencies not specified have margin &lt; -10dB (for peak and average detector)</p> |                   |        |

## Graphical representation of Band-edge compliance (Radiated)



### Low band-edge compliance

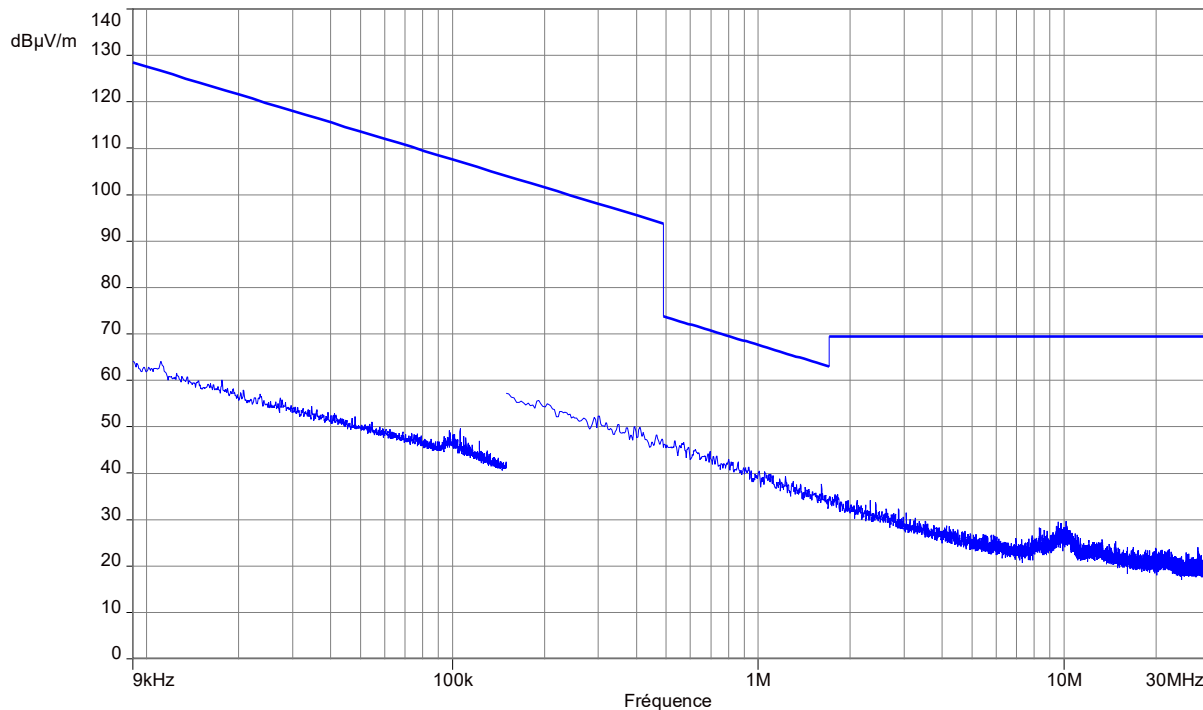
M1 = 2400MHz  
Average level at 2400MHz is 41.3dBμV/m  
(Average limit is 54dBμV/m - Peak limit is 74dBμV/m @ 3m)  
**RESULT: PASS**  
Note: Radiated measurement



### High band-edge compliance

M1 = 2483.5MHz  
Average level at 2483.5MHz is 39.2dBμV/m  
(Average limit is 54dBμV/m - Peak limit is 74dBμV/m @ 3m)  
**RESULT: PASS**  
Note: Radiated measurement

## Graphical representation of Radiated Disturbance Measurement (Peak detection, Anechoic chamber pre-scan, 9kHz-30MHz / 3m / Parallel & Perpendicular antenna position / Transmit mode)

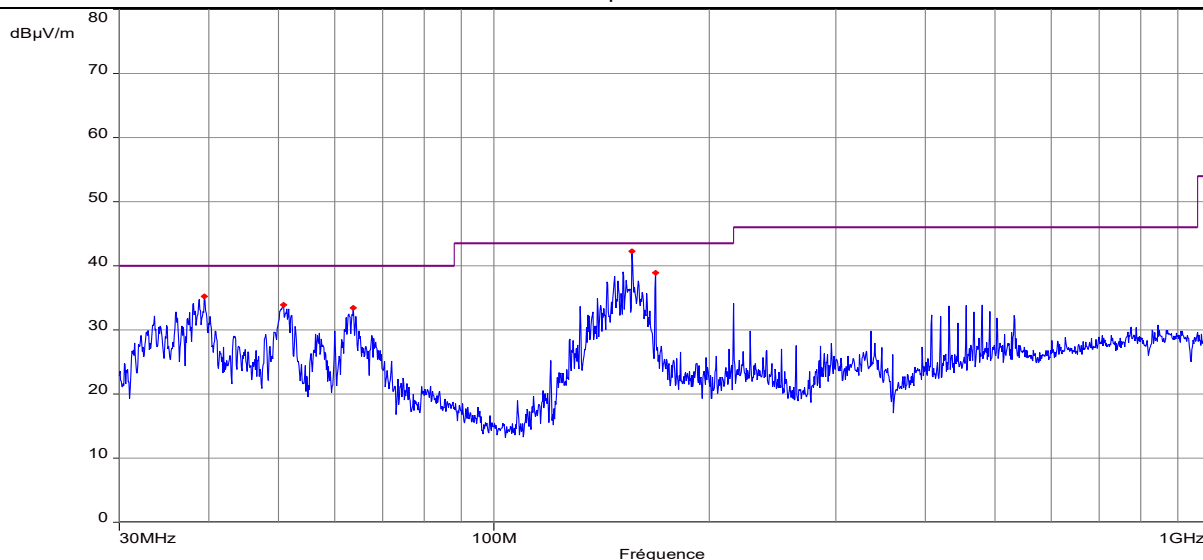


Notes: Pre-scan graph only for identification purpose.  
Same result for transmit mode on all channels.

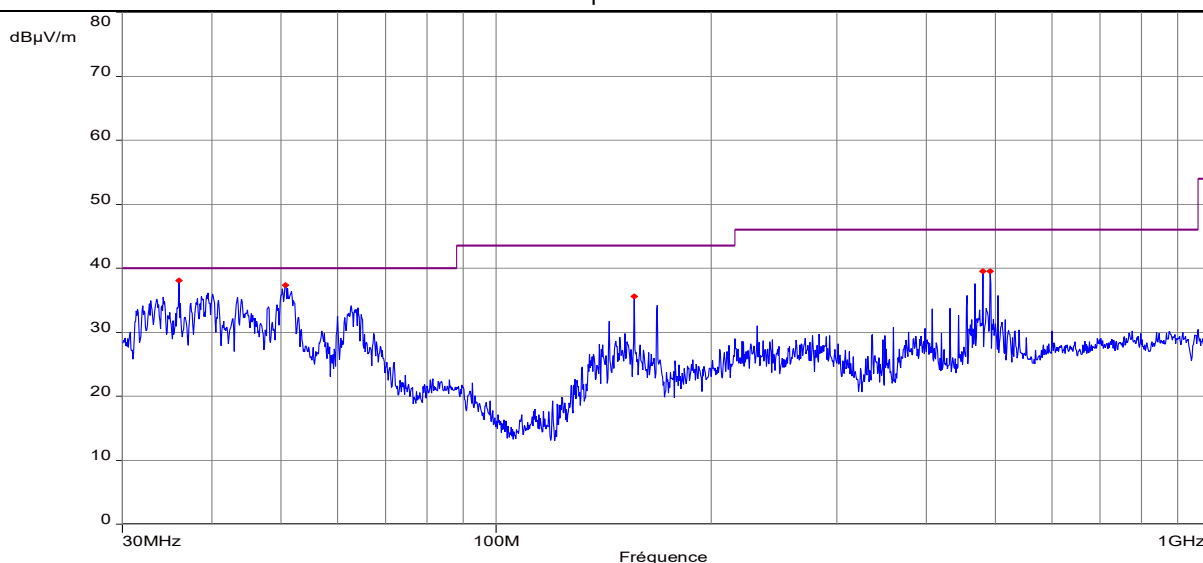
|                              |                                              |
|------------------------------|----------------------------------------------|
| Frequency band investigated: | 9kHz-30MHz                                   |
| Unit :                       | dBμV/m                                       |
| RBW :                        | 200Hz (9kHz-150kHz)<br>9kHz (150kHz-30MHz)   |
| Antenna polarization :       | Parallel & Perpendicular to measurement axis |
| Measurement detector:        | Peak                                         |

## Graphical representation of Radiated Disturbance Measurement (Peak detection, Anechoic chamber pre-scan, 30MHz-1GHz / 3m)

Horizontal polarization



Vertical polarization



----- : Peak measure

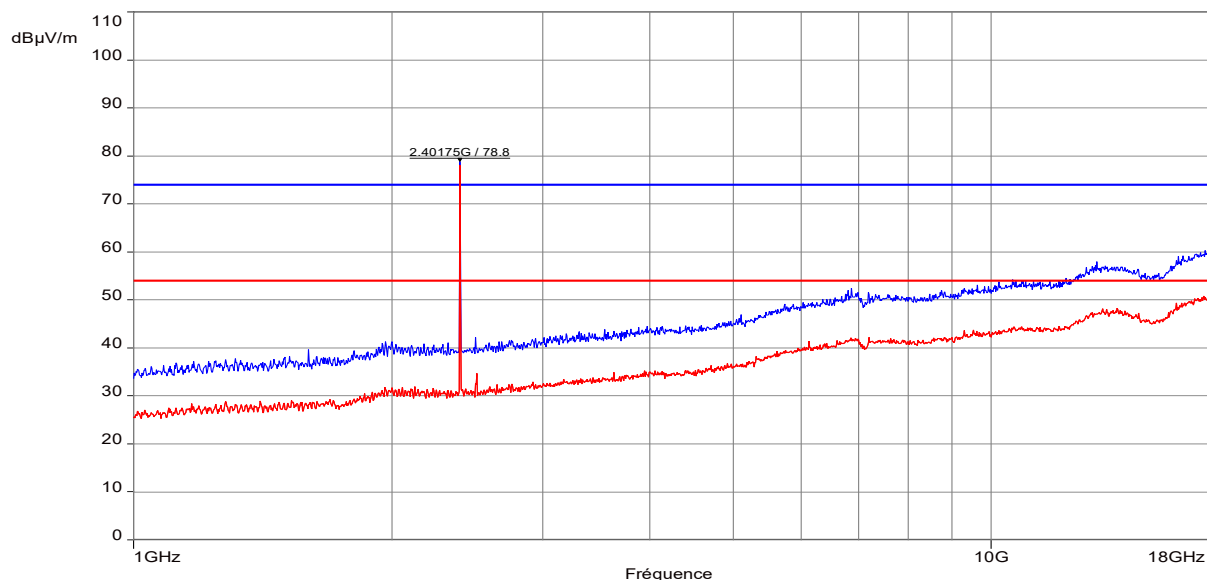
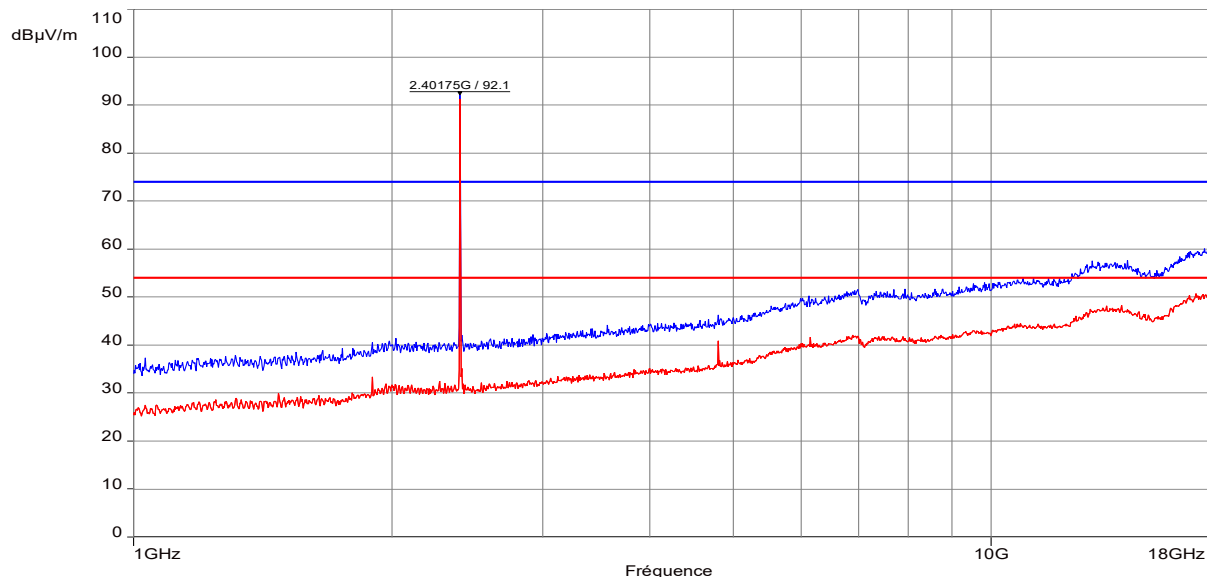
----- : QP limit (3m)

Note: Pre-scan graph only for identification purpose. Worst case results for Tx continuous, USB connection to PC, ring battery charging modes.

Marker List :

| Frequency (MHz) | Peak Level (dBμV/m) | Limit (dBμV/m) | Polarization |
|-----------------|---------------------|----------------|--------------|
| 39.3972         | 35.27               | 40.0           | H            |
| 50.8557         | 33.93               | 40.0           | H            |
| 63.6782         | 33.45               | 40.0           | H            |
| 155.922         | 42.29               | 43.5           | H            |
| 168.017         | 38.88               | 43.5           | H            |
| 36.0021         | 38.09               | 40.0           | V            |
| 50.7344         | 37.37               | 40.0           | V            |
| 156.013         | 35.56               | 43.5           | V            |
| 480.033         | 39.55               | 46.0           | V            |
| 492.007         | 39.5                | 46.0           | V            |

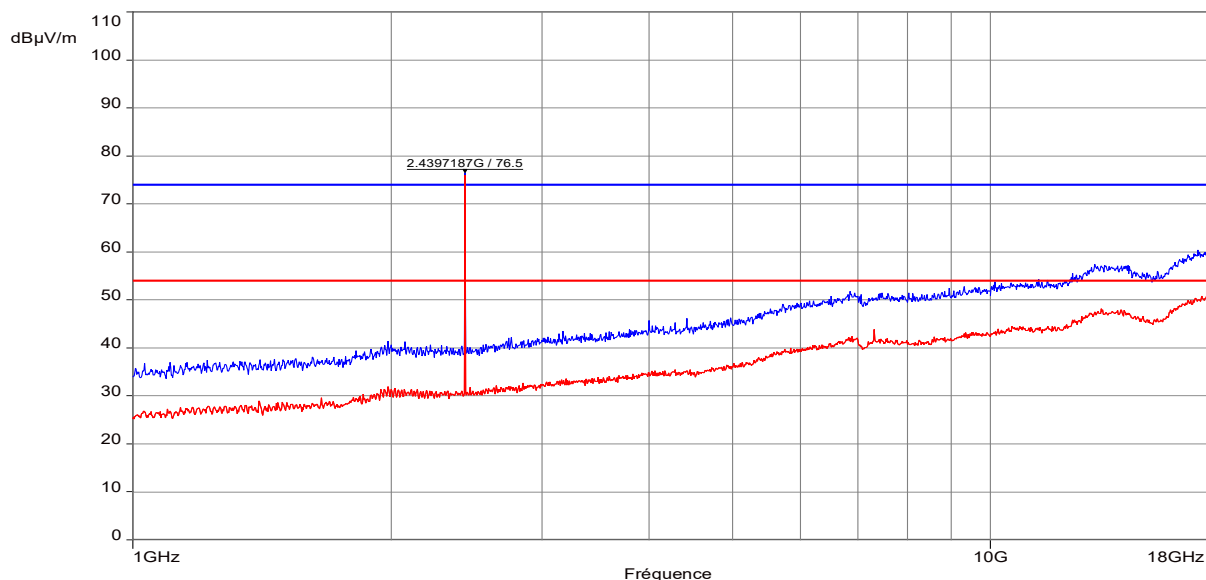
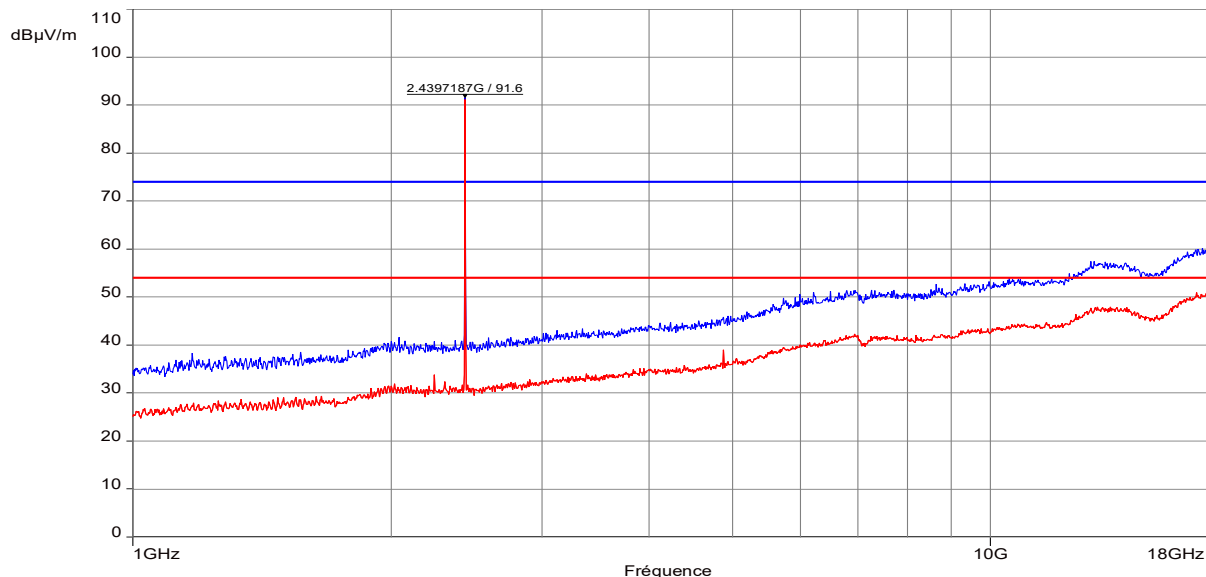
## Graphical representation of Radiated Disturbance Measurement (Peak detection, Anechoic chamber pre-scan, 1GHz-18GHz / 3m / Horizontal & Vertical / Transmit mode at 2402MHz)



Notes: Pre-scan graph only for identification purpose.

|                              |                              |
|------------------------------|------------------------------|
| Frequency band investigated: | 1GHz-18GHz                   |
| Unit :                       | dBμV/m                       |
| RBW :                        | 1MHz                         |
| Antenna polarization :       | Horizontal & Vertical        |
| Voltage:                     | 5V DC                        |
| Limit:                       | FCC 15.209 a) / RSS-Gen §8.9 |
| Measurement detector:        | Peak                         |

## Graphical representation of Radiated Disturbance Measurement (Peak detection, Anechoic chamber pre-scan, 1GHz-18GHz / 3m / Horizontal & Vertical / Transmit mode at 2440MHz)

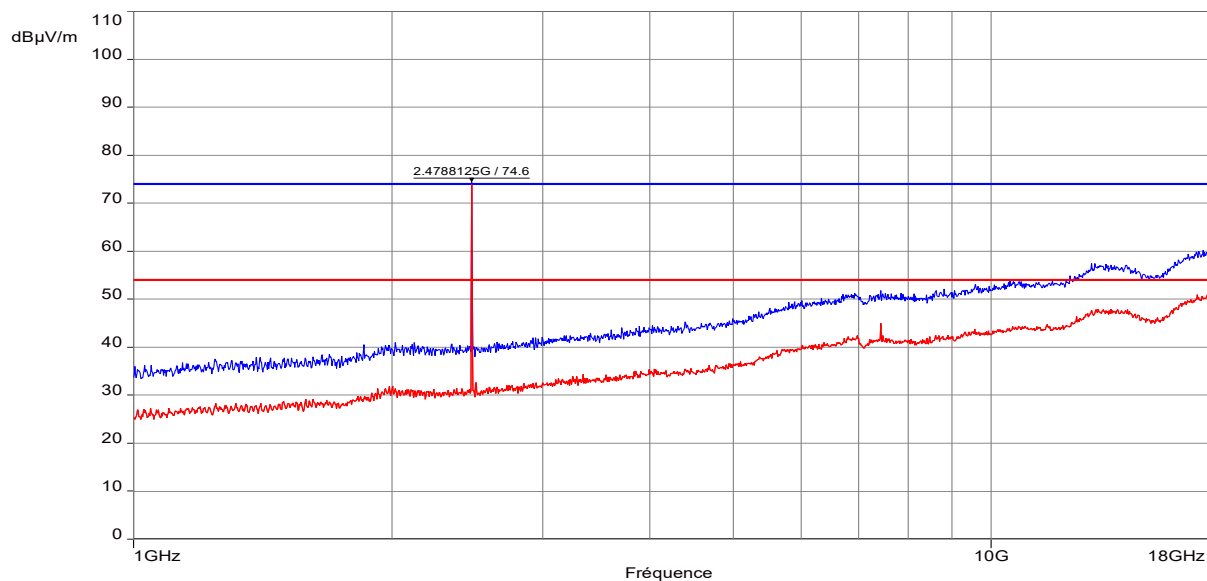
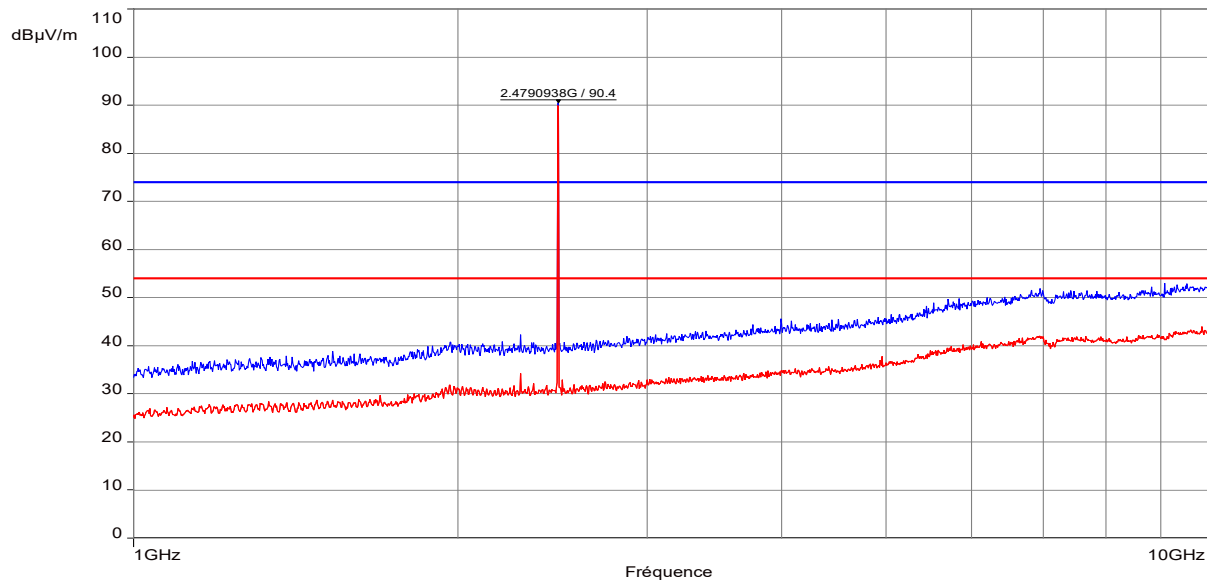


Notes: Pre-scan graph only for identification purpose.

|                              |                              |
|------------------------------|------------------------------|
| Frequency band investigated: | 1GHz-18GHz                   |
| Unit :                       | dBμV/m                       |
| RBW :                        | 1MHz                         |
| Antenna polarization :       | Horizontal & Vertical        |
| Voltage:                     | 5V DC                        |
| Limit:                       | FCC 15.209 a) / RSS-Gen §8.9 |
| Measurement detector:        | Peak                         |



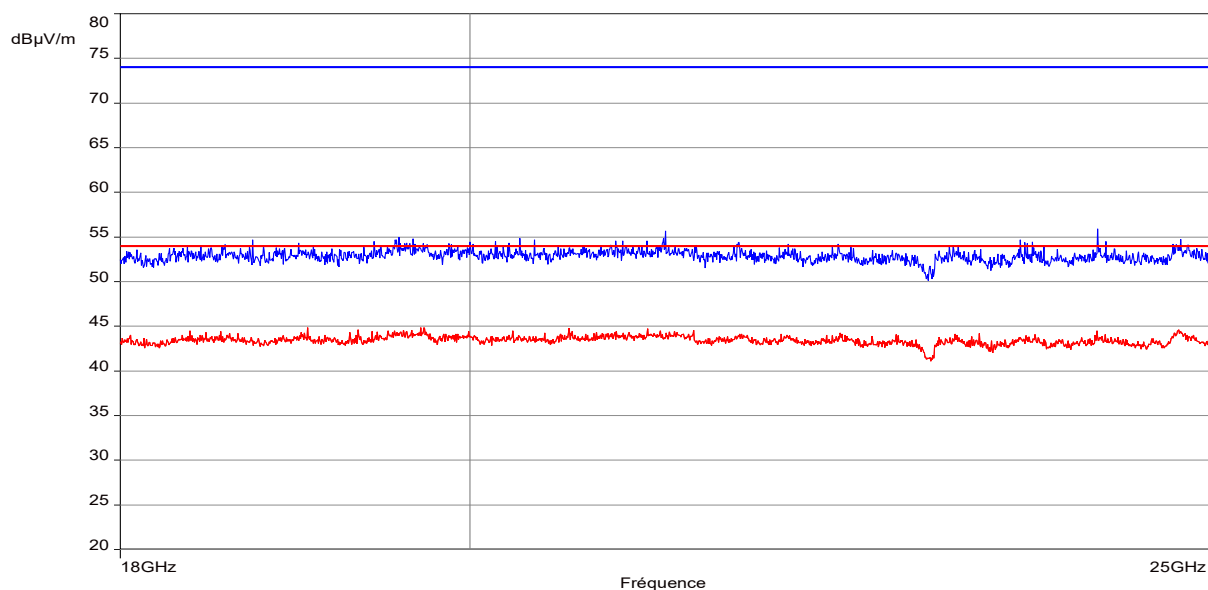
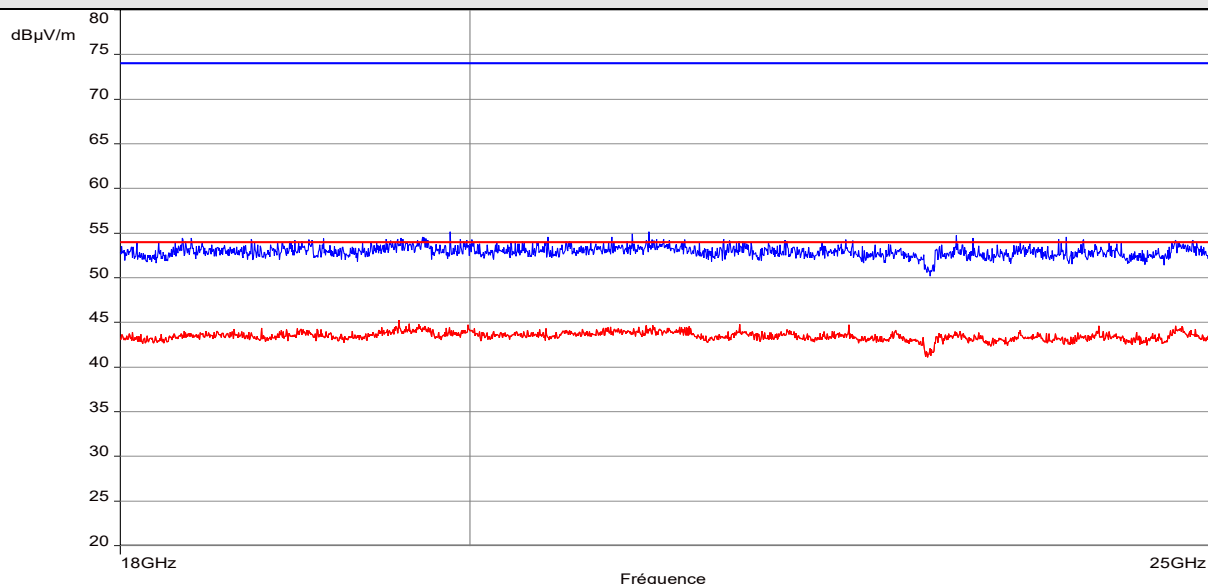
## Graphical representation of Radiated Disturbance Measurement (Peak detection, Anechoic chamber pre-scan, 1GHz-18GHz / 3m / Horizontal & Vertical / Transmit mode at 2479MHz)



Notes: Pre-scan graph only for identification purpose.

|                              |                              |
|------------------------------|------------------------------|
| Frequency band investigated: | 1GHz-18GHz                   |
| Unit :                       | dBμV/m                       |
| RBW :                        | 1MHz                         |
| Antenna polarization :       | Horizontal & Vertical        |
| Voltage:                     | 5V DC                        |
| Limit:                       | FCC 15.209 a) / RSS-Gen §8.9 |
| Measurement detector:        | Peak                         |

## Graphical representation of Radiated Disturbance Measurement (Peak detection, Anechoic chamber pre-scan, 18GHz-25GHz / 3m / Horizontal & Vertical / Transmit mode)



Notes: Pre-scan graph only for identification purpose.

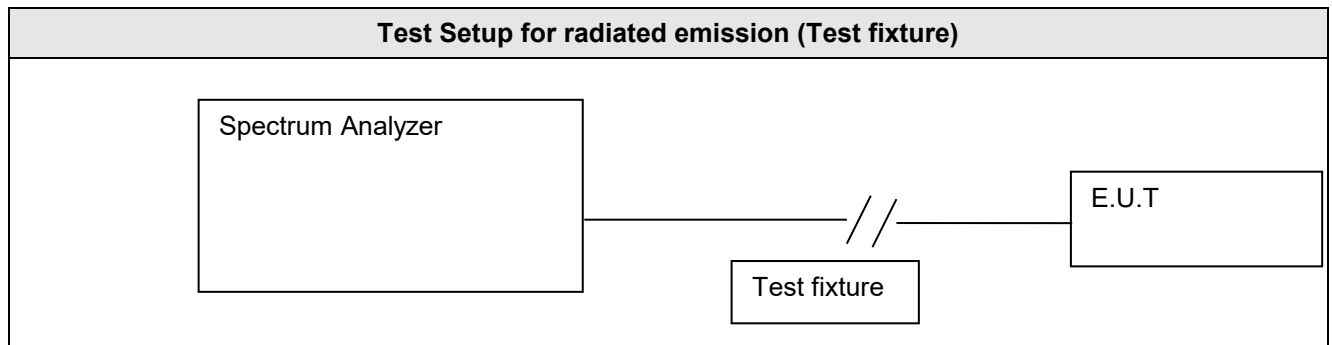
Same result for transmit mode at 2402MHz, 2440MHz or 2479MHz.

|                                     |                              |
|-------------------------------------|------------------------------|
| <b>Frequency band investigated:</b> | 18GHz-25GHz                  |
| <b>Unit :</b>                       | dBμV/m                       |
| <b>RBW :</b>                        | 1MHz                         |
| <b>Antenna polarization :</b>       | Horizontal & Vertical        |
| <b>Voltage:</b>                     | 5V DC                        |
| <b>Limit:</b>                       | FCC 15.209 a) / RSS-Gen §8.9 |
| <b>Measurement detector:</b>        | Peak and Average             |

## 12. Occupied bandwidth (99%)

| TEST: Occupied bandwidth (99%) / RSS-GEN                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                            |                 | Verdict |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|-----------------|---------|
| <p><b>Method:</b> The setup is in an anechoic chamber. The spectrum analyzer is connected to the measuring antenna. A radiated measurement is performed.</p> <p>The RBW is set in the range of 1% to 5% of the occupied bandwidth, with VBW ≥ 3 x RBW.</p> <p>The SPAN is wide enough to capture all products of the modulation process.</p> <p>A Peak detector is used.</p> <p>Measure is performed with OBW 99% function of the spectrum analyser.</p> <p>The tested equipment is set to transmit operation with modulation on low, mid and high channels.</p> |                            |                 | Pass    |
| Laboratory Parameters:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Required prior to the test | During the test |         |
| Ambient Temperature                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 10 to 40 °C                | 23°C ± 2        |         |
| Relative Humidity                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 10 to 90 %                 | 55% ± 5         |         |
| Supplementary information:<br>Test location: SMEE<br>Test date: November 5 <sup>th</sup> , 2019                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                            |                 |         |

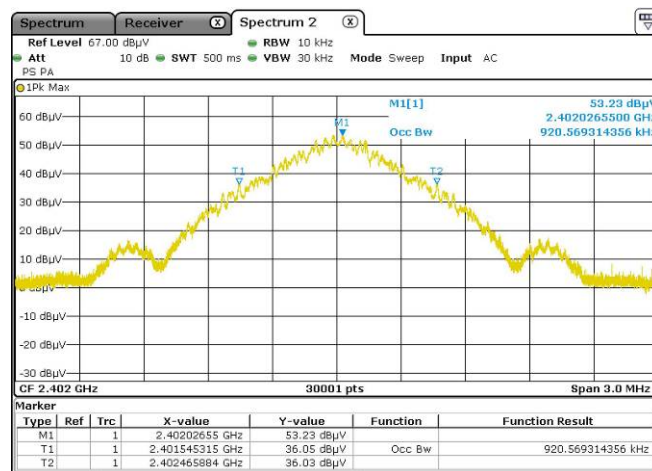
| Test Equipment Used |               |           |             |           |          |
|---------------------|---------------|-----------|-------------|-----------|----------|
| Description         | Manufacturer  | Model     | Identifier  | Cal. Date | Cal. Due |
| Horn antenna        | ETS-LINDGREN  | 3115      | ANT-141-013 | 2018/10   | 2021/10  |
| RF cable            | Pasternack RF | PE302-120 | CAB-131-024 | 2019/4    | 2020/4   |
| RF cable            | HUBER+SUHNER  | SF104     | CAB-141-030 | 2019/4    | 2020/4   |
| Anechoic chamber    | COMTEST       | 214263    | CAG-141-001 | 2017/6    | 2020/6   |



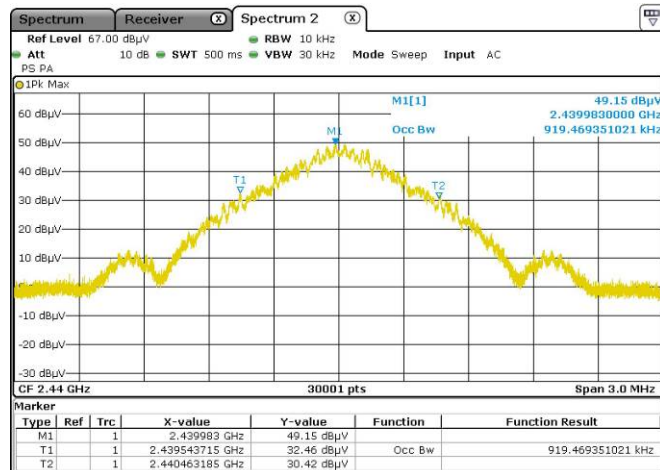
## Tabulated Results for Occupied Bandwidth

| Frequency<br>(MHz) | 99% Occupied Bandwidth<br>(kHz) |
|--------------------|---------------------------------|
| 2402.0             | 920.57                          |
| 2440.0             | 919.47                          |
| 2479.0             | 921.27                          |

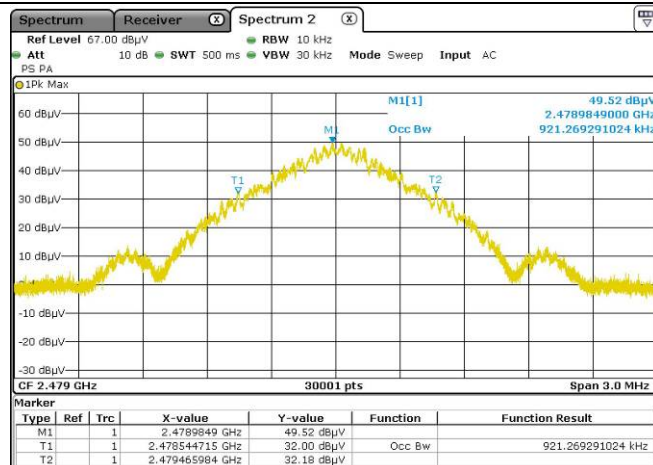
## Graphical representation of Occupied Bandwidth



Low Channel



Mid Channel



High Channel

**Frequency band investigated:** 2400MHz to 2483.5MHz

**RBW / VBW :** 10kHz / 30kHz

**Measurement detector:** Peak / Max hold