



# FCC PART 15C TEST REPORT

BLUETOOTH LOW ENERGY (BLE) PART

No. I16Z42206-SRD03

for

**TCL Communication Ltd.**

**LTE/UMTS/GSM smart phone**

**Model Name: 4055A**

**FCC ID: 2ACCJB082**

with

**Hardware Version: PIO**

**Software Version: V1.0**

**Issued Date: 2016-12-20**



**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.

**Test Laboratory:**

CTTL, Telecommunication Technology Labs, Academy of Telecommunication Research, MIIT.

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

[Tel:+86\(0\)10-62304633-2512](tel:+86(0)10-62304633-2512), [Fax:+86\(0\)10-62304633-2504](tel:+86(0)10-62304633-2504)

Email: [cttl\\_terminals@catr.cn](mailto:cttl_terminals@catr.cn), website: [www.chinattl.com](http://www.chinattl.com)



## **REPORT HISTORY**

<b>Report Number</b>	<b>Revision</b>	<b>Description</b>	<b>Issue Date</b>
I16Z42206-SRD03	Rev.0	1st edition	2016-12-20

## **CONTENTS**

<b>1. TEST LABORATORY.....</b>	<b>5</b>
1.1. TESTING LOCATION.....	5
1.2. TESTING ENVIRONMENT.....	5
1.3. PROJECT DATA.....	5
1.4. SIGNATURE.....	5
<b>2. CLIENT INFORMATION.....</b>	<b>6</b>
2.1. APPLICANT INFORMATION.....	6
2.2. MANUFACTURER INFORMATION.....	6
<b>3. EQUIPMENT UNDER TEST (EUT) AND ANCILLARY EQUIPMENT (AE).....</b>	<b>7</b>
3.1. ABOUT EUT.....	7
3.2. INTERNAL IDENTIFICATION OF EUT.....	7
3.3. INTERNAL IDENTIFICATION OF AE.....	7
3.4. NORMAL ACCESSORY SETTING.....	8
3.5. GENERAL DESCRIPTION.....	8
<b>4. REFERENCE DOCUMENTS.....</b>	<b>9</b>
4.1. DOCUMENTS SUPPLIED BY APPLICANT.....	9
4.2. REFERENCE DOCUMENTS FOR TESTING.....	9
<b>5. TEST RESULTS.....</b>	<b>10</b>
5.1. SUMMARY OF TEST RESULTS.....	10
5.2. STATEMENTS.....	10
<b>6. TEST FACILITIES UTILIZED.....</b>	<b>11</b>
<b>7. MEASUREMENT UNCERTAINTY.....</b>	<b>12</b>
7.1. PEAK OUTPUT POWER - CONDUCTED.....	12
7.2. FREQUENCY BAND EDGES.....	12
7.3. CONDUCTED EMISSION.....	12
7.4. RADIATED EMISSION.....	12
7.5. 6dB BANDWIDTH.....	12
7.6. MAXIMUM POWER SPECTRAL DENSITY LEVEL.....	12
7.7. AC POWERLINE CONDUCTED EMISSION.....	13
<b>ANNEX A: DETAILED TEST RESULTS.....</b>	<b>14</b>
A.1. MEASUREMENT METHOD.....	14
A.2. PEAK OUTPUT POWER - CONDUCTED.....	15
A.3. FREQUENCY BAND EDGES - CONDUCTED.....	16



A.4. TRANSMITTER SPURIOUS EMISSION - CONDUCTED.....	18
A.5. TRANSMITTER SPURIOUS EMISSION - RADIATED.....	27
A.6. 6dB BANDWIDTH.....	37
A.7. MAXIMUM POWER SPECTRAL DENSITY LEVEL.....	40
A.8. AC POWERLINE CONDUCTED EMISSION.....	43

## **1. Test Laboratory**

### **1.1. 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(BDA)

Address: No. 18 Jia Kangding Street, BDA District, Beijing, P. R.  
China 100191

### **1.2. Testing Environment**

Normal Temperature: 15-35°C

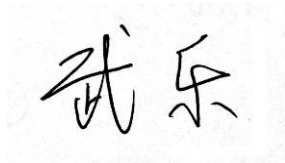
Relative Humidity: 20-75%

### **1.3. Project data**

Testing Start Date: 2016-11-9

Testing End Date: 2016-12-19

### **1.4. 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: 5F, C-Tower, No. 232, Liang Jing Road, ZhangJiang High-Tech Park,  
Pudong Area,Shanghai,201203,P.R.China  
City: Shanghai  
Postal Code: 201203  
Country: China  
Telephone: (0)21 51798260  
Fax: (0)21 6146 0600

### **2.2. Manufacturer Information**

Company Name: TCL Communication Ltd.  
Address /Post: 5F, C-Tower, No. 232, Liang Jing Road, ZhangJiang High-Tech Park,  
Pudong Area,Shanghai,201203,P.R.China  
City: Shanghai  
Postal Code: 201203  
Country: China  
Telephone: (0)21 51798260  
Fax: (0)21 6146 0600

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

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

Description	LTE/UMTS/GSM smart phone
Model Name	4055A
FCC ID	2ACCJB082
Frequency Band	ISM 2400MHz~2483.5MHz
Type of Modulation(LE mode)	GFSK (Bluetooth Low Energy)
Number of Channels(LE mode)	40
Power Supply	3.8V DC by Battery

#### **3.2. Internal Identification of EUT**

EUT ID*	SN or IMEI	HW Version	SW Version
EUT1	353631080002475	PIO	V1.0
EUT2	353631080000859	PIO	V1.0

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

#### **3.3. Internal Identification of AE**

AE ID*	Description	SN
AE1	Battery	16TCT-BA-1231
AE2	Battery	16TCT-BA-1239
AE3	Battery	16TCT-BA-1228
AE4	Battery	16TCT-BA-1230
AE5	Battery	/
AE6	USB Cable	16TCT-DC-0507
AE7	USB Cable	16TCT-DC-0512
AE8	Travel charger	16TCT-CH-1382
AE9	Travel charger	16TCT-CH-1381
AE10	Travel charger	16TCT-CH-1394
AE11	Travel charger	16TCT-CH-1393

AE1,AE2

Model	CAB1630001C1
Manufacturer	BYD
Capacitance	1630mAh
Nominal voltage	3.85V

AE3,AE4,AE5

Model	CAB1630003C7
Manufacturer	VEKEN

Capacitance	1630mAh
Nominal voltage	3.85V

AE6,AE7

Model	CDA3122005C1
Manufacturer	JUWEI
Length of cable	101cm

AE8,AE9

Model	CBA0066AGAC5
Manufacturer	PUAN
Length of cable	118cm

AE10,AE11

Model	CBA0066AGAC1
Manufacturer	BYD
Length of cable	122cm

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

### 3.4. Normal Accessory setting

Fully charged battery is used during the test.

### 3.5. General Description

The Equipment Under Test (EUT) is a model of LTE/UMTS/GSM smart phone with integrated antenna. It consists of normal options: lithium battery, charger. Manual and specifications of the EUT were provided to fulfil 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:	
	15.205 Restricted bands of operation;	
	15.209 Radiated emission limits, general requirements;	2015
ANSI C63.10	15.247 Operation within the bands 902–928MHz, 2400–2483.5 MHz, and 5725–5850 MHz.	
	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

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

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

## 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	2017-10-25
2	LISN	ENV216	101200	Rohde & Schwarz	1 year	2017-07-10
3	Test Receiver	ESCI	100344	Rohde & Schwarz	1 year	2017-03-01
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	2017-03-02
2	Loop antenna	HFH2-Z2	829324/007	Rohde & Schwarz	3 years	2017-12-16
3	BiLog Antenna	VULB9163	9163-514	Schwarzbeck	3 years	2017-11-24
4	Dual-Ridge Waveguide Horn Antenna	3117	00139065	ETS-Lindgren	3 years	2017-09-21
5	Dual-Ridge Waveguide Horn Antenna	3116	2663	ETS-Lindgren	3 years	2017-06-17
6	Vector Signal Analyzer	FSV	101047	Rohde & Schwarz	1 year	2017-06-28

## 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. Conducted Emission

#### 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. Radiated Emission

#### 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
-------------------------------	--------

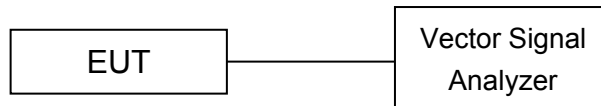
## **ANNEX A: Detailed Test Results**

### **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**

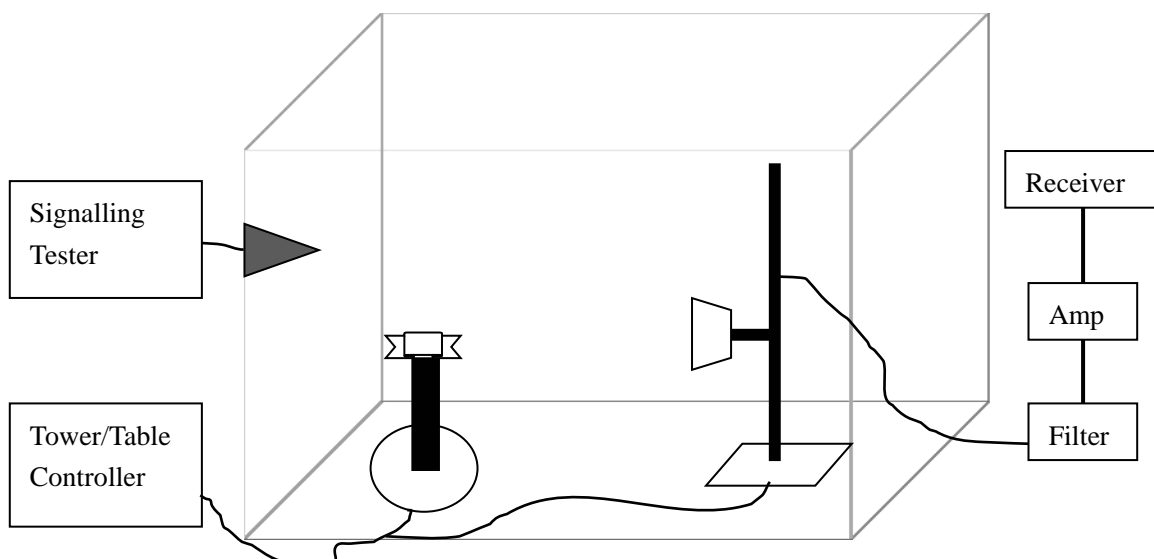
The measurement is made according to ANSI C63.10.

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

**Measurement Results:**

**For GFSK**

Channel No.	Frequency (MHz)	Peak Conducted Output Power (dBm)	Conclusion
0	2402	-2.84	P
19	2440	-2.45	P
39	2480	-3.20	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: coupled
- 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	-46.17	P
39	2480	Hopping OFF	Fig.2	-48.54	P

**Conclusion: PASS**



Test graphs as below

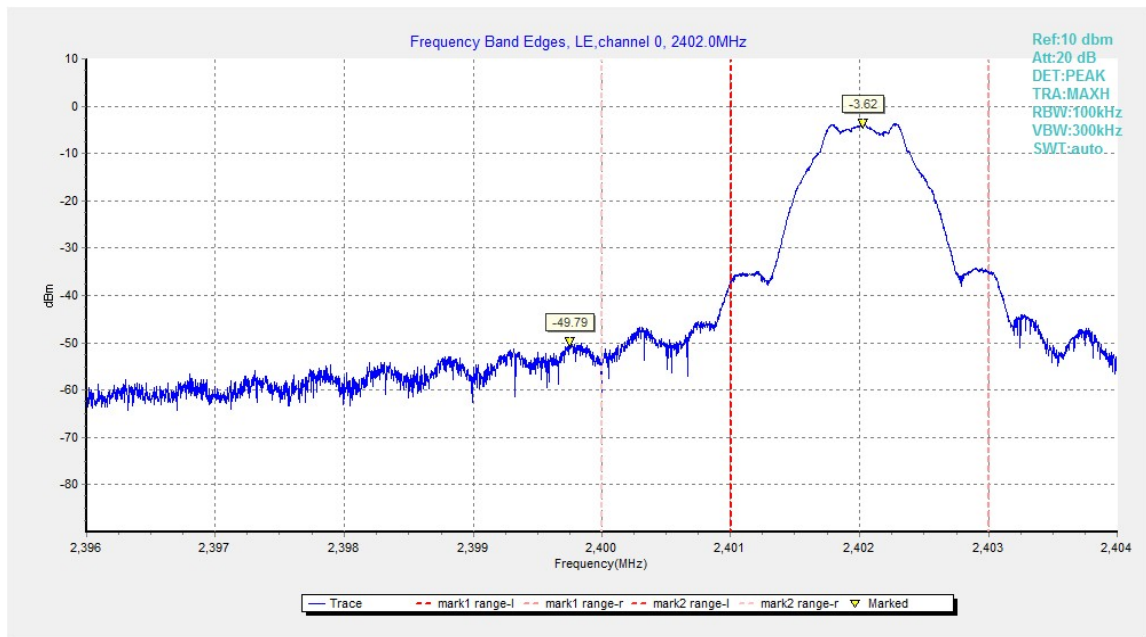


Fig.1. Frequency Band Edges: GFSK, 2402 MHz, Hopping Off

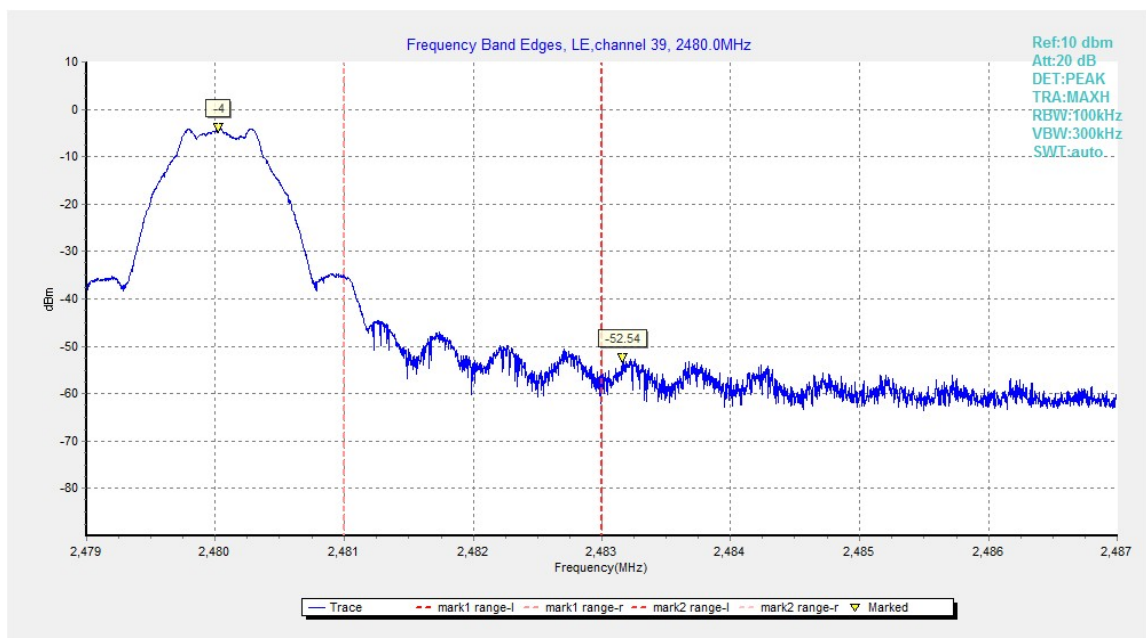


Fig.2. Frequency Band Edges: GFSK, 2480 MHz, Hopping Off

#### 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  $\geq 1.5$  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**

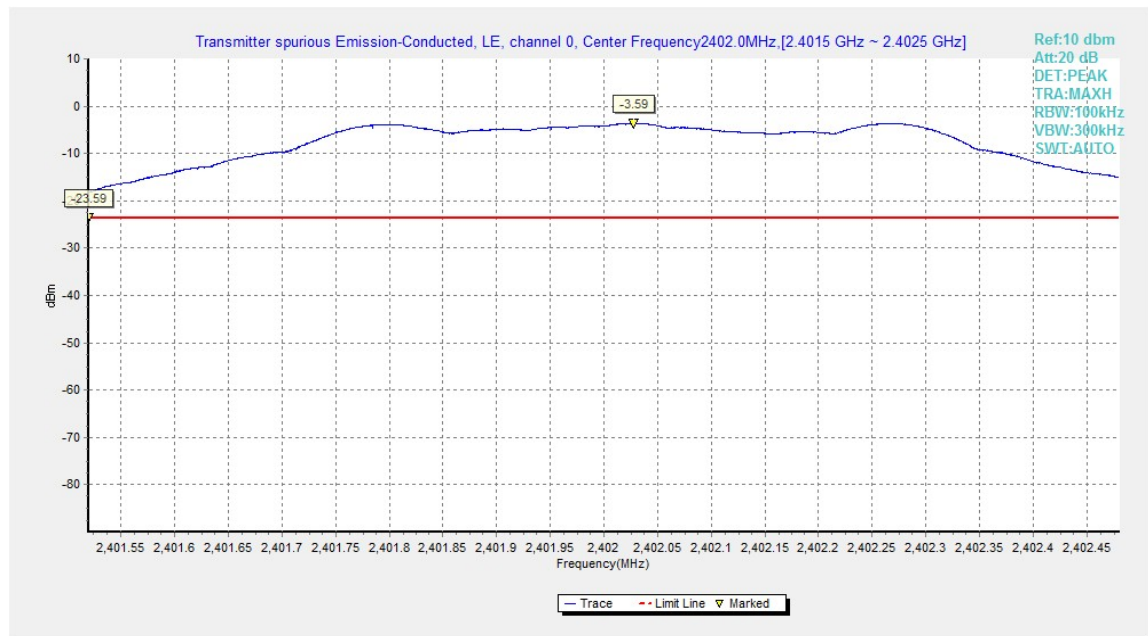


Fig.3. Transmitter Spurious Emission - Conducted: GFSK,2402MHz

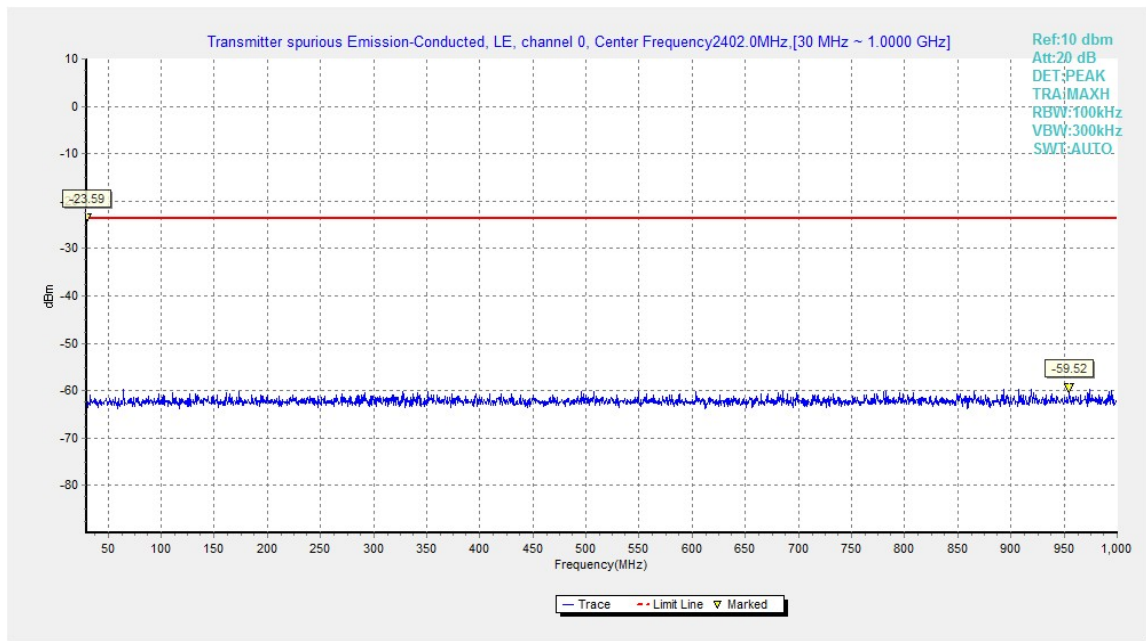


Fig.4. Transmitter Spurious Emission - Conducted: GFSK, 2402 MHz, 30MHz - 1GHz

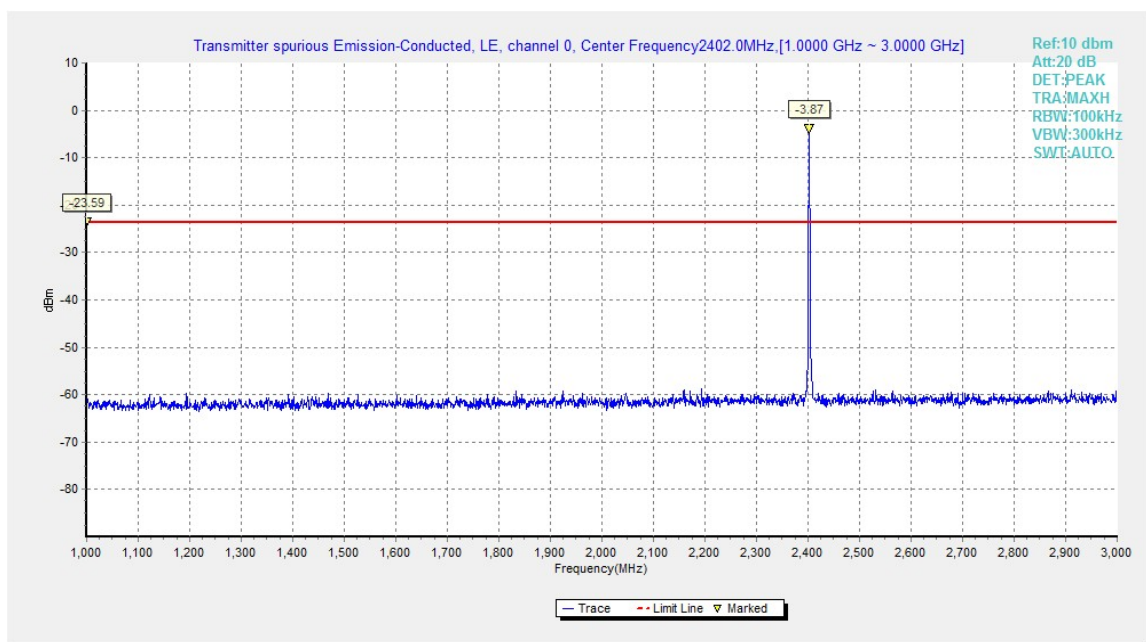


Fig.5. Transmitter Spurious Emission - Conducted: GFSK, 2402 MHz, 1GHz - 3GHz

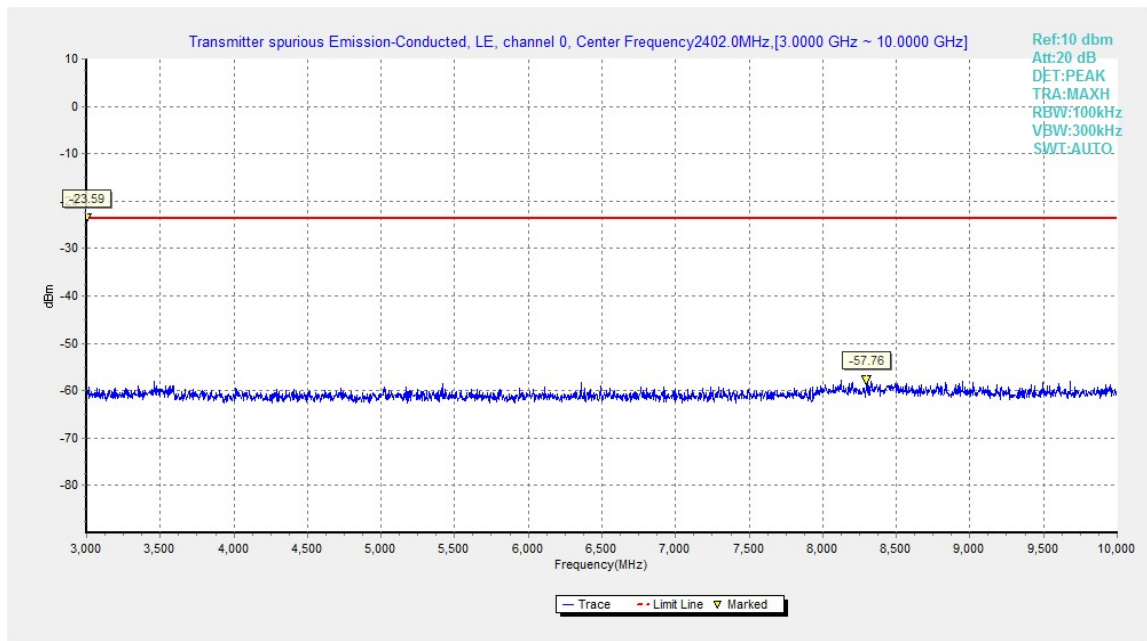


Fig.6. Transmitter Spurious Emission - Conducted: GFSK, 2402 MHz,3GHz - 10GHz

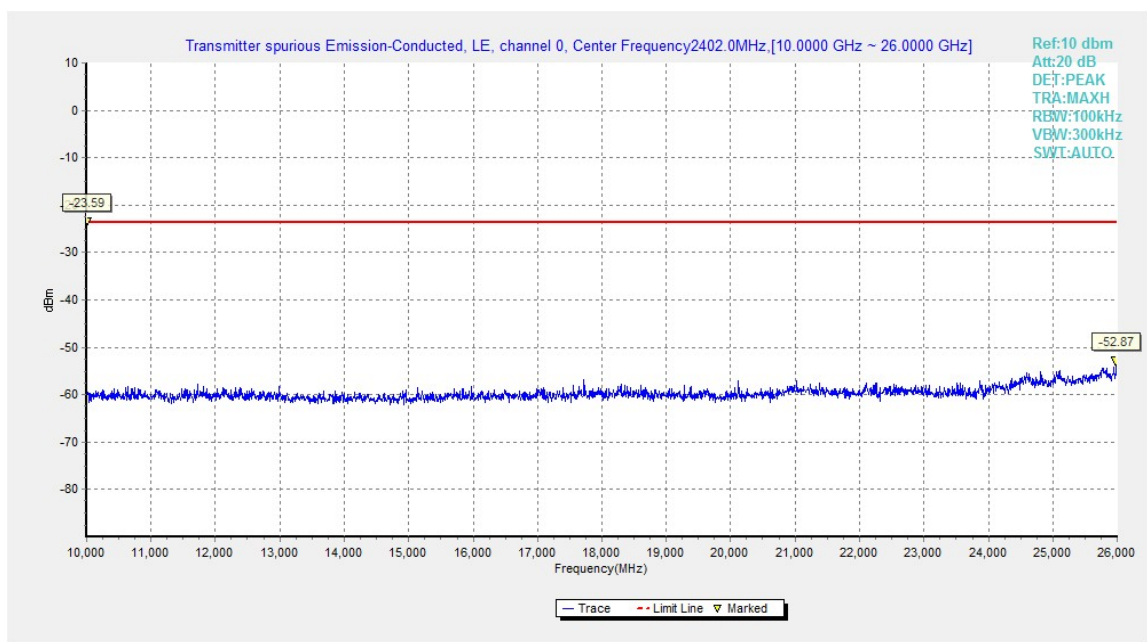


Fig.7. Transmitter Spurious Emission - Conducted: GFSK, 2402 MHz,10GHz - 26GHz

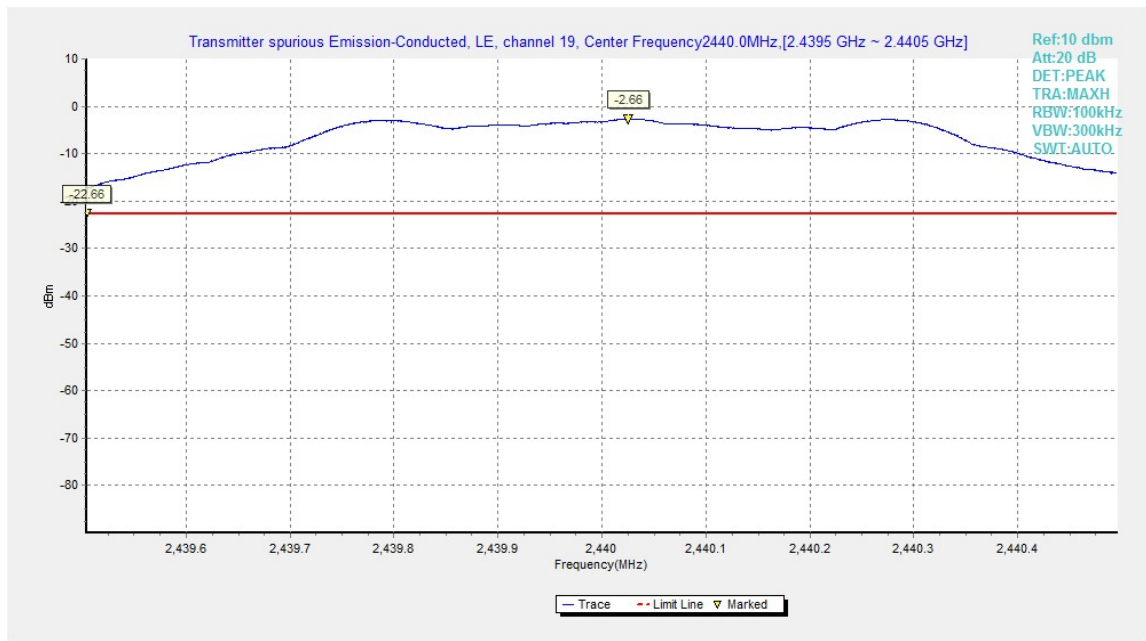


Fig.8. Transmitter Spurious Emission - Conducted: GFSK, 2440MHz

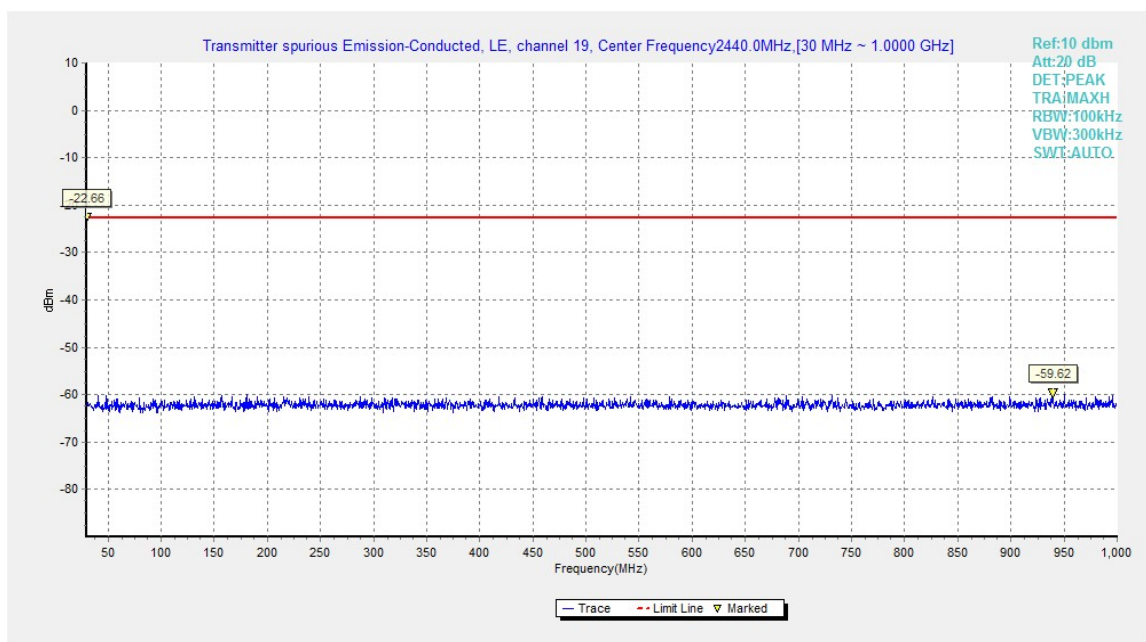


Fig.9. Transmitter Spurious Emission - Conducted: GFSK, 2440 MHz, 30MHz - 1GHz



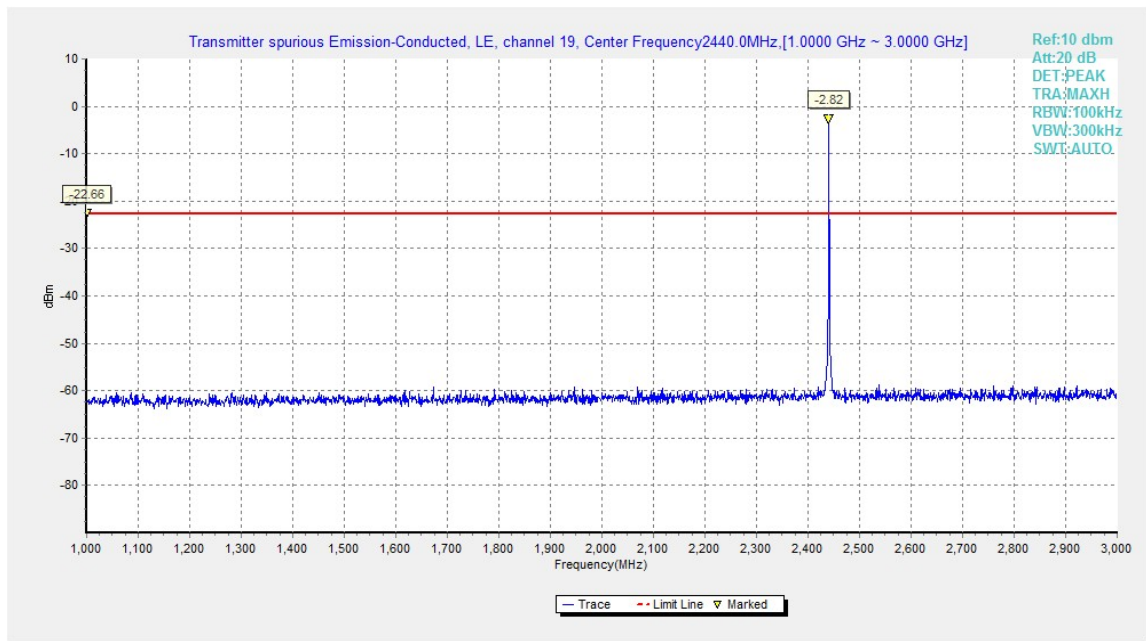


Fig.10. Transmitter Spurious Emission - Conducted: GFSK, 2440 MHz, 1GHz – 3GHz

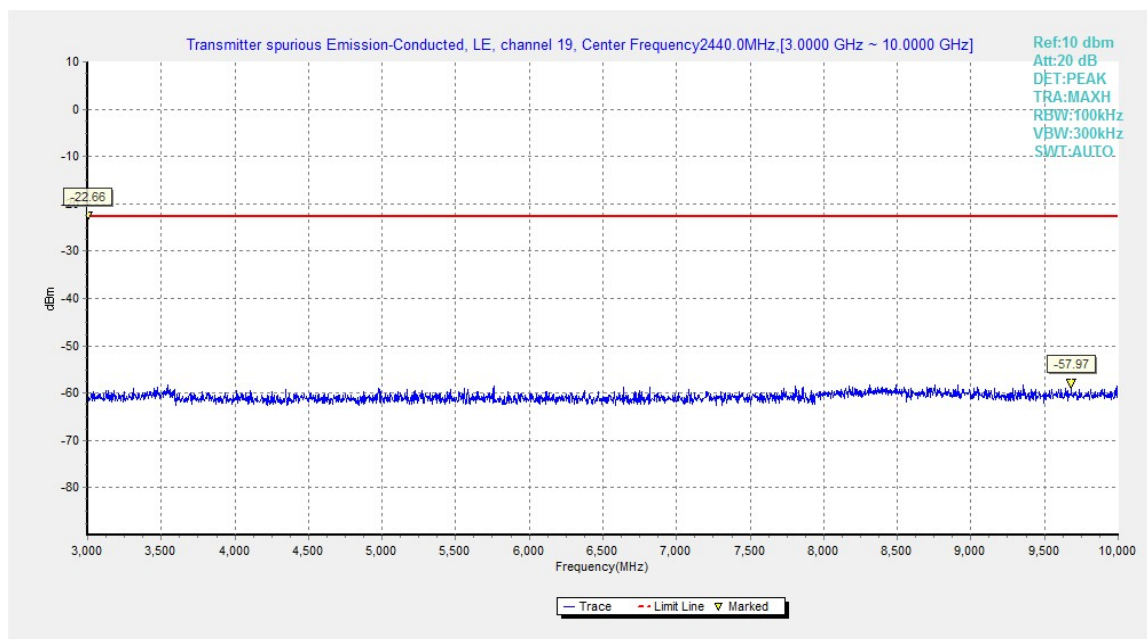


Fig.11. Transmitter Spurious Emission - Conducted: GFSK, 2440 MHz, 3GHz – 10GHz

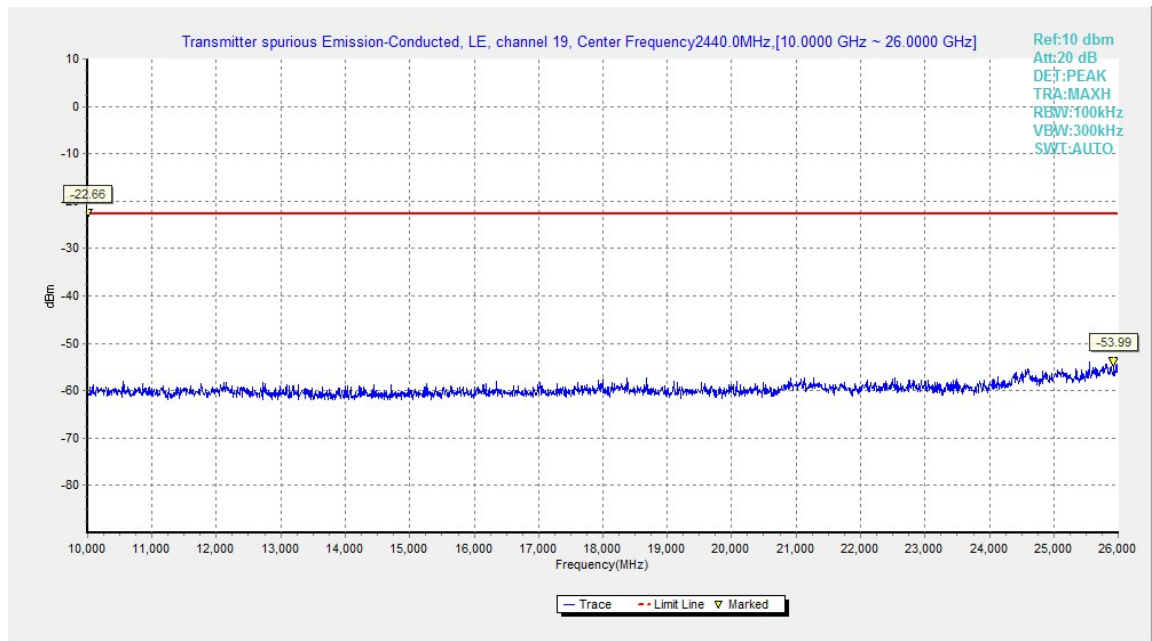


Fig.12. Transmitter Spurious Emission - Conducted: GFSK, 2440 MHz, 10GHz – 26GHz

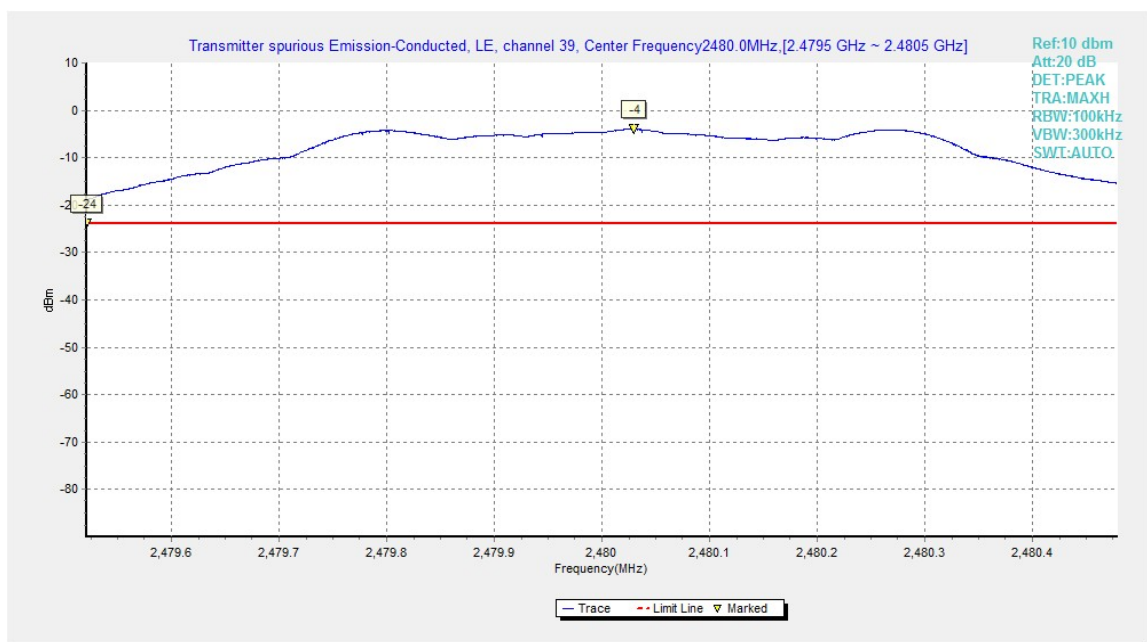


Fig.13. Transmitter Spurious Emission - Conducted: GFSK, 2480 MHz



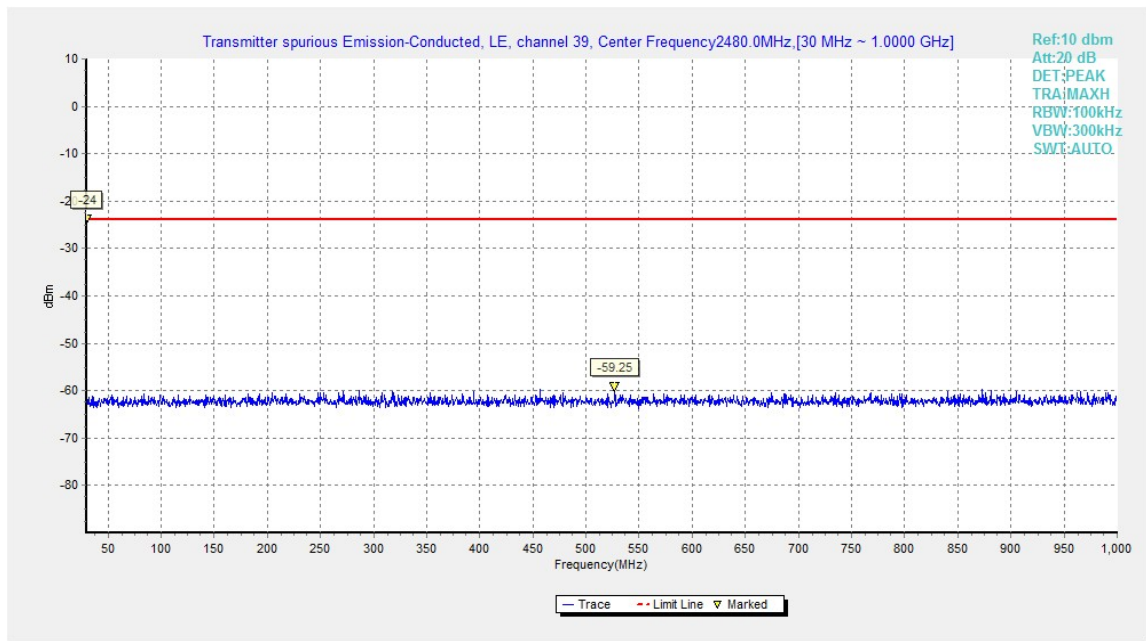


Fig.14. Transmitter Spurious Emission - Conducted: GFSK, 2480 MHz, 30MHz - 1GHz

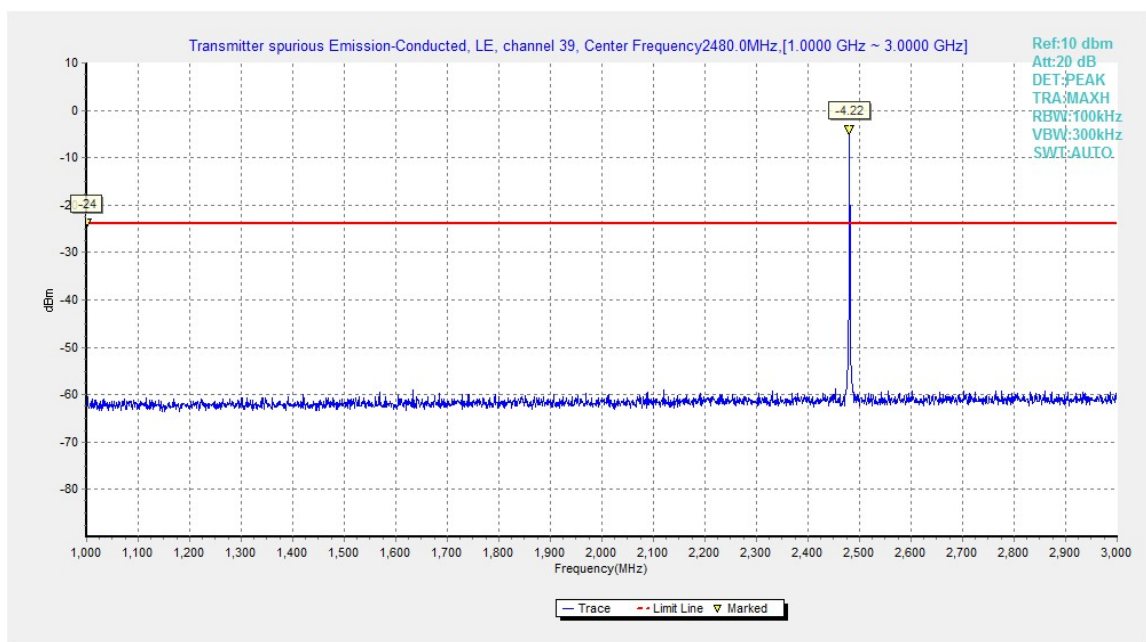


Fig.15. Transmitter Spurious Emission - Conducted: GFSK, 2480 MHz, 1GHz - 3GHz

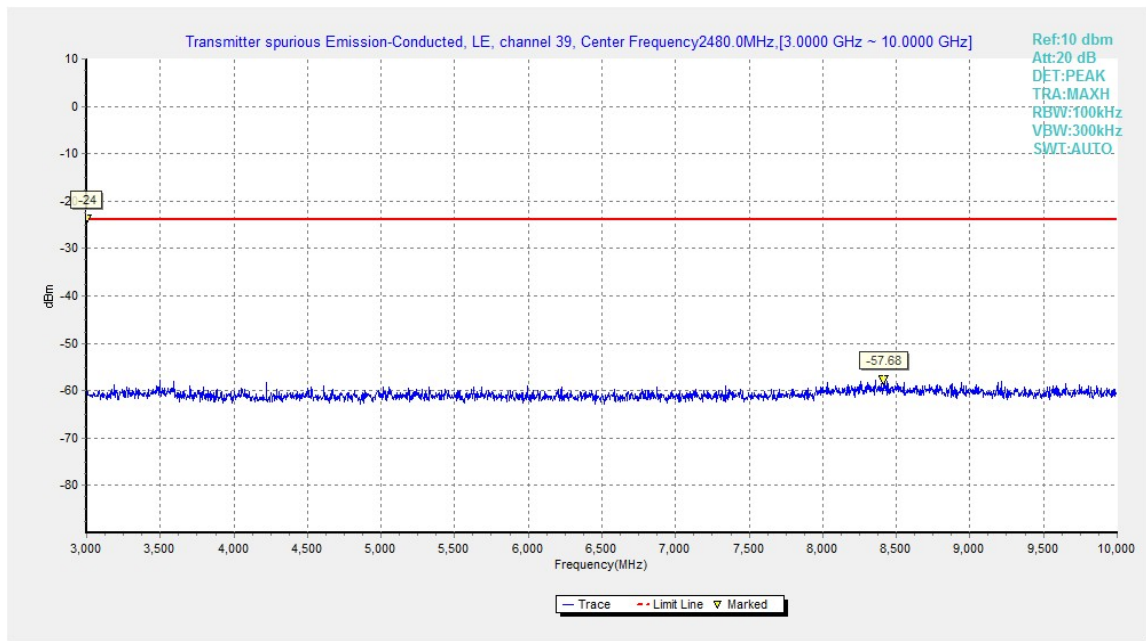


Fig.16. Transmitter Spurious Emission - Conducted: GFSK, 2480 MHz, 3GHz - 10GHz

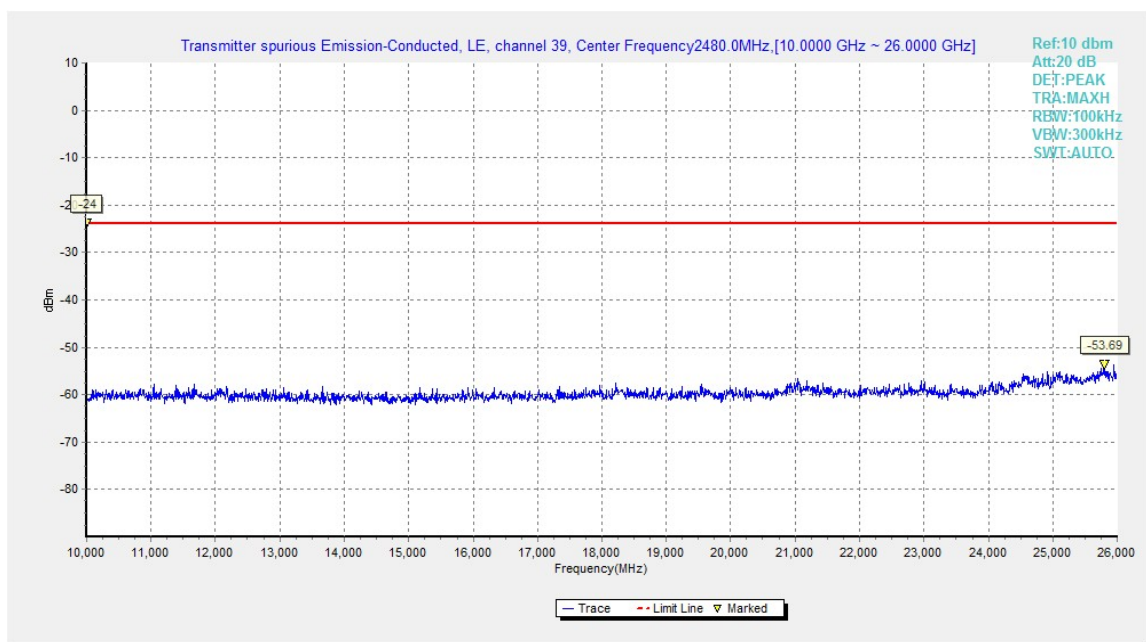


Fig.17. Transmitter Spurious Emission - Conducted: GFSK, 2480 MHz, 10GHz - 26GHz

### 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 los.

The measurement results are obtained as described below:

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

#### For GFSK

Frequency	Frequency Range	Test Results	Conclusion
2402 MHz	1 GHz ~ 3 GHz	Fig.18	P
	3 GHz ~ 18 GHz	Fig.19	P
2441 MHz	9 kHz ~ 30 MHz	Fig.20	P
	30 MHz ~ 1 GHz	Fig.21	P
	1 GHz ~ 3 GHz	Fig.22	P
	3 GHz ~ 18 GHz	Fig.23	P

2480 MHz	1 GHz ~ 3 GHz	Fig.24	P
	3 GHz ~ 18 GHz	Fig.25	P
Power	2.38GHz~2.4GHz---L	Fig.26	P
Power	2.45GHz~2.5GHz---H	Fig.27	P
For all channels	18 GHz ~ 26.5 GHz	Fig.28	P

#### GFSK 2402MHz–Average

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol. (H/V)
2380.200	47.0	2.9	32.1	12.083	54.0	7.0	H
2389.000	47.1	2.9	32.0	12.248	54.0	6.9	H
4804.500	37.6	-17.3	34.5	20.351	54.0	16.4	H
7206.000	39.7	-16.4	36.1	20.031	54.0	14.3	H
9607.500	38.7	-18.2	37.0	19.969	54.0	15.3	H
12010.500	41.5	-17.4	39.3	19.606	54.0	12.5	H

#### GFSK 2440MHz–Average

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol. (H/V)
2375.800	47.0	2.9	32.1	12.050	54.0	7.0	H
2486.200	48.1	2.9	32.7	12.481	54.0	5.9	H
4882.500	36.3	-18.5	34.5	20.375	54.0	17.7	H
7323.000	37.5	-18.5	36.1	19.956	54.0	16.5	H
9763.500	39.5	-17.8	37.2	20.007	54.0	14.5	H
12205.500	40.8	-17.8	39.2	19.339	54.0	13.2	H

#### GFSK 2480MHz–Average

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol. (H/V)
2483.600	48.2	2.9	32.8	12.510	54.0	5.8	H
2485.200	48.1	2.9	32.7	12.454	54.0	5.9	H
4960.500	37.0	-18.2	34.5	20.649	54.0	17.0	H
7440.000	39.4	-16.9	36.0	20.247	54.0	14.6	H
9919.500	40.3	-17.1	37.4	19.959	54.0	13.7	H
12400.500	41.0	-17.5	39.1	19.391	54.0	13.0	H

#### GFSK 2402MHz–Peak

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol. (H/V)
2383.808	60.3	2.9	32.0	25.425	74.0	13.7	H
2386.230	60.3	2.9	32.0	25.410	74.0	13.7	H
17636.250	60.7	-13.0	41.1	32.604	74.0	13.3	H
17956.500	59.9	-13.6	40.8	32.652	74.0	14.1	V
17685.750	59.8	-13.1	41.1	31.880	74.0	14.2	H
17599.500	59.8	-13.4	41.1	32.008	74.0	14.2	V

**GFSK 2440MHz–Peak**

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol. (H/V)
2377.200	50.8	-26.5	32.1	45.168	74.0	23.2	H
2511.200	50.6	-26.5	32.5	44.655	74.0	23.4	H
17208.750	60.2	-14.4	41.2	33.408	74.0	13.8	H
17598.000	60.1	-13.4	41.1	32.360	74.0	13.9	V
17294.250	60.0	-14.0	41.2	32.752	74.0	14.0	V
17865.000	59.8	-13.5	40.9	32.424	74.0	14.2	H

**GFSK 2480MHz–Peak**

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol. (H/V)
2482.100	61.2	2.9	32.8	25.425	74.0	12.8	H
2492.220	60.8	2.9	32.5	25.353	74.0	13.2	H
17254.500	60.3	-14.1	41.2	33.203	74.0	13.7	H
17311.500	60.0	-14.1	41.2	32.868	74.0	14.0	H
17664.750	59.9	-13.1	41.1	31.941	74.0	14.1	V
17736.000	59.7	-13.3	41.0	31.918	74.0	14.3	V



0							
---	--	--	--	--	--	--	--

**Conclusion: PASS**

**Test graphs as below:**

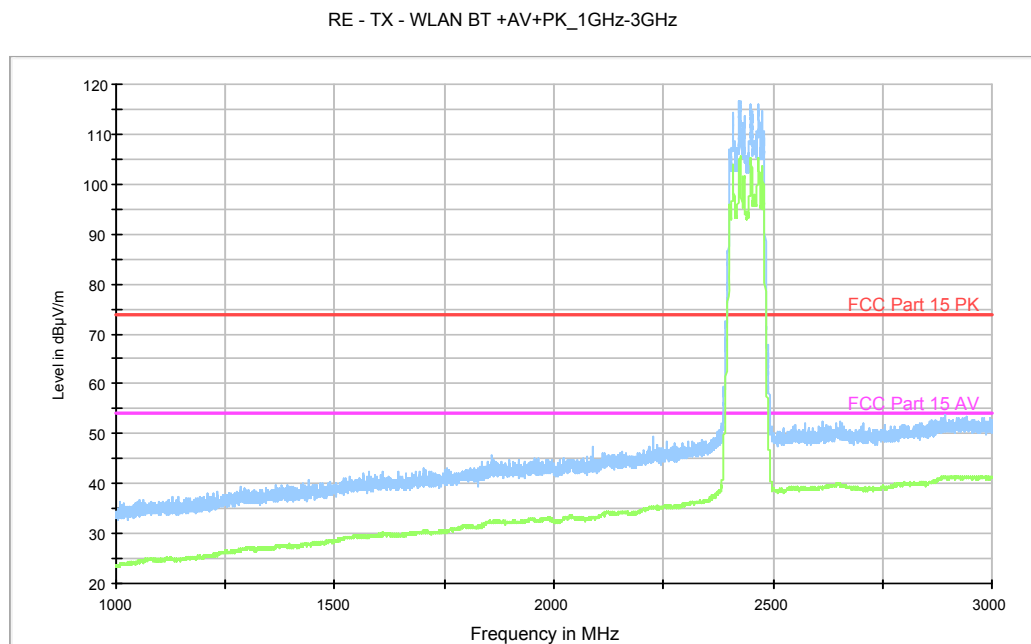


Fig.18. Transmitter Spurious Emission - Radiated: GFSK, 2402MHz, 1 GHz - 3GHz

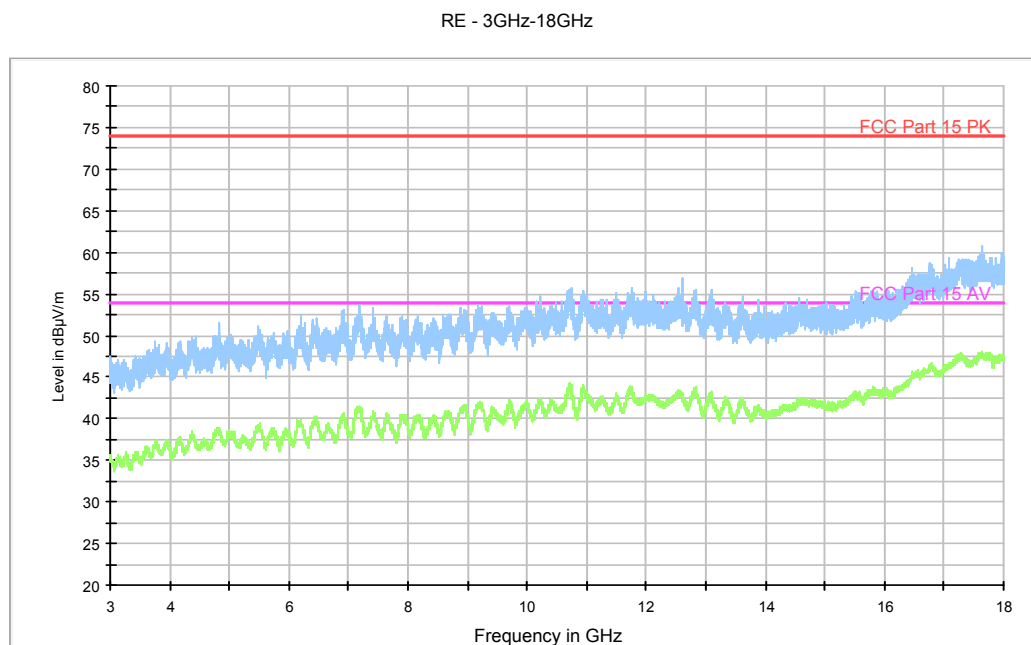


Fig.19. Transmitter Spurious Emission - Radiated: GFSK, 2402MHz, 3 GHz - 18 GHz

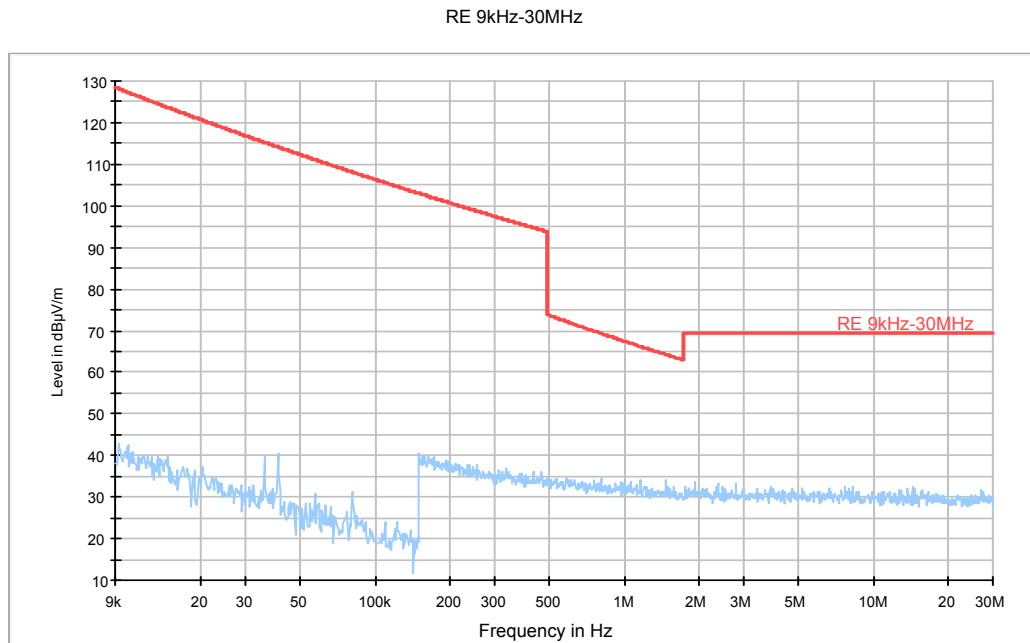


Fig.20. Transmitter Spurious Emission - Radiated: GFSK, 2440MHz, 9 kHz - 30 MHz

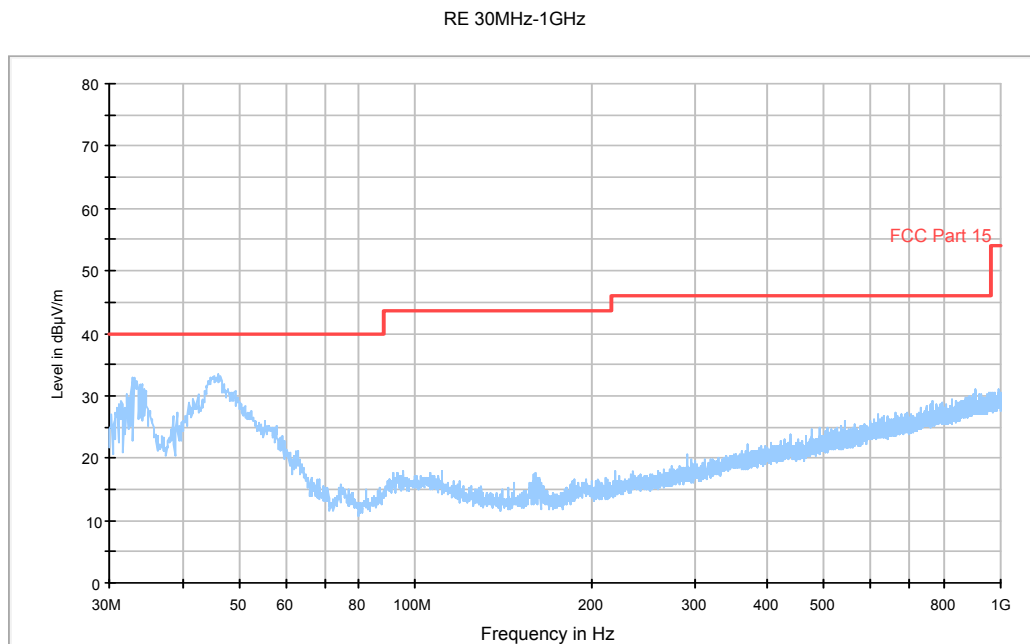


Fig.21. Transmitter Spurious Emission - Radiated: GFSK, 2440MHz, 30 MHz - 1 GHz



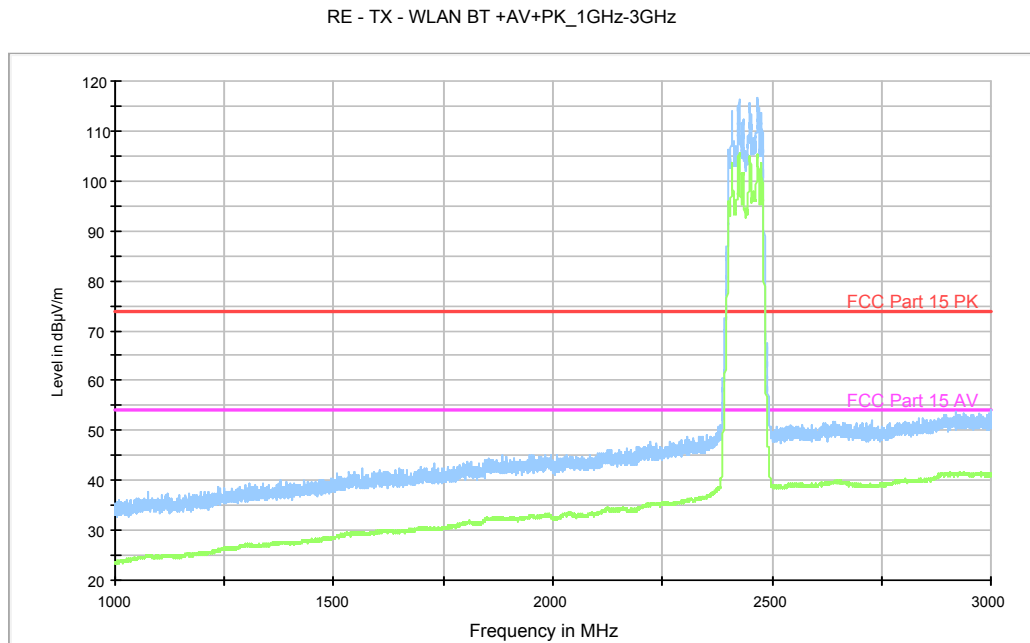


Fig.22. Transmitter Spurious Emission - Radiated: GFSK, 2440MHz, 1 GHz - 3 GHz

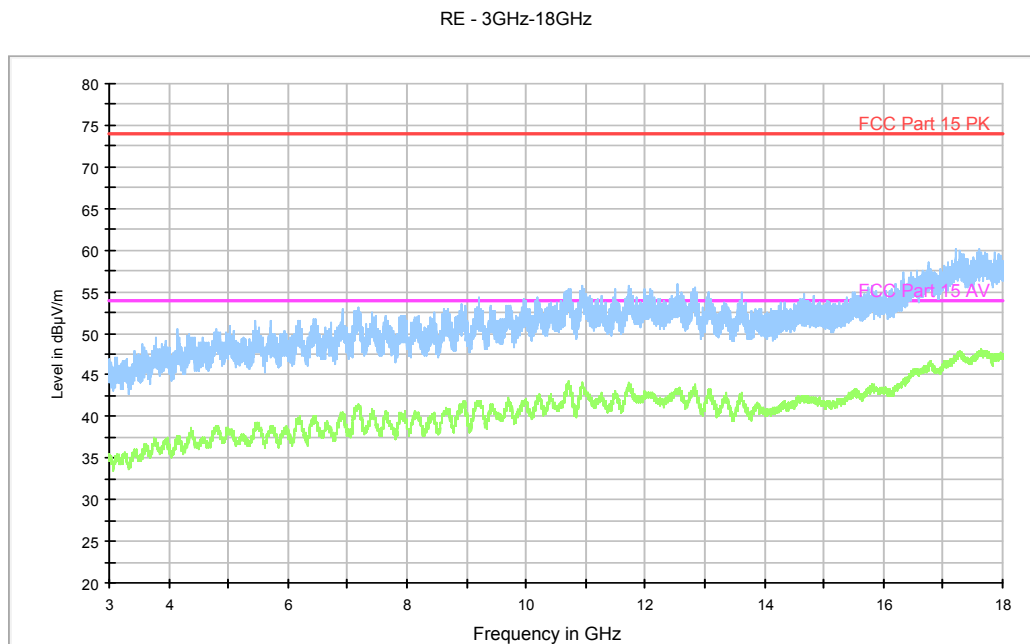


Fig.23. Transmitter Spurious Emission - Radiated: GFSK, 2440MHz, 3 GHz - 18 GHz

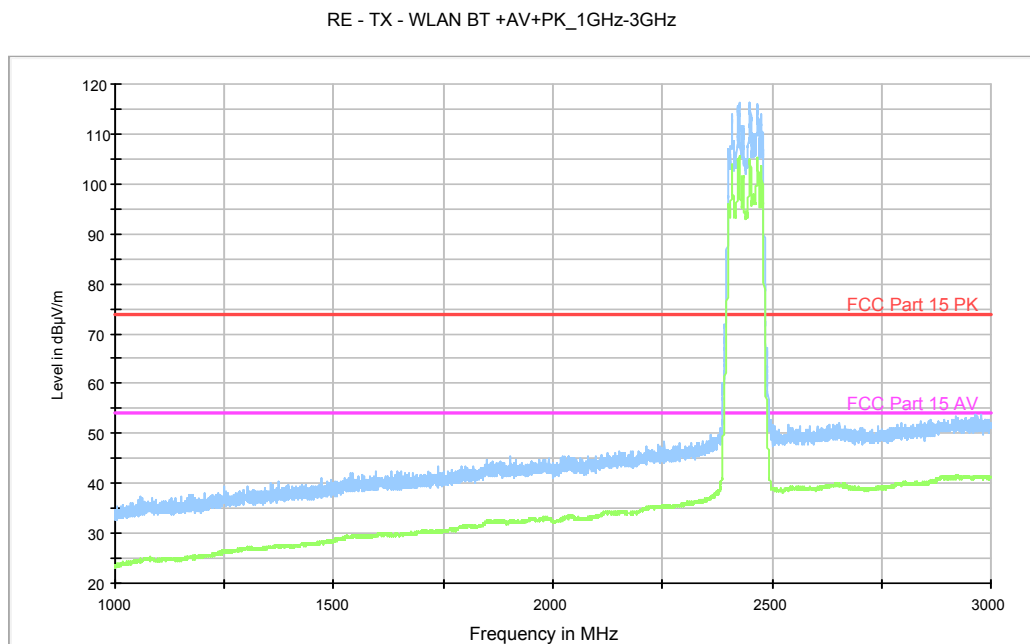


Fig.24. Transmitter Spurious Emission - Radiated: GFSK, 2480MHz, 1 GHz - 3 GHz

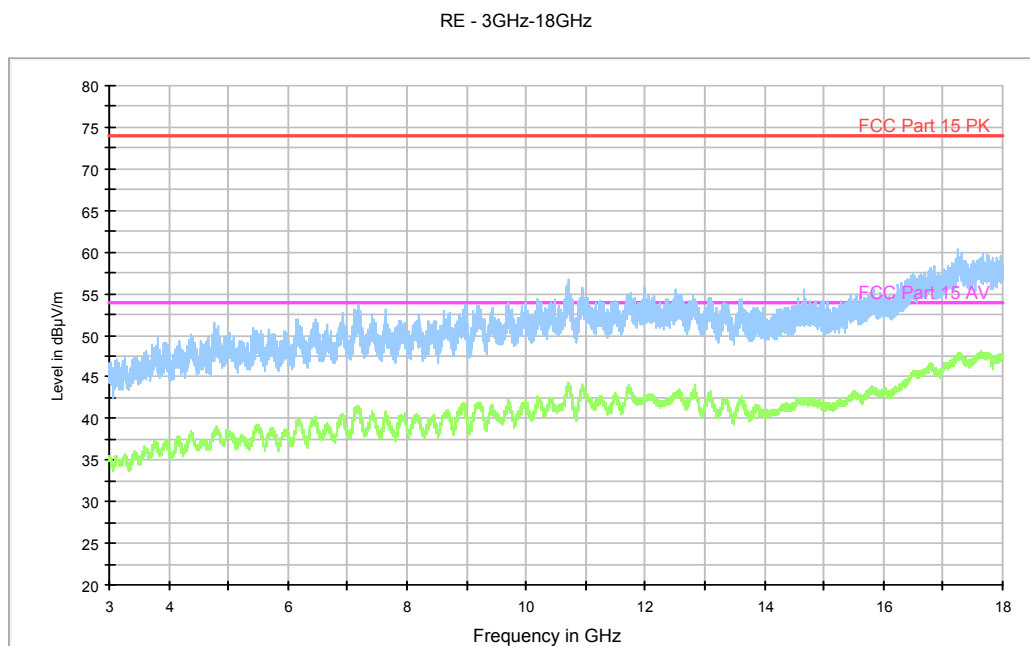


Fig.25. Transmitter Spurious Emission - Radiated: GFSK, 2480MHz, 3 GHz - 18 GHz

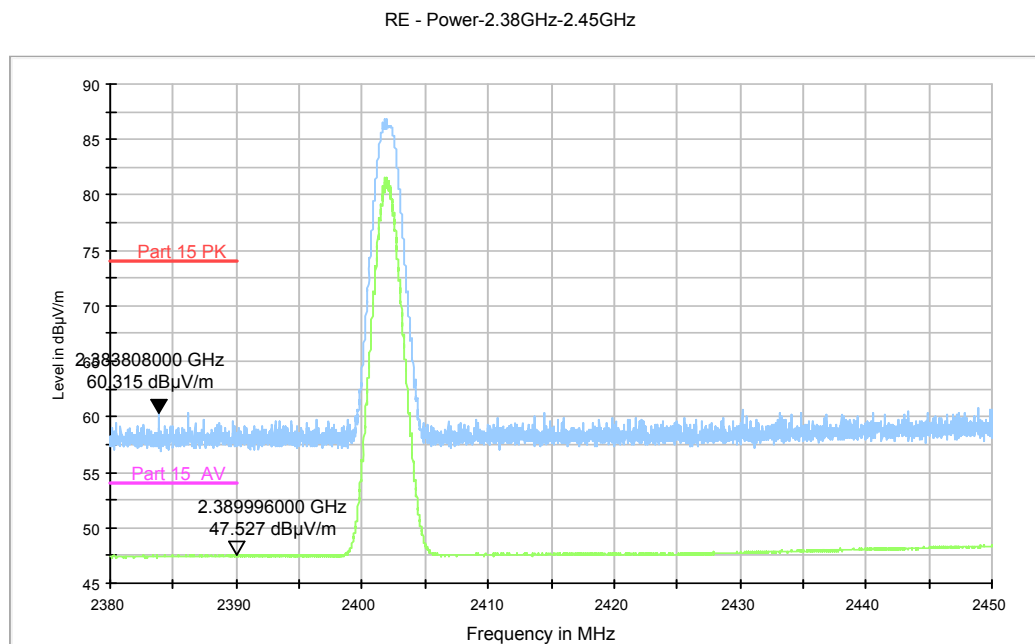


Fig.26. Transmitter Spurious Emission - Radiated (Power): GFSK low channel

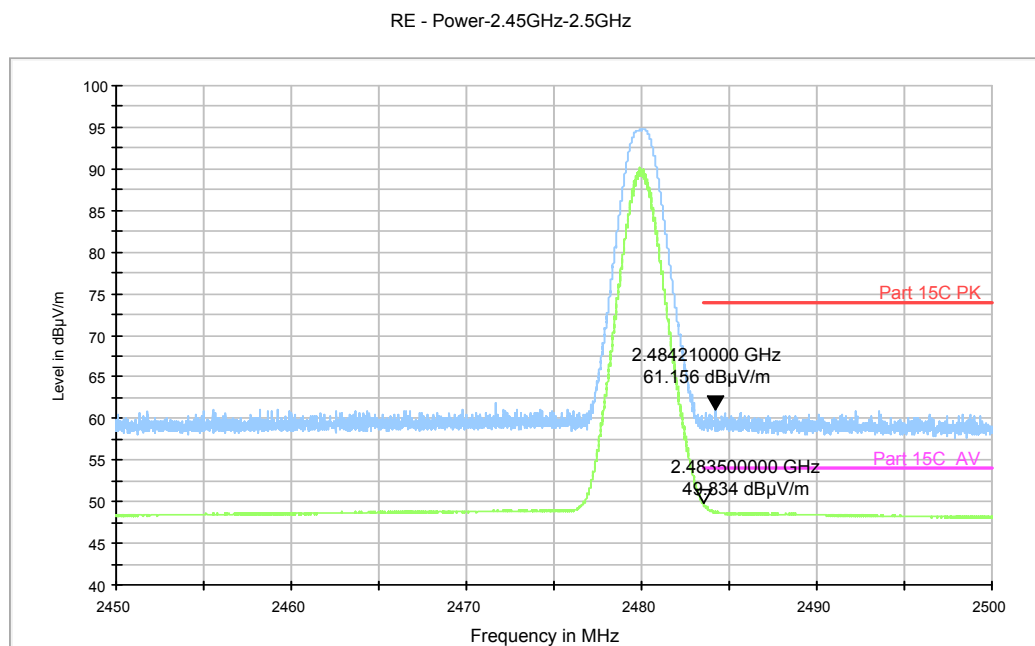


Fig.27. Transmitter Spurious Emission - Radiated (Power): GFSK high channel

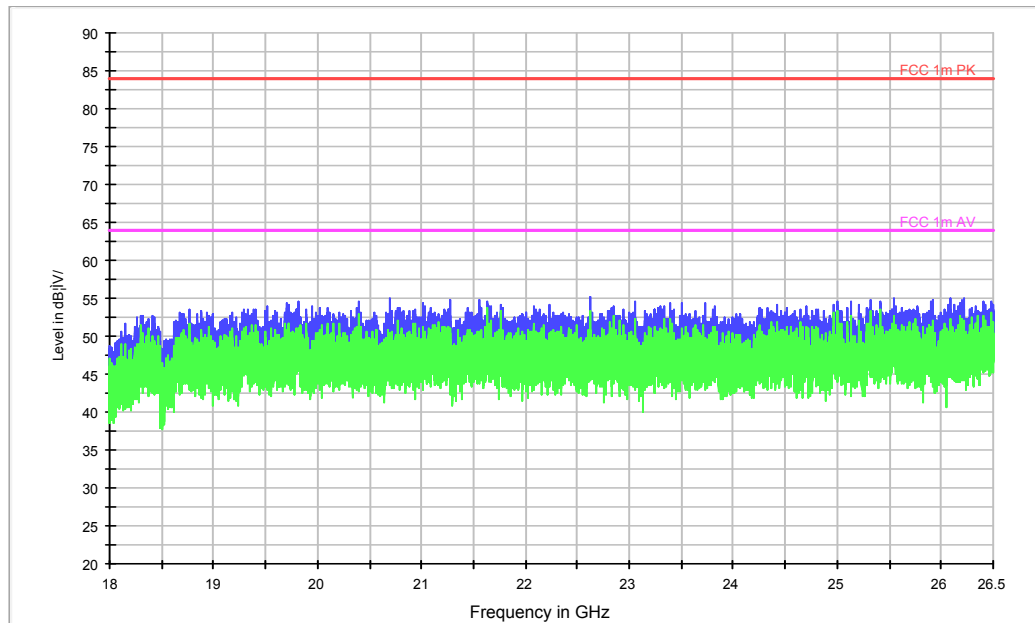


Fig.28. Transmitter Spurious Emission - Radiated: GFSK, 18 GHz - 26 GHz

## 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)	$\geq 500\text{KHz}$

### Measurement Results:

#### For GFSK

Channel No.	Frequency (MHz)	6dB Bandwidth (kHz)		Conclusion
0	2402	Fig.29	685.33	P
19	2440	Fig.30	679.33	P
39	2480	Fig.31	680.67	P

**Conclusion: PASS**

**Test graphs as below:**

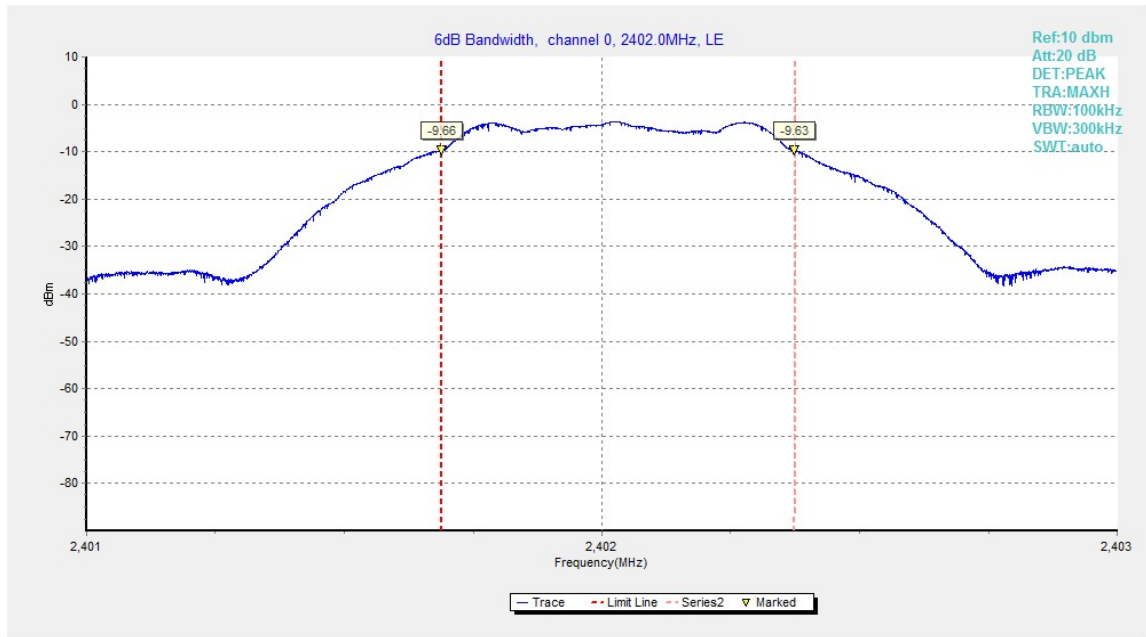


Fig.29. 6dB Bandwidth: GFSK, 2402 MHz

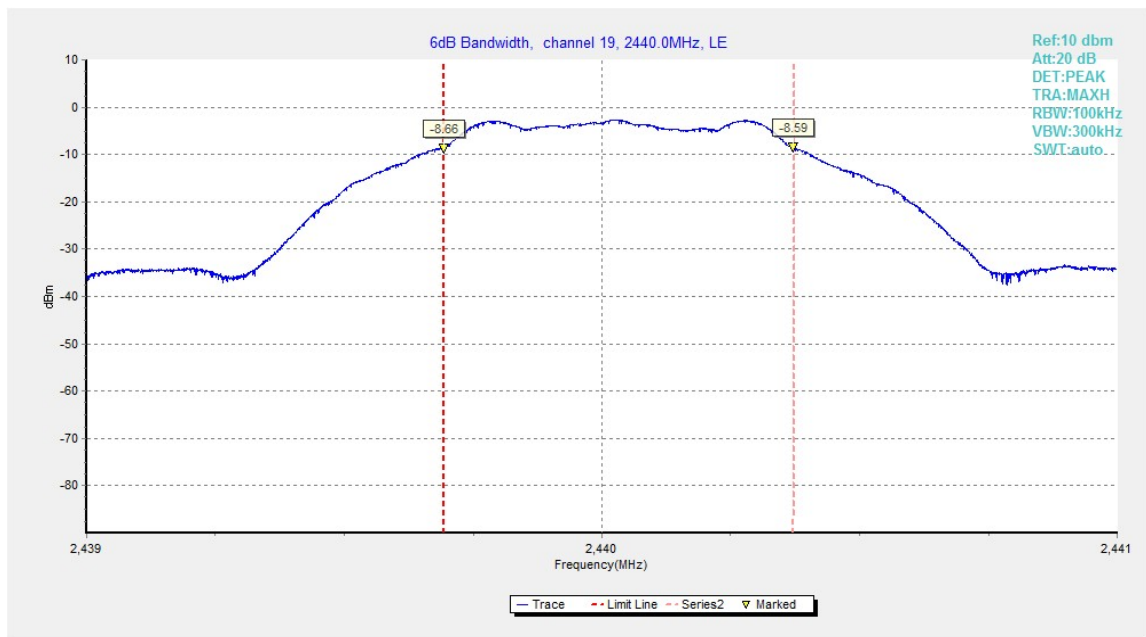


Fig.30. 6dB Bandwidth: GFSK, 2440 MHz

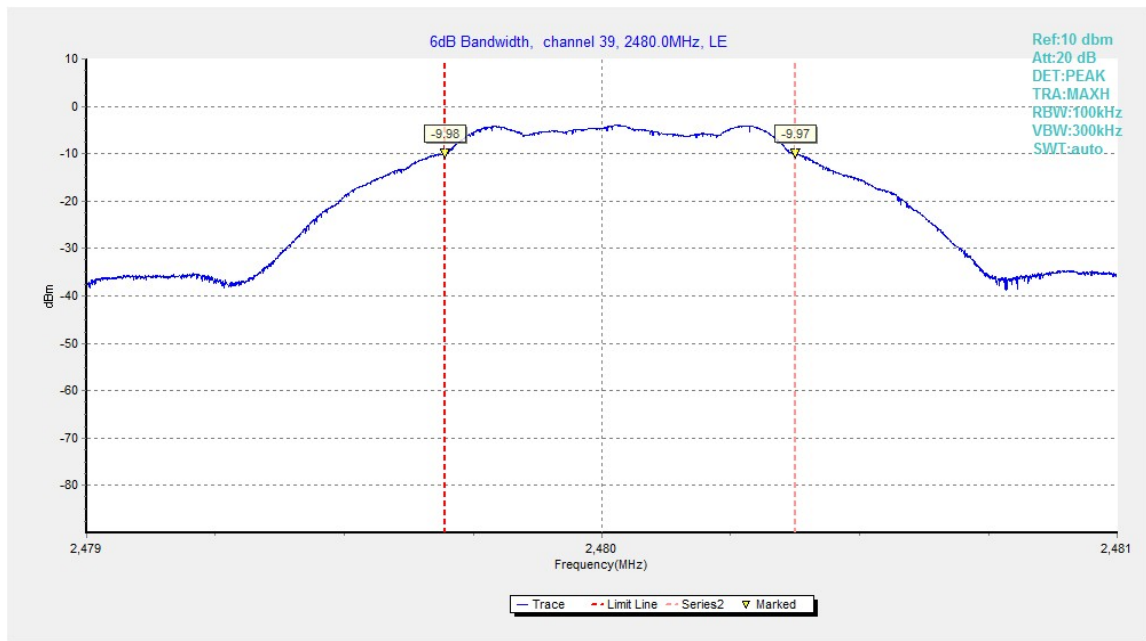


Fig.31. 6dB Bandwidth: GFSK, 2480 MHz

## 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)	$\leq 8.0 \text{ dBm/3kHz}$

### Measurement Results:

#### For GFSK

Channel No.	Frequency (MHz)	Maximum Power Spectral Density Level(dBm/3kHz)		Conclusion
0	2402	Fig.32	-33.40	P
19	2440	Fig.33	-32.45	P
39	2480	Fig.34	-33.82	P

Test graphs as below:



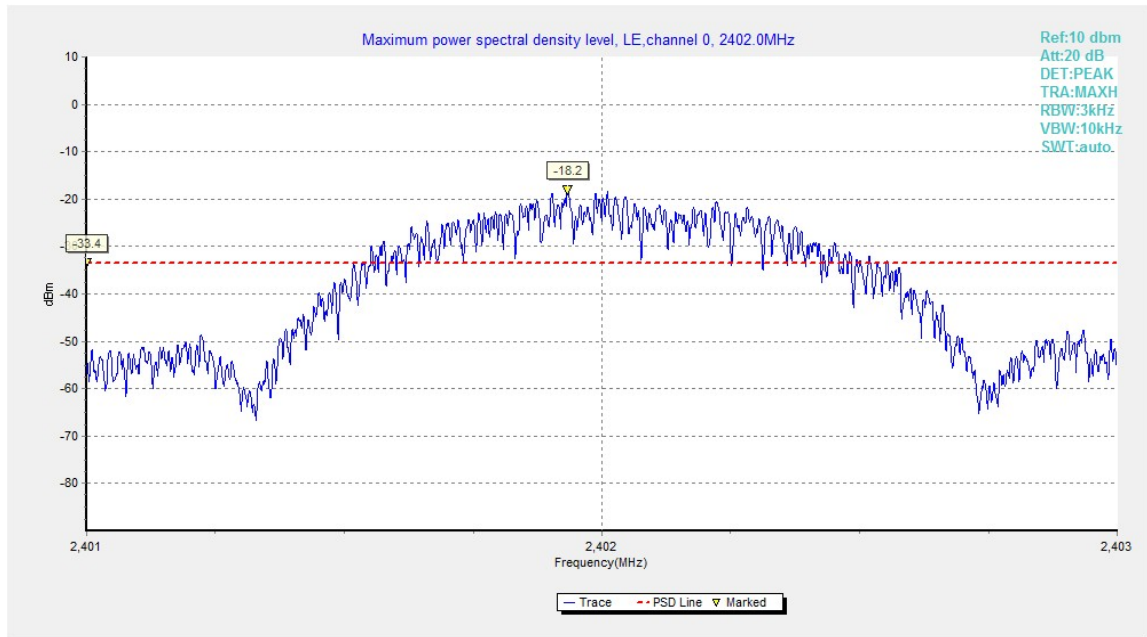


Fig.32. Maximum Power Spectral Density Level Function: GFSK, 2402 MHz

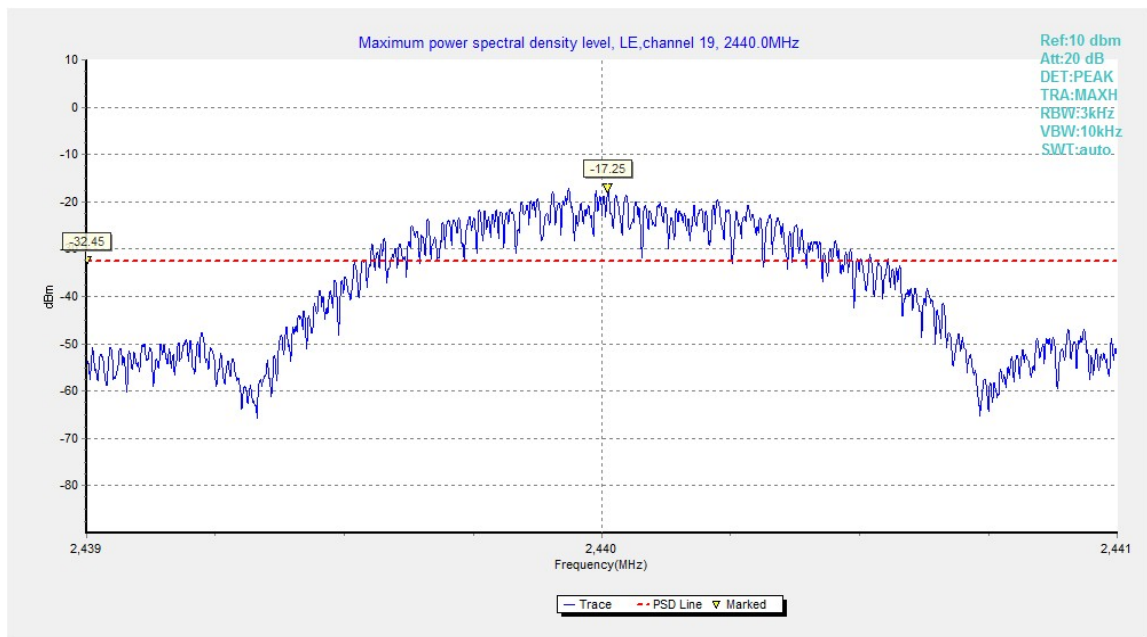


Fig.33. Maximum Power Spectral Density Level Function: GFSK, 2440 MHz

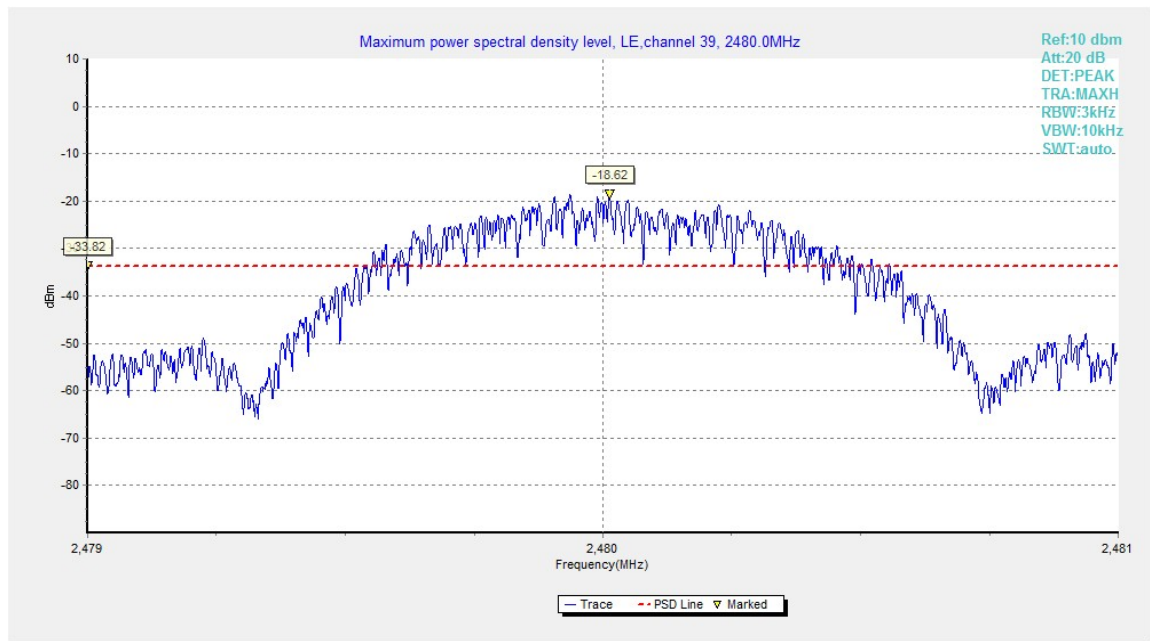


Fig.34. Maximum Power Spectral Density Level Function: GFSK, 2480 MHz

## 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.<sup>36</sup> 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 (dB $\mu$ V)	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)**

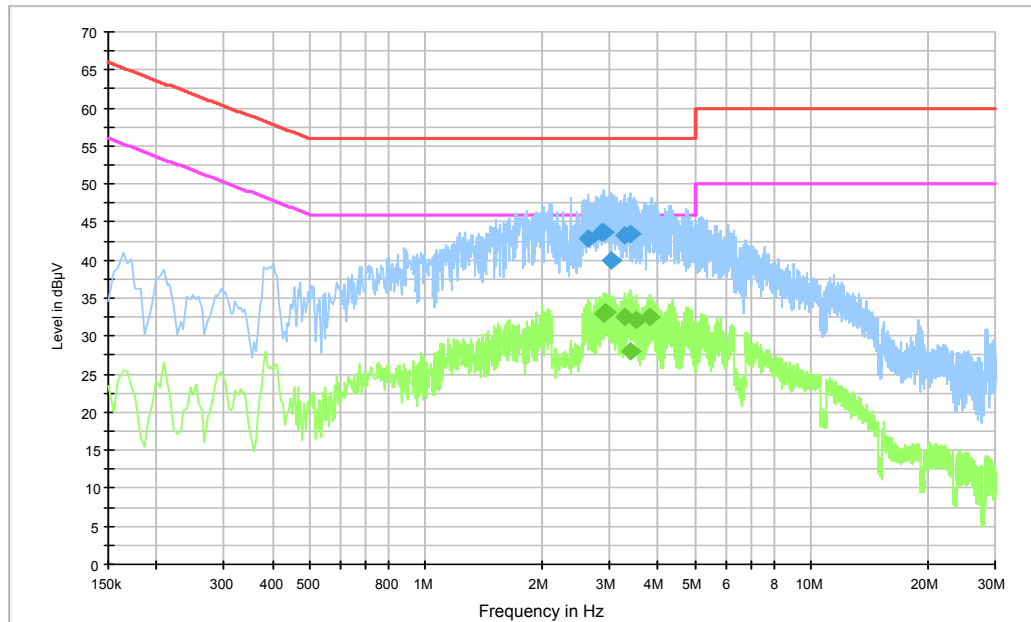
Frequency range (MHz)	Average Limit (dB $\mu$ V)	Conclusion
0.15 to 0.5	56 to 46	P
0.5 to 5	46	
5 to 30	50	
NOTE: The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.5 MHz.		

The measurement is made according to ANSI C63.10

**Conclusion: PASS**

**Test graphs as below:**

### Traffic:



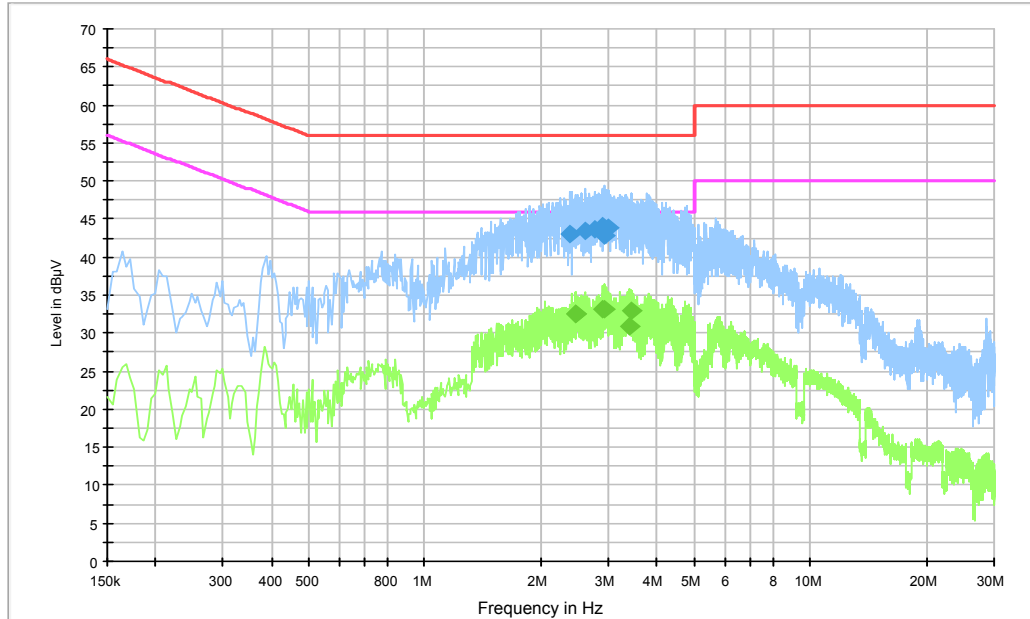
### Final Result 1

Frequency (MHz)	QuasiPeak (dBμV)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
2.629500	42.8	GND	L1	10.4	13.2	56.0
2.845500	43.7	GND	L1	10.4	12.3	56.0
2.881500	43.7	GND	L1	10.4	12.3	56.0
3.030000	40.0	GND	L1	10.4	16.0	56.0
3.264000	43.3	GND	L1	10.4	12.7	56.0
3.408000	43.5	GND	L1	10.4	12.5	56.0

### Final Result 2

Frequency (MHz)	Average (dBμV)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
2.881500	33.0	GND	L1	10.4	13.0	46.0
2.931000	33.1	GND	L1	10.4	12.9	46.0
3.282000	32.6	GND	L1	10.4	13.4	46.0
3.381000	28.0	GND	L1	10.4	18.0	46.0
3.498000	32.1	GND	L1	10.4	13.9	46.0
3.813000	32.6	GND	L1	10.4	13.4	46.0

Idle:



## Final Result 1

Frequency (MHz)	QuasiPeak (dBμV)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
2.382000	43.1	GND	L1	10.4	12.9	56.0
2.593500	43.5	GND	L1	10.4	12.5	56.0
2.769000	43.6	GND	L1	10.4	12.4	56.0
2.899500	44.0	GND	L1	10.4	12.0	56.0
2.926500	42.8	GND	L1	10.4	13.2	56.0
3.007500	43.8	GND	L1	10.4	12.2	56.0

## Final Result 2

Frequency (MHz)	Average (dBμV)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
2.449500	32.5	GND	L1	10.4	13.5	46.0
2.458500	32.4	GND	L1	10.4	13.6	46.0
2.899500	33.1	GND	L1	10.4	12.9	46.0
2.935500	33.2	GND	L1	10.4	12.8	46.0
3.376500	30.9	GND	L1	10.4	15.1	46.0
3.426000	33.0	GND	L1	10.4	13.0	46.0

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