



**SGS-CSTC Standards Technical Services Co., Ltd.  
Shenzhen Branch**

No. 1 Workshop, M-10, Middle section, Science & Technology Park,  
Shenzhen, Guangdong, China 518057

Telephone: +86 (0) 755 2601 2053  
Fax: +86 (0) 755 2671 0594  
Email: ee.shenzhen@sgs.com

Report No.: SZEM180900844103  
Page: 1 of 51

## **TEST REPORT**

**Application No.:** SZEM1809008441CR  
**Applicant:** Shenzhen Breo Technology Co., Ltd  
**Address of Applicant:** 19/F Hisense Southen Buiding, 1777ChuangYe Road, NanShan District, SZ, 518000, China  
**Manufacturer:** Shenzhen Breo Technology Co., Ltd.  
**Address of Manufacturer:** 19/F Hisense Southen Buiding, 1777ChuangYe Road, NanShan District, SZ, China  
**Factory:** Shenzhen Breo Technology Co., Ltd.  
**Address of Factory:** 19/F Hisense Southen Buiding, 1777ChuangYe Road, NanShan District, SZ, China  
**Equipment Under Test (EUT):**  
**EUT Name:** Breo iSee M  
**Model No.:** iSee M, see m1, see m2, see m3, see m4, see m5, see m6 ♣  
♣ Please refer to section 2 of this report which indicates which model was actually tested and which were electrically identical.  
**FCC ID:** PXU-ISEEM  
**Standard(s) :** 47 CFR Part 15, Subpart C 15.247  
**Date of Receipt:** 2018-09-19  
**Date of Test:** 2018-10-12 to 2018-11-23  
**Date of Issue:** 2018-11-26

|                     |              |
|---------------------|--------------|
| <b>Test Result:</b> | <b>Pass*</b> |
|---------------------|--------------|

\* In the configuration tested, the EUT complied with the standards specified above.



Keny Xu  
EMC Laboratory Manager

The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report. If the product in this report is used in any configuration other than that detailed in the report, the manufacturer must ensure the new system complies with all relevant standards. Any mention of SGS International Electrical Approvals or testing done by SGS International Electrical Approvals in connection with, distribution or use of the product described in this report must be approved by SGS International Electrical Approvals in writing.

This document is issued by the Company subject to its General Conditions of Service printed overleaf, available on request or accessible at <http://www.sgs.com/en/Terms-and-Conditions.aspx> and, for electronic format documents, subject to Terms and Conditions for Electronic Documents at <http://www.sgs.com/en/Terms-and-Conditions/Terms-e-Documents.aspx>. Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein. Any holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. This document cannot be reproduced except in full, without prior written approval of the Company. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law. Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 30 days only.



| Revision Record |         |            |          |          |
|-----------------|---------|------------|----------|----------|
| Version         | Chapter | Date       | Modifier | Remark   |
| 01              |         | 2018-11-26 |          | Original |
|                 |         |            |          |          |
|                 |         |            |          |          |

|                          |  |   |  |  |
|--------------------------|--|---|--|--|
| Authorized for issue by: |  |   |  |  |
|                          |  |    |  |  |
|                          |  | <hr/>   |  |  |
|                          |  | Bill Chen /Project Engineer   |  |  |
|                          |  |  |  |  |
|                          |  | <hr/>   |  |  |
|                          |  | Eric Fu /Reviewer   |  |  |



## 2 Test Summary

| Radio Spectrum Technical Requirement |                                  |        |  |        |
|--------------------------------------|----------------------------------|--------|--|--------|
| Item                                 | Standard                         | Method | Requirement                                  | Result |
| Antenna Requirement                  | 47 CFR Part 15, Subpart C 15.247 | N/A    | 47 CFR Part 15, Subpart C 15.203 & 15.247(b) | Pass   |

| Radio Spectrum Matter Part                            |                                  |  |   |        |
|---|----------------------------------|--|---|--------|
| Item  | Standard                         | Method                                 | Requirement                               | Result |
| Minimum 6dB Bandwidth                                 | 47 CFR Part 15, Subpart C 15.247 | ANSI C63.10 (2013) Section 11.8.1      | 47 CFR Part 15, Subpart C 15.247a(2)      | Pass   |
| Conducted Peak Output Power                           | 47 CFR Part 15, Subpart C 15.247 | ANSI C63.10 (2013) Section 11.9.1      | 47 CFR Part 15, Subpart C 15.247(b)(3)    | Pass   |
| Power Spectrum Density                                | 47 CFR Part 15, Subpart C 15.247 | ANSI C63.10 (2013) Section 11.10.2     | 47 CFR Part 15, Subpart C 15.247(e)       | Pass   |
| Conducted Band Edges Measurement                      | 47 CFR Part 15, Subpart C 15.247 | ANSI C63.10 (2013) Section 11.13.3.2   | 47 CFR Part 15, Subpart C 15.247(d)       | Pass   |
| Conducted Spurious Emissions                          | 47 CFR Part 15, Subpart C 15.247 | ANSI C63.10 (2013) Section 11.11       | 47 CFR Part 15, Subpart C 15.247(d)       | Pass   |
| Radiated Emissions which fall in the restricted bands | 47 CFR Part 15, Subpart C 15.247 | ANSI C63.10 (2013) Section 6.10.5      | 47 CFR Part 15, Subpart C 15.205 & 15.209 | Pass   |
| Radiated Spurious Emissions                           | 47 CFR Part 15, Subpart C 15.247 | ANSI C63.10 (2013) Section 6.4,6.5,6.6 | 47 CFR Part 15, Subpart C 15.205 & 15.209 | Pass   |

### Declaration of EUT Family Grouping:

Model No.: iSee M, see m1, see m2, see m3, see m4, see m5, see m6

Only the model iSee M was tested, since the electrical circuit design, layout, components used, internal wiring and functions were identical for the above models, with only difference on the colour of appearance.



### 3 Contents

|   | Page |
|---|------|
| 1 COVER PAGE .....  | 1    |
| 2 TEST SUMMARY .....  | 3    |
| 3 CONTENTS .....  | 4    |
| 4 GENERAL INFORMATION .....                                     | 6    |
| 4.1 DETAILS OF E.U.T. ....                                      | 6    |
| 4.2 DESCRIPTION OF SUPPORT UNITS .....                          | 6    |
| 4.3 MEASUREMENT UNCERTAINTY .....                               | 6    |
| 4.4 TEST LOCATION.....  | 8    |
| 4.5 TEST FACILITY.....  | 8    |
| 4.6 DEVIATION FROM STANDARDS.....                               | 8    |
| 4.7 ABNORMALITIES FROM STANDARD CONDITIONS .....                | 8    |
| 5 EQUIPMENT LIST.....   | 9    |
| 6 RADIO SPECTRUM TECHNICAL REQUIREMENT .....                    | 13   |
| 6.1 ANTENNA REQUIREMENT .....                                   | 13   |
| 6.1.1 Test Requirement: .....                                   | 13   |
| 6.1.2 Conclusion .....  | 13   |
| 7 RADIO SPECTRUM MATTER TEST RESULTS.....                       | 14   |
| 7.1 MINIMUM 6dB BANDWIDTH.....                                  | 14   |
| 7.1.1 E.U.T. Operation .....                                    | 14   |
| 7.1.2 Test Setup Diagram .....                                  | 14   |
| 7.1.3 Measurement Procedure and Data.....                       | 14   |
| 7.2 CONDUCTED PEAK OUTPUT POWER.....                            | 15   |
| 7.2.1 E.U.T. Operation .....                                    | 15   |
| 7.2.2 Test Setup Diagram .....                                  | 15   |
| 7.2.3 Measurement Procedure and Data.....                       | 15   |
| 7.3 POWER SPECTRUM DENSITY.....                                 | 16   |
| 7.3.1 E.U.T. Operation .....                                    | 16   |
| 7.3.2 Test Setup Diagram .....                                  | 16   |
| 7.3.3 Measurement Procedure and Data.....                       | 16   |
| 7.4 CONDUCTED BAND EDGES MEASUREMENT .....                      | 17   |
| 7.4.1 E.U.T. Operation .....                                    | 17   |
| 7.4.2 Test Setup Diagram .....                                  | 17   |
| 7.4.3 Measurement Procedure and Data.....                       | 17   |
| 7.5 CONDUCTED SPURIOUS EMISSIONS.....                           | 18   |
| 7.5.1 E.U.T. Operation .....                                    | 18   |
| 7.5.2 Test Setup Diagram .....                                  | 18   |
| 7.5.3 Measurement Procedure and Data.....                       | 18   |
| 7.6 RADIATED EMISSIONS WHICH FALL IN THE RESTRICTED BANDS ..... | 19   |
| 7.6.1 E.U.T. Operation .....                                    | 19   |
| 7.6.2 Test Setup Diagram .....                                  | 19   |
| 7.6.3 Measurement Procedure and Data.....                       | 20   |
| 7.7 RADIATED SPURIOUS EMISSIONS .....                           | 25   |
| 7.7.1 E.U.T. Operation .....                                    | 26   |
| 7.7.2 Test Setup Diagram .....                                  | 26   |



|       |  |           |
|-------|--|-----------|
| 7.7.3 | Measurement Procedure and Data.....          | 27        |
| 8     | <b>PHOTOGRAPHS.....</b>                      | <b>36</b> |
| 8.1   | TEST SETUP.....                              | 36        |
| 8.2   | EUT CONSTRUCTIONAL DETAILS (EUT PHOTOS)..... | 36        |
| 9     | <b>APPENDIX.....</b>                         | <b>37</b> |
| 9.1   | APPENDIX 15.247 .....                        | 37-51     |

## 4 General Information

### 4.1 Details of E.U.T.

|                     |  |
|---------------------|--|
| Power supply:       | Rechargeable battery:DC 3.7V 1150mAh 4.26Wh(Charge by USB) |
| Cable:              | USB cable:97cm unshielded                                  |
| Frequency Range:    | 2402MHz to 2480MHz   |
| Bluetooth Version:  | V5.0(This test report is for BLE mode.)                    |
| Modulation Type:    | GFSK   |
| Number of Channels: | 40   |
| Sample Type:        | Portable production  |
| Antenna Type:       | Ceramic antenna  |
| Antenna Gain:       | 3.2dBi   |

| Operation Frequency each of channel |           |         |           |         |           |         |           |
|-------------------------------------|-----------|---------|-----------|---------|-----------|---------|-----------|
| Channel                             | Frequency | Channel | Frequency | Channel | Frequency | Channel | Frequency |
| 0                                   | 2402MHz   | 10      | 2422MHz   | 20      | 2442MHz   | 30      | 2462MHz   |
| 1                                   | 2404MHz   | 11      | 2424MHz   | 21      | 2444MHz   | 31      | 2464MHz   |
| 2                                   | 2406MHz   | 12      | 2426MHz   | 22      | 2446MHz   | 32      | 2466MHz   |
| 3                                   | 2408MHz   | 13      | 2428MHz   | 23      | 2448MHz   | 33      | 2468MHz   |
| 4                                   | 2410MHz   | 14      | 2430MHz   | 24      | 2450MHz   | 34      | 2470MHz   |
| 5                                   | 2412MHz   | 15      | 2432MHz   | 25      | 2452MHz   | 35      | 2472MHz   |
| 6                                   | 2414MHz   | 16      | 2434MHz   | 26      | 2454MHz   | 36      | 2474MHz   |
| 7                                   | 2416MHz   | 17      | 2436MHz   | 27      | 2456MHz   | 37      | 2476MHz   |
| 8                                   | 2418MHz   | 18      | 2438MHz   | 28      | 2458MHz   | 38      | 2478MHz   |
| 9                                   | 2420MHz   | 19      | 2440MHz   | 29      | 2460MHz   | 39      | 2480MHz   |

Note:

In section 15.31(m), regards to the operating frequency range over 10 MHz, the lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, and the selected channel see below:

| Channel                    | Frequency |
|----------------------------|-----------|
| The lowest channel (CH0)   | 2402MHz   |
| The middle channel (CH19)  | 2440MHz   |
| The highest channel (CH39) | 2480MHz   |

### 4.2 Description of Support Units

The EUT has been tested as an independent unit.

### 4.3 Measurement Uncertainty

| No. | Item | Measurement Uncertainty |
|-----|------|-------------------------|
|-----|------|-------------------------|



**SGS-CSTC Standards Technical Services Co., Ltd.**  
**Shenzhen Branch**

Report No.: SZEM180900844103

Page: 7 of 51

|    |                                 |                                 |
|----|---------------------------------|---------------------------------|
| 1  | Radio Frequency                 | $\pm 7.25 \times 10^{-8}$       |
| 2  | Duty cycle                      | $\pm 0.37\%$                    |
| 3  | Occupied Bandwidth              | $\pm 3\%$                       |
| 4  | RF conducted power              | $\pm 0.75\text{dB}$             |
| 5  | RF power density                | $\pm 2.84\text{dB}$             |
| 6  | Conducted Spurious emissions    | $\pm 0.75\text{dB}$             |
| 7  | RF Radiated power               | $\pm 4.5\text{dB}$ (below 1GHz) |
|    |                                 | $\pm 4.8\text{dB}$ (above 1GHz) |
| 8  | Radiated Spurious emission test | $\pm 4.5\text{dB}$ (Below 1GHz) |
|    |                                 | $\pm 4.8\text{dB}$ (Above 1GHz) |
| 9  | Temperature test                | $\pm 1^\circ\text{C}$           |
| 10 | Humidity test                   | $\pm 3\%$                       |
| 11 | Supply voltages                 | $\pm 1.5\%$                     |
| 12 | Time                            | $\pm 3\%$                       |



#### **4.4 Test Location**

All tests were performed at:

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen Branch

No. 1 Workshop, M-10, Middle Section, Science & Technology Park, Shenzhen, Guangdong, China.  
518057.

Tel: +86 755 2601 2053 Fax: +86 755 2671 0594

No tests were sub-contracted.

#### **4.5 Test Facility**

The test facility is recognized, certified, or accredited by the following organizations:

- **CNAS (No. CNAS L2929)**

CNAS has accredited SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch EMC Lab to ISO/IEC 17025:2005 General Requirements for the Competence of Testing and Calibration Laboratories (CNAS-CL01 Accreditation Criteria for the Competence of Testing and Calibration Laboratories) for the competence in the field of testing.

- **A2LA (Certificate No. 3816.01)**

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory is accredited by the American Association for Laboratory Accreditation(A2LA). Certificate No. 3816.01.

- **VCCI**

The 3m Fully-anechoic chamber for above 1GHz, 10m Semi-anechoic chamber for below 1GHz, Shielded Room for Mains Port Conducted Interference Measurement and Telecommunication Port Conducted Interference Measurement of SGS-CSTC Standards Technical Services Co., Ltd. have been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: G-20026, R-14188, C-12383 and T-11153 respectively.

- **FCC –Designation Number: CN1178**

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory has been recognized as an accredited testing laboratory.

Designation Number: CN1178. Test Firm Registration Number: 406779.

- **Innovation, Science and Economic Development Canada**

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory has been recognized by ISED as an accredited testing laboratory.

CAB identifier: CN0006.

IC#: 4620C.

#### **4.6 Deviation from Standards**

None

#### **4.7 Abnormalities from Standard Conditions**

None





## 5 Equipment List

| Minimum 6dB Bandwidth |                      |                         |              |            |              |
|-----------------------|----------------------|-------------------------|--------------|------------|--------------|
| Equipment             | Manufacturer         | Model No                | Inventory No | Cal Date   | Cal Due Date |
| DC Power Supply       | ZhaoXin              | RXN-305D                | SEM011-02    | 2018-09-25 | 2019-09-24   |
| Spectrum Analyzer     | Rohde & Schwarz      | FSP                     | SEM004-06    | 2018-09-27 | 2019-09-26   |
| Measurement Software  | JS Tonscend          | JS1120-2<br>BT/WIFI V2. | N/A          | N/A        | N/A          |
| Coaxial Cable         | SGS                  | N/A                     | SEM031-02    | 2018-07-12 | 2019-07-11   |
| Attenuator            | Weinschel Associates | WA41                    | SEM021-09    | N/A        | N/A          |
| Signal Generator      | KEYSIGHT             | N5173B                  | SEM006-05    | 2018-09-27 | 2019-09-26   |
| Power Meter           | Rohde & Schwarz      | NRVS                    | SEM014-02    | 2018-09-25 | 2019-09-24   |

| Conducted Peak Output Power |                      |                         |              |            |              |
|-----------------------------|----------------------|-------------------------|--------------|------------|--------------|
| Equipment                   | Manufacturer         | Model No                | Inventory No | Cal Date   | Cal Due Date |
| DC Power Supply             | ZhaoXin              | RXN-305D                | SEM011-02    | 2018-09-25 | 2019-09-24   |
| Spectrum Analyzer           | Rohde & Schwarz      | FSP                     | SEM004-06    | 2018-09-27 | 2019-09-26   |
| Measurement Software        | JS Tonscend          | JS1120-2<br>BT/WIFI V2. | N/A          | N/A        | N/A          |
| Coaxial Cable               | SGS                  | N/A                     | SEM031-02    | 2018-07-12 | 2019-07-11   |
| Attenuator                  | Weinschel Associates | WA41                    | SEM021-09    | N/A        | N/A          |
| Signal Generator            | KEYSIGHT             | N5173B                  | SEM006-05    | 2018-09-27 | 2019-09-26   |
| Power Meter                 | Rohde & Schwarz      | NRVS                    | SEM014-02    | 2018-09-25 | 2019-09-24   |

| Power Spectrum Density |                      |                         |              |            |              |
|------------------------|----------------------|-------------------------|--------------|------------|--------------|
| Equipment              | Manufacturer         | Model No                | Inventory No | Cal Date   | Cal Due Date |
| DC Power Supply        | ZhaoXin              | RXN-305D                | SEM011-02    | 2018-09-25 | 2019-09-24   |
| Spectrum Analyzer      | Rohde & Schwarz      | FSP                     | SEM004-06    | 2018-09-27 | 2019-09-26   |
| Measurement Software   | JS Tonscend          | JS1120-2<br>BT/WIFI V2. | N/A          | N/A        | N/A          |
| Coaxial Cable          | SGS                  | N/A                     | SEM031-02    | 2018-07-12 | 2019-07-11   |
| Attenuator             | Weinschel Associates | WA41                    | SEM021-09    | N/A        | N/A          |
| Signal Generator       | KEYSIGHT             | N5173B                  | SEM006-05    | 2018-09-27 | 2019-09-26   |
| Power Meter            | Rohde & Schwarz      | NRVS                    | SEM014-02    | 2018-09-25 | 2019-09-24   |

| Conducted Band Edges Measurement |                      |                         |              |            |              |
|----------------------------------|----------------------|-------------------------|--------------|------------|--------------|
| Equipment                        | Manufacturer         | Model No                | Inventory No | Cal Date   | Cal Due Date |
| DC Power Supply                  | ZhaoXin              | RXN-305D                | SEM011-02    | 2018-09-25 | 2019-09-24   |
| Spectrum Analyzer                | Rohde & Schwarz      | FSP                     | SEM004-06    | 2018-09-27 | 2019-09-26   |
| Measurement Software             | JS Tonscend          | JS1120-2<br>BT/WIFI V2. | N/A          | N/A        | N/A          |
| Coaxial Cable                    | SGS                  | N/A                     | SEM031-02    | 2018-07-12 | 2019-07-11   |
| Attenuator                       | Weinschel Associates | WA41                    | SEM021-09    | N/A        | N/A          |
| Signal Generator                 | KEYSIGHT             | N5173B                  | SEM006-05    | 2018-09-27 | 2019-09-26   |

This document is issued by the Company subject to its General Conditions of Service printed overleaf, available on request or accessible at <http://www.sgs.com/en/Terms-and-Conditions.aspx> and, for electronic format documents, subject to Terms and Conditions for Electronic Documents at <http://www.sgs.com/en/Terms-and-Conditions/Terms-e-Documents.aspx>. Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein. Any holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. This document cannot be reproduced except in full, without prior written approval of the Company. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law. Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 30 days only.



# SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch

Report No.: SZEM180900844103

Page: 10 of 51

|             |                 |      |           |            |            |
|-------------|-----------------|------|-----------|------------|------------|
| Power Meter | Rohde & Schwarz | NRVS | SEM014-02 | 2018-09-25 | 2019-09-24 |
|-------------|-----------------|------|-----------|------------|------------|

**Conducted Spurious Emissions**

| Equipment            | Manufacturer         | Model No                | Inventory No | Cal Date   | Cal Due Date |
|----------------------|----------------------|-------------------------|--------------|------------|--------------|
| DC Power Supply      | ZhaoXin              | RXN-305D                | SEM011-02    | 2018-09-25 | 2019-09-24   |
| Spectrum Analyzer    | Rohde & Schwarz      | FSP                     | SEM004-06    | 2018-09-27 | 2019-09-26   |
| Measurement Software | JS Tonscend          | JS1120-2<br>BT/WIFI V2. | N/A          | N/A        | N/A          |
| Coaxial Cable        | SGS                  | N/A                     | SEM031-02    | 2018-07-12 | 2019-07-11   |
| Attenuator           | Weinschel Associates | WA41                    | SEM021-09    | N/A        | N/A          |
| Signal Generator     | KEYSIGHT             | N5173B                  | SEM006-05    | 2018-09-27 | 2019-09-26   |
| Power Meter          | Rohde & Schwarz      | NRVS                    | SEM014-02    | 2018-09-25 | 2019-09-24   |

**Radiated Emissions which fall in the restricted bands**

| Equipment                         | Manufacturer                             | Model No        | Inventory No | Cal Date   | Cal Due Date |
|-----------------------------------|--|-----------------|--------------|------------|--------------|
| 3m Semi-Anechoic Chamber          | AUDIX                                    | N/A             | SEM001-02    | 2018-03-13 | 2021-03-12   |
| Measurement Software              | AUDIX                                    | e3 V8.2014-6-27 | N/A          | N/A        | N/A          |
| Coaxial Cable                     | SGS                                      | N/A             | SEM026-01    | 2018-07-12 | 2019-07-11   |
| Spectrum Analyzer                 | Rohde & Schwarz                          | FSU43           | SEM004-08    | 2018-04-02 | 2019-04-01   |
| BiConiLog Antenna<br>(26-3000MHz) | ETS-Lindgren                             | 3142C           | SEM003-01    | 2017-06-27 | 2020-06-26   |
| Horn Antenna<br>(1-18GHz)         | Rohde & Schwarz                          | HF907           | SEM003-07    | 2018-04-13 | 2021-04-12   |
| Horn Antenna<br>(15GHz-40GHz)     | Schwarzbeck                              | BBHA 9170       | SEM003-15    | 2017-10-17 | 2020-10-16   |
| Pre-amplifier<br>(0.1-1300MHz)    | HP                                       | 8447D           | SEM005-02    | 2018-09-25 | 2019-09-24   |
| Pre-Amplifier<br>(0.1-26.5GHz)    | Compliance<br>Directions Systems<br>Inc. | PAP-0126        | SEM004-11    | 2018-09-27 | 2019-09-26   |
| Pre-amplifier<br>(18-26GHz)       | Rohde & Schwarz                          | CH14-H052       | SEM005-17    | 2018-04-02 | 2019-04-01   |
| Pre-amplifier<br>(26GHz-40GHz)    | Compliance<br>Directions Systems<br>Inc. | PAP-2640-50     | SEM005-08    | 2018-04-02 | 2019-04-01   |
| DC Power Supply                   | Zhao Xin                                 | RXN-305D        | SEM011-02    | 2018-09-25 | 2019-09-24   |
| Active Loop Antenna               | ETS-Lindgren                             | 6502            | SEM003-08    | 2017-08-22 | 2020-08-21   |
| Band filter                       | N/A                                      | N/A             | SEM023-01    | N/A        | N/A          |



# SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch

Report No.: SZEM180900844103

Page: 11 of 51

| RE in Chamber                     |                      |                 |               |                           |                               |
|-----------------------------------|----------------------|-----------------|---------------|---------------------------|-------------------------------|
| Test Equipment                    | Manufacturer         | Model No.       | Inventory No. | Cal. Date<br>(yyyy-mm-dd) | Cal. Due date<br>(yyyy-mm-dd) |
| 3m Semi-Anechoic Chamber          | ETS-LINDGREN         | N/A             | SEM001-01     | 2017-08-05                | 2020-08-04                    |
| MXE EMI Receiver<br>(20Hz-8.4GHz) | Agilent Technologies | N9038A          | SEM004-05     | 2018-09-25                | 2019-09-24                    |
| BiConiLog Antenna<br>(26-3000MHz) | ETS-LINDGREN         | 3142C           | SEM003-01     | 2017-06-27                | 2020-06-26                    |
| Pre-amplifier<br>(0.1-1300MHz)    | Agilent Technologies | 8447D           | SEM005-01     | 2018-04-02                | 2019-04-01                    |
| Measurement Software              | AUDIX                | e3 V8.2014-6-27 | N/A           | N/A                       | N/A                           |
| Coaxial Cable                     | SGS                  | N/A             | SEM025-01     | 2018-07-12                | 2019-07-11                    |

| Radiated Spurious Emissions       |  |                 |              |            |              |
|-----------------------------------|--|-----------------|--------------|------------|--------------|
| Equipment                         | Manufacturer                             | Model No        | Inventory No | Cal Date   | Cal Due Date |
| 3m Semi-Anechoic Chamber          | AUDIX                                    | N/A             | SEM001-02    | 2018-03-13 | 2021-03-12   |
| Measurement Software              | AUDIX                                    | e3 V8.2014-6-27 | N/A          | N/A        | N/A          |
| Coaxial Cable                     | SGS                                      | N/A             | SEM026-01    | 2018-07-12 | 2019-07-11   |
| Spectrum Analyzer                 | Rohde & Schwarz                          | FSU43           | SEM004-08    | 2018-04-02 | 2019-04-01   |
| BiConiLog Antenna<br>(26-3000MHz) | ETS-Lindgren                             | 3142C           | SEM003-01    | 2017-06-27 | 2020-06-26   |
| Horn Antenna<br>(1-18GHz)         | Rohde & Schwarz                          | HF907           | SEM003-07    | 2018-04-13 | 2021-04-12   |
| Horn Antenna<br>(15GHz-40GHz)     | Schwarzbeck                              | BBHA 9170       | SEM003-15    | 2017-10-17 | 2020-10-16   |
| Pre-amplifier<br>(0.1-1300MHz)    | HP                                       | 8447D           | SEM005-02    | 2018-09-25 | 2019-09-24   |
| Pre-Amplifier<br>(0.1-26.5GHz)    | Compliance<br>Directions Systems<br>Inc. | PAP-0126        | SEM004-11    | 2018-09-27 | 2019-09-26   |
| Pre-amplifier<br>(18-26GHz)       | Rohde & Schwarz                          | CH14-H052       | SEM005-17    | 2018-04-02 | 2019-04-01   |
| Pre-amplifier<br>(26GHz-40GHz)    | Compliance<br>Directions Systems<br>Inc. | PAP-2640-50     | SEM005-08    | 2018-04-02 | 2019-04-01   |
| DC Power Supply                   | Zhao Xin                                 | RXN-305D        | SEM011-02    | 2018-09-25 | 2019-09-24   |
| Active Loop Antenna               | ETS-Lindgren                             | 6502            | SEM003-08    | 2017-08-22 | 2020-08-21   |
| Band filter                       | N/A                                      | N/A             | SEM023-01    | N/A        | N/A          |

| General used equipment |              |          |              |          |              |
|------------------------|--------------|----------|--------------|----------|--------------|
| Equipment              | Manufacturer | Model No | Inventory No | Cal Date | Cal Due Date |

This document is issued by the Company subject to its General Conditions of Service printed overleaf, available on request or accessible at <http://www.sgs.com/en/Terms-and-Conditions.aspx> and, for electronic format documents, subject to Terms and Conditions for Electronic Documents at <http://www.sgs.com/en/Terms-and-Conditions/Terms-e-Document.aspx>. Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein. Any holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. This document cannot be reproduced except in full, without prior written approval of the Company. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law. Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 30 days only.



**SGS-CSTC Standards Technical Services Co., Ltd.**  
**Shenzhen Branch**

Report No.: SZEM180900844103

Page: 12 of 51

|                                 |   |        |           |            |            |
|---------------------------------|---|--------|-----------|------------|------------|
| Humidity/ Temperature Indicator | Shanghai Meteorological Industry Factory  | ZJ1-2B | SEM002-03 | 2018-09-27 | 2019-09-26 |
| Humidity/ Temperature Indicator | Shanghai Meteorological Industry Factory  | ZJ1-2B | SEM002-04 | 2018-09-27 | 2019-09-26 |
| Humidity/ Temperature Indicator | Mingle                                    | N/A    | SEM002-08 | 2018-09-27 | 2019-09-26 |
| Barometer                       | Changchun Meteorological Industry Factory | DYM3   | SEM002-01 | 2018-04-08 | 2019-04-07 |



## **6 Radio Spectrum Technical Requirement**

### **6.1 Antenna Requirement**

#### **6.1.1 Test Requirement:**

47 CFR Part 15, Subpart C 15.203 & 15.247(b)

#### **6.1.2 Conclusion**

Standard 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, 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.

15.247(b) (4) requirement:

The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

EUT Antenna:

The antenna is integrated on the main PCB and no consideration of replacement. The best case gain of the antenna is 3.2dBi.

Antenna location: Refer to Appendix(Internal photos)

## 7 Radio Spectrum Matter Test Results

### 7.1 Minimum 6dB Bandwidth

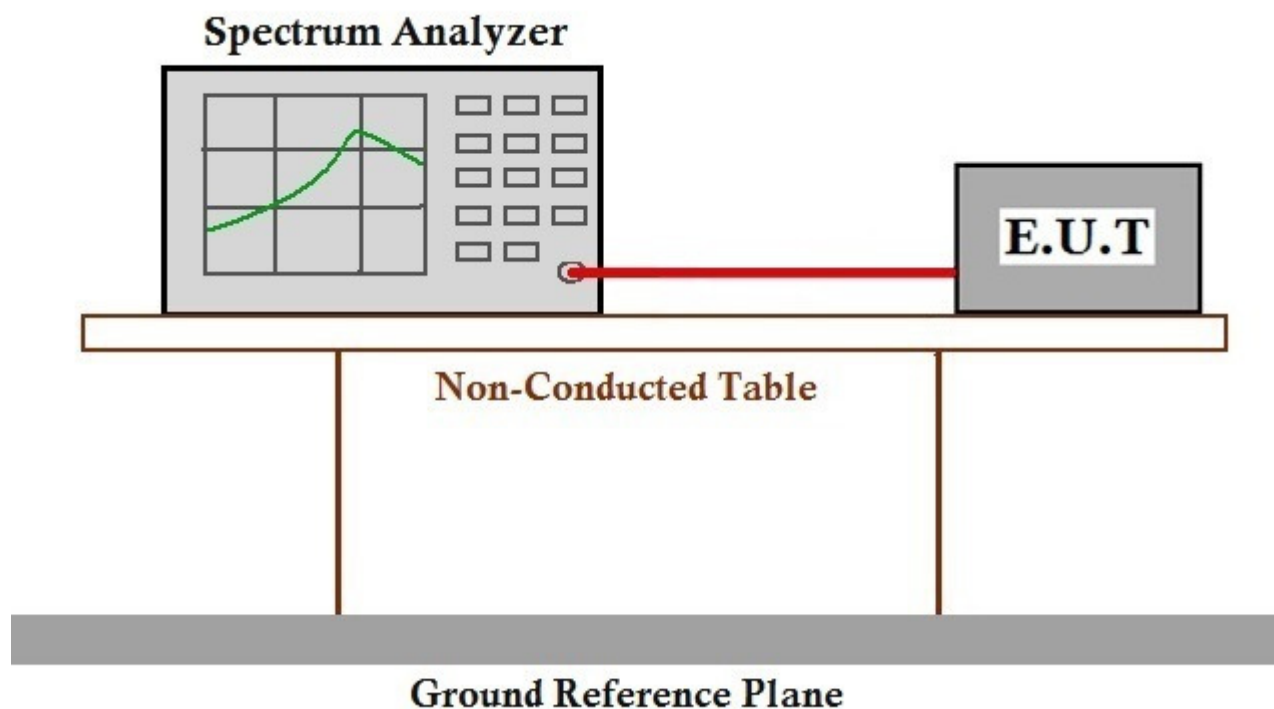
Test Requirement 47 CFR Part 15, Subpart C 15.247a(2)  
Test Method: ANSI C63.10 (2013) Section 11.8.1  
Limit:  $\geq 500$  kHz

#### 7.1.1 E.U.T. Operation

Operating Environment:

Temperature: 24 °C Humidity: 43.1 % RH Atmospheric Pressure: 1010 mbar  
Test mode e:TX mode\_Keep the EUT in continuously transmitting mode with GFSK modulation

#### 7.1.2 Test Setup Diagram



#### 7.1.3 Measurement Procedure and Data

The detailed test data see: Appendix 15.247

## 7.2 Conducted Peak Output Power

Test Requirement 47 CFR Part 15, Subpart C 15.247(b)(3)

Test Method: ANSI C63.10 (2013) Section 11.9.1

Limit:

| Frequency range(MHz) | Output power of the intentional radiator(watt)         |
|----------------------|--|
| 902-928              | 1 for $\geq 50$ hopping channels                       |
|                      | 0.25 for $25 \leq$ hopping channels $< 50$             |
|                      | 1 for digital modulation                               |
| 2400-2483.5          | 1 for $\geq 75$ non-overlapping hopping channels       |
|                      | 0.125 for all other frequency hopping systems          |
|                      | 1 for digital modulation                               |
| 5725-5850            | 1 for frequency hopping systems and digital modulation |

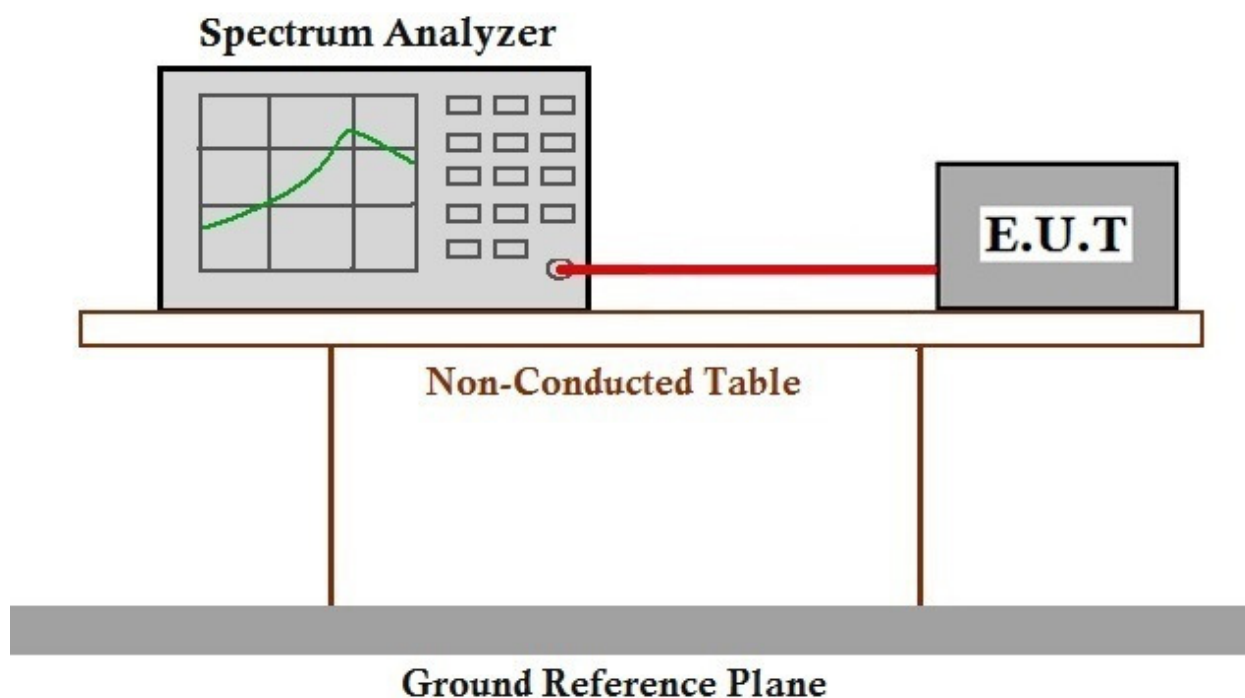
### 7.2.1 E.U.T. Operation

Operating Environment:

Temperature: 24 °C Humidity: 43.1 % RH Atmospheric Pressure: 1010 mbar

Test mode e:TX mode\_Keep the EUT in continuously transmitting mode with GFSK modulation

### 7.2.2 Test Setup Diagram



### 7.2.3 Measurement Procedure and Data

The detailed test data see: Appendix 15.247

### 7.3 Power Spectrum Density

Test Requirement 47 CFR Part 15, Subpart C 15.247(e)  
 Test Method: ANSI C63.10 (2013) Section 11.10.2  
 Limit:  $\leq 8\text{dBm}$  in any 3 kHz band during any time interval of continuous transmission

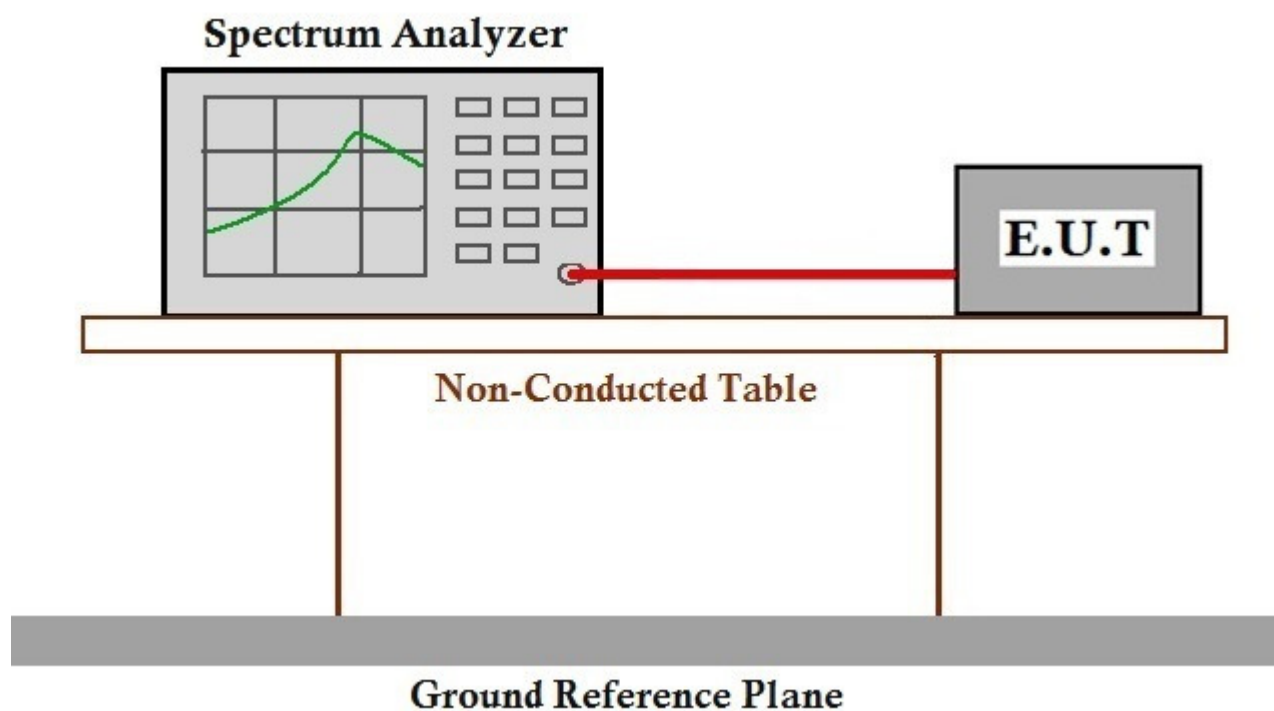
#### 7.3.1 E.U.T. Operation

Operating Environment:

Temperature: 24 °C Humidity: 43.1 % RH Atmospheric Pressure: 1010 mbar

Test mode e:TX mode\_Keep the EUT in continuously transmitting mode with GFSK modulation

#### 7.3.2 Test Setup Diagram



#### 7.3.3 Measurement Procedure and Data

The detailed test data see: Appendix 15.247



## 7.4 Conducted Band Edges Measurement

|                  |   |
|------------------|---|
| Test Requirement | 47 CFR Part 15, Subpart C 15.247(d)   |
| Test Method:     | ANSI C63.10 (2013) Section 11.13.3.2  |
| Limit:           | In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. 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)) |

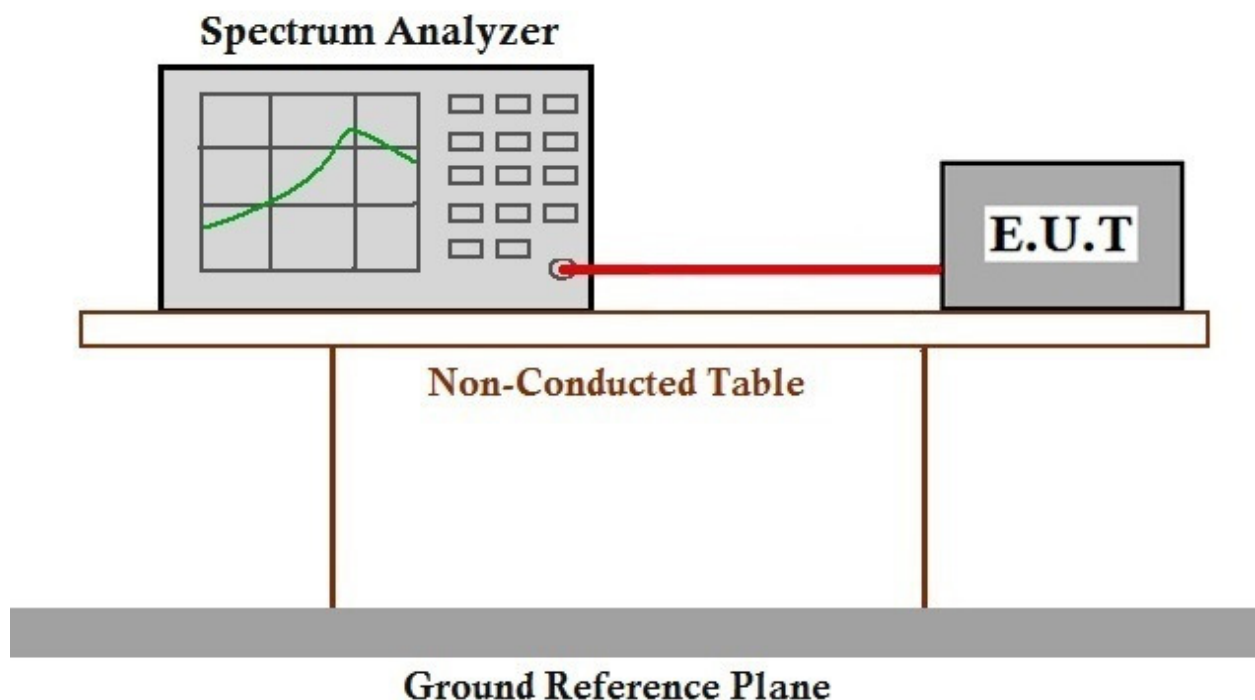
### 7.4.1 E.U.T. Operation

Operating Environment:

Temperature: 24 °C Humidity: 43 % RH Atmospheric Pressure: 1010 mbar

Test mode e:TX mode\_Keep the EUT in continuously transmitting mode with GFSK modulation

### 7.4.2 Test Setup Diagram



### 7.4.3 Measurement Procedure and Data

The detailed test data see: Appendix 15.247

## 7.5 Conducted Spurious Emissions

|                  |   |
|------------------|---|
| Test Requirement | 47 CFR Part 15, Subpart C 15.247(d)   |
| Test Method:     | ANSI C63.10 (2013) Section 11.11  |
| Limit:           | In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. 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)) |

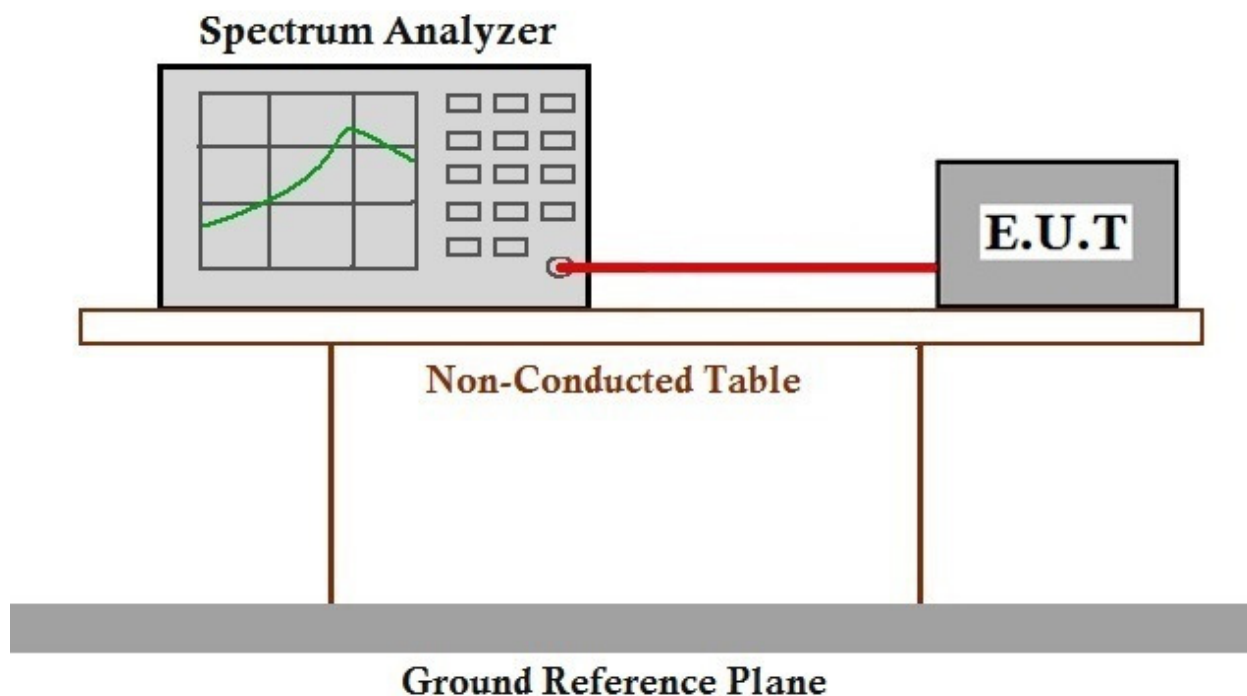
### 7.5.1 E.U.T. Operation

Operating Environment:

Temperature: 24 °C Humidity: 43.1 % RH Atmospheric Pressure: 1010 mbar

Test mode e:TX mode\_Keep the EUT in continuously transmitting mode with GFSK modulation

### 7.5.2 Test Setup Diagram



### 7.5.3 Measurement Procedure and Data

The detailed test data see: Appendix 15.247

## 7.6 Radiated Emissions which fall in the restricted bands

Test Requirement 47 CFR Part 15, Subpart C 15.205 & 15.209

Test Method: ANSI C63.10 (2013) Section 6.10.5

Measurement Distance: 3m

Limit:

| Frequency(MHz) | Field strength(microvolts/meter) | 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                            |

Remark: The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90kHz, 110-490kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

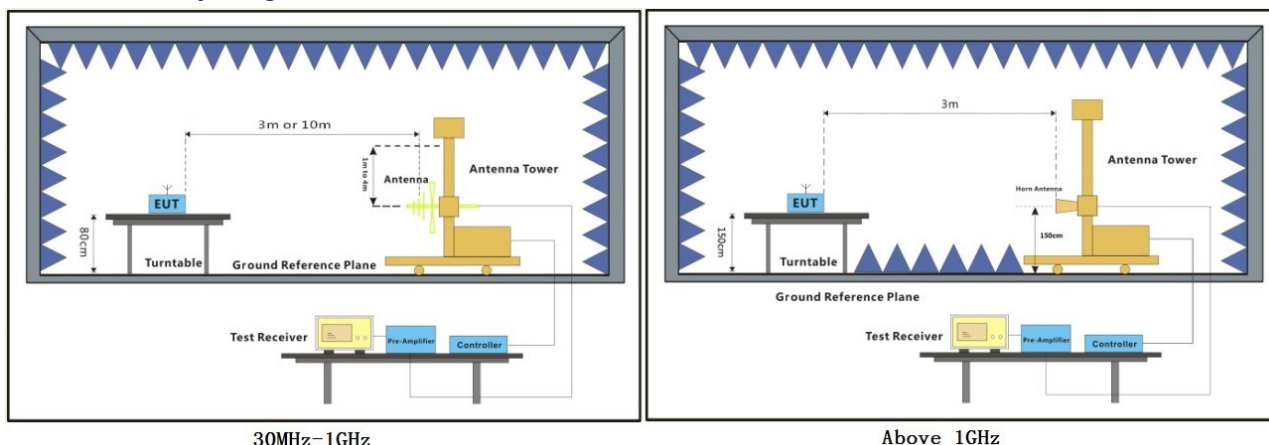
### 7.6.1 E.U.T. Operation

Operating Environment:

Temperature: 21.2 °C Humidity: 49.2 % RH Atmospheric Pressure: 1010 mbar

Test mode e:TX mode\_Keep the EUT in continuously transmitting mode with GFSK modulation

### 7.6.2 Test Setup Diagram



### **7.6.3 Measurement Procedure and Data**

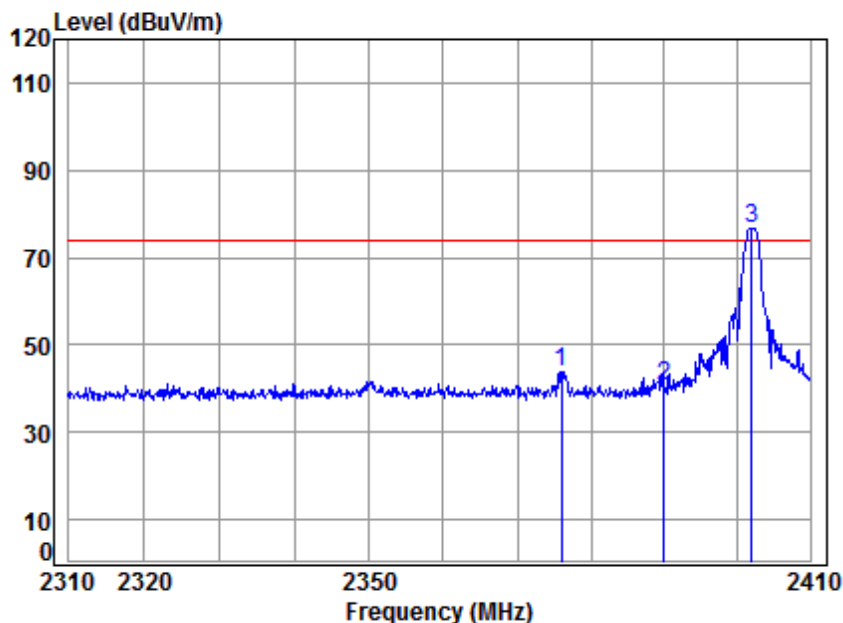
- a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter fully-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- c. The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- d. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- e. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- f. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- g. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.
- h. Test the EUT in the lowest channel, the middle channel, the Highest channel.
- i. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.
- j. Repeat above procedures until all frequencies measured was complete.

Remark 1:  $\text{Level} = \text{Read Level} + \text{Cable Loss} + \text{Antenna Factor} - \text{Preamp Factor}$

Remark 2: For frequencies above 1GHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For the emissions whose peak level is lower than the average limit, only the peak measurement is shown in the report.



Mode:e; Polarization:Horizontal; Modulation:GFSK; ; Channel:Low

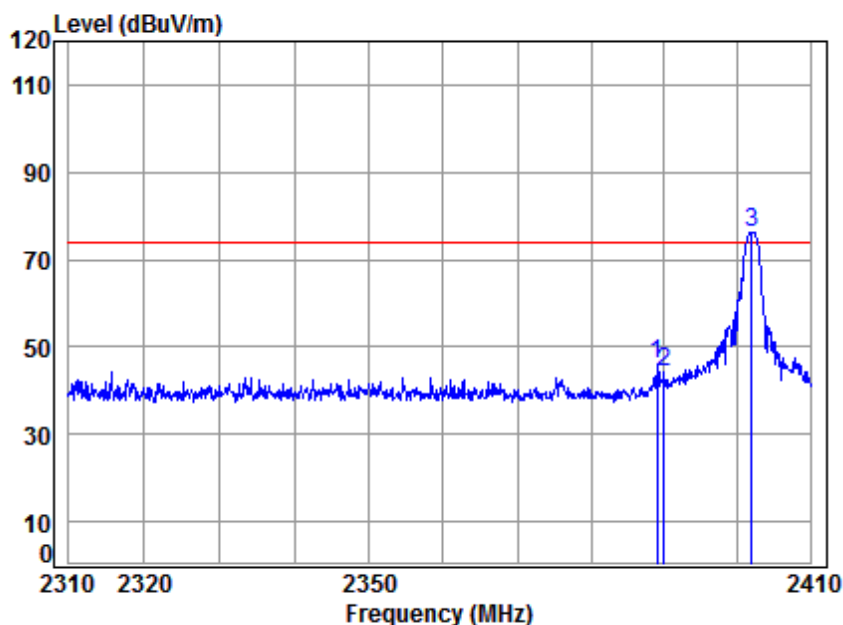


Site : chamber  
Condition: 3m HORIZONTAL  
Job No : 08441CR  
Mode : 2402 Band edge  
Note : BLE

|     |          | Cable | Ant    | Preamp | Read  | Limit  | Over   |             |
|-----|----------|-------|--------|--------|-------|--------|--------|-------------|
|     | Freq     | Loss  | Factor | Factor | Level | Line   | Limit  | Remark      |
|     | MHz      | dB    | dB/m   | dB     | dBuV  | dBuV/m | dBuV/m | dB          |
| 1   | 2376.027 | 5.46  | 28.49  | 41.87  | 51.83 | 43.91  | 74.00  | -30.09 peak |
| 2   | 2390.000 | 5.47  | 28.52  | 41.87  | 48.31 | 40.43  | 74.00  | -33.57 peak |
| 3 * | 2402.000 | 5.49  | 28.54  | 41.88  | 84.68 | 76.83  | 74.00  | 2.83 peak   |



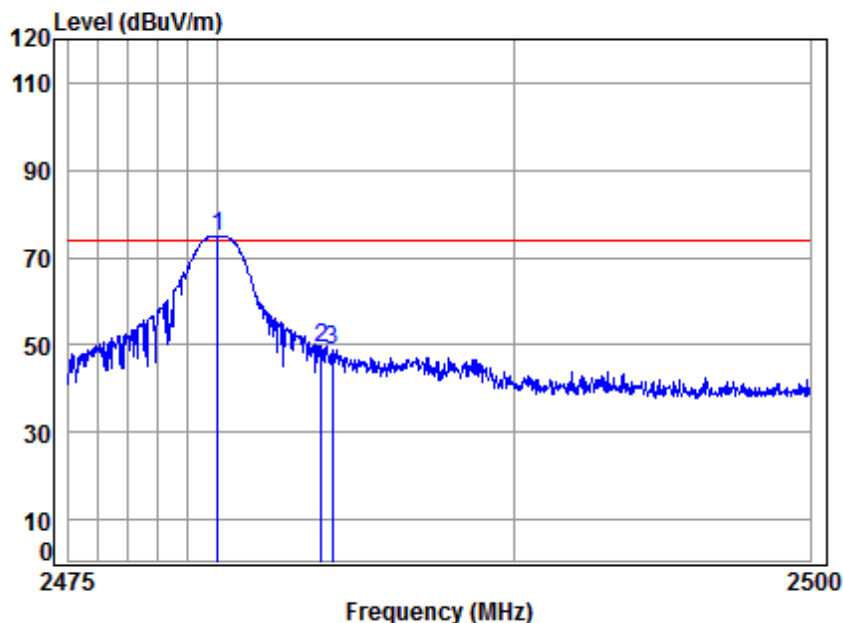
Mode:e; Polarization:Vertical; Modulation:GFSK; ; Channel:Low



Site : chamber  
Condition: 3m VERTICAL  
Job No : 08441CR  
Mode : 2402 Band edge  
Note : BLE

|     |          | Cable | Ant    | Preamp | Read  | Limit  | Over   |              |
|-----|----------|-------|--------|--------|-------|--------|--------|--------------|
|     | Freq     | Loss  | Factor | Factor | Level | Level  | Line   | Limit Remark |
|     | MHz      | dB    | dB/m   | dB     | dBuV  | dBuV/m | dBuV/m | dB           |
| 1   | 2388.951 | 5.47  | 28.52  | 41.87  | 53.92 | 46.04  | 74.00  | -27.96 peak  |
| 2   | 2390.000 | 5.47  | 28.52  | 41.87  | 52.34 | 44.46  | 74.00  | -29.54 peak  |
| 3 * | 2402.000 | 5.49  | 28.54  | 41.88  | 83.96 | 76.11  | 74.00  | 2.11 peak    |

Mode:e; Polarization:Horizontal; Modulation:GFSK; ; Channel:High

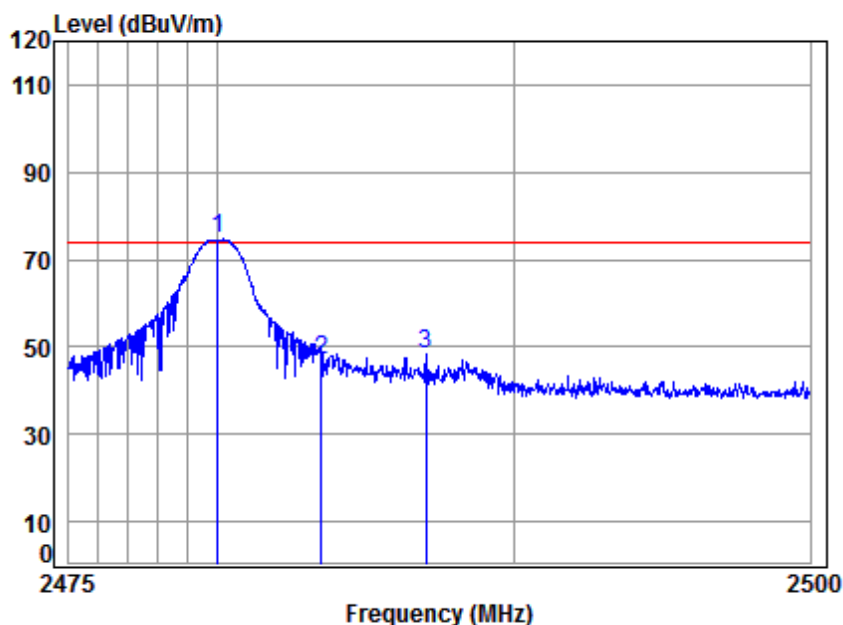


Site : chamber  
Condition: 3m HORIZONTAL  
Job No : 08441CR  
Mode : 2480 Band edge  
Note : BLE

|              | Cable | Ant    | Preamp | Read  | Limit  | Over   |              |
|--------------|-------|--------|--------|-------|--------|--------|--------------|
| Freq         | Loss  | Factor | Factor | Level | Level  | Line   | Limit Remark |
| MHz          | dB    | dB/m   | dB     | dBuV  | dBuV/m | dBuV/m | dB           |
| 1 * 2480.000 | 5.59  | 28.67  | 41.91  | 82.60 | 74.95  | 74.00  | 0.95 peak    |
| 2 2483.500   | 5.60  | 28.67  | 41.91  | 56.84 | 49.20  | 74.00  | -24.80 peak  |
| 3 2483.846   | 5.60  | 28.67  | 41.91  | 56.56 | 48.92  | 74.00  | -25.08 peak  |



Mode:e; Polarization:Vertical; Modulation:GFSK; ; Channel:High



Site : chamber  
Condition: 3m VERTICAL  
Job No : 08441CR  
Mode : 2480 Band edge  
Note : BLE

|              | Cable | Ant    | Preamp | Read  |        | Limit  | Over   |        |
|--------------|-------|--------|--------|-------|--------|--------|--------|--------|
| Freq         | Loss  | Factor | Factor | Level | Level  | Line   | Limit  | Remark |
| MHz          | dB    | dB/m   | dB     | dBuV  | dBuV/m | dBuV/m | dB     |        |
| 1 * 2480.000 | 5.59  | 28.67  | 41.91  | 82.29 | 74.64  | 74.00  | 0.64   | peak   |
| 2 2483.500   | 5.60  | 28.67  | 41.91  | 54.52 | 46.88  | 74.00  | -27.12 | peak   |
| 3 2487.019   | 5.60  | 28.68  | 41.91  | 55.80 | 48.17  | 74.00  | -25.83 | peak   |





## 7.7 Radiated Spurious Emissions

Test Requirement 47 CFR Part 15, Subpart C 15.205 & 15.209

Test Method: ANSI C63.10 (2013) Section 6.4,6.5,6.6

Measurement Distance: 3m

Limit:

| Frequency(MHz) | Field strength(microvolts/meter) | 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                            |

Remark: The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90kHz, 110-490kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

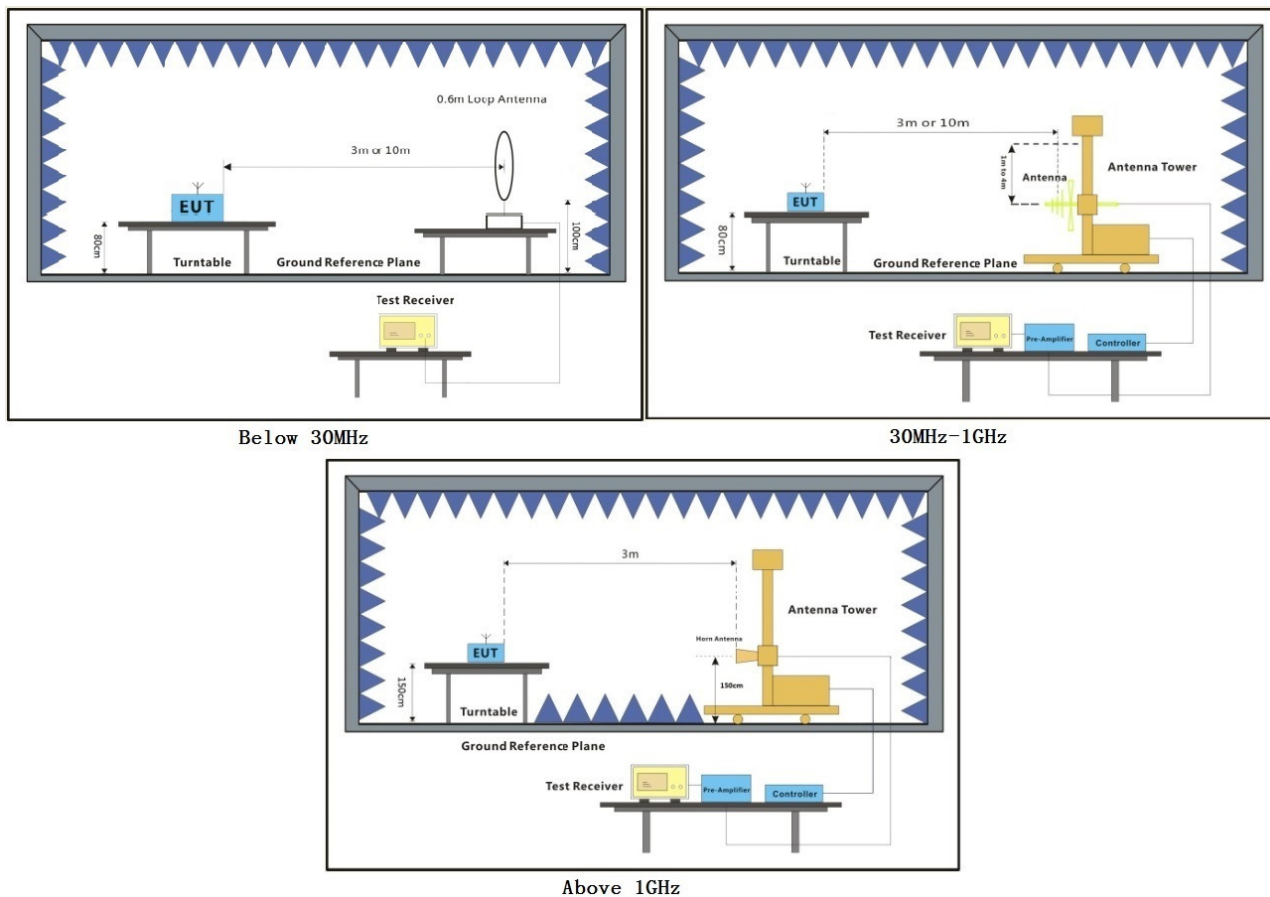
### 7.7.1 E.U.T. Operation

Operating Environment:

Temperature: 23.5 °C Humidity: 52.2 % RH Atmospheric Pressure: 1010 mbar

Test mode e:TX mode\_Keep the EUT in continuously transmitting mode with GFSK modulation

### 7.7.2 Test Setup Diagram



### 7.7.3 Measurement Procedure and Data

- a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter fully-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- c. The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- d. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- e. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- f. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- g. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.
- h. Test the EUT in the lowest channel, the middle channel, the Highest channel.
- i. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.
- j. Repeat above procedures until all frequencies measured was complete.

#### Remark:

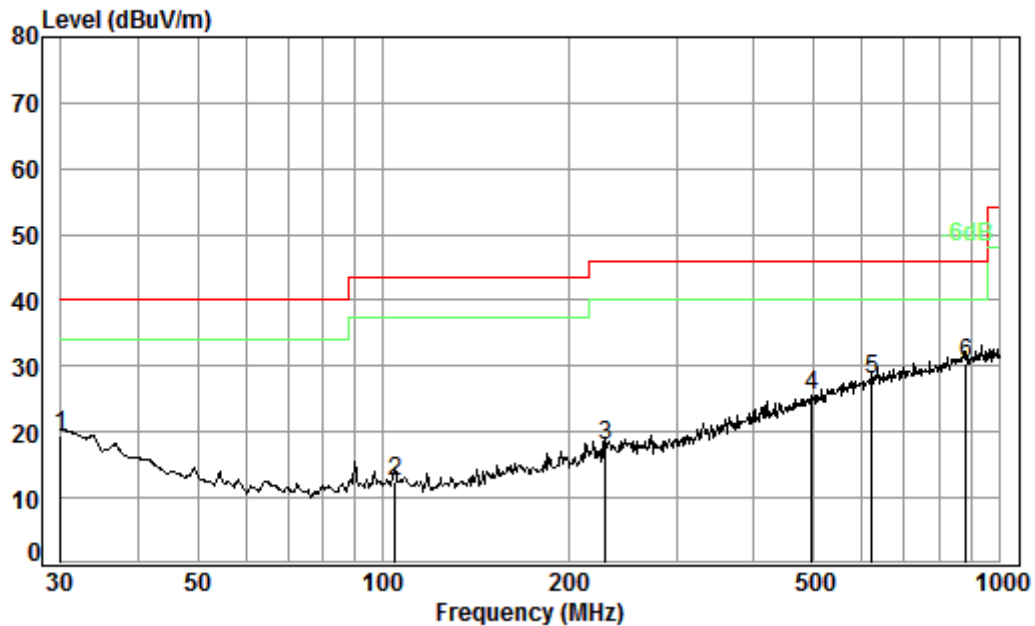
- 1) For emission below 1GHz, through pre-scan found the worst case is the lowest channel. Only the worst case is recorded in the report.
- 2) The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:  
$$\text{Final Test Level} = \text{Receiver Reading} + \text{Antenna Factor} + \text{Cable Factor} - \text{Preamplifier Factor}$$
- 3) Scan from 9kHz to 25GHz, the disturbance above 18GHz and below 30MHz was very low. The points marked on above plots are the highest emissions could be found when testing, so only above points had been displayed. The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported.
- 4) For frequencies above 1GHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For the emissions whose peak level is lower than the average limit, only the peak measurement is shown in the report.



30MHz~1GHz

Detection: QP

Mode: e; Polarization: Horizontal



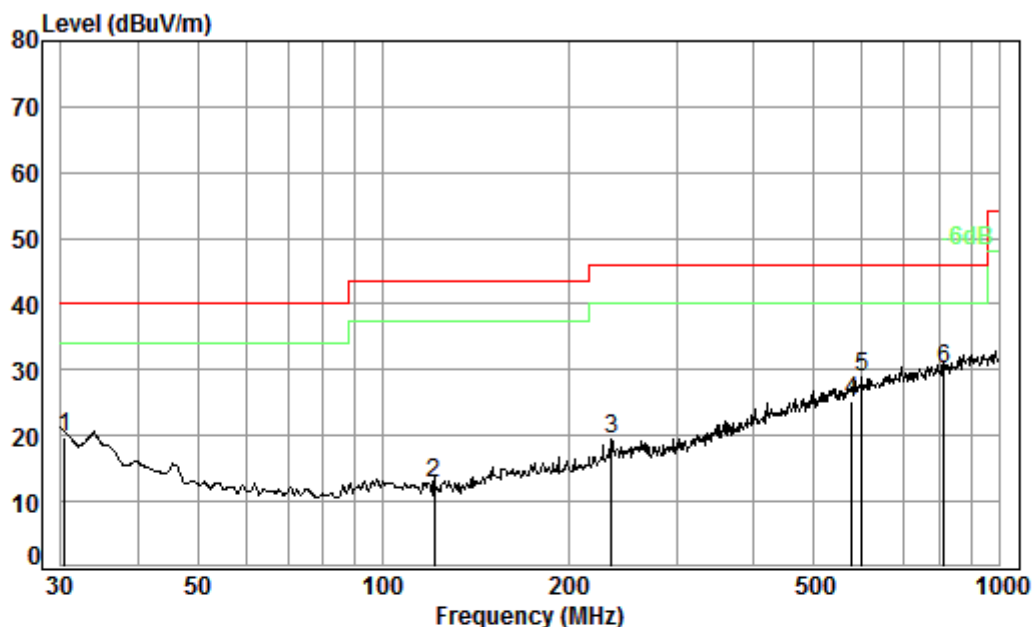
Condition: 3m HORIZONTAL

Job No. : 08441CR

Test mode: e

|      | Freq   | Cable | Ant    | Preamp | Read  | Limit  | Over         |
|------|--------|-------|--------|--------|-------|--------|--------------|
|      | MHz    | Loss  | Factor | Factor | Level | Line   | Limit        |
|      | MHz    | dB    | dB/m   | dB     | dBuV  | dBuV/m | dBuV/m       |
| 1    | 30.00  | 0.60  | 22.50  | 27.67  | 24.08 | 19.51  | 40.00 -20.49 |
| 2    | 104.54 | 1.21  | 13.78  | 27.51  | 25.01 | 12.49  | 43.50 -31.01 |
| 3    | 230.10 | 1.57  | 18.03  | 27.53  | 25.73 | 17.80  | 46.00 -28.20 |
| 4    | 497.68 | 2.59  | 24.55  | 27.88  | 26.25 | 25.51  | 46.00 -20.49 |
| 5    | 622.89 | 2.75  | 26.92  | 27.66  | 26.02 | 28.03  | 46.00 -17.97 |
| 6 pp | 884.50 | 3.54  | 29.61  | 27.13  | 24.34 | 30.36  | 46.00 -15.64 |

Mode: e; Polarization: Vertical



Condition: 3m VERTICAL

Job No. : 08441CR

Test mode: e

|      | Freq   | Cable Loss | Ant Factor | Preamp Factor | Read Level | Level  | Limit Line | Over Limit |
|------|--------|------------|------------|---------------|------------|--------|------------|------------|
|      | MHz    | dB         | dB/m       | dB            | dBuV       | dBuV/m | dBuV/m     | dB         |
| 1    | 30.42  | 0.60       | 22.26      | 27.67         | 24.46      | 19.65  | 40.00      | -20.35     |
| 2    | 121.12 | 1.26       | 13.14      | 27.52         | 25.88      | 12.76  | 43.50      | -30.74     |
| 3    | 234.99 | 1.60       | 18.41      | 27.53         | 27.13      | 19.61  | 46.00      | -26.39     |
| 4    | 576.64 | 2.68       | 26.16      | 27.74         | 24.21      | 25.31  | 46.00      | -20.69     |
| 5    | 599.32 | 2.70       | 26.59      | 27.70         | 27.17      | 28.76  | 46.00      | -17.24     |
| 6 pp | 813.11 | 3.26       | 28.68      | 27.37         | 25.40      | 29.97  | 46.00      | -16.03     |



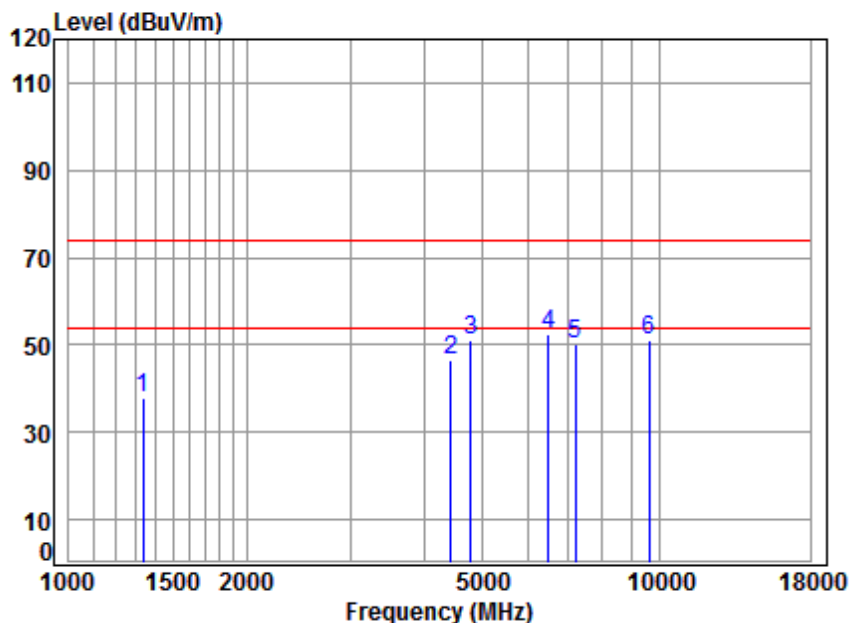
SGS-CSTC Standards Technical Services Co., Ltd.  
Shenzhen Branch

Report No.: SZEM180900844103

Page: 30 of 51

Above 1GHz

Mode:e; Polarization:Horizontal; Modulation:GFSK; ; Channel:Low

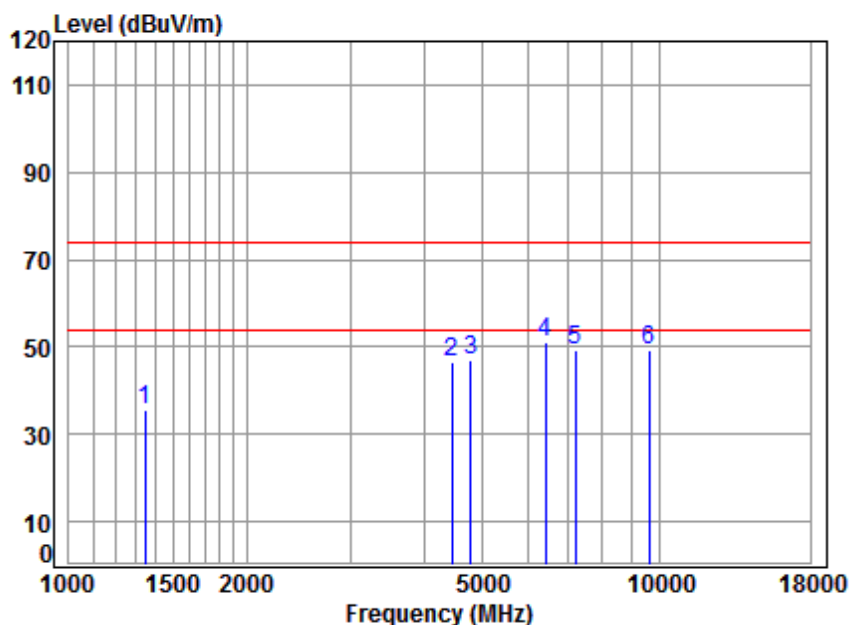


Site : chamber  
Condition: 3m HORIZONTAL  
Job No : 08441CR  
Mode : 2402 TX SE  
Note : BLE

|   | Freq     | Cable Loss | Ant Factor | Preamp Factor | Read Level | Level  | Limit Line | Over Limit | Remark |
|---|----------|------------|------------|---------------|------------|--------|------------|------------|--------|
|   | MHz      | dB         | dB/m       | dB            | dBuV       | dBuV/m | dBuV/m     | dB         |        |
| 1 | 1335.141 | 4.93       | 25.17      | 41.29         | 49.02      | 37.83  | 74.00      | -36.17     | peak   |
| 2 | 4443.453 | 7.50       | 33.50      | 42.41         | 48.13      | 46.72  | 74.00      | -27.28     | peak   |
| 3 | 4804.000 | 7.89       | 33.97      | 42.47         | 51.50      | 50.89  | 74.00      | -23.11     | peak   |
| 4 | 6488.754 | 11.52      | 35.59      | 41.22         | 46.37      | 52.26  | 74.00      | -21.74     | peak   |
| 5 | 7206.000 | 10.08      | 36.07      | 40.71         | 44.77      | 50.21  | 74.00      | -23.79     | peak   |
| 6 | 9608.000 | 10.75      | 37.67      | 37.74         | 40.35      | 51.03  | 74.00      | -22.97     | peak   |



Mode:e; Polarization:Vertical; Modulation:GFSK; ; Channel:Low

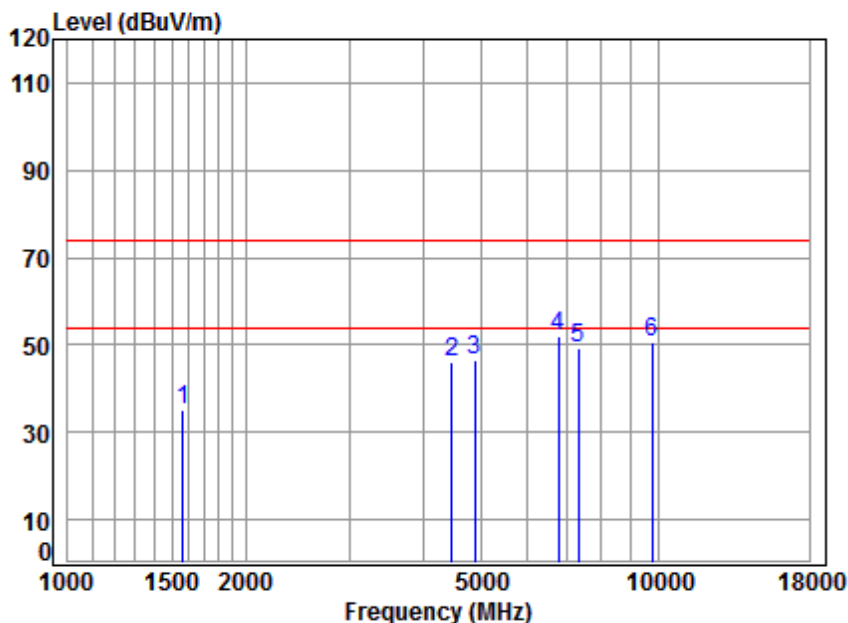


Site : chamber  
Condition: 3m VERTICAL  
Job No : 08441CR  
Mode : 2402 TX SE  
Note : BLE

|   | Freq     | Cable Loss | Ant Factor | Preamp Factor | Read Level | Level  | Limit Line | Over Limit | Remark |
|---|----------|------------|------------|---------------|------------|--------|------------|------------|--------|
|   | MHz      | dB         | dB/m       | dB            | dBuV       | dBuV/m | dBuV/m     | dB         |        |
| 1 | 1346.769 | 4.97       | 25.22      | 41.30         | 46.57      | 35.46  | 74.00      | -38.54     | peak   |
| 2 | 4456.315 | 7.51       | 33.53      | 42.41         | 47.70      | 46.33  | 74.00      | -27.67     | peak   |
| 3 | 4804.000 | 7.89       | 33.97      | 42.47         | 47.51      | 46.90  | 74.00      | -27.10     | peak   |
| 4 | 6414.167 | 11.38      | 35.52      | 41.28         | 45.41      | 51.03  | 74.00      | -22.97     | peak   |
| 5 | 7206.000 | 10.08      | 36.07      | 40.71         | 43.83      | 49.27  | 74.00      | -24.73     | peak   |
| 6 | 9608.000 | 10.75      | 37.67      | 37.74         | 38.38      | 49.06  | 74.00      | -24.94     | peak   |



Mode:e; Polarization:Horizontal; Modulation:GFSK; ; Channel:middle



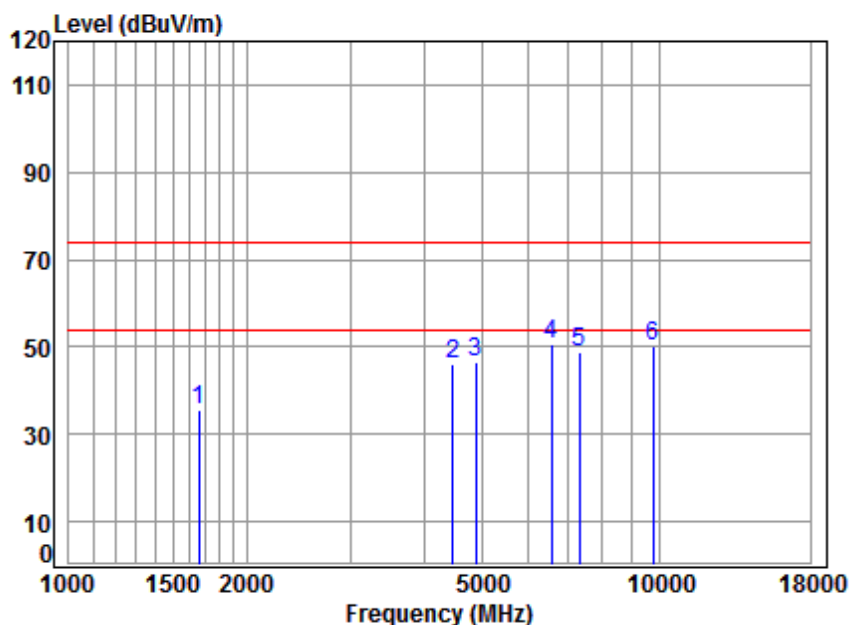
Site : chamber  
Condition: 3m HORIZONTAL  
Job No : 08441CR  
Mode : 2440 TX SE  
Note : BLE

|   | Freq     | Cable Loss | Ant Factor | Preamp Factor | Read Level | Level  | Limit Line | Over Limit | Remark |
|---|----------|------------|------------|---------------|------------|--------|------------|------------|--------|
|   | MHz      | dB         | dB/m       | dB            | dBuV       | dBuV/m | dBuV/m     | dB         |        |
| 1 | 1565.191 | 5.39       | 26.10      | 41.45         | 44.91      | 34.95  | 74.00      | -39.05     | peak   |
| 2 | 4469.214 | 7.53       | 33.55      | 42.41         | 47.40      | 46.07  | 74.00      | -27.93     | peak   |
| 3 | 4880.000 | 7.97       | 34.06      | 42.48         | 46.94      | 46.49  | 74.00      | -27.51     | peak   |
| 4 | 6776.265 | 10.75      | 35.77      | 41.01         | 46.45      | 51.96  | 74.00      | -22.04     | peak   |
| 5 | 7320.000 | 10.05      | 36.16      | 40.63         | 43.78      | 49.36  | 74.00      | -24.64     | peak   |
| 6 | 9760.000 | 10.82      | 37.76      | 37.53         | 39.82      | 50.87  | 74.00      | -23.13     | peak   |





Mode:e; Polarization:Vertical; Modulation:GFSK; ; Channel:middle

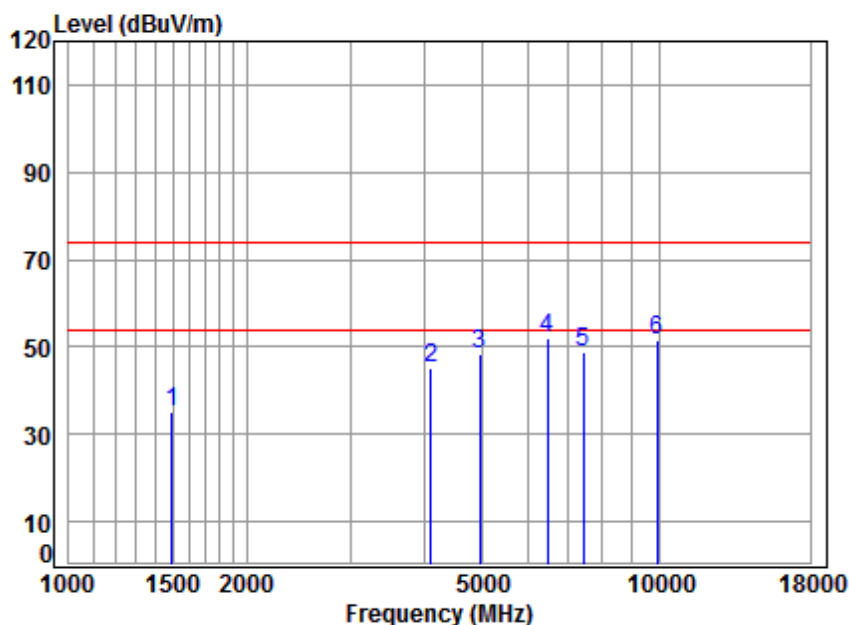


Site : chamber  
Condition: 3m VERTICAL  
Job No : 08441CR  
Mode : 2440 TX SE  
Note : BLE

|   | Freq     | Cable Loss | Ant Factor | Preamp Factor | Read Level | Level  | Limit Line | Over Limit | Remark |
|---|----------|------------|------------|---------------|------------|--------|------------|------------|--------|
|   | MHz      | dB         | dB/m       | dB            | dBuV       | dBuV/m | dBuV/m     | dB         |        |
| 1 | 1663.137 | 5.27       | 26.52      | 41.51         | 45.15      | 35.43  | 74.00      | -38.57     | peak   |
| 2 | 4469.214 | 7.53       | 33.55      | 42.41         | 47.39      | 46.06  | 74.00      | -27.94     | peak   |
| 3 | 4880.000 | 7.97       | 34.06      | 42.48         | 46.83      | 46.38  | 74.00      | -27.62     | peak   |
| 4 | 6564.209 | 11.35      | 35.64      | 41.17         | 44.67      | 50.49  | 74.00      | -23.51     | peak   |
| 5 | 7320.000 | 10.05      | 36.16      | 40.63         | 43.09      | 48.67  | 74.00      | -25.33     | peak   |
| 6 | 9760.000 | 10.82      | 37.76      | 37.53         | 38.98      | 50.03  | 74.00      | -23.97     | peak   |



Mode:e; Polarization:Horizontal; Modulation:GFSK; ; Channel:High

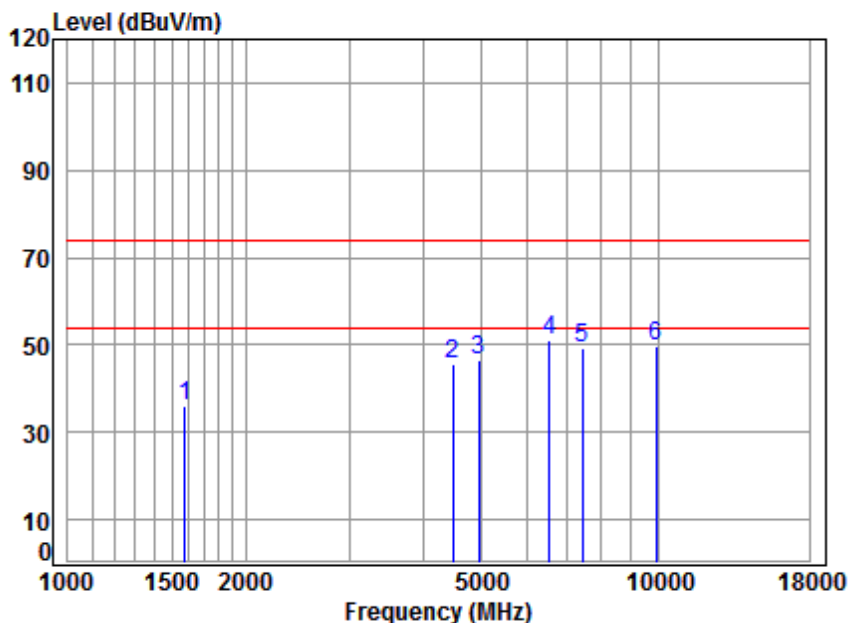


Site : chamber  
Condition: 3m HORIZONTAL  
Job No : 08441CR  
Mode : 2480 TX SE  
Note : BLE

|   | Freq     | Cable Loss | Ant Factor | Preamp Factor | Read Level | Level  | Limit Line | Over Limit | Remark |
|---|----------|------------|------------|---------------|------------|--------|------------|------------|--------|
|   | MHz      | dB         | dB/m       | dB            | dBuV       | dBuV/m | dBuV/m     | dB         |        |
| 1 | 1494.455 | 5.46       | 25.78      | 41.40         | 45.22      | 35.06  | 74.00      | -38.94     | peak   |
| 2 | 4109.872 | 7.11       | 32.91      | 42.35         | 47.40      | 45.07  | 74.00      | -28.93     | peak   |
| 3 | 4960.000 | 8.05       | 34.15      | 42.49         | 48.50      | 48.21  | 74.00      | -25.79     | peak   |
| 4 | 6470.026 | 11.48      | 35.57      | 41.24         | 46.00      | 51.81  | 74.00      | -22.19     | peak   |
| 5 | 7440.000 | 10.02      | 36.25      | 40.56         | 43.31      | 49.02  | 74.00      | -24.98     | peak   |
| 6 | 9920.000 | 10.90      | 37.85      | 37.31         | 39.96      | 51.40  | 74.00      | -22.60     | peak   |



Mode:e; Polarization:Vertical; Modulation:GFSK; ; Channel:High



Site : chamber  
Condition: 3m VERTICAL  
Job No : 08441CR  
Mode : 2480 TX SE  
Note : BLE

|   | Freq     | Cable Loss | Ant Factor | Preamp Factor | Read Level | Level  | Limit Line | Over Limit | Remark |
|---|----------|------------|------------|---------------|------------|--------|------------|------------|--------|
|   | MHz      | dB         | dB/m       | dB            | dBuV       | dBuV/m | dBuV/m     | dB         |        |
| 1 | 1578.822 | 5.38       | 26.16      | 41.46         | 46.10      | 36.18  | 74.00      | -37.82     | peak   |
| 2 | 4495.125 | 7.55       | 33.59      | 42.42         | 46.72      | 45.44  | 74.00      | -28.56     | peak   |
| 3 | 4960.000 | 8.05       | 34.15      | 42.49         | 46.73      | 46.44  | 74.00      | -27.56     | peak   |
| 4 | 6545.263 | 11.41      | 35.63      | 41.18         | 45.24      | 51.10  | 74.00      | -22.90     | peak   |
| 5 | 7440.000 | 10.02      | 36.25      | 40.56         | 43.68      | 49.39  | 74.00      | -24.61     | peak   |
| 6 | 9920.000 | 10.90      | 37.85      | 37.31         | 38.51      | 49.95  | 74.00      | -24.05     | peak   |



## **8 Photographs**

### **8.1 Test Setup**

Refer to Setup Photos

### **8.2 EUT Constructional Details (EUT Photos)**

Refer to EUT external and internal photos

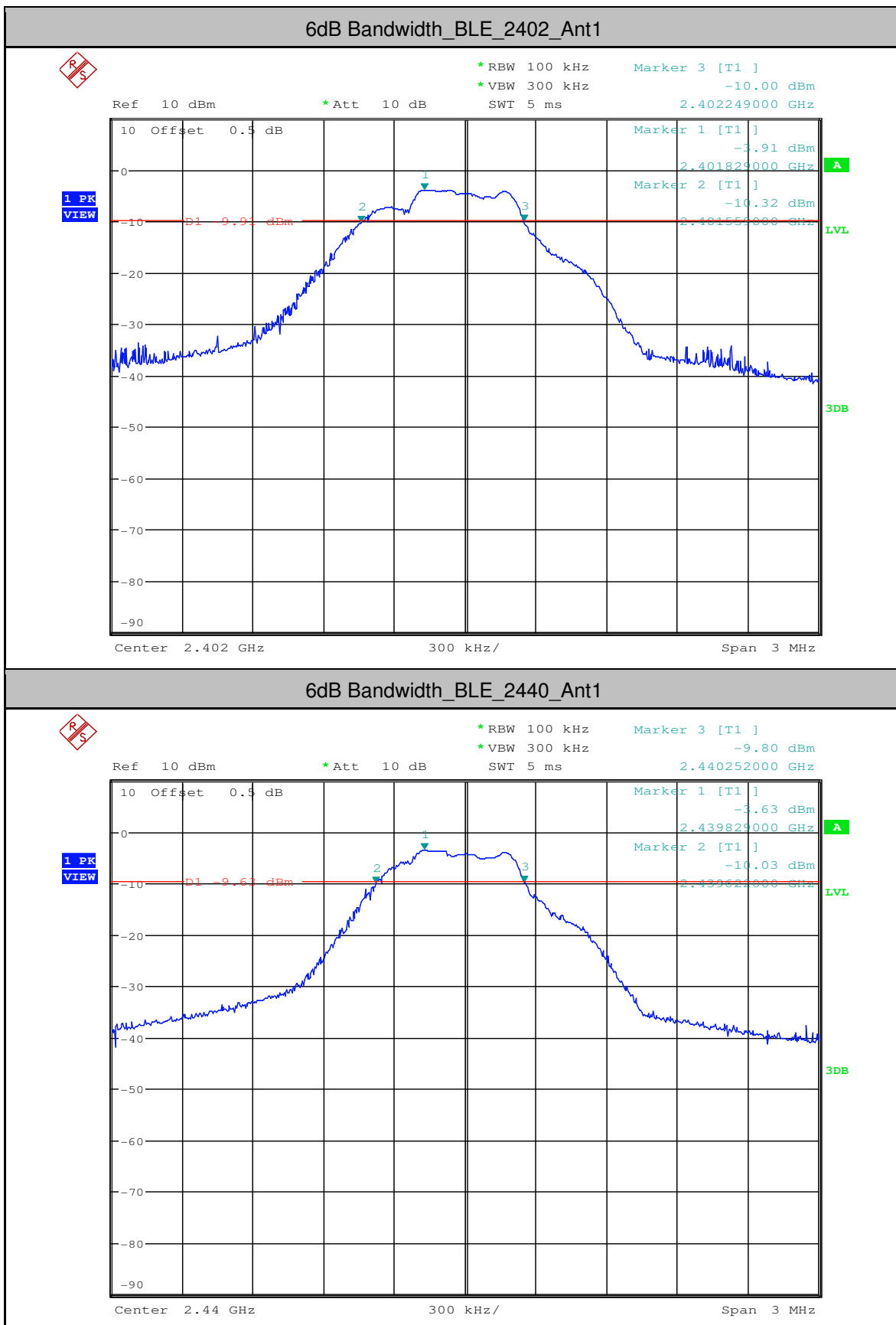


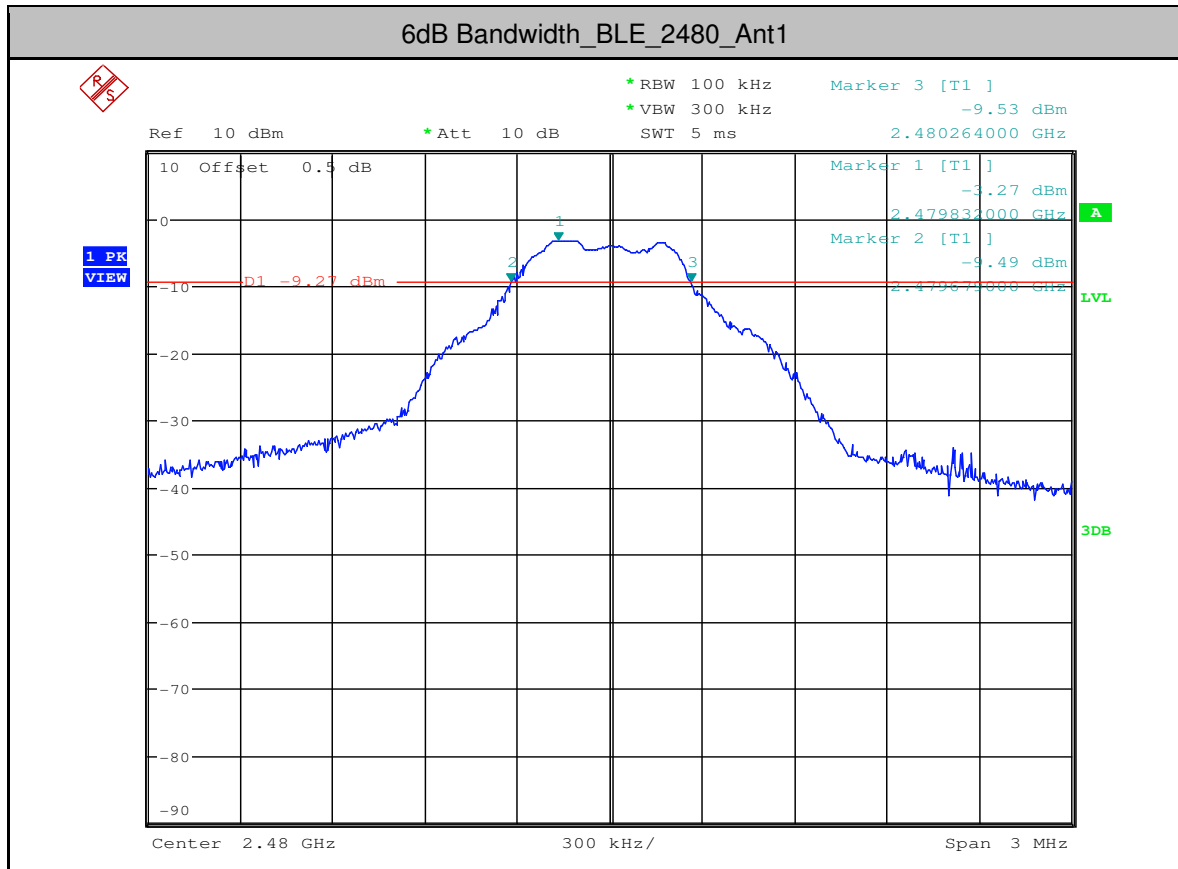
## 9 Appendix

### 9.1 Appendix 15.247

#### 1.6dB Bandwidth

| Test Mode | Test Channel | Ant  | EBW[MHz] | Limit[MHz] | Verdict |
|-----------|--------------|------|----------|------------|---------|
| BLE       | 2402         | Ant1 | 0.690    | $\geq 0.5$ | PASS    |
| BLE       | 2440         | Ant1 | 0.630    | $\geq 0.5$ | PASS    |
| BLE       | 2480         | Ant1 | 0.585    | $\geq 0.5$ | PASS    |



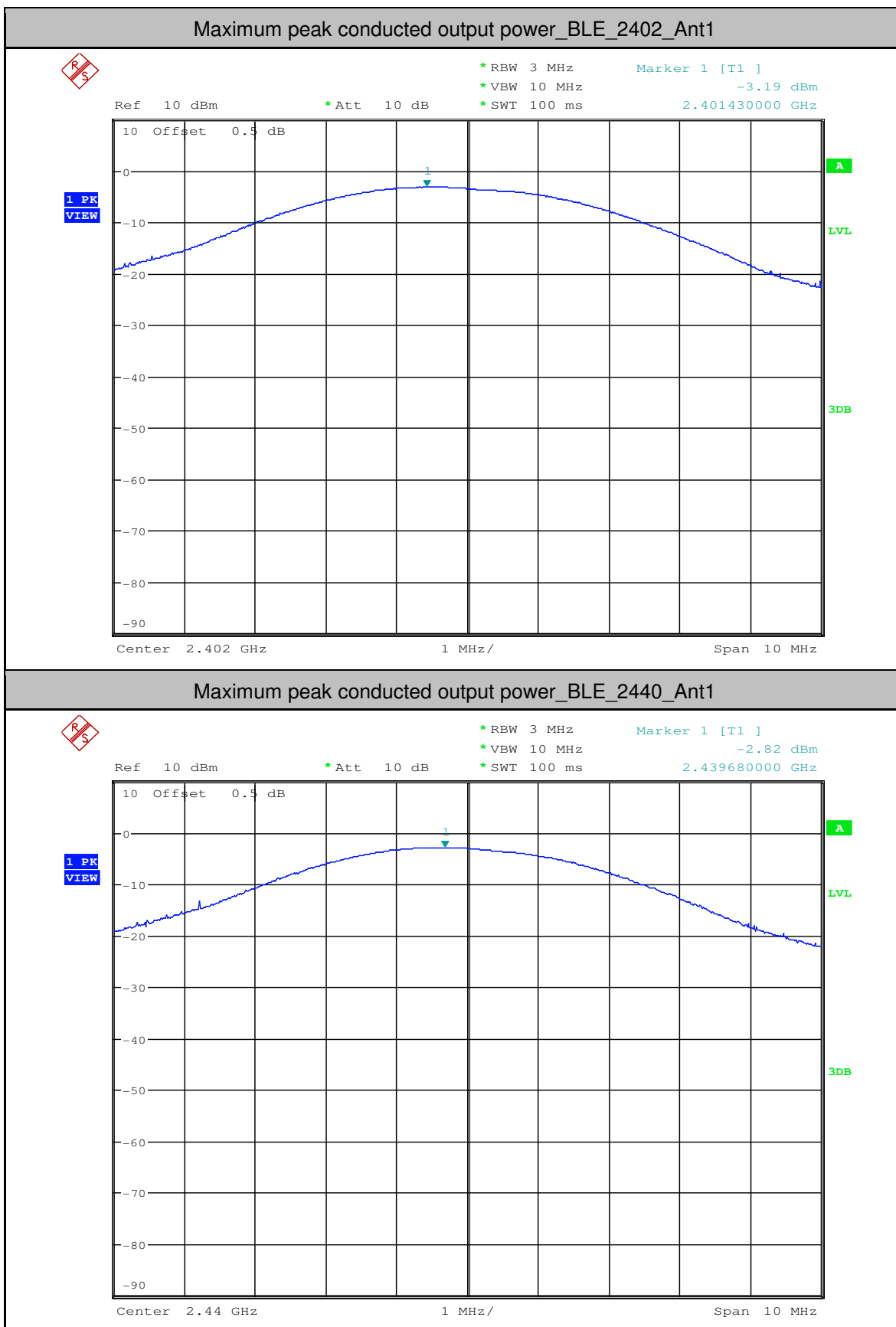


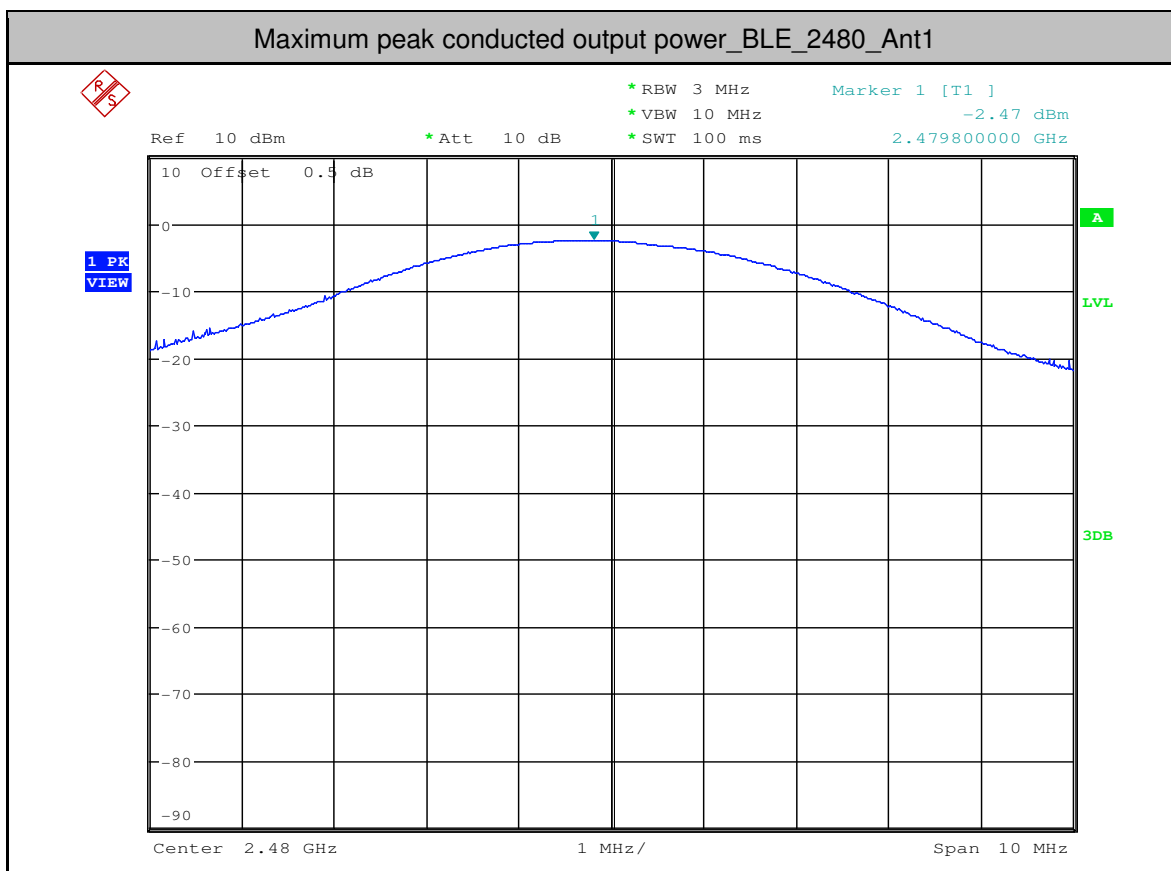


**2.Maximum peak conducted output power**

| Test Mode | Test Channel | Ant  | Power[dBm] | Limit[dBm] | Verdict |
|-----------|--------------|------|------------|------------|---------|
| BLE       | 2402         | Ant1 | -3.19      | <30        | PASS    |
| BLE       | 2440         | Ant1 | -2.82      | <30        | PASS    |
| BLE       | 2480         | Ant1 | -2.47      | <30        | PASS    |

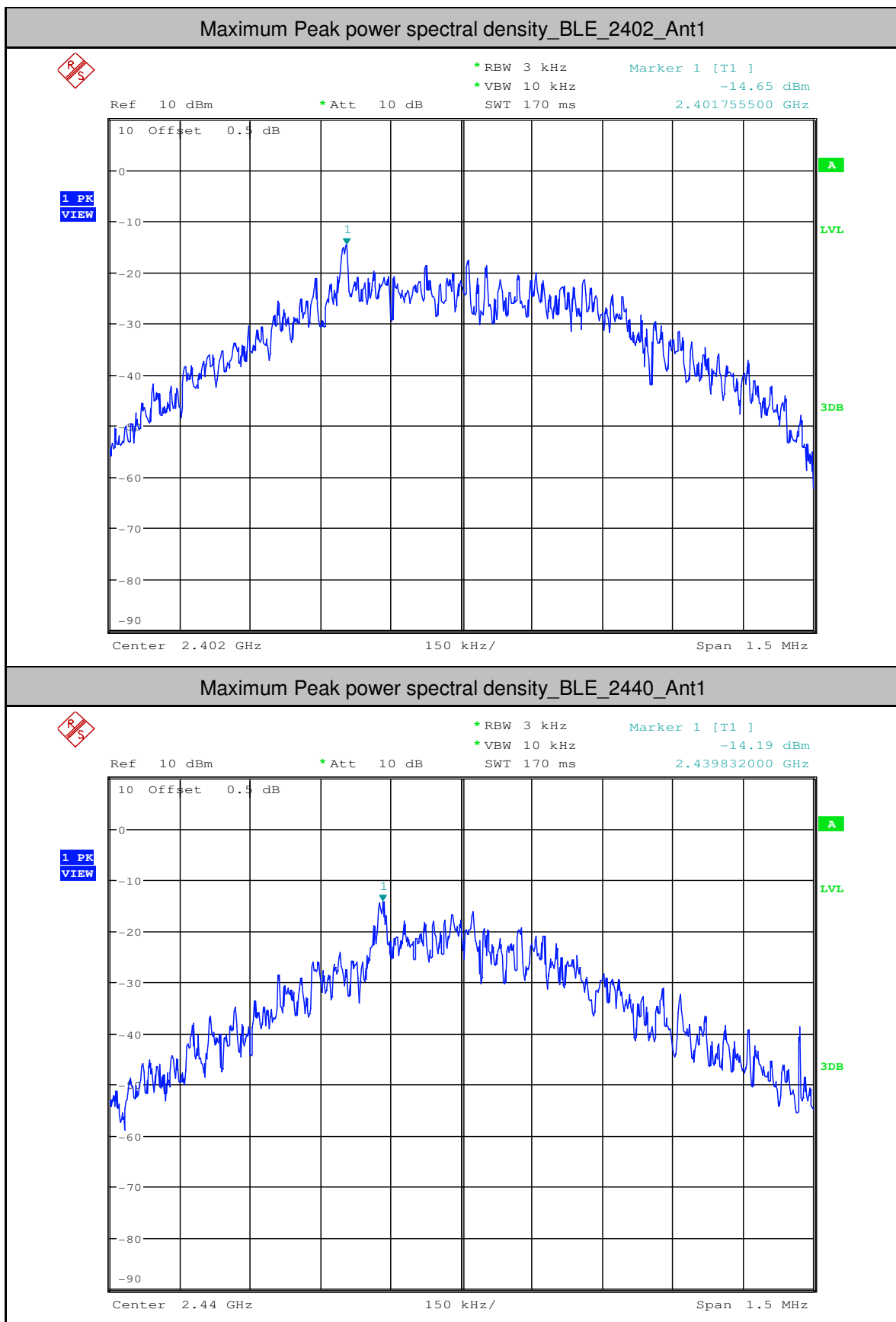


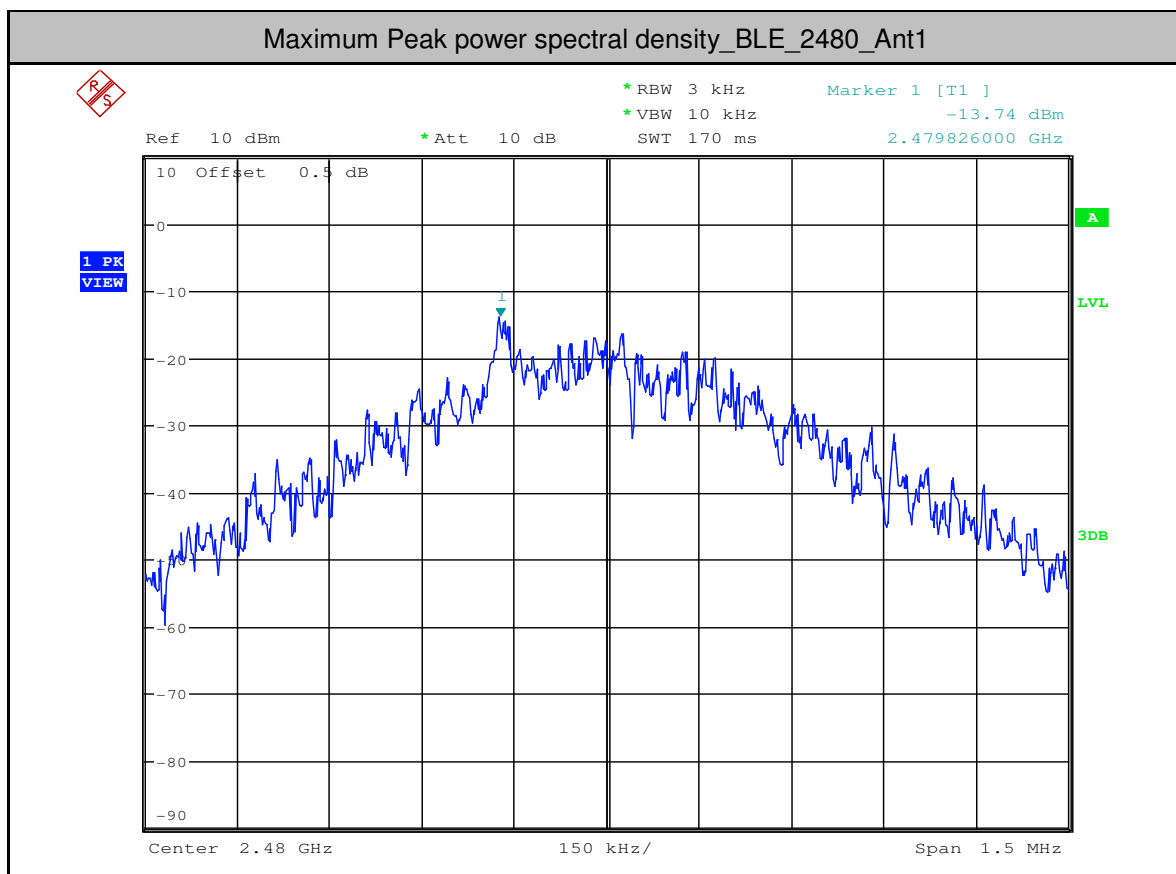




### 3.Maximum Peak power spectral density

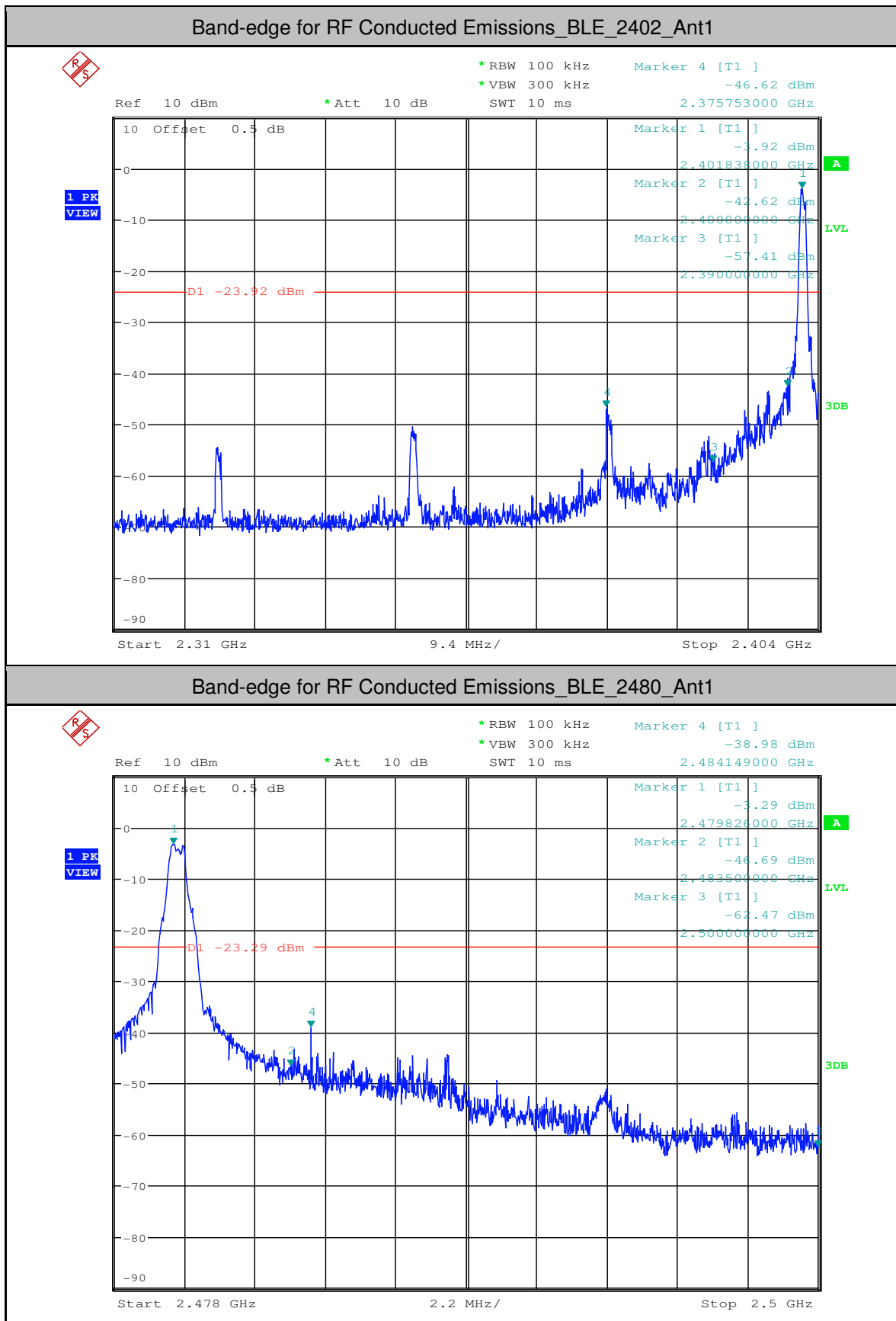
| Test Mode | Test Channel | Ant  | PSD[dBm/3kHz] | Limit[dBm/3kHz] | Verdict |
|-----------|--------------|------|---------------|-----------------|---------|
| BLE       | 2402         | Ant1 | -14.65        | <8.00           | PASS    |
| BLE       | 2440         | Ant1 | -14.19        | <8.00           | PASS    |
| BLE       | 2480         | Ant1 | -13.74        | <8.00           | PASS    |





#### 4.Band-edge for RF Conducted Emissions

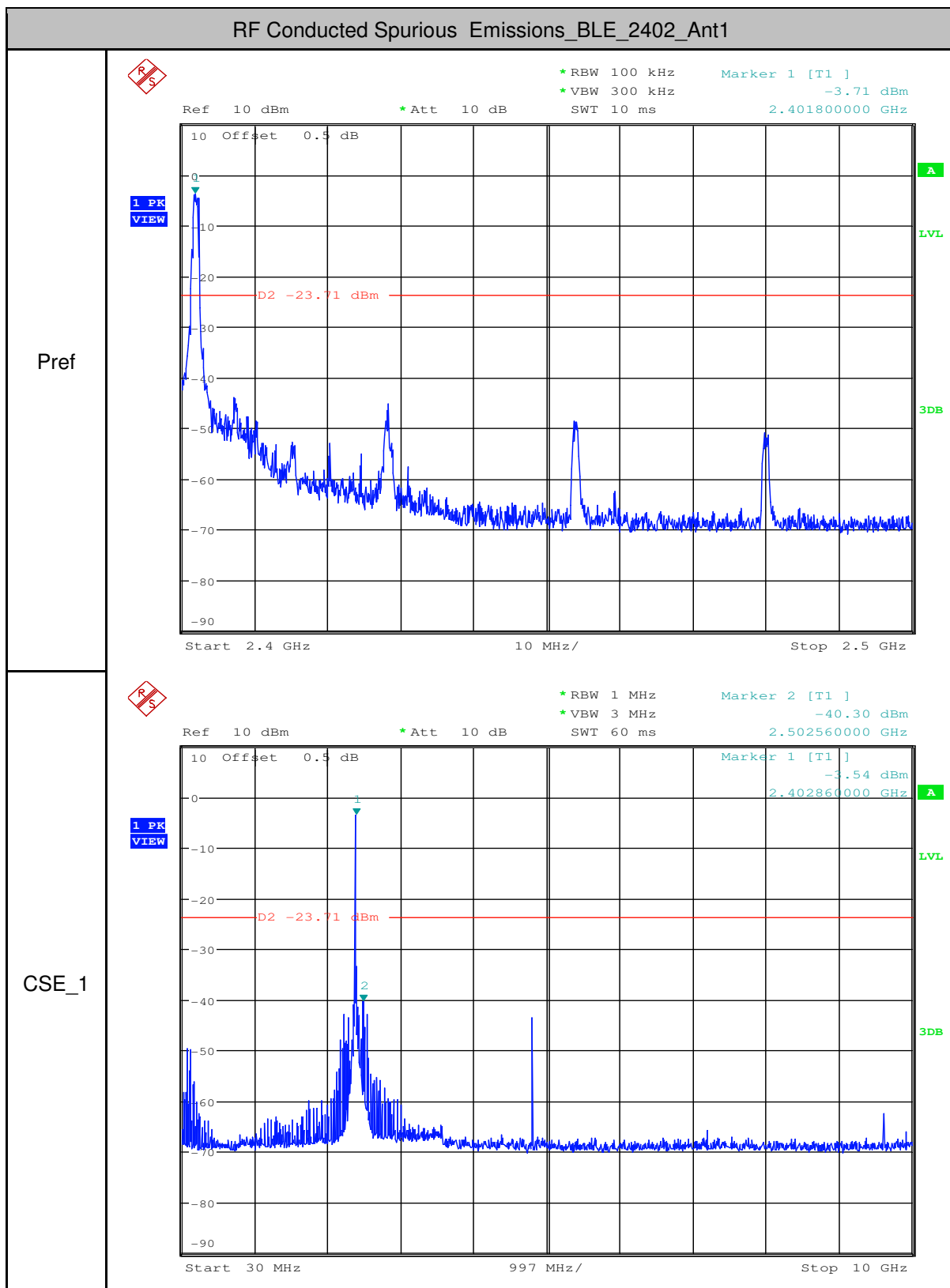
| Test Mode | Test Channel | Ant  | Carrier Power[dBm] | Max. Spurious Level [dBm] | Limit [dBm] | Verdict |
|-----------|--------------|------|--------------------|---------------------------|-------------|---------|
| BLE       | 2402         | Ant1 | -3.920             | -46.619                   | <-23.92     | PASS    |
| BLE       | 2480         | Ant1 | -3.290             | -38.981                   | <-23.29     | PASS    |

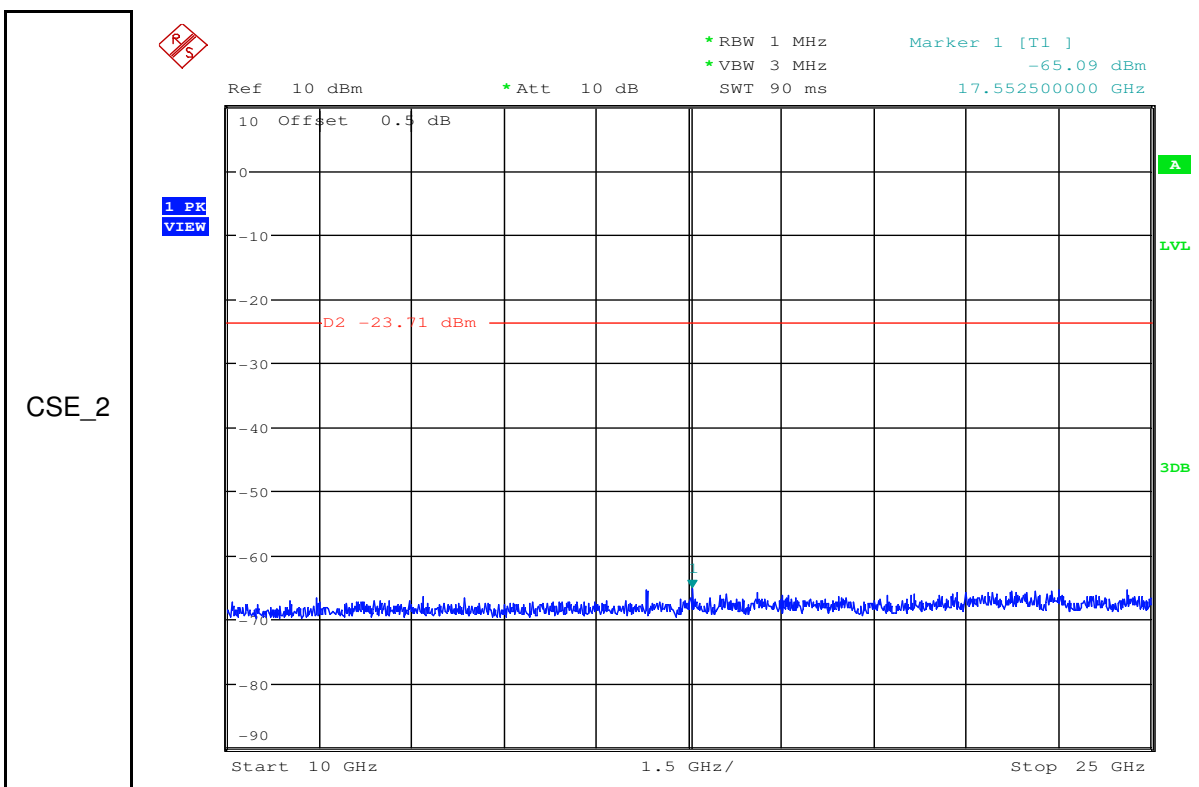




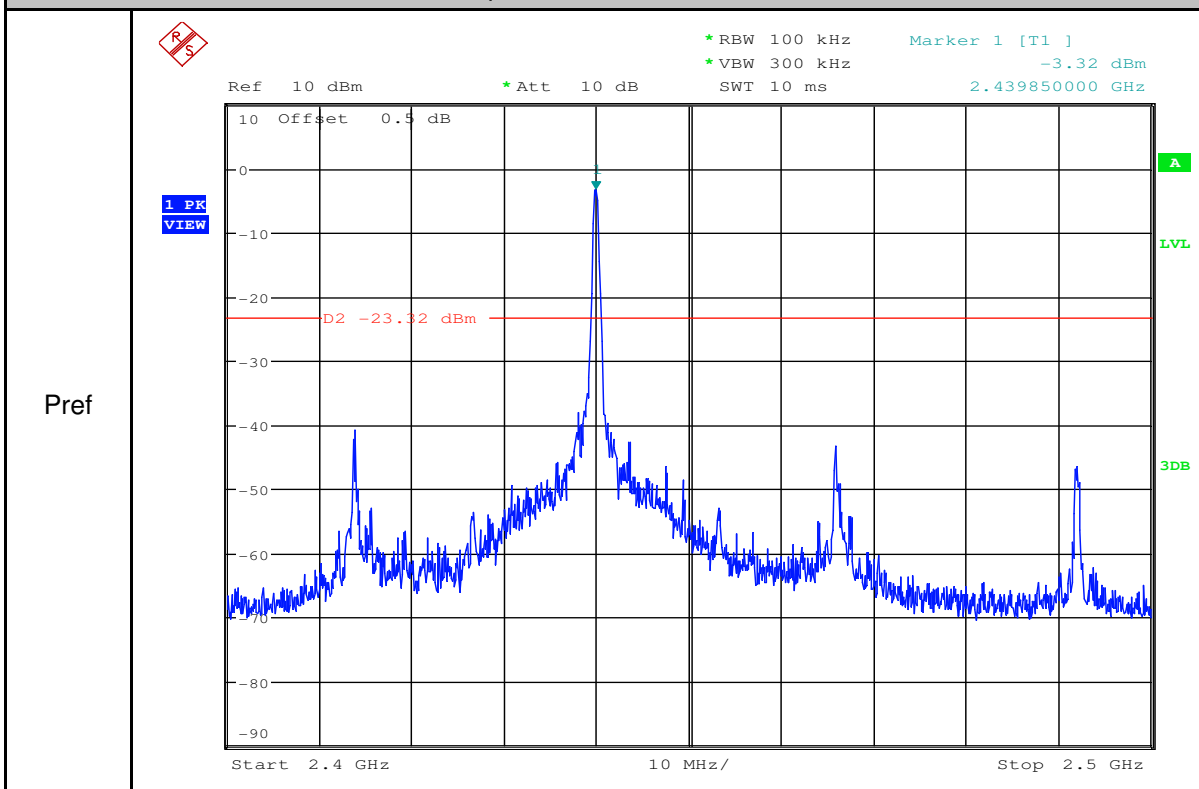
5.RF Conducted Spurious Emissions

| Test Mode | Test Channel | StartFre [MHz] | StopFre [MHz] | RBW [kHz] | VBW [kHz] | Pref[dBm] | Max. Level [dBm] | Limit [dBm] | Verdict |
|-----------|--------------|----------------|---------------|-----------|-----------|-----------|------------------|-------------|---------|
| BLE       | 2402         | 30             | 10000         | 1000      | 3000      | -3.71     | -40.300          | <-23.71     | PASS    |
| BLE       | 2402         | 10000          | 25000         | 1000      | 3000      | -3.71     | -65.090          | <-23.71     | PASS    |
| BLE       | 2440         | 30             | 10000         | 1000      | 3000      | -3.32     | -40.370          | <-23.32     | PASS    |
| BLE       | 2440         | 10000          | 25000         | 1000      | 3000      | -3.32     | -65.350          | <-23.32     | PASS    |
| BLE       | 2480         | 30             | 10000         | 1000      | 3000      | -2.88     | -39.250          | <-22.88     | PASS    |
| BLE       | 2480         | 10000          | 25000         | 1000      | 3000      | -2.88     | -64.760          | <-22.88     | PASS    |

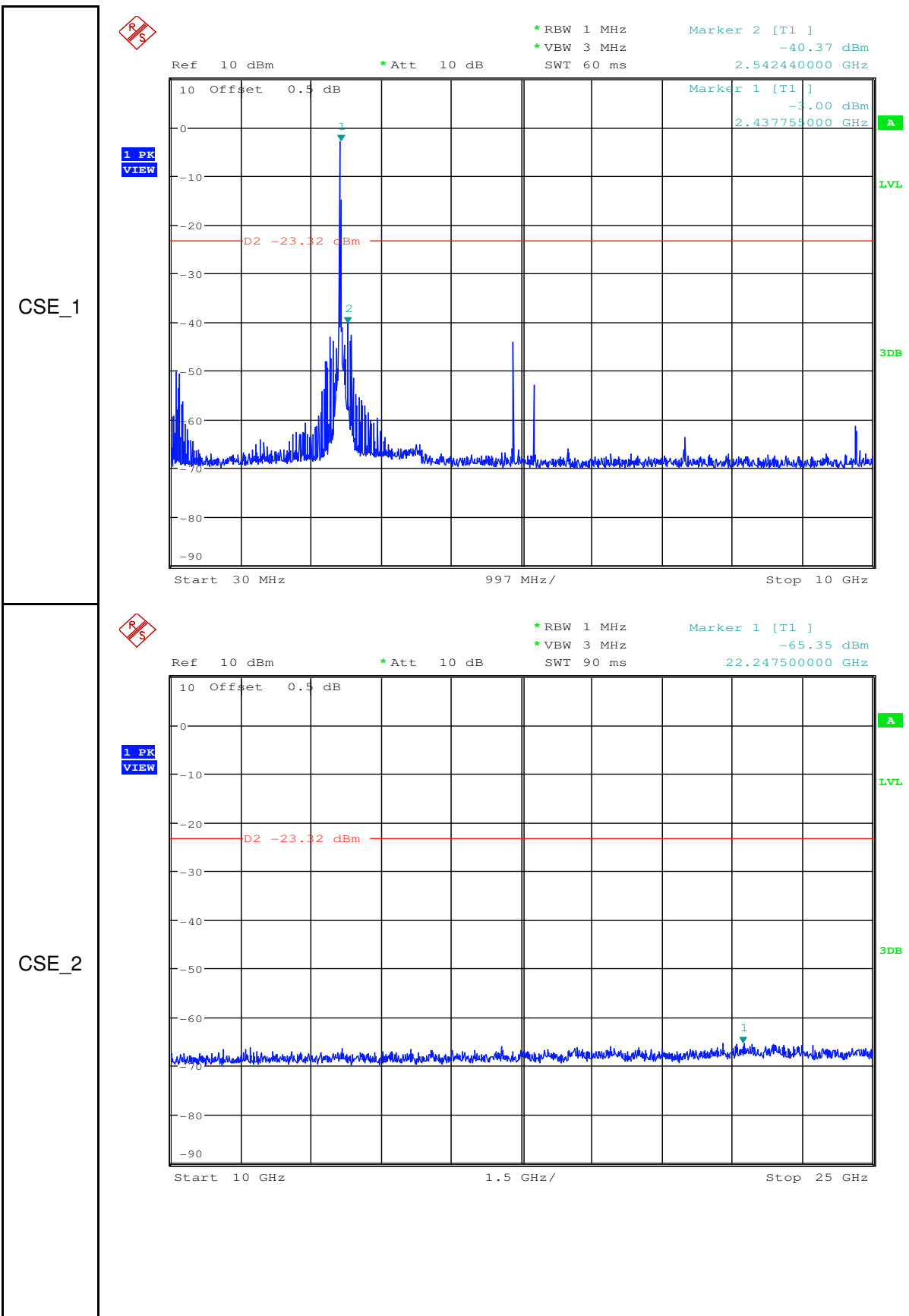


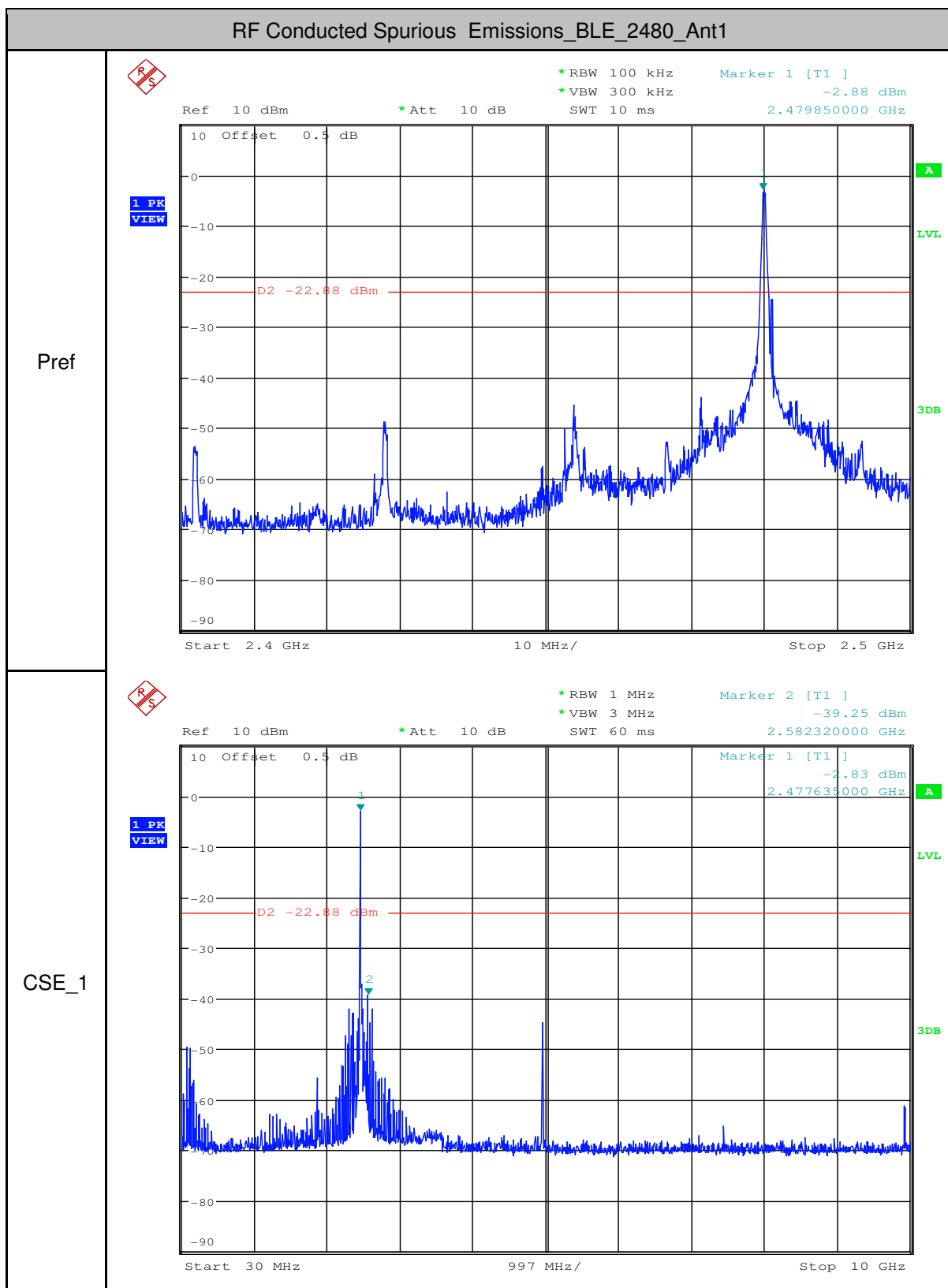


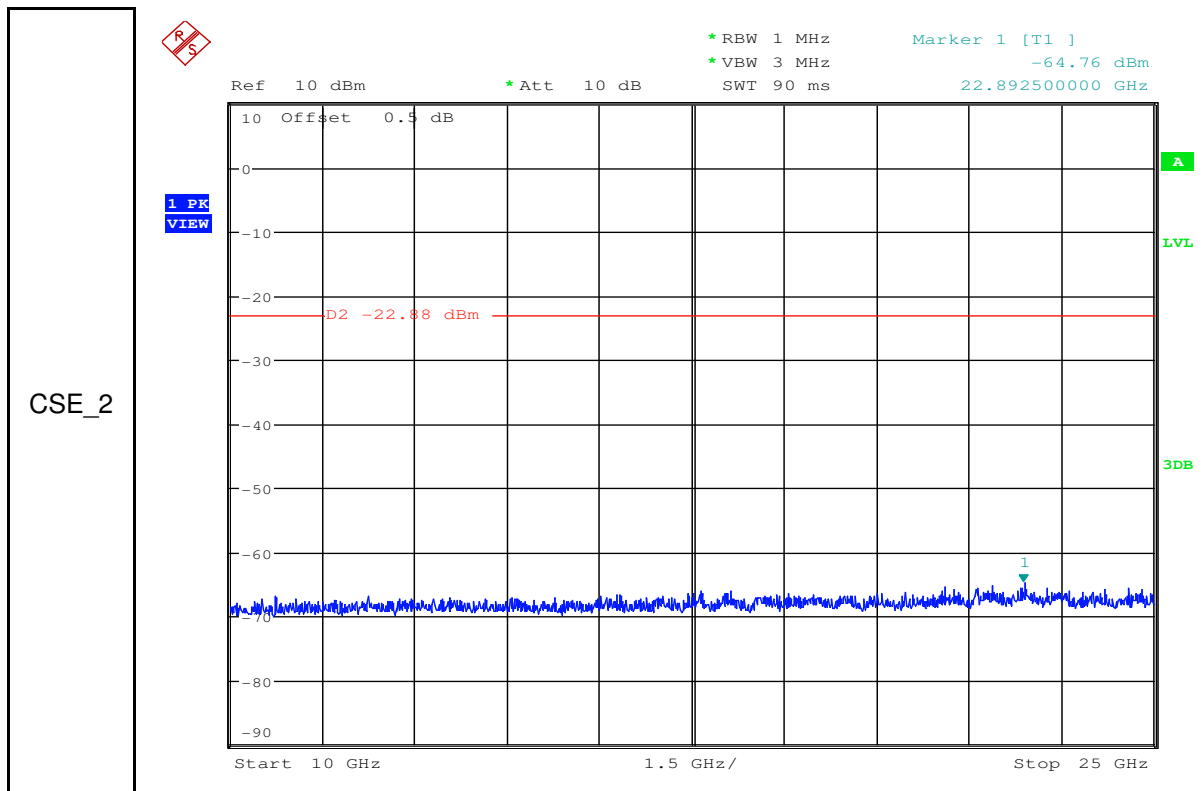
### RF Conducted Spurious Emissions\_BLE\_2440\_Ant1











- End of the Report -