



# FCC PART 15C TEST REPORT No. 2013EEB00520-BT(BLE)

For

**BDE Technology Co., Ltd.**

**BDE Bluetooth 4.0 Single Mode HCI Module**

**Model Name: BDE-BLEM101A**

**Marketing Name: BDE-BLEM101A**

With

**Hardware Version: 1.1**

**Software Version: 08**

**FCC ID: 2ABRUBDLEM101A**

**Issued Date: Feb 27<sup>th</sup>, 2014**

**Test Laboratory:**

**FCC 2.948 Listed: No.310359**

**IC O.A.T.S listed: No.6629C-1**

**Note:**

The test results in this test report relate only to the devices specified in this report. This report shall not be reproduced except in full without the written approval of TMC Beijing.

TMC Beijing, Telecommunication Metrology Center of Ministry of Industry and Information Technology

No. 52, Huayuan Bei Road, Haidian District, Beijing, P. R. China 100191

Tel:+86(0)10-62304633-2678 , Fax:+86(0)10-62304633-2504 Email:welcome@emcite.com. www.emcite.com

## **CONTENTS**

|                                          |                                                                      |           |
|------------------------------------------|----------------------------------------------------------------------|-----------|
| <b>1.</b>                                | <b>TEST LABORATORY .....</b>                                         | <b>4</b>  |
| 1.1.                                     | TESTING LOCATION .....                                               | 4         |
| 1.2.                                     | TESTING ENVIRONMENT.....                                             | 4         |
| 1.3.                                     | PROJECT DATA .....                                                   | 4         |
| 1.4.                                     | SIGNATURE .....                                                      | 4         |
| <b>2.</b>                                | <b>CLIENT INFORMATION.....</b>                                       | <b>5</b>  |
| 2.1.                                     | APPLICANT INFORMATION .....                                          | 5         |
| 2.2.                                     | MANUFACTURER INFORMATION .....                                       | 5         |
| <b>3.</b>                                | <b>EQUIPMENT UNDER TEST (EUT) AND ANCILLARY EQUIPMENT (AE) .....</b> | <b>6</b>  |
| 3.1.                                     | ABOUT EUT .....                                                      | 6         |
| 3.2.                                     | INTERNAL IDENTIFICATION OF EUT USED DURING THE TEST .....            | 6         |
| 3.3.                                     | INTERNAL IDENTIFICATION OF AE USED DURING THE TEST .....             | 6         |
| <b>4.</b>                                | <b>REFERENCE DOCUMENTS .....</b>                                     | <b>7</b>  |
| 4.1.                                     | DOCUMENTS SUPPLIED BY APPLICANT .....                                | 7         |
| 4.2.                                     | REFERENCE DOCUMENTS FOR TESTING.....                                 | 7         |
| <b>5.</b>                                | <b>LABORATORY ENVIRONMENT .....</b>                                  | <b>8</b>  |
| <b>6.</b>                                | <b>SUMMARY OF TEST RESULTS .....</b>                                 | <b>9</b>  |
| 6.1.                                     | SUMMARY OF TEST RESULTS.....                                         | 9         |
| 6.2.                                     | STATEMENTS.....                                                      | 9         |
| 6.3.                                     | TERMS USED IN THE RESULT TABLE .....                                 | 9         |
| <b>7.</b>                                | <b>TEST EQUIPMENTS UTILIZED .....</b>                                | <b>10</b> |
| <b>ANNEX A: EUT PHOTOGRAPH .....</b>     |                                                                      | <b>11</b> |
| <b>ANNEX B: MEASUREMENT RESULTS.....</b> |                                                                      | <b>12</b> |
| B.0                                      | ANTENNA REQUIREMENT .....                                            | 12        |
| B.1                                      | MAXIMUM PEAK OUTPUT POWER .....                                      | 13        |
| B.2                                      | PEAK POWER SPECTRAL DENSITY .....                                    | 13        |
| B.3                                      | OCCUPIED 6dB BANDWIDTH .....                                         | 13        |
| B.4                                      | BAND EDGES COMPLIANCE .....                                          | 14        |
| B.5                                      | TRANSMITTER SPURIOUS EMISSION.....                                   | 14        |
| B.5.1                                    | TRANSMITTER SPURIOUS EMISSION - CONDUCTED .....                      | 14        |
| B.5.2                                    | TRANSMITTER SPURIOUS EMISSION - RADIATED .....                       | 15        |
| B.6                                      | AC POWERLINE CONDUCTED EMISSION .....                                | 17        |
| <b>ANNEX C: TEST FIGURE LIST .....</b>   |                                                                      | <b>18</b> |
| FIG. 1                                   | MAXIMUM PEAK OUTPUT POWER (CH 0).....                                | 18        |

|         |                                                                |    |
|---------|----------------------------------------------------------------|----|
| FIG. 2  | MAXIMUM PEAK OUTPUT POWER (CH 19).....                         | 18 |
| FIG. 3  | MAXIMUM PEAK OUTPUT POWER (CH 39).....                         | 19 |
| FIG. 4  | POWER SPECTRAL DENSITY (CH 0) .....                            | 19 |
| FIG. 5  | POWER SPECTRAL DENSITY (CH 19) .....                           | 20 |
| FIG. 6  | POWER SPECTRAL DENSITY (CH 39) .....                           | 20 |
| FIG. 7  | OCCUPIED 6dB BANDWIDTH (CH 0).....                             | 21 |
| FIG. 8  | OCCUPIED 6dB BANDWIDTH (CH 19).....                            | 21 |
| FIG. 9  | OCCUPIED 6dB BANDWIDTH (CH 39).....                            | 22 |
| FIG. 10 | BAND EDGES (CH 0) .....                                        | 22 |
| FIG. 11 | BAND EDGES (CH 39) .....                                       | 23 |
| FIG. 12 | CONDUCTED SPURIOUS EMISSION (CH0, CENTER FREQUENCY) .....      | 23 |
| FIG. 13 | CONDUCTED SPURIOUS EMISSION (CH0, 30 MHz-3 GHz).....           | 24 |
| FIG. 14 | CONDUCTED SPURIOUS EMISSION (CH0, 3 GHz-18 GHz) .....          | 24 |
| FIG. 15 | CONDUCTED SPURIOUS EMISSION (CH19, CENTER FREQUENCY) .....     | 25 |
| FIG. 16 | CONDUCTED SPURIOUS EMISSION (CH19, 30 MHz-3 GHz).....          | 25 |
| FIG. 17 | CONDUCTED SPURIOUS EMISSION (CH19, 3 GHz-18 GHz) .....         | 26 |
| FIG. 18 | CONDUCTED SPURIOUS EMISSION (CH39, CENTER FREQUENCY) .....     | 26 |
| FIG. 19 | CONDUCTED SPURIOUS EMISSION (CH39, 30 MHz-3 GHz).....          | 27 |
| FIG. 20 | CONDUCTED SPURIOUS EMISSION (CH39, 3 GHz-18 GHz) .....         | 27 |
| FIG. 21 | CONDUCTED SPURIOUS EMISSION (ALL CHANNELS, 18 GHz-26 GHz)..... | 28 |
| FIG. 22 | RADIATED SPURIOUS EMISSION (CH0, 30 MHz-1 GHz) .....           | 28 |
| FIG. 23 | RADIATED SPURIOUS EMISSION (CH0, 1 GHz-3 GHz) .....            | 29 |
| FIG. 24 | RADIATED SPURIOUS EMISSION (CH0, 3 GHz-18 GHz) .....           | 29 |
| FIG. 25 | RADIATED SPURIOUS EMISSION (CH19, 30 MHz-1 GHz) .....          | 30 |
| FIG. 26 | RADIATED SPURIOUS EMISSION (CH19, 1 GHz-3 GHz) .....           | 30 |
| FIG. 27 | RADIATED SPURIOUS EMISSION (CH19, 3 GHz-18 GHz) .....          | 31 |
| FIG. 28 | RADIATED SPURIOUS EMISSION (CH39, 30 MHz-1 GHz) .....          | 31 |
| FIG. 29 | RADIATED SPURIOUS EMISSION (CH39, 1 GHz-3 GHz) .....           | 32 |
| FIG. 30 | RADIATED SPURIOUS EMISSION (CH39, 3 GHz-18 GHz) .....          | 32 |
| FIG. 31 | RADIATED EMISSION: 18 GHz - 26 GHz .....                       | 33 |
| FIG. 32 | AC POWER LINE CONDUCTED EMISSION (TRAFFIC) .....               | 34 |
| FIG. 33 | AC POWER LINE CONDUCTED EMISSION (IDLE).....                   | 35 |

## 1. Test Laboratory

### 1.1. Testing Location

Company Name: TMC Shenzhen, Telecommunication Metrology Center of MIIT  
Address: No. 12 Building, Shangsha Innovation and Technology Park, Futian District, Shenzhen, P. R. China  
Postal Code: 518048  
Telephone: +86(0)755-33322000  
Fax: +86(0)755-33322001

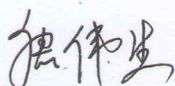
### 1.2. Testing Environment

Normal Temperature: 15°C-30°C  
Extreme Temperature: -20°C/+55°C  
Relative Humidity: 30%-60%

### 1.3. Project data

Project Leader: Zhang Bojun  
Test Engineer: Tang Weisheng  
Testing Start Date: Oct 16<sup>th</sup>, 2013  
Testing End Date: Nov 26<sup>th</sup>, 2013

### 1.4. Signature



---

Tang Weisheng  
(Prepared this test report)



---

Zhang Bojun  
(Reviewed this test report)



---

Lu Minniu  
Director of the laboratory  
(Approved this test report)

## **2. Client Information**

### **2.1. Applicant Information**

Company Name: BDE Technology Co., Ltd.  
Address /Post: Innovation Building C1-1105, 182 Science Ave, Science City  
Guangzhou, P.R.China  
City: Guangzhou  
Postal Code: 510663  
Country: China  
Contact Persons: Evan WU  
E-mail: xwu@bdecomm.com  
Telephone: (+86)20-28065335  
Fax: (+86)20-28065338

### **2.2. Manufacturer Information**

Company Name: BDE Technology Co., Ltd.  
Address /Post: Innovation Building C1-1105, 182 Science Ave, Science City  
Guangzhou, P.R.China  
City: Guangzhou  
Postal Code: 510663  
Country: China  
Contact Persons: Evan WU  
E-mail: xwu@bdecomm.com  
Telephone: (+86)20-28065335  
Fax: (+86)20-28065338

### **3. Equipment Under Test (EUT) and Ancillary Equipment (AE)**

#### **3.1. About EUT**

|                    |                                          |
|--------------------|------------------------------------------|
| Description        | BDE Bluetooth 4.0 Single Mode HCI Module |
| Model Name         | BDE-BLEM101A                             |
| Market Name        | BDE-BLEM101A                             |
| Type of Modulation | GFSK                                     |
| FCC ID             | 2ABRUBDLEM101A                           |

Note: Photographs of EUT are shown in ANNEX A of this test report.

#### **3.2. Internal Identification of EUT used during the test**

| <b>EUT ID*</b> | <b>IMEI</b> | <b>HW Version</b> | <b>SW Version</b> |
|----------------|-------------|-------------------|-------------------|
| EUT1           | /           | 1.1               | 08                |

#### **3.3. Internal Identification of AE used during the test**

| <b>AE ID*</b> | <b>Description</b> | <b>Type</b> | <b>SN</b> |
|---------------|--------------------|-------------|-----------|
| /             | /                  | /           | /         |

\*AE ID: is used to identify the test accessory in the lab internally.

#### **4. Reference Documents**

##### **4.1. Documents supplied by applicant**

EUT feature information is supplied by the applicant or manufacturer, which is the basis of testing.

##### **4.2. Reference Documents for testing**

The following documents listed in this section are referred for testing.

| <b>Reference</b> | <b>Title</b>                                                                                                                                                                                                               | <b>Version</b>       |
|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|
| FCC Part15       | FCC CFR 47, Part 15, Subpart C:<br>15.205 Restricted bands of operation;<br>15.209 Radiated emission limits, general requirements;<br>15.247 Operation within the bands 902–928MHz, 2400–2483.5<br>MHz, and 5725–5850 MHz. | Oct, 2012<br>Edition |
| ANSI C63.4       | Methods of Measurement of Radio-Noise Emissions from<br>Low-Voltage Electrical and Electronic Equipment in the Range<br>of 9 kHz to 40 GHz                                                                                 | 2009                 |
| KDB558074        | Measurement of Digital Transmission Systems<br>Operating under Section 15.247                                                                                                                                              | April,<br>2013       |

## 5. Laboratory Environment

**Half-anechoic chamber** (11.20 meters×6.10 meters×5.60 meters) did not exceed following limits:

|                                   |                                                           |
|-----------------------------------|-----------------------------------------------------------|
| Temperature                       | Min. = 15 °C, Max. = 30 °C                                |
| Relative humidity                 | Min. = 30 %, Max. = 60 %                                  |
| Shielding effectiveness           | > 110 dB                                                  |
| Electrical insulation             | > 2M Ω                                                    |
| Ground system resistance          | < 0.5 Ω                                                   |
| Normalized Site Attenuation (NSA) | < ±3.5dB, with 3m of Measuring distance, 30MHz<br>1000MHz |
| Uniformity of field strength      | Between 0 and 6 dB, from 80MHz to 3000 MHz                |

**Fully-anechoic chamber** (11.20 meters×6.10 meters×6.60 meters) did not exceed following limits:

|                          |                                              |
|--------------------------|----------------------------------------------|
| Temperature              | Min. = 15 °C, Max. = 30 °C                   |
| Relative humidity        | Min. = 30 %, Max. = 60 %                     |
| Shielding effectiveness  | > 110 dB                                     |
| Electrical insulation    | > 2M Ω                                       |
| Ground system resistance | < 0.5 Ω                                      |
| VSWR                     | Between 0 and 6 dB, from 30MHz to 18 000 MHz |

**Conduction Lab** did not exceed following limits:

|                          |                        |
|--------------------------|------------------------|
| Temperature              | Min.=15 °C, Max.=30 °C |
| Relative humidity        | Min.=30 %, Max.= 60 %  |
| Shielding effectiveness  | > 80 dB                |
| Electrical insulation    | > 2M Ω                 |
| Ground system resistance | < 0.5 Ω                |

## 6. Summary of Test Results

### 6.1. Summary of Test Results

| No | Test cases                                | Sub-clause of Part15C     | Verdict |
|----|-------------------------------------------|---------------------------|---------|
| 0  | Antenna Requirement                       | 15.203                    | P       |
| 1  | Maximum Peak Output Power                 | 15.247 (b)                | P       |
| 2  | Peak Power Spectral Density               | 15.247 (e)                | P       |
| 3  | Occupied 6dB Bandwidth                    | 15.247 (a)                | P       |
| 4  | Band Edges Compliance                     | 15.247 (d)                | P       |
| 5  | Transmitter Spurious Emission - Conducted | 15.247 (d)                | P       |
| 6  | Transmitter Spurious Emission - Radiated  | 15.247, 15.205,<br>15.209 | P       |
| 7  | AC Powerline Conducted Emission           | 15.207                    | P       |

### 6.2. Statements

TMC has evaluated the test cases requested by the applicant/manufacture as listed in section 6.1 of this report, for the EUT specified in section 3, according to the standards or reference documents listed in section 4.2

### 6.3. Terms used in the result table

Terms used in Verdict column

|    |               |
|----|---------------|
| P  | Pass          |
| NA | Not Available |
| F  | Fail          |

#### Abbreviations

|          |                                                 |
|----------|-------------------------------------------------|
| AC       | Alternating Current                             |
| AFH      | Adaptive Frequency Hopping                      |
| BW       | Band Width                                      |
| E.I.R.P. | equivalent isotropical radiated power           |
| ISM      | Industrial, Scientific and Medical              |
| R&TTE    | Radio and Telecommunications Terminal Equipment |
| RF       | Radio Frequency                                 |
| Tx       | Transmitter                                     |

## 7. Test Equipments Utilized

### Conducted test system

| No. | Equipment              | Model | Serial Number | Manufacturer    | Calibration Due date | Calibration Period |
|-----|------------------------|-------|---------------|-----------------|----------------------|--------------------|
| 1   | Vector Signal Analyzer | FSV40 | 100903        | Rohde & Schwarz | 2014-04-23           | 1 year             |

### Radiated emission test system

| No. | Equipment                         | Model     | Serial Number | Manufacturer    | Calibration Due date | Calibration Period |
|-----|-----------------------------------|-----------|---------------|-----------------|----------------------|--------------------|
| 1   | Chamber                           | FACT5-2.0 | 4166          | ETS-Lindgren    | 2016-05-29           | 3 years            |
| 2   | Test Receiver                     | ESCI      | 100701        | Rohde & Schwarz | 2014-07-31           | 1 year             |
| 3   | Spectrum Analyzer                 | FSP40     | 100378        | Rohde & Schwarz | 2013-12-21           | 1 year             |
| 4   | BiLog Antenna                     | VULB9163  | 9163-330      | Schwarzbeck     | 2014-02-24           | 3 years            |
| 5   | Dual-Ridge Waveguide Horn Antenna | 3164-05   | 00085724      | ETS-Lindgren    | 2014-02-17           | 3 years            |
| 6   | Test Receiver                     | ESCI      | 100702        | Rohde & Schwarz | 2014-07-31           | 1 year             |
| 7   | LISN                              | ESH2-Z5   | 100196        | Rohde & Schwarz | 2014-01-23           | 1 year             |
| 8   | Signal Generator                  | SMR40     | 100541        | Rohde & Schwarz | 2014-01-10           | 1 year             |
| 9   | Dual-Ridge Waveguide Horn Antenna | 3117      | 00066577      | ETS-Lindgren    | 2016-04-01           | 3 years            |
| 10  | Loop Antenna                      | HLA6120   | 35779         | TESEQ           | 2016-02-25           | 3 years            |
| 11  | EMI Antenna                       | 3160-09   | 00118383      | ETS-Lindgren    | 2015-09-05           | 3 years            |

### Anechoic chamber

Fully anechoic chamber by ETS-Lindgren.

**ANNEX A: EUT photograph****Pic A-1 Module****Pic A-2 Module**

## ANNEX B: MEASUREMENT RESULTS

### B.0 Antenna requirement

#### Measurement Limit:

| Standard            | Requirement                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|---------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| FCC CRF Part 15.203 | 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 §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 §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. |

**Conclusion: The Directional gains of antenna used for transmitting is 0.5 dBi.  
The RF transmitter uses an integrate antenna without connector.**

## B.1 Maximum Peak Output Power

### Measurement Limit and Method:

| Standard                  | Limit (dBm) |
|---------------------------|-------------|
| FCC CRF Part 15.247(b)(1) | < 30        |

### Measurement Results:

| Mode | Channel | Maximum Peak Output Power (dBm) |      | Conclusion |
|------|---------|---------------------------------|------|------------|
| GFSK | 0       | Fig.1                           | 0.86 | P          |
|      | 19      | Fig.2                           | 0.92 | P          |
|      | 39      | Fig.3                           | 1.28 | P          |

See ANNEX C for test graphs.

Conclusion: Pass

## B.2 Peak Power Spectral Density

### Measurement Limit:

| Standard               | Limit         |
|------------------------|---------------|
| FCC CRF Part 15.247(d) | < 8 dBm/3 kHz |

### Measurement Results:

| Mode | Channel | Peak Power Spectral Density (dBm) |        | Conclusion |
|------|---------|-----------------------------------|--------|------------|
| GFSK | 0       | Fig.4                             | -13.97 | P          |
|      | 19      | Fig.5                             | -14.01 | P          |
|      | 39      | Fig.6                             | -13.71 | P          |

See ANNEX C for test graphs.

Conclusion: Pass

## B.3 Occupied 6dB Bandwidth

### Measurement Limit:

| Standard                   | Limit (kHz) |
|----------------------------|-------------|
| FCC 47 CFR Part 15.247 (a) | ≥ 500       |

### Measurement Result:

| Mode | Channel | Test Results ( kHz) |       | conclusion |
|------|---------|---------------------|-------|------------|
| GFSK | 0       | Fig.7               | 694.6 | P          |
|      | 19      | Fig.8               | 687.4 | P          |
|      | 39      | Fig.9               | 701.9 | P          |

See ANNEX C for test graphs.

Conclusion: Pass

## B.4 Band Edges Compliance

### Measurement Limit:

| Standard                   | Limit (dBc) |
|----------------------------|-------------|
| FCC 47 CFR Part 15.247 (d) | > 20        |

### Measurement Result:

| Mode | Channel | Test Results | Conclusion |
|------|---------|--------------|------------|
| GFSK | 0       | Fig.10       | P          |
|      | 39      | Fig.11       | P          |

See ANNEX C for test graphs.

Conclusion: Pass

## B.5 Transmitter Spurious Emission

### B.5.1 Transmitter Spurious Emission - Conducted

#### Measurement Limit:

| Standard                   | Limit                                             |
|----------------------------|---------------------------------------------------|
| FCC 47 CFR Part 15.247 (d) | 20dB below peak output power in 100 kHz bandwidth |

#### Measurement Results:

| MODE | Channel      | Frequency Range | Test Results | Conclusion |
|------|--------------|-----------------|--------------|------------|
| GFSK | 0            | 2.402 GHz       | Fig.12       | P          |
|      |              | 30 MHz-3 GHz    | Fig.13       | P          |
|      |              | 3GHz-18GHz      | Fig.14       | P          |
|      | 19           | 2.440 GHz       | Fig.15       | P          |
|      |              | 30 MHz-3 GHz    | Fig.16       | P          |
|      |              | 3GHz-18GHz      | Fig.17       | P          |
|      | 39           | 2.480 GHz       | Fig.18       | P          |
|      |              | 30 MHz-3 GHz    | Fig.19       | P          |
|      |              | 3GHz-18GHz      | Fig.20       | P          |
|      | All channels | 18GHz-26GHz     | Fig.21       | P          |

See ANNEX C for test graphs.

Conclusion: Pass

### B.5.2 Transmitter Spurious Emission - Radiated

#### Measurement Limit:

| Standard                               | Limit                        |
|----------------------------------------|------------------------------|
| FCC 47 CFR Part 15.247, 15.205, 15.209 | 20dB below peak output power |

In addition, radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in § 15.209(a) (see § 15.205(c)).

#### Limit in restricted band:

| Frequency of emission (MHz) | Field strength( $\mu$ V/m) | Measurement distance(meters) |
|-----------------------------|----------------------------|------------------------------|
| 0.009-0.490                 | 2400/F(kHz)                | 300                          |
| 0.490-1.705                 | 24000/F(kHz)               | 30                           |
| 1.705-30.0                  | 30                         | 30                           |
| 30-88                       | 100                        | 3                            |
| 88-216                      | 150                        | 3                            |
| 216-960                     | 200                        | 3                            |
| Above 960                   | 500                        | 3                            |

#### Test Condition

The EUT was placed on a non-conductive table. The measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and the EUT azimuth were varied in order to identify the maximum level of emissions from the EUT. This maximization process was repeated with the EUT positioned in each of its three orthogonal orientations.

| Frequency of emission (MHz) | RBW/VBW       | Sweep Time(s) |
|-----------------------------|---------------|---------------|
| 30-1000                     | 100KHz/300KHz | 5             |
| 1000-4000                   | 1MHz/1MHz     | 15            |
| 4000-18000                  | 1MHz/1MHz     | 40            |
| 18000-26500                 | 1MHz/1MHz     | 20            |

#### Note:

According to the performance evaluation, the radiated emission margin of EUT is over 20dB in the band from 9kHz to 30MHz. Therefore, the measurement starts from 30MHz to tenth harmonic.

The measurement results include the horizontal polarization and vertical polarization measurements.

**Measurement Results:**

| Mode | Channel      | Frequency Range  | Test Results | Conclusion |
|------|--------------|------------------|--------------|------------|
| GFSK | 0            | 30 MHz ~1 GHz    | Fig.22       | P          |
|      |              | 1 GHz ~ 3 GHz    | Fig.23       | P          |
|      |              | 3 GHz ~ 18 GHz   | Fig.24       | P          |
|      | 19           | 30 MHz ~1 GHz    | Fig.25       | P          |
|      |              | 1 GHz ~ 3 GHz    | Fig.26       | P          |
|      |              | 3 GHz ~ 18 GHz   | Fig.27       | P          |
|      | 39           | 30 MHz ~1 GHz    | Fig.28       | P          |
|      |              | 1 GHz ~ 3 GHz    | Fig.29       | P          |
|      |              | 3 GHz ~ 18 GHz   | Fig.30       | P          |
| /    | All channels | 18 GHz~ 26.5 GHz | Fig.31       | P          |

**Note:**

A "reference path loss" is established and the  $A_{Rpl}$  is the attenuation of "reference path loss", and including the gain of receive antenna, the gain of the preamplifier, the cable loss.

$P_{Mea}$  is the field strength recorded from the instrument.

The measurement results are obtained as described below:

Result= $P_{Mea}+A_{Rpl}= P_{Mea}+Cable Loss+Antenna Factor$

**See ANNEX C for test graphs.**

**Conclusion: Pass**

## B.6 AC Powerline Conducted Emission

### Test Condition:

| Voltage (V) | Frequency (Hz) |
|-------------|----------------|
| 120         | 60             |

### Measurement Result and limit:

BLE (Quasi-peak Limit)

| Frequency range (MHz) | Quasi-peak Limit (dB $\mu$ V) | Result (dB $\mu$ V) |        | Conclusion |
|-----------------------|-------------------------------|---------------------|--------|------------|
|                       |                               | Traffic             | Idle   |            |
| 0.15 to 0.5           | 66 to 56                      | Fig.32              | Fig.33 | P          |
| 0.5 to 5              | 56                            |                     |        |            |
| 5 to 30               | 60                            |                     |        |            |

NOTE: The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.5 MHz.

BLE (Average Limit)

| Frequency range (MHz) | Average-peak Limit (dB $\mu$ V) | Result (dB $\mu$ V) |        | Conclusion |
|-----------------------|---------------------------------|---------------------|--------|------------|
|                       |                                 | Traffic             | Idle   |            |
| 0.15 to 0.5           | 56 to 46                        | Fig.32              | Fig.33 | P          |
| 0.5 to 5              | 46                              |                     |        |            |
| 5 to 30               | 50                              |                     |        |            |

NOTE: The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.5 MHz.

**Note:** The measurement results include the L1 and N measurements.

**See ANNEX C for test graphs.**

**Conclusion: Pass**

## ANNEX C: TEST FIGURE LIST

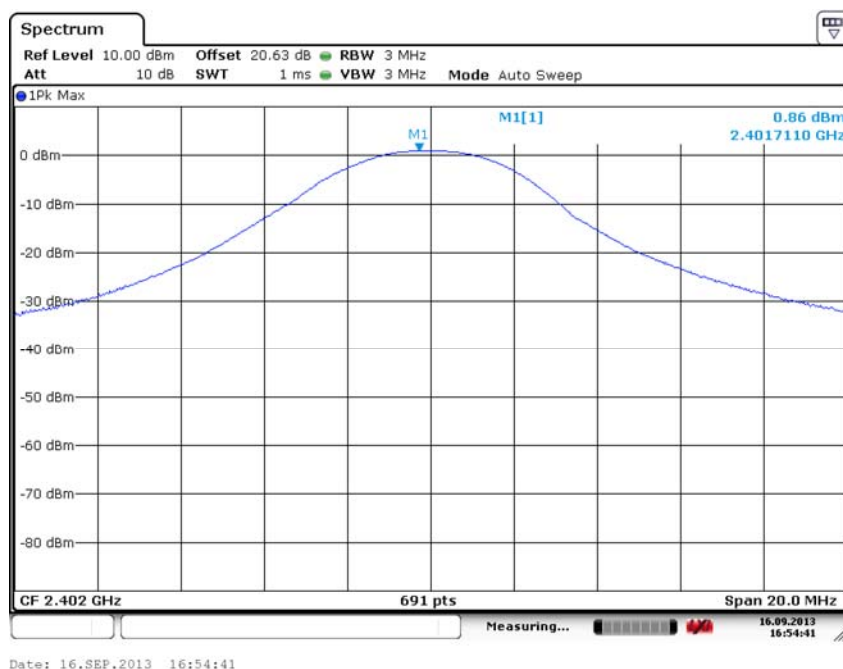


Fig. 1 Maximum Peak Output Power (Ch 0)

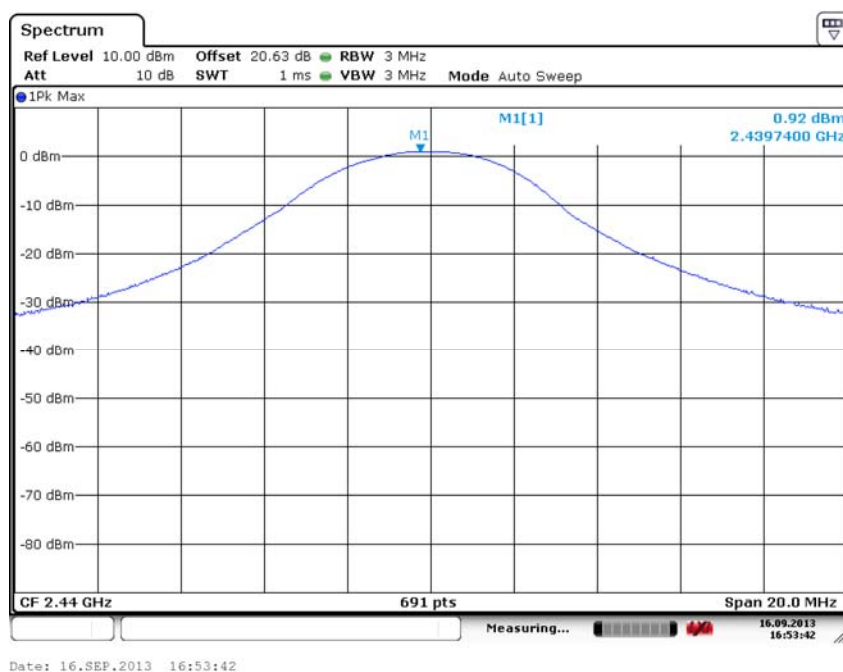


Fig. 2 Maximum Peak Output Power (Ch 19)

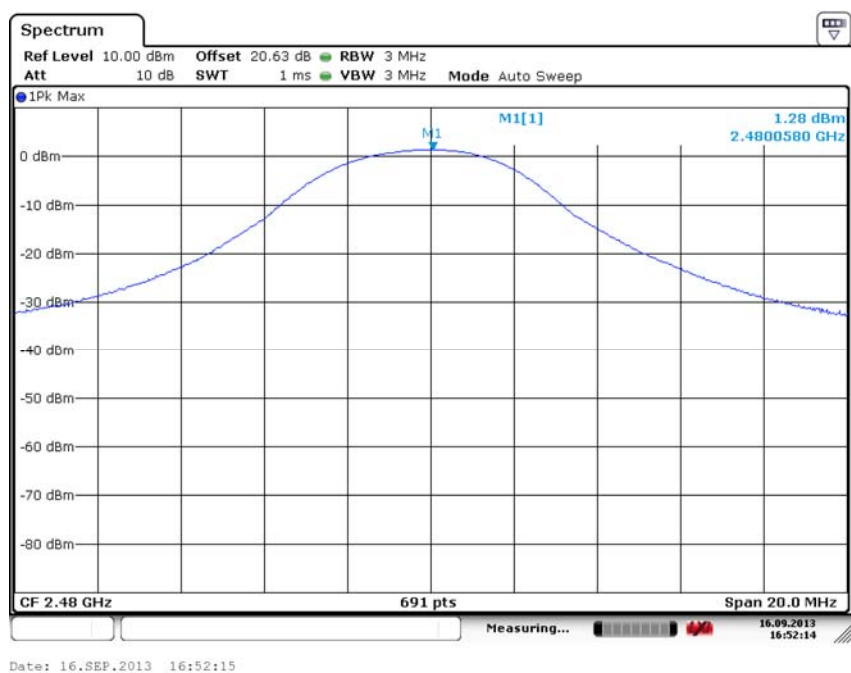


Fig. 3 Maximum Peak Output Power (Ch 39)

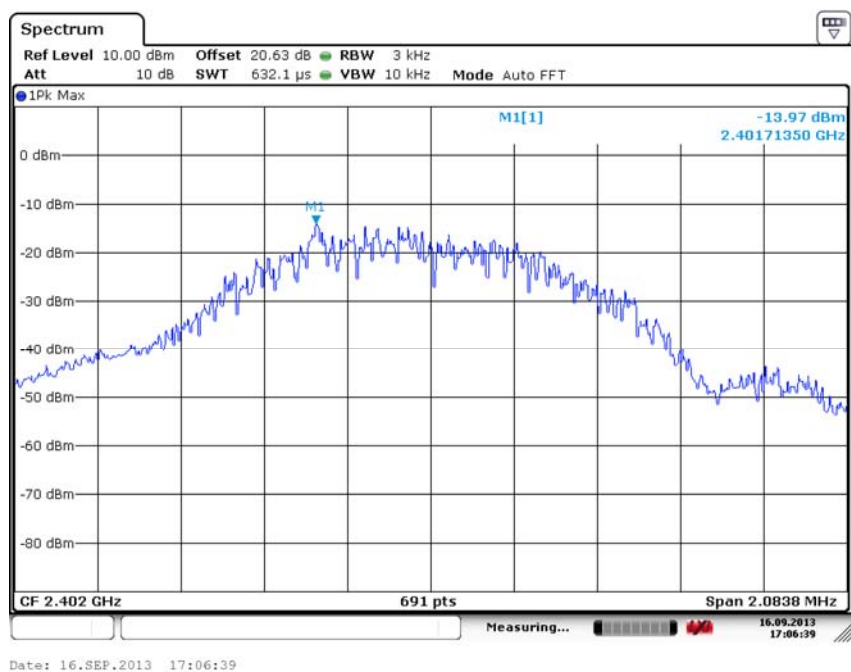


Fig. 4 Power Spectral Density (Ch 0)

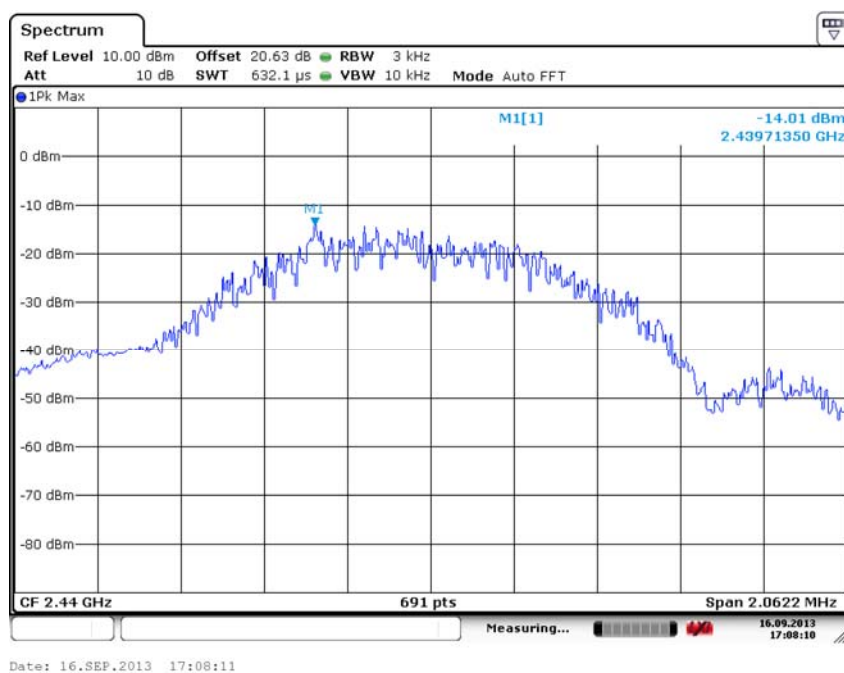


Fig. 5 Power Spectral Density (Ch 19)

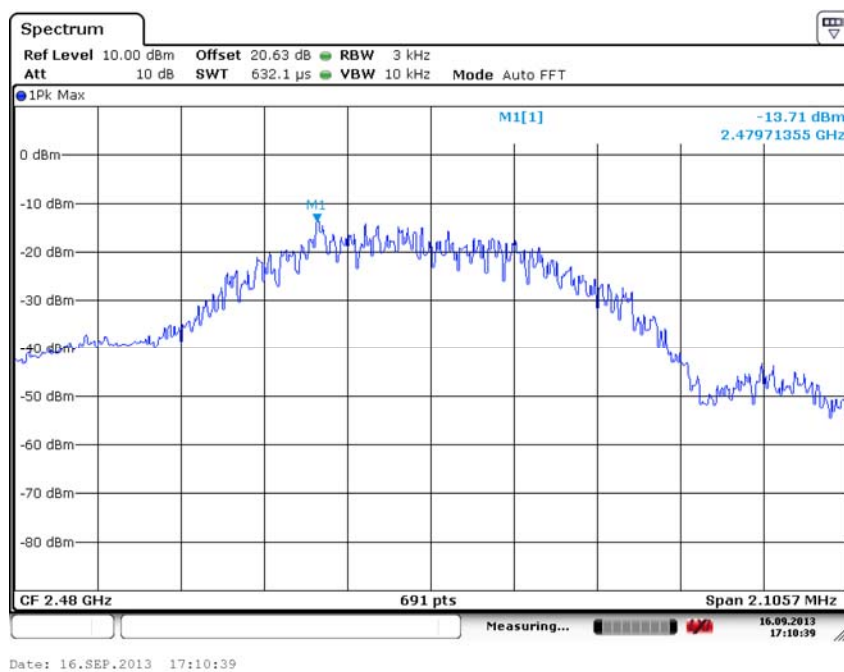


Fig. 6 Power Spectral Density (Ch 39)

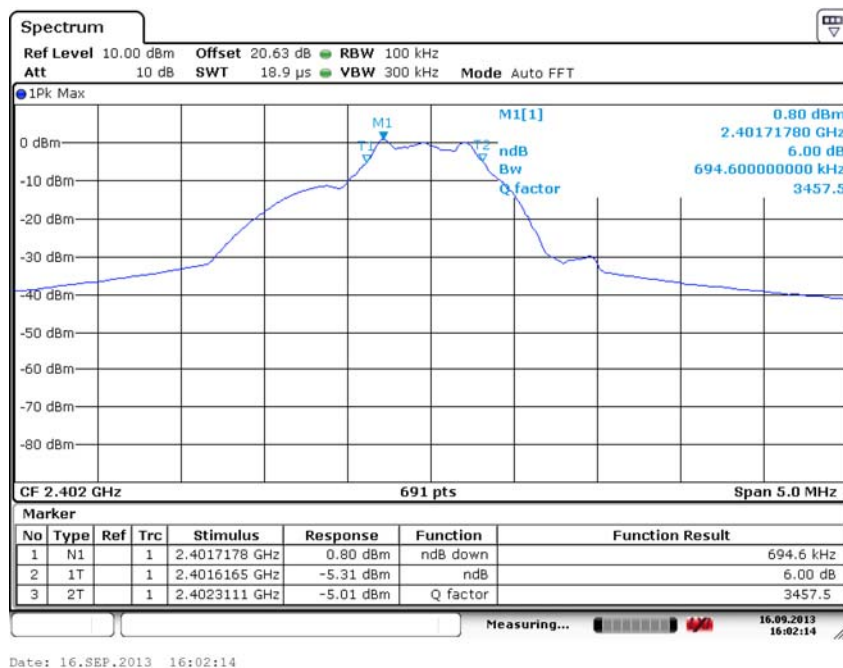


Fig. 7 Occupied 6dB Bandwidth (Ch 0)

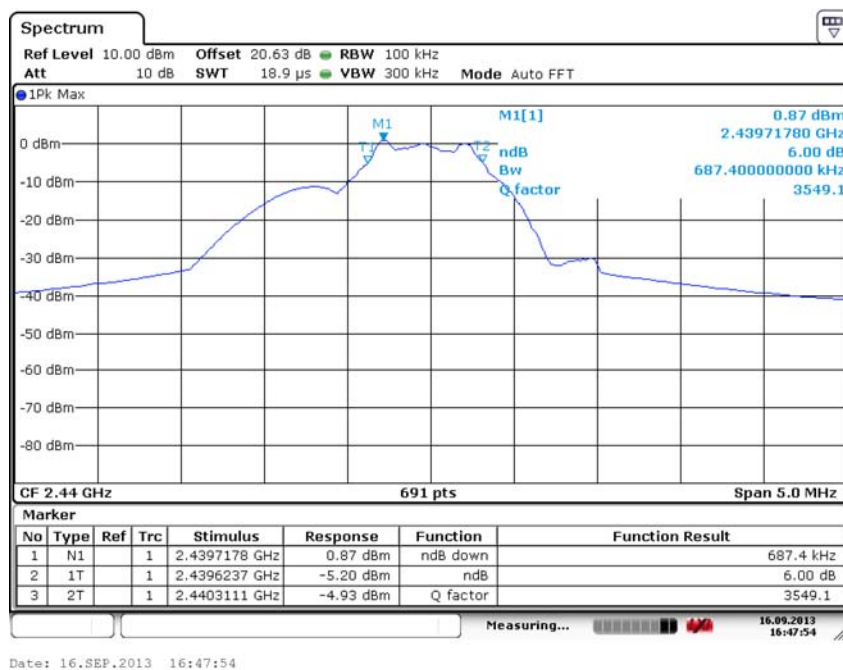


Fig. 8 Occupied 6dB Bandwidth (Ch 19)

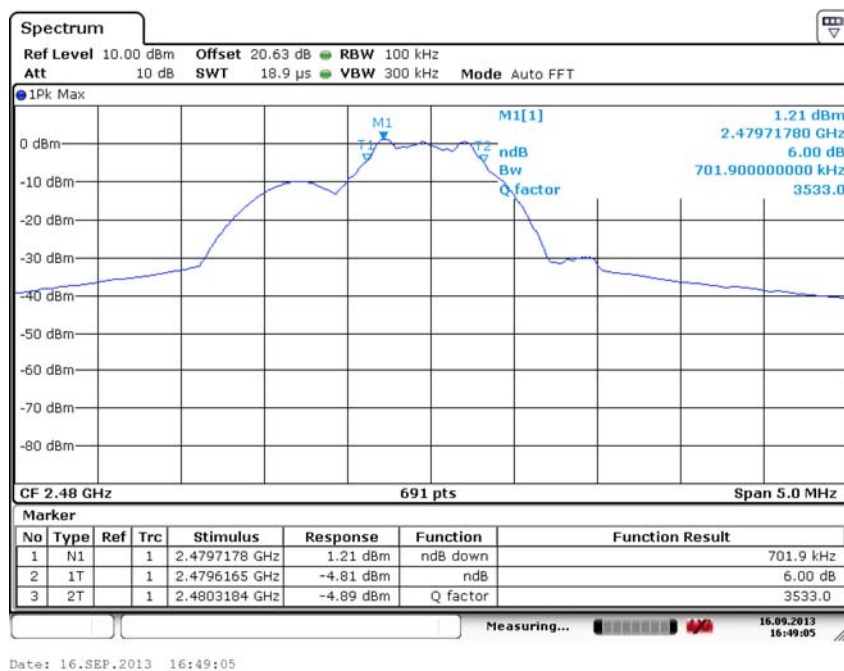


Fig. 9 Occupied 6dB Bandwidth (Ch 39)

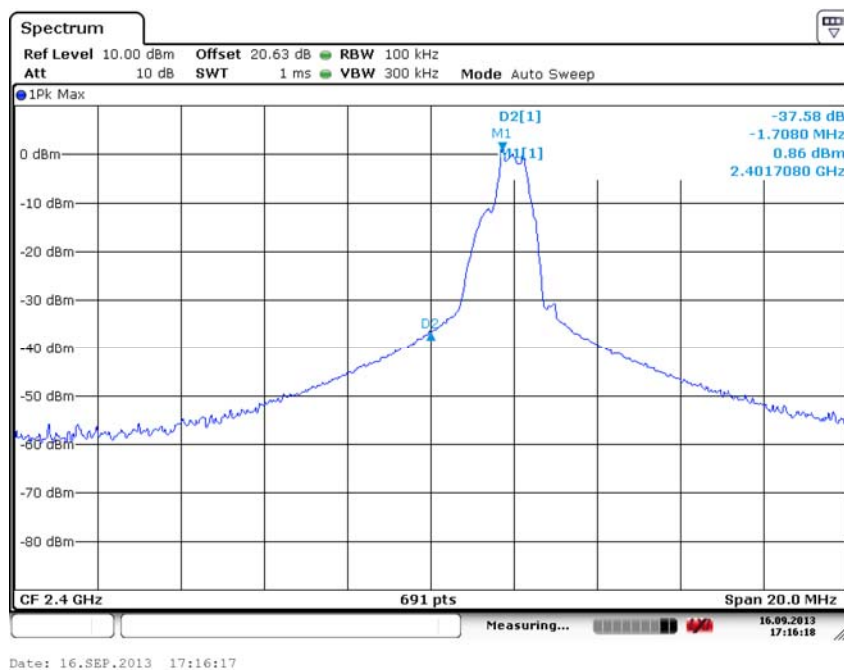


Fig. 10 Band Edges (Ch 0)

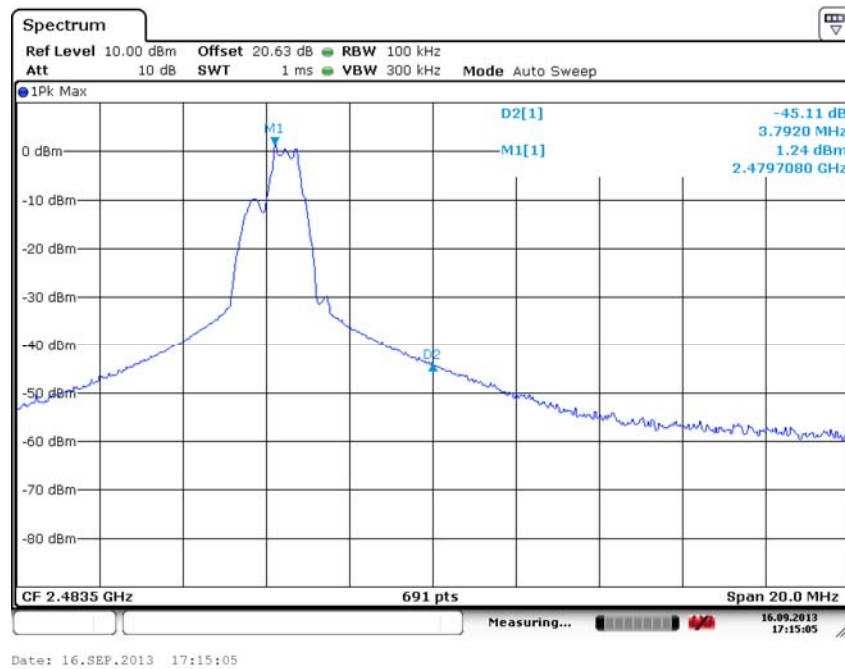


Fig. 11 Band Edges (Ch 39)



Fig. 12 Conducted Spurious Emission (Ch0, Center Frequency)

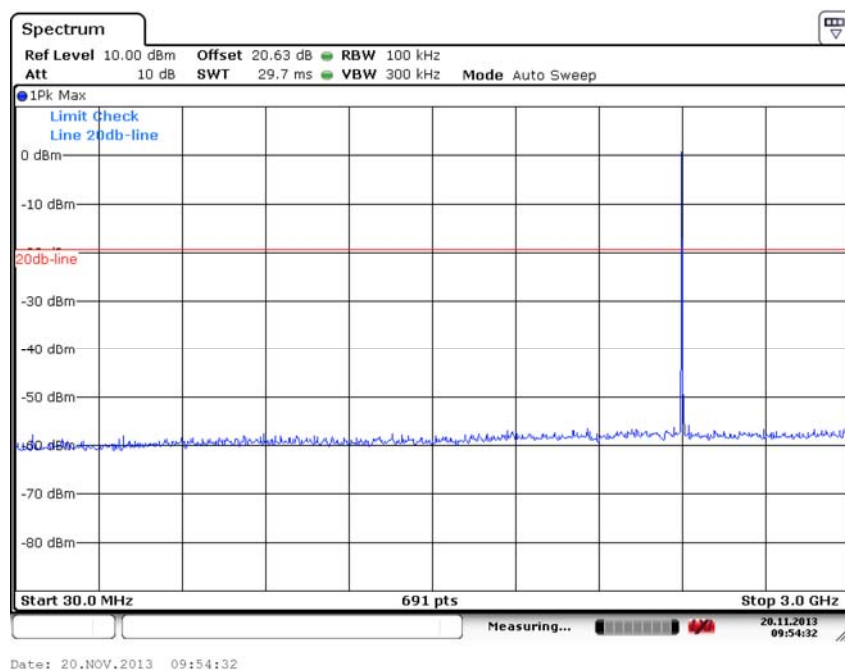


Fig. 13 Conducted Spurious Emission (Ch0, 30 MHz-3 GHz)

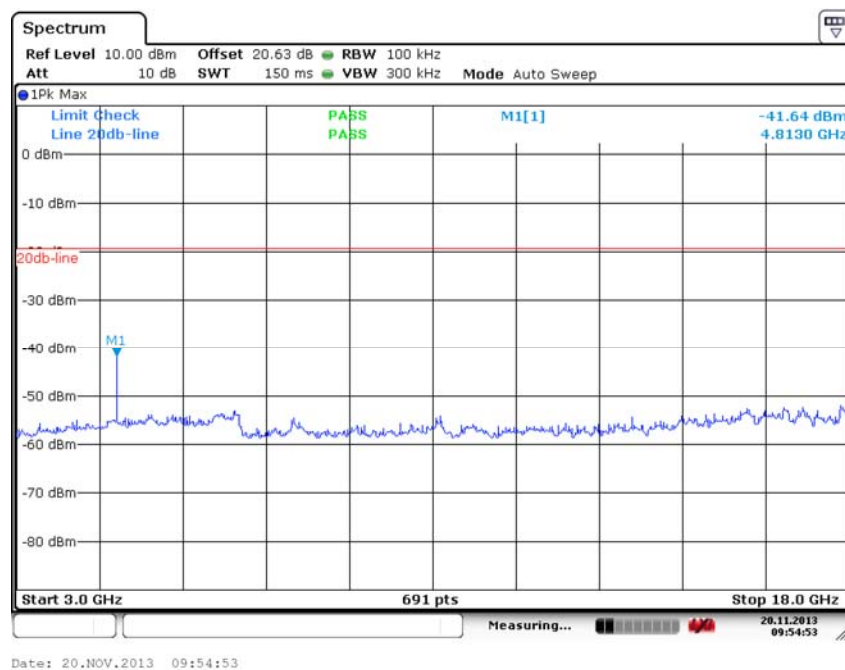


Fig. 14 Conducted Spurious Emission (Ch0, 3 GHz-18 GHz)



Fig. 15 Conducted Spurious Emission (Ch19, Center Frequency)

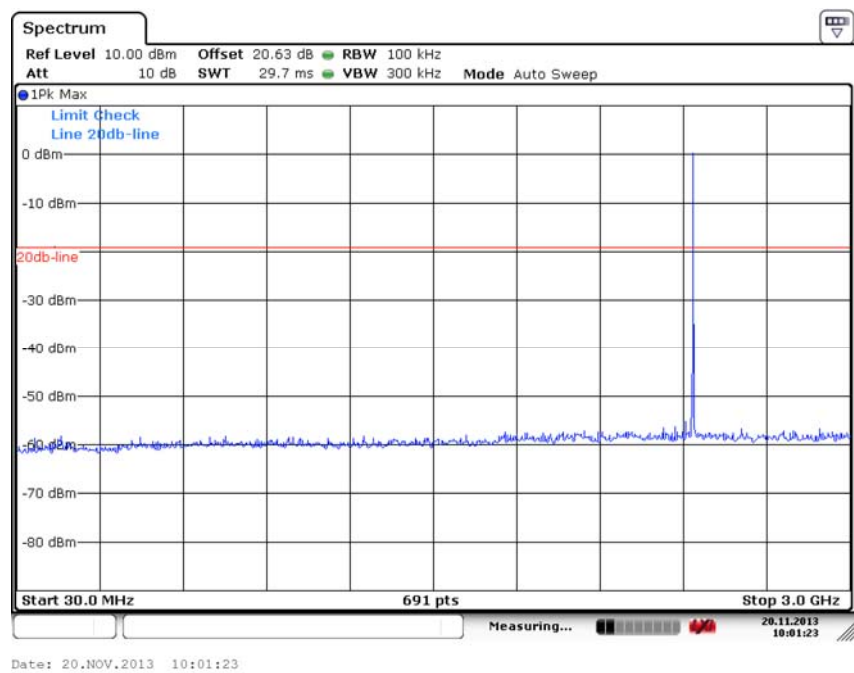
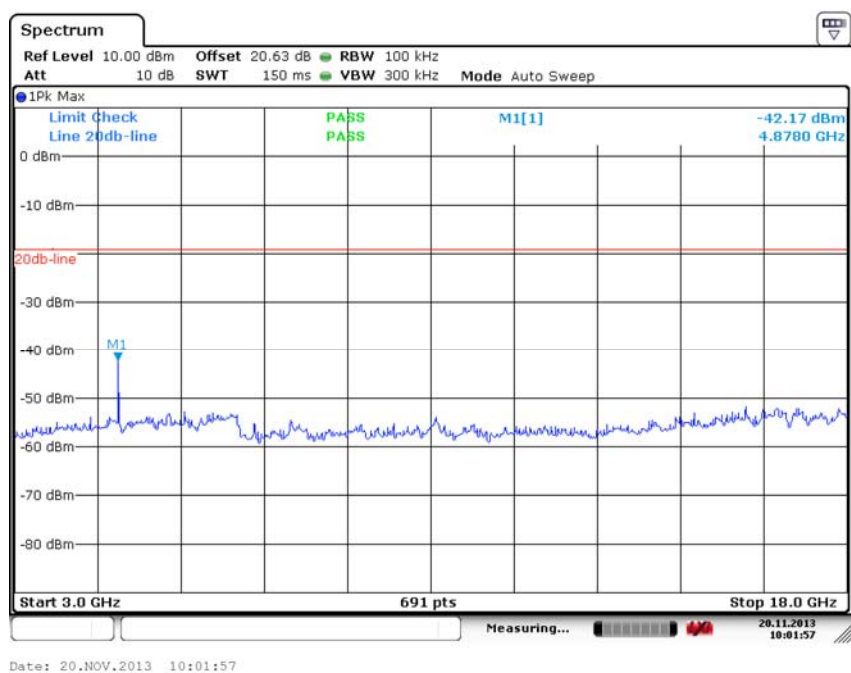


Fig. 16 Conducted Spurious Emission (Ch19, 30 MHz-3 GHz)



**Fig. 17 Conducted Spurious Emission (Ch19, 3 GHz-18 GHz)**



**Fig. 18 Conducted Spurious Emission (Ch39, Center Frequency)**

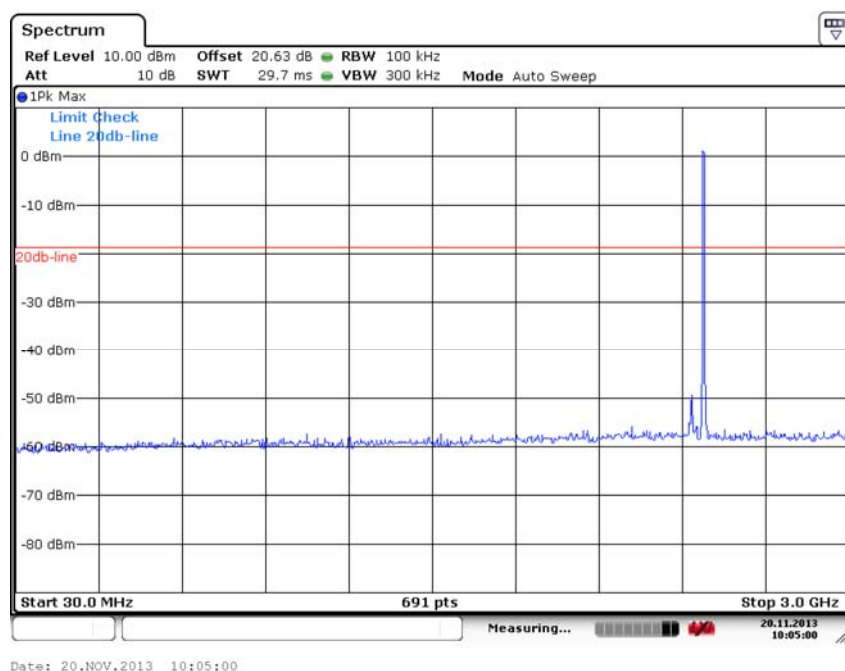


Fig. 19 Conducted Spurious Emission (Ch39, 30 MHz-3 GHz)

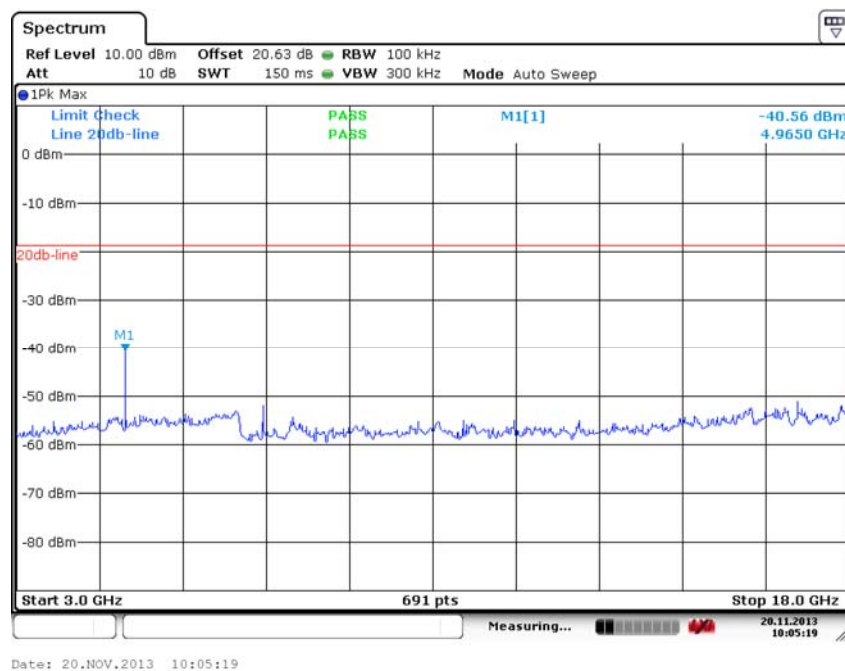


Fig. 20 Conducted Spurious Emission (Ch39, 3 GHz-18 GHz)

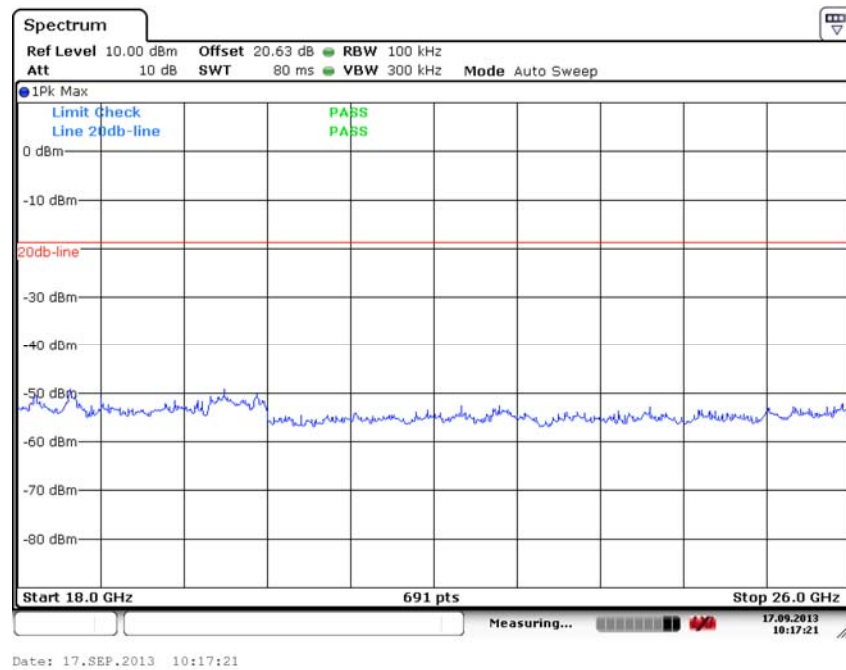


Fig. 21 Conducted Spurious Emission (All channels, 18 GHz-26 GHz)

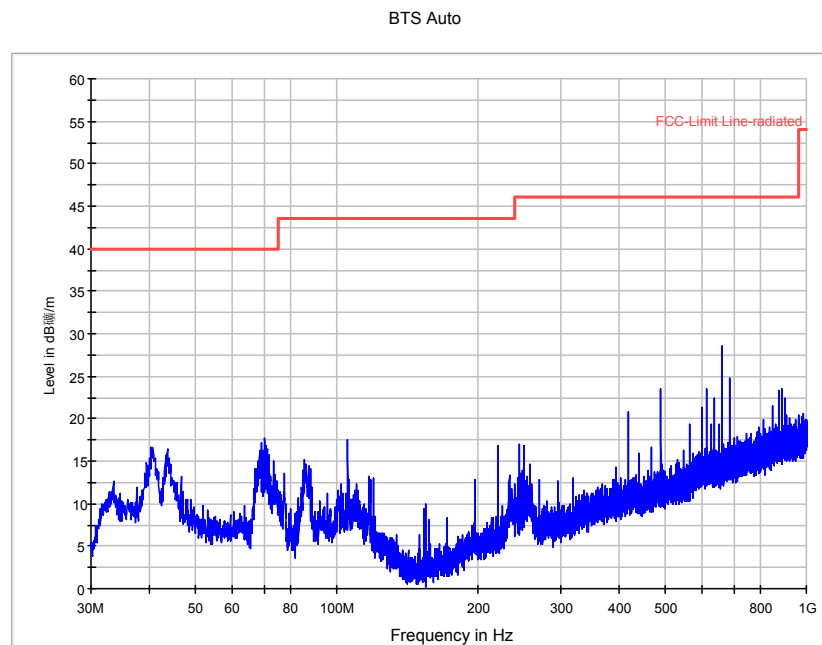
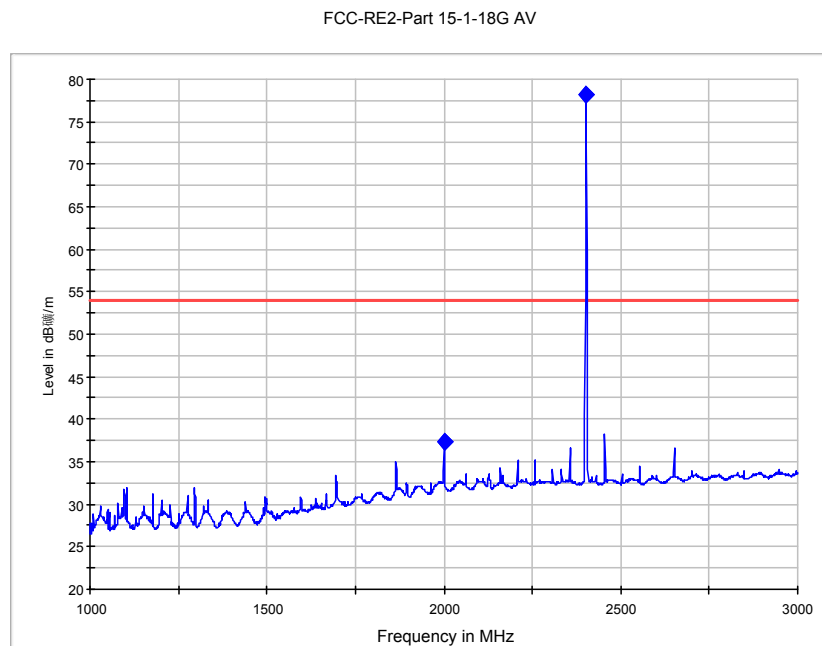
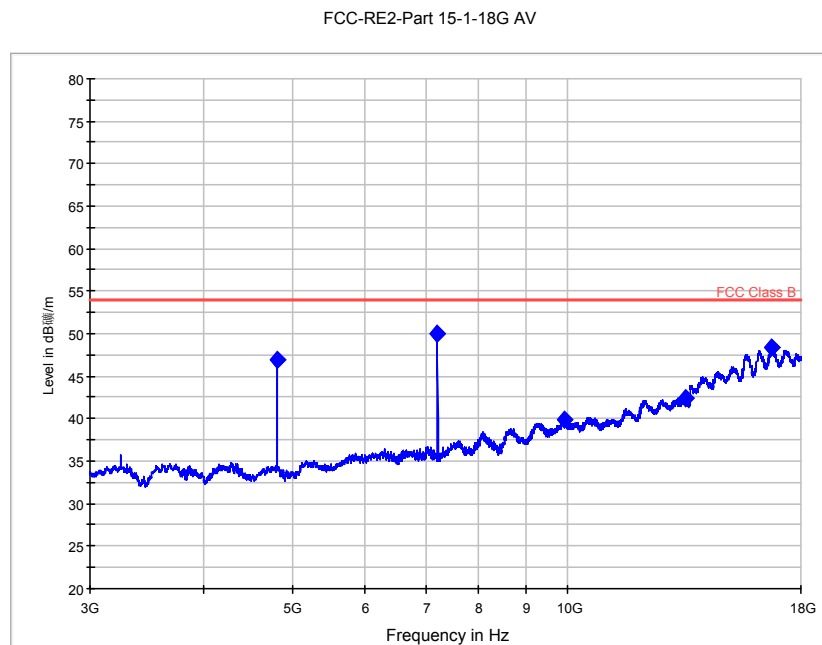


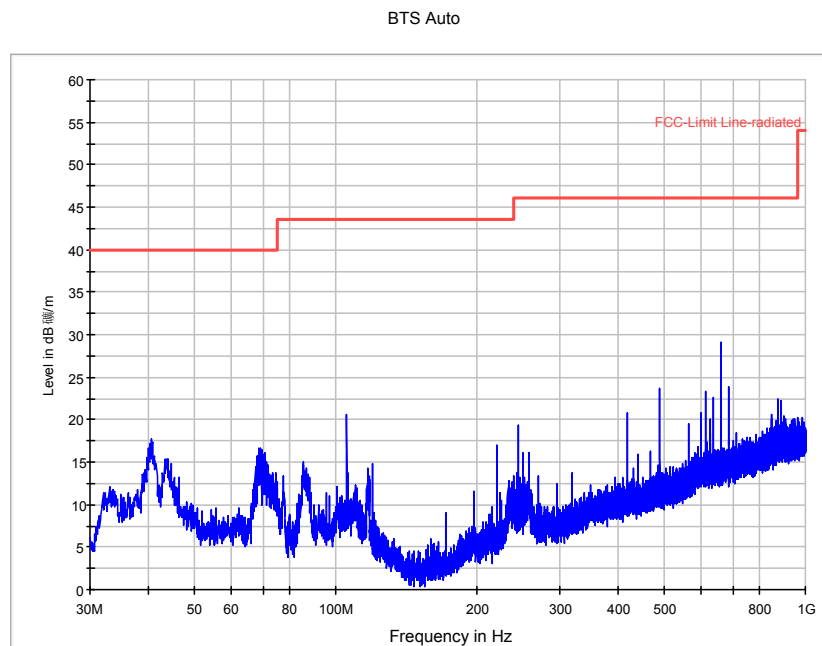
Fig. 22 Radiated Spurious Emission (Ch0, 30 MHz-1 GHz)



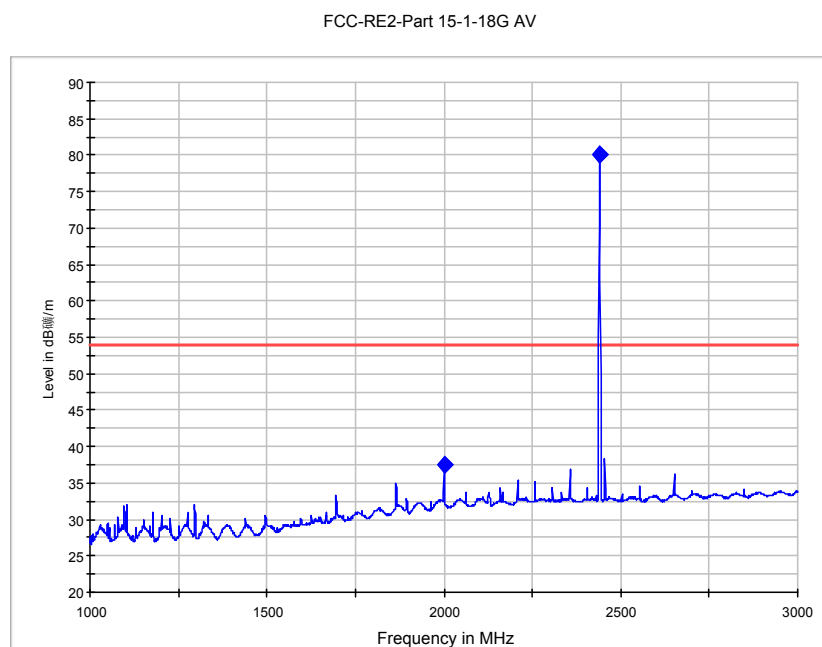
**Fig. 23 Radiated Spurious Emission (Ch0, 1 GHz-3 GHz)**



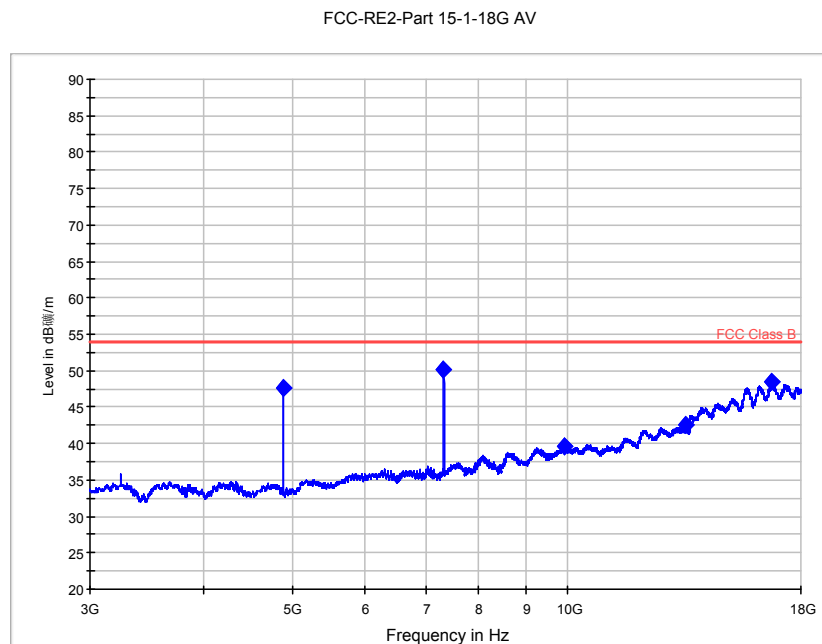
**Fig. 24 Radiated Spurious Emission (Ch0, 3 GHz-18 GHz)**



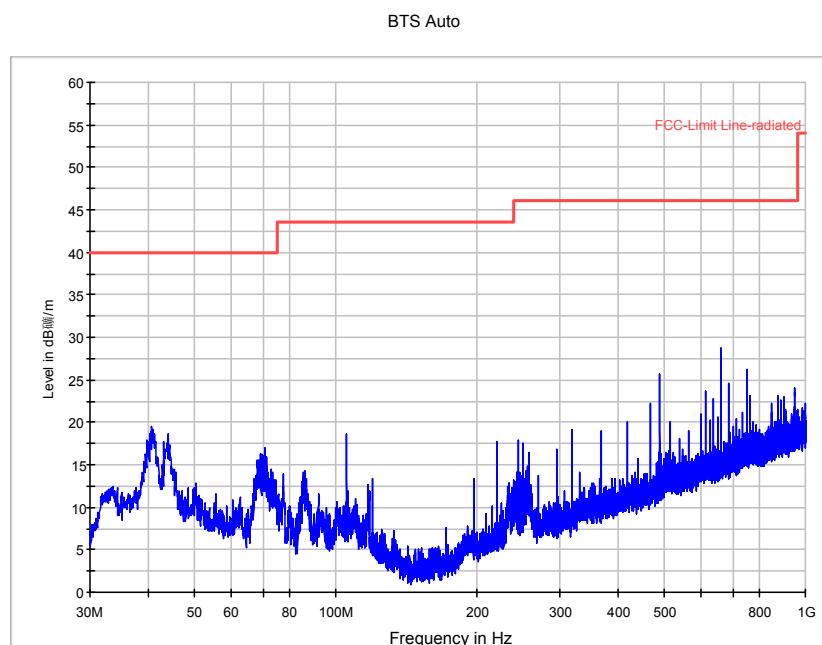
**Fig. 25 Radiated Spurious Emission (Ch19, 30 MHz-1 GHz)**



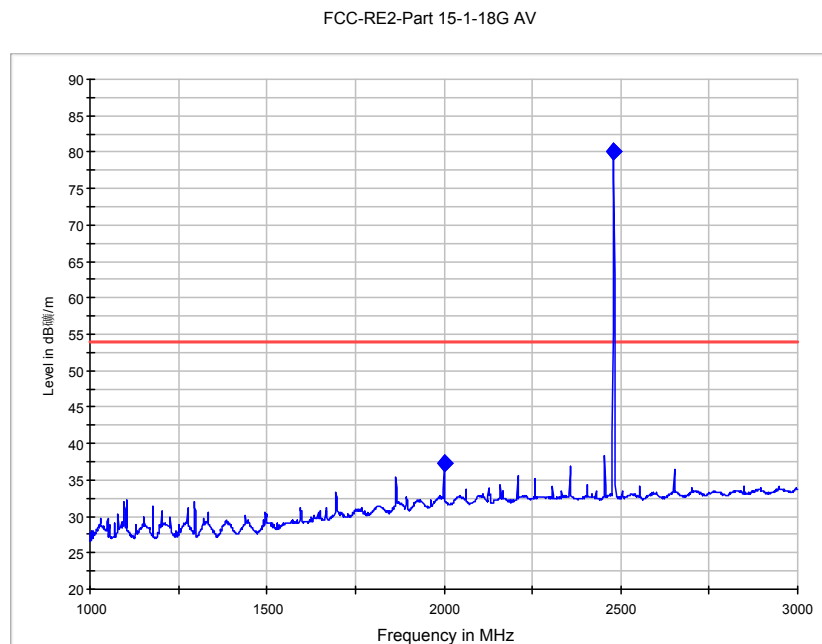
**Fig. 26 Radiated Spurious Emission (Ch19, 1 GHz-3 GHz)**



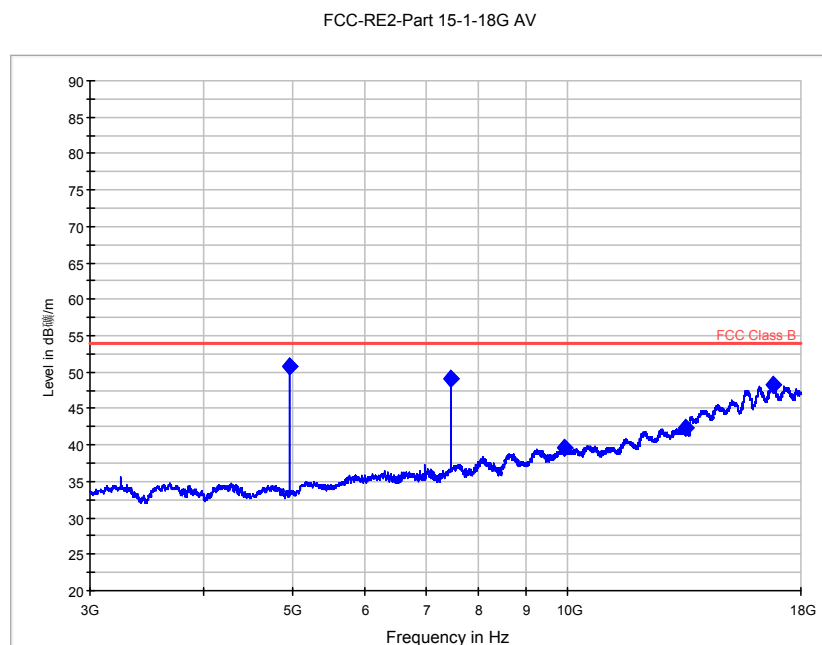
**Fig. 27 Radiated Spurious Emission (Ch19, 3 GHz-18 GHz)**



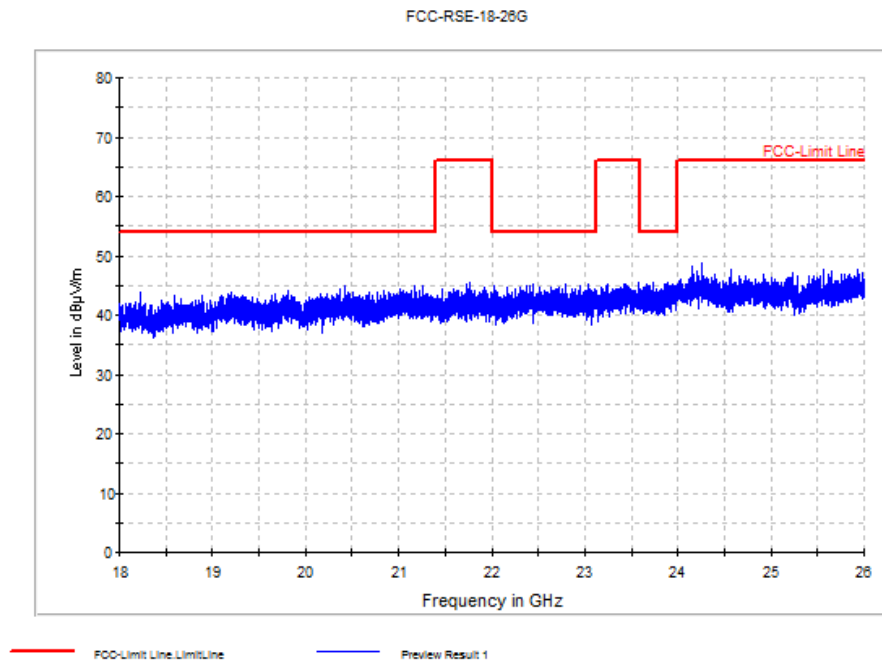
**Fig. 28 Radiated Spurious Emission (Ch39, 30 MHz-1 GHz)**



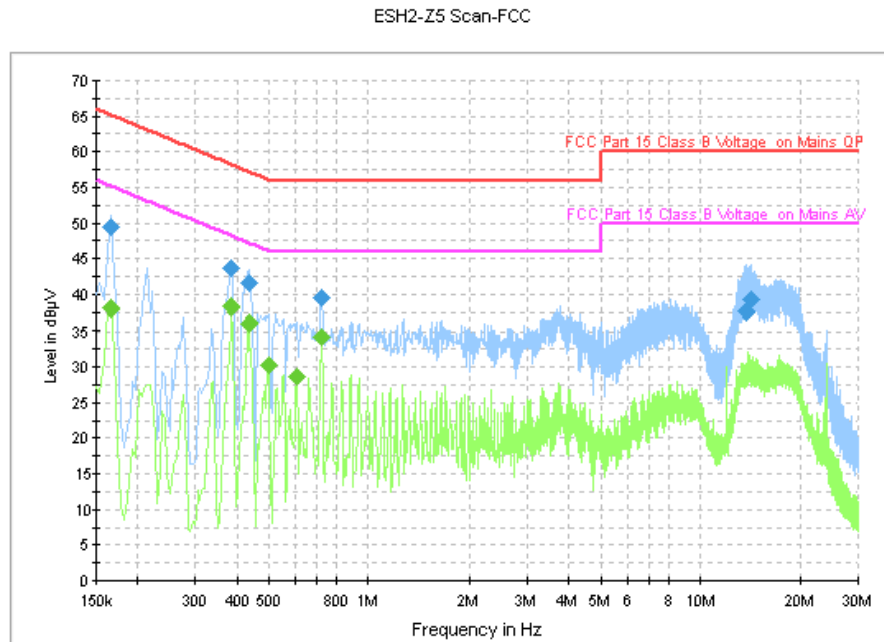
**Fig. 29 Radiated Spurious Emission (Ch39, 1 GHz-3 GHz)**



**Fig. 30 Radiated Spurious Emission (Ch39, 3 GHz-18 GHz)**



**Fig. 31 Radiated emission: 18 GHz - 26 GHz**



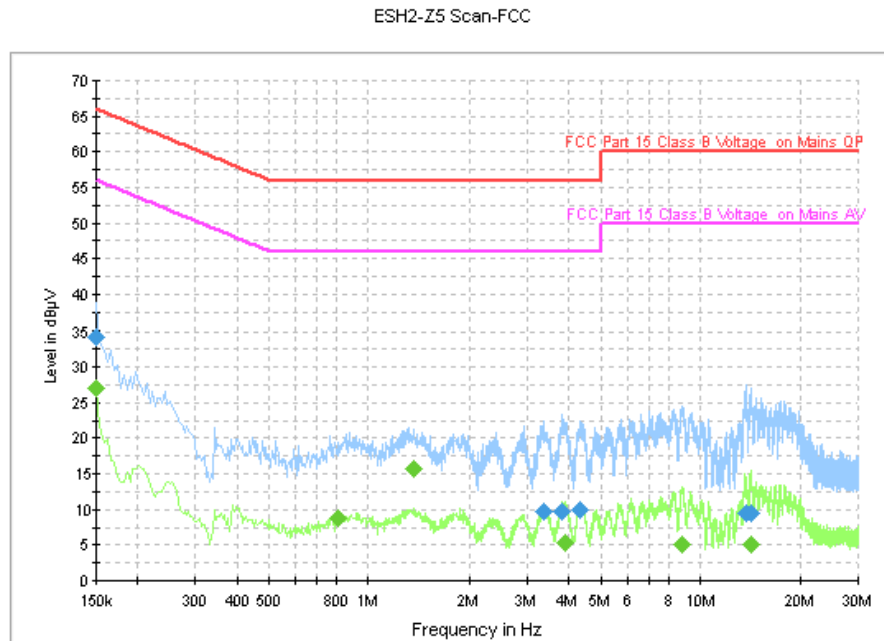
**Fig. 32 AC Power line Conducted Emission (Traffic)**

MEASUREMENT RESULT: " QuasiPeak "

| Frequency (MHz) | QuasiPeak (dBµV) | PE  | Line | Corr. (dB) | Margin (dB) | Limit (dBµV) |
|-----------------|------------------|-----|------|------------|-------------|--------------|
| 0.166000        | 49.4             | FLO | L1   | 10.0       | 15.8        | 65.2         |
| 0.386000        | 43.7             | FLO | L1   | 10.0       | 14.4        | 58.1         |
| 0.434000        | 41.6             | FLO | L1   | 10.0       | 15.6        | 57.2         |
| 0.718000        | 39.5             | FLO | L1   | 10.0       | 16.5        | 56.0         |
| 13.822000       | 37.6             | FLO | L1   | 10.4       | 22.4        | 60.0         |
| 14.298000       | 39.4             | FLO | L1   | 10.5       | 20.6        | 60.0         |

MEASUREMENT RESULT: " Average "

| Frequency (MHz) | CAverage (dBµV) | PE  | Line | Corr. (dB) | Margin (dB) | Limit (dBµV) |
|-----------------|-----------------|-----|------|------------|-------------|--------------|
| 0.166000        | 38.2            | FLO | L1   | 10.0       | 16.9        | 55.2         |
| 0.386000        | 38.3            | FLO | L1   | 10.0       | 9.9         | 48.1         |
| 0.434000        | 36.1            | FLO | L1   | 10.0       | 11.1        | 47.2         |
| 0.498000        | 30.3            | FLO | L1   | 10.0       | 15.7        | 46.0         |
| 0.606000        | 28.7            | FLO | L1   | 10.0       | 17.3        | 46.0         |
| 0.718000        | 34.3            | FLO | L1   | 10.0       | 11.8        | 46.0         |



**Fig. 33 AC Power line Conducted Emission (Idle)**

MEASUREMENT RESULT: " QuasiPeak "

| Frequency (MHz) | QuasiPeak (dBµV) | PE  | Line | Corr. (dB) | Margin (dB) | Limit (dBµV) |
|-----------------|------------------|-----|------|------------|-------------|--------------|
| 0.150000        | 34.2             | FLO | L1   | 10.0       | 31.8        | 66.0         |
| 3.338000        | 9.8              | FLO | L1   | 10.2       | 46.2        | 56.0         |
| 3.826000        | 9.8              | FLO | L1   | 10.2       | 46.2        | 56.0         |
| 4.306000        | 9.9              | FLO | L1   | 10.2       | 46.1        | 56.0         |
| 13.718000       | 9.5              | FLO | L1   | 10.4       | 50.5        | 60.0         |
| 14.186000       | 9.5              | FLO | L1   | 10.5       | 50.5        | 60.0         |

MEASUREMENT RESULT: " Average "

| Frequency (MHz) | CAverage (dBµV) | PE  | Line | Corr. (dB) | Margin (dB) | Limit (dBµV) |
|-----------------|-----------------|-----|------|------------|-------------|--------------|
| 0.150000        | 27.1            | FLO | L1   | 10.0       | 28.9        | 56.0         |
| 0.806000        | 8.7             | FLO | L1   | 10.1       | 37.3        | 46.0         |
| 1.370000        | 15.7            | FLO | L1   | 10.1       | 30.3        | 46.0         |
| 3.882000        | 5.3             | FLO | L1   | 10.2       | 40.7        | 46.0         |
| 8.790000        | 5.2             | FLO | L1   | 10.3       | 44.8        | 50.0         |
| 14.178000       | 5.0             | FLO | L1   | 10.5       | 45.0        | 50.0         |

\*\*\* END OF REPORT BODY \*\*\*