# FCC PART 15C
# TEST REPORT

**BLUETOOTH LOW ENERGY (BLE) PART**

No. I19Z60823-IOT02

**for**

**TCL Communication Ltd.**

**Tablet PC**

**Model Name: 9029W**

**FCC ID: 2ACCJBT16**

**with**

**Hardware Version: 02**

**Software Version: v5F5U**

**Issued Date: 2019-6-4**

TESTING
NVLAP LAB CODE 600118-0

**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 CTTL.

The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the U.S.Government.

**Test Laboratory:**

CTTL, Telecommunication Technology Labs, CAICT

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

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# REPORT HISTORY

| Report Number | Revision | Description | Issue Date |
|---|---|---|---|
| I19Z60823-IOT02 | Rev.0 | 1st edition | 2019-6-4 |

# CONTENTS

# 1. Test Laboratory

## 1.1. Introduction &Accreditation

Telecommunication Technology Labs, CAICT is an ISO/IEC 17025:2005accredited test laboratory under NATIONAL VOLUNTARY LABORATORY ACCREDITATION PROGRAM (NVLAP) with lab code600118-0, and is also an FCC accredited test laboratory (CN5017), and ISED accredited test laboratory (CN0066). The detail accreditation scope can be found on NVLAP website.

## 1.2. Testing Location

Conducted testing Location: CTTL(huayuan North Road)

Address: No. 52, Huayuan North Road, Haidian District, Beijing, P. R. China100191

Radiated testing Location: CTTL(Shouxiang)

Address: No. 51 Shouxiang Science Building, Xueyuan Road, Haidian District, Beijing, P. R. China100191

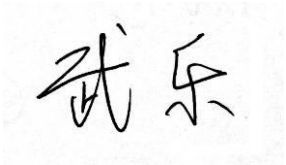
## 1.3. Testing Environment

Normal Temperature: 15-35℃
Relative Humidity: 20-75%

## 1.4. Project data

Testing Start Date: 2018-7-2
Testing End Date: 2019-5-30

## 1.5. Signature



**Wu Le**

**(Prepared this test report)**

**Sun Zhenyu**

**(Reviewed this test report)**

**Li Zhuofang**

**(Approved this test report)**

# 2. Client Information

## 2.1. Applicant Information

| | |
|---|---|
| Company Name: | TCL Communication Ltd. |
| Address /Post: | 7/F, Block F4, TCL Communication Technology Building, TCL International E City, Zhong Shan Yuan Road, Nanshan District, Shenzhen, Guangdong, P.R. China 518052 |
| City: | Shenzhen |
| Postal Code: | 518052 |
| Country: | China |
| Telephone: | 0086-755-36611722 |
| Fax: | / |

## 2.2. Manufacturer Information

| | |
|---|---|
| Company Name: | TCL Communication Ltd. |
| Address /Post: | 7/F, Block F4, TCL Communication Technology Building, TCL International E City, Zhong Shan Yuan Road, Nanshan District, Shenzhen, Guangdong, P.R. China 518052 |
| City: | Shenzhen |
| Postal Code: | 518052 |
| Country: | China |
| Telephone: | 0086-755-36611722 |
| Fax: | / |

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

## 3.1. About EUT

| | |
|---|---|
| Description | Tablet PC |
| Model Name | 9029W |
| FCC ID | 2ACCJBT16 |
| Frequency Band | ISM 2400MHz~2483.5MHz |
| Type of Modulation(LE mode) | GFSK (Bluetooth Low Energy) |
| Number of Channels(LE mode) | 40 |
| Power Supply | 3.9V DC by Battery |

## 3.2. Internal Identification of EUT

| EUT ID* | SN or IMEI | HW Version | SW Version |
|---|---|---|---|
| EUT2 | / | 02 | v5F5U |
| EUT3 | 015500000200214 | 02 | v5F5U |

*EUT ID: is used to identify the test sample in the lab internally.

## 3.3. Internal Identification of AE

| AE ID* | Description | | |
|---|---|---|---|
| AE1 | Battery | / | inbuilt |
| AE2 | Charger | / | 18TCT-CH-0515 |
| AE3 | Charger | / | 18TCT-CH-0531 |
| AE4 | USB Cable | / | 18TCT-DC-0209 |

AE1

| | |
|---|---|
| Model | TLp040J1 |
| Manufacturer | BYD |
| Capacitance | 4000mAh |
| Nominal voltage | 3.85V |

AE2

| | |
|---|---|
| Model | CBA0059AGAC7 |
| Manufacturer | Chenyang |
| Length of cable | / |

AE3

| | |
|---|---|
| Model | CBA0059AGAC5 |
| Manufacturer | PUAN |
| Length of cable | / |

AE4

| | |
|---|---|
| Model | CDA0000024C8 |
| Manufacturer | / |
| Length of cable | / |

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

## 3.4. EUT set-ups

| EUT set-up No. | Combination of EUT and AE | Remarks |
|---|---|---|
| Set.10 | EUT2+ AE1+ AE2+ AE4 | BT&WIFI |
| Set.11 | EUT2+ AE1+ AE3+ AE4 | BT&WIFI |

## 3.5. Normal Accessory setting

Fully charged battery is used during the test.

## 3.6. General Description

The Equipment Under Test (EUT) is a model of Tablet PC with integrated antenna. It consists of normal options: lithium battery, charger. Manual and specifications of the EUT were provided to fulfill the test. Samples undergoing test were selected by the Client.

# 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.

| Reference | Title | Version |
|---|---|---|
| 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 MHz, and 5725–5850 MHz. | 2016 |
| ANSI C63.10 | American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices | June,2013 |

# 5. Test Results

## 5.1. Summary of Test Results

Abbreviations used in this clause:

**P** Pass, The EUT complies with the essential requirements in the standard.

**F** Fail, The EUT does not comply with the essential requirements in the standard

**NA** Not Applicable, The test was not applicable

**NP** Not Performed, The test was not performed by CTTL

**R** Re-use test data from basic model report.

| SUMMARY OF MEASUREMENT RESULTS | Sub-clause | Verdict |
|---|---|---|
| 6dB Bandwidth | 15.247 (a)(2) | **R** |
| Peak Output Power - Conducted | 15.247 (b)(1) | **P** |
| Maximum Power Spectral Density Level | 15.247(e) | **R** |
| Transmitter Spurious Emission - Conducted | 15.247 (d) | **R** |
| Transmitter Spurious Emission - Radiated | 15.247, 15.205, 15.209 | **R** |
| Frequency Band Edges | 15.247 (d) | **R** |
| AC Powerline Conducted Emission | 15.107, 15.207 | **R** |

Please refer to **ANNEX A** for detail.

The measurement is made according to ANSI C63.10.

## 5.2. Statements

CTTL has evaluated the test cases requested by the applicant /manufacturer as listed in section 5.1 of this report for the EUT specified in section 3 according to the standards or reference documents listed in section 4.2

## 5.3. Explanation of re-use of test data

The Equipment Under Test (EUT) model 9029W(FCC ID: 2ACCJBT16) is a variant product of 9027W(FCC ID: 2ACCJBT13), according to the declaration of changes provided by the applicant and FCC KDB publication 484596 D01, spot check measurements were performed on this device, other test results are derived from test report No. I18Z61163-IOT02. Please refer Annex A for detail spot check verification data and reference data. the spot check test results are consistent with basic model.

For detail differences between two models please refer the Declaration of Changes document.

## 6. Test Facilities Utilized

### Conducted test system

| No. | Equipment | Model | Serial Number | Manufacturer | Calibration Period | Calibration Due date |
|---|---|---|---|---|---|---|
| 1 | Vector Signal Analyzer | FSQ26 | 200136 | Rohde & Schwarz | 1 year | 2019-11-21 |
| 2 | Test Receiver | ESCI 3 | 100344 | Rohde & Schwarz | 1 year | 2020-02-14 |
| 3 | LISN | ENY216 | 101200 | Rohde & Schwarz | 1 year | 2020-03-14 |
| 4 | Shielding Room | S81 | / | ETS-Lindgren | / | / |

### Radiated emission test system

| No. | Equipment | Model | Serial Number | Manufacturer | Calibration Period | Calibration Due date |
|---|---|---|---|---|---|---|
| 1 | Test Receiver | ESU26 | 100235 | Rohde & Schwarz | 1 year | 2020-03-01 |
| 2 | BiLog Antenna | VULB9163 | 302 | Schwarzbeck | 3 years | 2020-01-27 |
| 3 | EMI Antenna | 3115 | 00167250 | ETS-Lindgren | 3 Years | 2020-05-21 |

# 7. Measurement Uncertainty

## 7.1. Peak Output Power - Conducted

**Measurement Uncertainty:**

| | |
|---|---|
| Measurement Uncertainty (k=2) | 0.66dB |

## 7.2. Frequency Band Edges

**Measurement Uncertainty:**

| | |
|---|---|
| Measurement Uncertainty (k=2) | 0.66dB |

## 7.3. Transmitter Spurious Emission - Conducted

**Measurement Uncertainty:**

| Frequency Range | Uncertainty (k=2) |
|---|---|
| 30 MHz ~ 8 GHz | 1.22dB |
| 8 GHz ~ 12.75 GHz | 1.51dB |
| 12.7GHz ~ 26 GHz | 1.51dB |

## 7.4. Transmitter Spurious Emission - Radiated

**Measurement Uncertainty:**

| Frequency Range | Uncertainty (k=2) |
|---|---|
| ＜ 1 GHz | 4.86dB |
| ＞ 1 GHz | 5.26dB |

## 7.5. 6dB Bandwidth

**Measurement Uncertainty:**

| | |
|---|---|
| Measurement Uncertainty (k=2) | 61.936Hz |

## 7.6. Maximum Power Spectral Density Level

**Measurement Uncertainty:**

| | |
|---|---|
| Measurement Uncertainty (k=2) | 0.66dB |

## 7.7. AC Powerline Conducted Emission

**Measurement Uncertainty:**

| | |
|---|---|
| Measurement Uncertainty (k=2) | 3.38dB |

# ANNEX A: Detailed Test Results

## A.1. Measurement Method

### A.1.1. Conducted Measurements

The measurement is made according to ANSI C63.10.

1). Connect the EUT to the test system correctly.

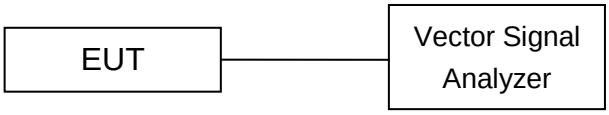
2). Set the EUT to the required work mode (Transmitter, receiver or transmitter & receiver).

3). Set the EUT to the required channel.

4). Set the EUT hopping mode (hopping or hopping off).

5). Set the spectrum analyzer to start measurement.

6). Record the values. Vector Signal Analyzer




### A.1.2. Radiated Emission Measurements

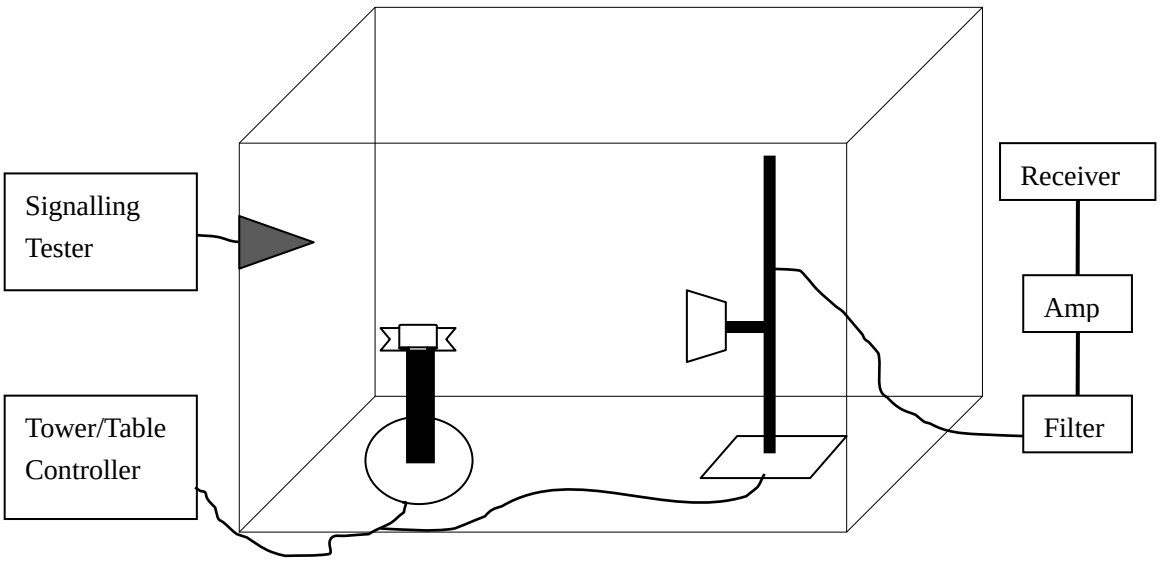
The measurement is made according to ANSI C63.10.

The radiated emission test is performed in semi-anechoic chamber. The distance from the EUT to the reference point of measurement antenna is 3m. The test is carried out on both vertical and horizontal polarization and only maximization result of both polarizations is kept. During the test, the turntable is rotated 360° and the measurement antenna is moved from 1m to 4m to get the maximization result.

In the case of radiated emission, the used settings are as follows,

Sweep frequency from 30 MHz to 1GHz, RBW = 100 kHz, VBW = 300 kHz;

Sweep frequency from 1 GHz to 26GHz, RBW = 1MHz, VBW = 1MHz;



## A.2. Peak Output Power - Conducted

**Method of Measurement: See ANSI C63.10-clause 11.9.1.1**

a) Set the RBW = 1 MHz.
b) Set VBW = 3 MHz.
c) Set span = 3 MHz.
d) Sweep time = auto couple.
e) Detector = peak.
f) Trace mode = max hold.
g) Allow trace to fully stabilize.
h) Use peak marker function to determine the peak amplitude level.

**Measurement Limit:**

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

**Spot check Measurement Results:**

**For GFSK**

| Channel No. | Frequency (MHz) | Peak Conducted Output Power (dBm) | Conclusion |
|---|---|---|---|
| 0 | 2402 | -1.37 | P |
| 19 | 2440 | -1.49 | P |
| 39 | 2480 | -1.59 | P |

**Conclusion: PASS**

**Reference Measurement Results from basic model:**

**For GFSK**

| Channel No. | Frequency (MHz) | Peak Conducted Output Power (dBm) | Conclusion |
|---|---|---|---|
| 0 | 2402 | -1.07 | P |
| 19 | 2440 | -1.16 | P |
| 39 | 2480 | -1.17 | P |

**Conclusion: PASS**

## A.3. Frequency Band Edges - Conducted

**Method of Measurement: See ANSI C63.10-clause 6.10.4**

Connect the spectrum analyzer to the EUT using an appropriate RF cable connected to the EUT output. Configure the spectrum analyzer settings as described below.

a) Set Span = 8MHz
b) Sweep Time: Auto
c) Set the RBW= 100 kHz
c) Set the VBW= 300 kHz
d) Detector: Peak
e) Trace: Max hold

Observe the stored trace and measure the amplitude delta between the peak of the fundamental and the peak of the band-edge emission. This is not an absolute field strength measurement; it is only a relative measurement to determine the amount by which the emission drops at the band edge relative to the highest fundamental emission level.

**Measurement Limit:**

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

**Measurement Result:**

**For GFSK**

| Channel No. | Frequency (MHz) | Hopping | Band Edge Power ( dBc) | | Conclusion |
|---|---|---|---|---|---|
| 0 | 2402 | Hopping OFF | Fig.1 | -53.78 | P |
| 39 | 2480 | Hopping OFF | Fig.2 | -55.65 | P |

**Conclusion: PASS**

**Test graphs as below**

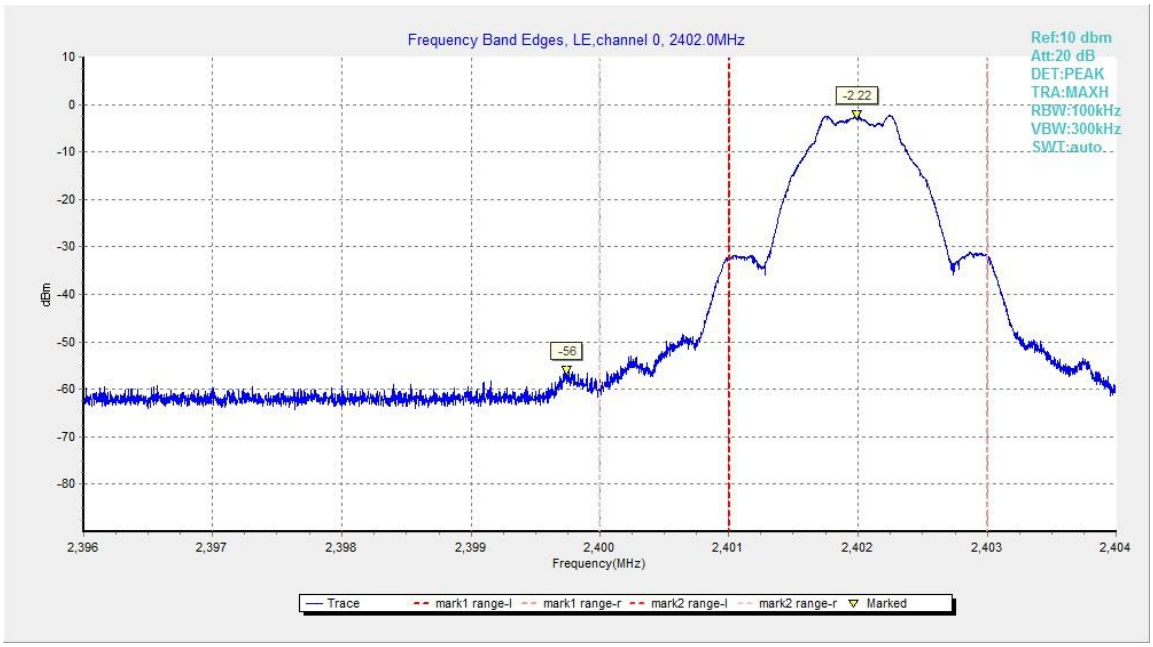



Fig.1. Frequency Band Edges: GFSK, 2402 MHz**,** Hopping Off

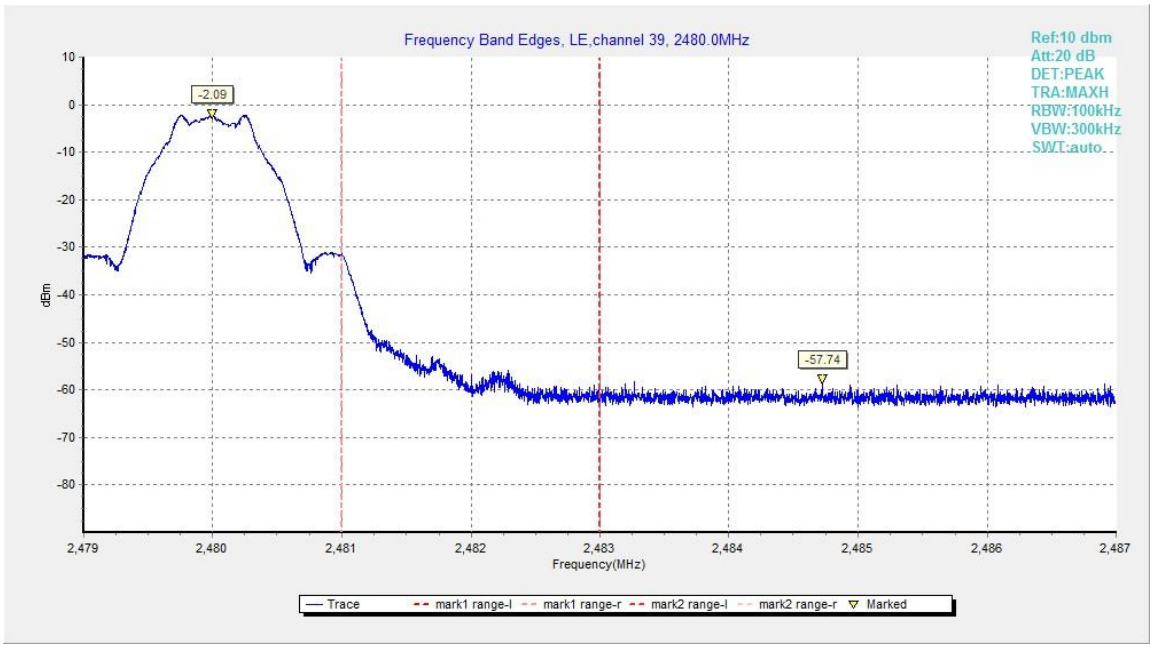



Fig.2. Frequency Band Edges: GFSK, 2480 MHz, Hopping Off

## A.4. Transmitter Spurious Emission - Conducted

**Method of Measurement: See ANSI C63.10-clause 11.11.2 and clause 11.11.3**

**Measurement Procedure – Reference Level**

1. Set the RBW = 100 kHz.
2. Set the VBW = 300 kHz.
3. Set the span to ≥1.5 times the DTS bandwidth.
4. Detector = peak.
5. Sweep time = auto couple.
6. Trace mode = max hold.
7. Allow trace to fully stabilize.
8. Use the peak marker function to determine the maximum PSD level. Next, determine the power in 100 kHz band segments outside of the authorized frequency band using the following measurement:

**Measurement Procedure - Unwanted Emissions**

1. Set RBW = 100 kHz.
2. Set VBW = 300 kHz.
3. Set span to encompass the spectrum to be examined.
4. Detector = peak.
5. Trace Mode = max hold.
6. Sweep = auto couple.
7. Allow the trace to stabilize (this may take some time, depending on the extent of the span).

Ensure that the amplitude of all unwanted emissions outside of the authorized frequency band (excluding restricted frequency bands) is attenuated by at least the minimum requirements specified above.

**Measurement Limit:**

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

**Measurement Results:**

**For GFSK**

| Channel No. | Frequency (MHz) | Frequency Range | Test Results | Conclusion |
|---|---|---|---|---|
| 0 | 2402 | Center Frequency | Fig.3 | P |
| | | 30 MHz ~ 1 GHz | Fig.4 | P |
| | | 1 GHz ~ 3 GHz | Fig.5 | P |
| | | 3 GHz ~ 10 GHz | Fig.6 | P |
| | | 10GHz ~ 26 GHz | Fig.7 | P |
| 19 | 2440 | Center Frequency | Fig.8 | P |
| | | 30 MHz ~ 1 GHz | Fig.9 | P |
| | | 1 GHz ~ 3 GHz | Fig.10 | P |
| | | 3 GHz ~ 10 GHz | Fig.11 | P |
| | | 10GHz ~ 26 GHz | Fig.12 | P |
| 39 | 2480 | Center Frequency | Fig.13 | P |
| | | 30 MHz ~ 1 GHz | Fig.14 | P |
| | | 1 GHz ~ 3GHz | Fig.15 | P |
| | | 3 GHz ~ 10 GHz | Fig.16 | P |
| | | 10 GHz ~ 26 GHz | Fig.17 | P |

**Conclusion: PASS**

**Test graphs as below**

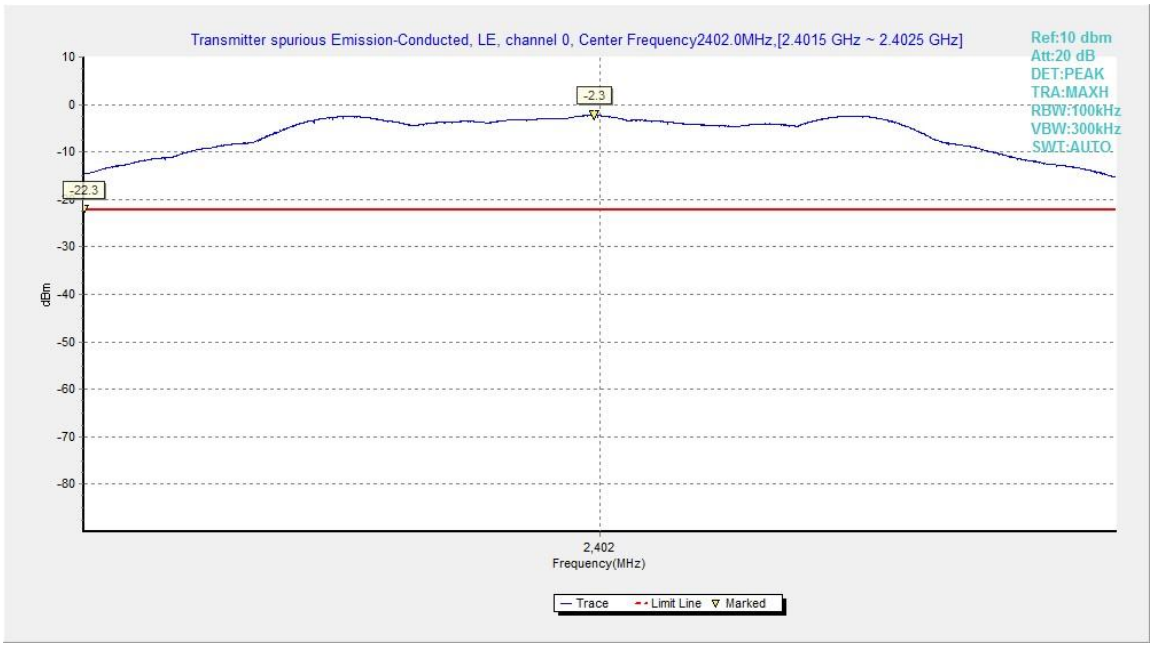



Fig.3. Transmitter Spurious Emission - Conducted: GFSK,2402MHz

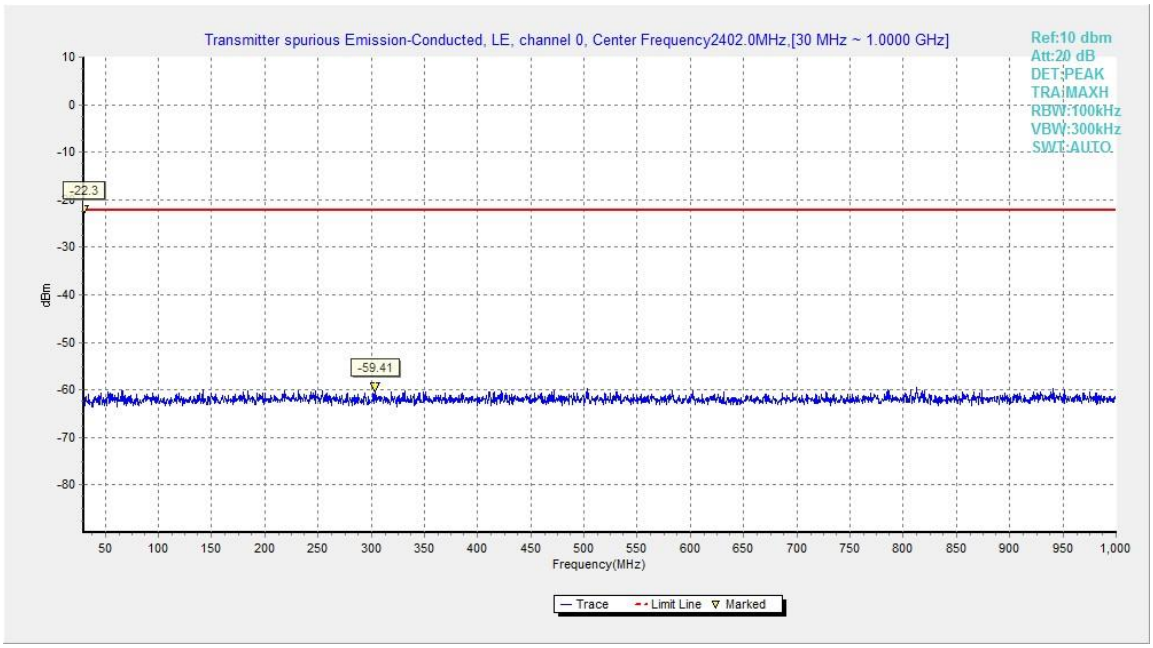



Fig.4. Transmitter Spurious Emission - Conducted: GFSK, 2402 MHz, 30MHz - 1GHz

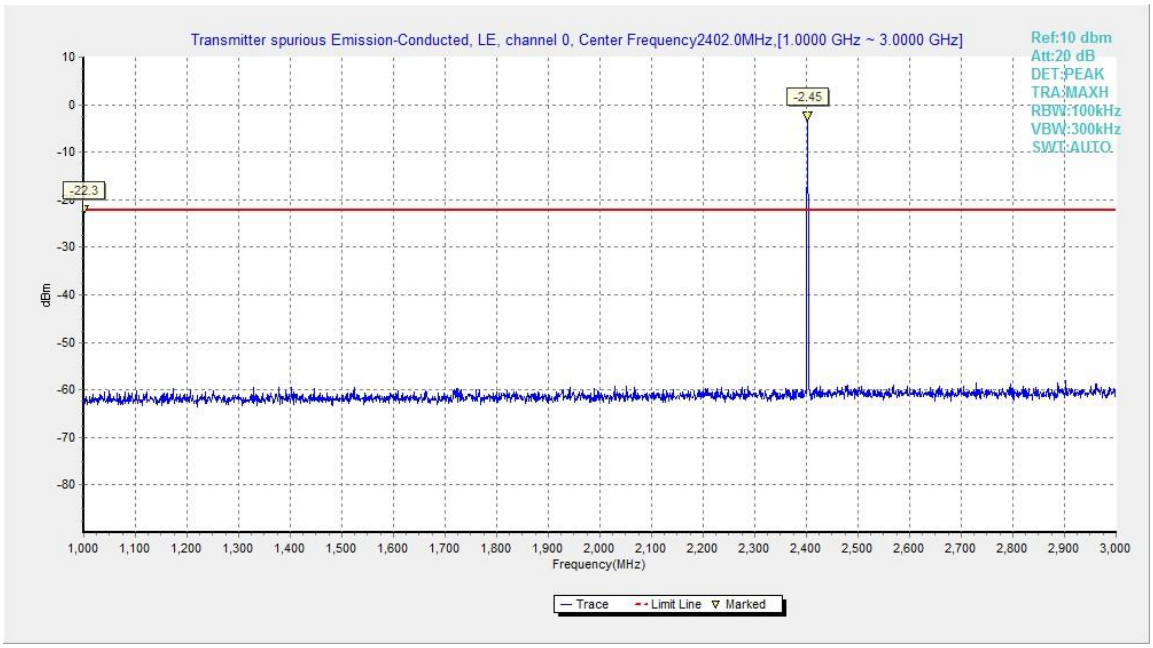



Fig.5. Transmitter Spurious Emission - Conducted: GFSK, 2402 MHz,1GHz - 3GHz

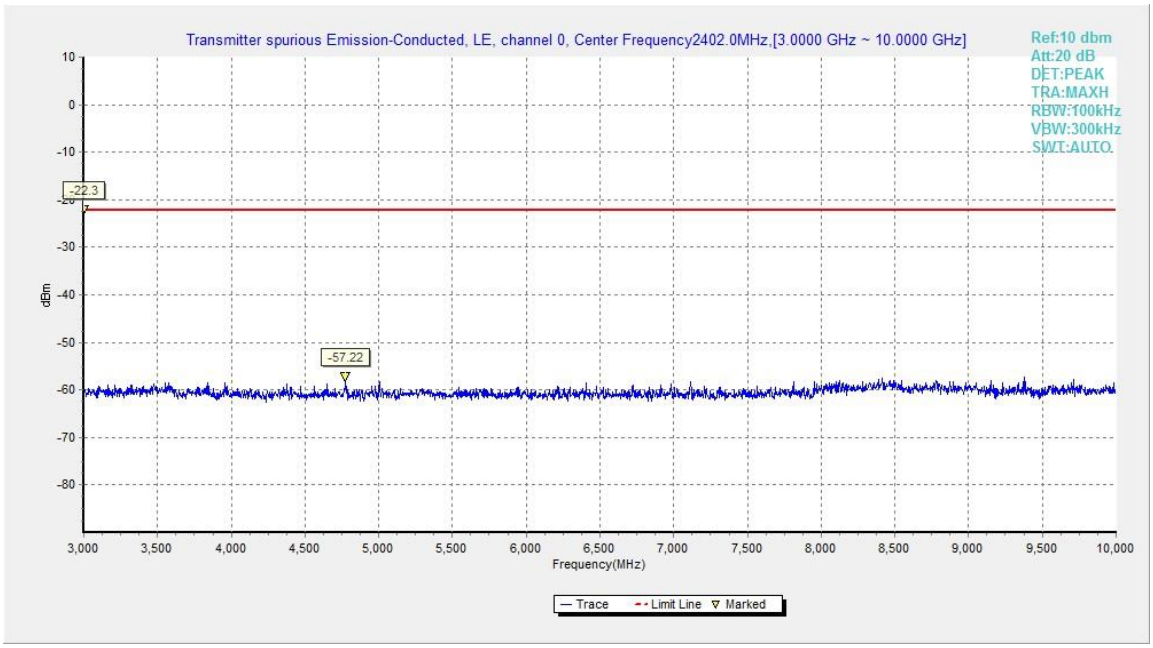



Fig.6. Transmitter Spurious Emission - Conducted: GFSK, 2402 MHz,3GHz - 10GHz

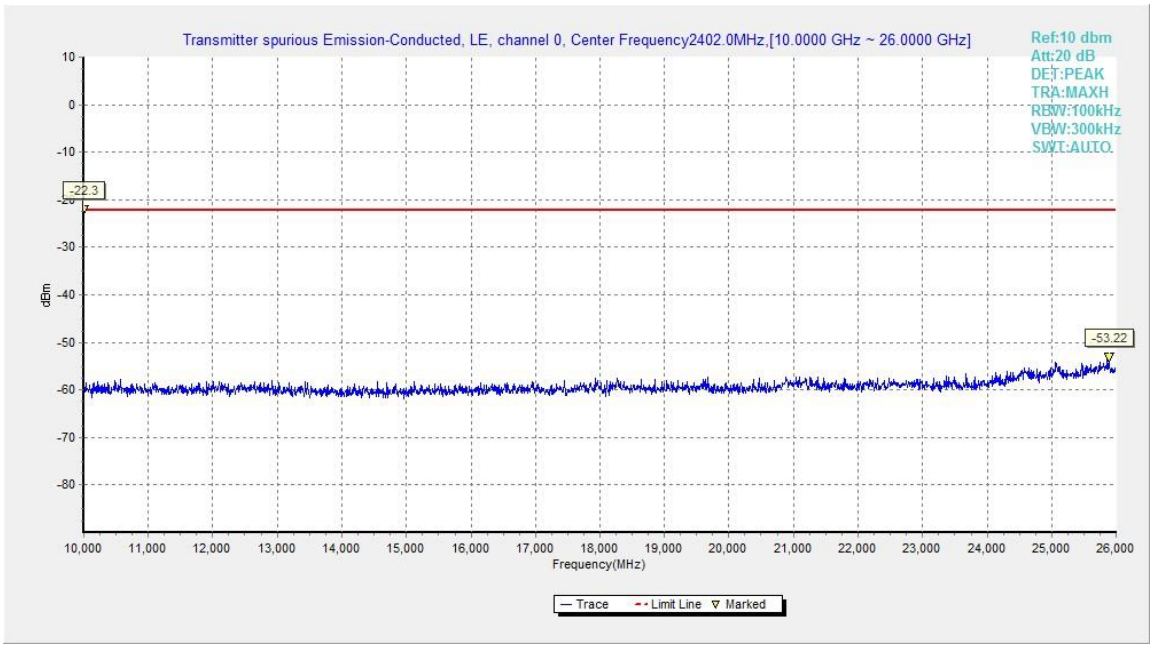



Fig.7. Transmitter Spurious Emission - Conducted: GFSK, 2402 MHz,10GHz - 26GHz

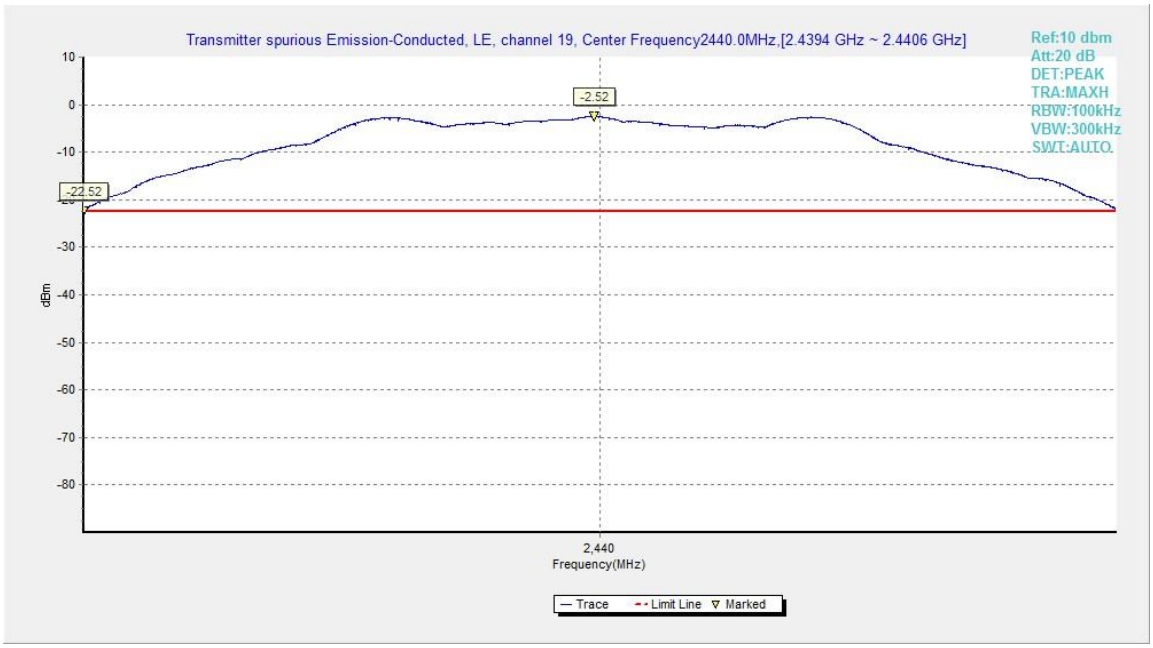



Fig.8. Transmitter Spurious Emission - Conducted: GFSK, 2440MHz

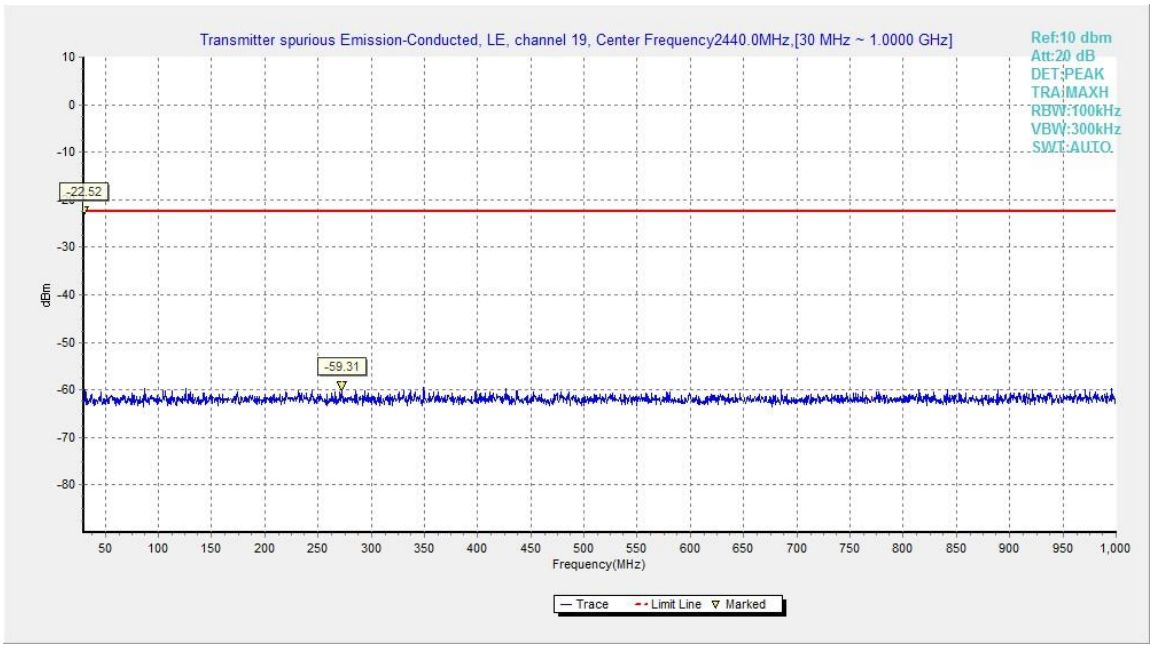



Fig.9. Transmitter Spurious Emission - Conducted: GFSK, 2440 MHz, 30MHz - 1GHz

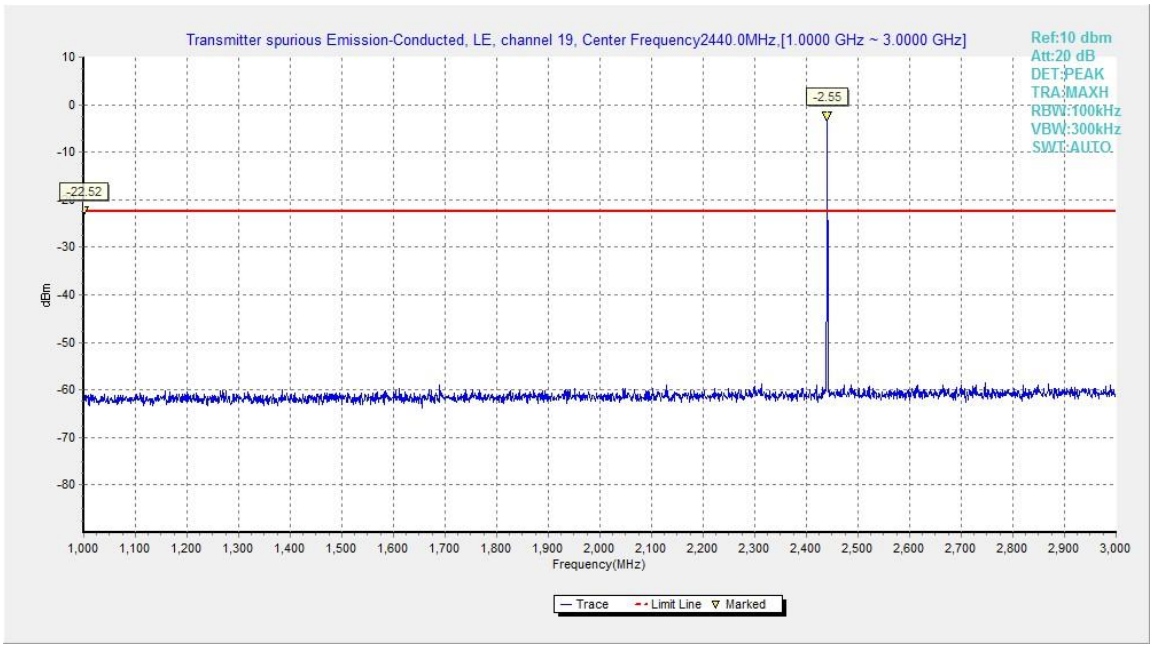



Fig.10. Transmitter Spurious Emission - Conducted: GFSK, 2440 MHz, 1GHz – 3GHz

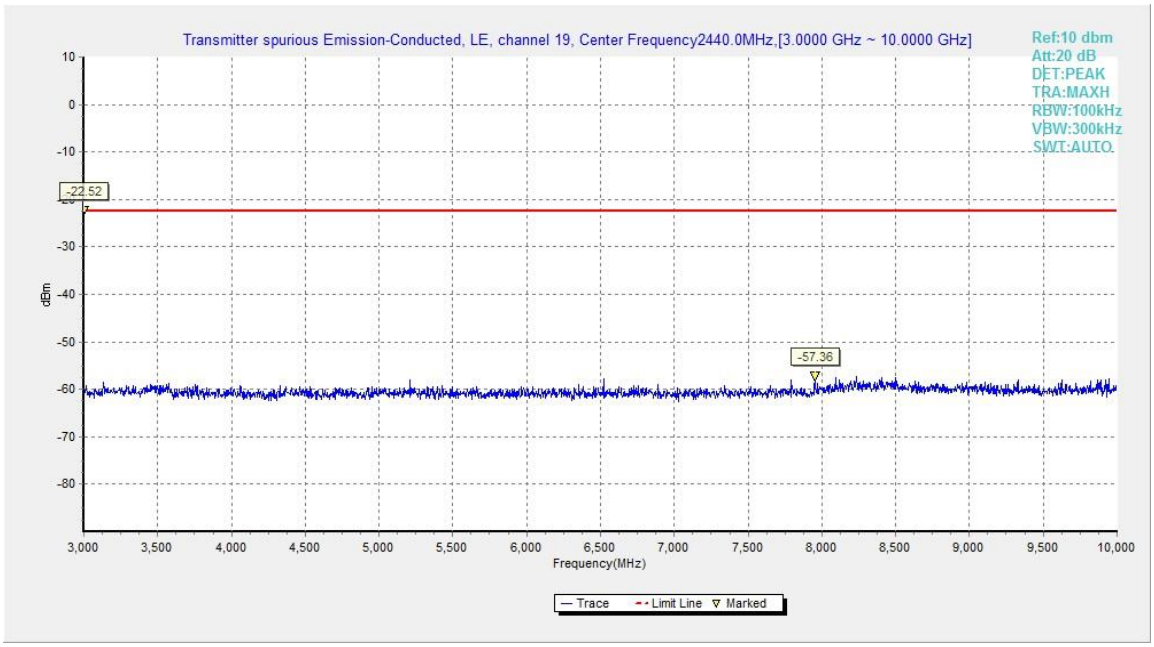



Fig.11. Transmitter Spurious Emission - Conducted: GFSK, 2440 MHz, 3GHz – 10GHz

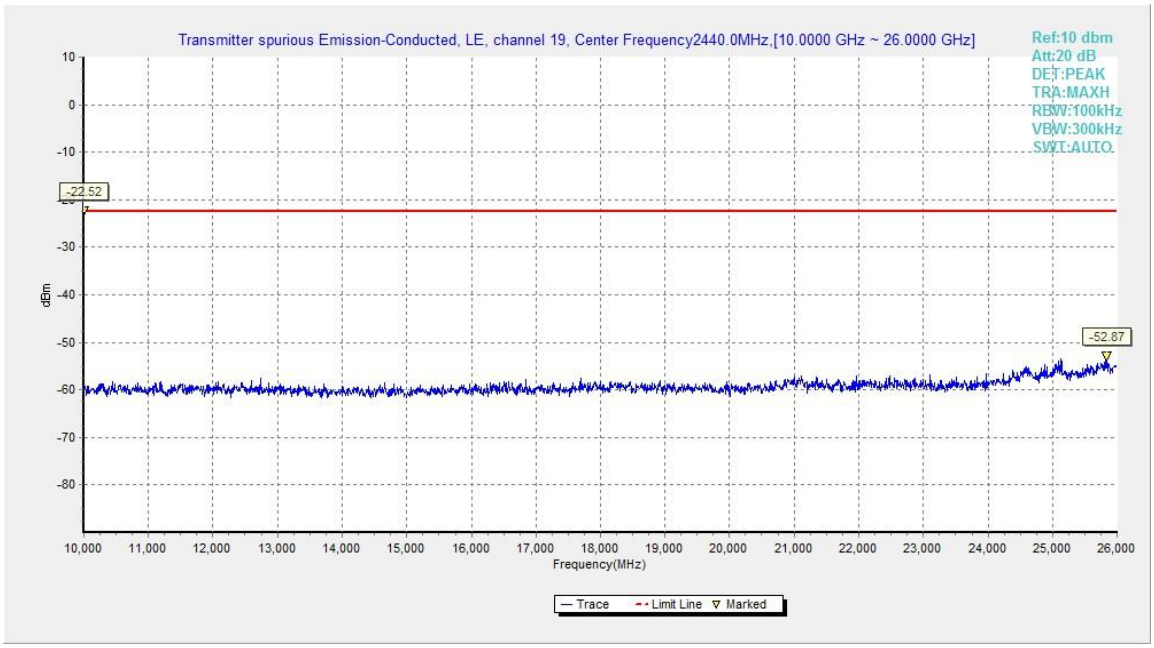



Fig.12. Transmitter Spurious Emission - Conducted: GFSK, 2440 MHz, 10GHz – 26GHz

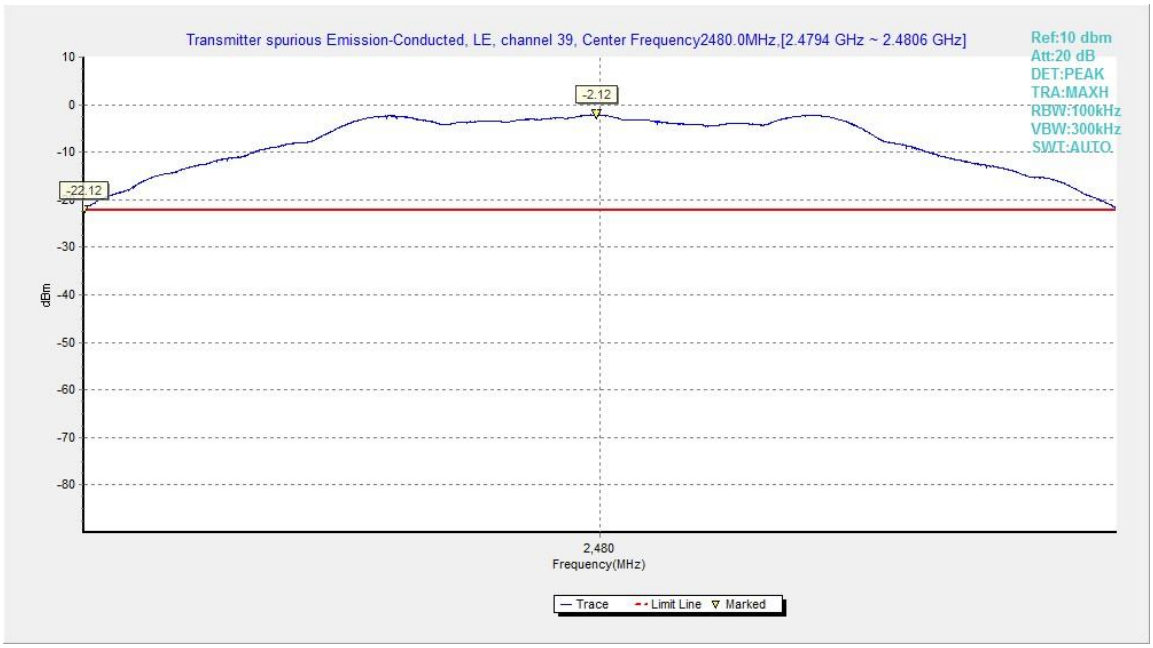



Fig.13. Transmitter Spurious Emission - Conducted: GFSK, 2480 MHz

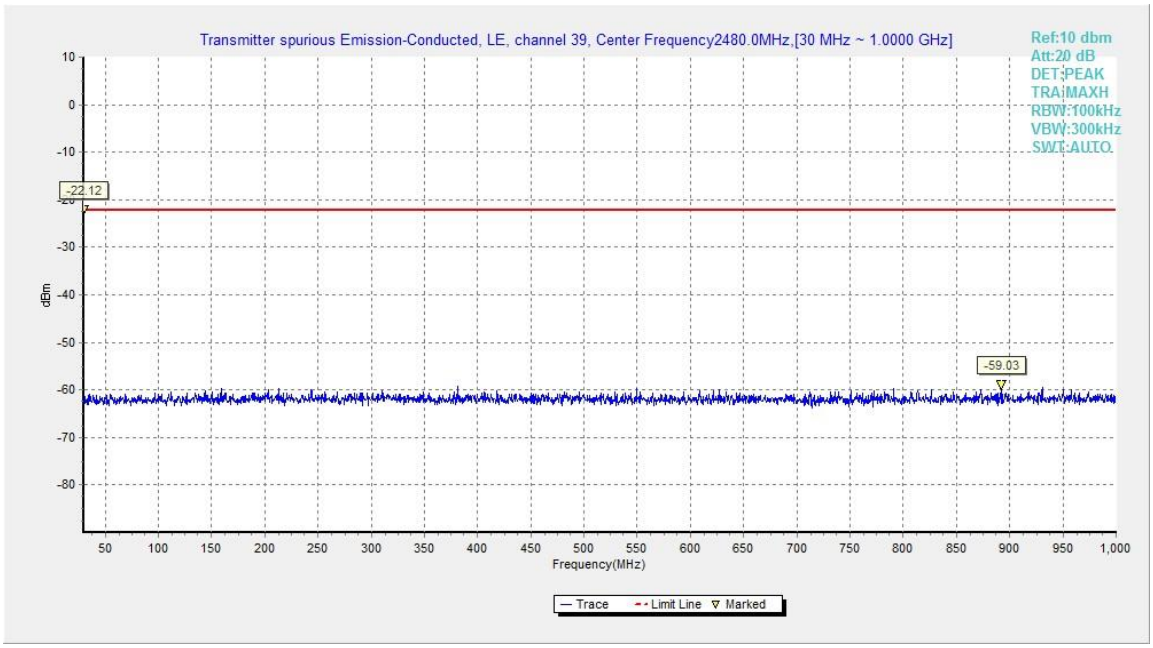



Fig.14. Transmitter Spurious Emission - Conducted: GFSK, 2480 MHz, 30MHz - 1GHz

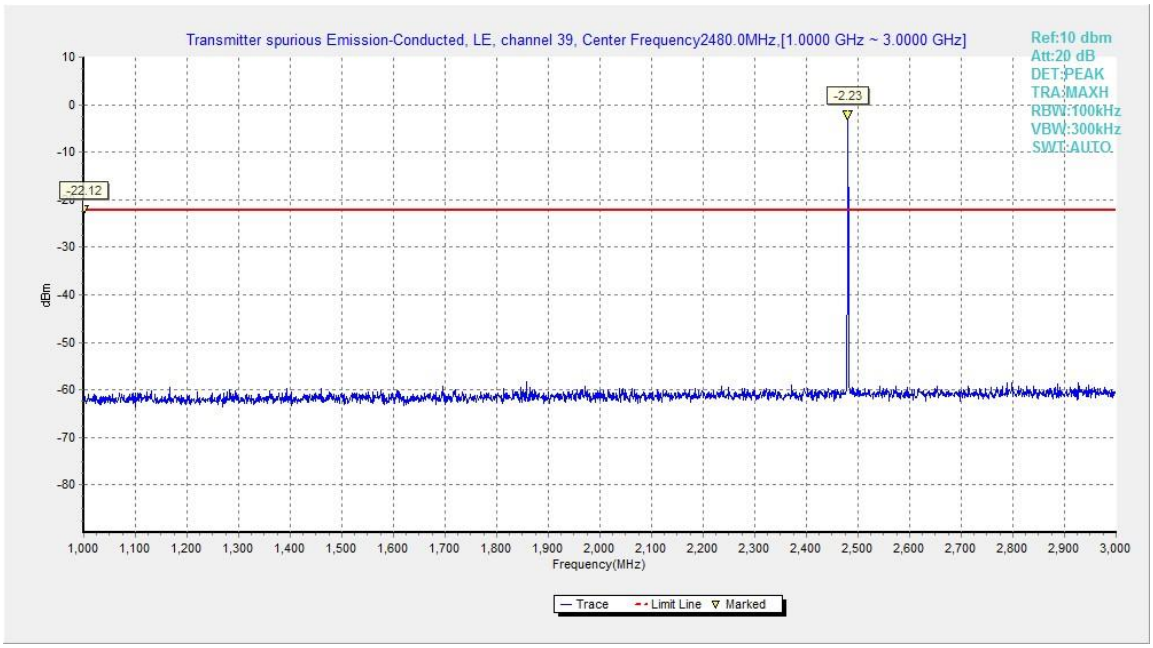



Fig.15. Transmitter Spurious Emission - Conducted: GFSK, 2480 MHz, 1GHz - 3GHz

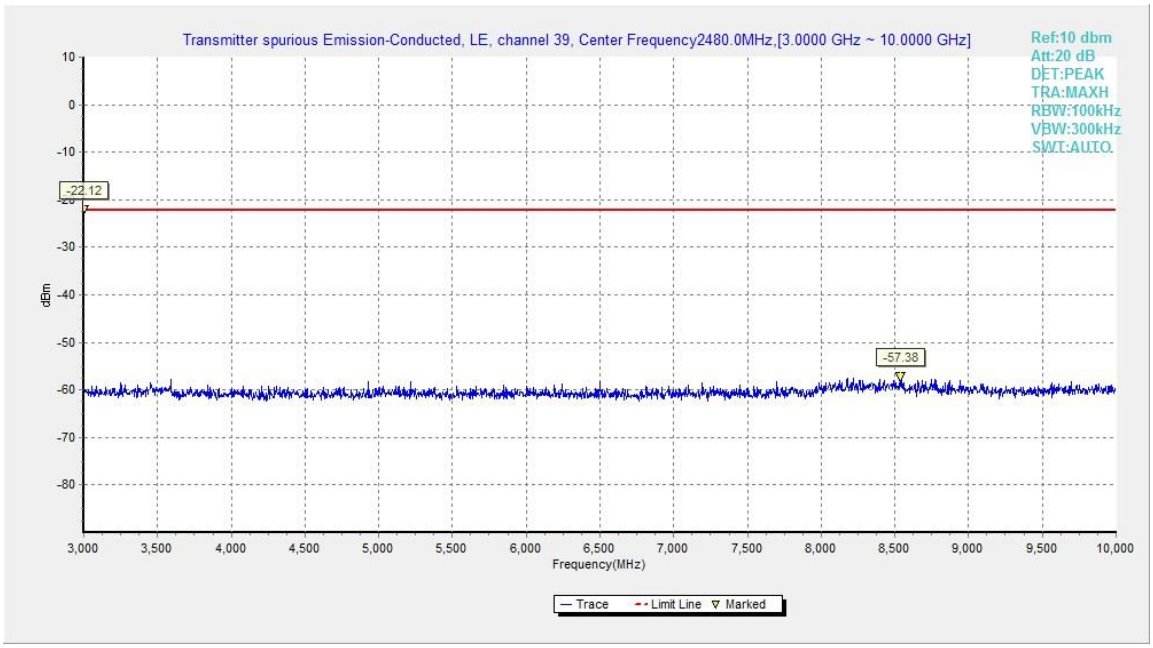



Fig.16. Transmitter Spurious Emission - Conducted: GFSK, 2480 MHz, 3GHz - 10GHz

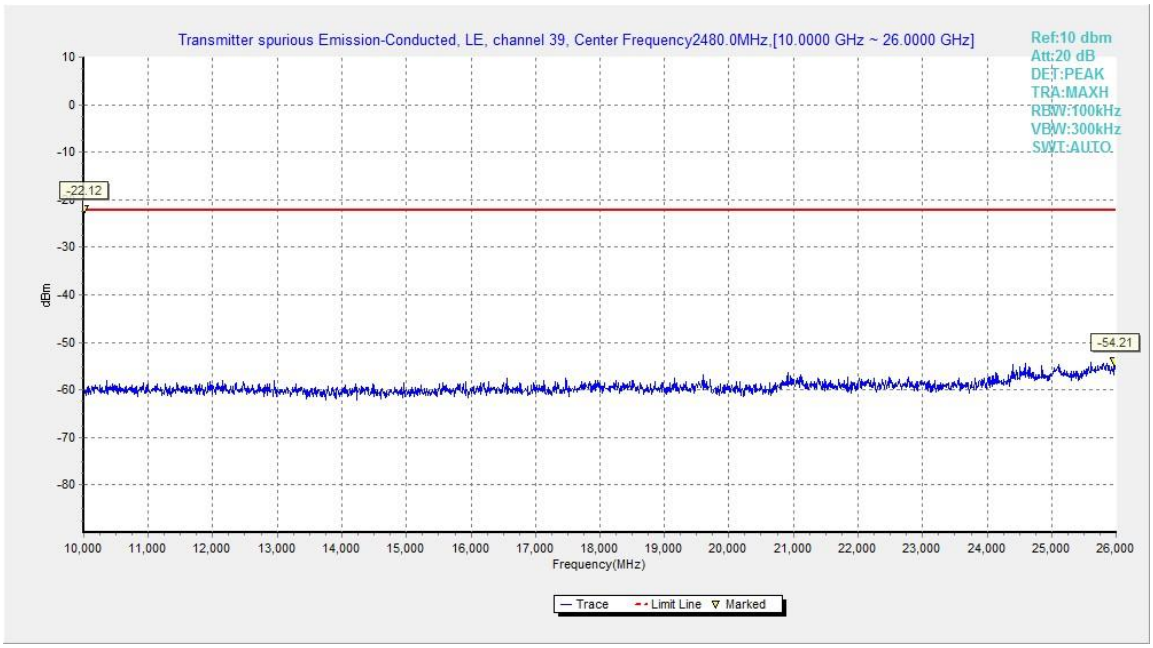



Fig.17. Transmitter Spurious Emission - Conducted: GFSK, 2480 MHz, 10GHz - 26GHz

## A.5. 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)).

The measurement is made according to ANSI C63.10

**Limit in restricted band:**

| Frequency of emission (MHz) | Field strength(uV/m) | Field strength(dBuV/m) |
|---|---|---|
| 30-88 | 100 | 40 |
| 88-216 | 150 | 43.5 |
| 216-960 | 200 | 46 |
| Above 960 | 500 | 54 |

**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 |

**Measurement Results:**

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.
The measurement results are obtained as described below:

$Result=P_{Mea}+A_{Rpl}$

**For GFSK**

| Frequency | Frequency Range | Test Results | Conclusion |
|---|---|---|---|
| 2402 MHz | 1 GHz ~ 3 GHz | -- | P |
| | 3 GHz ~ 18 GHz | -- | P |
| 2440 MHz | 9 kHz ~ 30 MHz | -- | P |
| | 30 MHz ~ 1 GHz | -- | P |
| | 1 GHz ~ 3 GHz | -- | P |
| | 3 GHz ~ 18 GHz | -- | P |

| | | | |
|---|---|---|---|
| 2480 MHz | 1 GHz ~ 3 GHz | -- | P |
| | 3 GHz ~ 18 GHz | -- | P |
| Power | 2.38GHz~2.4GHz---L | Fig.18 | P |
| Power | 2.45GHz~2.5GHz---H | Fig.19 | P |
| For all channels | 18 GHz ~ 26.5 GHz | -- | P |

**GFSK 2402MHz–Average**

| Frequency (MHz) | Measurement Result (dBμV/m) | Cable loss (dB) | Antenna Factor (dB/m) | Receiver Reading (dBμV) | Antenna Pol. (H/V) |
|---|---|---|---|---|---|
| 2389.370 | 42.1 | -38.8 | 27.2 | 53.749 | H |
| 17992.500 | 40.8 | -25.5 | 43.4 | 22.902 | H |
| 17998.500 | 40.7 | -25.5 | 43.4 | 22.802 | V |
| 17989.500 | 40.7 | -25.5 | 43.4 | 22.802 | H |
| 17983.500 | 40.7 | -25.5 | 43.4 | 22.802 | H |
| 17988.000 | 40.6 | -25.5 | 43.4 | 22.702 | H |

**GFSK 2440MHz–Average**

| Frequency (MHz) | Measurement Result (dBμV/m) | Cable loss (dB) | Antenna Factor (dB/m) | Receiver Reading (dBμV) | Antenna Pol. (H/V) |
|---|---|---|---|---|---|
| 18000.000 | 40.8 | -26.5 | 46.4 | 20.905 | H |
| 17997.000 | 40.8 | -25.5 | 43.4 | 22.902 | H |
| 17994.000 | 40.8 | -25.5 | 43.4 | 22.902 | V |
| 17962.500 | 40.8 | -25.5 | 43.4 | 22.902 | H |
| 17992.500 | 40.7 | -25.5 | 43.4 | 22.802 | H |
| 17995.500 | 40.7 | -25.5 | 43.4 | 22.802 | H |

**GFSK 2480MHz–Average**

| Frequency (MHz) | Measurement Result (dBμV/m) | Cable loss (dB) | Antenna Factor (dB/m) | Receiver Reading (dBμV) | Antenna Pol. (H/V) |
|---|---|---|---|---|---|
| 2485.335 | 42.1 | -39.0 | 27.2 | 53.914 | H |
| 17998.500 | 40.9 | -25.5 | 43.4 | 23.002 | H |
| 17994.000 | 40.9 | -25.5 | 43.4 | 23.002 | V |
| 17989.500 | 40.8 | -25.5 | 43.4 | 22.902 | H |
| 17988.000 | 40.8 | -25.5 | 43.4 | 22.902 | H |
| 18000.000 | 40.8 | -26.5 | 46.4 | 20.905 | H |

**GFSK 2402MHz–Peak**

| Frequency (MHz) | Measurement Result (dBμV/m) | Cable loss (dB) | Antenna Factor (dB/m) | Receiver Reading (dBμV) | Antenna Pol. (H/V) |
|---|---|---|---|---|---|
| 2389.875 | 54.6 | -38.8 | 27.2 | 66.249 | H |
| 17997.000 | 52.5 | -25.5 | 43.4 | 34.602 | H |
| 17971.500 | 52.3 | -25.5 | 43.4 | 34.402 | V |
| 17970.000 | 52.3 | -25.5 | 43.4 | 34.402 | H |
| 17992.500 | 52.2 | -25.5 | 43.4 | 34.302 | H |
| 17958.000 | 52.1 | -25.5 | 43.4 | 34.202 | H |

**GFSK 2440MHz–Peak**

| Frequency (MHz) | Measurement Result (dBμV/m) | Cable loss (dB) | Antenna Factor (dB/m) | Receiver Reading (dBμV) | Antenna Pol. (H/V) |
|---|---|---|---|---|---|
| 17995.500 | 52.0 | -25.5 | 43.4 | 34.102 | H |
| 17923.500 | 51.9 | -25.5 | 43.4 | 34.002 | H |
| 17968.500 | 51.9 | -25.5 | 43.4 | 34.002 | V |
| 17974.500 | 51.9 | -25.5 | 43.4 | 34.002 | H |
| 17709.000 | 51.9 | -26.9 | 43.4 | 35.352 | H |
| 17943.000 | 51.8 | -25.5 | 43.4 | 33.902 | H |

**GFSK 2480MHz–Peak**

| Frequency (MHz) | Measurement Result (dBμV/m) | Cable loss (dB) | Antenna Factor (dB/m) | Receiver Reading (dBμV) | Antenna Pol. (H/V) |
|---|---|---|---|---|---|
| 2486.345 | 55.1 | -39.0 | 27.2 | 66.914 | H |
| 17832.000 | 52.6 | -25.7 | 43.4 | 34.942 | H |
| 17985.000 | 52.6 | -25.5 | 43.4 | 34.702 | V |
| 18000.000 | 52.4 | -26.5 | 46.4 | 32.505 | H |
| 17958.000 | 52.3 | -25.5 | 43.4 | 34.402 | H |
| 17913.000 | 52.1 | -25.7 | 43.4 | 34.442 | H |

**Conclusion: PASS**

**Test graphs as below:**

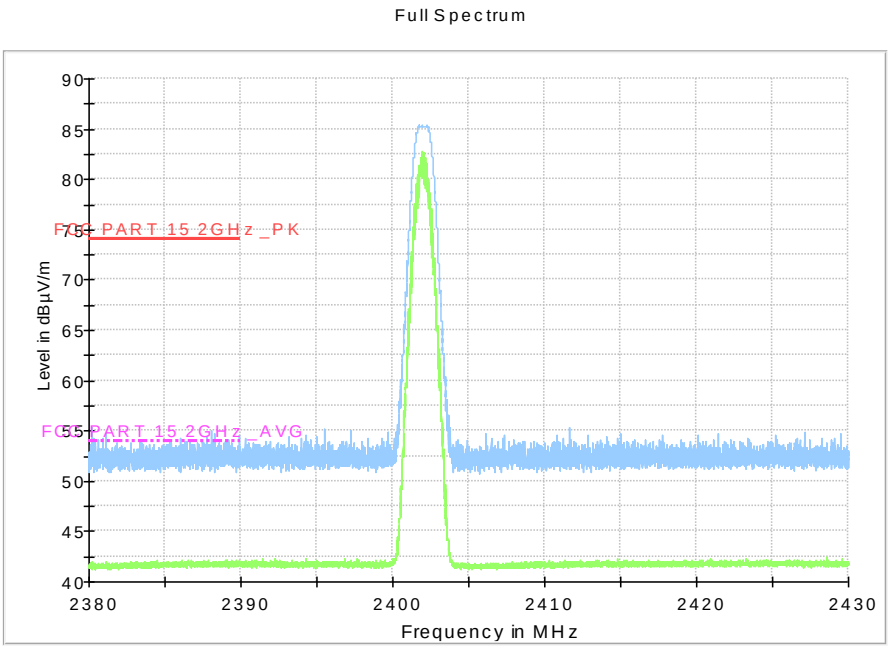



Fig.18. Transmitter Spurious Emission - Radiated (Power): GFSK low channel

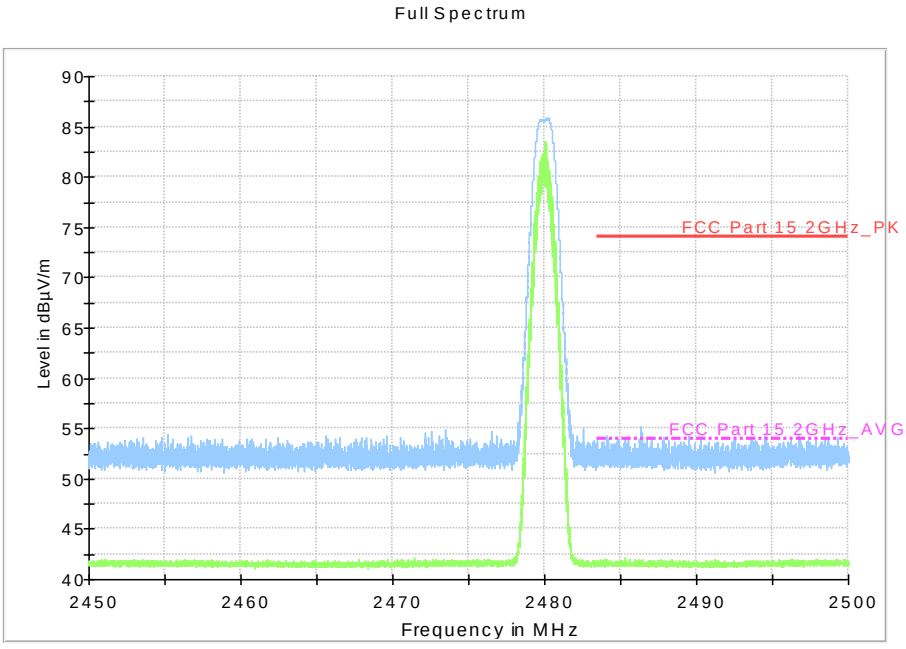



Fig.19. Transmitter Spurious Emission - Radiated (Power): GFSK high channel

## A.6. 6dB Bandwidth

**Method of Measurement:**

The measurement is made according to ANSI C63.10 clause 11.8.1
1.Set RBW = 100 kHz.
2. Set the video bandwidth (VBW) = 300 kHz.
3. Detector = Peak.
4. Trace mode = max hold.
5. Sweep = auto couple.
6. Allow the trace to stabilize.
7. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

**Measurement Limit:**

| Standard | Limit |
|---|---|
| FCC 47 CFR Part 15.247(a)(2) | >= 500KHz |

**Measurement Results:**

**For GFSK**

| Channel No. | Frequency (MHz) | 6dB Bandwidth (kHz) | | Conclusion |
|---|---|---|---|---|
| 0 | 2402 | Fig.20 | 694.00 | P |
| 19 | 2440 | Fig.21 | 694.50 | P |
| 39 | 2480 | Fig.22 | 694.50 | P |

**Conclusion: PASS**

**Test graphs as below:**

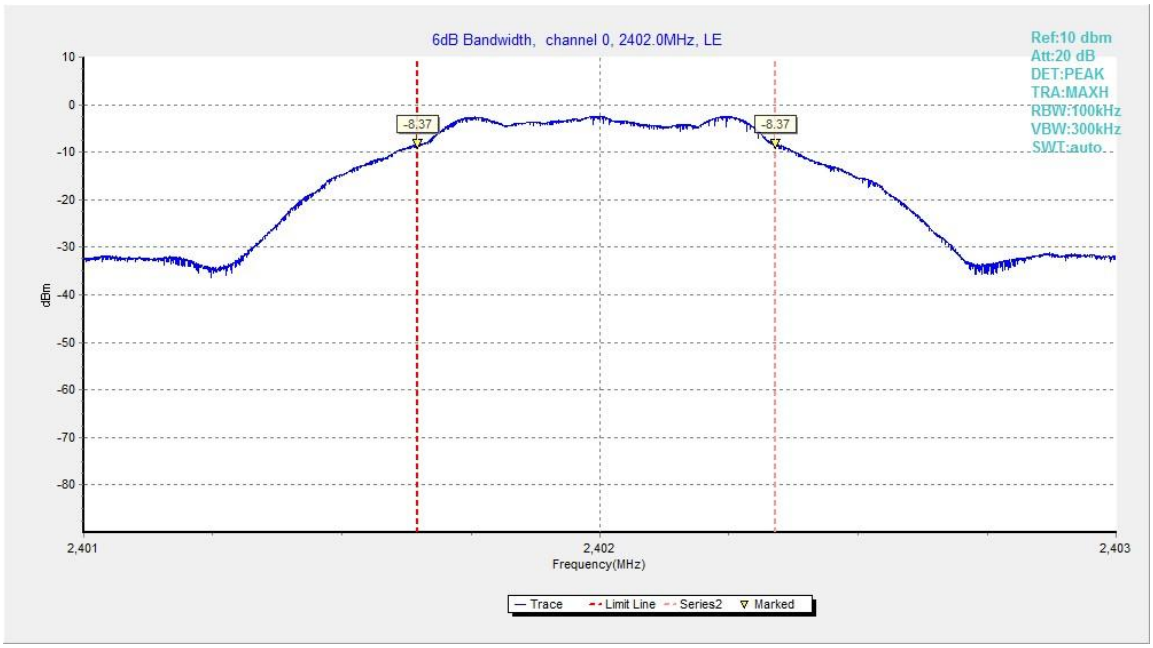



Fig.20. 6dB Bandwidth: GFSK, 2402 MHz


Fig.21. 6dB Bandwidth: GFSK, 2440 MHz

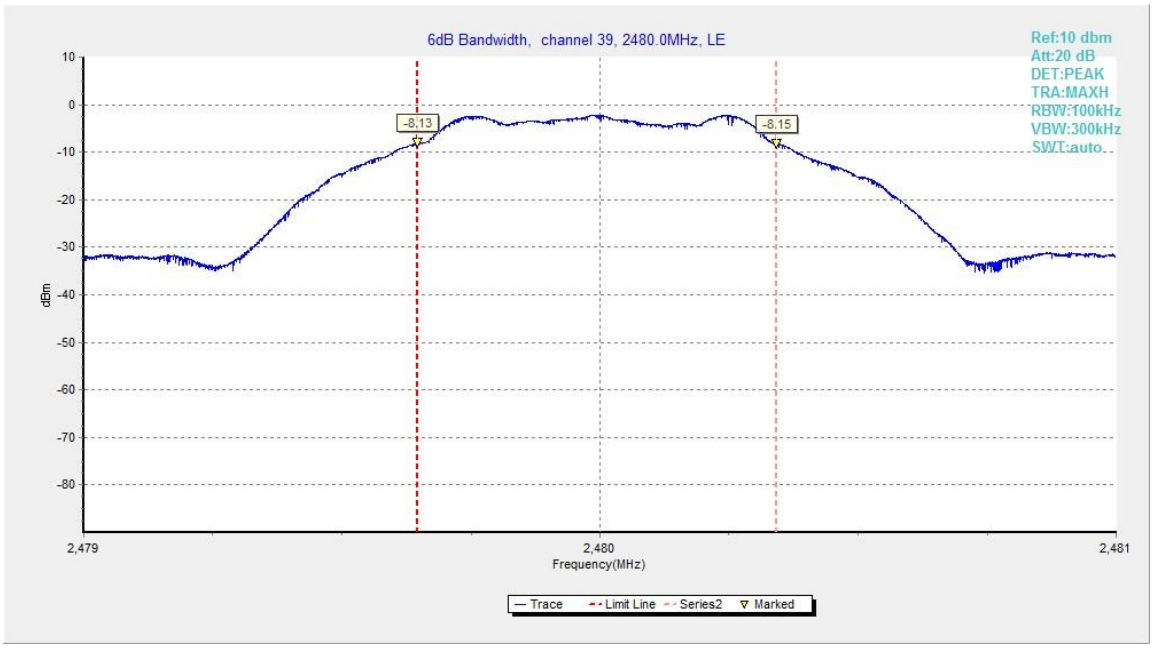



Fig.22. 6dB Bandwidth: GFSK, 2480 MHz

## A.7. Maximum Power Spectral Density Level

**Method of Measurement:**

The measurement is made according to ANSI C63.10 clause 11.10.2

1. Set the RBW = 3 kHz.
2. Set the VBW = 10 kHz.
3. Set the span to 2 times the DTS bandwidth.
4. Detector = peak.
5. Sweep time = auto couple.
6. Trace mode = max hold.
7. Allow trace to fully stabilize.
8. Use the peak marker function to determine the maximum amplitude level within the RBW.

**Measurement Limit:**

| Standard | Limit |
|---|---|
| FCC 47 CFR Part 15.247(e) | <=8.0dBm/3kHz |

**Measurement Results:**

**For GFSK**

| Channel No. | Frequency (MHz) | Maximum Power Spectral Density Level(dBm/3kHz) | | Conclusion |
|---|---|---|---|---|
| 0 | 2402 | Fig.23 | -16.62 | P |
| 19 | 2440 | Fig.24 | -16.82 | P |
| 39 | 2480 | Fig.25 | -16.35 | P |

**Test graphs as below:**

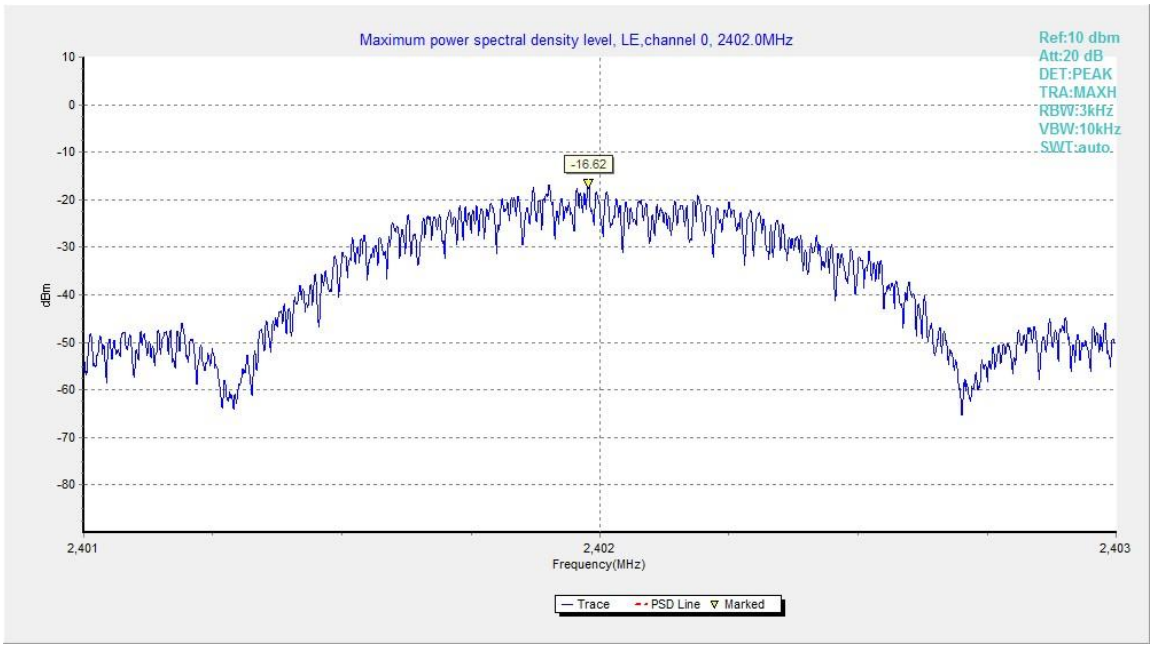



Fig.23. Maximum Power Spectral Density Level Function: GFSK, 2402 MHz

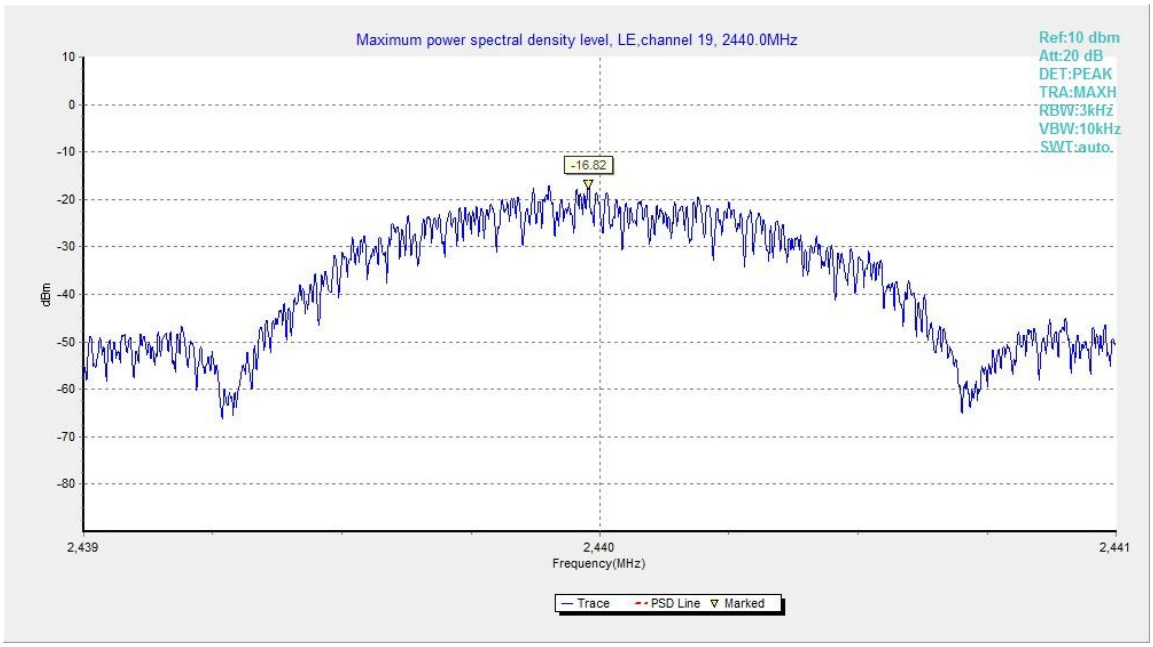



Fig.24. Maximum Power Spectral Density Level Function: GFSK, 2440 MHz

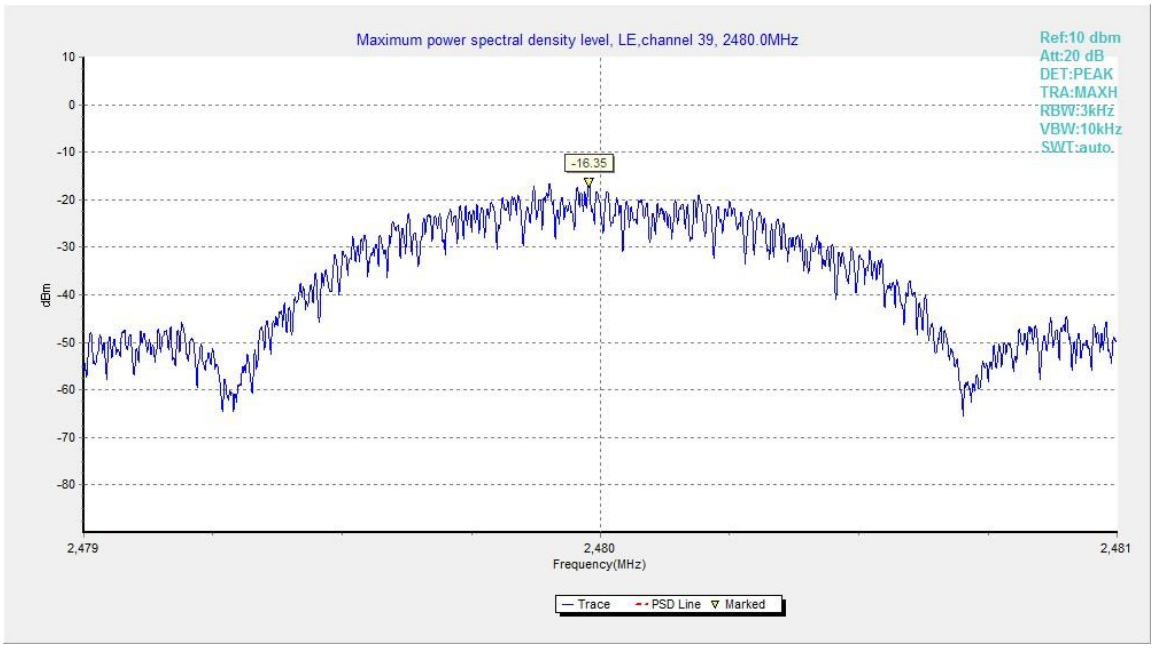



Fig.25. Maximum Power Spectral Density Level Function: GFSK, 2480 MHz

## A.8. AC Powerline Conducted Emission

**Method of Measurement: See ANSI C63.10-clause 6.2**

1. the one EUT cable configuration and arrangement and mode of operation that produced the emission with the highest amplitude relative to the limit is selected for the final measurement, while applying the appropriate modulating signal to the EUT.
2. If the EUT is relocated from an exploratory test site to a final test site, the highest emissions shall be remaximized at the final test location before final ac power-line conducted emission measurements are performed.
3. The final test on all current-carrying conductors of all of the power cords to the equipment that comprises the EUT (but not the cords associated with other non-EUT equipment in the system) is then performed for the full frequency range for which the EUT is being tested for compliance without further variation of the EUT arrangement, cable positions, or EUT mode of operation.
4. If the EUT is comprised of equipment units that have their own separate ac power connections, e.g., floor-standing equipment with independent power cords for each shelf that are able to connect directly to the ac power network, each current-carrying conductor of one unit is measured while the other units are connected to a second (or more) LISN(s). All units shall be separately measured. If a power strip is provided by the manufacturer, to supply all of the units making up the EUT, only the conductors in the power cord of the power strip shall be measured.
5. If the EUT uses a detachable antenna, these measurements shall be made with a suitable dummy load connected to the antenna output terminals; otherwise, the tests shall be made with the antenna connected and, if adjustable, fully extended. When measuring the ac conducted emissions from a device that operates between 150 kHz and 30 MHz a non-detachable antenna may be replaced with a dummy load for the measurements within the fundamental emission band of the transmitter, but only for those measurements.36 Record the six highest EUT emissions relative to the limit of each of the current-carrying conductors of the power cords of the equipment that comprises the EUT over the frequency range specified by the procuring or regulatory agency. Diagram or photograph the test setup that was used. See Clause 8 for full reporting requirements.

**Test Condition**

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

**Measurement Result and limit:**

**Bluetooth (Quasi-peak Limit)**

| Frequency range (MHz) | Quasi-peak Limit (dBμV) | Conclusion |
|---|---|---|
| 0.15 to 0.5 | 66 to 56 | 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. | | |

**Bluetooth (Average Limit)**

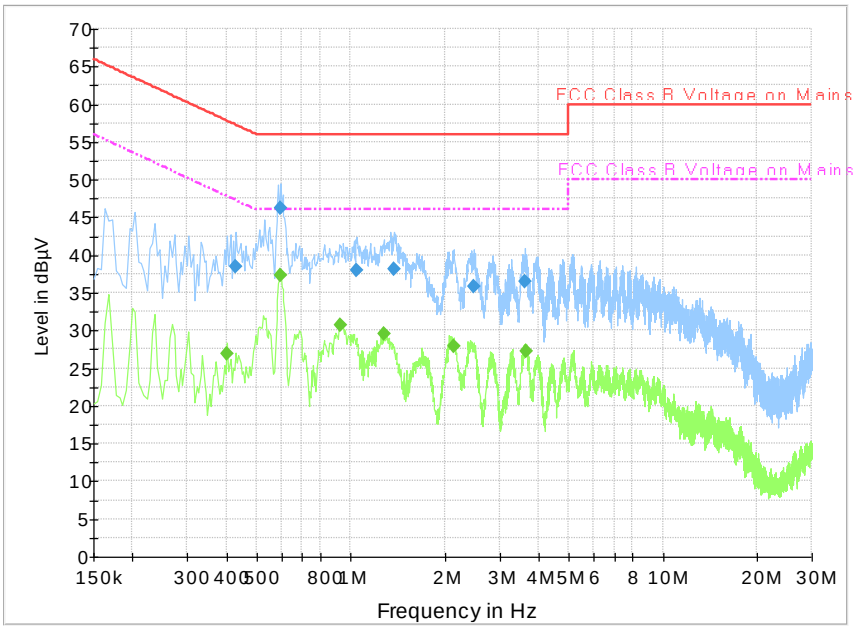
| Frequency range (MHz) | Average Limit (dBμV) | Conclusion |
|---|---|---|
| 0.15 to 0.5 | 56 to 46 | P |
| 0.5 to 5 | 46 | |
| 5 to 30 | 50 | |
| NOTE: The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.5 MHz. | | |

The measurement is made according to ANSI C63.10

**Conclusion: PASS**

**Test graphs as below:**

**Traffic: Set.10**



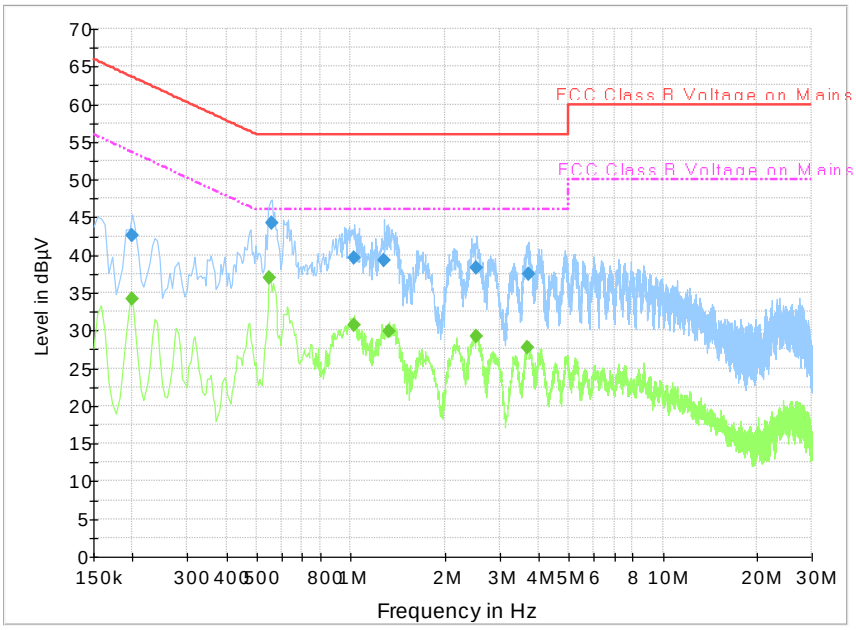

## Final Result 1

| Frequency (MHz) | QuasiPeak (dBµV) | Meas. Time (ms) | Bandwidth (kHz) | Filter | Line | Corr. (dB) | Margin (dB) | Limit (dBµV) |
|---|---|---|---|---|---|---|---|---|
| 0.429000 | 38.5 | 2000.0 | 9.000 | On | L1 | 19.9 | 18.8 | 57.3 |
| 0.595500 | 46.2 | 2000.0 | 9.000 | On | L1 | 19.8 | 9.8 | 56.0 |
| 1.045500 | 38.0 | 2000.0 | 9.000 | On | N | 19.7 | 18.0 | 56.0 |
| 1.383000 | 38.2 | 2000.0 | 9.000 | On | N | 19.6 | 17.8 | 56.0 |
| 2.490000 | 35.8 | 2000.0 | 9.000 | On | L1 | 19.7 | 20.2 | 56.0 |
| 3.606000 | 36.5 | 2000.0 | 9.000 | On | L1 | 19.6 | 19.5 | 56.0 |

## Final Result 2

| Frequency (MHz) | QuasiPeak (dBµV) | Meas. Time (ms) | Bandwidth (kHz) | Filter | Line | Corr. (dB) | Margin (dB) | Limit (dBµV) |
|---|---|---|---|---|---|---|---|---|
| 0.402000 | 26.9 | 2000.0 | 9.000 | On | L1 | 19.9 | 20.9 | 47.8 |
| 0.595500 | 37.3 | 2000.0 | 9.000 | On | L1 | 19.8 | 8.7 | 46.0 |
| 0.924000 | 30.7 | 2000.0 | 9.000 | On | L1 | 19.7 | 15.3 | 46.0 |
| 1.279500 | 29.6 | 2000.0 | 9.000 | On | L1 | 19.6 | 16.4 | 46.0 |
| 2.143500 | 28.0 | 2000.0 | 9.000 | On | L1 | 19.7 | 18.0 | 46.0 |
| 3.655500 | 27.3 | 2000.0 | 9.000 | On | L1 | 19.6 | 18.7 | 46.0 |

**Traffic: Set.11**



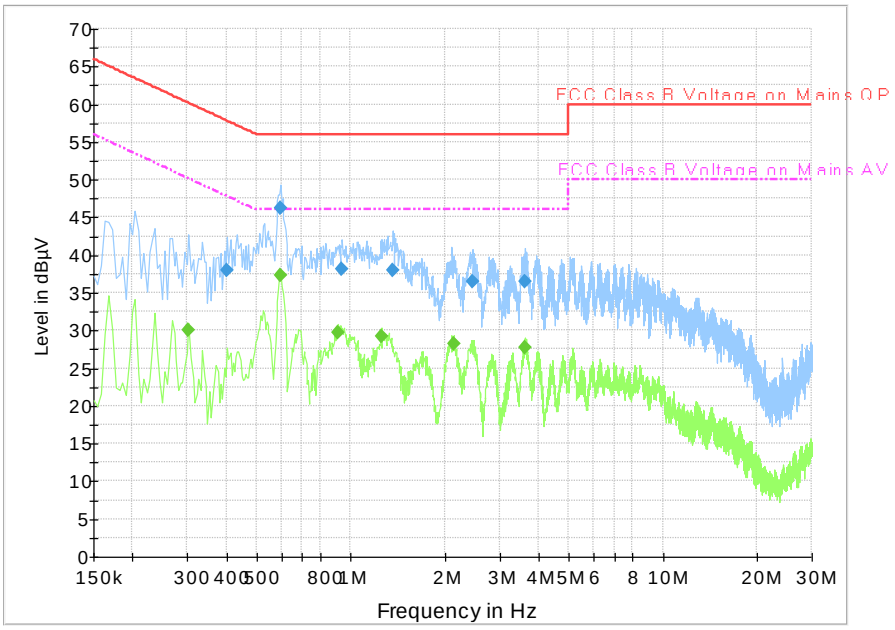

## Final Result 1

| Frequency (MHz) | QuasiPeak (dBµV) | Meas. Time (ms) | Bandwidth (kHz) | Filter | Line | Corr. (dB) | Margin (dB) | Limit (dBµV) |
|---|---|---|---|---|---|---|---|---|
| 0.199500 | 42.6 | 2000.0 | 9.000 | On | N | 19.8 | 21.1 | 63.6 |
| 0.559500 | 44.3 | 2000.0 | 9.000 | On | L1 | 19.9 | 11.7 | 56.0 |
| 1.027500 | 39.6 | 2000.0 | 9.000 | On | L1 | 19.6 | 16.4 | 56.0 |
| 1.279500 | 39.3 | 2000.0 | 9.000 | On | L1 | 19.6 | 16.7 | 56.0 |
| 2.535000 | 38.3 | 2000.0 | 9.000 | On | L1 | 19.7 | 17.7 | 56.0 |
| 3.709500 | 37.5 | 2000.0 | 9.000 | On | L1 | 19.6 | 18.5 | 56.0 |

## Final Result 2

| Frequency (MHz) | QuasiPeak (dBµV) | Meas. Time (ms) | Bandwidth (kHz) | Filter | Line | Corr. (dB) | Margin (dB) | Limit (dBµV) |
|---|---|---|---|---|---|---|---|---|
| 0.199500 | 34.2 | 2000.0 | 9.000 | On | N | 19.8 | 19.4 | 53.6 |
| 0.550500 | 37.0 | 2000.0 | 9.000 | On | N | 19.9 | 9.0 | 46.0 |
| 1.027500 | 30.7 | 2000.0 | 9.000 | On | L1 | 19.6 | 15.3 | 46.0 |
| 1.329000 | 29.9 | 2000.0 | 9.000 | On | L1 | 19.6 | 16.1 | 46.0 |
| 2.535000 | 29.2 | 2000.0 | 9.000 | On | L1 | 19.7 | 16.8 | 46.0 |
| 3.696000 | 27.7 | 2000.0 | 9.000 | On | L1 | 19.6 | 18.3 | 46.0 |

**Idle: Set.10**



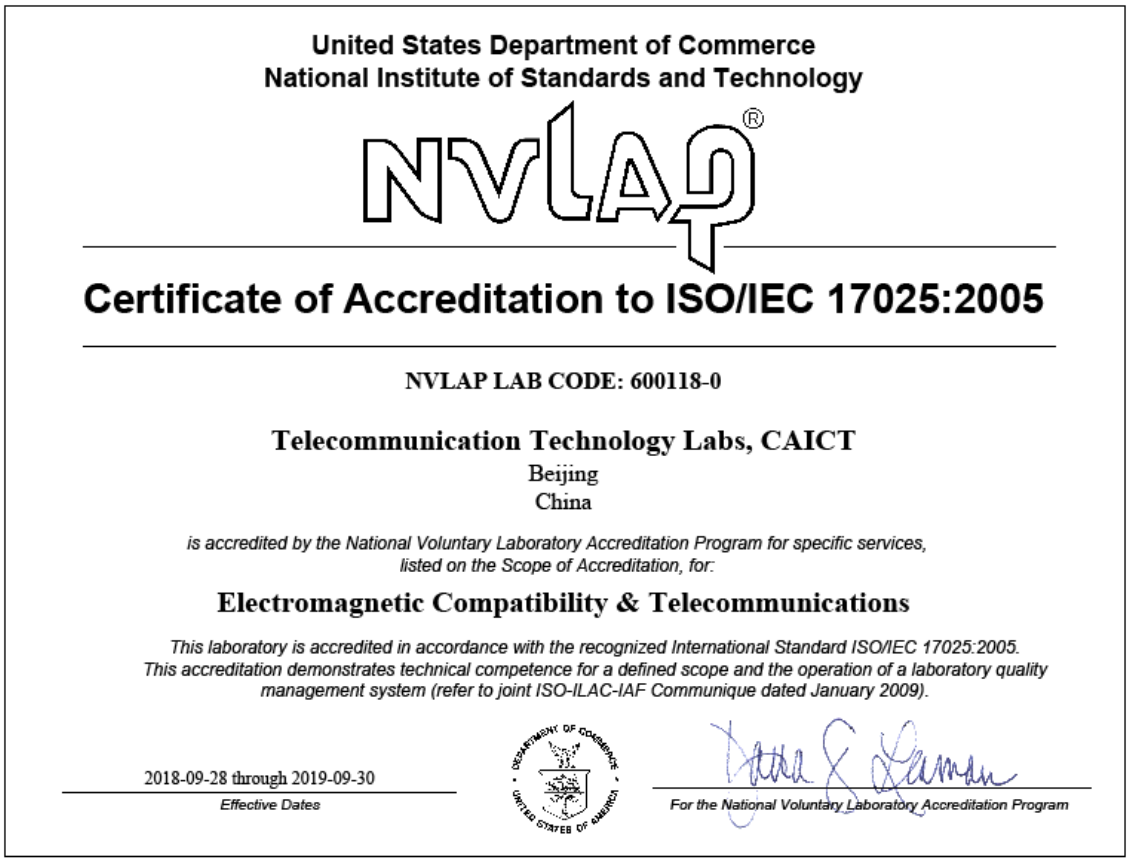

## Final Result 1

| Frequency (MHz) | QuasiPeak (dBµV) | Meas. Time (ms) | Bandwidth (kHz) | Filter | Line | Corr. (dB) | Margin (dB) | Limit (dBµV) |
|---|---|---|---|---|---|---|---|---|
| 0.402000 | 38.0 | 2000.0 | 9.000 | On | L1 | 19.9 | 19.8 | 57.8 |
| 0.595500 | 46.3 | 2000.0 | 9.000 | On | L1 | 19.8 | 9.7 | 56.0 |
| 0.937500 | 38.1 | 2000.0 | 9.000 | On | L1 | 19.6 | 17.9 | 56.0 |
| 1.365000 | 37.9 | 2000.0 | 9.000 | On | N | 19.6 | 18.1 | 56.0 |
| 2.463000 | 36.5 | 2000.0 | 9.000 | On | L1 | 19.7 | 19.5 | 56.0 |
| 3.606000 | 36.4 | 2000.0 | 9.000 | On | L1 | 19.6 | 19.6 | 56.0 |

## Final Result 2

| Frequency (MHz) | QuasiPeak (dBµV) | Meas. Time (ms) | Bandwidth (kHz) | Filter | Line | Corr. (dB) | Margin (dB) | Limit (dBµV) |
|---|---|---|---|---|---|---|---|---|
| 0.303000 | 30.1 | 2000.0 | 9.000 | On | L1 | 19.8 | 20.0 | 50.2 |
| 0.595500 | 37.3 | 2000.0 | 9.000 | On | L1 | 19.8 | 8.7 | 46.0 |
| 0.906000 | 29.7 | 2000.0 | 9.000 | On | L1 | 19.7 | 16.3 | 46.0 |
| 1.257000 | 29.3 | 2000.0 | 9.000 | On | L1 | 19.6 | 16.7 | 46.0 |
| 2.134500 | 28.2 | 2000.0 | 9.000 | On | L1 | 19.7 | 17.8 | 46.0 |
| 3.615000 | 27.7 | 2000.0 | 9.000 | On | L1 | 19.6 | 18.3 | 46.0 |

## ANNEX E: Accreditation Certificate



United States Department of Commerce
National Institute of Standards and Technology

NVLAP®

**Certificate of Accreditation to ISO/IEC 17025:2005**

**NVLAP LAB CODE: 600118-0**

**Telecommunication Technology Labs, CAICT**
Beijing
China

*is accredited by the National Voluntary Laboratory Accreditation Program for specific services, listed on the Scope of Accreditation, for:*

**Electromagnetic Compatibility & Telecommunications**

*This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communique dated January 2009).*

2018-09-28 through 2019-09-30
*Effective Dates*

*For the National Voluntary Laboratory Accreditation Program*

*****END OF REPORT*****