



# FCC PART 15C TEST REPORT

## BLUETOOTH LOW ENERGY (BLE) PART

No. I23Z70158-IOT06

for

**Samsung Electronics Co., Ltd.**

**Multi-band GSM/WCDMA/LTE/5G NR Tablet with Bluetooth, WLAN**

**Model Name: SM-X216B**

**FCC ID: ZCASM216B**

with

**Hardware Version: REV1.0**

**Software Version: X216B.001**

**Issued Date: 2023-9-8**

**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, CAICT**

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## **REPORT HISTORY**

<b>Report Number</b>	<b>Revision</b>	<b>Description</b>	<b>Issue Date</b>
I23Z70158-IOT06	Rev.0	1st edition	2023-8-22
I23Z70158-IOT06	Rev.1	Add test plot for duty cycle in B.10 and power measurement in B.2.	2023-9-8

Note: the latest revision of the test report supersedes all previous version.

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## **1. Test Laboratory**

### **1.1. Introduction & Accreditation**

**Telecommunication Technology Labs, CAICT** is an ISO/IEC 17025:2017 accredited test laboratory under American Association for Laboratory Accreditation (A2LA) with lab code 7049.01, and is also an FCC accredited test laboratory (CN1349), and ISED accredited test laboratory (CAB identifier:CN0066). The detail accreditation scope can be found on A2LA 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 (BDA)

Address: No. 18A, Kangding Street, Beijing Economic-Technology  
Development Area, Beijing, 100176, P.R. China

CTTL(huayuan North Road)

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

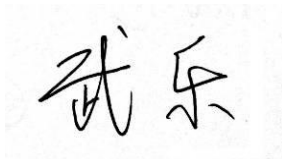
### 1.3. Testing Environment

Normal Temperature: 20-27°C  
Relative Humidity: 20-50%

### 1.4. Project data

Testing Start Date: 2023-6-12  
Testing End Date: 2023-9-7

### 1.5. Signature



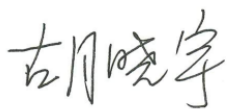
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**Wu Le**  
**(Prepared this test report)**



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**Sun Zhenyu**  
**(Reviewed this test report)**



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**Hu Xiaoyu**  
**(Approved this test report)**



## **2. Client Information**

### **2.1. Applicant Information**

Company Name: Samsung Electronics Co., Ltd.  
Address /Post: 19 Chapin Rd., Building D Pine Brook, NJ 07058  
Contact Person: Jenni Chun  
Contact Email: j1.chun@samsung.com  
Telephone: +1-201-937-4203

### **2.2. Manufacturer Information**

Company Name: Samsung Electronics Co., Ltd.  
Address /Post: Samsung R5, Maetan dong 129, Samsung ro  
Youngtong gu, Suwon city 443 742, Korea  
Contact Person: 조성훈 (Sunghoon Cho)  
Contact Email: ggobi.cho@samsung.com  
Telephone: +82-10-2722-4159  
Fax: /

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

#### 3.1. About EUT

Description	Multi-band GSM/WCDMA/LTE/5G NR Tablet with Bluetooth, WLAN
Model Name	SM-X216B
FCC ID	ZCASM216B
Frequency Band	ISM 2400MHz~2483.5MHz
Type of Modulation(LE mode)	GFSK (Bluetooth Low Energy)
Number of Channels(LE mode)	40
Power Supply	3.85V DC by Battery
Antenna gain	-1.36dBi

#### 3.2. Internal Identification of EUT

EUT ID*	SN or IMEI	HW Version	SW Version	Date of receipt
UT25a	I23Z70158UT25a	REV1.0	X216B.001	2023-7-14
UT15a	I23Z70158UT15a	REV1.0	X216B.001	2023-6-12

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

#### 3.3. Internal Identification of AE

AE ID*	Name	Model	Manufacturer
AE1	Battery	WT-S-W11	SCUD (Fujian) Electronics Co., Ltd.
AE2	Adapter	EP-T1510	DONGGUAN DONGWON ELECTRONICS CO.,LTD.
AE3-1	Date Cable1 C-C	EP-DN980BWE	Guangxi Broad Telecommunication Co.,Ltd.
AE3-2	Date Cable2 C-C	EP-DN980BWE	RFTECH Co., Ltd.
AE3-3	Date Cable3 C-C	EP-DN980BWE	CRESYN HANOI Co., Ltd
AE5	Headset	ESH61ASFWE	/

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

\*AE2 and A5 are not the AE for EUT, provided by the client for relevant tests.

#### 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 Multi-band GSM/WCDMA/LTE/5G NR Tablet with Bluetooth, WLAN 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 parameters, referring to Annex A for detailed information, is supplied by the client 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;	2021
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 EUT Mode

Two modes are provided:

Mode	Conditions
Mode A	1Mbps
Mode B	2Mbps

\*For the test results, the EUT had been tested all conditions. But only the worst case (Mode B) was shown in test report except the "Peak Output Power" test was shown all conditions.

### 5.2. 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
Peak Output Power	15.247 (b)(1)	<b>P</b>
Frequency Band Edges- Conducted	15.247 (d)	<b>P</b>
Frequency Band Edges- Radiated	15.247, 15.205, 15.209	<b>P</b>
Transmitter Spurious Emission - Conducted	15.247 (d)	<b>P</b>
Transmitter Spurious Emission - Radiated	15.247, 15.205, 15.209	<b>P</b>
6dB Bandwidth	15.247 (a)(2)	<b>P</b>
Maximum Power Spectral Density Level	15.247(e)	<b>P</b>
AC Powerline Conducted Emission	15.107, 15.207	<b>P</b>
Duty cycle	/	<b>NA</b>
Antenna Requirement	15.203	<b>P</b>

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

The measurement is made according to ANSI C63.10.

### 5.3. 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	100024	R&S	1 year	2024-03-09
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	100376	R&S	1 year	2023-09-22
2	Test Receiver	FSV40	101047	R&S	1 year	2024-06-25
3	Test Receiver	ESW44	103144	R&S	1 year	2023-10-25
4	Loop Antenna	HFH2-Z2	829324/007	R&S	1 year	2023-12-22
5	EMI Antenna	VULB9163	01177	Schwarzbeck	1 year	2023-09-03
6	EMI Antenna	3117	00119021	ETS-Lindgren	1 year	2024-06-24
7	EMI Antenna	LB-180400 -25-C-KF	21100840000 06	A-INFO	1 year	2024-03-02

Note:

The EMI Antenna which series number is 01177 was before the CAL. DUE DATE when used.

### AC Power Line Conducted Emission

No.	Equipment	Model	Serial Number	Manufacturer	Calibration Period	Calibration Due date
1	LISN	ENV216	101459	R&S	1 year	2024-02-29
2	Test Receiver	ESCI	100766	R&S	1 year	2024-03-30

## 7. Measurement Uncertainty

### 7.1. Peak Output Power - Conducted

Measurement Uncertainty:

Measurement Uncertainty (k=2)	0.66dB
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### 7.2. Frequency Band Edges - Conducted

Measurement Uncertainty:

Measurement Uncertainty (k=2)	0.66dB
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### 7.3. Frequency Band Edges - Radiated

Measurement Uncertainty:

Measurement Uncertainty (k=2)	/
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### 7.4. 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

### 7.5. Transmitter Spurious Emission - Radiated

Measurement Uncertainty:

Frequency Range	Uncertainty(dBm) (k=2)
9kHz-30MHz	4.92
30MHz ≤ f ≤ 1GHz	5.73
1GHz ≤ f ≤ 18GHz	5.58
18GHz ≤ f ≤ 40GHz	3.37

### 7.6. 6dB Bandwidth

Measurement Uncertainty:

Measurement Uncertainty (k=2)	61.936Hz
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### 7.7. Maximum Power Spectral Density Level

**Measurement Uncertainty:**

Measurement Uncertainty (k=2)	0.66dB
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### 7.8. AC Powerline Conducted Emission

**Measurement Uncertainty:**

Measurement Uncertainty (k=2)	3.10dB
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## **ANNEX A: EUT parameters**

Disclaimer: The antenna gain provided by the client may affect the validity of the measurement results in this report, and the client shall bear the impact and consequences arising therefrom.

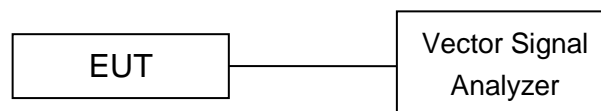
## **ANNEX B: Detailed Test Results**

### **B.1. Measurement Method**

#### **B.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



#### **B.1.2. Radiated Emission Measurements**

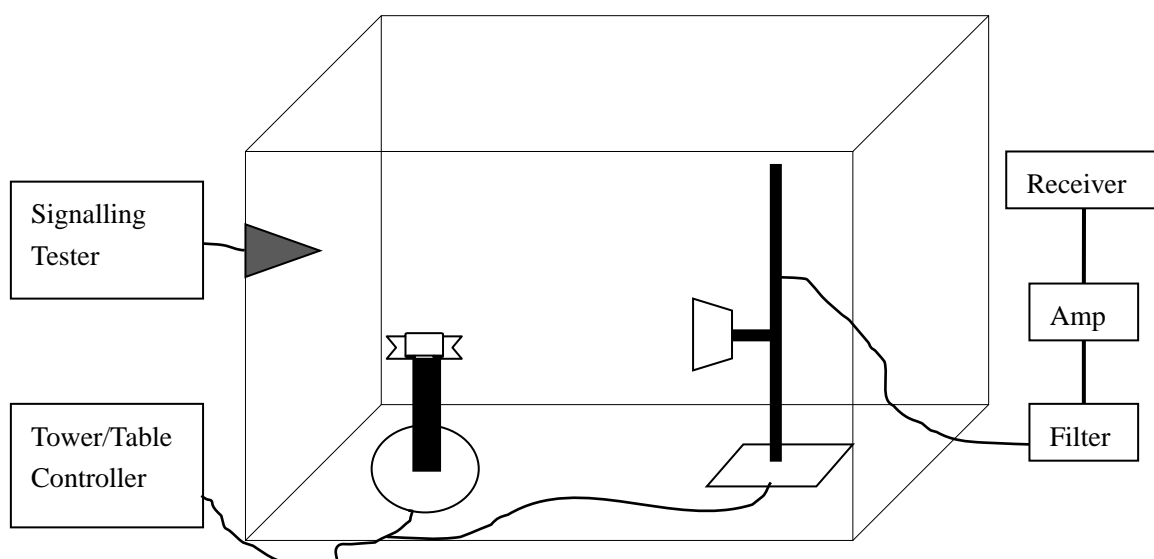
The measurement is made according to ANSI C63.10.

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. This maximization process was repeated with the EUT positioned in each of its three orthogonal orientations.

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 = 3MHz;



## B.2. Peak Output Power

### B.2.1. Peak Output Power - Conducted

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

- a) Set the RBW = 3 MHz.
- b) Set VBW = 10 MHz.
- c) Set span = 10 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)(3)	< 30

**Measurement Results:**

**For GFSK**

Sample Rate	Channel No.	Frequency (MHz)	Peak Conducted Output Power (dBm)		Conclusion
1Mbps	0	2402	Fig.1	1.67	P
	19	2440	Fig.2	1.91	P
	39	2480	Fig.3	1.68	P
2Mbps	0	2402	Fig.4	1.7	P
	19	2440	Fig.5	1.95	P
	39	2480	Fig.6	1.72	P

**Conclusion: PASS**

### B.2.2. E.I.R.P.

**The radiated E.I.R.P. is listed below:**

Antenna gain = -1.36dBi

**For GFSK**

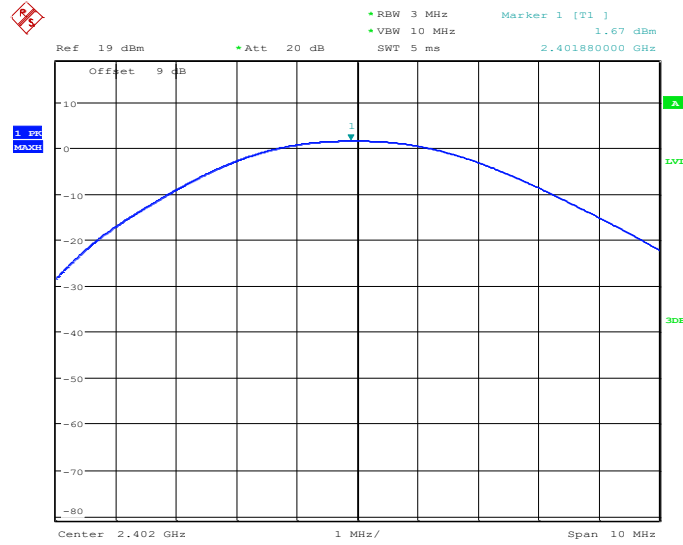
Sample Rate	Channel No.	Frequency (MHz)	E.I.R.P. (dBm)	Conclusion
1Mbps	0	2402	0.31	P
	19	2440	0.55	P
	39	2480	0.32	P
2Mbps	0	2402	0.34	P
	19	2440	0.59	P
	39	2480	0.36	P

Note: E.I.R.P. are calculated with the antenna gain.

**Conclusion: PASS**

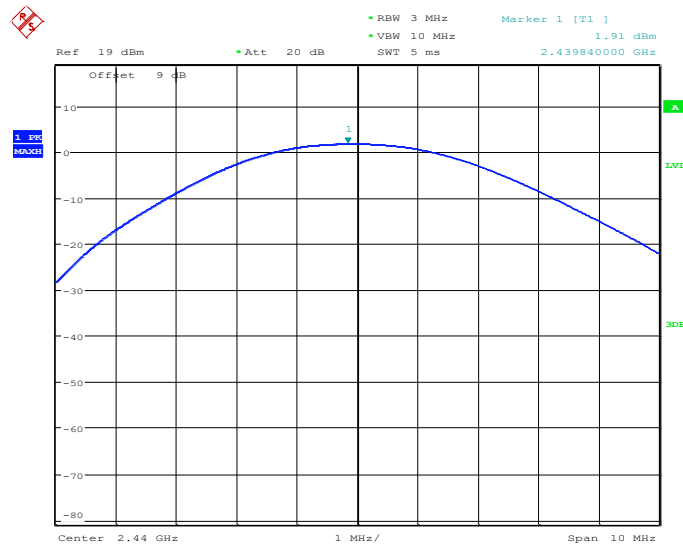


Test graphs as below



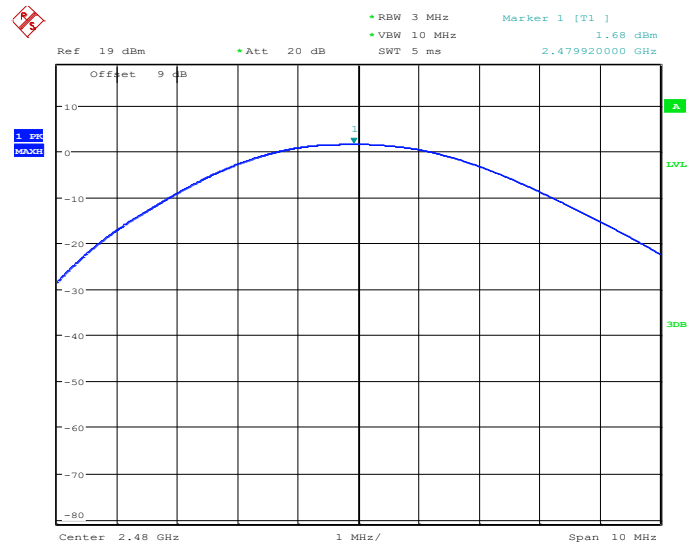
Date: 25.JAN.2000 07:00:16

**Fig.1.** Peak Conducted Output Power: BLE, 1Mbps, Channel 0,



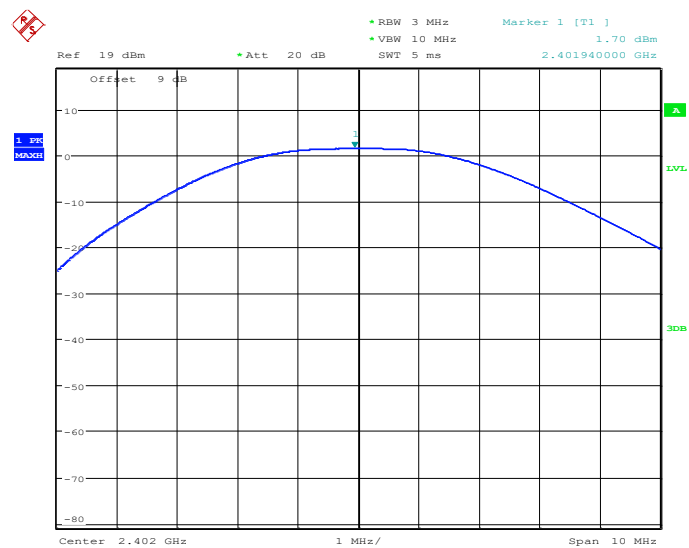
Date: 25.JAN.2000 07:01:53

**Fig.2.** Peak Conducted Output Power: BLE, 1Mbps, Channel 19,



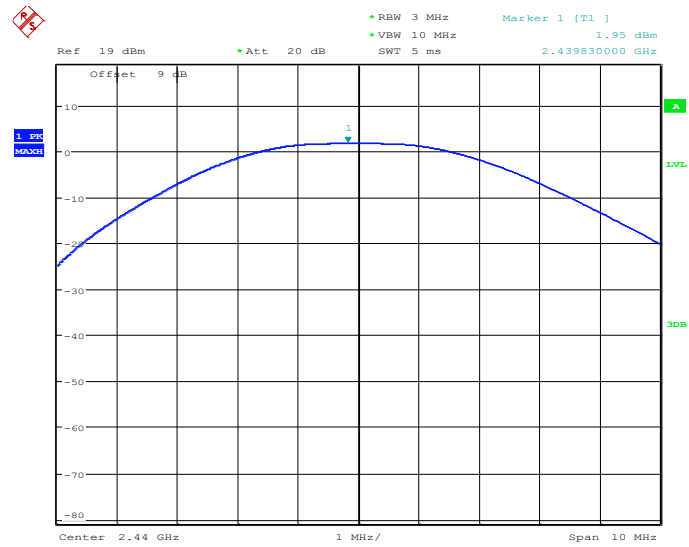
Date: 25.JAN.2000 07:03:50

**Fig.3.** Peak Conducted Output Power: BLE, 1Mbps, Channel 39,



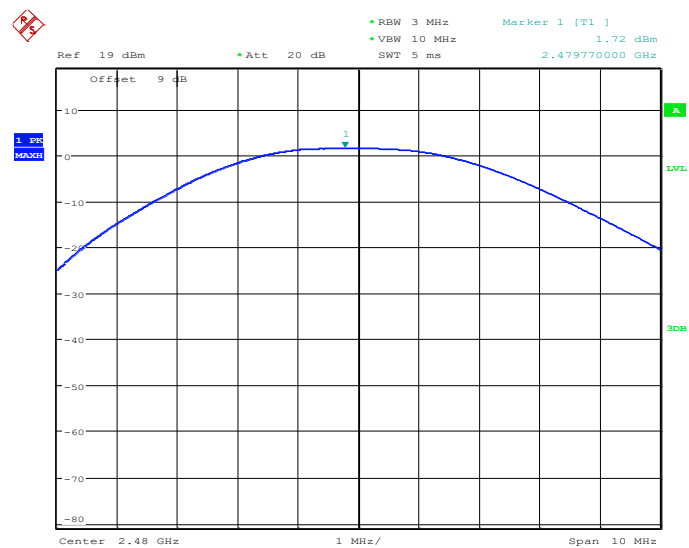
Date: 25.JAN.2000 07:01:07

**Fig.4.** Peak Conducted Output Power: BLE, 2Mbps, Channel 0,



Date: 25.JAN.2000 07:02:21

**Fig.5.** Peak Conducted Output Power: BLE, 2Mbps, Channel 19,



Date: 25.JAN.2000 07:04:23

**Fig.6.** Peak Conducted Output Power: BLE, 2Mbps, Channel 39,

### B.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.7	-42.51	P
39	2480	Hopping OFF	Fig.8	-52.93	P

**Conclusion: PASS**

Test graphs as below

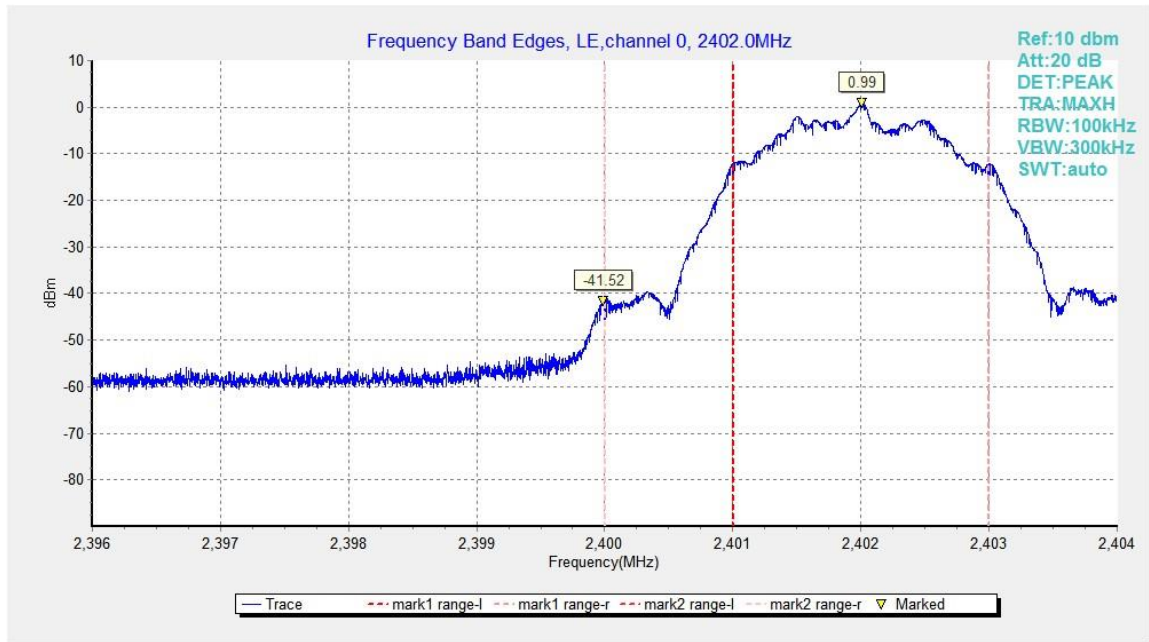


Fig.7. Frequency Band Edges: GFSK, 2402 MHz, Hopping Off

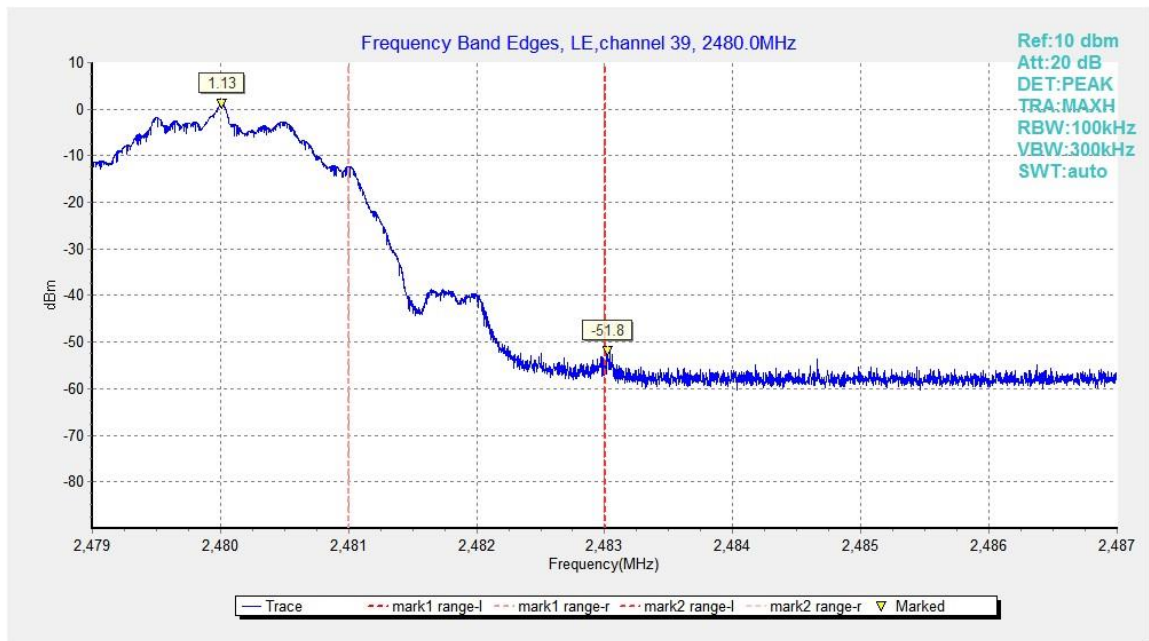


Fig.8. Frequency Band Edges: GFSK, 2480 MHz, Hopping Off

## B.4. Frequency Band Edges –Radiated

**Method of Measurement:** See ANSI C63.10 clause 6.4 &6.5 & 6.6

**Measurement Limit:**

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

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

**Limit in restricted band:**

Frequency of emission (MHz)	Field strength (uV/m)	Field strength (dBuV/m)	Measurement distance (m)
Above 960	500	54	3

**Set up:**

Tabletop devices shall be placed on a nonconducting platform with nominal top surface dimensions 1 m by 1.5 m and the table height shall be 1.5 m.

The EUT and transmitting antenna shall be centered on the turntable.

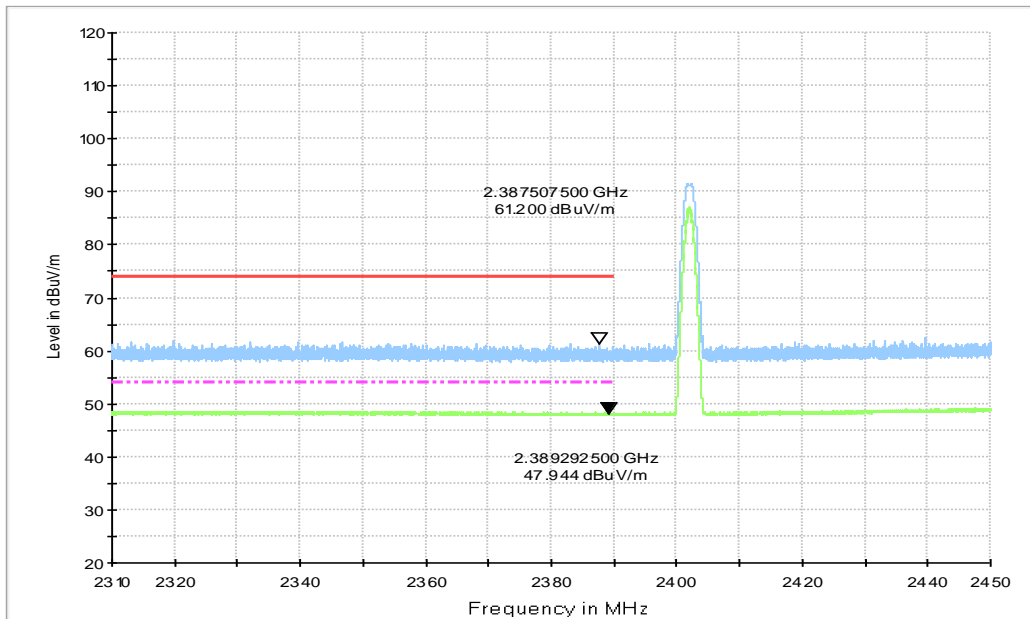
**Measurement Results:**

**EUT ID: UT25a**

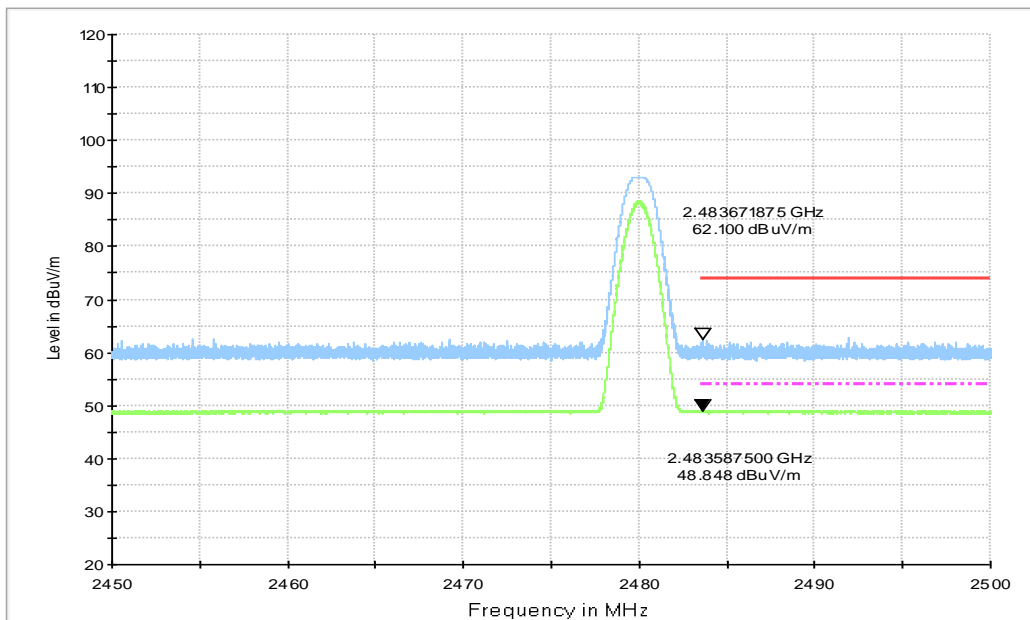
Mode	Channel	Frequency Range	Test Results	Conclusion
GFSK	0	2.31GHz ~2.45GHz	Fig.9	P
	39	2.45GHz ~2.5GHz	Fig.10	P

**Conclusion: PASS**

Test graphs as below



**Fig.9. Frequency Band Edges: GFSK, 2402 MHz, 2.31 GHz – 2.45GHz**



**Fig.10. Frequency Band Edges: GFSK, 2480 MHz, 2.45 GHz - 2.50GHz**

## B.5. 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

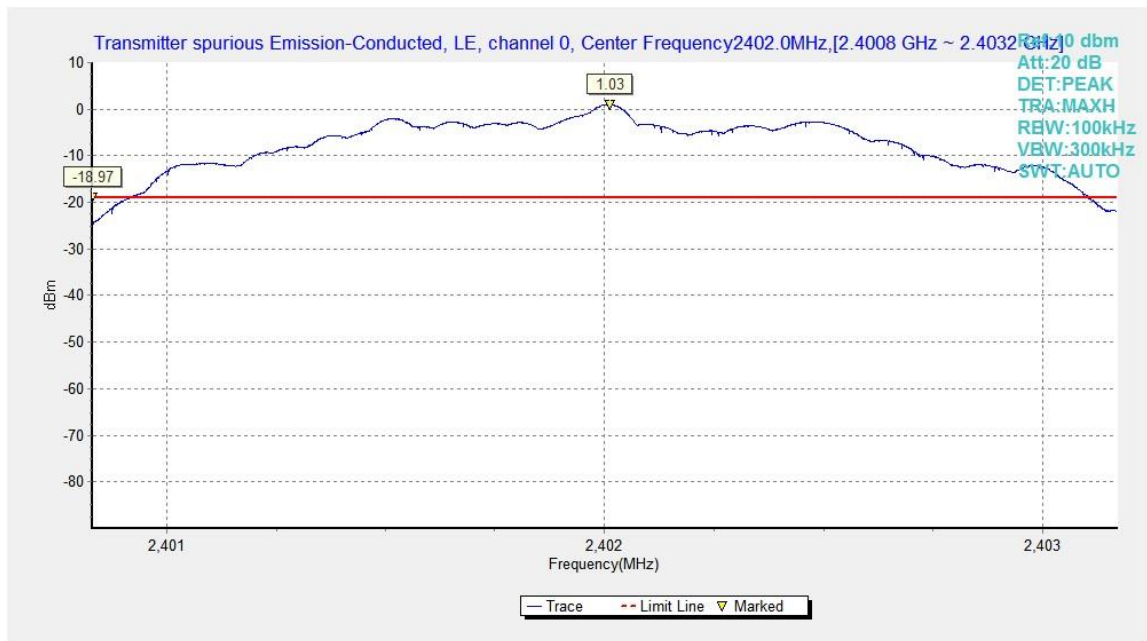


**Measurement Results:**  
**For GFSK**

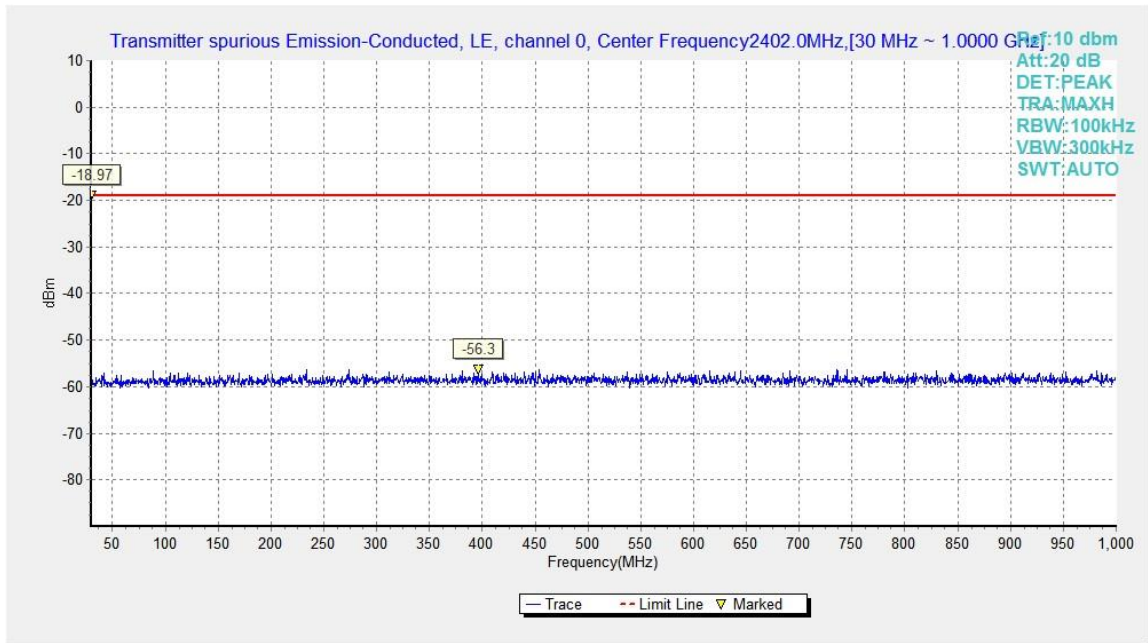
Channel No.	Frequency (MHz)	Frequency Range	Test Results	Conclusion
0	2402	Center Frequency	Fig.11	P
		30 MHz ~ 1 GHz	Fig.12	P
		1 GHz ~ 3 GHz	Fig.13	P
		3 GHz ~ 10 GHz	Fig.14	P
		10GHz ~ 26 GHz	Fig.15	P
19	2440	Center Frequency	Fig.16	P
		30 MHz ~ 1 GHz	Fig.17	P
		1 GHz ~ 3 GHz	Fig.18	P
		3 GHz ~ 10 GHz	Fig.19	P
		10GHz ~ 26 GHz	Fig.20	P
39	2480	Center Frequency	Fig.21	P
		30 MHz ~ 1 GHz	Fig.22	P
		1 GHz ~ 3GHz	Fig.23	P
		3 GHz ~ 10 GHz	Fig.24	P
		10 GHz ~ 26 GHz	Fig.25	P

**Conclusion: PASS**

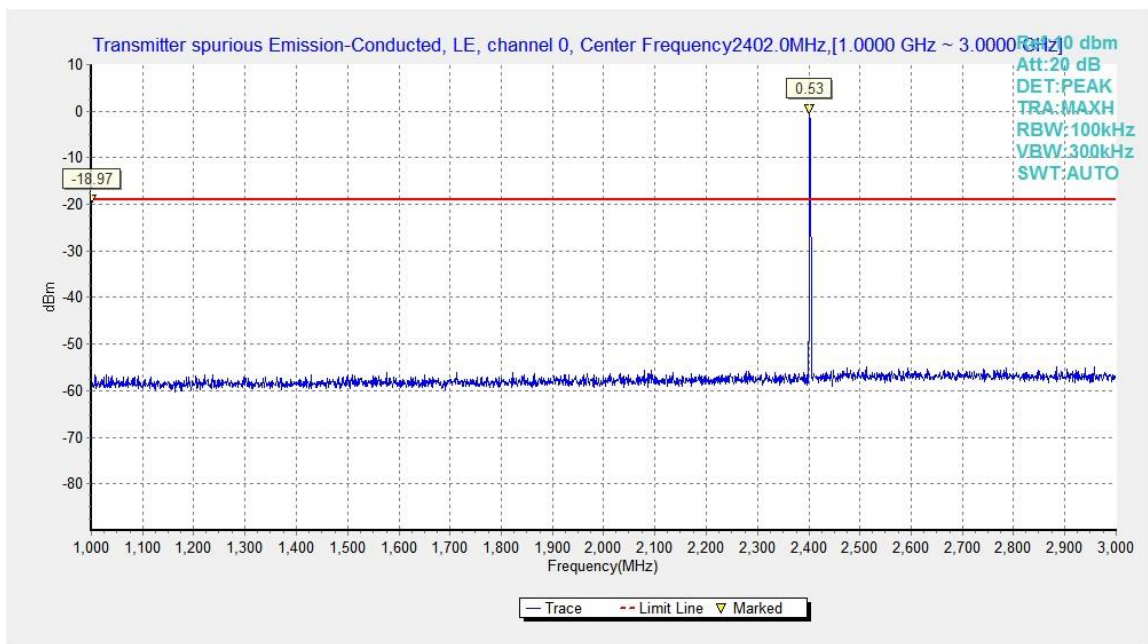
**Test graphs as below**



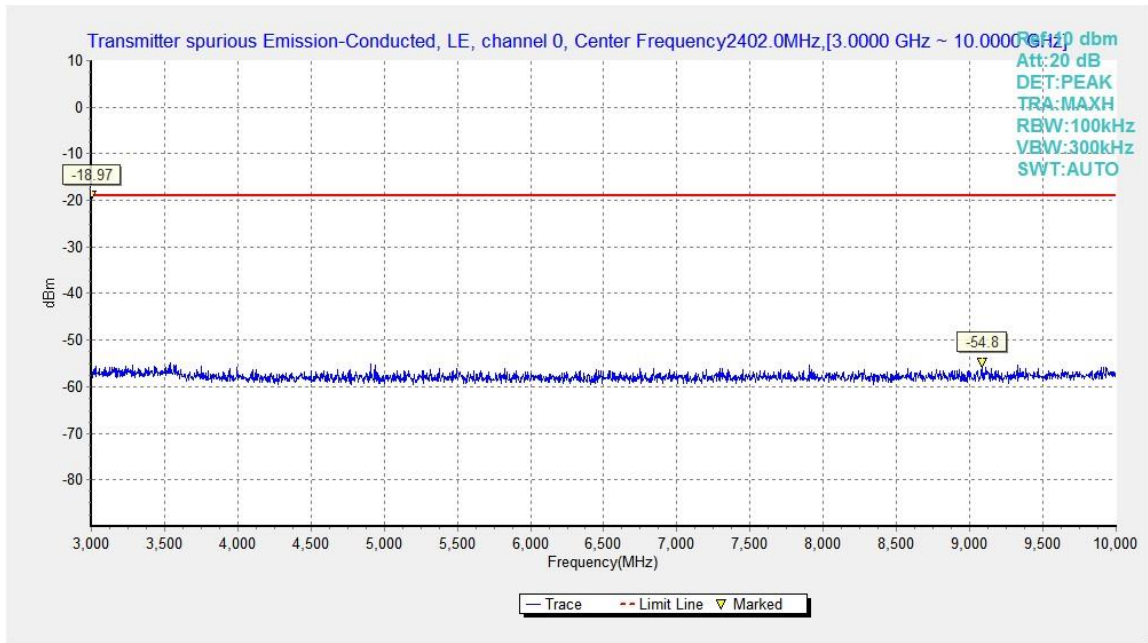
**Fig.11.** Transmitter Spurious Emission - Conducted: GFSK,2402MHz



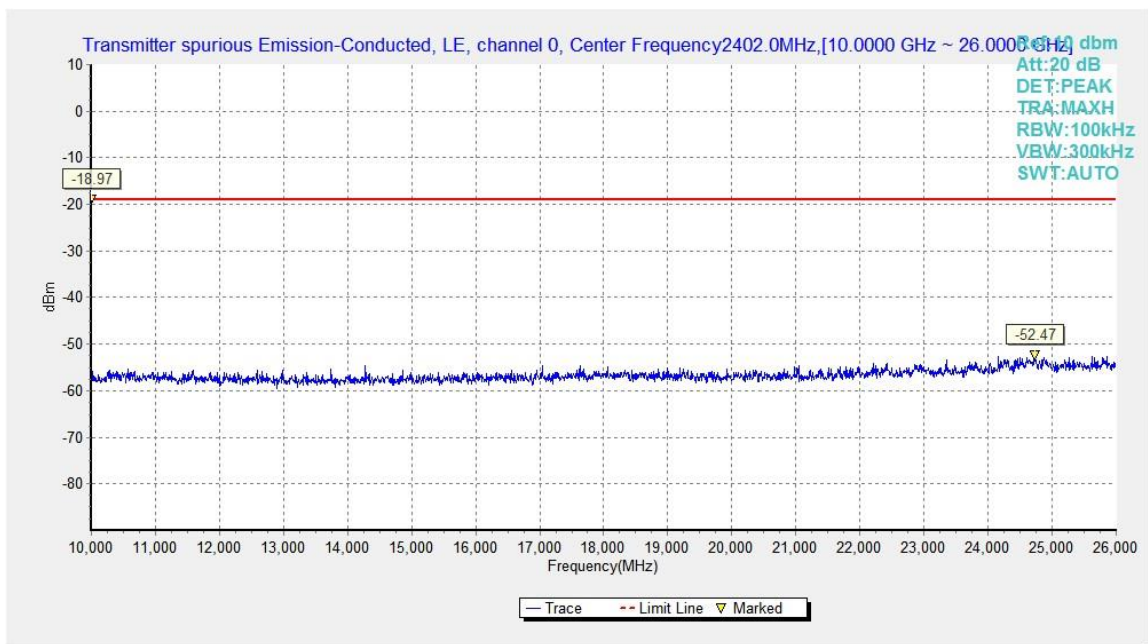
**Fig.12.** Transmitter Spurious Emission - Conducted: GFSK, 2402 MHz, 30MHz - 1GHz



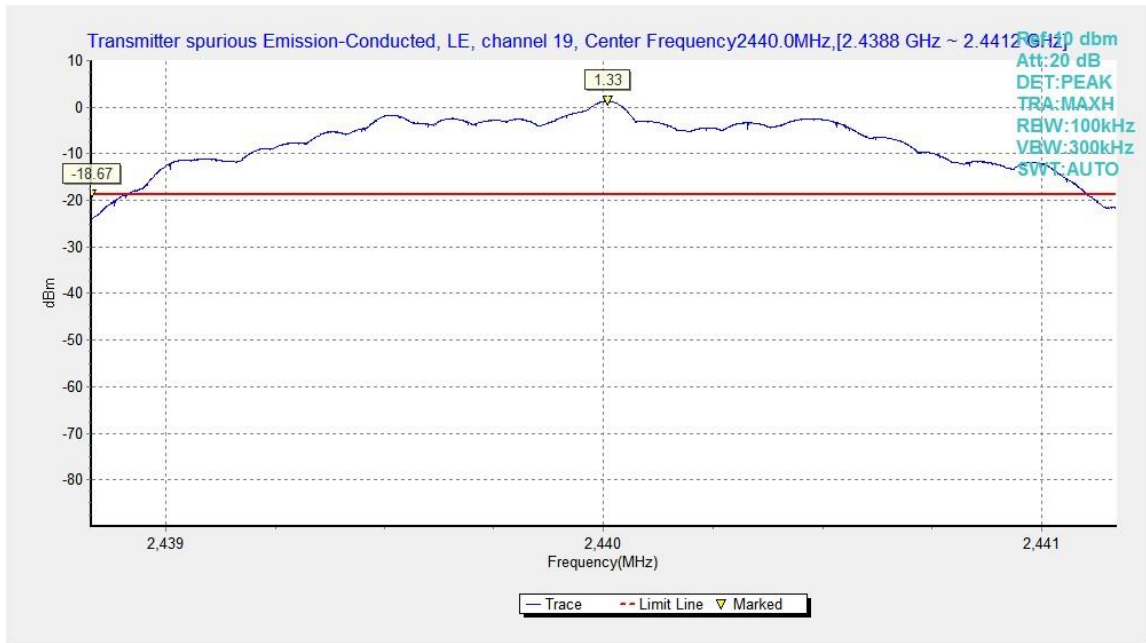
**Fig.13.** Transmitter Spurious Emission - Conducted: GFSK, 2402 MHz, 1GHz - 3GHz



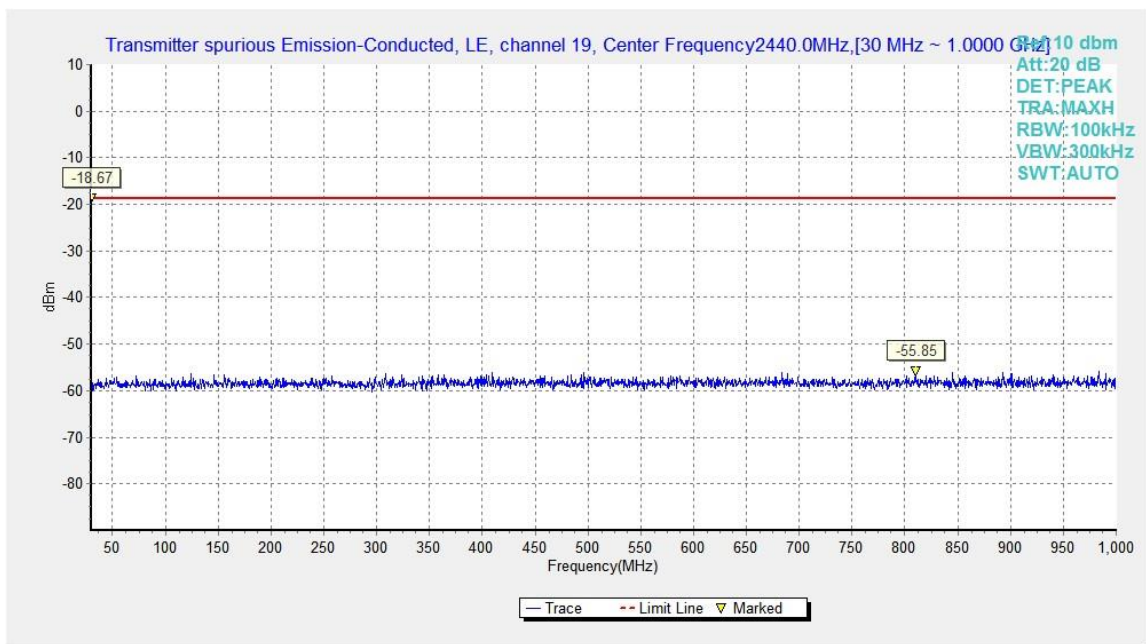
**Fig.14.** Transmitter Spurious Emission - Conducted: GFSK, 2402 MHz,3GHz - 10GHz



**Fig.15.** Transmitter Spurious Emission - Conducted: GFSK, 2402 MHz,10GHz - 26GHz

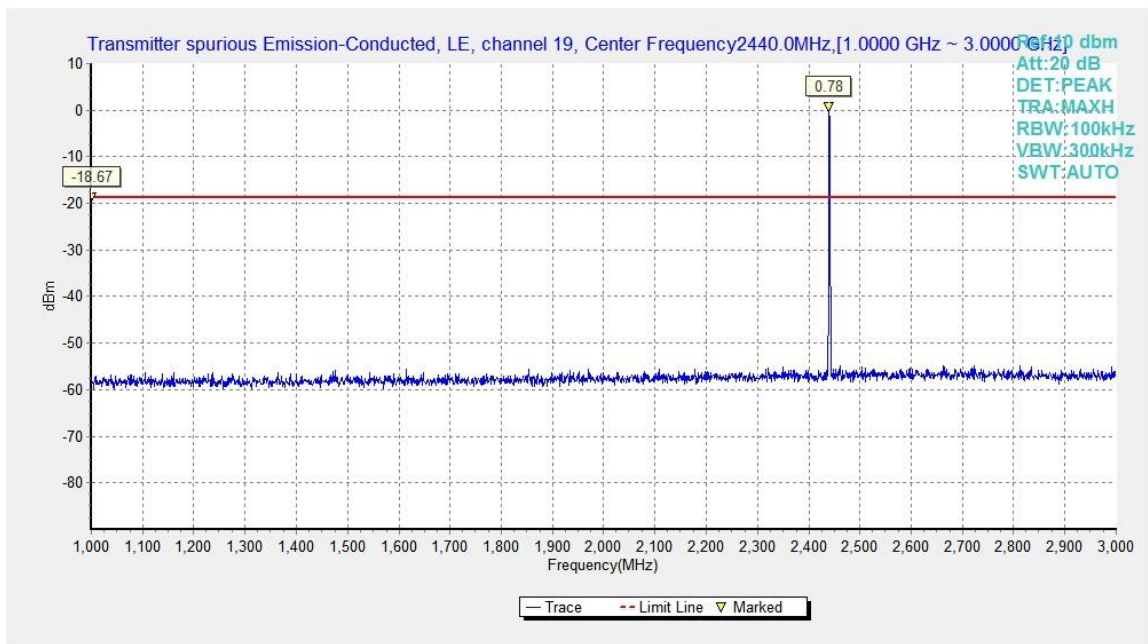


**Fig.16.** Transmitter Spurious Emission - Conducted: GFSK, 2440MHz

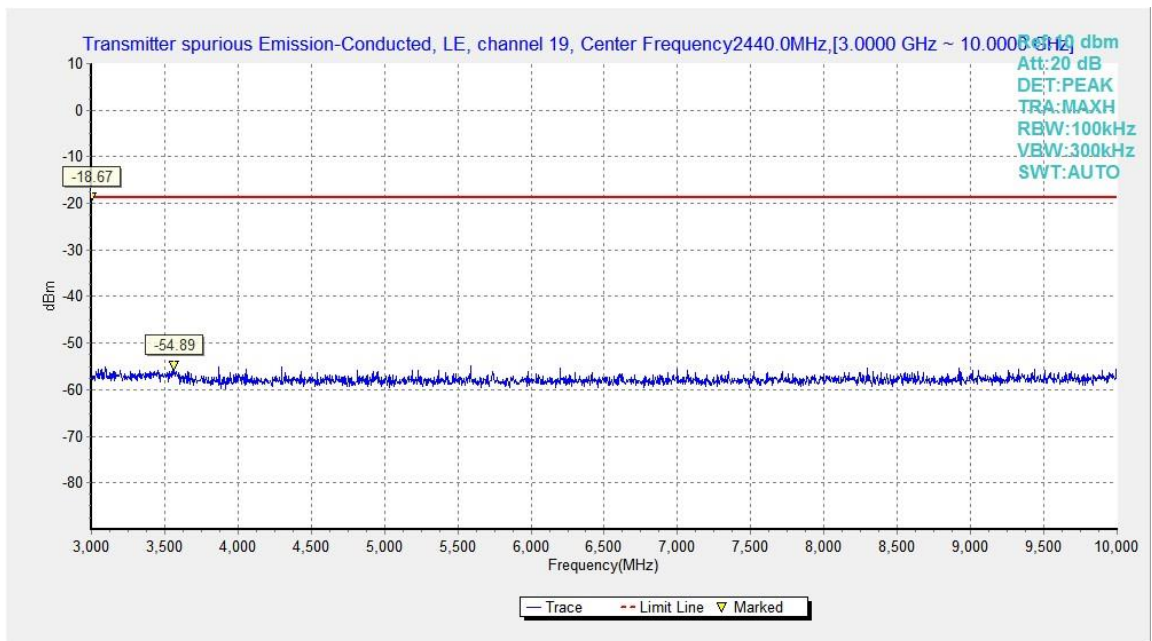


**Fig.17.** Transmitter Spurious Emission - Conducted: GFSK, 2440 MHz, 30MHz - 1GHz

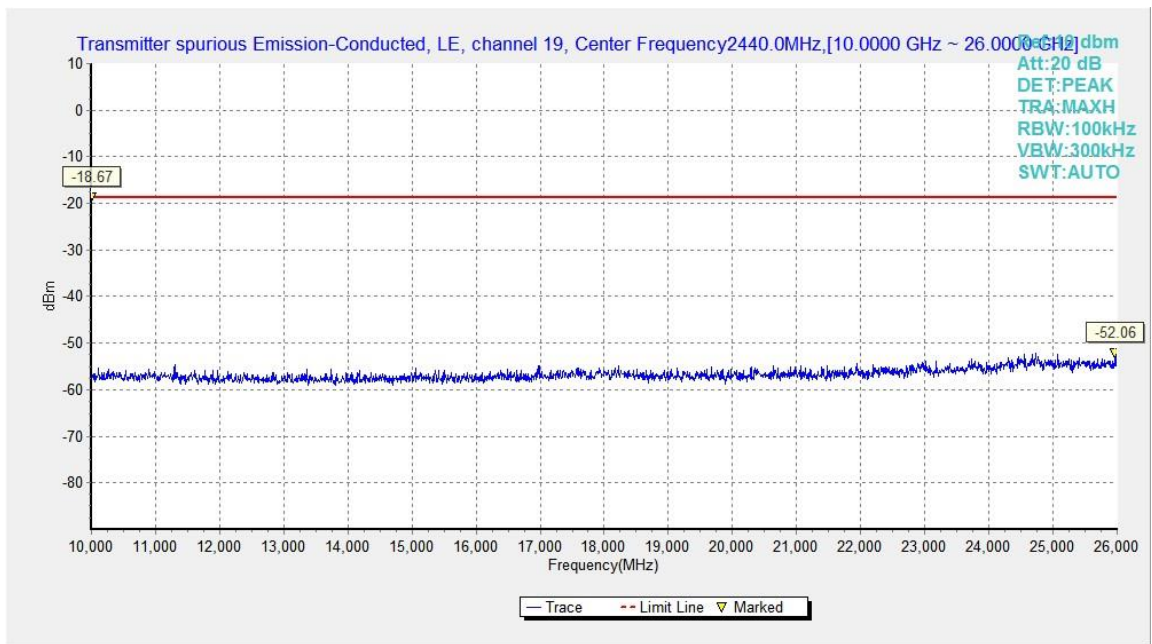




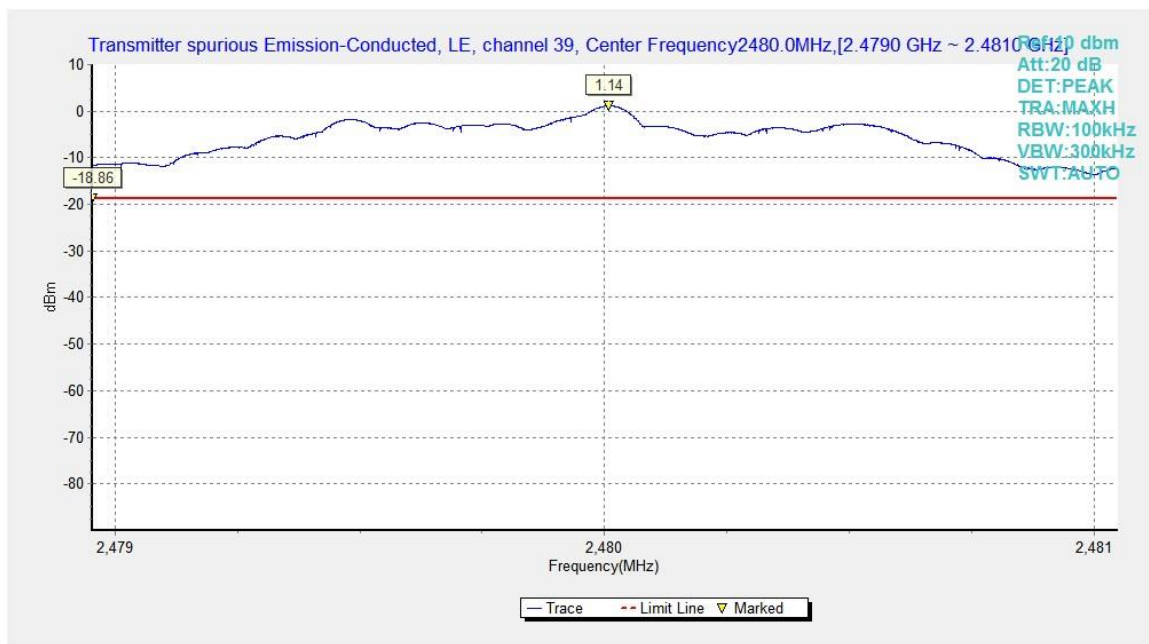
**Fig.18.** Transmitter Spurious Emission - Conducted: GFSK, 2440 MHz, 1GHz – 3GHz



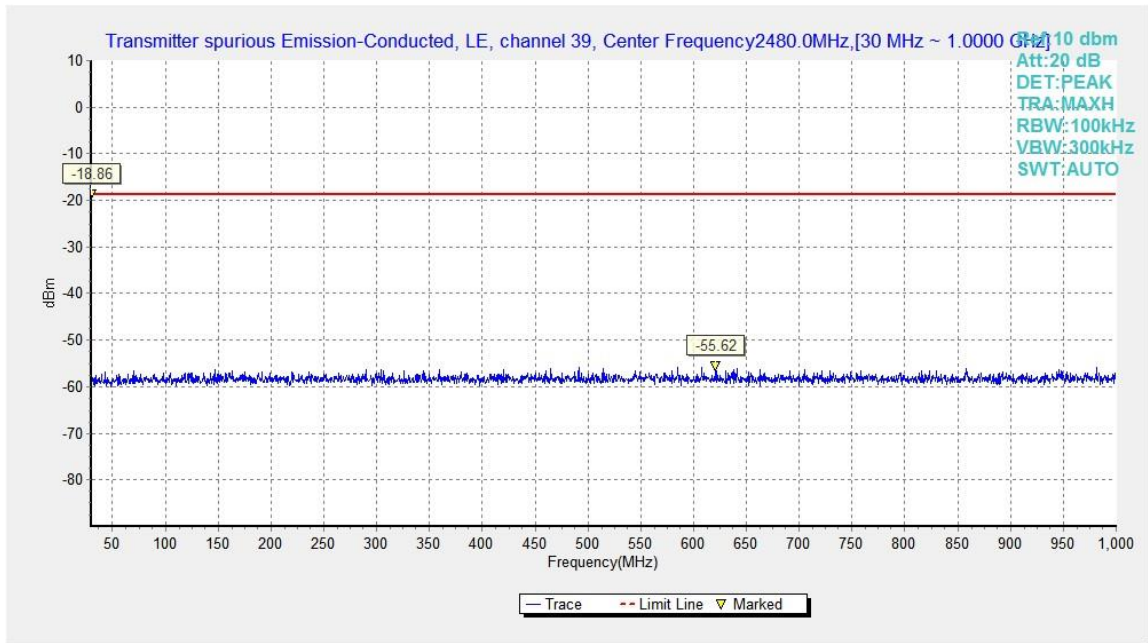
**Fig.19.** Transmitter Spurious Emission - Conducted: GFSK, 2440 MHz, 3GHz – 10GHz



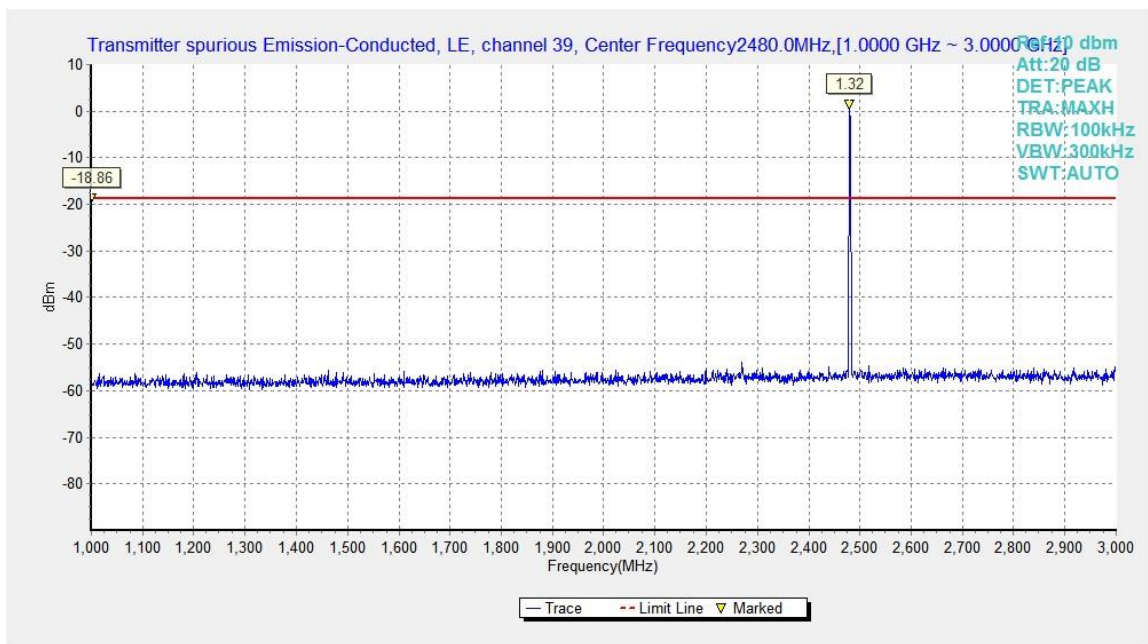
**Fig.20.** Transmitter Spurious Emission - Conducted: GFSK, 2440 MHz, 10GHz – 26GHz



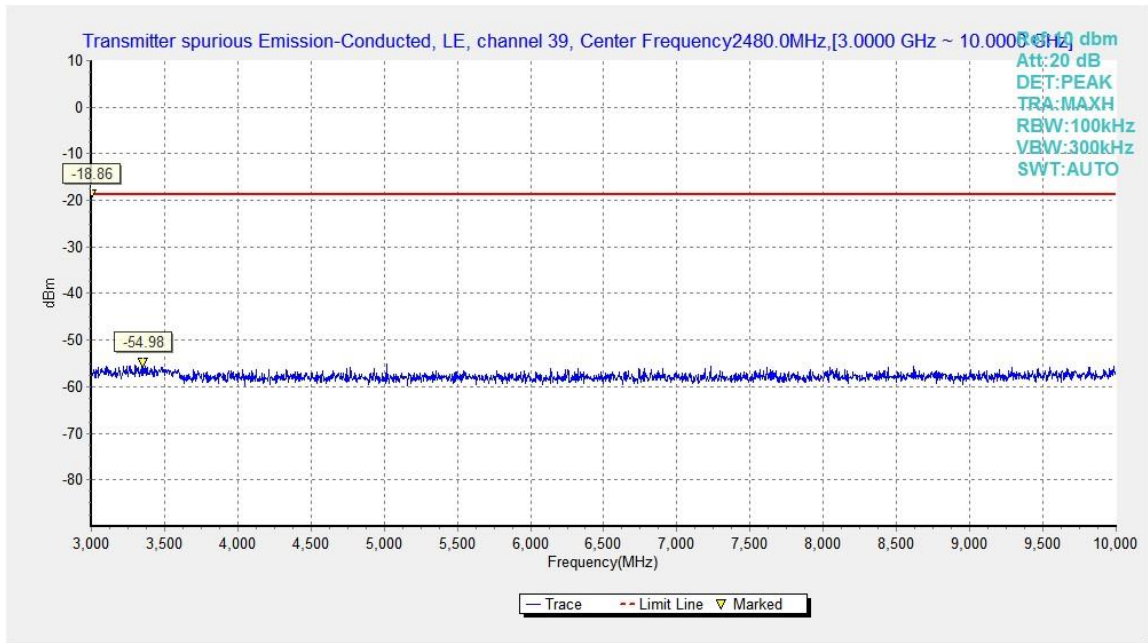
**Fig.21.** Transmitter Spurious Emission - Conducted: GFSK, 2480 MHz



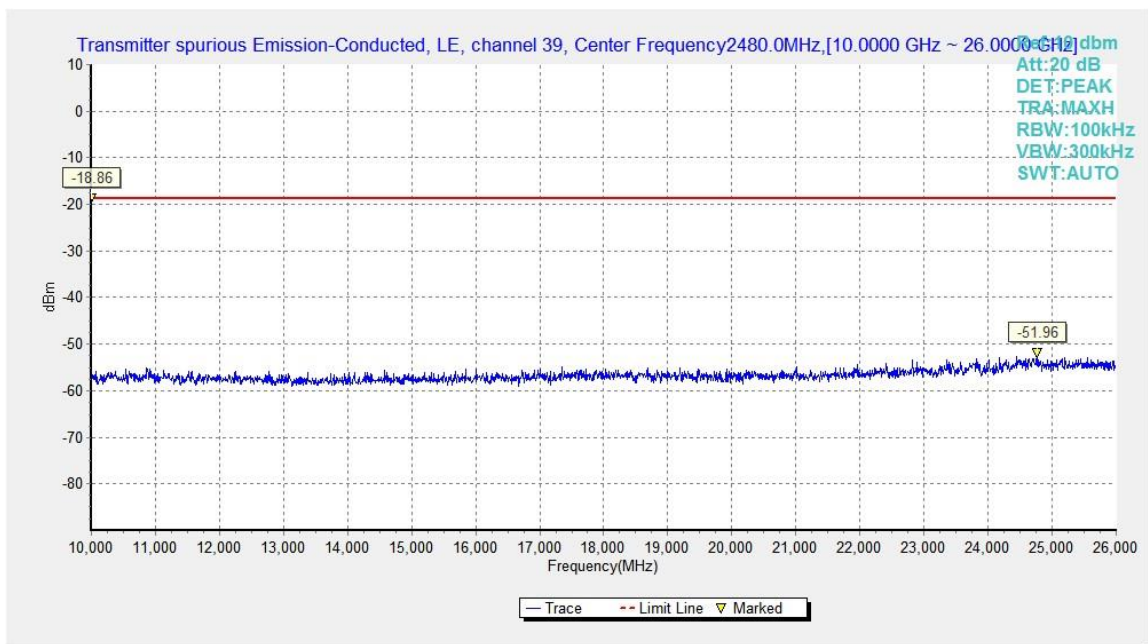
**Fig.22.** Transmitter Spurious Emission - Conducted: GFSK, 2480 MHz, 30MHz - 1GHz



**Fig.23.** Transmitter Spurious Emission - Conducted: GFSK, 2480 MHz, 1GHz - 3GHz



**Fig.24.** Transmitter Spurious Emission - Conducted: GFSK, 2480 MHz, 3GHz - 10GHz



**Fig.25.** Transmitter Spurious Emission - Conducted: GFSK, 2480 MHz, 10GHz - 26GHz



## B.6. Transmitter Spurious Emission - Radiated

**Method of Measurement:** See ANSI C63.10 clause 6.4 & 6.5 & 6.6

**Measurement Limit:**

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

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

**Limit in restricted band:**

Frequency (MHz)	Field strength(μV/m)	Measurement distance (m)
0.009 - 0.490	2400/F(kHz)	300
0.490 - 1.705	24000/F(kHz)	30
1.705 – 30.0	30	30

Frequency of emission (MHz)	Field strength (uV/m)	Field strength (dBuV/m)	Measurement distance (m)
30-88	100	40	3
88-216	150	43.5	3
216-960	200	46	3
Above 960	500	54	3

**Set up:**

Tabletop devices shall be placed on a nonconducting platform with nominal top surface dimensions 1 m by 1.5 m. For emissions testing at or below 1 GHz, the table height shall be 80 cm above the reference ground plane. For emission measurements above 1 GHz, the table height shall be 1.5 m

The EUT and transmitting antenna shall be centered on the turntable.

**Note:**

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

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

The measurement results are obtained as described below:

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

2. The range of evaluated frequency is from 9 kHz to 26GHz. Measurement value showed here only 6 maximum emissions noted.

**Average Measurement results**
**GFSK 2402MHz**

Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
2389.875	46.56	4.62	27.48	14.47	54.00	7.44	V
2389.988	46.59	4.62	27.48	14.49	54.00	7.41	V
4804.000	29.49	-35.05	33.98	30.57	54.00	24.51	V
7206.000	31.61	-33.04	35.52	29.12	54.00	22.39	H
9608.000	32.49	-32.21	36.32	28.38	54.00	21.51	V
12010.000	35.19	-30.19	38.80	26.58	54.00	18.81	H

**GFSK 2440MHz**

Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
2436.863	47.36	4.66	27.72	14.98	54.00	6.64	V
2442.675	47.29	4.67	27.76	14.86	54.00	6.71	V
4882.000	29.73	-34.37	33.83	30.28	54.00	24.27	V
7323.000	31.43	-33.03	35.40	29.06	54.00	22.57	V
9764.000	32.56	-31.87	36.57	27.86	54.00	21.44	H
12205.000	35.39	-29.39	38.79	25.99	54.00	18.61	V

**GFSK 2480MHz**

Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
2483.550	47.59	4.65	27.80	15.14	54.00	6.41	V
2483.588	47.58	4.65	27.80	15.12	54.00	6.42	V
4960.000	29.56	-34.42	33.80	30.19	54.00	24.44	V
7440.000	30.96	-32.79	35.42	28.34	54.00	23.04	V
9920.000	32.84	-32.04	36.84	28.03	54.00	21.16	H
12400.000	35.44	-29.42	38.60	26.25	54.00	18.56	H

**Peak Measurement results**
**GFSK 2402MHz**

Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
2383.124	61.46	4.60	27.47	29.39	74.00	12.54	V
2387.508	61.20	4.61	27.48	29.12	74.00	12.80	H
4804.000	41.74	-35.05	33.98	42.82	74.00	32.26	V
7206.000	43.26	-33.04	35.52	40.78	74.00	30.74	H
9608.000	44.28	-32.21	36.32	40.18	74.00	29.72	H
12010.000	47.59	-30.19	38.80	38.98	74.00	26.41	H

**GFSK 2440MHz**

Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
2360.800	45.11	-35.63	31.40	49.34	74.00	28.89	V
2509.200	46.12	-35.99	32.46	49.65	74.00	27.88	V
4882.000	41.82	-34.37	33.83	42.37	74.00	32.18	H
7323.000	42.62	-33.03	35.40	40.25	74.00	31.38	V
9764.000	44.42	-31.87	36.57	39.72	74.00	29.58	H
12205.000	47.30	-29.39	38.79	37.89	74.00	26.70	H

**GFSK 2480MHz**

Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
2483.672	62.10	4.65	27.80	29.65	74.00	11.90	V
2483.866	62.13	4.65	27.80	29.67	74.00	11.87	H
4960.000	51.51	-34.42	33.80	52.14	74.00	22.49	V
7440.000	43.13	-32.79	35.42	40.50	74.00	30.87	V
9920.000	44.92	-32.04	36.84	40.12	74.00	29.08	H
12400.000	47.70	-29.42	38.60	38.52	74.00	26.30	V

**Conclusion: PASS**

## B.7. 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)	$\geq 500\text{KHz}$

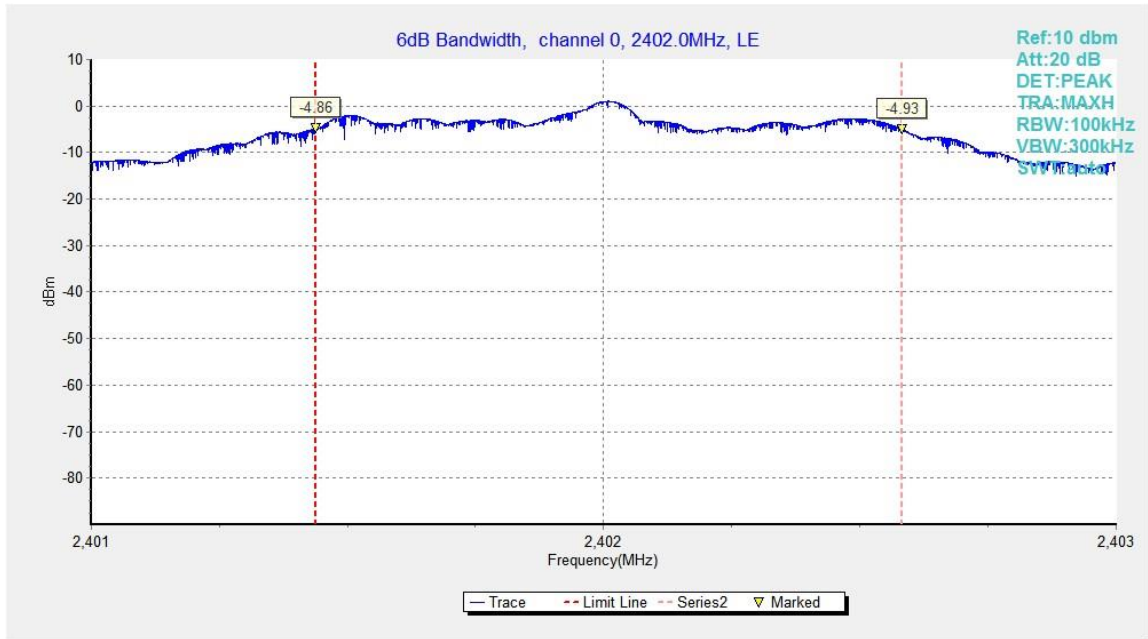
### Measurement Results:

#### For GFSK

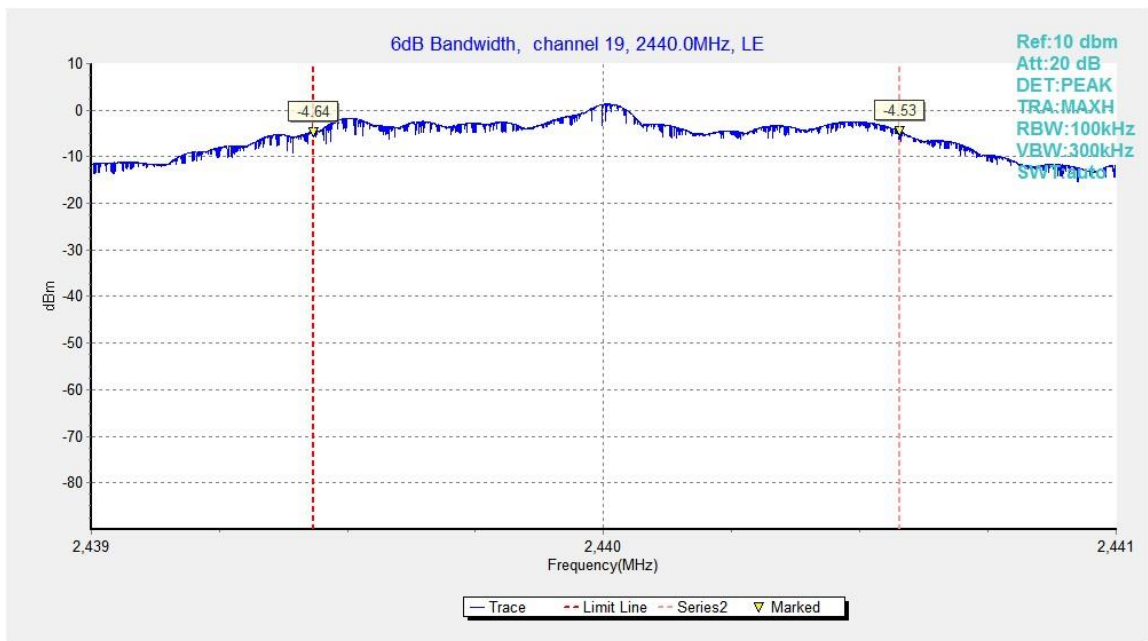
Channel No.	Frequency (MHz)	6dB Bandwidth (kHz)		Conclusion
0	2402	Fig.26	1144.00	P
19	2440	Fig.27	1144.50	P
39	2480	Fig.28	1147.50	P

**Conclusion: PASS**

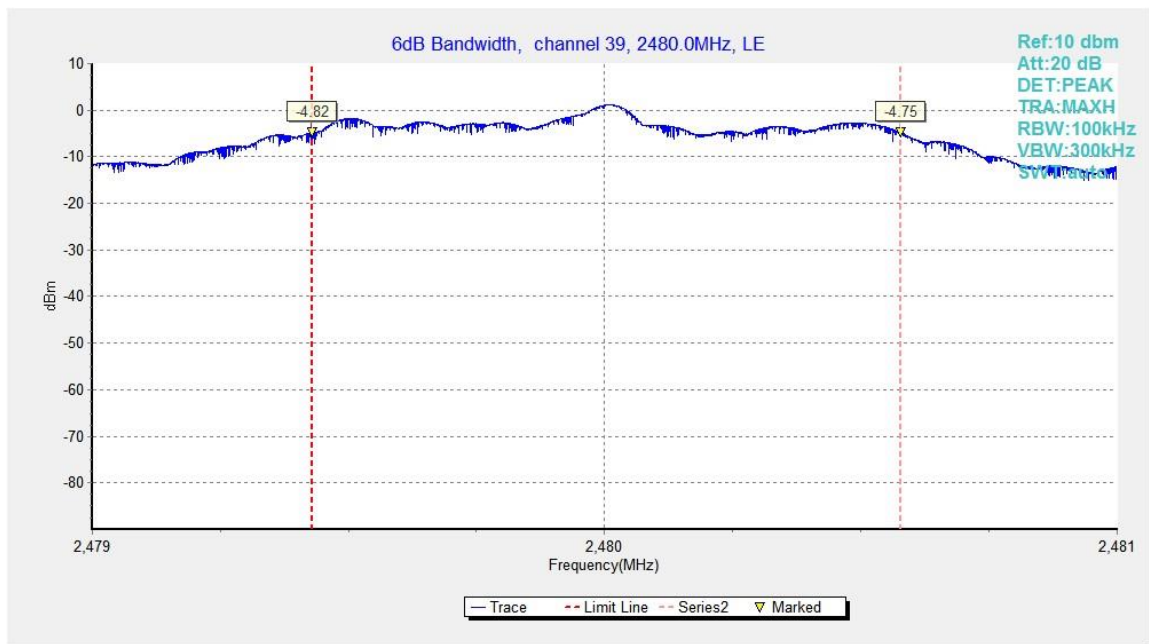
Test graphs as below:



**Fig.26.** 6dB Bandwidth: GFSK, 2402 MHz



**Fig.27.** 6dB Bandwidth: GFSK, 2440 MHz



**Fig.28.** 6dB Bandwidth: GFSK, 2480 MHz

## B.8. 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:

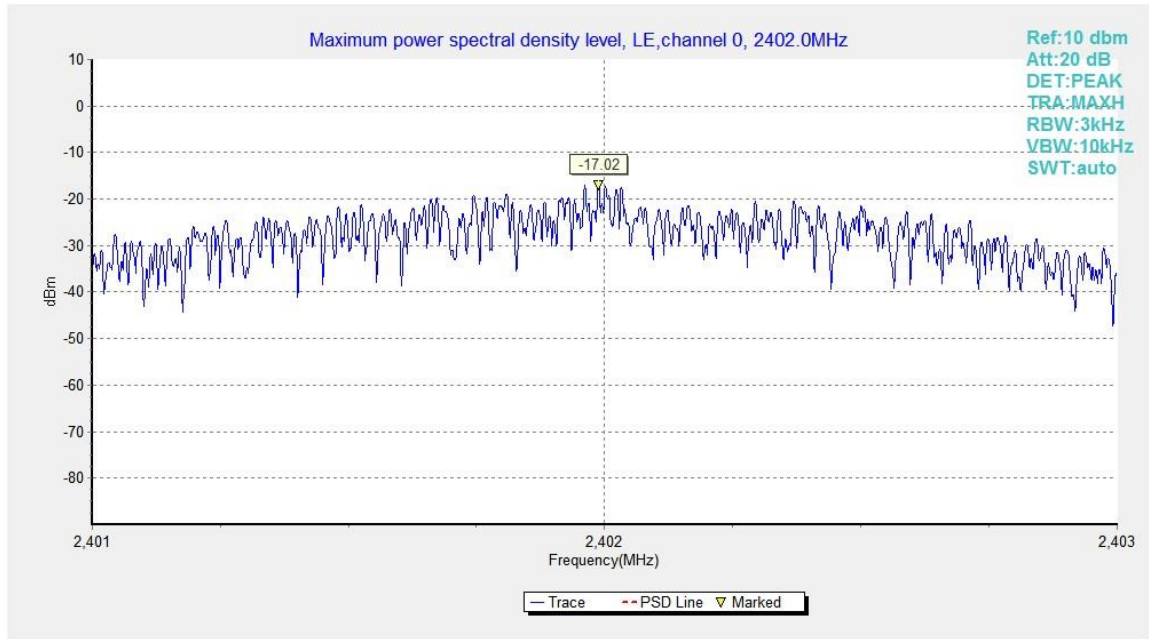
Standard	Limit
FCC 47 CFR Part 15.247(e)	$\leq 8.0\text{dBm}/3\text{kHz}$

### Measurement Results:

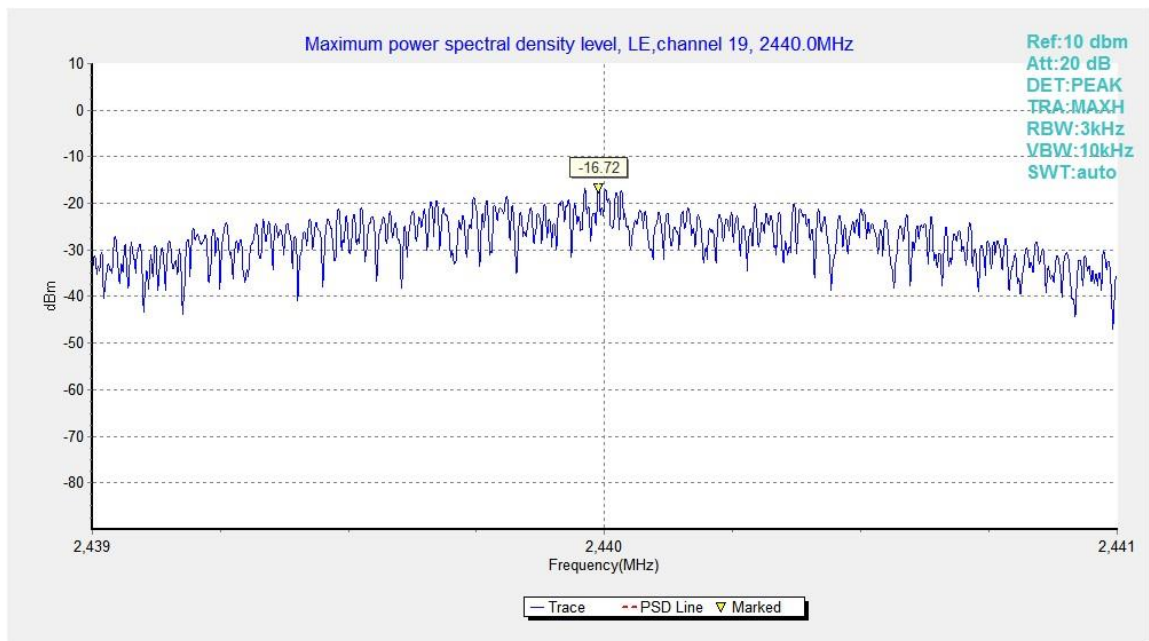
#### For GFSK

Channel No.	Frequency (MHz)	Maximum Power Spectral Density Level(dBm/3kHz)		Conclusion
		Fig.	Level	
0	2402	Fig.29	-17.02	P
19	2440	Fig.30	-16.72	P
39	2480	Fig.31	-16.90	P

Test graphs as below:

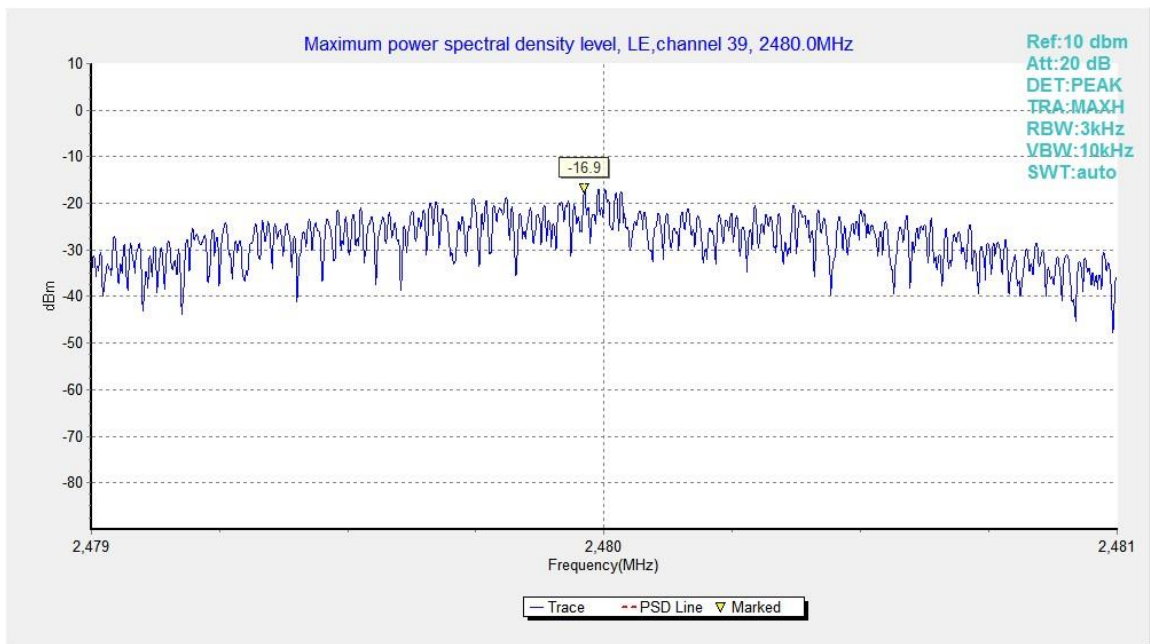


**Fig.29.** Maximum Power Spectral Density Level Function: GFSK, 2402 MHz



**Fig.30.** Maximum Power Spectral Density Level Function: GFSK, 2440 MHz





**Fig.31.** Maximum Power Spectral Density Level Function: GFSK, 2480 MHz

## B.9. AC Powerline Conducted Emission

### Summary

All AC line conducted spurious emissions are measured with a receiver connected to a grounded LISN while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies. All data rates and modes were investigated for conducted spurious emissions. Only the conducted emissions of the configuration that produced the worst case emissions are reported in this section

### Method of Measurement:

See Clause 6.2 of ANSI C63.10 specifically.

See Clause 4 and Clause 5 of ANSI C63.10 generally.

The conducted emissions from the AC port of the EUT are measured in a shielding room. The EUT is connected to a Line Impedance Stabilization Network (LISN). An overview sweep with peak detection was performed. The measurements were performed with a quasi-peak detector and if required, an average detector.

The conducted emission measurements were made with the following detector of the test receiver: Quasi-Peak / Average Detector.

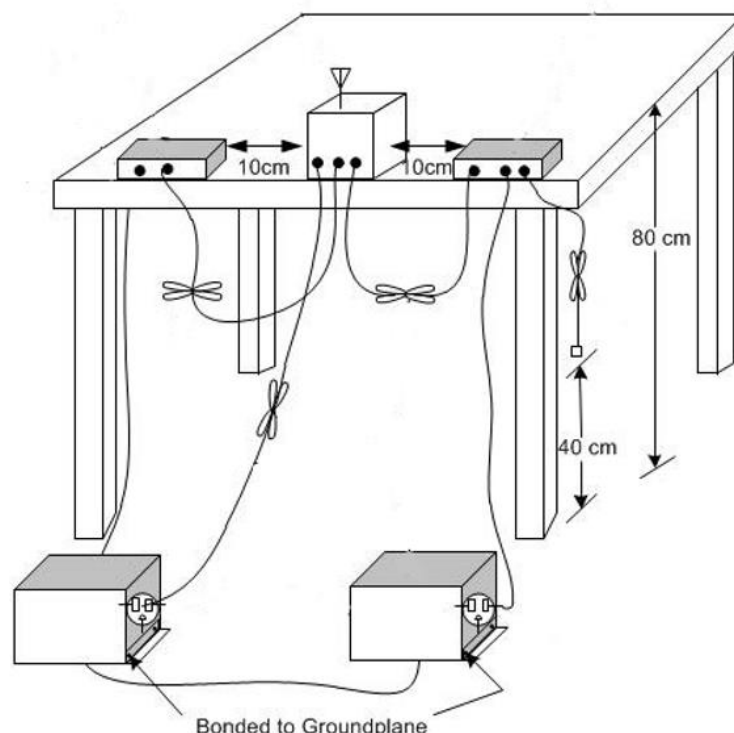
The measurement bandwidth is:

Frequency of Emission (MHz)	RBW/IF bandwidth
0.15-30	9kHz

### Test Condition:

Voltage (V)	Frequency (Hz)
120	60

### Measurement Setup



**Measurement Result and limit:**
**EUT ID: UT25a**

Bluetooth (Quasi-peak Limit)

Frequency range (MHz)	Quasi-peak Limit (dB $\mu$ V)	Result (dB $\mu$ V)		Conclusion
		With charger		
		bluetooth	Idle	
0.15 to 0.5	66 to 56	Fig.B.9.1	Fig.B.9.2	<b>P</b>
0.5 to 5	56			
5 to 30	60			

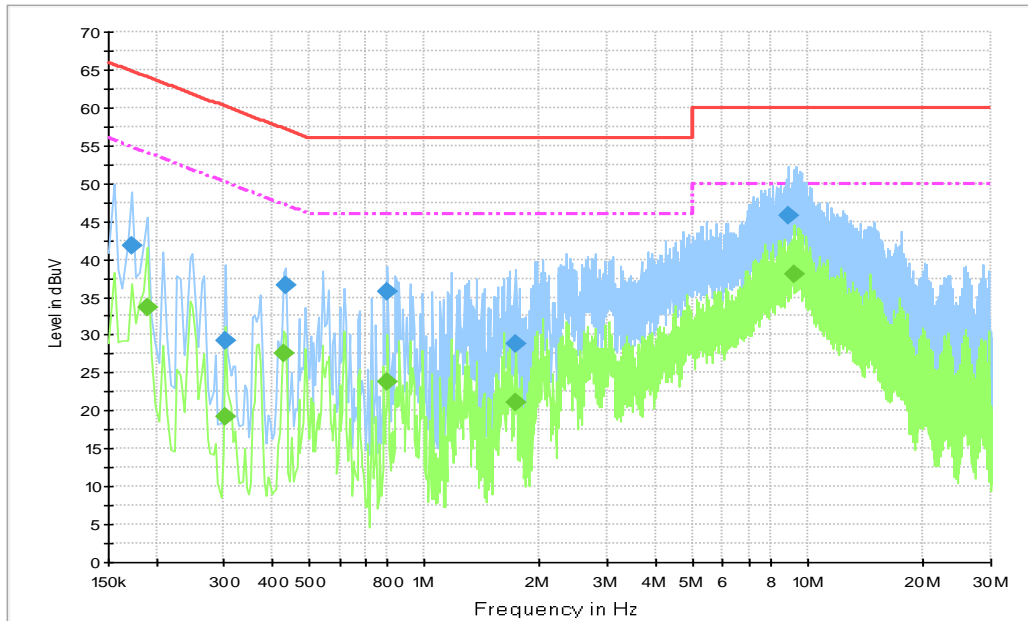
NOTE: The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.5 MHz.

Bluetooth (Average Limit)

Frequency range (MHz)	Average Limit (dB $\mu$ V)	Result (dB $\mu$ V)		Conclusion
		With charger		
		bluetooth	Idle	
0.15 to 0.5	56 to 46	Fig.B.9.1	Fig.B.9.2	<b>P</b>
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.

**Conclusion: Pass**
**Test graphs as below:**



**Fig.B.9.1 AC Powerline Conducted Emission- bluetooth**

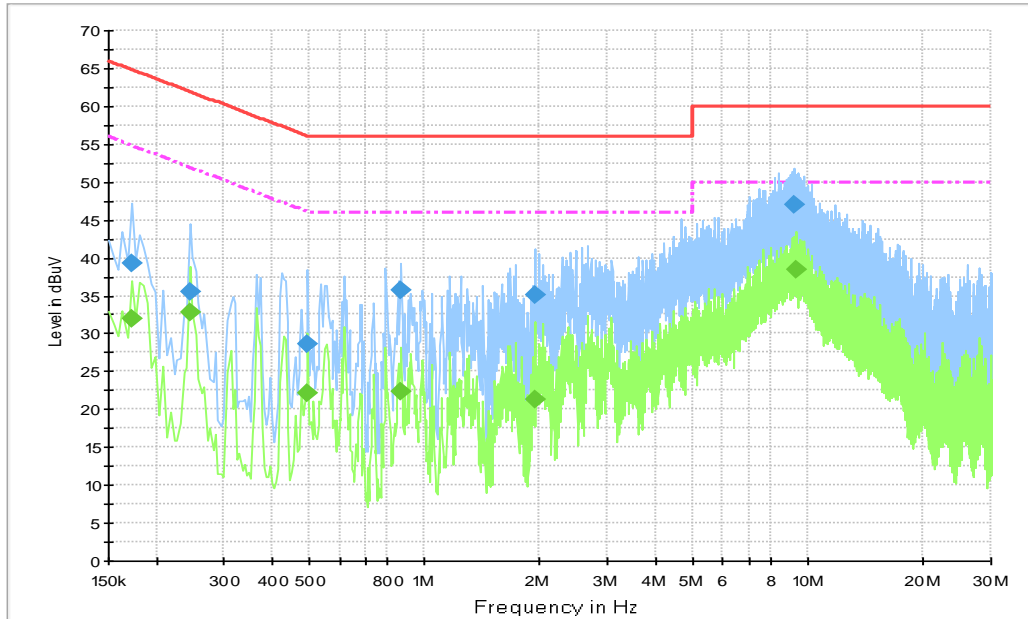
Note: The graphic result above is the maximum of the measurements for both phase line and neutral line.

**Final Result 1**

Frequency (MHz)	QuasiPeak (dB $\mu$ V)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dB $\mu$ V)
0.172500	41.8	2000.0	9.000	On	L1	24.3	23.0	64.8
0.303000	29.3	2000.0	9.000	On	L1	19.7	30.9	60.2
0.433500	36.5	2000.0	9.000	On	L1	19.8	20.7	57.2
0.802500	35.7	2000.0	9.000	On	L1	19.7	20.3	56.0
1.738500	28.8	2000.0	9.000	On	L1	19.6	27.2	56.0
8.916000	45.8	2000.0	9.000	On	N	19.7	14.2	60.0

**Final Result 2**

Frequency (MHz)	Average (dB $\mu$ V)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dB $\mu$ V)
0.190500	33.6	2000.0	9.000	On	N	21.2	20.4	54.0
0.303000	19.3	2000.0	9.000	On	N	19.7	30.9	50.2
0.429000	27.6	2000.0	9.000	On	N	19.8	19.7	47.3
0.802500	23.8	2000.0	9.000	On	L1	19.7	22.2	46.0
1.738500	21.0	2000.0	9.000	On	L1	19.6	25.0	46.0
9.190500	38.0	2000.0	9.000	On	N	19.8	12.0	50.0



**Fig.B.9.2 AC Powerline Conducted Emission-Idle**

Note: The graphic result above is the maximum of the measurements for both phase line and neutral line.

**Final Result 1**

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.172500	39.3	2000.0	9.000	On	L1	24.3	25.6	64.8
0.244500	35.6	2000.0	9.000	On	L1	19.7	26.3	61.9
0.496500	28.5	2000.0	9.000	On	N	19.8	27.5	56.1
0.870000	35.7	2000.0	9.000	On	L1	19.7	20.3	56.0
1.950000	35.1	2000.0	9.000	On	N	19.6	20.9	56.0
9.213000	46.9	2000.0	9.000	On	N	19.8	13.1	60.0

**Final Result 2**

Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.172500	32.0	2000.0	9.000	On	N	24.3	22.8	54.8
0.244500	32.8	2000.0	9.000	On	N	19.7	19.1	51.9
0.496500	22.2	2000.0	9.000	On	N	19.8	23.8	46.1
0.870000	22.4	2000.0	9.000	On	N	19.7	23.6	46.0
1.950000	21.3	2000.0	9.000	On	L1	19.6	24.7	46.0
9.303000	38.4	2000.0	9.000	On	N	19.8	11.6	50.0

## B.10. Duty cycle

### Method of Measurement:

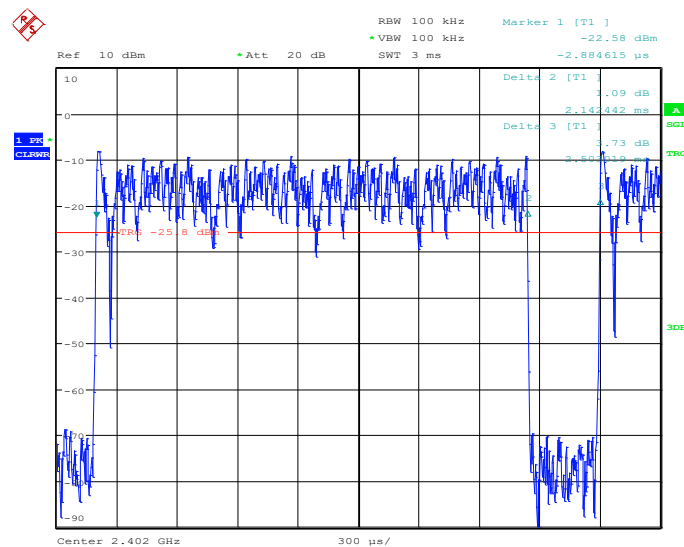
Use the following spectrum analyzer settings:

- Span = zero span
- RBW = 100kHz
- VBW  $\geq$  RBW
- Sweep = single sweep
- Detector function = peak

### Measurement Results:

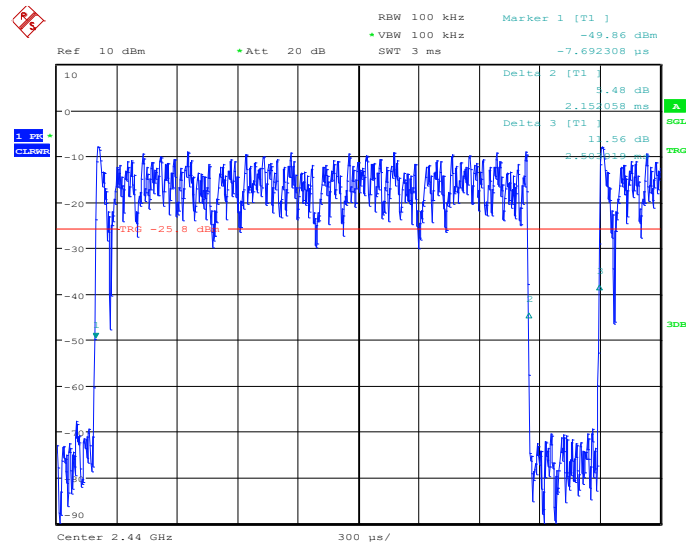
Channel No.	Frequency (MHz)	Duty cycle	
0	2402	Fig.32	0.86
19	2440	Fig.33	0.86
39	2480	Fig.34	0.86

See test graphs as following.



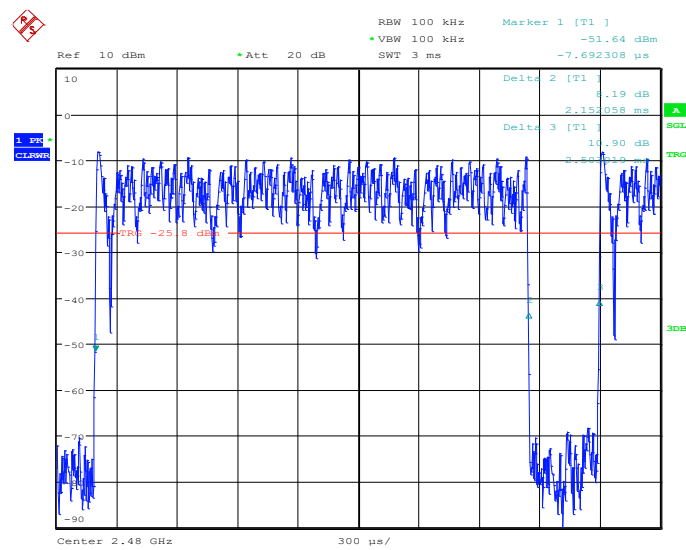
Date: 25.JAN.2000 07:10:40

Fig. 32 Duty cycle: BLE 2402 MHz



Date: 25.JAN.2000 07:14:56

**Fig. 33 Duty cycle: BLE 2440 MHz**



Date: 25.JAN.2000 07:15:49

**Fig. 34 Duty cycle: BLE 2480 MHz**



## **B.11. Antenna Requirement**

The antenna of the device is permanently attached. There are no provisions for connection to an external antenna.

The unit complies with the requirement of FCC Part 15.203.



## ANNEX C: Accreditation Certificate



### Accredited Laboratory

A2LA has accredited

### TELECOMMUNICATION TECHNOLOGY LABS, CAICT

Beijing, People's Republic of China

for technical competence in the field of

### Electrical Testing

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017 General requirements for the competence of testing and calibration laboratories. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communiqué dated April 2017).



Presented this 26<sup>th</sup> day of June 2023.



Mr. Trace McInturf, Vice President, Accreditation Services  
For the Accreditation Council  
Certificate Number 7049.01  
Valid to July 31, 2024

For the tests to which this accreditation applies, please refer to the laboratory's Electrical Scope of Accreditation.

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