

# TEST REPORT

## No. AR16-0006655-01a

performed in accordance with

FCC Rules: Code of Federal Regulations (CFR) no. 47  
Part 15 Subpart C Section 15.247

|                 |                             |
|-----------------|-----------------------------|
| PRODUCT         | Bluetooth low energy module |
| MODEL(s) TESTED | SPBTLE-1S                   |
| FCC ID          | S9NSPBTLE1S                 |
| TRADE MARK(s)   | STMicroelectronics          |

|           |                                                                                                              |
|-----------|--------------------------------------------------------------------------------------------------------------|
| APPLICANT | STMicroelectronics S.r.l. ~ Centro Direzionale Colleoni - Palazzo Andromeda 3<br>I-20864 Agrate Brianza (MB) |
|-----------|--------------------------------------------------------------------------------------------------------------|

|             |                                        |  |
|-------------|----------------------------------------|--|
| Tested by   | Roberto Radice [Laboratory Technician] |  |
| Approved by | Giovanni Di Turi [Laboratory manager]  |  |

### Revision Sheet

| Release No. | Date       | Revision Description                                                                                 |
|-------------|------------|------------------------------------------------------------------------------------------------------|
| Rev. 0      | 2017-03-08 | First edition<br>Digital signed - AR16-0006655-01a_TR_FCC 15.247_STMICROELECTRONICS_Modulo SPBTLE-1S |

The results of tests and checks reported in this Test Report refer exclusively to the samples tested and described in the Report itself.  
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## 1. GENERAL DATA

| SAMPLE                                                                                                                                                                                                                                                                                                               |                                                                                                                                                       |                                       |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------|
| Samples received on                                                                                                                                                                                                                                                                                                  | 2017-01-19                                                                                                                                            | (item sent and sampling by applicant) |
| IMQ reference samples                                                                                                                                                                                                                                                                                                | BEM                                                                                                                                                   | 84563                                 |
| Samples tested No.                                                                                                                                                                                                                                                                                                   | 2 (1 for radiated test and 1 with antenna connector for conducted test)                                                                               |                                       |
| Object under analysis recognition                                                                                                                                                                                                                                                                                    | <b>Not carried out</b><br>Except where stated, characteristics of products were taken from client description and were not verified by the laboratory |                                       |
| Date of acceptance of test item                                                                                                                                                                                                                                                                                      | 2016-11-28                                                                                                                                            |                                       |
| TEST LOCATION                                                                                                                                                                                                                                                                                                        |                                                                                                                                                       |                                       |
| Testing dates                                                                                                                                                                                                                                                                                                        | 2017-01-20 ÷ 2017-01-24                                                                                                                               |                                       |
| Testing laboratory                                                                                                                                                                                                                                                                                                   | IMQ S.p.A. - Via Quintiliano, 43 – I-20138 Milano                                                                                                     |                                       |
| ENVIRONMENTAL CONDITIONING                                                                                                                                                                                                                                                                                           |                                                                                                                                                       |                                       |
| <i>Parameter</i>                                                                                                                                                                                                                                                                                                     | <i>Measured</i>                                                                                                                                       |                                       |
| Ambient Temperature                                                                                                                                                                                                                                                                                                  | 20 ÷ 25 °C                                                                                                                                            |                                       |
| Relative Humidity                                                                                                                                                                                                                                                                                                    | 50 ÷ 60 %                                                                                                                                             |                                       |
| Atmospheric Pressure                                                                                                                                                                                                                                                                                                 | 900 ÷ 1000 mbar                                                                                                                                       |                                       |
| REMARKS                                                                                                                                                                                                                                                                                                              |                                                                                                                                                       |                                       |
| Throughout this report a point is used as the decimal separator.<br>The ability or reliability of this product to perform its intended function in a particular application has not been investigated.<br>IMQ declines any responsibility derived from missing or wrong information provided aside by the applicant. |                                                                                                                                                       |                                       |

## 2. REFERENCE DOCUMENT

|                                     | DOCUMENT       | DATE | TITLE                                                                                                                                |
|-------------------------------------|----------------|------|--------------------------------------------------------------------------------------------------------------------------------------|
| <input checked="" type="checkbox"/> | 47 CFR Part 15 | 2015 | Radio Frequency Device                                                                                                               |
| <input checked="" type="checkbox"/> | ANSI C63.4     | 2014 | Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz |
| <input checked="" type="checkbox"/> | ANSI C63.10    | 2013 | American National Standard for Testing Unlicensed Wireless Devices                                                                   |

### 3. EQUIPMENT UNDER TEST (EUT) DETAILS

#### GENERAL DATA

| MODEL (basic) | Description                 |
|---------------|-----------------------------|
| SPBTLE-1S     | Bluetooth low energy module |

| FCC ID | S9NSPBTLE1S |
|--------|-------------|
|--------|-------------|

| Manufacturer | STMicroelectronics S.r.l. ~ Centro Direzionale Colleoni - Palazzo Andromeda 3<br>I-20864 Agrate Brianza (MB) |
|--------------|--------------------------------------------------------------------------------------------------------------|
|--------------|--------------------------------------------------------------------------------------------------------------|

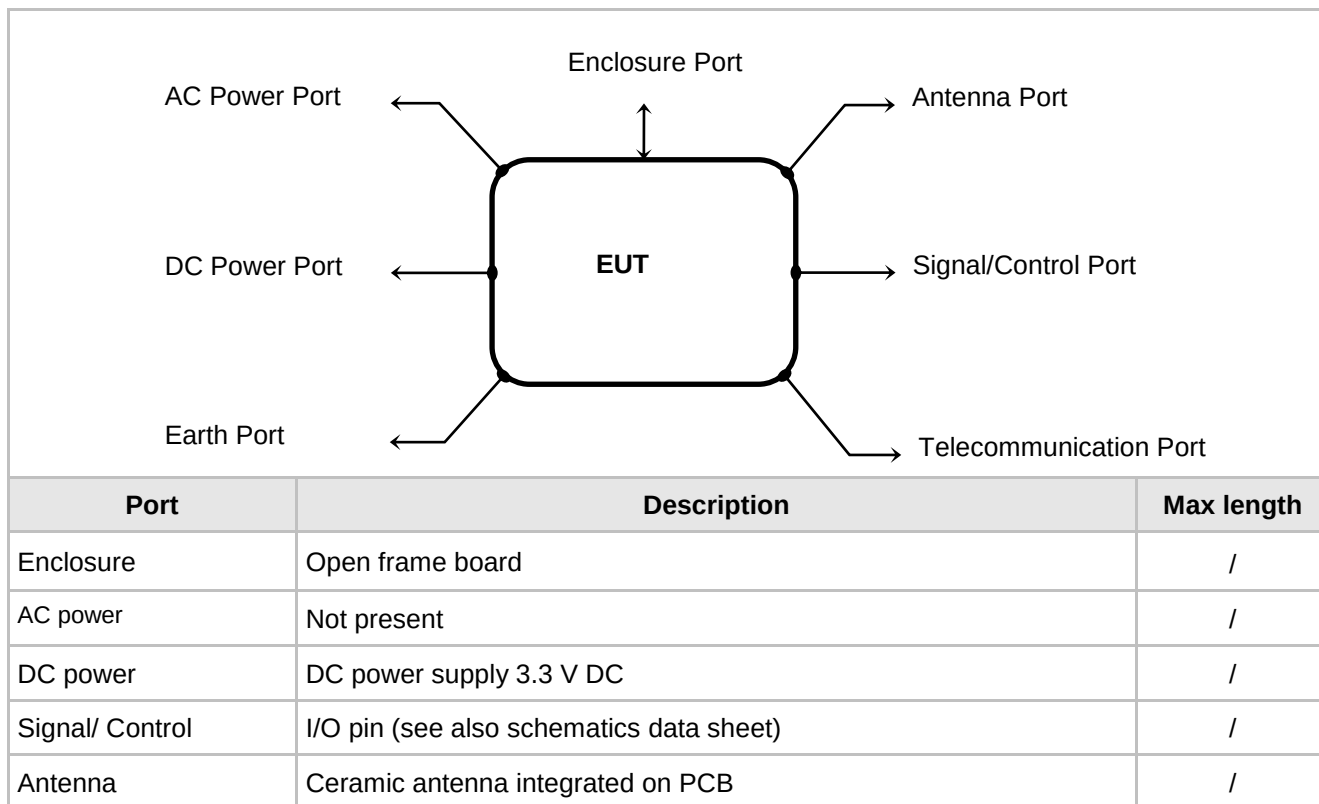
| Equipment classification | According to the definition 15.3 (o) EUT is a <b>Intentional Radiator operating within the bands 2400 ÷ 2483.5 MHz</b> so it shall fulfill provisions of 47CFR Part 15 Subpart C – Intentional radiators – and Section 15.247 |
|--------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|--------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

| Type of equipment   | Radio module                                                                                             |
|---------------------|----------------------------------------------------------------------------------------------------------|
| Operating frequency | 2402 ÷ 2480 MHz                                                                                          |
| Equipment Class     | DTS                                                                                                      |
| Max radiated power  | 101.09 dBμV/m (at 3m. distance)                                                                          |
| Modulation          | GFSK                                                                                                     |
| Channel Spacing     | 2MHz                                                                                                     |
| Channel bandwidth   | 1MHz                                                                                                     |
| Antenna             | Ceramic antenna (Johanson Technology p/n 2450AT18A100E)<br>peak gain: +0.5 dBi<br>average gain: -0.5 dBi |
| Number of channels  | 40                                                                                                       |

| Channel No. | Frequency (MHz) | Channel No. | Frequency (MHz) | Channel No. | Frequency (MHz) | Channel No. | Frequency (MHz) |
|-------------|-----------------|-------------|-----------------|-------------|-----------------|-------------|-----------------|
| 1           | 2402            | 2           | 2404            | 3           | 2406            | 4           | 2408            |
| 5           | 2410            | 6           | 2412            | 7           | 2414            | 8           | 2416            |
| 9           | 2418            | 10          | 2416            | 11          | 2422            | 12          | 2424            |
| 13          | 2426            | 14          | 2420            | 15          | 2430            | 16          | 2432            |
| 17          | 2434            | 18          | 2424            | 19          | 2438            | 20          | 2440            |
| 21          | 2442            | 22          | 2428            | 23          | 2446            | 24          | 2448            |
| 25          | 2450            | 26          | 2432            | 27          | 2454            | 28          | 2456            |
| 29          | 2458            | 30          | 2436            | 31          | 2462            | 32          | 2464            |
| 33          | 2466            | 34          | 2440            | 35          | 2470            | 36          | 2472            |
| 37          | 2474            | 38          | 2444            | 39          | 2478            | 40          | 2480            |

## 4. TEST CONFIGURATION OF EQUIPMENT UNDER TEST

### EUT PORTS



## STATE OF THE EUT DURING TESTS

| Ref. | Mode      | Description                                                                                                                                                                                                                                                                                                                                                    |
|------|-----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1   | Operating | <p>Continuous transmission (single channel transmission 2402MHz, 2440MHz, 2480MHz) with GFSK modulation.</p> <p>Signal pattern PRBS9</p> <p>The EUT is installed on module device board (dongle). The dongle is powered from the USB cable port.</p> <p>The EUT is in continuously transmitting with max. RF power setting (declared by applicant): +5dBm.</p> |

## SUPPORT EQUIPMENT

Defined as equipment needed for correct operation or loading of the EUT, but not considered as tested:

| Equipment                                                                                                                                                                            | Manufacturer       | Model     |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|-----------|
| Dongle furnished by manufacturer for supply and management of radio module                                                                                                           | STMicroelectronics | PC44B V01 |
| <p>Software used for testing: BlueNRG GUI (STM V.2.2.1)</p> <p>This software was running on PC connected via USB to the Dongle. It was used to enable the test operation mode #1</p> |                    |           |

## ELECTROMAGNETICALLY RELEVANT COMPONENTS

| Component     | No. | Manufacturer | Model   |
|---------------|-----|--------------|---------|
| BLUENRG1 (U1) | 1   | STM          | WLCSP34 |

## RFI SUPPRESSION DEVICES

| Component | No. | Manufacturer | Model |
|-----------|-----|--------------|-------|
| /         | /   | /            | /     |

## EMI PROTECTION DEVICES

| Component | No. | Manufacturer | Model |
|-----------|-----|--------------|-------|
| /         | /   | /            | /     |

## EUT TECHNICAL DOCUMENTATION

| Document                     | Reference                                      |
|------------------------------|------------------------------------------------|
| Datasheet – Preliminary data | SPBTLE-1S – February 2017                      |
| Schematic diagram            | Doc. Ref. SPBTLE-1S – Drawing n° DM00347879.V1 |
| Component layout             | Doc. Ref. SPBTLE-1S – Drawing n° DM00347883-V1 |
| Bill of Materials            | Doc. Ref. SPBTLE-1S – Drawing n° DM00347880.V1 |

## 5. METHODS OF MEASUREMENT

All compliance measurements have been carried out using the procedures described in the standard ANSI C63.4-2014, ANSI C63.10-2013 and Section 15.31 of CFR47 Part 15 (2015) – Subpart A (General).

Additional test requirements have been adopted according to the reference Section indicated in the § 6 of this test report.

### FREQUENCY RANGE INVESTIGATED

Conducted emission tests: from 150 kHz to 30MHz

Radiated emission tests: from 9 kHz to tenth harmonic of fundamental.



## 6. SUMMARY OF TEST RESULTS

| POSSIBLE TEST CASE VERDICTS                 |      |
|---------------------------------------------|------|
| Test object does meet the requirement       | PASS |
| Test object does not meet the requirement   | FAIL |
| Test case does not apply to the test object | N.A. |
| Test not performed                          | N.P. |

| CFR47 Part 15                            | TITLE                                                                   | RESULT            |
|------------------------------------------|-------------------------------------------------------------------------|-------------------|
| § 15.203                                 | Antenna Requirements                                                    | PASS              |
| § 15.247 (b)(4)(i)                       |                                                                         |                   |
| § 15.207 (a)                             | Power Line Conducted Emission                                           | PASS              |
| § 15.209 (a) (f)                         | Radiated Emission                                                       | PASS              |
| § 15.247 (d)                             | Out-of-band emissions                                                   | PASS              |
| § 15.247 (d)                             | 100 kHz Bandwidth of Frequency Band Edges                               | PASS              |
| § 15.247 (a)                             | Frequency Hopping Spread Spectrum Specifications                        |                   |
| § 15.247(a)                              | 20 dB Bandwidth                                                         | N.A. <sup>1</sup> |
| § 15.247(a)(1)                           | Carrier frequency (Hopping Channel) Separation                          | N.A. <sup>1</sup> |
| § 15.247(a)(1)(iii)                      | Number of Hopping Channels Used                                         | N.A. <sup>1</sup> |
| § 15.247(a)(1)(iii)                      | Time occupancy (Dwell Time) of Each Ch. within a 0,4 x Nch (sec) Period | N.A. <sup>1</sup> |
| § 15.247(a)(2)                           | 6dB Minimum Bandwidth                                                   | PASS              |
| § 15.247(b)                              | Maximum Peak Output Power                                               |                   |
| § 15.247(b) (1)                          | Peak Output Power, radiated (EIRP)                                      | N.A. <sup>1</sup> |
| § 15.247(b) (3)                          | RF power output, radiated (EIRP)                                        | PASS              |
| § 15.247(b) (4)                          | Antenna gain                                                            |                   |
| § 15.247(c)                              | Operation with directional antenna gains greater than 6 dBi             | N.A.              |
| § 15.247 (e)                             | Power Spectral Density                                                  | PASS              |
| § 15.247 (f)                             | Hybrid systems                                                          | N.A. <sup>1</sup> |
| § 15.247 (g)                             | FHSS Transmission characteristics                                       | N.A. <sup>1</sup> |
| § 15.247 (h)                             | Recognition of occupied channel and multiple transmission system        | N.A.              |
| § 15.247(i)<br>(§ 47CFR<br>1.1307(b)(1)) | RF humane exposure                                                      | PASS              |

**Note 1** Not applicable for DTS equipment

## 7. TEST RESULTS

### 7.1 ANTENNA REQUIREMENTS

#### TEST REQUIREMENT

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of Sections 15.211, 15.213, 15.217, 15.219, or 15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with Section 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this Part are not exceeded.

|               |            |
|---------------|------------|
| Testing dates | 2017-01-20 |
|---------------|------------|

#### Antenna specifications

|                                |                                 |
|--------------------------------|---------------------------------|
| N° of authorized antenna types | 1                               |
| Antenna type                   | Integral Ceramic antenna on PCB |
| Maximum total gain             | +0.5 dBi                        |
| External power amplifiers      | Not present                     |

#### TEST RESULT

The EUT meets the requirements of section 15.203 and 15.204

## 7.2 POWER LINE CONDUCTED EMISSION

| TEST REQUIREMENT        |                  |
|-------------------------|------------------|
| Test setup              | ANSI C63.4       |
| Test facility           | Shielded chamber |
| Frequency range         | 150 kHz – 30 MHz |
| IF bandwidth            | 9 kHz            |
| EMC class               | B                |
| EUT operating condition | #1               |
| Testing dates           | 2017-01-24       |

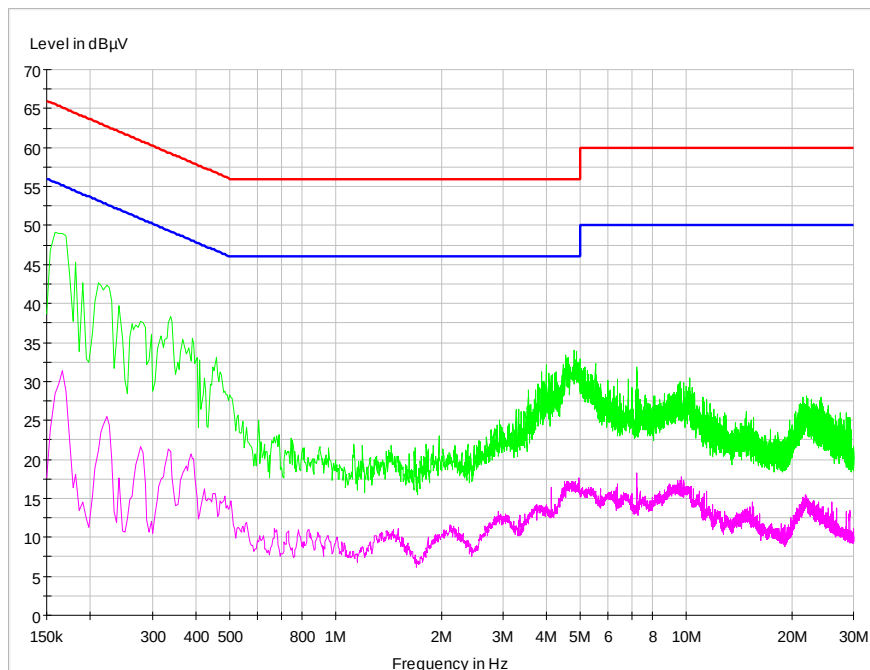
| LIMITS             |                         |                            |
|--------------------|-------------------------|----------------------------|
| Band of operations | Quasi-Peak (dB $\mu$ V) | Average Limit (dB $\mu$ V) |
| 0.15 ÷ 0.5         | 66 ÷ 56                 | 56 ÷ 46                    |
| 0.5 ÷ 5            | 56                      | 46                         |
| 5 ÷ 30             | 60                      | 50                         |

| TEST RESULT                                            |
|--------------------------------------------------------|
| The EUT meets the requirements of sections 15.207 (a). |

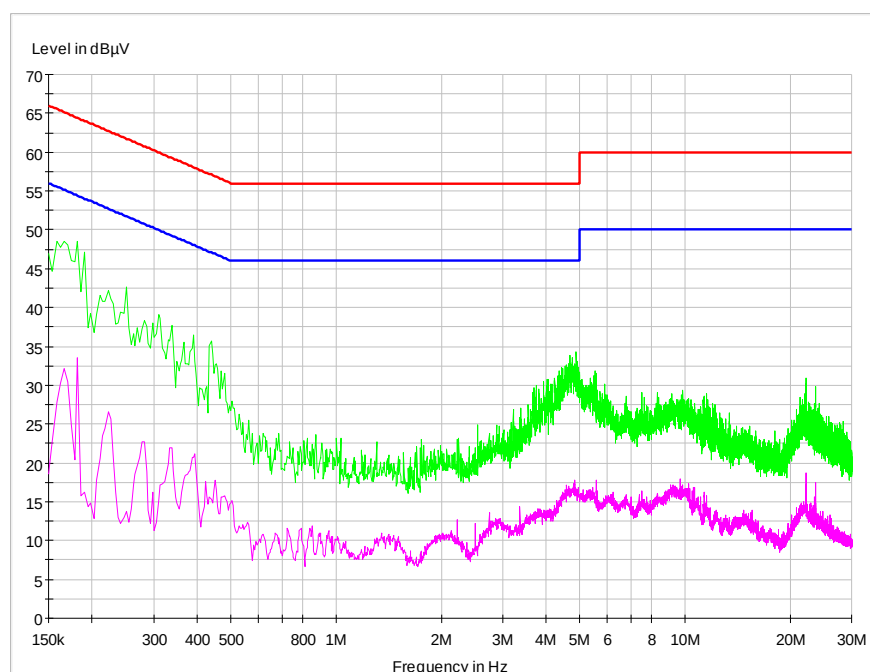
| TEST PROCEDURE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ol style="list-style-type: none"> <li>1) The EUT was placed on a wooden table of size, 80 cm by 80 cm, raised 80 cm in which is located 40 cm away from the vertical wall the shielded room.</li> <li>2) Each EUT power cord input cord was individually connected through a 50<math>\Omega</math>/50<math>\mu</math>H LISN to the input power source.</li> <li>3) Exploratory measurements were made to identify the frequency of the emission that had the highest amplitude relative to the limit by operating the EUT in a range of typical modes of operation, cable position, and with a typical system equipment configuration and arrangement. Based on the exploratory tests of the EUT, the one EUT cable configuration and arrangement and mode of operation that had produced the emission with the highest amplitude relative to the limit was selected for the final measurement.</li> <li>4) The final test on all current-carrying conductors of all of the power cords to the equipment that comprises the EUT (but not the cords associated with other non-EUT equipment is the system) was then performed over the frequency range of 0.15 MHz to 30 MHz.</li> <li>5) The measurements were made with the detector set to PEAK and AVERAGE amplitude within a bandwidth of 9 kHz during the measurements.</li> <li>6) The measurements with Quasi-Peak detector are performed only for frequencies for which the Peak values are <math>\geq</math> (Q.P. limit - 6 dB).</li> </ol> |

**MEASUREMENTS RESULT: Conducted disturbance on AC power supply of Personal Computer where the dongle is connected.**

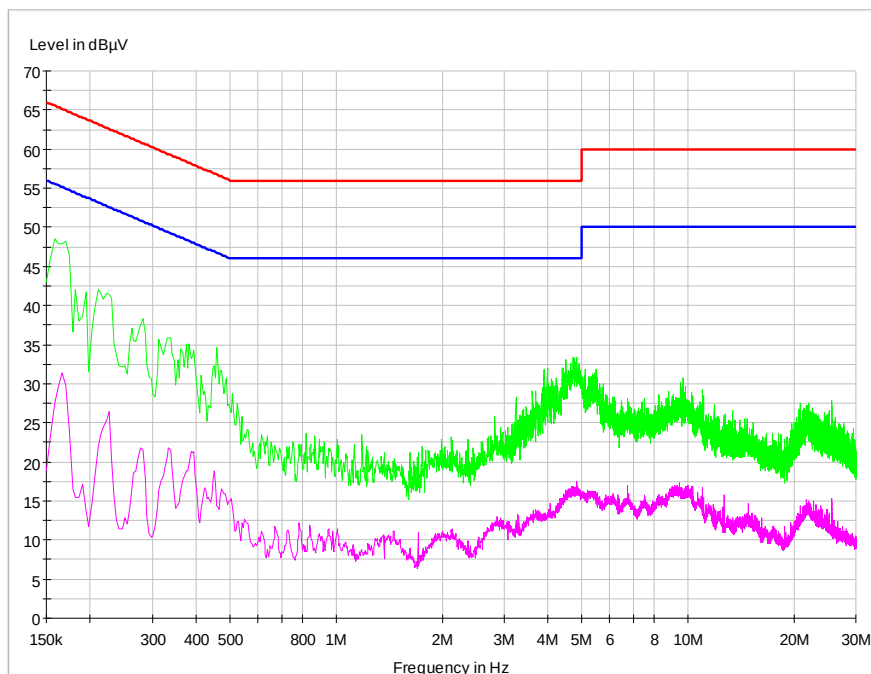
**Test condition: Lower channel (2402MHz)**



**Test condition: Middle channel (2440MHz)**



**Test condition: Higher channel (2480MHz)**



## 7.3 RADIATED DISTURBANCES

| TEST REQUIREMENT                                                                                                                                                                                                                                                                                                                                                                                                                         |                                        |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|
| Test setup                                                                                                                                                                                                                                                                                                                                                                                                                               | ANSI C63.4                             |
| Test facility                                                                                                                                                                                                                                                                                                                                                                                                                            | Semi-anechoic chamber                  |
| Test distance                                                                                                                                                                                                                                                                                                                                                                                                                            | 3 meters                               |
| Frequency range                                                                                                                                                                                                                                                                                                                                                                                                                          | 9 kHz to tenth harmonic of fundamental |
| IF bandwidth (below 30 MHz)                                                                                                                                                                                                                                                                                                                                                                                                              | 9 kHz                                  |
| IF bandwidth (below 1.000 MHz)                                                                                                                                                                                                                                                                                                                                                                                                           | 120 kHz                                |
| IF bandwidth (above 1.000 MHz)                                                                                                                                                                                                                                                                                                                                                                                                           | 1 MHz                                  |
| EMC class                                                                                                                                                                                                                                                                                                                                                                                                                                | B                                      |
| EUT operating condition                                                                                                                                                                                                                                                                                                                                                                                                                  | #1                                     |
| Remark: In accordance with part 15.31 (f) (2), where the measurement distance was specified to be 30 or 300 meters, a correction factor was applied in order to permit measurement to be performed at a separation distance. The applied formula for limits at 3 meter is: Extrapolation (dB) = $40\log(300\text{meter} / 3\text{meter}) = +80\text{db}$<br>Extrapolation (dB) = $40\log(30\text{meter} / 3\text{meter}) = +40\text{db}$ |                                        |
| Testing dates                                                                                                                                                                                                                                                                                                                                                                                                                            | 2017-01-20                             |

| LIMITS                      |                                                             |                              |
|-----------------------------|-------------------------------------------------------------|------------------------------|
| Band of operations          | Peak (dB $\mu$ V/m)                                         | Average Limit (dB $\mu$ V/m) |
| Restricted bands (§ 15.205) | 74                                                          | 54                           |
| Other bands                 | According to 15.209 or fundamental -20dB (which is greater) |                              |

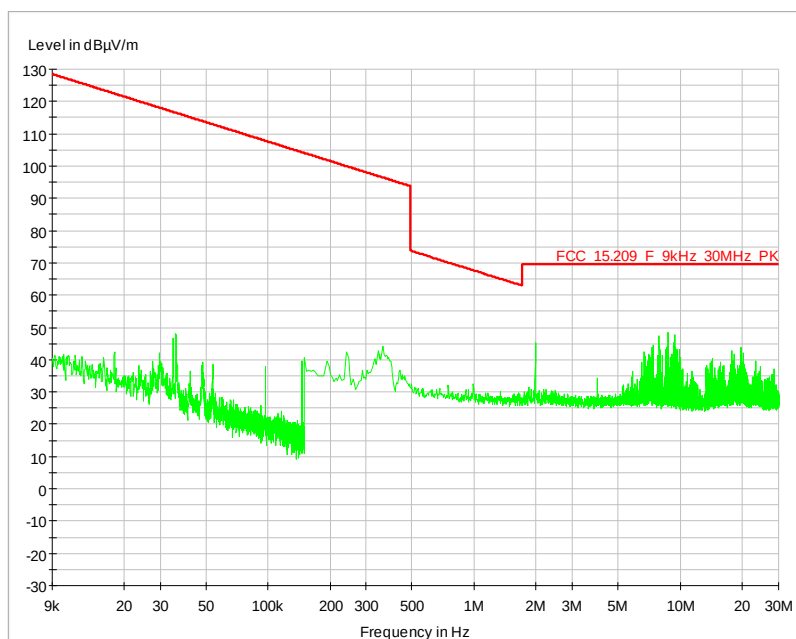
| TEST RESULT                                                                                                                                                                                                                                                                                                                                                                                                  |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>The EUT has been tested in 3 orthogonal axes at the frequencies lowest, middle and highest. The results reported are worst case.</p> <p>The measurement of spurious emission of EUT in receiver mode is deemed to be fulfilled as no limits are exceeded in transmitter mode (condition considered more burdensome).</p> <p>The EUT meets the requirements of sections 15.205 (b), 15.209 and 15.247.</p> |

| TEST PROCEDURE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ol style="list-style-type: none"> <li>1) The EUT was placed on turntable which is 0.8 m above the ground plane</li> <li>2) The turntable shall rotate from 0° to 360° degrees to determine the position of maximum emission level.</li> <li>3) The EUT is positioned 3 m away from the receiving antenna which varied from 1 to 4 m to find the highest emission.</li> <li>4) The measurements were made with the detector set to PEAK and AVERAGE amplitude within a bandwidth of 100 kHz below 1000 MHz and 1 MHz above 1000 MHz.</li> <li>5) The receiving antenna was positioned in both horizontal and vertical polarization.</li> <li>6) The measurements with Quasi-Peak detector, below 1000 MHz are performed only for frequencies for which the Peak values are <math>\geq</math> (Q.P. limit - 6 dB).</li> </ol> |

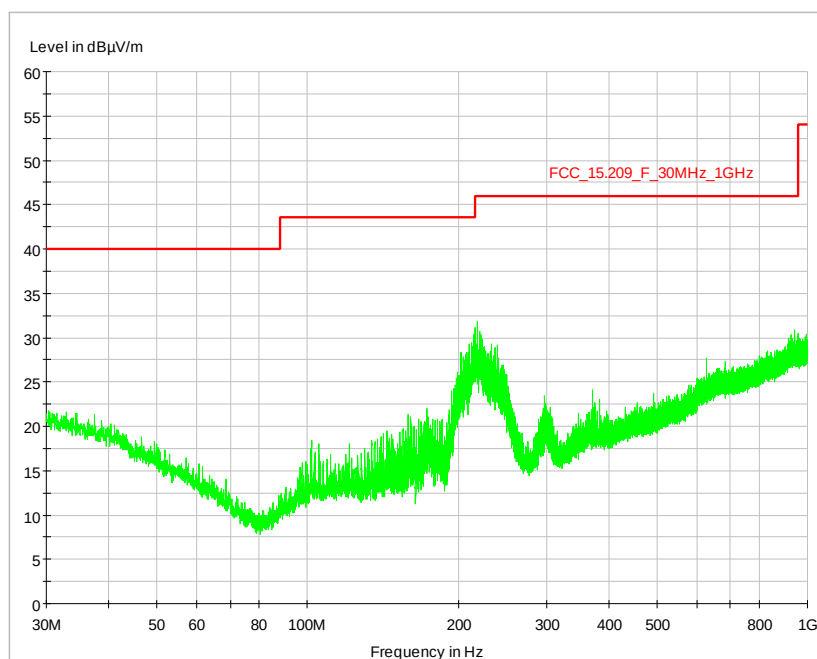
## MEASUREMENTS RESULTS - RADIATED

### LOWER CHANNEL 2402MHZ

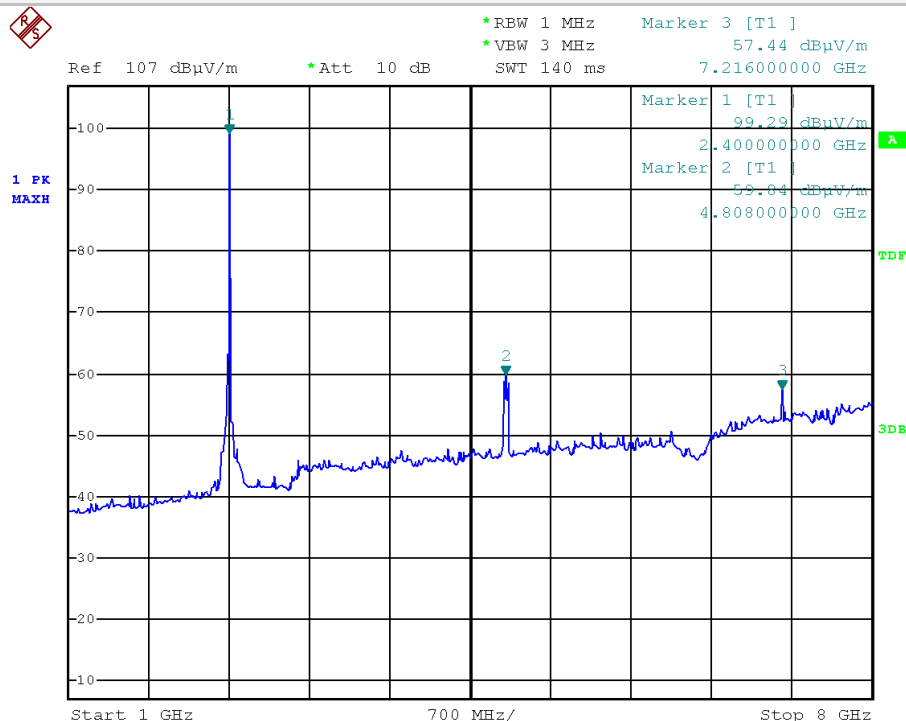
#### 9 kHz÷30 MHz



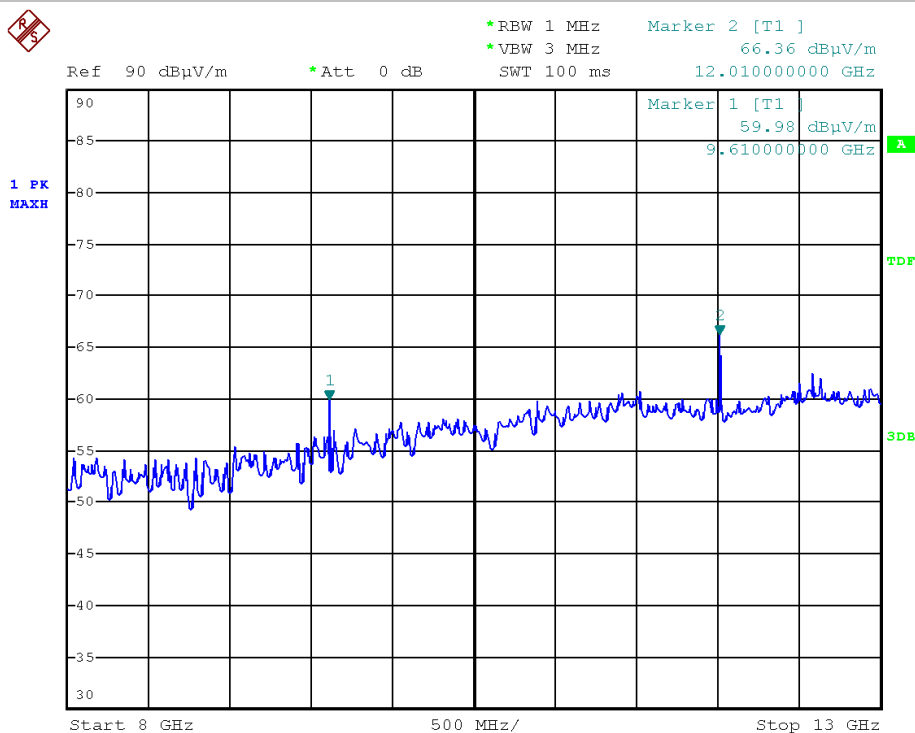
#### 30÷1.000 MHz



### 1 GHz÷8 GHz

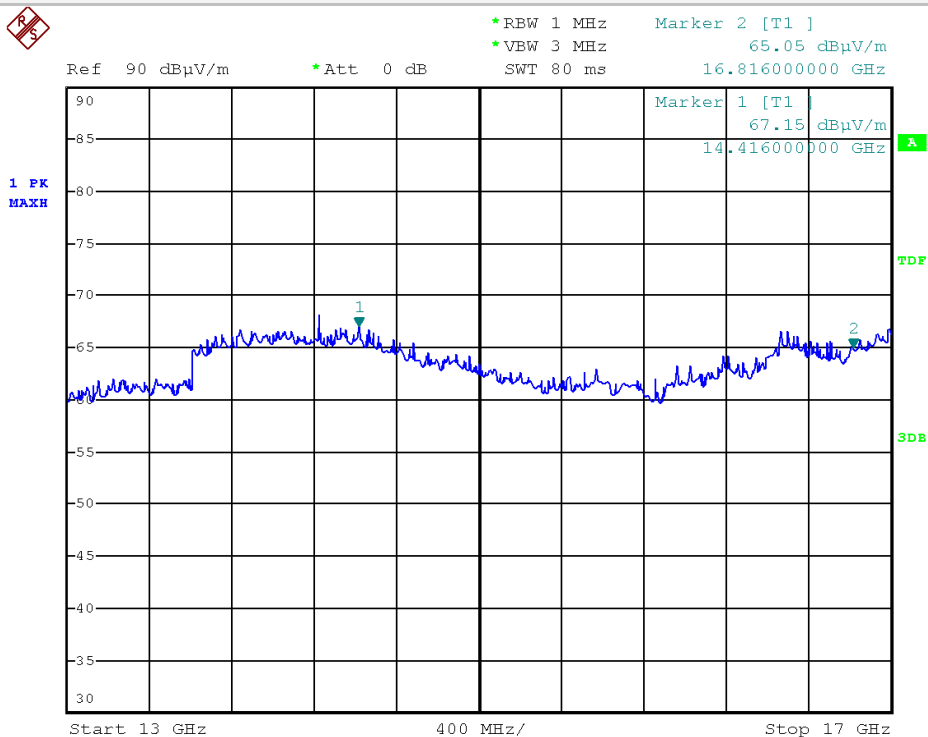


### 8 GHz÷13 GHz

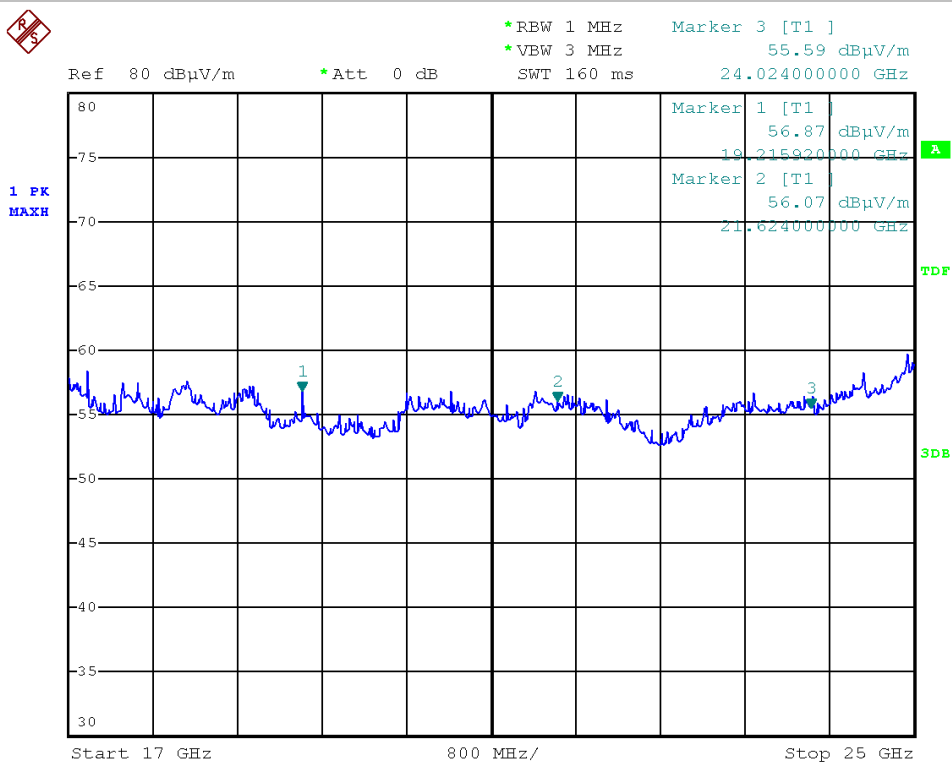




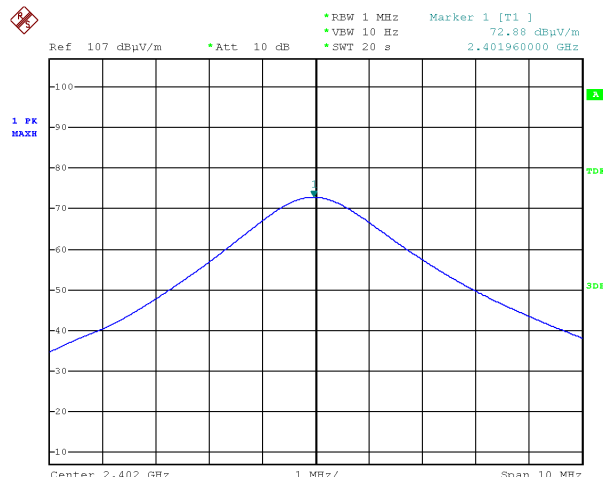
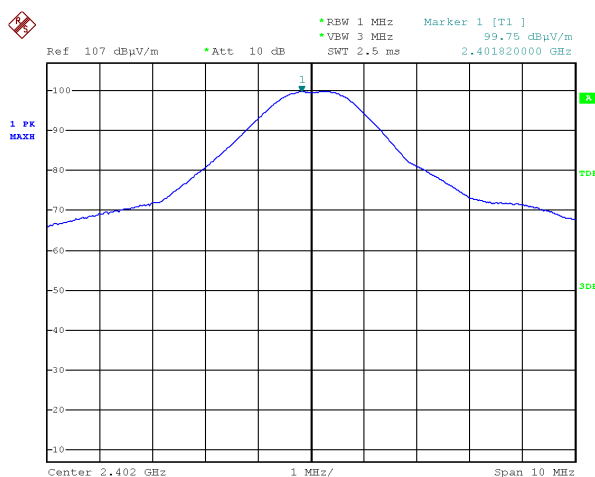
### 13 GHz÷17 GHz



### 17 GHz÷25 GHz



### Fundamental 2402MHz



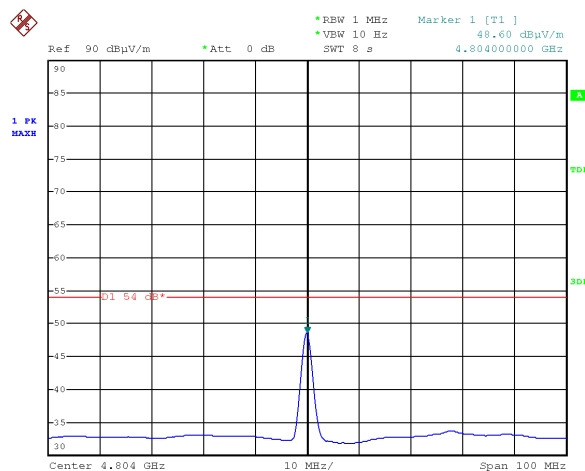
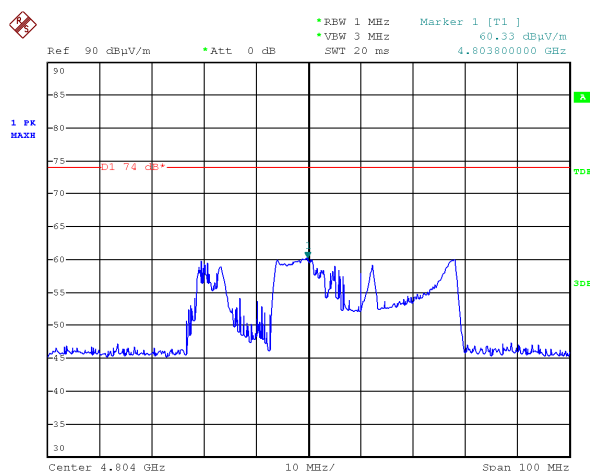
### PEAK RESULT (RBW=1MHz; VBW=3MHz)

| Frequency          | Reading value | Antenna Factor | Cable Loss | Pre-Amp. Gain | Correcting reading | PK Limit (AV + 20dB) | PK Limit (AV + 20dB) | Margin |
|--------------------|---------------|----------------|------------|---------------|--------------------|----------------------|----------------------|--------|
| (MHz)              | (dBμV)        | (dB3/m)        | (dB)       | (dB)          | (dBμV/m)           | (μV/m)               | (dBμV/m)             | (dB)   |
| 2402 (fundamental) | 105.51        | 27.70          | 4.14       | -37.60        | <b>99.75</b>       | -----                | -----                | -----  |

### AVERAGE RESULT (RBW=1MHz; VBW=10Hz)

| Frequency          | Reading value | Antenna Factor | Cable Loss | Pre-Amp. Gain | Correcting reading | AV Limit | AV Limit | Margin |
|--------------------|---------------|----------------|------------|---------------|--------------------|----------|----------|--------|
| (MHz)              | (dBμV)        | (dB3/m)        | (dB)       | (dB)          | (dBμV/m)           | (μV/m)   | (dBμV/m) | (dB)   |
| 2402 (fundamental) | 78.64         | 27.70          | 4.14       | -37.60        | <b>72.88</b>       | -----    | -----    | -----  |

## 2° Harmonic 4804MHz



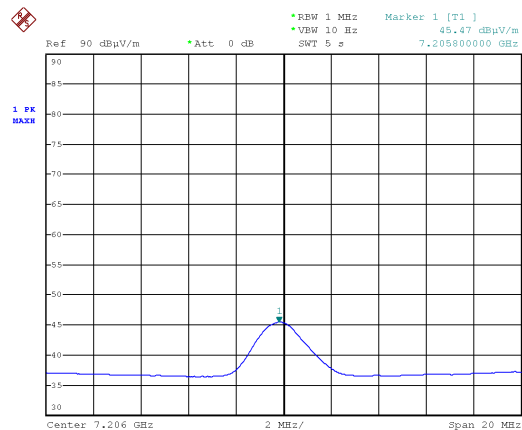
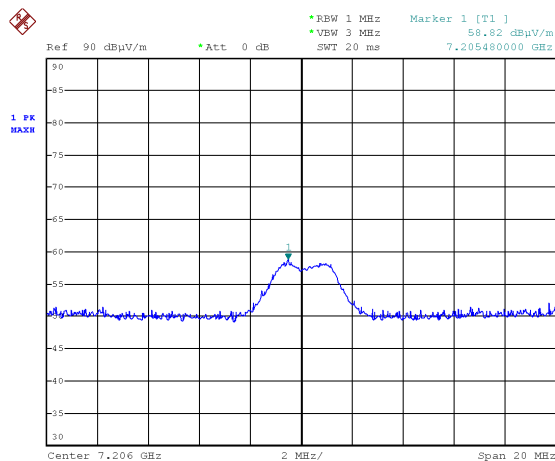
### PEAK RESULT (RBW=1MHz; VBW=3MHz)

| Frequency | Reading value | Antenna Factor | Cable Loss | Pre-Amp. Gain | Correcting reading | PK Limit (AV + 20dB) | PK Limit (AV + 20dB) | Margin |
|-----------|---------------|----------------|------------|---------------|--------------------|----------------------|----------------------|--------|
| (MHz)     | (dBμV)        | (dB3/m)        | (dB)       | (dB)          | (dBμV/m)           | (μV/m)               | (dBμV/m)             | (dB)   |
| 4804      | 60.75         | 31.30          | 5.47       | -37.19        | <b>60.33</b>       | 5000                 | 74.00                | >13    |

### AVERAGE RESULT (RBW=1MHz; VBW=10Hz)

| Frequency | Reading value | Antenna Factor | Cable Loss | Pre-Amp. Gain | Correcting reading | AV Limit | AV Limit | Margin |
|-----------|---------------|----------------|------------|---------------|--------------------|----------|----------|--------|
| (MHz)     | (dBμV)        | (dB3/m)        | (dB)       | (dB)          | (dBμV/m)           | (μV/m)   | (dBμV/m) | (dB)   |
| 4804      | 49.02         | 31.30          | 5.47       | -37.19        | <b>48.60</b>       | 500      | 54.00    | >5     |

### 3° Harmonic 7206MHz



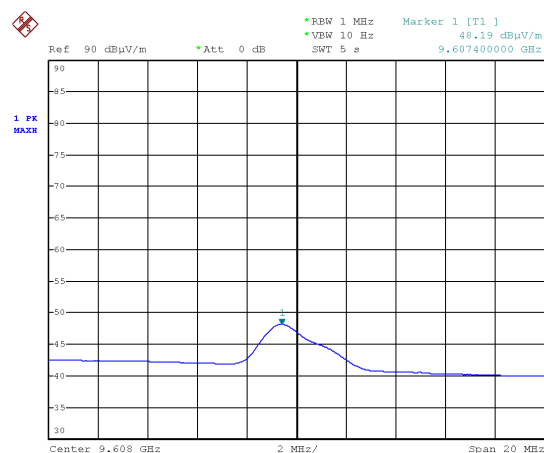
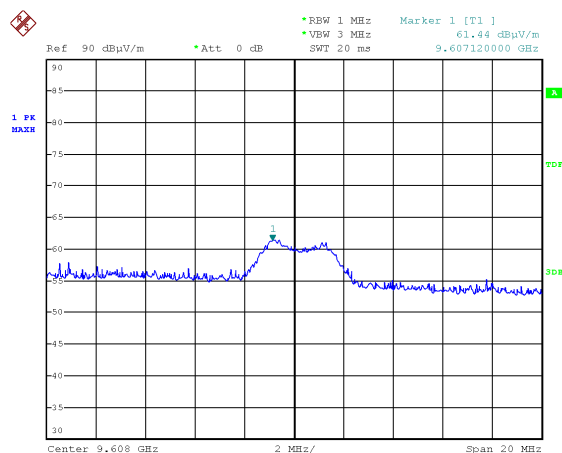
#### PEAK RESULT (RBW=1MHz; VBW=3MHz)

| Frequency | Reading value | Antenna Factor | Cable Loss | Pre-Amp. Gain | Correcting reading | PK Limit (AV + 20dB) | PK Limit (AV + 20dB) | Margin |
|-----------|---------------|----------------|------------|---------------|--------------------|----------------------|----------------------|--------|
| (MHz)     | (dBμV)        | (dB3/m)        | (dB)       | (dB)          | (dBμV/m)           | (μV/m)               | (dBμV/m)             | (dB)   |
| 7206      | 53.94         | 36.00          | 6.51       | -37.63        | <b>58.82</b>       | 5000                 | 74.00                | >15    |

#### AVERAGE RESULT (RBW=1MHz; VBW=10Hz)

| Frequency | Reading value | Antenna Factor | Cable Loss | Pre-Amp. Gain | Correcting reading | AV Limit | AV Limit | Margin |
|-----------|---------------|----------------|------------|---------------|--------------------|----------|----------|--------|
| (MHz)     | (dBμV)        | (dB3/m)        | (dB)       | (dB)          | (dBμV/m)           | (μV/m)   | (dBμV/m) | (dB)   |
| 7206      | 40.59         | 36.00          | 6.51       | -37.63        | <b>45.47</b>       | 500      | 54.00    | >8     |

### 4° Harmonic 9608MHz



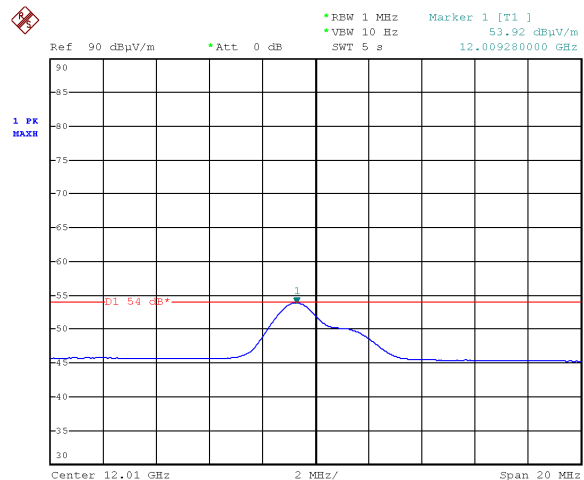
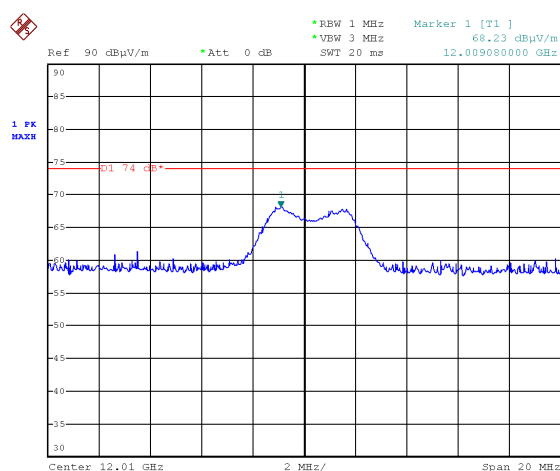
### PEAK RESULT (RBW=1MHz; VBW=3MHz)

| Frequency | Reading value | Antenna Factor | Cable Loss | Pre-Amp. Gain | Correcting reading | PK Limit (AV + 20dB) | PK Limit (AV + 20dB) | Margin |
|-----------|---------------|----------------|------------|---------------|--------------------|----------------------|----------------------|--------|
| (MHz)     | (dBμV)        | (dB3/m)        | (dB)       | (dB)          | (dBμV/m)           | (μV/m)               | (dBμV/m)             | (dB)   |
| 9608      | 53.04         | 37.70          | 8.70       | -38.00        | <b>61.44</b>       | 5000                 | 74.00                | >12    |

### AVERAGE RESULT (RBW=1MHz; VBW=10Hz)

| Frequency | Reading value | Antenna Factor | Cable Loss | Pre-Amp. Gain | Correcting reading | AV Limit | AV Limit | Margin |
|-----------|---------------|----------------|------------|---------------|--------------------|----------|----------|--------|
| (MHz)     | (dBμV)        | (dB3/m)        | (dB)       | (dB)          | (dBμV/m)           | (μV/m)   | (dBμV/m) | (dB)   |
| 9608      | 39.79         | 37.70          | 8.70       | -38.00        | <b>48.19</b>       | 500      | 54.00    | >5     |

### 5° Harmonic 12010MHz



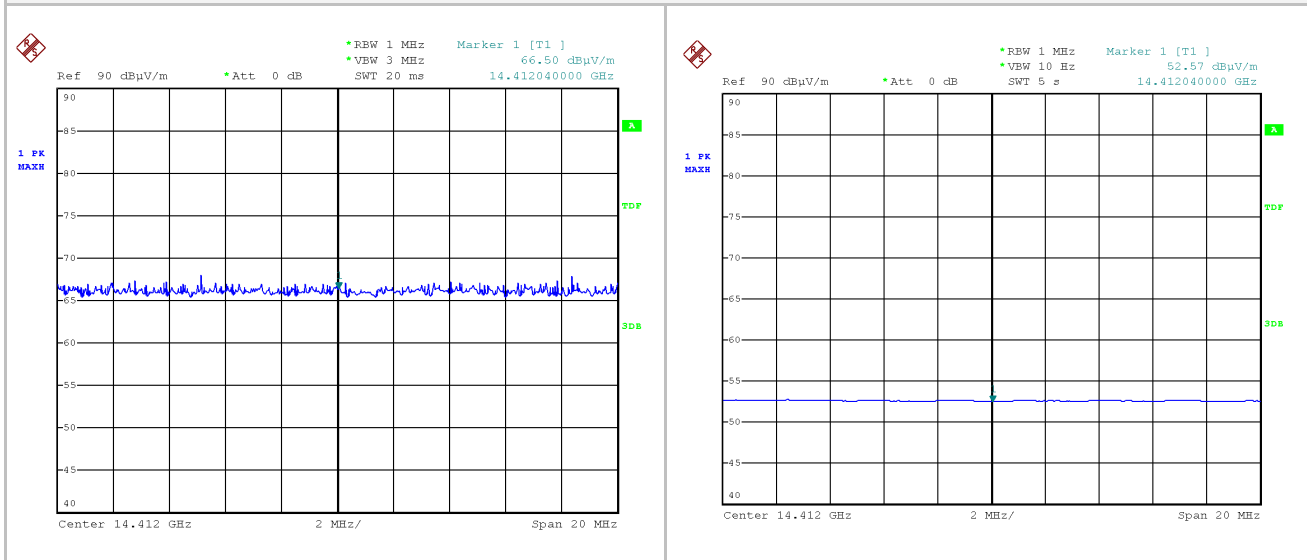
### PEAK RESULT (RBW=1MHz; VBW=3MHz)

| Frequency | Reading value | Antenna Factor | Cable Loss | Pre-Amp. Gain | Correcting reading | PK Limit (AV + 20dB) | PK Limit (AV + 20dB) | Margin |
|-----------|---------------|----------------|------------|---------------|--------------------|----------------------|----------------------|--------|
| (MHz)     | (dBμV)        | (dB3/m)        | (dB)       | (dB)          | (dBμV/m)           | (μV/m)               | (dBμV/m)             | (dB)   |
| 12010     | 56.64         | 39.10          | 10.04      | -37.55        | <b>68.23</b>       | 5000                 | 74.00                | >5     |

### AVERAGE RESULT (RBW=1MHz; VBW=10Hz)

| Frequency | Reading value | Antenna Factor | Cable Loss | Pre-Amp. Gain | Correcting reading | AV Limit | AV Limit | Margin |
|-----------|---------------|----------------|------------|---------------|--------------------|----------|----------|--------|
| (MHz)     | (dBμV)        | (dB3/m)        | (dB)       | (dB)          | (dBμV/m)           | (μV/m)   | (dBμV/m) | (dB)   |
| 12010     | 42.33         | 39.10          | 10.04      | -37.55        | <b>53.92</b>       | 500      | 54.00    | 0.08   |

### 6° Harmonic 14412MHz



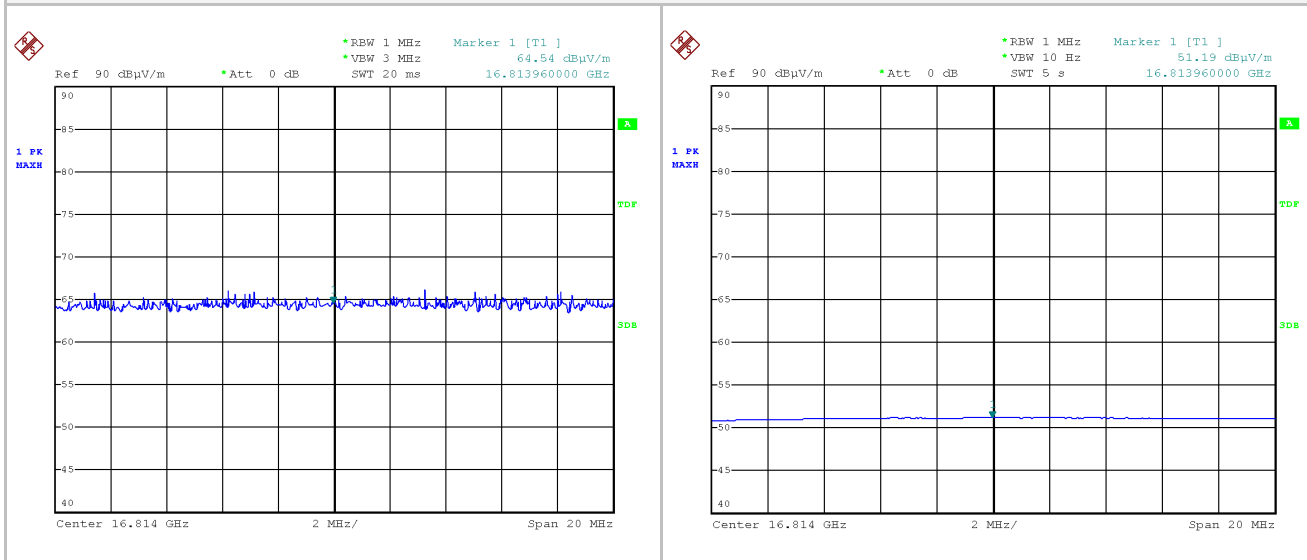
### PEAK RESULT (RBW=1MHz; VBW=3MHz)

| Frequency | Reading value | Antenna Factor | Cable Loss | Pre-Amp. Gain | Correcting reading | PK Limit (AV + 20dB) | PK Limit (AV + 20dB) | Margin |
|-----------|---------------|----------------|------------|---------------|--------------------|----------------------|----------------------|--------|
| (MHz)     | (dBμV)        | (dB3/m)        | (dB)       | (dB)          | (dBμV/m)           | (μV/m)               | (dBμV/m)             | (dB)   |
| 14412     | 49.84         | 41.80          | 10.86      | -36.00        | <b>66.50</b>       | 5000                 | 74.00                | >7     |

### AVERAGE RESULT (RBW=1MHz; VBW=10Hz)

| Frequency | Reading value | Antenna Factor | Cable Loss | Pre-Amp. Gain | Correcting reading | AV Limit | AV Limit | Margin |
|-----------|---------------|----------------|------------|---------------|--------------------|----------|----------|--------|
| (MHz)     | (dBμV)        | (dB3/m)        | (dB)       | (dB)          | (dBμV/m)           | (μV/m)   | (dBμV/m) | (dB)   |
| 14412     | 35.91         | 41.80          | 10.86      | -36.00        | <b>52.57</b>       | 500      | 54.00    | 1.43   |

### 7° Harmonic 16814MHz



#### PEAK RESULT (RBW=1MHz; VBW=3MHz)

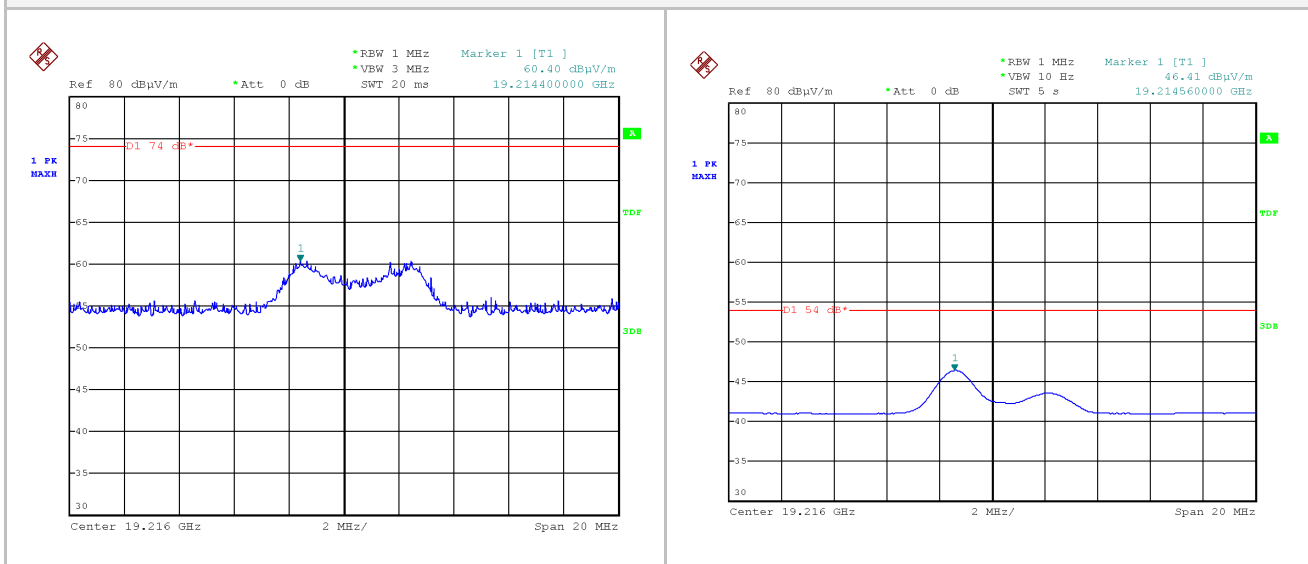
| Frequency | Reading value | Antenna Factor | Cable Loss | Pre-Amp. Gain | Correcting reading | PK Limit (AV + 20dB) | PK Limit (AV + 20dB) | Margin |
|-----------|---------------|----------------|------------|---------------|--------------------|----------------------|----------------------|--------|
| (MHz)     | (dBμV)        | (dB3/m)        | (dB)       | (dB)          | (dBμV/m)           | (μV/m)               | (dBμV/m)             | (dB)   |
| 16814     | 48.80         | 40.00          | 11.63      | -35.89        | <b>64.54</b>       | 5000                 | 74.00                | >9     |

#### AVERAGE RESULT (RBW=1MHz; VBW=10Hz)

| Frequency | Reading value | Antenna Factor | Cable Loss | Pre-Amp. Gain | Correcting reading | AV Limit | AV Limit | Margin |
|-----------|---------------|----------------|------------|---------------|--------------------|----------|----------|--------|
| (MHz)     | (dBμV)        | (dB3/m)        | (dB)       | (dB)          | (dBμV/m)           | (μV/m)   | (dBμV/m) | (dB)   |
| 16814     | 35.45         | 40.00          | 11.63      | -35.89        | <b>51.19</b>       | 500      | 54.00    | 2.81   |



### 8° Harmonic 19216MHz



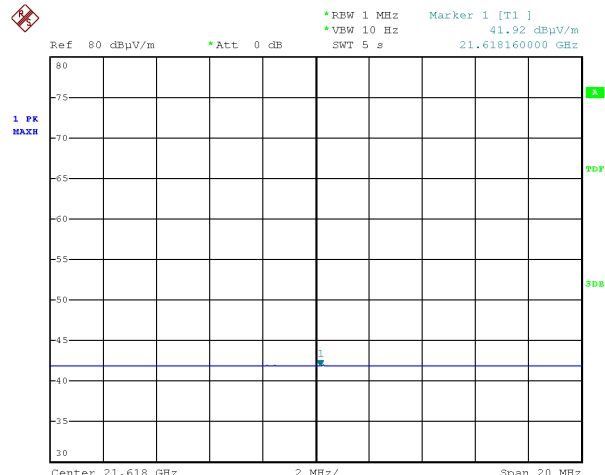
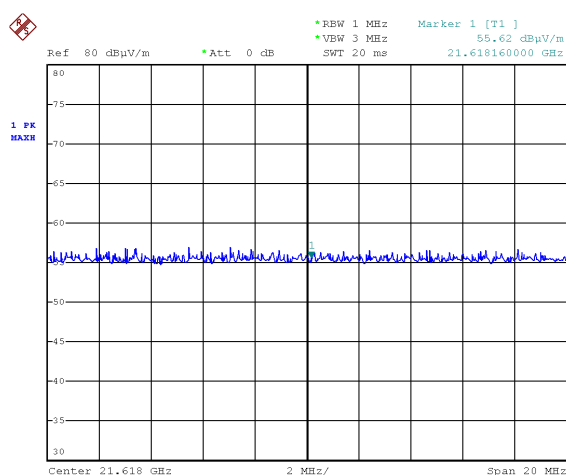
### PEAK RESULT (RBW=1MHz; VBW=3MHz)

| Frequency | Reading value | Antenna Factor | Cable Loss | Pre-Amp. Gain | Correcting reading | PK Limit (AV + 20dB) | PK Limit (AV + 20dB) | Margin |
|-----------|---------------|----------------|------------|---------------|--------------------|----------------------|----------------------|--------|
| (MHz)     | (dBμV)        | (dB1/m)        | (dB)       | (dB)          | (dBμV/m)           | (μV/m)               | (dBμV/m)             | (dB)   |
| 19216     | 50.34         | 38.00          | 4.80       | -32.70        | <b>60.44</b>       | 5000                 | 74.00                | >13    |

### AVERAGE RESULT (RBW=1MHz; VBW=10Hz)

| Frequency | Reading value | Antenna Factor | Cable Loss | Pre-Amp. Gain | Correcting reading | AV Limit | AV Limit | Margin |
|-----------|---------------|----------------|------------|---------------|--------------------|----------|----------|--------|
| (MHz)     | (dBμV)        | (dB1/m)        | (dB)       | (dB)          | (dBμV/m)           | (μV/m)   | (dBμV/m) | (dB)   |
| 19216     | 36.31         | 38.00          | 4.80       | -32.70        | <b>46.41</b>       | 500      | 54.00    | >7     |

### 9° Harmonic 21618MHz



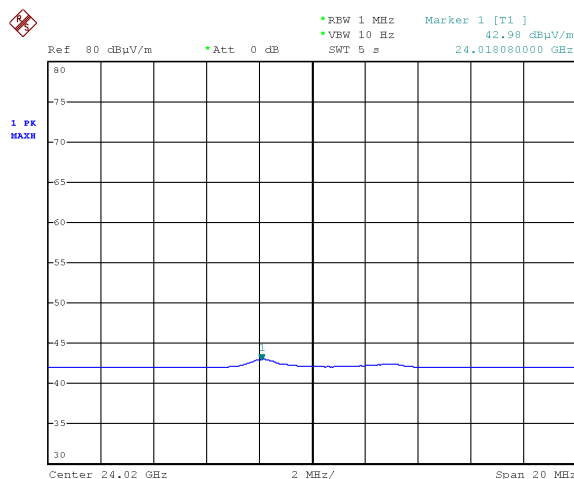
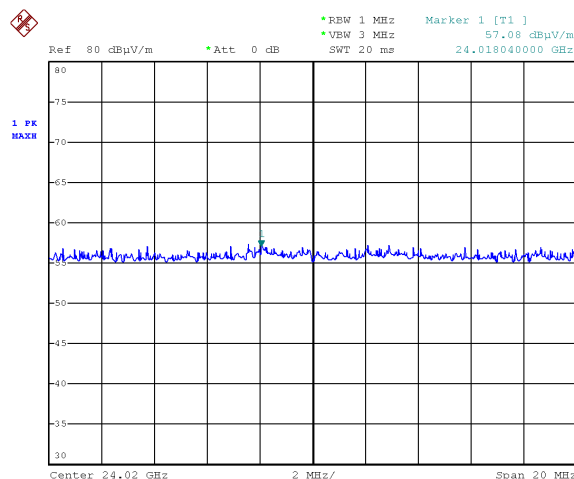
### PEAK RESULT (RBW=1MHz; VBW=3MHz)

| Frequency | Reading value | Antenna Factor | Cable Loss | Pre-Amp. Gain | Correcting reading | PK Limit (AV + 20dB) | PK Limit (AV + 20dB) | Margin |
|-----------|---------------|----------------|------------|---------------|--------------------|----------------------|----------------------|--------|
| (MHz)     | (dBμV)        | (dB1/m)        | (dB)       | (dB)          | (dBμV/m)           | (μV/m)               | (dBμV/m)             | (dB)   |
| 21618     | 45.61         | 38.21          | 5.30       | -33.50        | <b>55.62</b>       | 5000                 | 74.00                | >18    |

### AVERAGE RESULT (RBW=1MHz; VBW=10Hz)

| Frequency | Reading value | Antenna Factor | Cable Loss | Pre-Amp. Gain | Correcting reading | AV Limit | AV Limit | Margin |
|-----------|---------------|----------------|------------|---------------|--------------------|----------|----------|--------|
| (MHz)     | (dBμV)        | (dB1/m)        | (dB)       | (dB)          | (dBμV/m)           | (μV/m)   | (dBμV/m) | (dB)   |
| 21618     | 31.91         | 38.21          | 5.30       | -33.50        | <b>41.92</b>       | 500      | 54.00    | >12    |

### 10° Harmonic 24020MHz



### PEAK RESULT (RBW=1MHz; VBW=3MHz)

| Frequency | Reading value | Antenna Factor | Cable Loss | Pre-Amp. Gain | Correcting reading | PK Limit (AV + 20dB) | PK Limit (AV + 20dB) | Margin |
|-----------|---------------|----------------|------------|---------------|--------------------|----------------------|----------------------|--------|
| (MHz)     | (dBμV)        | (dB1/m)        | (dB)       | (dB)          | (dBμV/m)           | (μV/m)               | (dBμV/m)             | (dB)   |
| 24020     | 45.13         | 39.05          | 5.60       | -32.70        | <b>57.08</b>       | 5000                 | 74.00                | >16    |

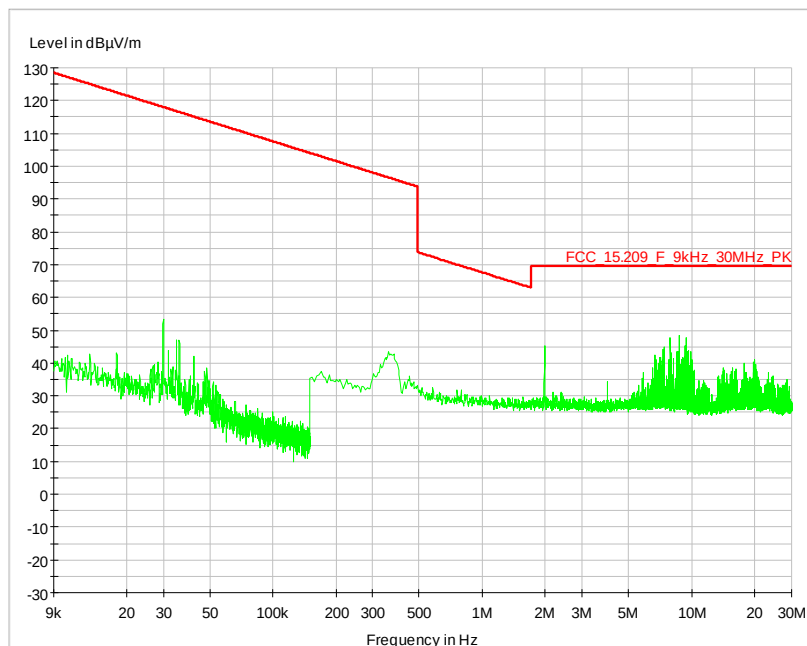
### AVERAGE RESULT (RBW=1MHz; VBW=10Hz)

| Frequency | Reading value | Antenna Factor | Cable Loss | Pre-Amp. Gain | Correcting reading | AV Limit | AV Limit | Margin |
|-----------|---------------|----------------|------------|---------------|--------------------|----------|----------|--------|
| (MHz)     | (dBμV)        | (dB1/m)        | (dB)       | (dB)          | (dBμV/m)           | (μV/m)   | (dBμV/m) | (dB)   |
| 24020     | 31.03         | 39.05          | 5.60       | -32.70        | <b>42.98</b>       | 500      | 54.00    | >11    |

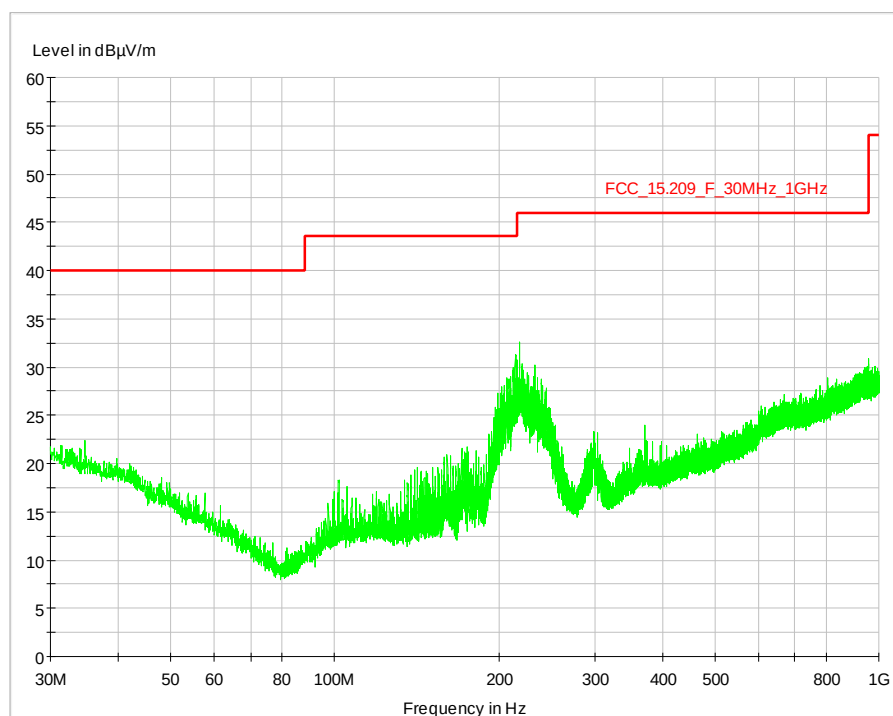
NOTE: All the previous measures are the worst case on 3 axes X Y and Z and both polarization.

(MIDDLE CHANNEL 2440MHZ)

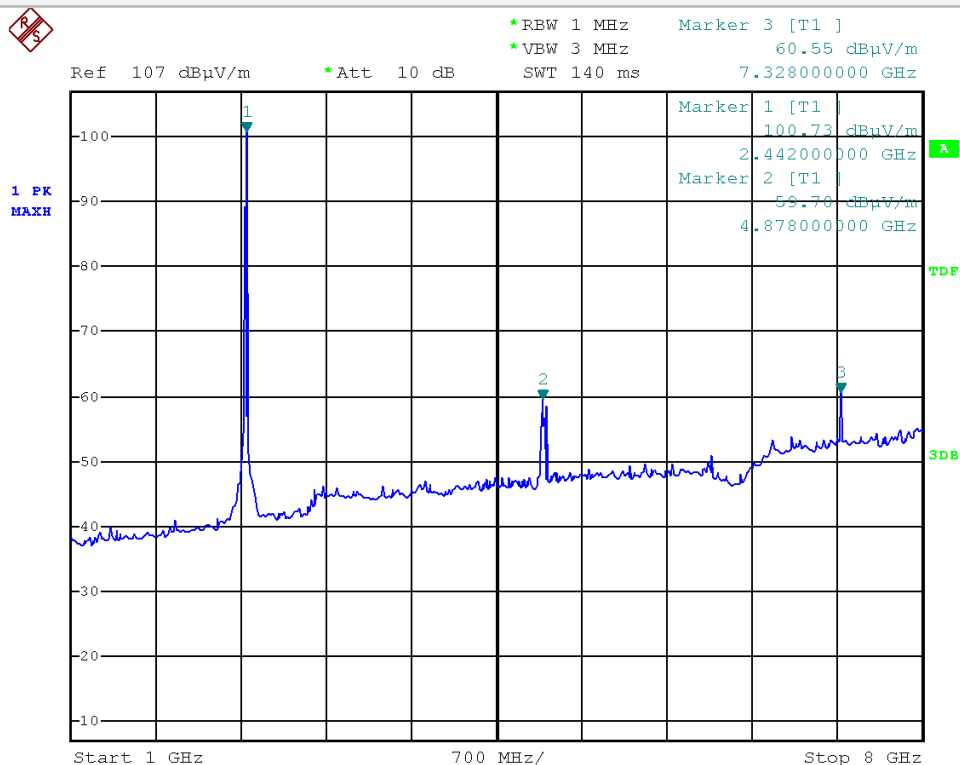
9 kHz÷30 MHz



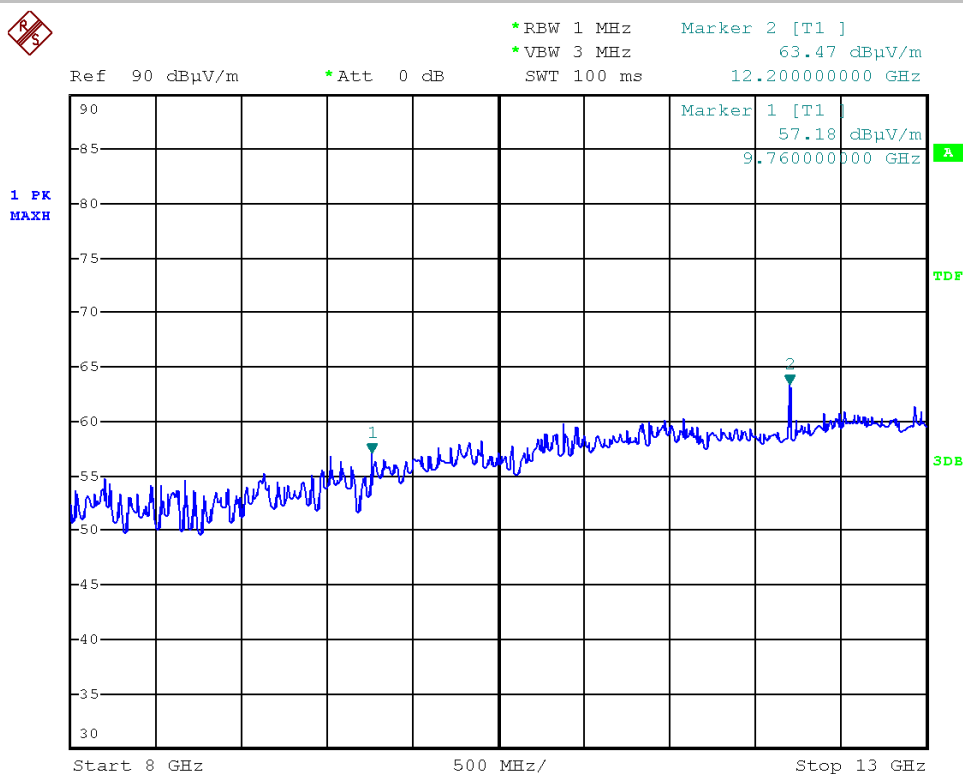
30÷1.000 MHz



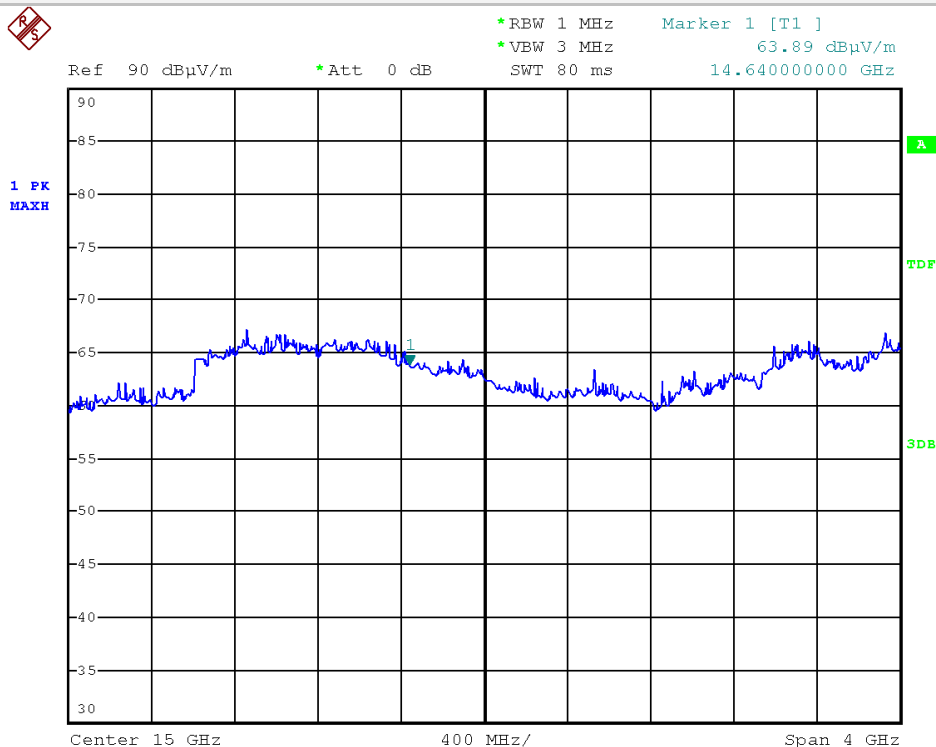
### 1 GHz÷8 GHz



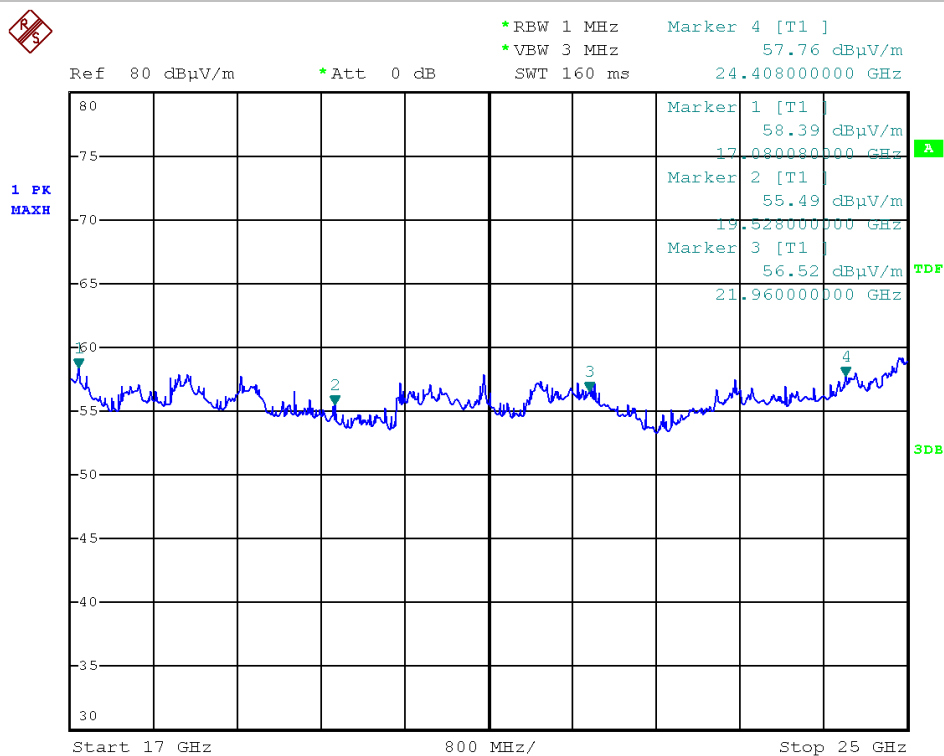
### 8 GHz÷13 GHz



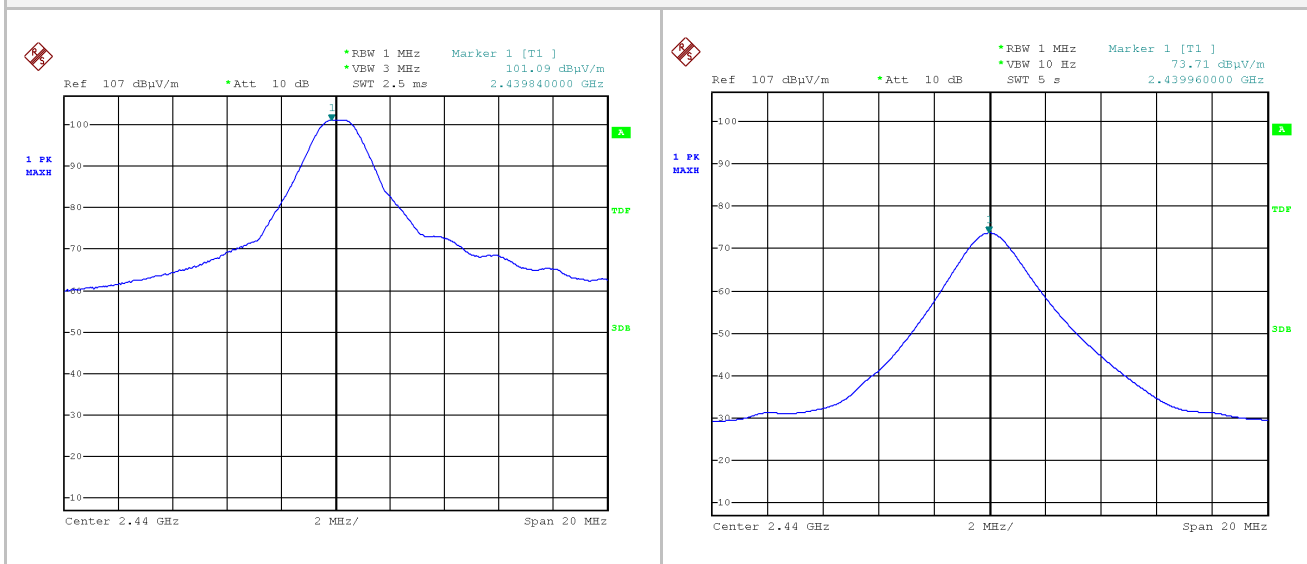
### 13 GHz÷17 GHz



### 17 GHz÷25 GHz



### Fundamental 2440MHz



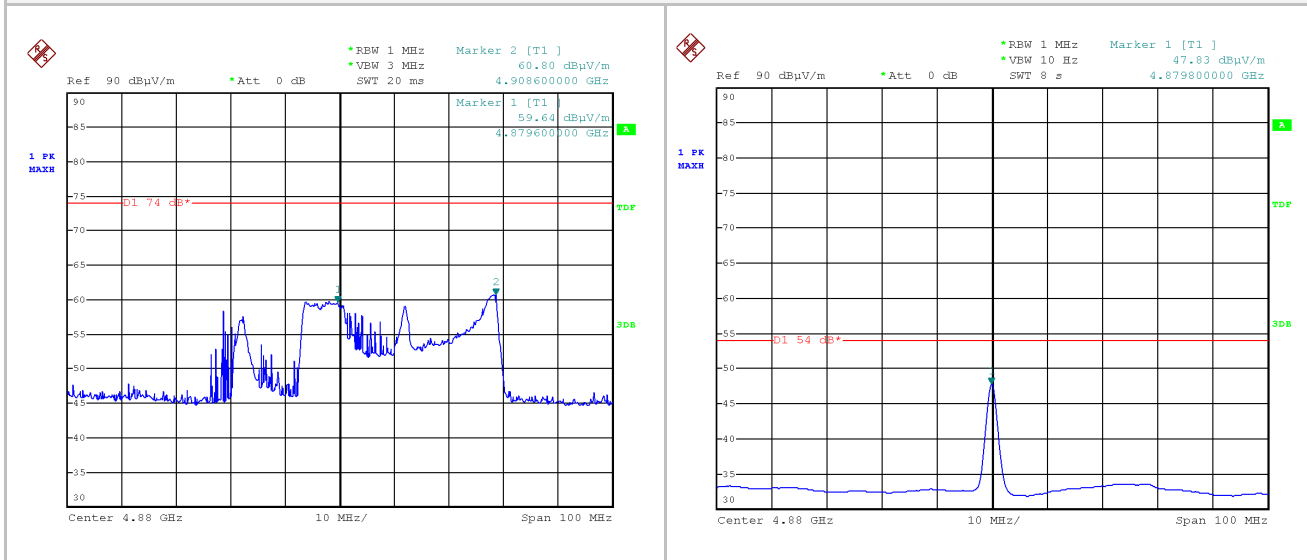
### PEAK RESULT (RBW=1MHz; VBW=3MHz)

| Frequency          | Reading value | Antenna Factor | Cable Loss | Pre-Amp. Gain | Correcting reading | PK Limit (AV + 20dB) | PK Limit (AV + 20dB) | Margin |
|--------------------|---------------|----------------|------------|---------------|--------------------|----------------------|----------------------|--------|
| (MHz)              | (dBμV)        | (dB3/m)        | (dB)       | (dB)          | (dBμV/m)           | (μV/m)               | (dBμV/m)             | (dB)   |
| 2440 (fundamental) | 107.37        | 27.70          | 3.62       | -37.60        | <b>101.09</b>      | -----                | -----                | -----  |

### AVERAGE RESULT (RBW=1MHz; VBW=10Hz)

| Frequency          | Reading value | Antenna Factor | Cable Loss | Pre-Amp. Gain | Correcting reading | AV Limit | AV Limit | Margin |
|--------------------|---------------|----------------|------------|---------------|--------------------|----------|----------|--------|
| (MHz)              | (dBμV)        | (dB3/m)        | (dB)       | (dB)          | (dBμV/m)           | (μV/m)   | (dBμV/m) | (dB)   |
| 2440 (fundamental) | 79.99         | 27.70          | 3.62       | -37.60        | <b>73.71</b>       | -----    | -----    | -----  |

## 2° Harmonic 4880MHz



### PEAK RESULT (RBW=1MHz; VBW=3MHz)

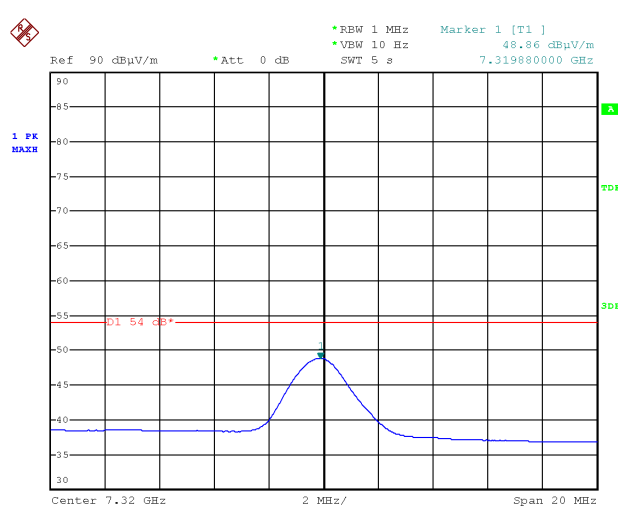
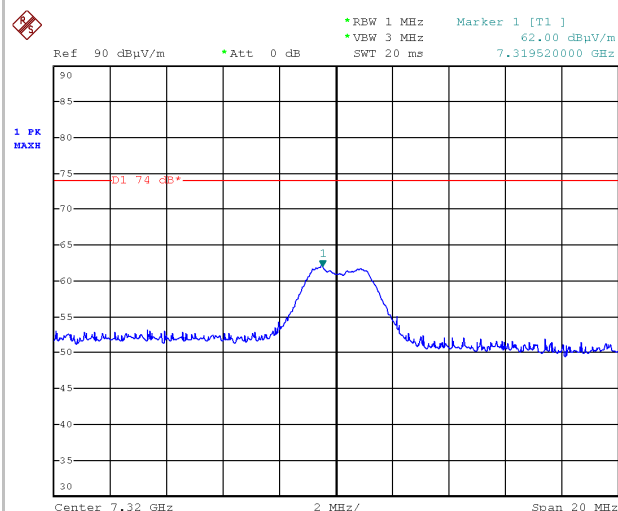
| Frequency | Reading value | Antenna Factor | Cable Loss | Pre-Amp. Gain | Correcting reading | PK Limit (AV + 20dB) | PK Limit (AV + 20dB) | Margin |
|-----------|---------------|----------------|------------|---------------|--------------------|----------------------|----------------------|--------|
| (MHz)     | (dBμV)        | (dB3/m)        | (dB)       | (dB)          | (dBμV/m)           | (μV/m)               | (dBμV/m)             | (dB)   |
| 4880      | 58.94         | 31.30          | 6.22       | -36.82        | <b>59.64</b>       | 5000                 | 74.00                | >13    |
| 4908      | 60.18         | 31.30          | 6.22       | -36.82        | <b>60.88</b>       | 5000                 | 74.00                | >13    |

### AVERAGE RESULT (RBW=1MHz; VBW=10Hz)

| Frequency | Reading value | Antenna Factor | Cable Loss | Pre-Amp. Gain | Correcting reading | AV Limit | AV Limit | Margin |
|-----------|---------------|----------------|------------|---------------|--------------------|----------|----------|--------|
| (MHz)     | (dBμV)        | (dB3/m)        | (dB)       | (dB)          | (dBμV/m)           | (μV/m)   | (dBμV/m) | (dB)   |
| 4880      | 43.13         | 31.30          | 6.22       | -36.82        | <b>47.83</b>       | 500      | 54.00    | >5     |



### 3° Harmonic 7320MHz



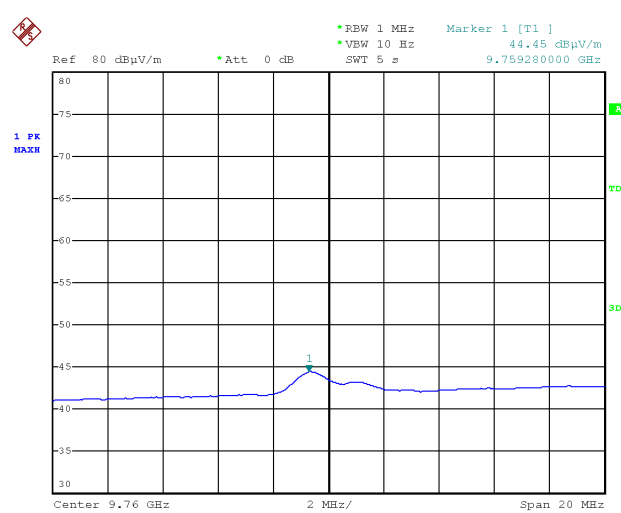
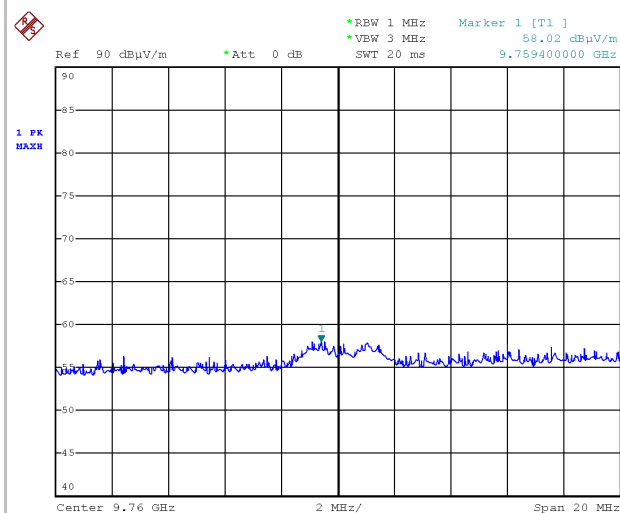
#### PEAK RESULT (RBW=1MHz; VBW=3MHz)

| Frequency | Reading value | Antenna Factor | Cable Loss | Pre-Amp. Gain | Correcting reading | PK Limit (AV + 20dB) | PK Limit (AV + 20dB) | Margin |
|-----------|---------------|----------------|------------|---------------|--------------------|----------------------|----------------------|--------|
| (MHz)     | (dBμV)        | (dB3/m)        | (dB)       | (dB)          | (dBμV/m)           | (μV/m)               | (dBμV/m)             | (dB)   |
| 7320      | 56.77         | 36.50          | 6.36       | -37.63        | <b>62.00</b>       | 5000                 | 74.00                | 12     |

#### AVERAGE RESULT (RBW=1MHz; VBW=10Hz)

| Frequency | Reading value | Antenna Factor | Cable Loss | Pre-Amp. Gain | Correcting reading | AV Limit | AV Limit | Margin |
|-----------|---------------|----------------|------------|---------------|--------------------|----------|----------|--------|
| (MHz)     | (dBμV)        | (dB3/m)        | (dB)       | (dB)          | (dBμV/m)           | (μV/m)   | (dBμV/m) | (dB)   |
| 7320      | 43.63         | 36.50          | 6.36       | -37.63        | <b>48.86</b>       | 500      | 54.00    | >5     |

### 4° Harmonic 9760MHz



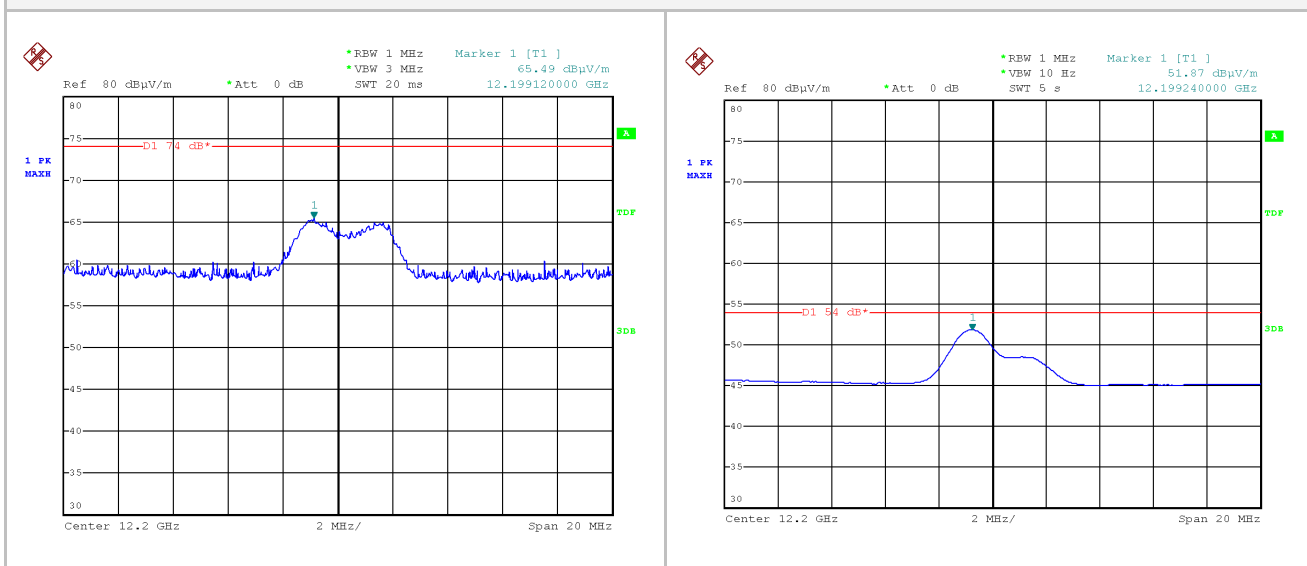
### PEAK RESULT (RBW=1MHz; VBW=3MHz)

| Frequency | Reading value | Antenna Factor | Cable Loss | Pre-Amp. Gain | Correcting reading | PK Limit (AV + 20dB) | PK Limit (AV + 20dB) | Margin |
|-----------|---------------|----------------|------------|---------------|--------------------|----------------------|----------------------|--------|
| (MHz)     | (dBμV)        | (dB3/m)        | (dB)       | (dB)          | (dBμV/m)           | (μV/m)               | (dBμV/m)             | (dB)   |
| 9760      | 49.27         | 37.70          | 9.00       | -37.95        | <b>58.02</b>       | 5000                 | 74.00                | >15    |

### AVERAGE RESULT (RBW=1MHz; VBW=10Hz)

| Frequency | Reading value | Antenna Factor | Cable Loss | Pre-Amp. Gain | Correcting reading | AV Limit | AV Limit | Margin |
|-----------|---------------|----------------|------------|---------------|--------------------|----------|----------|--------|
| (MHz)     | (dBμV)        | (dB3/m)        | (dB)       | (dB)          | (dBμV/m)           | (μV/m)   | (dBμV/m) | (dB)   |
| 9760      | 35.70         | 37.70          | 9.00       | -37.95        | <b>44.45</b>       | 500      | 54.00    | >9     |

### 5° Harmonic 12200MHz



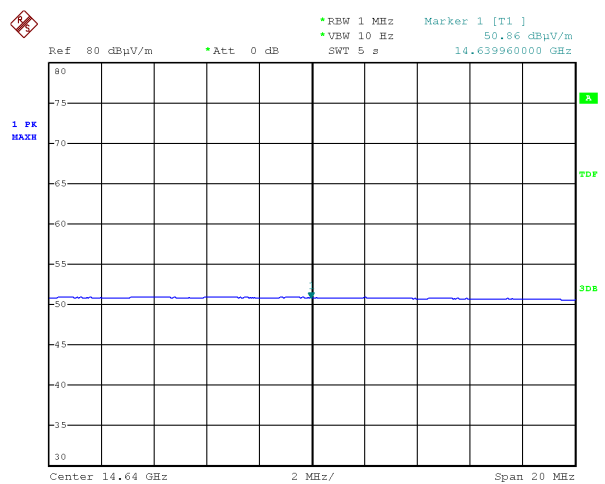
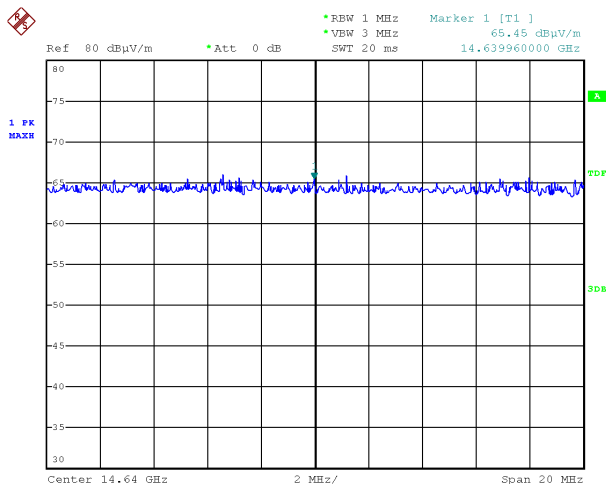
### PEAK RESULT (RBW=1MHz; VBW=3MHz)

| Frequency | Reading value | Antenna Factor | Cable Loss | Pre-Amp. Gain | Correcting reading | PK Limit (AV + 20dB) | PK Limit (AV + 20dB) | Margin |
|-----------|---------------|----------------|------------|---------------|--------------------|----------------------|----------------------|--------|
| (MHz)     | (dBμV)        | (dB3/m)        | (dB)       | (dB)          | (dBμV/m)           | (μV/m)               | (dBμV/m)             | (dB)   |
| 12200     | 54.46         | 39.10          | 9.48       | -37.55        | <b>65.49</b>       | 5000                 | 74.00                | >8     |

### AVERAGE RESULT (RBW=1MHz; VBW=10Hz)

| Frequency | Reading value | Antenna Factor | Cable Loss | Pre-Amp. Gain | Correcting reading | AV Limit | AV Limit | Margin |
|-----------|---------------|----------------|------------|---------------|--------------------|----------|----------|--------|
| (MHz)     | (dBμV)        | (dB3/m)        | (dB)       | (dB)          | (dBμV/m)           | (μV/m)   | (dBμV/m) | (dB)   |
| 12200     | 40.84         | 39.10          | 9.48       | -37.55        | <b>51.87</b>       | 500      | 54.00    | >2     |

### 6° Harmonic 14640MHz



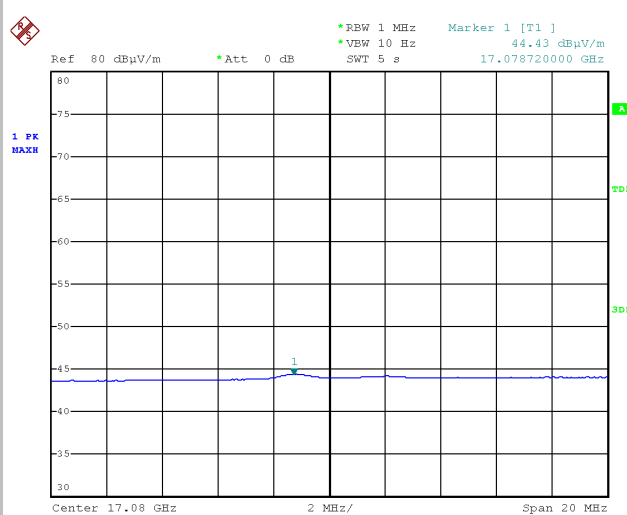
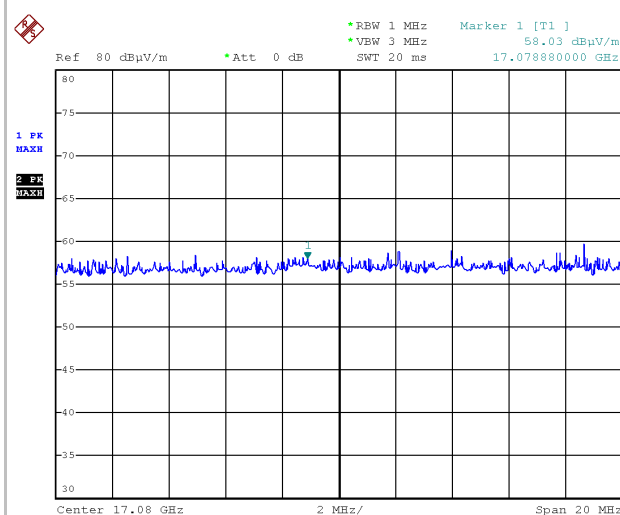
### PEAK RESULT (RBW=1MHz; VBW=3MHz)

| Frequency | Reading value | Antenna Factor | Cable Loss | Pre-Amp. Gain | Correcting reading | PK Limit (AV + 20dB) | PK Limit (AV + 20dB) | Margin |
|-----------|---------------|----------------|------------|---------------|--------------------|----------------------|----------------------|--------|
| (MHz)     | (dBμV)        | (dB3/m)        | (dB)       | (dB)          | (dBμV/m)           | (μV/m)               | (dBμV/m)             | (dB)   |
| 14640     | 49.00         | 41.80          | 10.65      | -36.00        | <b>65.45</b>       | 5000                 | 74.00                | >8     |

### AVERAGE RESULT (RBW=1MHz; VBW=10Hz)

| Frequency | Reading value | Antenna Factor | Cable Loss | Pre-Amp. Gain | Correcting reading | AV Limit | AV Limit | Margin |
|-----------|---------------|----------------|------------|---------------|--------------------|----------|----------|--------|
| (MHz)     | (dBμV)        | (dB3/m)        | (dB)       | (dB)          | (dBμV/m)           | (μV/m)   | (dBμV/m) | (dB)   |
| 14640     | 34.41         | 41.80          | 10.65      | -36.00        | <b>50.86</b>       | 500      | 54.00    | >3     |

### 7° Harmonic 17080MHz



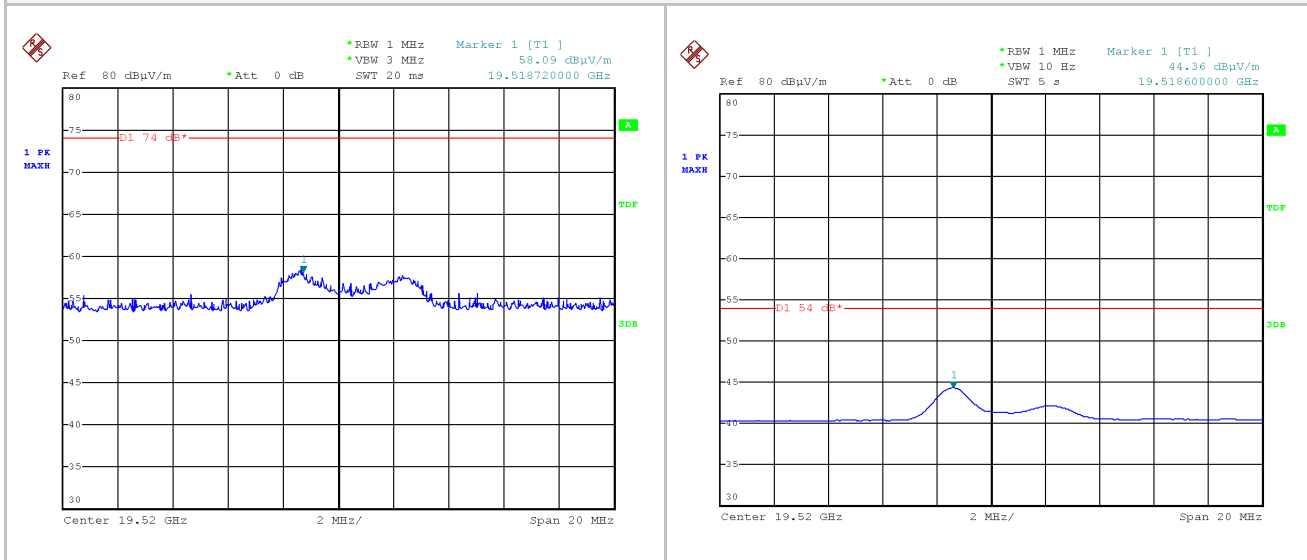
### PEAK RESULT (RBW=1MHz; VBW=3MHz)

| Frequency | Reading value | Antenna Factor | Cable Loss | Pre-Amp. Gain | Correcting reading | PK Limit (AV + 20dB) | PK Limit (AV + 20dB) | Margin |
|-----------|---------------|----------------|------------|---------------|--------------------|----------------------|----------------------|--------|
| (MHz)     | (dBμV)        | (dB1/m)        | (dB)       | (dB)          | (dBμV/m)           | (μV/m)               | (dBμV/m)             | (dB)   |
| 17080     | 45.32         | 37.92          | 4.80       | -30.01        | <b>58.03</b>       | 5000                 | 74.00                | >15    |

### AVERAGE RESULT (RBW=1MHz; VBW=10Hz)

| Frequency | Reading value | Antenna Factor | Cable Loss | Pre-Amp. Gain | Correcting reading | AV Limit | AV Limit | Margin |
|-----------|---------------|----------------|------------|---------------|--------------------|----------|----------|--------|
| (MHz)     | (dBμV)        | (dB1/m)        | (dB)       | (dB)          | (dBμV/m)           | (μV/m)   | (dBμV/m) | (dB)   |
| 17080     | 31.72         | 37.92          | 4.80       | -30.01        | <b>44.43</b>       | 500      | 54.00    | >9     |

### 8° Harmonic 19520MHz



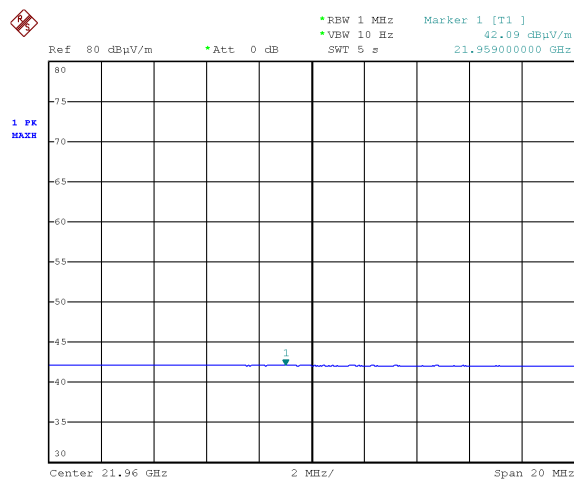
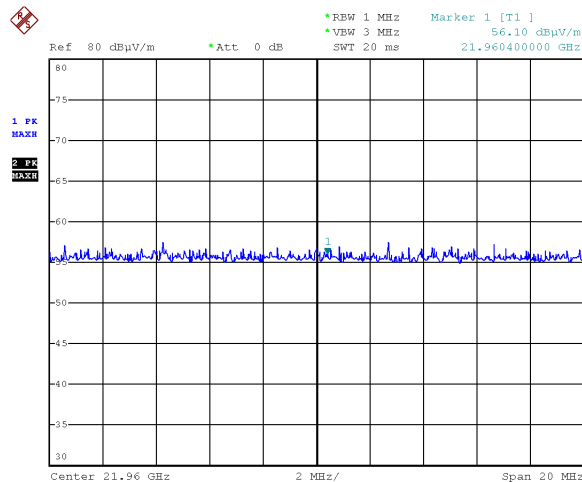
### PEAK RESULT (RBW=1MHz; VBW=3MHz)

| Frequency | Reading value | Antenna Factor | Cable Loss | Pre-Amp. Gain | Correcting reading | PK Limit (AV + 20dB) | PK Limit (AV + 20dB) | Margin |
|-----------|---------------|----------------|------------|---------------|--------------------|----------------------|----------------------|--------|
| (MHz)     | (dBμV)        | (dB1/m)        | (dB)       | (dB)          | (dBμV/m)           | (μV/m)               | (dBμV/m)             | (dB)   |
| 19520     | 49.07         | 37.92          | 4.80       | -33.70        | <b>58.09</b>       | 5000                 | 74.00                | >15    |

### AVERAGE RESULT (RBW=1MHz; VBW=10Hz)

| Frequency | Reading value | Antenna Factor | Cable Loss | Pre-Amp. Gain | Correcting reading | AV Limit | AV Limit | Margin |
|-----------|---------------|----------------|------------|---------------|--------------------|----------|----------|--------|
| (MHz)     | (dBμV)        | (dB1/m)        | (dB)       | (dB)          | (dBμV/m)           | (μV/m)   | (dBμV/m) | (dB)   |
| 19520     | 35.34         | 37.92          | 4.80       | -33.70        | <b>44.36</b>       | 500      | 54.00    | >9     |

### 9° Harmonic 21960MHz



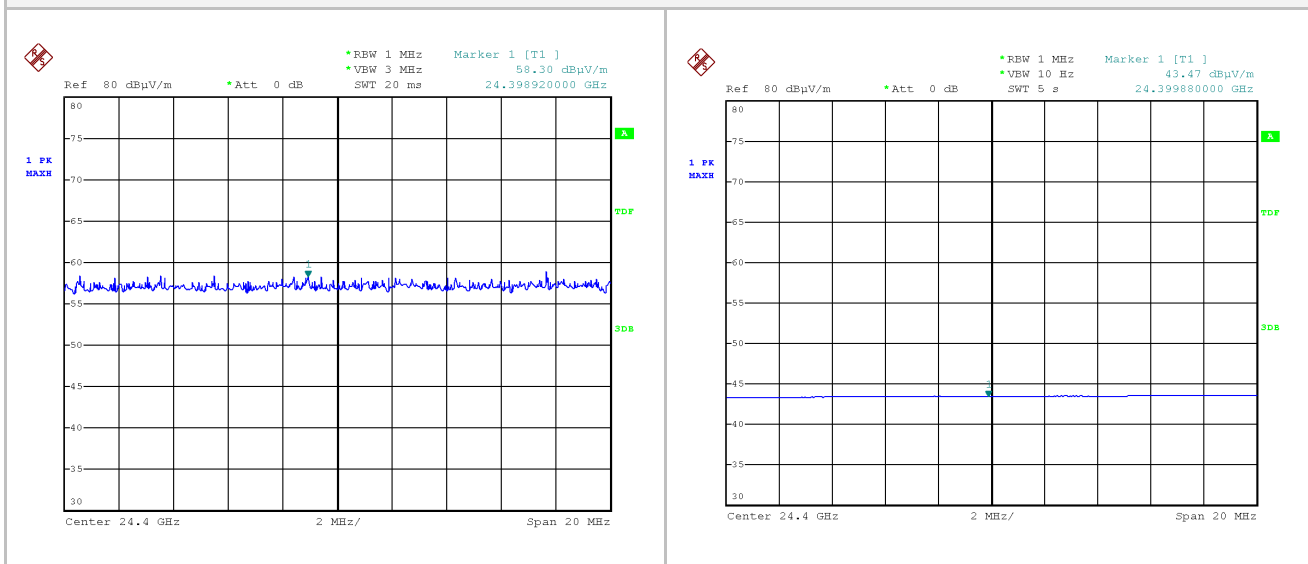
### PEAK RESULT (RBW=1MHz; VBW=3MHz)

| Frequency | Reading value | Antenna Factor | Cable Loss | Pre-Amp. Gain | Correcting reading | PK Limit (AV + 20dB) | PK Limit (AV + 20dB) | Margin |
|-----------|---------------|----------------|------------|---------------|--------------------|----------------------|----------------------|--------|
| (MHz)     | (dBμV)        | (dB1/m)        | (dB)       | (dB)          | (dBμV/m)           | (μV/m)               | (dBμV/m)             | (dB)   |
| 21960     | 45.97         | 38.13          | 5.30       | -33.30        | <b>56.10</b>       | 5000                 | 74.00                | >17    |

### AVERAGE RESULT (RBW=1MHz; VBW=10Hz)

| Frequency | Reading value | Antenna Factor | Cable Loss | Pre-Amp. Gain | Correcting reading | AV Limit | AV Limit | Margin |
|-----------|---------------|----------------|------------|---------------|--------------------|----------|----------|--------|
| (MHz)     | (dBμV)        | (dB1/m)        | (dB)       | (dB)          | (dBμV/m)           | (μV/m)   | (dBμV/m) | (dB)   |
| 21960     | 31.96         | 38.13          | 5.30       | -33.30        | <b>42.09</b>       | 500      | 54.00    | >11    |

### 10° Harmonic 24400MHz



### PEAK RESULT (RBW=1MHz; VBW=3MHz)

| Frequency | Reading value | Antenna Factor | Cable Loss | Pre-Amp. Gain | Correcting reading | PK Limit (AV + 20dB) | PK Limit (AV + 20dB) | Margin |
|-----------|---------------|----------------|------------|---------------|--------------------|----------------------|----------------------|--------|
| (MHz)     | (dBμV)        | (dB1/m)        | (dB)       | (dB)          | (dBμV/m)           | (μV/m)               | (dBμV/m)             | (dB)   |
| 24400     | 46.06         | 39.14          | 5.60       | -32.50        | <b>58.30</b>       | 5000                 | 74.00                | >15    |

### AVERAGE RESULT (RBW=1MHz; VBW=10Hz)

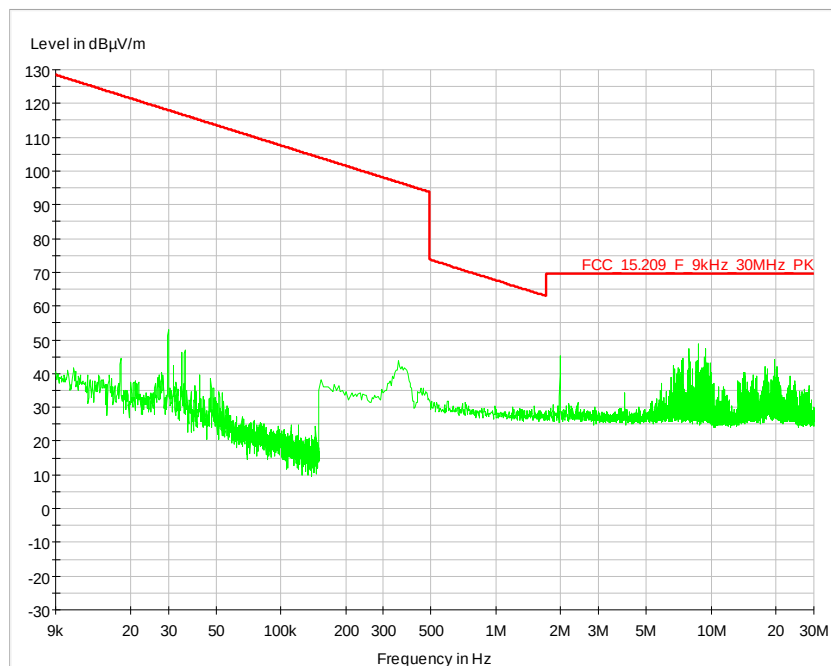
| Frequency | Reading value | Antenna Factor | Cable Loss | Pre-Amp. Gain | Correcting reading | AV Limit | AV Limit | Margin |
|-----------|---------------|----------------|------------|---------------|--------------------|----------|----------|--------|
| (MHz)     | (dBμV)        | (dB1/m)        | (dB)       | (dB)          | (dBμV/m)           | (μV/m)   | (dBμV/m) | (dB)   |
| 24400     | 31.23         | 39.14          | 5.60       | -32.50        | <b>43.47</b>       | 500      | 54.00    | >10    |

NOTE: All the previous measures are the worst case on 3 axes X Y and Z and both polarization.

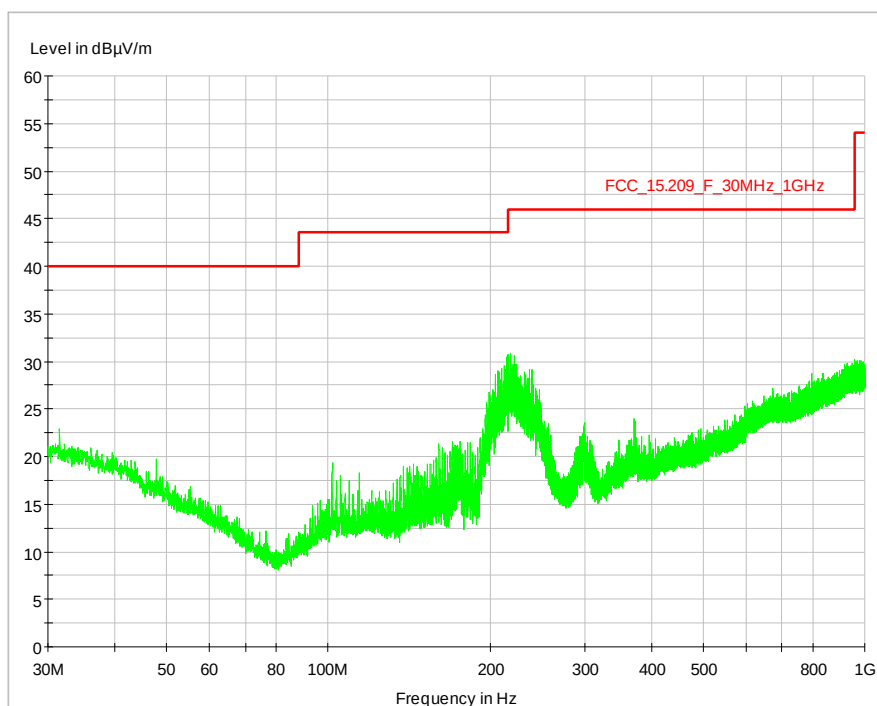


(HIGHER CHANNEL 2480MHz)

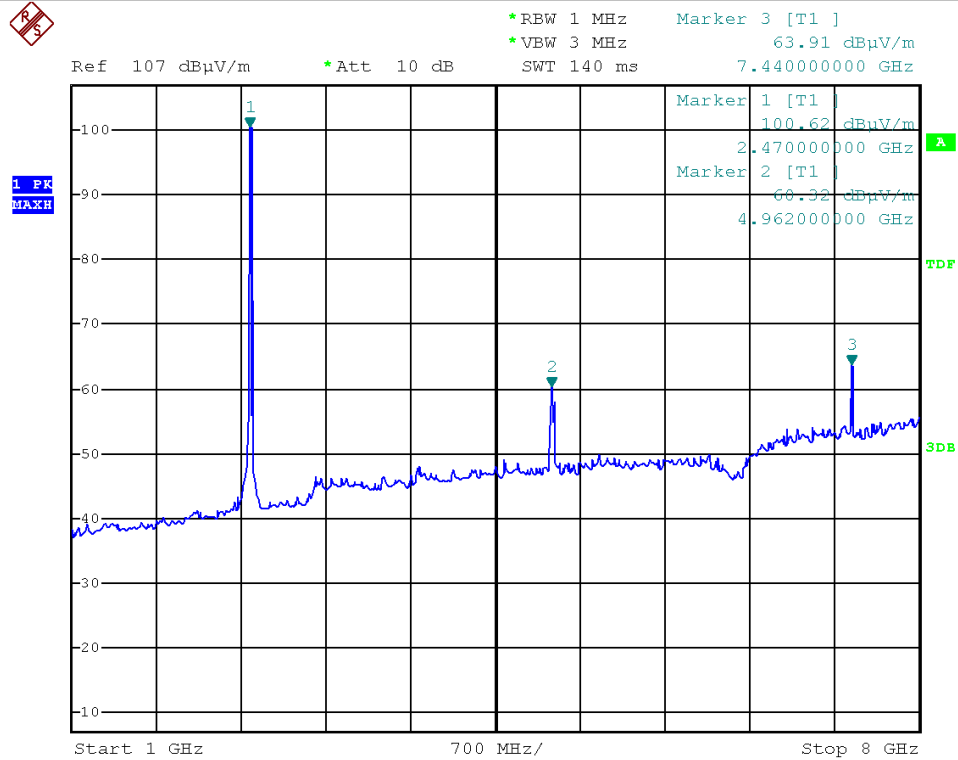
9 kHz÷30 MHz



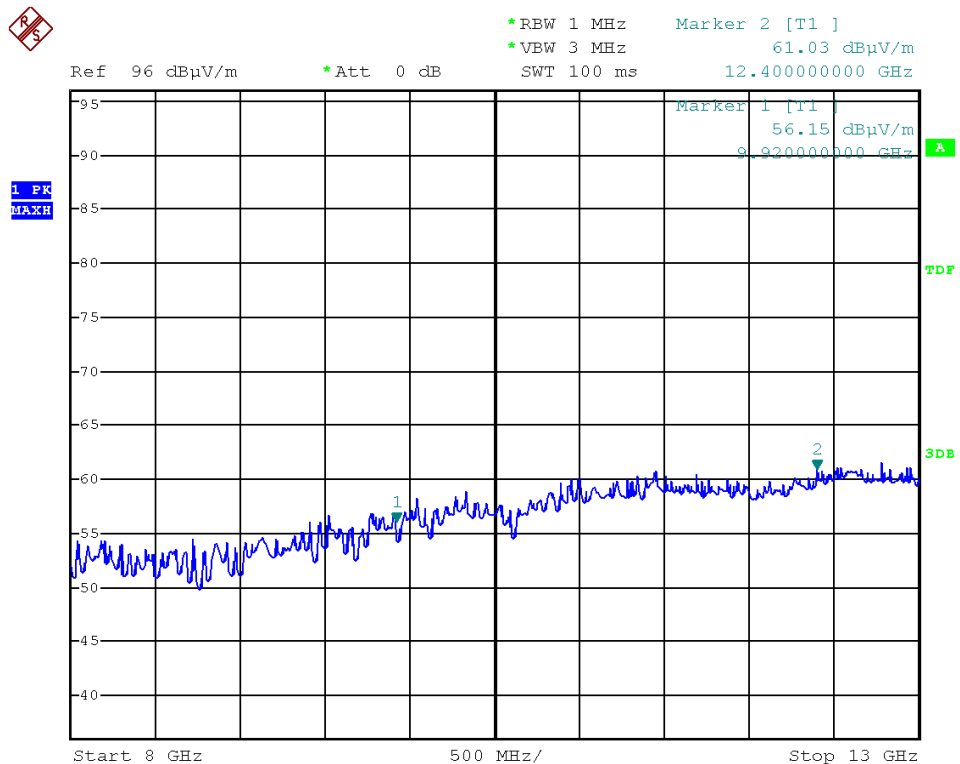
30÷1.000 MHz



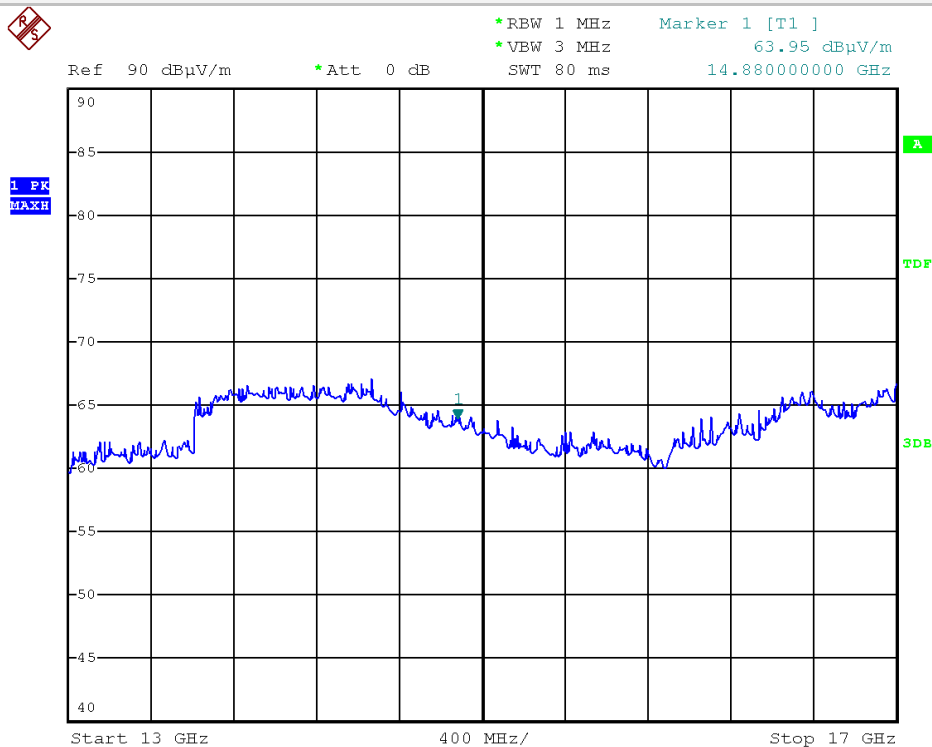
### 1 GHz÷8 GHz



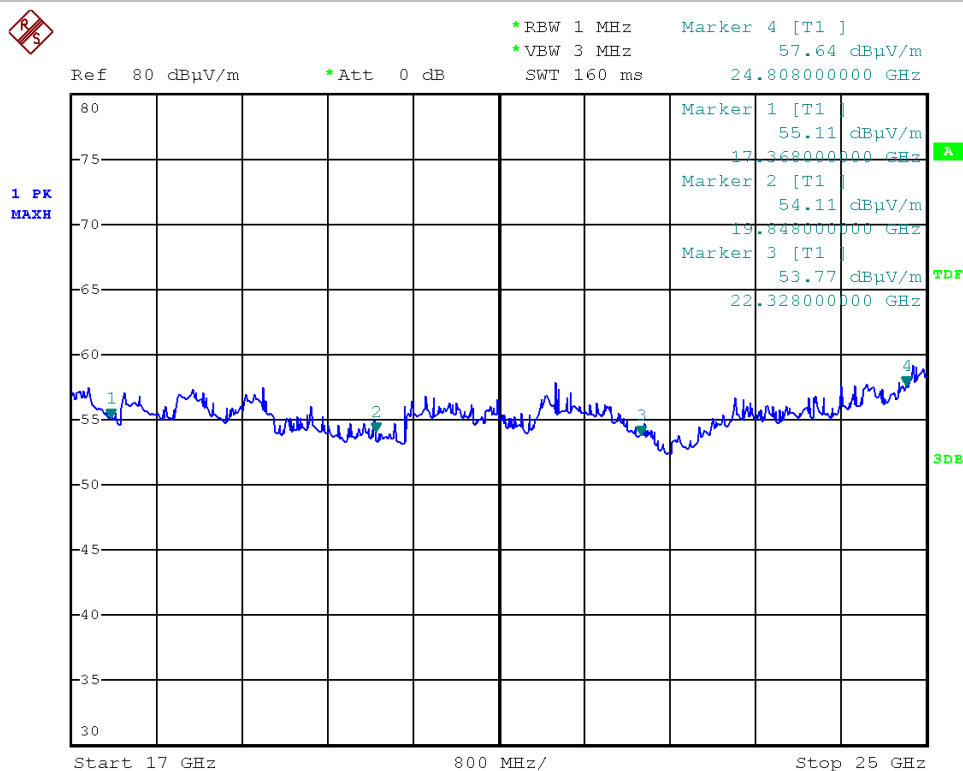
### 8 GHz÷13 GHz



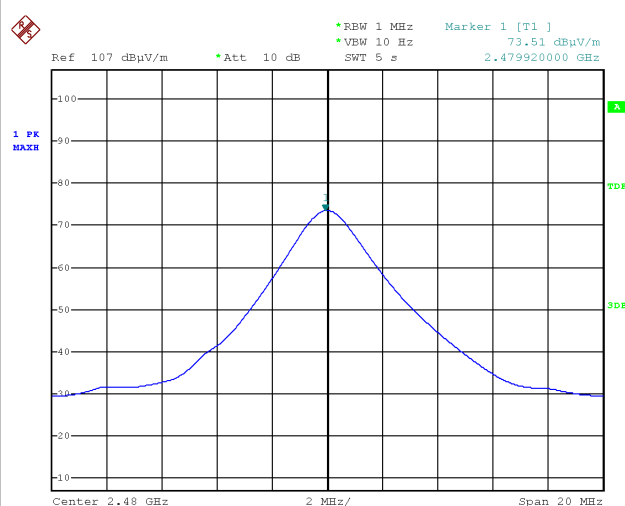
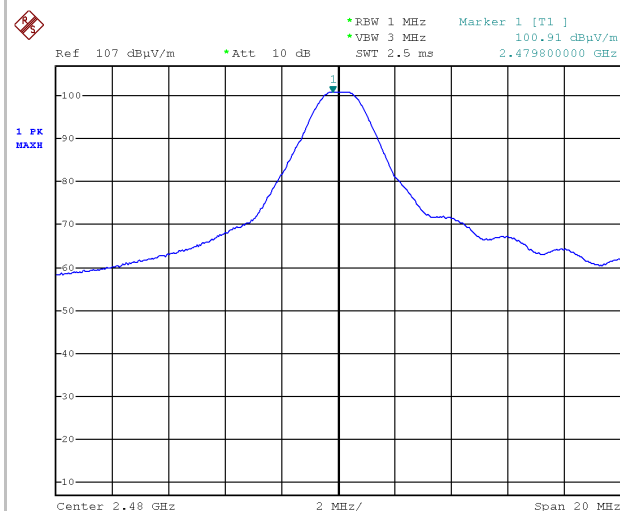
### 13 GHz÷17 GHz



### 17 GHz÷25 GHz



### Fundamental 2480MHz



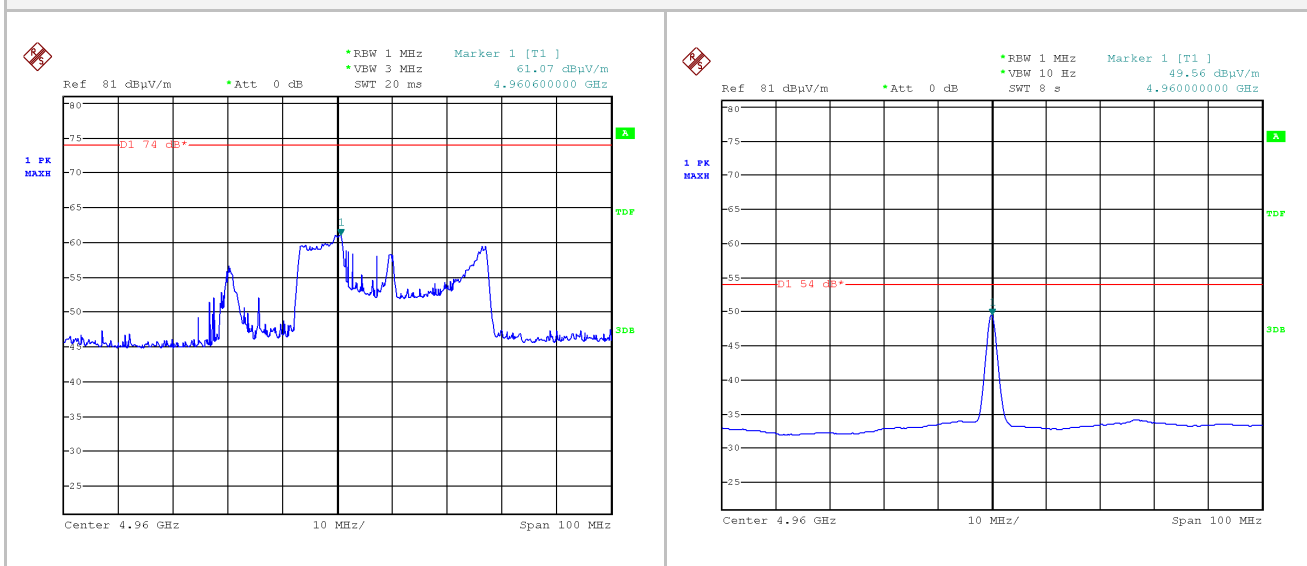
### PEAK RESULT (RBW=1MHz; VBW=3MHz)

| Frequency          | Reading value | Antenna Factor | Cable Loss | Pre-Amp. Gain | Correcting reading | PK Limit (AV + 20dB) | PK Limit (AV + 20dB) | Margin |
|--------------------|---------------|----------------|------------|---------------|--------------------|----------------------|----------------------|--------|
| (MHz)              | (dBμV)        | (dB3/m)        | (dB)       | (dB)          | (dBμV/m)           | (μV/m)               | (dBμV/m)             | (dB)   |
| 2480 (fundamental) | 106.79        | 27.70          | 4.02       | -37.60        | <b>100.91</b>      | -----                | -----                | -----  |

### AVERAGE RESULT (RBW=1MHz; VBW=10Hz)

| Frequency          | Reading value | Antenna Factor | Cable Loss | Pre-Amp. Gain | Correcting reading | AV Limit | AV Limit | Margin |
|--------------------|---------------|----------------|------------|---------------|--------------------|----------|----------|--------|
| (MHz)              | (dBμV)        | (dB3/m)        | (dB)       | (dB)          | (dBμV/m)           | (μV/m)   | (dBμV/m) | (dB)   |
| 2480 (fundamental) | 79.39         | 27.70          | 4.02       | -37.60        | <b>73.51</b>       | -----    | -----    | -----  |

## 2° Harmonic 4960MHz



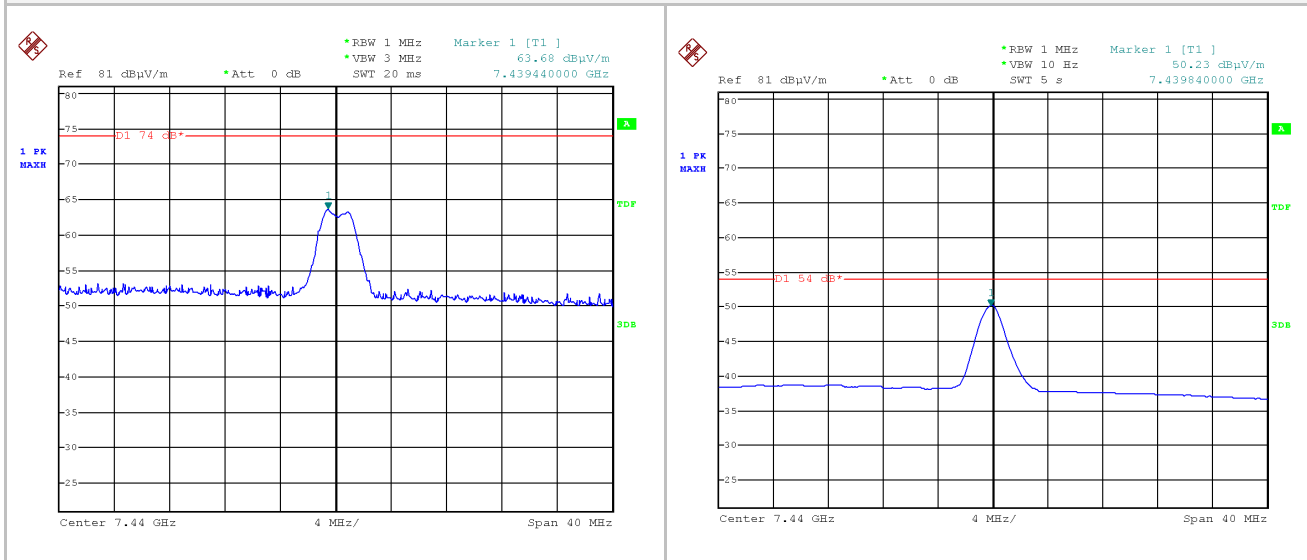
### PEAK RESULT (RBW=1MHz; VBW=3MHz)

| Frequency | Reading value | Antenna Factor | Cable Loss | Pre-Amp. Gain | Correcting reading | PK Limit (AV + 20dB) | PK Limit (AV + 20dB) | Margin |
|-----------|---------------|----------------|------------|---------------|--------------------|----------------------|----------------------|--------|
| (MHz)     | (dBμV)        | (dB3/m)        | (dB)       | (dB)          | (dBμV/m)           | (μV/m)               | (dBμV/m)             | (dB)   |
| 4960      | 60.35         | 31.30          | 6.24       | -36.82        | <b>61.07</b>       | 5000                 | 74.00                | >12    |

### AVERAGE RESULT (RBW=1MHz; VBW=10Hz)

| Frequency | Reading value | Antenna Factor | Cable Loss | Pre-Amp. Gain | Correcting reading | AV Limit | AV Limit | Margin |
|-----------|---------------|----------------|------------|---------------|--------------------|----------|----------|--------|
| (MHz)     | (dBμV)        | (dB3/m)        | (dB)       | (dB)          | (dBμV/m)           | (μV/m)   | (dBμV/m) | (dB)   |
| 4960      | 48.84         | 31.30          | 6.24       | -36.82        | <b>49.56</b>       | 500      | 54.00    | >4     |

### 3° Harmonic 7440MHz



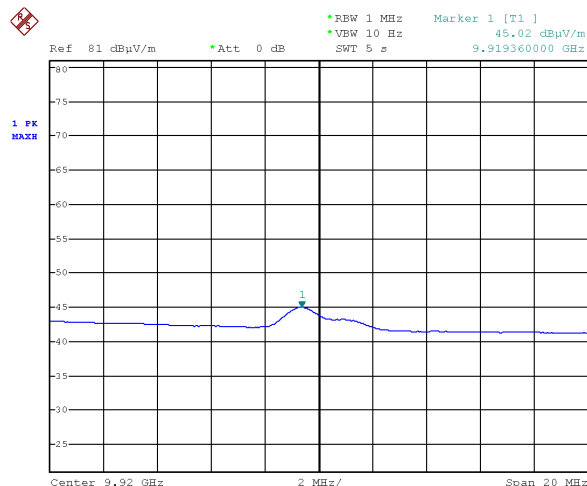
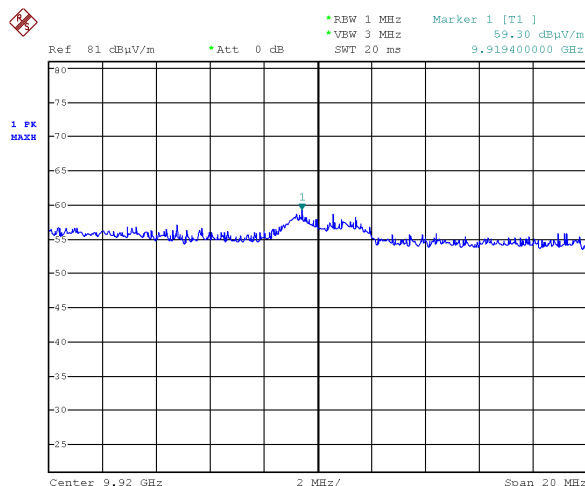
#### PEAK RESULT (RBW=1MHz; VBW=3MHz)

| Frequency | Reading value | Antenna Factor | Cable Loss | Pre-Amp. Gain | Correcting reading | PK Limit (AV + 20dB) | PK Limit (AV + 20dB) | Margin |
|-----------|---------------|----------------|------------|---------------|--------------------|----------------------|----------------------|--------|
| (MHz)     | (dBμV)        | (dB3/m)        | (dB)       | (dB)          | (dBμV/m)           | (μV/m)               | (dBμV/m)             | (dB)   |
| 7440      | 58.68         | 36.50          | 6.23       | -37.73        | <b>63.68</b>       | 5000                 | 74.00                | >10    |

#### AVERAGE RESULT (RBW=1MHz; VBW=10Hz)

| Frequency | Reading value | Antenna Factor | Cable Loss | Pre-Amp. Gain | Correcting reading | AV Limit | AV Limit | Margin |
|-----------|---------------|----------------|------------|---------------|--------------------|----------|----------|--------|
| (MHz)     | (dBμV)        | (dB3/m)        | (dB)       | (dB)          | (dBμV/m)           | (μV/m)   | (dBμV/m) | (dB)   |
| 7440      | 45.23         | 36.50          | 6.23       | -37.73        | <b>50.23</b>       | 500      | 54.00    | >3     |

### 4° Harmonic 9920MHz



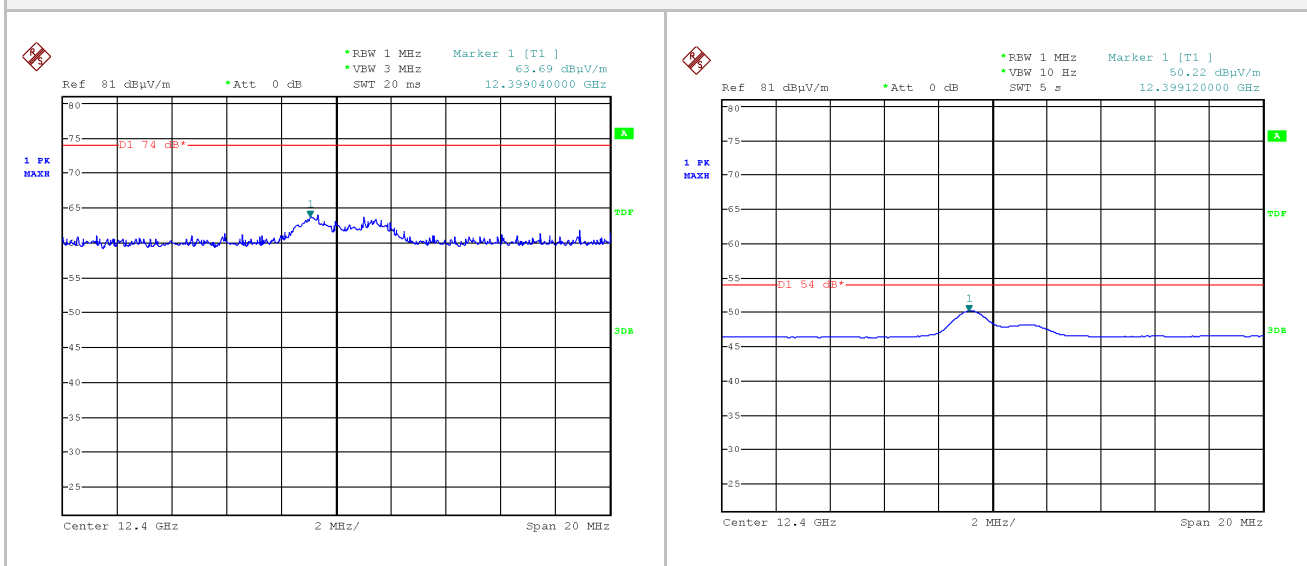
### PEAK RESULT (RBW=1MHz; VBW=3MHz)

| Frequency | Reading value | Antenna Factor | Cable Loss | Pre-Amp. Gain | Correcting reading | PK Limit (AV + 20dB) | PK Limit (AV + 20dB) | Margin |
|-----------|---------------|----------------|------------|---------------|--------------------|----------------------|----------------------|--------|
| (MHz)     | (dBμV)        | (dB3/m)        | (dB)       | (dB)          | (dBμV/m)           | (μV/m)               | (dBμV/m)             | (dB)   |
| 9920      | 50.35         | 38.50          | 8.54       | -38.09        | <b>59.30</b>       | 5000                 | 74.00                | >14    |

### AVERAGE RESULT (RBW=1MHz; VBW=10Hz)

| Frequency | Reading value | Antenna Factor | Cable Loss | Pre-Amp. Gain | Correcting reading | AV Limit | AV Limit | Margin |
|-----------|---------------|----------------|------------|---------------|--------------------|----------|----------|--------|
| (MHz)     | (dBμV)        | (dB3/m)        | (dB)       | (dB)          | (dBμV/m)           | (μV/m)   | (dBμV/m) | (dB)   |
| 9920      | 36.07         | 38.50          | 8.54       | -38.09        | <b>45.02</b>       | 500      | 54.00    | >8     |

### 5° Harmonic 12400MHz



#### PEAK RESULT (RBW=1MHz; VBW=3MHz)

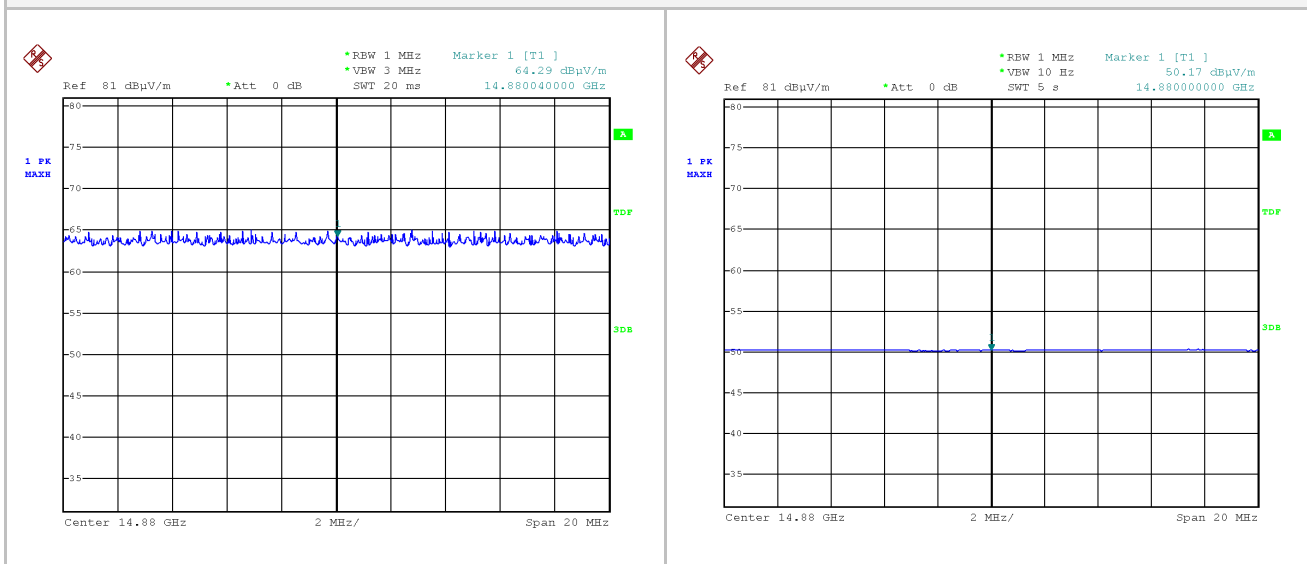
| Frequency | Reading value | Antenna Factor | Cable Loss | Pre-Amp. Gain | Correcting reading | PK Limit (AV + 20dB) | PK Limit (AV + 20dB) | Margin |
|-----------|---------------|----------------|------------|---------------|--------------------|----------------------|----------------------|--------|
| (MHz)     | (dBμV)        | (dB3/m)        | (dB)       | (dB)          | (dBμV/m)           | (μV/m)               | (dBμV/m)             | (dB)   |
| 12400     | 52.28         | 38.40          | 9.01       | -36.00        | <b>63.69</b>       | 5000                 | 74.00                | >10    |

#### AVERAGE RESULT (RBW=1MHz; VBW=10Hz)

| Frequency | Reading value | Antenna Factor | Cable Loss | Pre-Amp. Gain | Correcting reading | AV Limit | AV Limit | Margin |
|-----------|---------------|----------------|------------|---------------|--------------------|----------|----------|--------|
| (MHz)     | (dBμV)        | (dB3/m)        | (dB)       | (dB)          | (dBμV/m)           | (μV/m)   | (dBμV/m) | (dB)   |
| 12400     | 38.81         | 38.40          | 9.01       | -36.00        | <b>50.22</b>       | 500      | 54.00    | >3     |



### 6° Harmonic 14880MHz



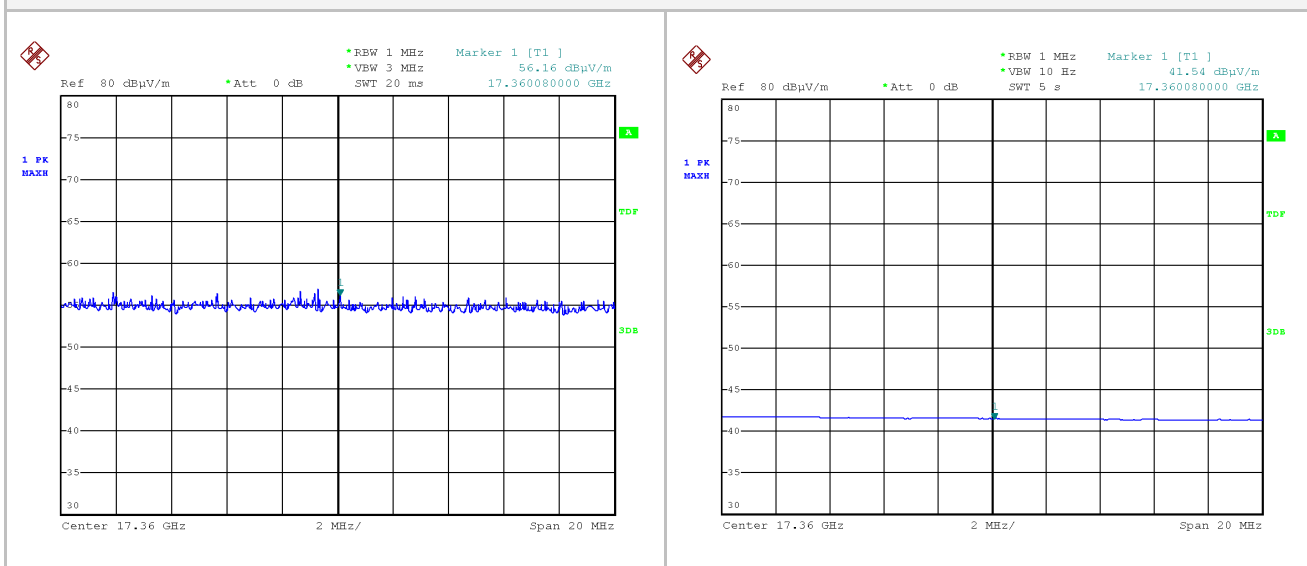
### PEAK RESULT (RBW=1MHz; VBW=3MHz)

| Frequency | Reading value | Antenna Factor | Cable Loss | Pre-Amp. Gain | Correcting reading | PK Limit (AV + 20dB) | PK Limit (AV + 20dB) | Margin |
|-----------|---------------|----------------|------------|---------------|--------------------|----------------------|----------------------|--------|
| (MHz)     | (dBμV)        | (dB3/m)        | (dB)       | (dB)          | (dBμV/m)           | (μV/m)               | (dBμV/m)             | (dB)   |
| 14880     | 49.54         | 39.90          | 10.27      | -35.42        | <b>64.29</b>       | 5000                 | 74.00                | >9     |

### AVERAGE RESULT (RBW=1MHz; VBW=10Hz)

| Frequency | Reading value | Antenna Factor | Cable Loss | Pre-Amp. Gain | Correcting reading | AV Limit | AV Limit | Margin |
|-----------|---------------|----------------|------------|---------------|--------------------|----------|----------|--------|
| (MHz)     | (dBμV)        | (dB3/m)        | (dB)       | (dB)          | (dBμV/m)           | (μV/m)   | (dBμV/m) | (dB)   |
| 14880     | 35.42         | 39.90          | 10.27      | -35.42        | <b>50.17</b>       | 500      | 54.00    | >3     |

### 7° Harmonic 17360MHz



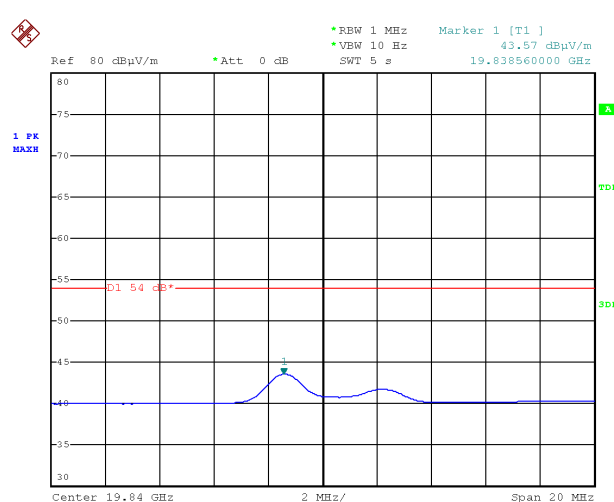
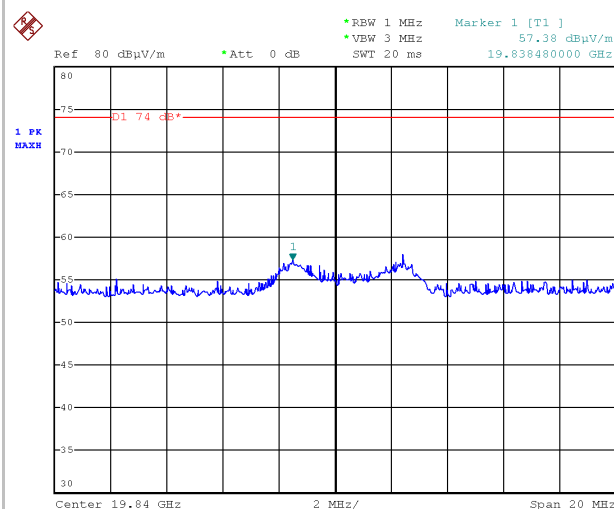
### PEAK RESULT (RBW=1MHz; VBW=3MHz)

| Frequency | Reading value | Antenna Factor | Cable Loss | Pre-Amp. Gain | Correcting reading | PK Limit (AV + 20dB) | PK Limit (AV + 20dB) | Margin |
|-----------|---------------|----------------|------------|---------------|--------------------|----------------------|----------------------|--------|
| (MHz)     | (dBμV)        | (dB1/m)        | (dB)       | (dB)          | (dBμV/m)           | (μV/m)               | (dBμV/m)             | (dB)   |
| 17360     | 43.56         | 37.90          | 4.80       | -30.10        | <b>56.16</b>       | 5000                 | 74.00                | >17    |

### AVERAGE RESULT (RBW=1MHz; VBW=10Hz)

| Frequency | Reading value | Antenna Factor | Cable Loss | Pre-Amp. Gain | Correcting reading | AV Limit | AV Limit | Margin |
|-----------|---------------|----------------|------------|---------------|--------------------|----------|----------|--------|
| (MHz)     | (dBμV)        | (dB1/m)        | (dB)       | (dB)          | (dBμV/m)           | (μV/m)   | (dBμV/m) | (dB)   |
| 17360     | 28.94         | 37.90          | 4.80       | -30.10        | <b>41.54</b>       | 500      | 54.00    | >12    |

### 8° Harmonic 19840MHz



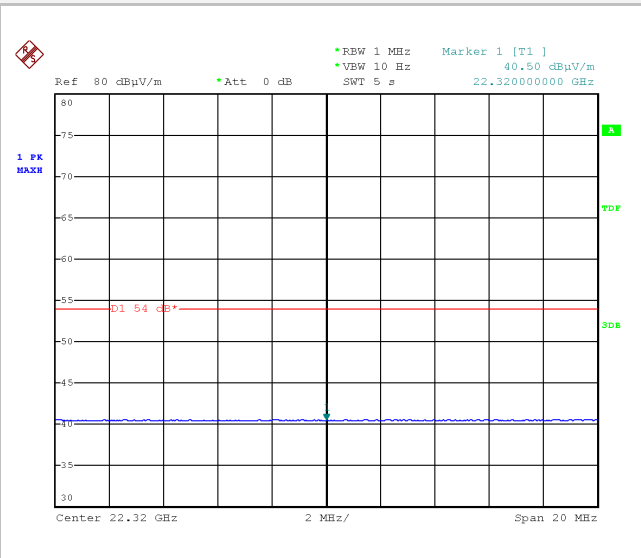
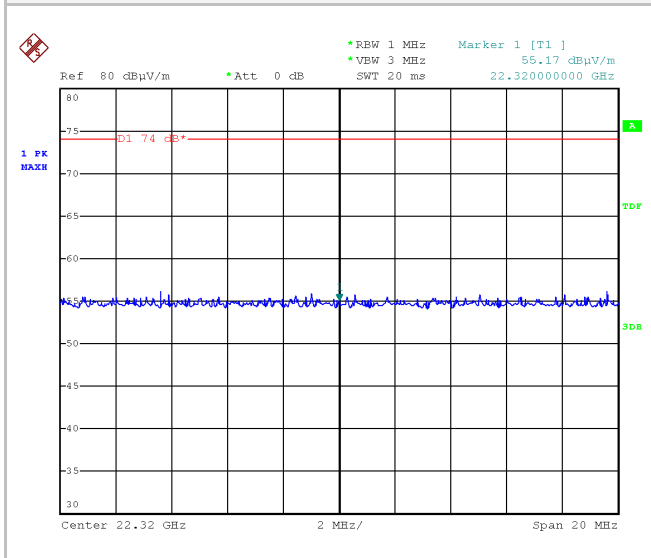
### PEAK RESULT (RBW=1MHz; VBW=3MHz)

| Frequency | Reading value | Antenna Factor | Cable Loss | Pre-Amp. Gain | Correcting reading | PK Limit (AV + 20dB) | PK Limit (AV + 20dB) | Margin |
|-----------|---------------|----------------|------------|---------------|--------------------|----------------------|----------------------|--------|
| (MHz)     | (dBμV)        | (dB1/m)        | (dB)       | (dB)          | (dBμV/m)           | (μV/m)               | (dBμV/m)             | (dB)   |
| 19840     | 47.96         | 37.82          | 5.30       | -33.70        | <b>57.38</b>       | 5000                 | 74.00                | >16    |

### AVERAGE RESULT (RBW=1MHz; VBW=10Hz)

| Frequency | Reading value | Antenna Factor | Cable Loss | Pre-Amp. Gain | Correcting reading | AV Limit | AV Limit | Margin |
|-----------|---------------|----------------|------------|---------------|--------------------|----------|----------|--------|
| (MHz)     | (dBμV)        | (dB1/m)        | (dB)       | (dB)          | (dBμV/m)           | (μV/m)   | (dBμV/m) | (dB)   |
| 19840     | 34.15         | 37.82          | 5.30       | -33.70        | <b>43.57</b>       | 500      | 54.00    | >10    |

### 9° Harmonic 22320MHz



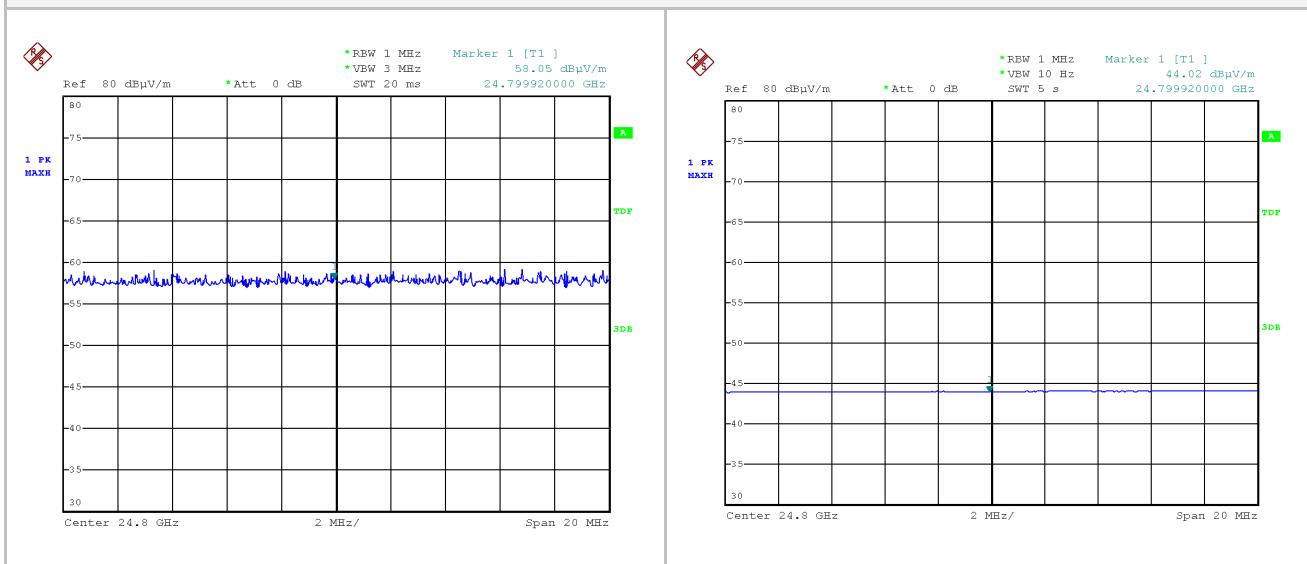
### PEAK RESULT (RBW=1MHz; VBW=3MHz)

| Frequency | Reading value | Antenna Factor | Cable Loss | Pre-Amp. Gain | Correcting reading | PK Limit (AV + 20dB) | PK Limit (AV + 20dB) | Margin |
|-----------|---------------|----------------|------------|---------------|--------------------|----------------------|----------------------|--------|
| (MHz)     | (dBμV)        | (dB1/m)        | (dB)       | (dB)          | (dBμV/m)           | (μV/m)               | (dBμV/m)             | (dB)   |
| 22320     | 44.94         | 38.23          | 5.30       | -33.30        | <b>55.17</b>       | 5000                 | 74.00                | >18    |

### AVERAGE RESULT (RBW=1MHz; VBW=10Hz)

| Frequency | Reading value | Antenna Factor | Cable Loss | Pre-Amp. Gain | Correcting reading | AV Limit | AV Limit | Margin |
|-----------|---------------|----------------|------------|---------------|--------------------|----------|----------|--------|
| (MHz)     | (dBμV)        | (dB1/m)        | (dB)       | (dB)          | (dBμV/m)           | (μV/m)   | (dBμV/m) | (dB)   |
| 22320     | 30.27         | 38.23          | 5.30       | -33.30        | <b>40.50</b>       | 500      | 54.00    | >13    |

### 10° Harmonic 24800MHz



### PEAK RESULT (RBW=1MHz; VBW=3MHz)

| Frequency | Reading value | Antenna Factor | Cable Loss | Pre-Amp. Gain | Correcting reading | PK Limit (AV + 20dB) | PK Limit (AV + 20dB) | Margin |
|-----------|---------------|----------------|------------|---------------|--------------------|----------------------|----------------------|--------|
| (MHz)     | (dBμV)        | (dB1/m)        | (dB)       | (dB)          | (dBμV/m)           | (μV/m)               | (dBμV/m)             | (dB)   |
| 24800     | 45.82         | 39.13          | 5.60       | -32.50        | <b>58.05</b>       | 5000                 | 74.00                | >15    |

### AVERAGE RESULT (RBW=1MHz; VBW=10Hz)

| Frequency | Reading value | Antenna Factor | Cable Loss | Pre-Amp. Gain | Correcting reading | AV Limit | AV Limit | Margin |
|-----------|---------------|----------------|------------|---------------|--------------------|----------|----------|--------|
| (MHz)     | (dBμV)        | (dB1/m)        | (dB)       | (dB)          | (dBμV/m)           | (μV/m)   | (dBμV/m) | (dB)   |
| 24800     | 31.79         | 39.13          | 5.60       | -32.50        | <b>44.02</b>       | 500      | 54.00    | >9     |

NOTE: All the previous measures are the worst case on 3 axes X Y and Z and both polarization.

## 7.4 6 DB BANDWIDTH

| TEST REQUIREMENT                  |            |
|-----------------------------------|------------|
| <b>Spectrum analyzer settings</b> |            |
| Span                              | 3 MHz      |
| Resolution bandwidth (RBW)        | 100 kHz    |
| Video bandwidth (VBW)             | 300 kHz    |
| Sweep time (SWT)                  | 2,5 ms     |
| Detector function                 | Peak       |
| Trace                             | max hold   |
| Attenuator                        | /          |
| Deviation to test procedure       | None       |
| EUT operating condition           | #1         |
| Remark                            | None       |
| Testing dates                     | 2017-01-23 |

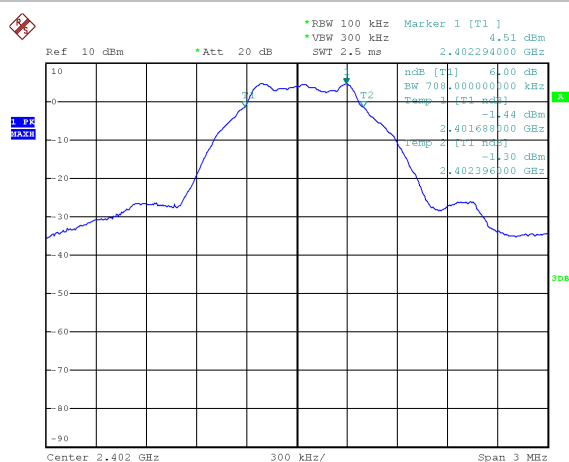
| TEST RESULT                                               |
|-----------------------------------------------------------|
| The EUT meets the requirements of sections 15.247 (a) (2) |

| TEST PROCEDURE                                                                                                                                                                      |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>The EUT is set to transmit has its maximum data rate.</p> <p>The Channel bandwidth is defined as the total spectrum the power of which is higher than peak power minus 6 dB.</p> |

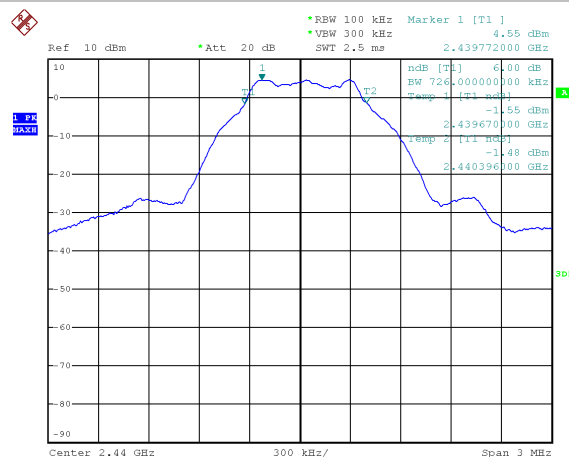
## MEASUREMENTS RESULTS

| Channel (No.) | Frequency (MHz) | Channel Bandwidth at -6dB (kHz) | Plot (No.) |
|---------------|-----------------|---------------------------------|------------|
| Low           | 2402            | 708                             | 1          |
| Middle        | 2440            | 726                             | 2          |
| High          | 2480            | 744                             | 3          |

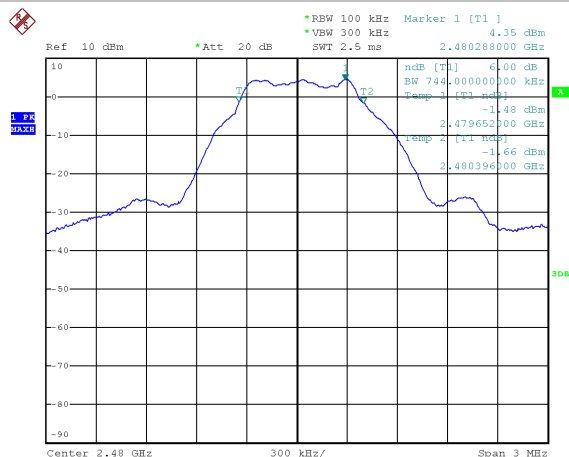
Plot 1



Plot 2



Plot 3



/

## 7.5 MAXIMUM PEAK OUTPUT POWER WITH EXTERNAL ANTENNA (DE FACTO EIRP)

| TEST REQUIREMENT                  |                                                                                                                                                                                                                                                                   |
|-----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Spectrum analyzer settings</b> |                                                                                                                                                                                                                                                                   |
| Resolution bandwidth (RBW)        | 3 MHz                                                                                                                                                                                                                                                             |
| Video bandwidth (VBW)             | 10 MHz                                                                                                                                                                                                                                                            |
| Sweep time (SWT)                  | 2,5 ms                                                                                                                                                                                                                                                            |
| Detector function                 | Peak                                                                                                                                                                                                                                                              |
| Trace                             | max hold                                                                                                                                                                                                                                                          |
| Test distance                     | 3 meters (for radiated measurement)                                                                                                                                                                                                                               |
| EUT operating condition           | #1                                                                                                                                                                                                                                                                |
| Remark                            | $eirp = p_t \times g_t = (E \times d)^2 / 30$ where:<br>$p_t$ = transmitter output power in watts,<br>$g_t$ = numeric gain of the transmitting antenna (unitless) -0.2 dBi,<br>$E$ = electric field strength in V/m,<br>$d$ = measurement distance in meters (m). |
| Testing dates                     | 2017-01-23                                                                                                                                                                                                                                                        |

### TEST RESULT

The EUT meets the requirements of sections 15.247 (b) (3)

### LIMITS

1 Watt (30dBm)

### TEST PROCEDURE

#### Conducted measurements:

As the conducted measurement cannot be performed because the transmitter antenna is integrated, it has been carried out radiated measurement, according to KDB 558074 measurements guidance for DTS equipment.

#### Radiated measurements:

As the EUT is supplied with a dedicated antenna, the effective radiated power is measured in a 3 m anechoic chamber with the substitution antenna method.

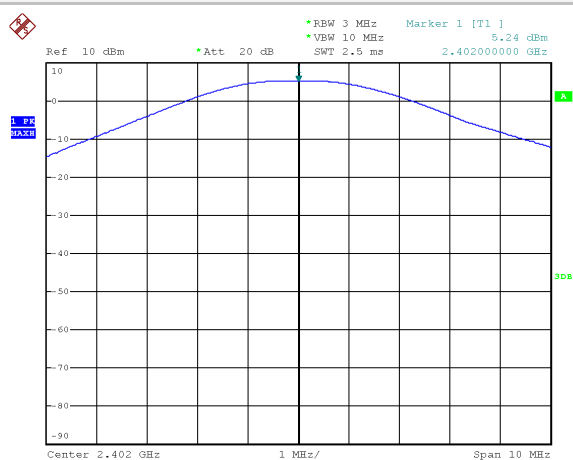
The field strength levels shall be converted to equivalent conducted power levels for comparison to the applicable output power limit refer to KDB 412172.



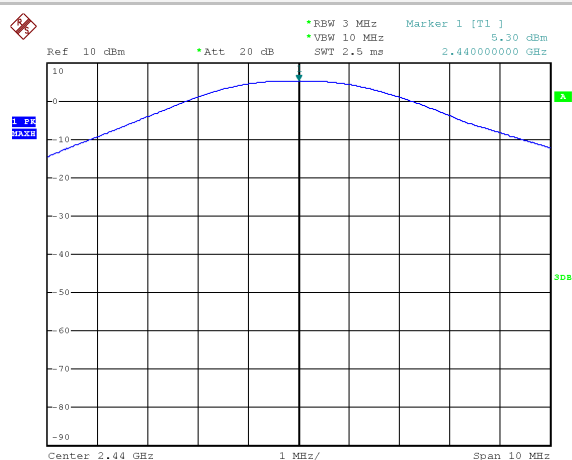
## MEASUREMENTS RESULTS (CONDUCTED)

| Channel (No.) | Frequency (MHz) | Output Power (dBm) | Limit (dBm) | Plot (No.) |
|---------------|-----------------|--------------------|-------------|------------|
| Low           | 2402            | +5.24              | +30         | 1          |
| Middle        | 2440            | +5.30              | +30         | 2          |
| High          | 2480            | +5.06              | +30         | 3          |

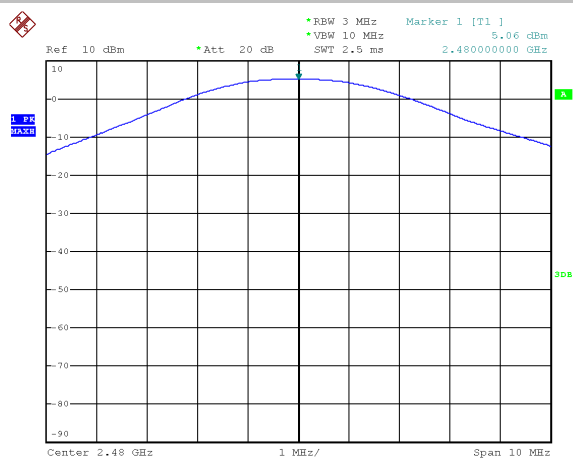
Plot 1



Plot 2



Plot 3



## MEASUREMENTS RESULTS (RADIATED)

| Channel<br>(No.) | Frequency<br>(MHz) | Radiated Output Power<br>(at 3m. distance)<br>(dBμV/m) | Calculated<br>E.I.R.P<br>(dBm) | Limit<br>(dBm) |
|------------------|--------------------|--------------------------------------------------------|--------------------------------|----------------|
| Low              | 2402               | 99.75                                                  | +4.52                          | 30             |
| Middle           | 2440               | 101.09                                                 | +5.86                          | 30             |
| High             | 2480               | 100.91                                                 | +5.68                          | 30             |

## 7.6 BAND-EDGE COMPLIANCE OF RF EMISSIONS

| TEST REQUIREMENT            |                                                                                                                                                                                                    |
|-----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Spectrum analyzer settings  |                                                                                                                                                                                                    |
| Span                        | Wide enough to capture the peak level of the emission operating on the channel closest to the band edge, as well as any modulation products which fall outside of the authorized band of operation |
| Resolution bandwidth (RBW)  | 1 MHz (100 kHz band-edge)                                                                                                                                                                          |
| Video bandwidth (VBW)       | 1 MHz (100 kHz band-edge)                                                                                                                                                                          |
| Sweep time (SWT)            | Auto                                                                                                                                                                                               |
| Detector function           | Peak                                                                                                                                                                                               |
| Trace                       | Max hold                                                                                                                                                                                           |
| Attenuator                  | /                                                                                                                                                                                                  |
| Deviation to test procedure | None                                                                                                                                                                                               |
| EUT operating condition     | #1                                                                                                                                                                                                 |
| Remark                      | None                                                                                                                                                                                               |
| Testing dates               | 2017-01-20 ÷ 2017-01-23                                                                                                                                                                            |

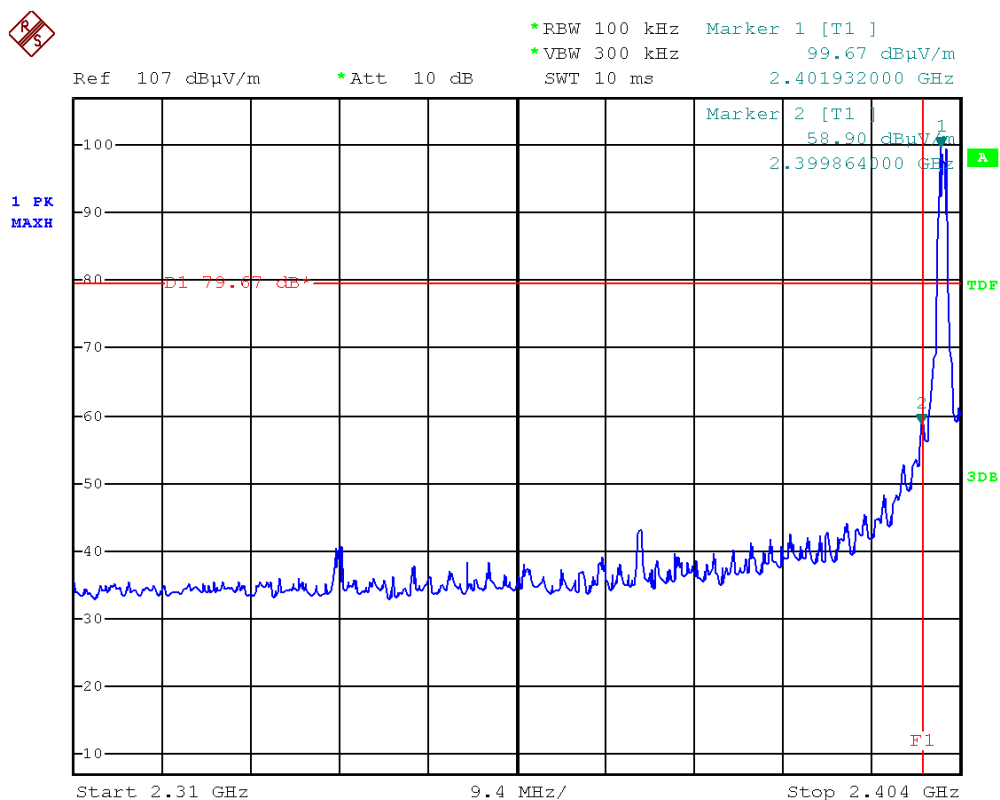
| TEST RESULT                                                                                                                                            |
|--------------------------------------------------------------------------------------------------------------------------------------------------------|
| The EUT meets the requirements of sections 15.247 (d)<br>All out of band spurious emissions are more 20 dB below the in band power of the fundamental. |

| LIMITS                         |
|--------------------------------|
| -20 dB below peak output power |

| TEST PROCEDURE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Only for measuring emissions up to 2 MHz removed from the band-edge the "delta" technique for Radiated emissions was used.<br>Delta technique: The transmitter output was connected to the spectrum analyser through a test fixture (radio frequency coupling device associated with the dedicated antenna of the equipment under test)<br>Once the trace is stabilized, by the marker the emission at the band edge (or on the highest modulation product outside of the band, if this level is greater than that at the band edge) was set.<br>The "n" by the marker-delta function and the marker-to-peak function the peak of the in-band emission was selected. The marker-delta value displayed was compared with the limit specified in this Section |

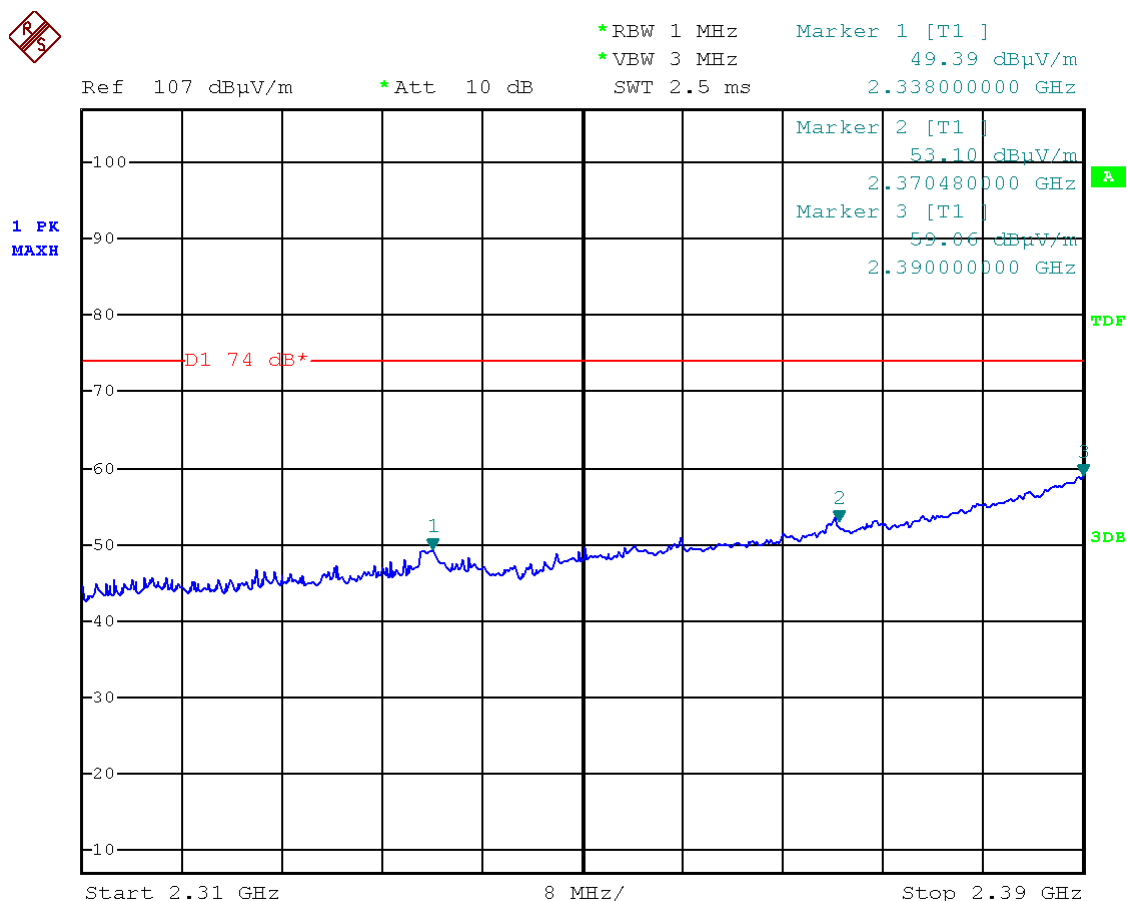
## Radiated Band-edge compliance - Lower band edge

### Peak Detector



## Spurious Emission in restricted band near 2400-2483.5 MHz

### Peak Detector



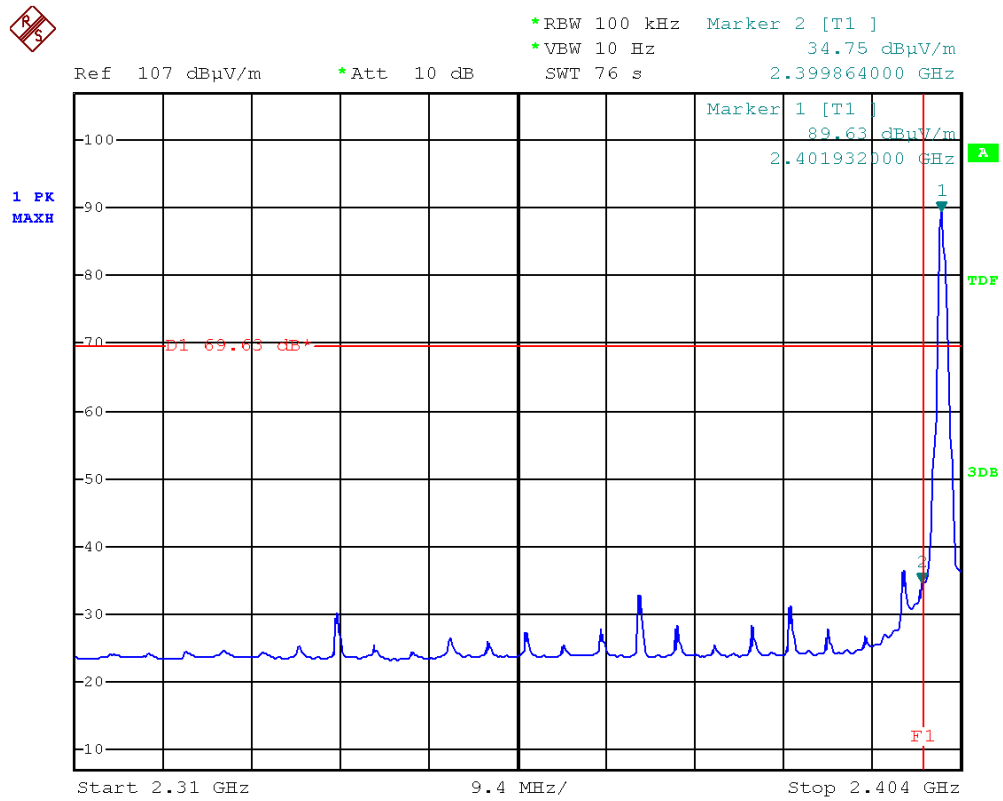
### PEAK RESULT (RBW=1MHz; VBW=3MHz)

| Frequency | Reading value | Antenna Factor | Cable Loss | Pre-Amp. Gain | Correcting reading | PK Limit | PK Limit | Margin |
|-----------|---------------|----------------|------------|---------------|--------------------|----------|----------|--------|
| (MHz)     | (dBμV)        | (dB3/m)        | (dB)       | (dB)          | (dBμV/m)           | (μV/m)   | (dBμV/m) | (dB)   |
| 2338.00   | 55.15         | 27.70          | 4.14       | -37.60        | <b>49.39</b>       | 5000     | 74.00    | 24.61  |
| 2370.48   | 58.86         | 27.70          | 4.14       | -37.60        | <b>53.10</b>       | 5000     | 74.00    | 20.90  |
| 2390.00   | 64.82         | 27.70          | 4.14       | -37.60        | <b>59.06</b>       | 5000     | 74.00    | 14.94  |

NOTE: The measures above are the worst case on 3 axes X Y and Z and both polarization.

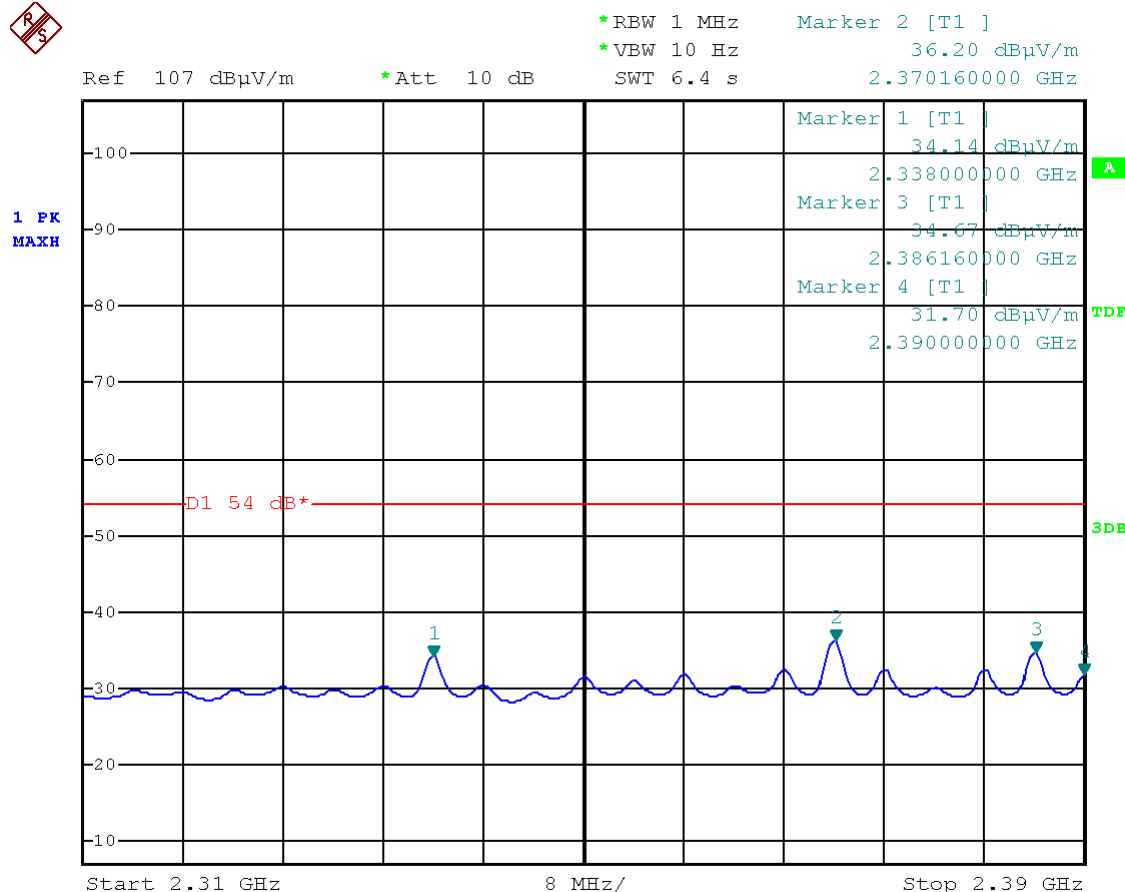
## Radiated Band-edge compliance - Lower band edge

### Average



## Spurious Emission in restricted band near 2400-2483.5 MHz

### Average Detector



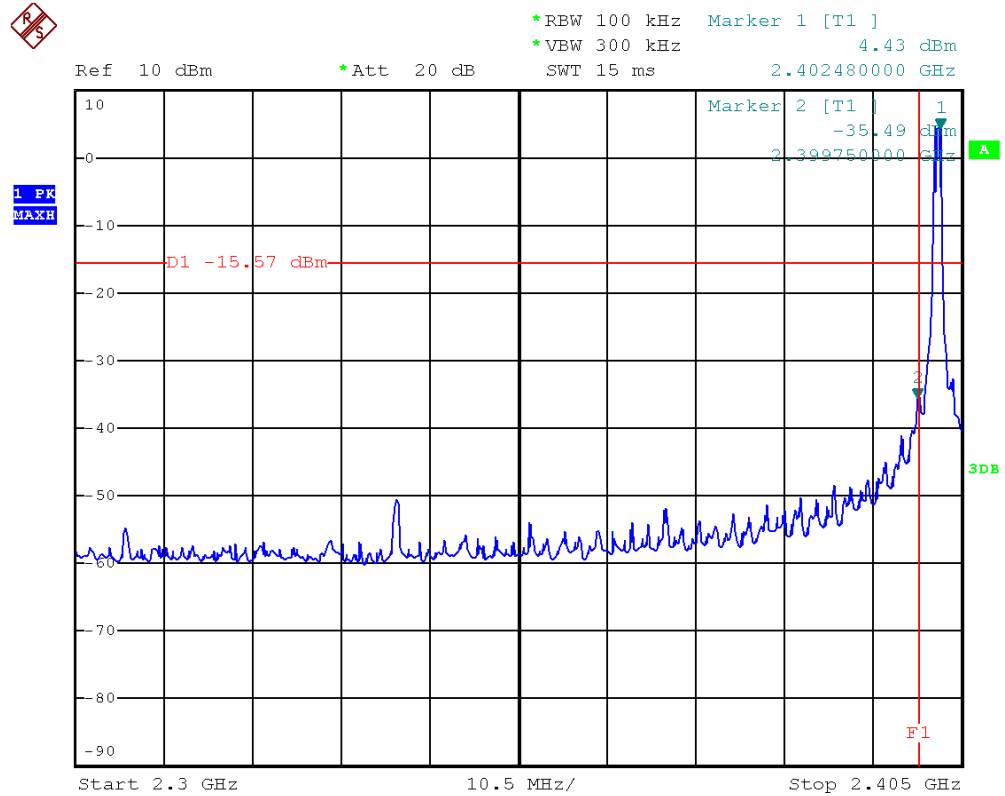
### AVERAGE RESULT (RBW=1MHz; VBW=10Hz)

| Frequency | Reading value | Antenna Factor | Cable Loss | Pre-Amp. Gain | Correcting reading | AV Limit | AV Limit | Margin |
|-----------|---------------|----------------|------------|---------------|--------------------|----------|----------|--------|
| (MHz)     | (dBμV)        | (dB3/m)        | (dB)       | (dB)          | (dBμV/m)           | (μV/m)   | (dBμV/m) | (dB)   |
| 2338.00   | 39.90         | 27.70          | 4.14       | -37.60        | <b>34.14</b>       | 500      | 54.00    | 19.86  |
| 2370.16   | 41.96         | 27.70          | 4.14       | -37.60        | <b>36.20</b>       | 500      | 54.00    | 17.80  |
| 2386.16   | 40.43         | 27.70          | 4.14       | -37.60        | <b>34.67</b>       | 500      | 54.00    | 19.33  |
| 2390.00   | 37.46         | 27.70          | 4.14       | -37.60        | <b>31.70</b>       | 500      | 54.00    | 22.30  |

NOTE: The measures above are the worst case on 3 axes X Y and Z and both polarization.

## Conducted Band-edge compliance - Lower band edge

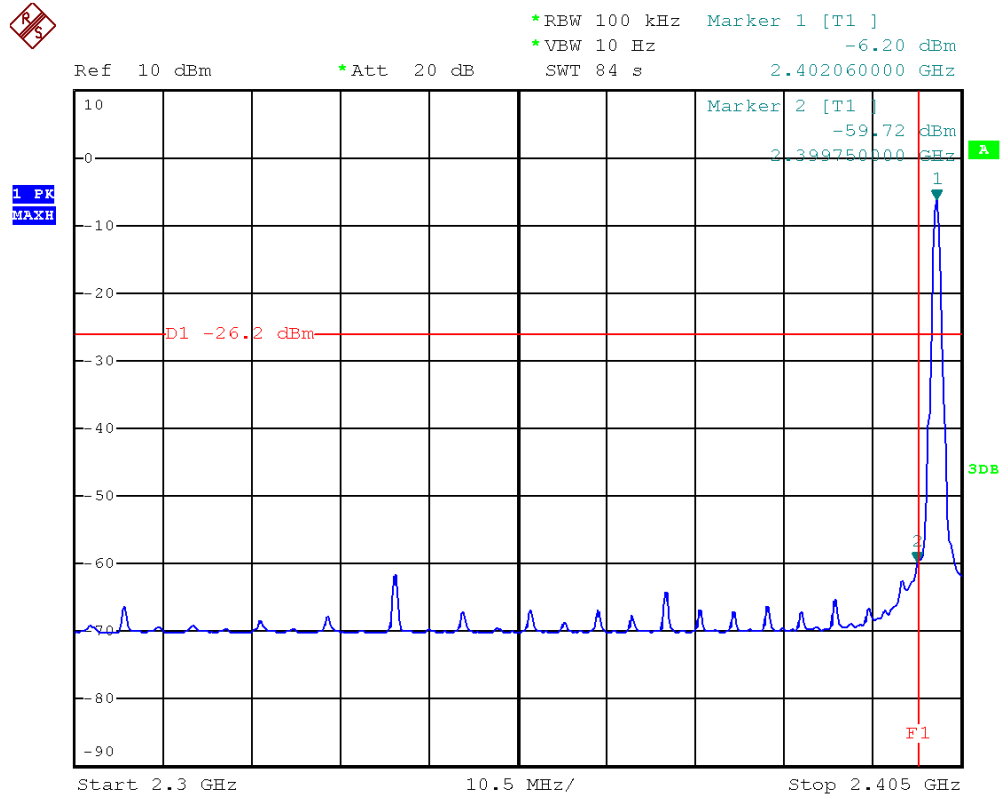
### Peak Detector





## Conducted Band-edge compliance - Lower band edge

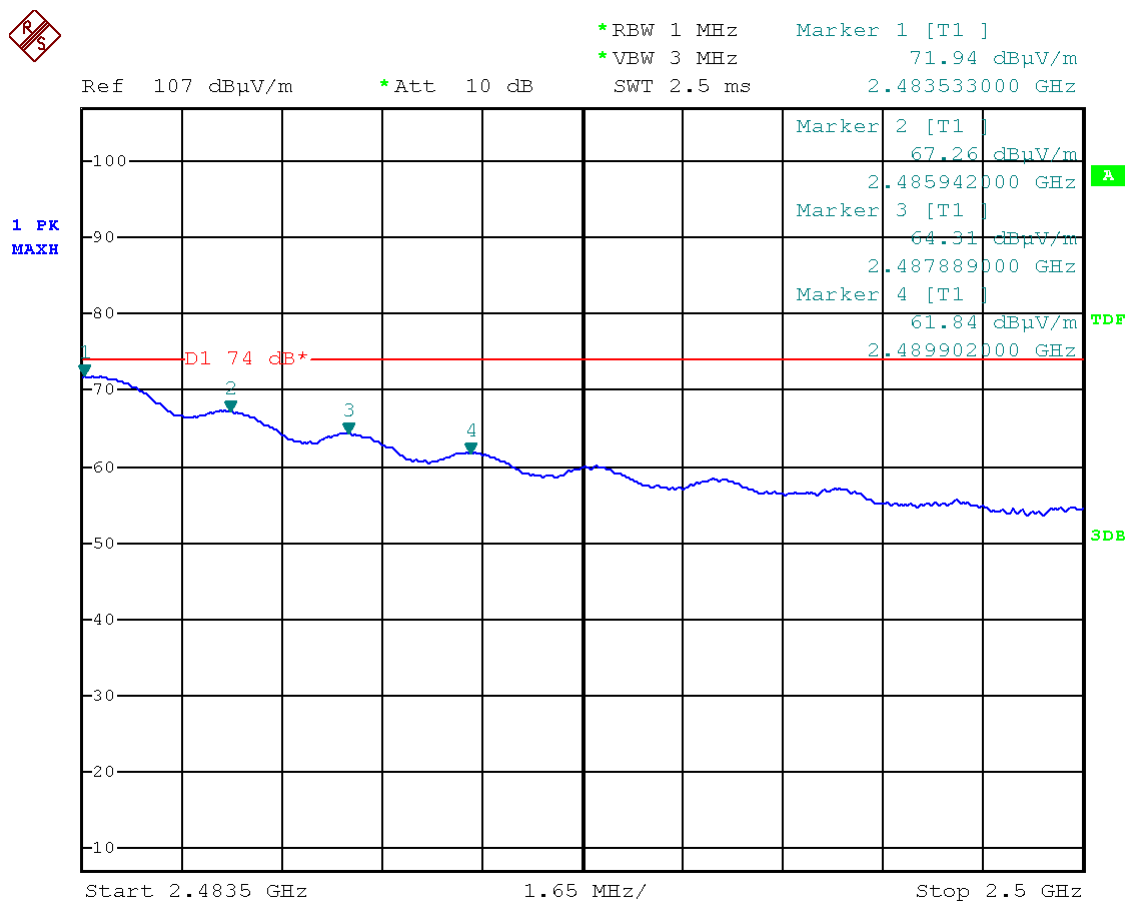
### Average





## Spurious Emission in restricted band near 2400-2483.5 MHz

### Peak Detector



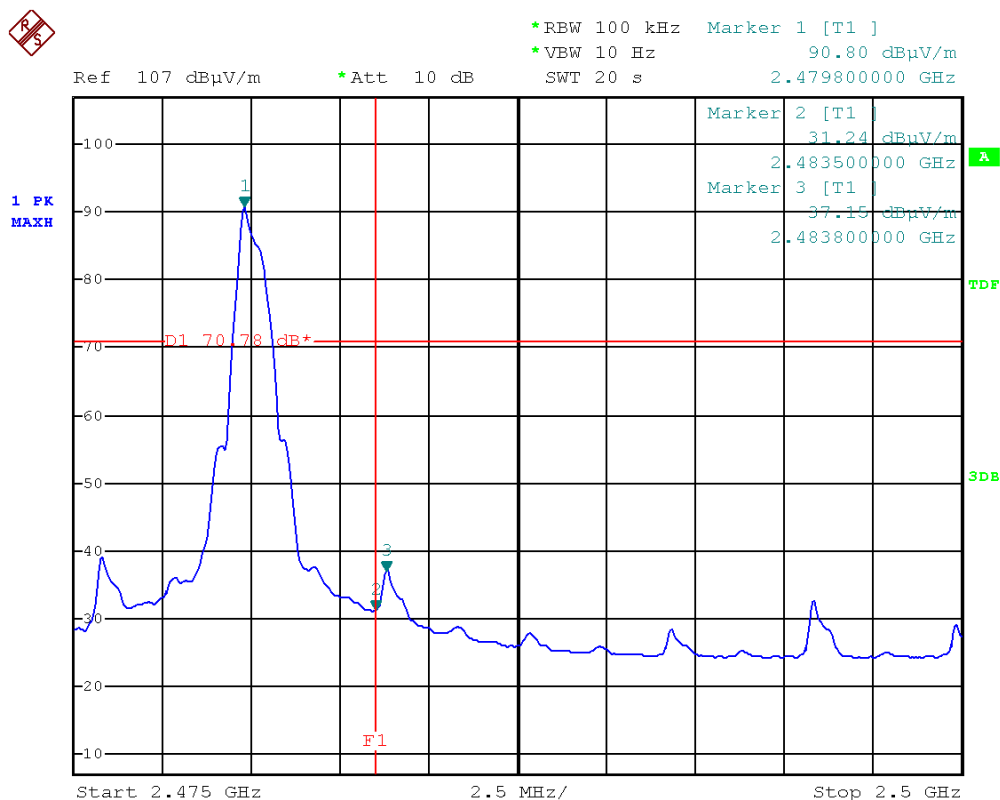
### PEAK RESULT (RBW=1MHz; VBW=3MHz)

| Frequency | Reading value | Antenna Factor | Cable Loss | Pre-Amp. Gain | Correcting reading | PK Limit | PK Limit | Margin |
|-----------|---------------|----------------|------------|---------------|--------------------|----------|----------|--------|
| (MHz)     | (dBμV)        | (dB3/m)        | (dB)       | (dB)          | (dBμV/m)           | (μV/m)   | (dBμV/m) | (dB)   |
| 2483.53   | 77.82         | 27.70          | 4.02       | -37.60        | <b>71.94</b>       | 5000     | 74.00    | 2.06   |
| 2485.94   | 73.14         | 27.70          | 4.02       | -37.60        | <b>67.26</b>       | 5000     | 74.00    | 6.74   |
| 2487.89   | 70.19         | 27.70          | 4.02       | -37.60        | <b>64.31</b>       | 5000     | 74.00    | 9.69   |
| 2489.90   | 67.72         | 27.70          | 4.02       | -37.60        | <b>61.84</b>       | 5000     | 74.00    | 12.16  |

NOTE: The measures above are the worst case on 3 axes X Y and Z and both polarization.

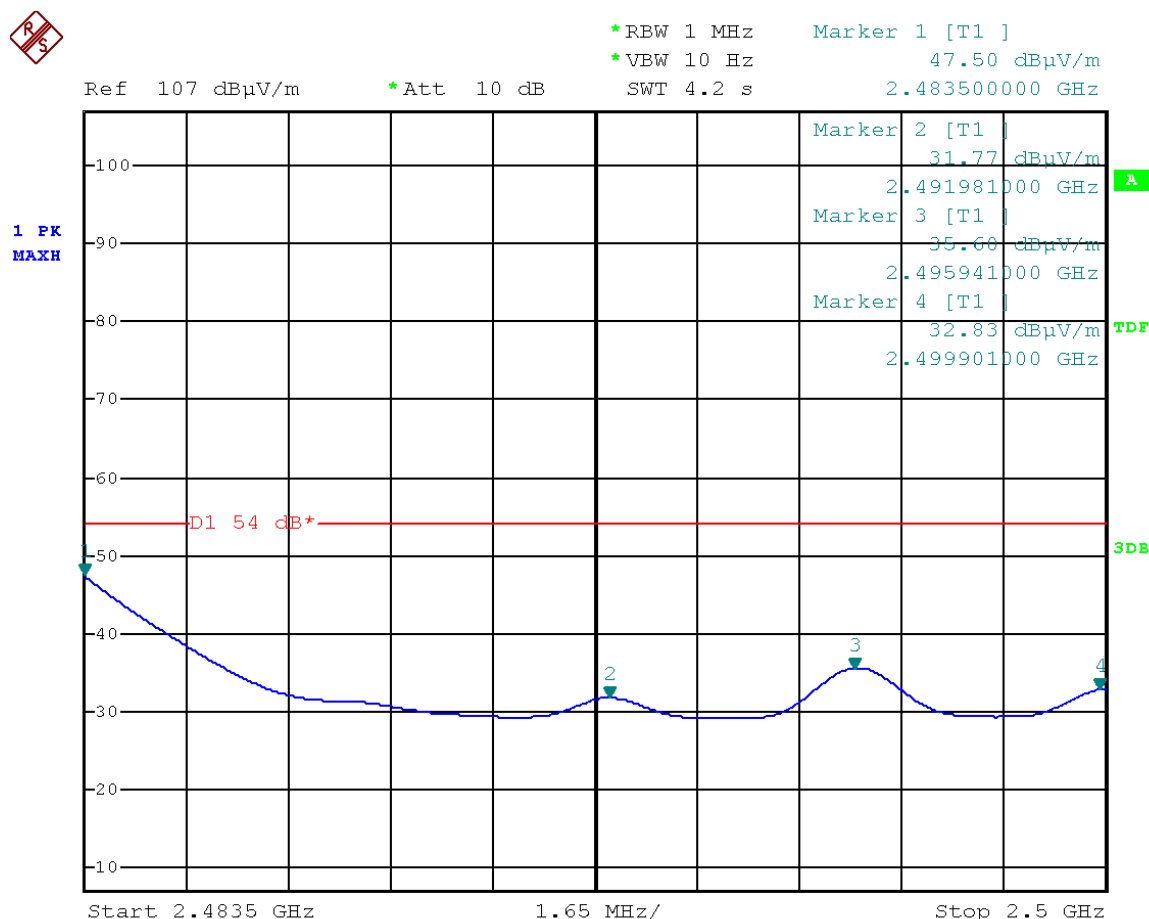
## Radiated Band-edge compliance - Higher band edge

### Average Detector



## Spurious Emission in restricted band near 2400-2483.5 MHz

### Average Detector



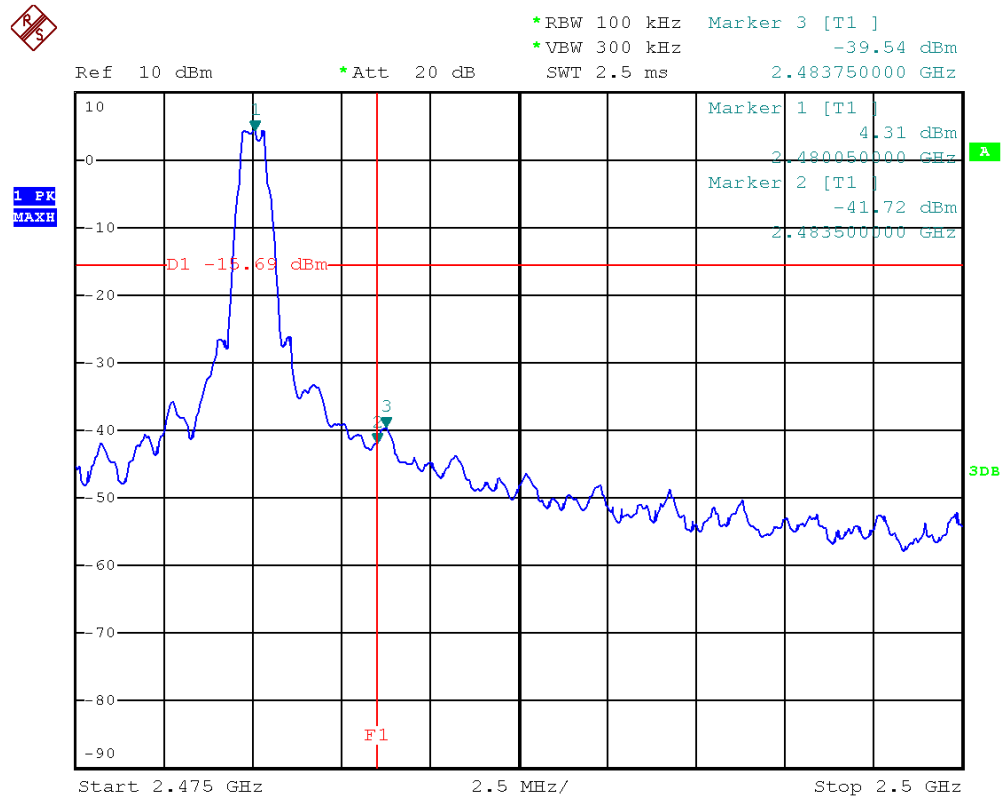
### AVERAGE RESULT (RBW=1MHz; VBW=10Hz)

| Frequency | Reading value | Antenna Factor | Cable Loss | Pre-Amp. Gain | Correcting reading | AV Limit | AV Limit | Margin |
|-----------|---------------|----------------|------------|---------------|--------------------|----------|----------|--------|
| (MHz)     | (dBμV)        | (dB3/m)        | (dB)       | (dB)          | (dBμV/m)           | (μV/m)   | (dBμV/m) | (dB)   |
| 2483.50   | 53.38         | 27.70          | 4.02       | -37.60        | <b>47.50</b>       | 500      | 54.00    | 6.50   |
| 2491.98   | 37.65         | 27.70          | 4.02       | -37.60        | <b>31.77</b>       | 500      | 54.00    | 22.23  |
| 2495.94   | 41.48         | 27.70          | 4.02       | -37.60        | <b>35.60</b>       | 500      | 54.00    | 18.40  |
| 2499.90   | 38.71         | 27.70          | 4.02       | -37.60        | <b>32.83</b>       | 500      | 54.00    | 21.17  |

NOTE: The measures above are the worst case on 3 axes X Y and Z and both polarization.

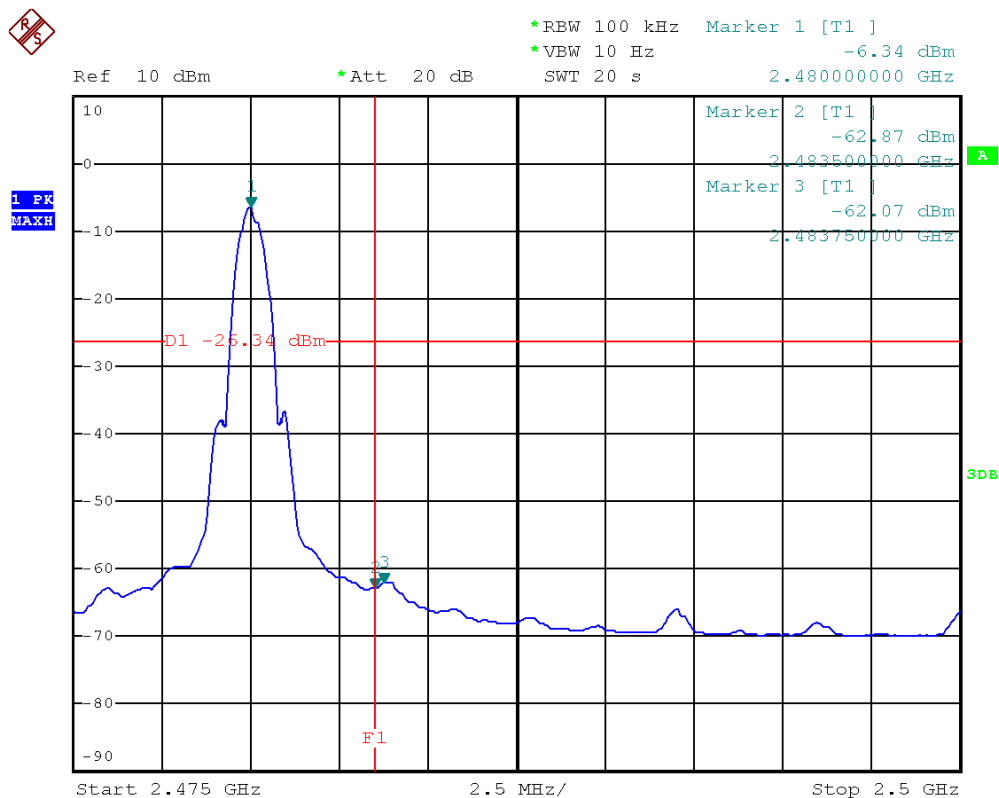
## Conducted Band-edge compliance - Higher band edge

### Peak Detector



## Conducted Band-edge compliance - Higher band edge

### Average Detector



## 7.7 OUT-OF-BAND EMISSIONS

| TEST REQUIREMENT                  |                                               |
|-----------------------------------|-----------------------------------------------|
| <b>Spectrum analyzer settings</b> |                                               |
| Span                              | /                                             |
| Resolution bandwidth (RBW)        | 100 kHz                                       |
| Video bandwidth (VBW)             | 300 kHz                                       |
| Sweep time (SWT)                  | as necessary to capture the entire dwell time |
| Detector function                 | Peak                                          |
| Trace                             | Max hold                                      |
| Attenuator                        | /                                             |
| Deviation to test procedure       | None                                          |
| EUT operating condition           | #1                                            |
| Remark                            | None                                          |
| Testing dates                     | 2017-01-24                                    |

| TEST PROCEDURE                                                                                                                                                                                                                                                                                                           |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>A spectrum analyzer is connected to the antenna port of the transmitter.</p> <p>The measure has been executed with the lowest transmit channel, the highest transmit channel and one located somewhere in the middle of the band.</p> <p>The measurement takes into account the loss generated by the used cable.</p> |

| LIMITS                         |
|--------------------------------|
| -20 dB below peak output power |

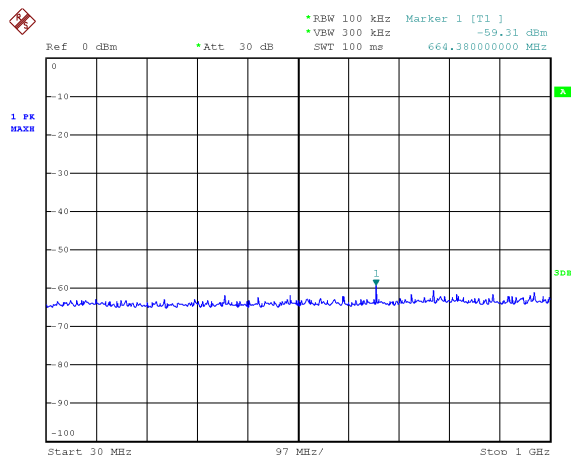
| TEST RESULT                                                                                                                                                       |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>The EUT meets the requirements of sections 15.247 (d)</p> <p>All out of band spurious emissions are more 20 dB below the in band power of the fundamental.</p> |



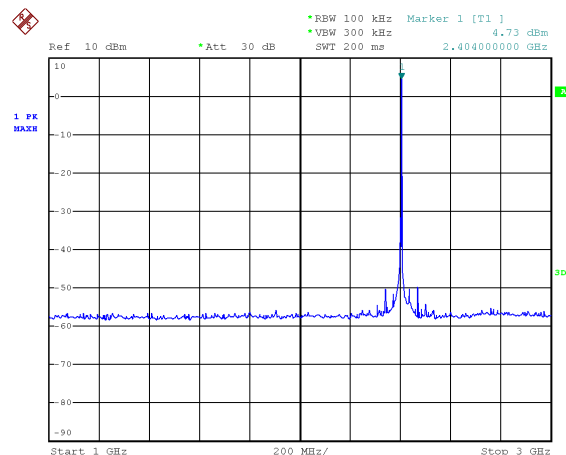
## MEASUREMENTS RESULTS - CONDUCTED

### LOWER CHANNEL 2402MHZ

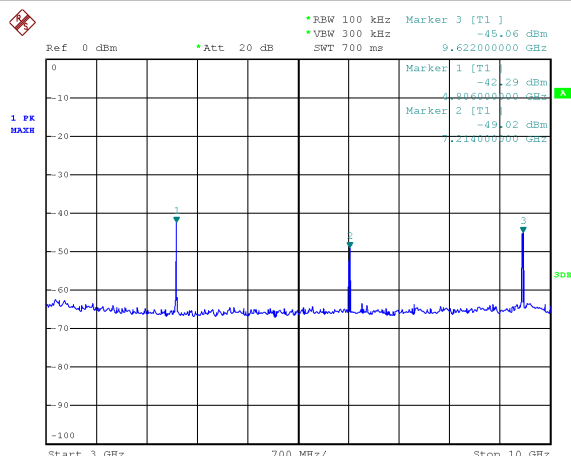
**Plot 1 (30÷1000MHz)**



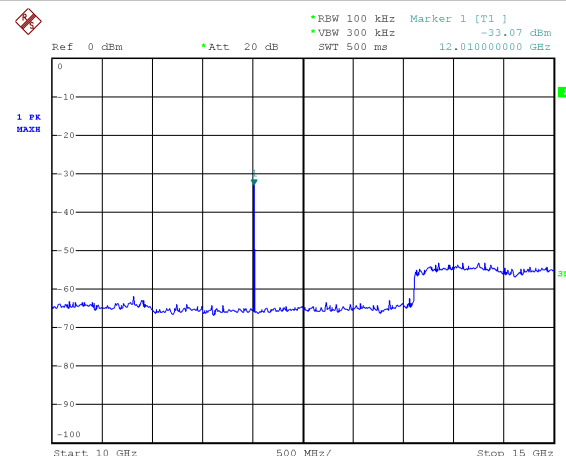
**Plot 2 (1÷3GHz)**



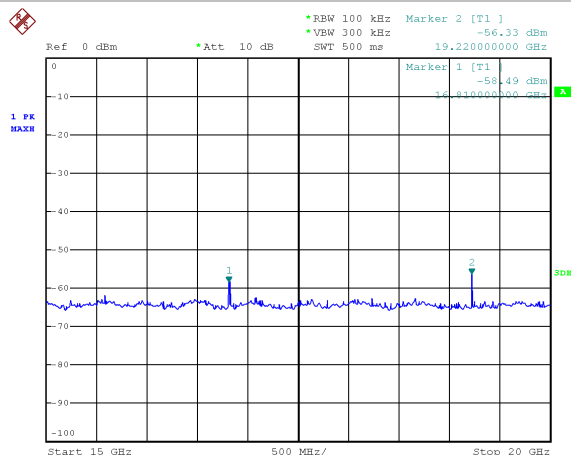
**Plot 3 (3÷10GHz)**



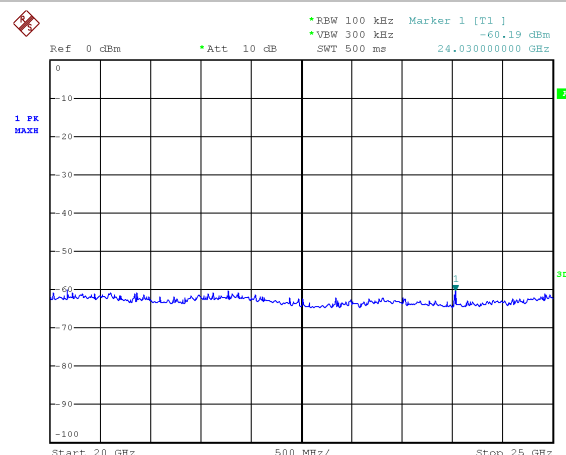
**Plot 4 (10÷15GHz)**



**Plot 5 (15÷20GHz)**

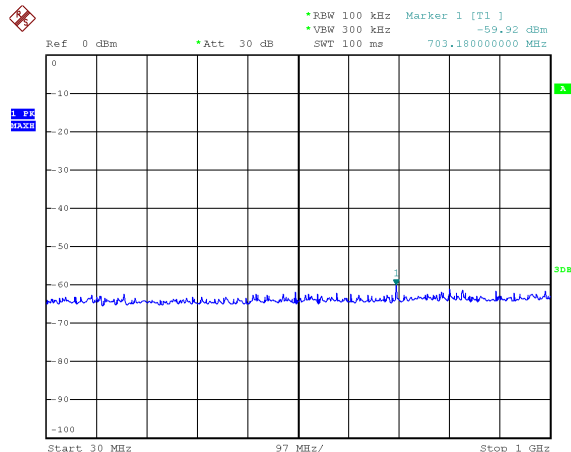


**Plot 6 (20÷25GHz)**

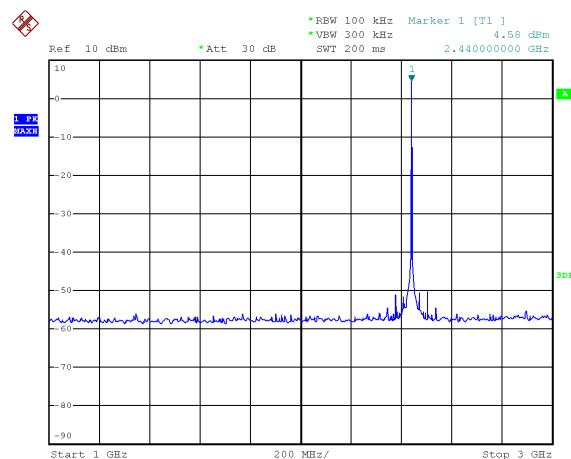


## MIDDLE CHANNEL 2440MHZ

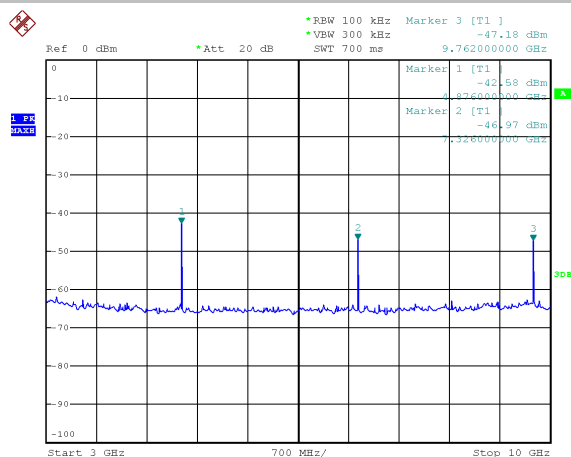
**Plot 1 (30÷1000MHz)**



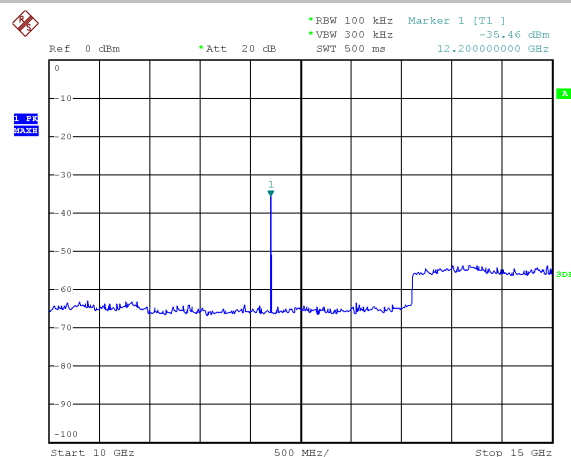
**Plot 2 (1÷3GHz)**



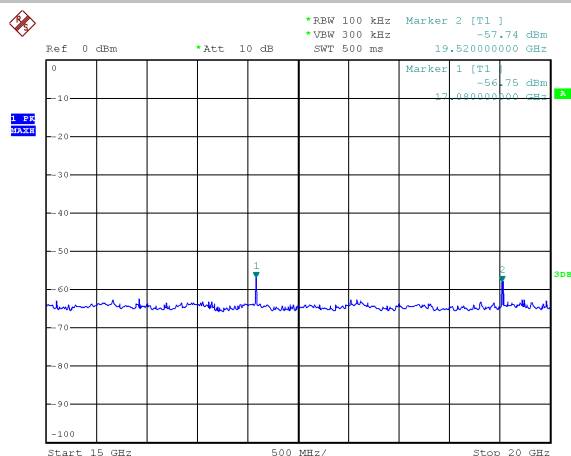
**Plot 3 (3÷10GHz)**



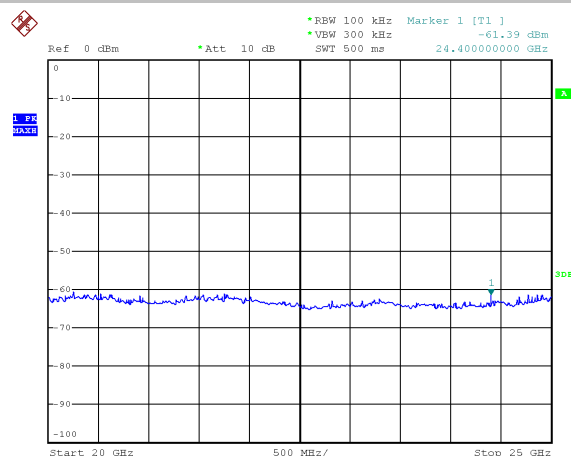
**Plot 4 (10÷15GHz)**



**Plot 5 (15÷20GHz)**

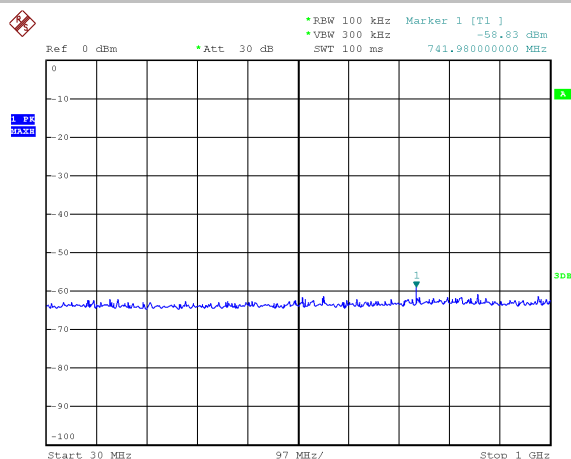


**Plot 6 (20÷25GHz)**

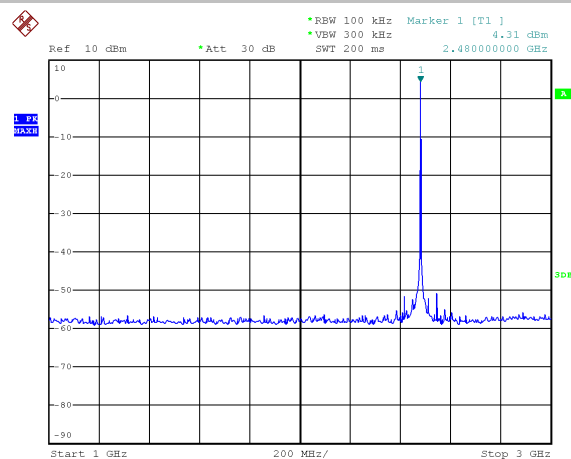


## HIGHER CHANNEL 2480MHZ

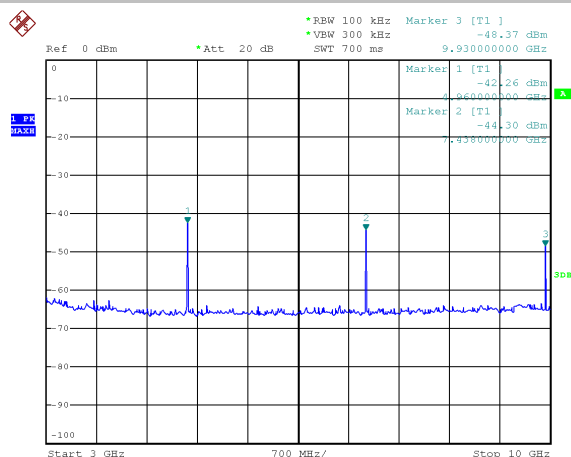
**Plot 1 (30÷1000MHz)**



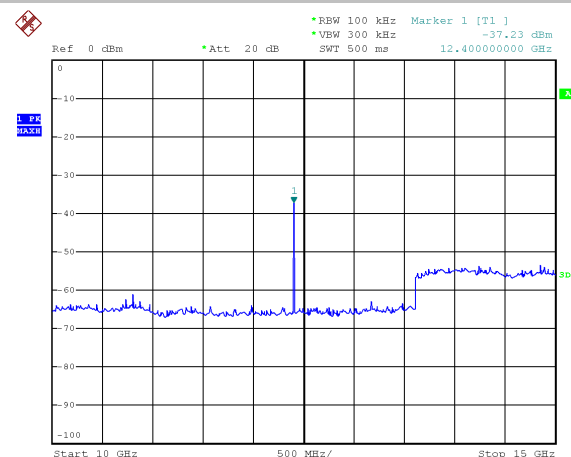
**Plot 2 (1÷3GHz)**



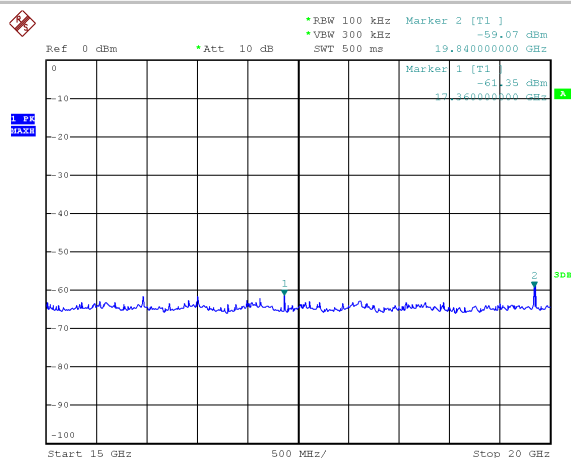
**Plot 3 (3÷10GHz)**



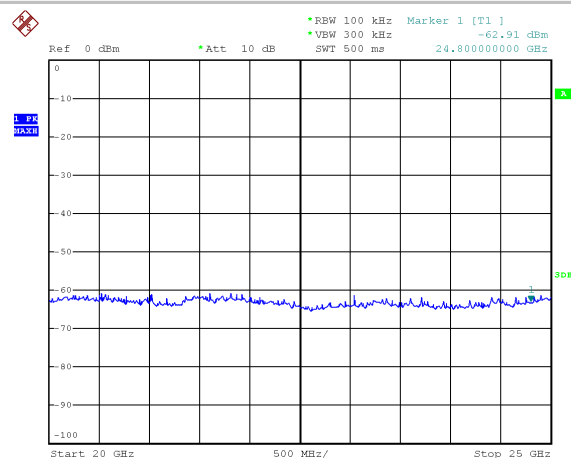
**Plot 4 (10÷15GHz)**



**Plot 5 (15÷20GHz)**



**Plot 6 (20÷25GHz)**



## 7.8 TRANSMITTER POWER SPECTRAL DENSITY

### TEST REQUIREMENT

#### Spectrum analyzer settings

|                             |            |
|-----------------------------|------------|
| Span                        | 10 MHz     |
| Resolution bandwidth (RBW)  | 3 kHz      |
| Video bandwidth (VBW)       | 10 kHz     |
| Sweep time (SWT)            | 500 s      |
| Detector function           | Peak       |
| Trace                       | Max hold   |
| Attenuator                  | /          |
| Deviation to test procedure | None       |
| EUT operating condition     | #1         |
| Remark                      | None       |
| Testing dates               | 2017-01-24 |

### TEST RESULT

The EUT meets the requirements of sections 15.247 (e)

### LIMITS

8 dBm in 3 kHz bandwidth.

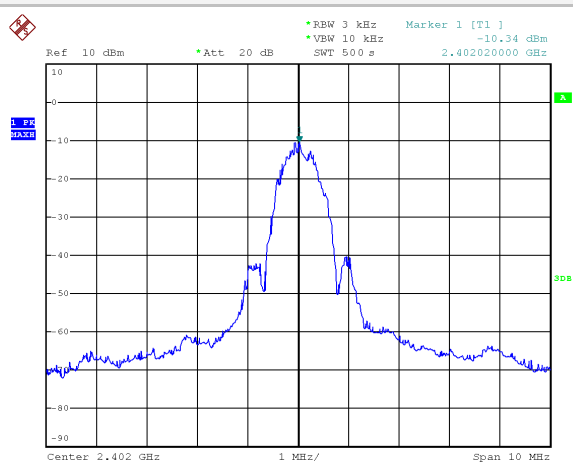
### TEST PROCEDURE

After trace stabilisation the marker shall be set on the signal peak. The indicated level is the power spectral density.

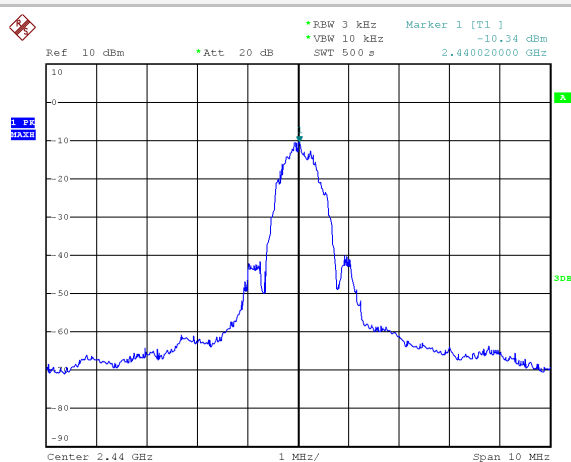
## MEASUREMENTS RESULTS

| Channel (No.) | Frequency (MHz) | Transmitter power on 3 kHz band (dBm) | Plot (No.) |
|---------------|-----------------|---------------------------------------|------------|
| Low           | 2.402           | -10.34                                | 1          |
| Middle        | 2.440           | -10.34                                | 2          |
| High          | 2.480           | -10.59                                | 3          |

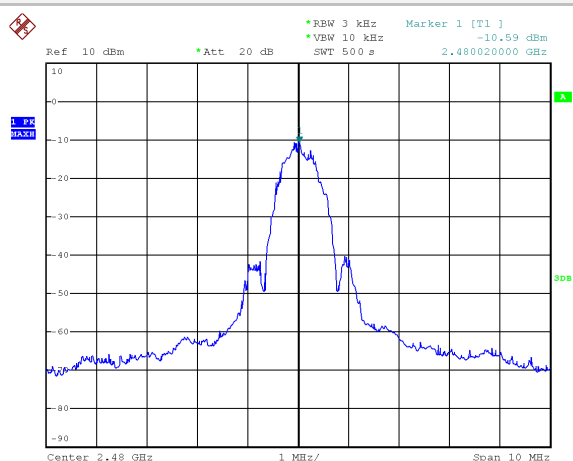
Plot 1



Plot 2



Plot 3



## 7.9 RF EXPOSURE EVALUATION

### TEST REQUIREMENT

Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess of the Commission's guidelines § 1.1307(b)(1).

|                                                        |                                                                                                                                                                                                                        |
|--------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| EUT classification (fixed, mobile or portable devices) | Portable according to § 2.1093(b) of this Chapter                                                                                                                                                                      |
| LIMITS                                                 | According to § 2.1093 of this Chapter, by means of the following guidelines: OET Mobile and Portable Devices RF Exposure Procedures and Equipment Authorization Policies (447498 D01 General RF Exposure Guidance v06) |
| Testing dates                                          | 2017-01-24                                                                                                                                                                                                             |

### SAR Test Exclusion Thresholds for 100 MHz – 6 GHz and ≤ 50 mm

447498 D01 General RF Exposure Guidance v06 – Appendix A

| MHz  | 5  | 10 | 15  | 20  | 25  | mm                                |
|------|----|----|-----|-----|-----|-----------------------------------|
| 150  | 39 | 77 | 116 | 155 | 194 | SAR Test Exclusion Threshold (mW) |
| 300  | 27 | 55 | 82  | 110 | 137 |                                   |
| 450  | 22 | 45 | 67  | 89  | 112 |                                   |
| 835  | 16 | 33 | 49  | 66  | 82  |                                   |
| 900  | 16 | 32 | 47  | 63  | 79  |                                   |
| 1500 | 12 | 24 | 37  | 49  | 61  |                                   |
| 1900 | 11 | 22 | 33  | 44  | 54  |                                   |
| 2450 | 10 | 19 | 29  | 38  | 48  |                                   |
| 3600 | 8  | 16 | 24  | 32  | 40  |                                   |
| 5200 | 7  | 13 | 20  | 26  | 33  |                                   |
| 5400 | 6  | 13 | 19  | 26  | 32  |                                   |
| 5800 | 6  | 12 | 19  | 25  | 31  |                                   |

The test separation distances  $\geq 5$  mm is applied to determine SAR test exclusion.

# SAR Test Exclusion Thresholds for 100 MHz – 6 GHz and ≤ 50 mm

447498 D01 General RF Exposure Guidance v06 – Appendix A

| Channel No. | Frequency (MHz) | Conducted Output Power | E.I.R.P. | Distance | $\frac{\text{max. power (mW)}}{\text{min. distance (mm)}} \times \sqrt{f(\text{GHz})}$ | Limits                                                       |
|-------------|-----------------|------------------------|----------|----------|----------------------------------------------------------------------------------------|--------------------------------------------------------------|
|             |                 | (dBm)                  | (mW)     | (mm)     |                                                                                        |                                                              |
| Lowest      | 2402            | 5.24                   | 3.34     | 5        | 1.035                                                                                  | ≤ 3.0 for 1-g head SAR<br>or<br>≤ 7.5 for 10-g extremity SAR |

| Channel No. | Frequency (MHz) | Conducted Output Power | E.I.R.P. | Distance | $\frac{\text{max. power (mW)}}{\text{min. distance (mm)}} \times \sqrt{f(\text{GHz})}$ | Limits                                                       |
|-------------|-----------------|------------------------|----------|----------|----------------------------------------------------------------------------------------|--------------------------------------------------------------|
|             |                 | (dBm)                  | (mW)     | (mm)     |                                                                                        |                                                              |
| Middle      | 2440            | 5.30                   | 3.39     | 5        | 1.059                                                                                  | ≤ 3.0 for 1-g head SAR<br>or<br>≤ 7.5 for 10-g extremity SAR |

| Channel No. | Frequency (MHz) | Conducted Output Power | E.I.R.P. | Distance | $\frac{\text{max. power (mW)}}{\text{min. distance (mm)}} \times \sqrt{f(\text{GHz})}$ | Limits                                                       |
|-------------|-----------------|------------------------|----------|----------|----------------------------------------------------------------------------------------|--------------------------------------------------------------|
|             |                 | (dBm)                  | (mW)     | (mm)     |                                                                                        |                                                              |
| Highest     | 2480            | 5.06                   | 3.20     | 5        | 1.007                                                                                  | ≤ 3.0 for 1-g head SAR<br>or<br>≤ 7.5 for 10-g extremity SAR |

## TEST RESULT

This value is less than the low threshold limit. No SAR test is required.

## 8. MEASUREMENTS AND TESTS UNCERTAINTY

Unless otherwise stated the uncertainties for the tests and measurements are evaluated in according to IMQ Operational Instruction IO-LAB-001 and IO-LAB-004. and requirement of NIST Technical Note 1297 and NIS 81: 1994 "The Treatment of Uncertainty in EMC Measurements"

The expanded uncertainty was calculated for all measurements and tests listed in this test report according to CISPR 16-4-2 "Specification for radio disturbance and immunity measuring apparatus and methods – Part 4-2: Uncertainty in EMC Measurements", with UKAS document LAB 34 and is documented in the quality system accordance to ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device

Internal Procedure PI-037 ensures that the requirements for traceability of calibrations, of all test equipment requiring calibration, and calibration intervals are met.

| Methods/Standard       | Parameter                                          | Expanded Uncertainty | Unit | Confidence level | Coverage Factor | Degree of freedom |
|------------------------|----------------------------------------------------|----------------------|------|------------------|-----------------|-------------------|
| Continuous disturbance | QP detector<br>9 – 150 kHz                         | 2,47                 | dB   | 95%              | 2,00            | 25                |
|                        | QP detector<br>150 k – 30 MHz                      | 2,61                 | dB   | 95%              | 2,00            | 26                |
|                        | QP detector using<br>Voltage Probe                 | 2,45                 | dB   | 95%              | 2,00            | 26                |
|                        | QP detector using<br>ISN                           | 3,15                 | dB   | 95%              | 2,00            | > 60              |
|                        | QP detector using<br>Current Probe                 | 2,15                 | dB   | 95%              | 2,00            | 35                |
| Radiated disturbance   | QP detector<br>(30 MHz - 100 MHz) H polarization   | 4,33                 | dB   | 95%              | 2,00            | > 60              |
|                        | QP detector<br>(30 MHz - 100 MHz) V polarization   | 4,22                 | dB   | 95%              | 2,00            | > 60              |
|                        | QP detector<br>(100 MHz - 200 MHz) H polarization  | 3,40                 | dB   | 95%              | 2,00            | > 60              |
|                        | QP detector<br>(100 MHz - 200 MHz) V polarization  | 4,76                 | dB   | 95%              | 2,00            | > 60              |
|                        | QP detector<br>(200 MHz - 1000 MHz) H polarization | 3,91                 | dB   | 95%              | 2,00            | > 60              |
|                        | QP detector<br>(200 MHz - 1000 MHz) V polarization | 3,82                 | dB   | 95%              | 2,00            | > 60              |
|                        | PK detector<br>1-6 GHz                             | 4,77                 | dB   | 95%              | 2,00            | > 60              |
|                        | PK detector<br>6 – 18 GHz                          | 5,14                 | dB   | 95%              | 2,00            | > 60              |



## 9. LIST OF MEASURING EQUIPMENT AND CALIBRATION INFORMATION

| IMQ Serial Number | Instrument                     | Manufacturer    | Type            | Last Cal. | Next Cal. | Calibration Company |
|-------------------|--------------------------------|-----------------|-----------------|-----------|-----------|---------------------|
| P01709            | Shielded semi-anechoic chamber | SIDT            | /               | 03-15     | 03-17     | IMQ                 |
| P02486            | Turntable controller unit      | FRANKONIA       | FCTAM01         | /         | /         | /                   |
| P02488            | Mast antenna                   | FRANKONIA       | FAM4            | /         | /         | /                   |
| S05562            | EMI Receiver                   | ROHDE & SCHWARZ | ESU 8           | 01-17     | 01-18     | Rohde & Schwarz     |
| S03631            | LISN 1 PHASE                   | ROHDE & SCHWARZ | ENV216          | 03-16     | 03-17     | I.N.R.I.M.          |
| S02508            | Loop Antenna                   | ROHDE & SCHWARZ | HFH2-Z2         | 01-15     | 01-17     | SEIBERSDORF         |
| S06463            | Log antenna                    | ARA             | VULB9160        | 04-16     | 04-19     | SEIBERSDORF         |
| S04272            | Horn antenna                   | SCHWARZBECK     | BBHA 9120D      | 07-14     | 07-17     | NPL                 |
| S03668            | Horn antenna                   | SCHWARZBECK     | BBHA 9170       | 08-13     | 02-17     | Liberty Labs        |
| S03629            | Spectrum Analyzer              | Rohde & Schwarz | FSP40           | 04-16     | 04-17     | Rohde & Schwarz     |
| S03542            | Preamplifier                   | Hewlett Packard | HP 8449B        | 04-16     | 04-18     | IMQ                 |
| S06764            | Preamplifier                   | SCHWARZBECK     | BBV 9721        | 01-16     | 01-17     | Rohde & Schwarz     |
| W-00199/E         | Software                       | ROHDE & SCHWARZ | EMC32 Ver. 6.30 | /         | /         | /                   |
| H-00165           | PC                             | /               | /               | /         | /         | /                   |

**END OF TEST REPORT**