FCC PART 15C
TEST REPORT

BLUETOOTH LOW ENERGY (BLE) PART

No. I19Z62142-IOT04

for

HMD Global Oy

Multi-band GSM/WCDMA/LTE phone with Bluetooth, WLAN

Model Name: TA-1207

FCC ID: 2AJOTTA-1207

with

Hardware Version: 89572_1_12

Software Version: 000T_0_110

Issued Date: 2020-1-9

Note:

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Test Laboratory:

CTTL, Telecommunication Technology Labs, CAICT

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REPORT HISTORY

Report Number	Revision	Description	Issue Date
I19Z62142-IOT04	Rev.0	1st edition	2020-1-9

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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(BDA)

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

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1.3. Testing Environment

Normal Temperature: 15-35℃

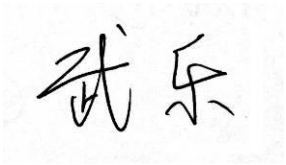
Relative Humidity: 20-75%

1.4. Project data

Testing Start Date: 2019-12-2

Testing End Date: 2020-1-9

1.5. Signature



Wu Le

(Prepared this test report)

Sun Zhenyu

(Reviewed this test report)

Li Zhuofang

(Approved this test report)

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2. Client Information

2.1. Applicant Information

Company Name:	HMD Global Oy
Address /Post:	Bertel Jungin aukio 9,02600 Espoo, Finland
City:	Espoo
Postal Code:	/
Country:	Finland
Telephone:	/
Fax:	/

2.2. Manufacturer Information

Company Name:	HMD Global Oy
Address /Post:	Bertel Jungin aukio 9,02600 Espoo, Finland
City:	Espoo
Postal Code:	/
Country:	Finland
Telephone:	/
Fax:	/

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

3.1. About EUT

Description	Multi-band GSM/WCDMA/LTE phone with Bluetooth, WLAN
Model Name	TA-1207
FCC ID	2AJOTTA-1207
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

3.2. Internal Identification of EUT

EUT ID*	SN or IMEI	HW Version	SW Version
EUT1	355781100004122	89572_1_12	000T_0_110
EUT2	355781100007356	89572_1_12	000T_0_110

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

3.3. Internal Identification of AE

AE ID*	Description		
AE1	Battery	/	/
AE2	Charger	/	/
AE3	Charger	/	/
AE4	Charger	/	/
AE5	USB Cable	/	/
AE6	USB Cable	/	/
AE7	Headset	/	/

AE1

Model	WT130
Manufacturer	GUANGDONG FENGHUA NEW ENERGY CO.,LTD
Capacitance	2920mAh
Nominal voltage	3.85v

AE2

Model	CH-35U
Manufacturer	Shenzhen Tianyin Electronics Co., Ltd
Length of cable	/

AE3

Model	CH-35X
Manufacturer	Shenzhen Tianyin Electronics Co., Ltd
Length of cable	/

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AE4

Model	CH-35A
Manufacturer	Shenzhen Tianyin Electronics Co., Ltd
Length of cable	/

AE5

Model	CB-35A
Manufacturer	Leagtech Electronics Co.,Ltd
Length of cable	/

AE6

Model	CB-35A
Manufacturer	Shenzhen BRL Technology Co.,Ltd.
Length of cable	/

AE7

Model	HS-34
Manufacturer	New Leader Industry Co.,Ltd
Length of cable	/

*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 Multi-band GSM/WCDMA/LTE phone 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.

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4. Reference Documents

4.1. Documents supplied by applicant

EUT feature 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; 15.247 Operation within the bands 902–928MHz, 2400–2483.5 MHz, and 5725–5850 MHz.	2018
ANSI C63.10	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices	June,2013

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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)	**P**
Peak Output Power - Conducted	15.247 (b)(1)	**P**
Maximum Power Spectral Density Level	15.247(e)	**P**
Transmitter Spurious Emission - Conducted	15.247 (d)	**P**
Transmitter Spurious Emission - Radiated	15.247, 15.205, 15.209	**P**
Frequency Band Edges	15.247 (d)	**P**
AC Powerline Conducted Emission	15.107, 15.207	**P**

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

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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	2020-11-29
2	LISN	ENV216	825562/028	R&S	1 year	2020-03-10
3	Test Receiver	ESCI	100766	R&S	1 year	2020-03-20
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	Rohde & Schwarz	1 year	2020-10-30
2	BiLog Antenna	VULB9163	9163-514	Schwarzbeck	1 year	2020-02-03
3	Dual-Ridge Waveguide Horn Antenna	3117	00119021	ETS-Lindgren	1 year	2021-01-04
4	Dual-Ridge Waveguide Horn Antenna	3116	2663	ETS-Lindgren	1 year	2020-05-31
5	Vector Signal Analyzer	FSV40	101047	Rohde & Schwarz	1 year	2020-07-20

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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	5.40dB
＞ 1 GHz	4.32dB

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

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7.7. AC Powerline Conducted Emission

Measurement Uncertainty:

Measurement Uncertainty (k=2)	3.10dB

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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.

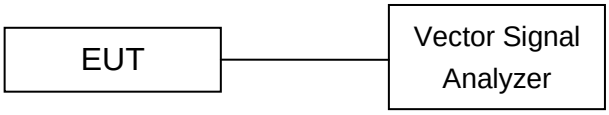
2). Set the EUT to the required work mode (Transmitter, receiver or transmitter & receiver).

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

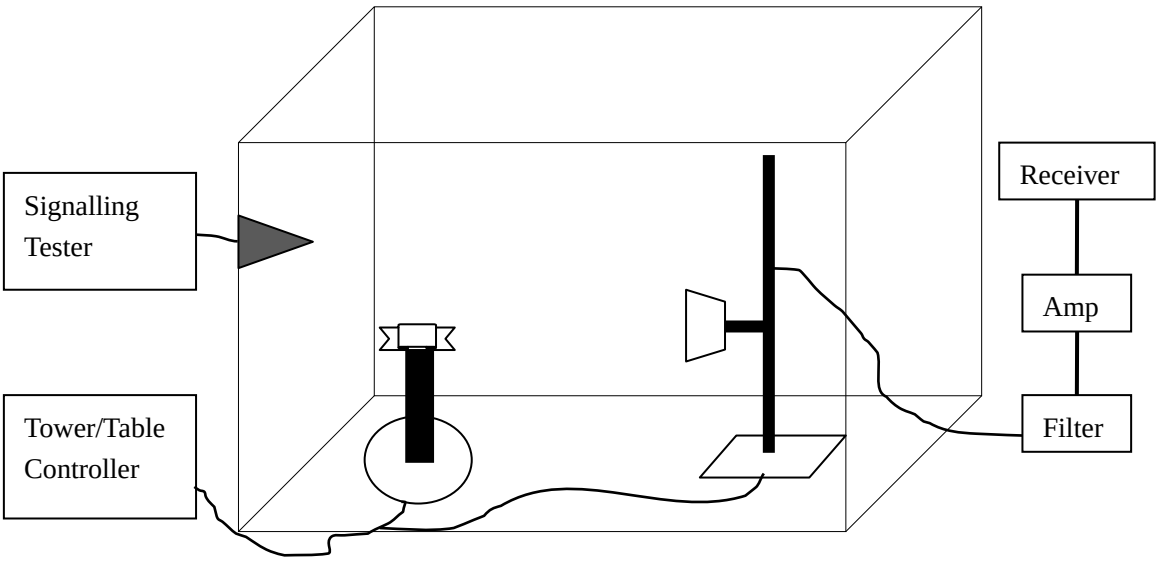
The measurement is made according to ANSI C63.10.

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;



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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)(3)	< 30

Measurement Results:

For GFSK

Channel No.	Frequency (MHz)	Peak Conducted Output Power (dBm)	Conclusion
0	2402	-2.68	P
19	2440	-1.12	P
39	2480	-3.92	P

Conclusion: PASS

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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	-51.44	P
39	2480	Hopping OFF	Fig.2	-52.38	P

Conclusion: PASS

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Test graphs as below

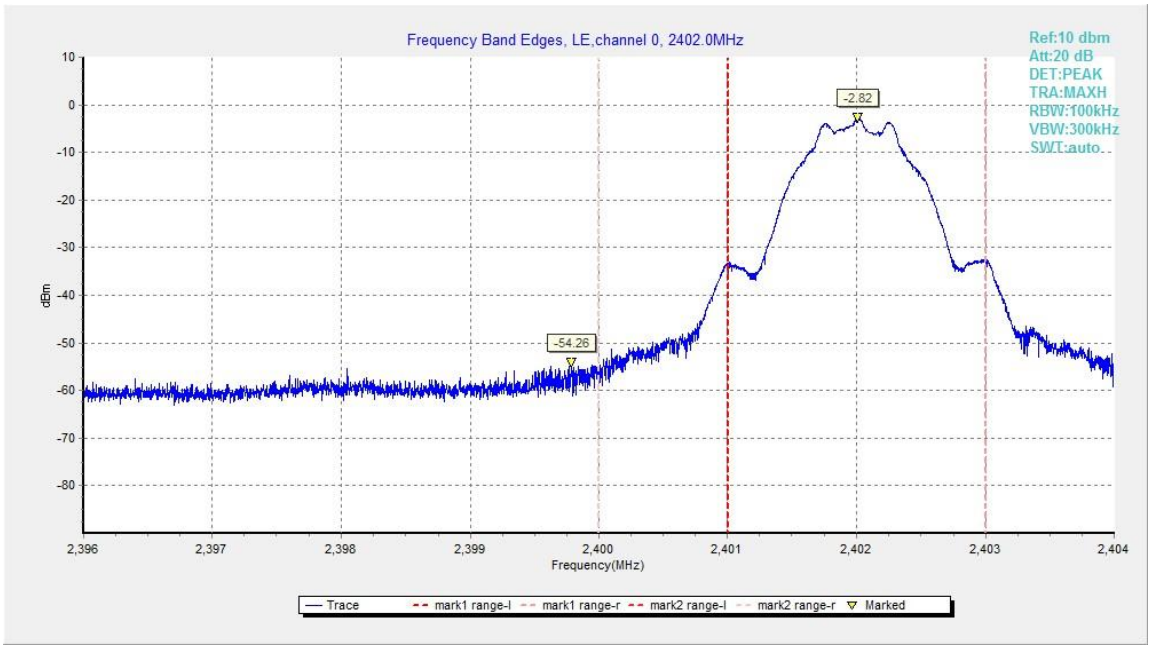

Fig.1. Frequency Band Edges: GFSK, 2402 MHz**,** Hopping Off

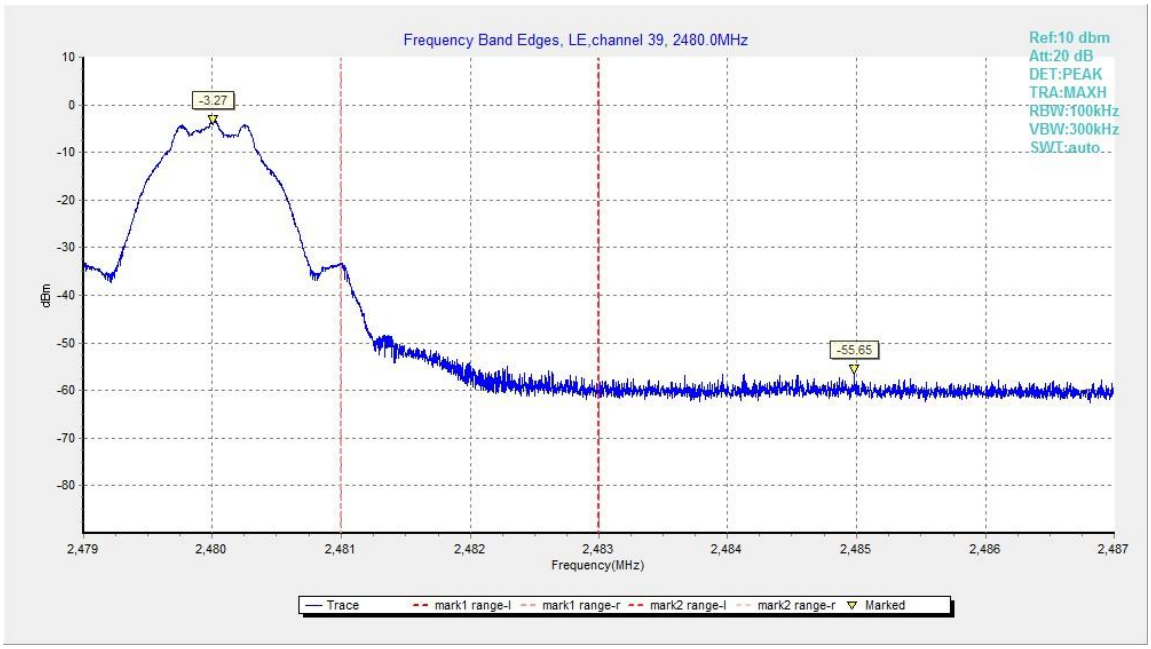

Fig.2. Frequency Band Edges: GFSK, 2480 MHz, Hopping Off

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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

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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

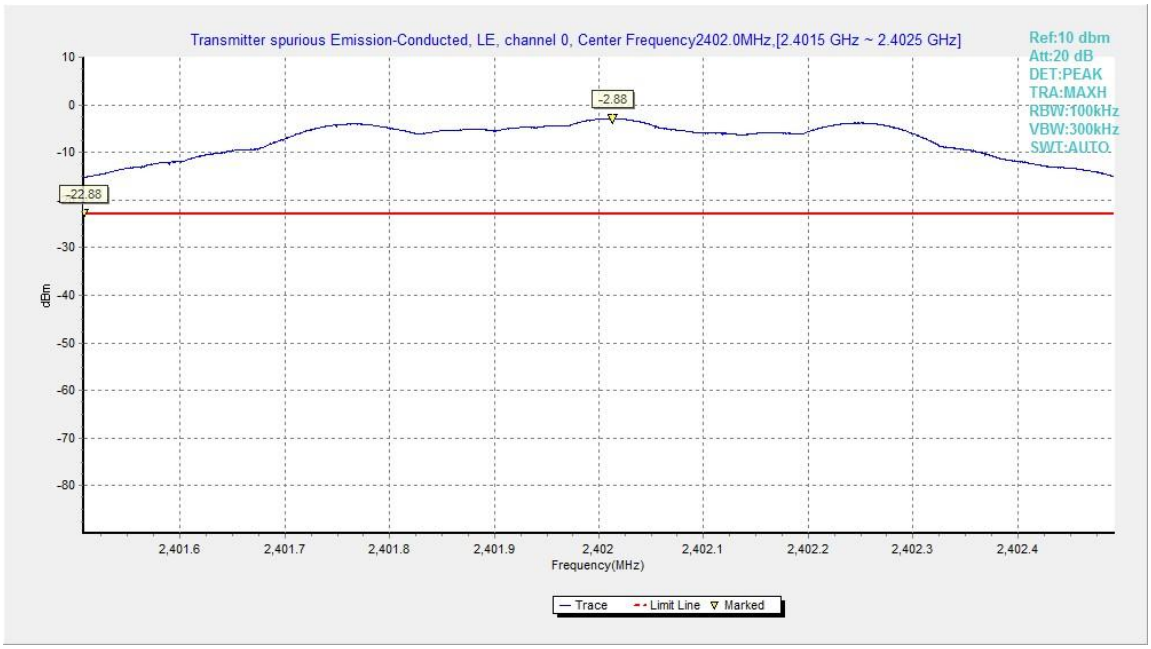

Fig.3. Transmitter Spurious Emission - Conducted: GFSK,2402MHz

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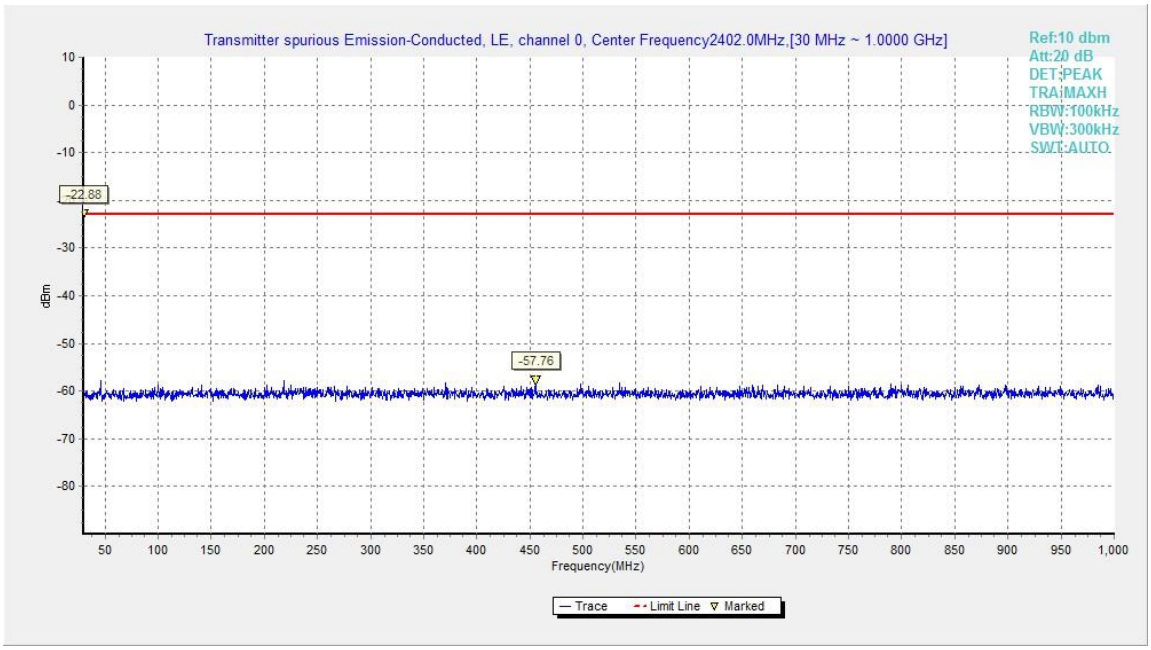

Fig.4. Transmitter Spurious Emission - Conducted: GFSK, 2402 MHz, 30MHz - 1GHz

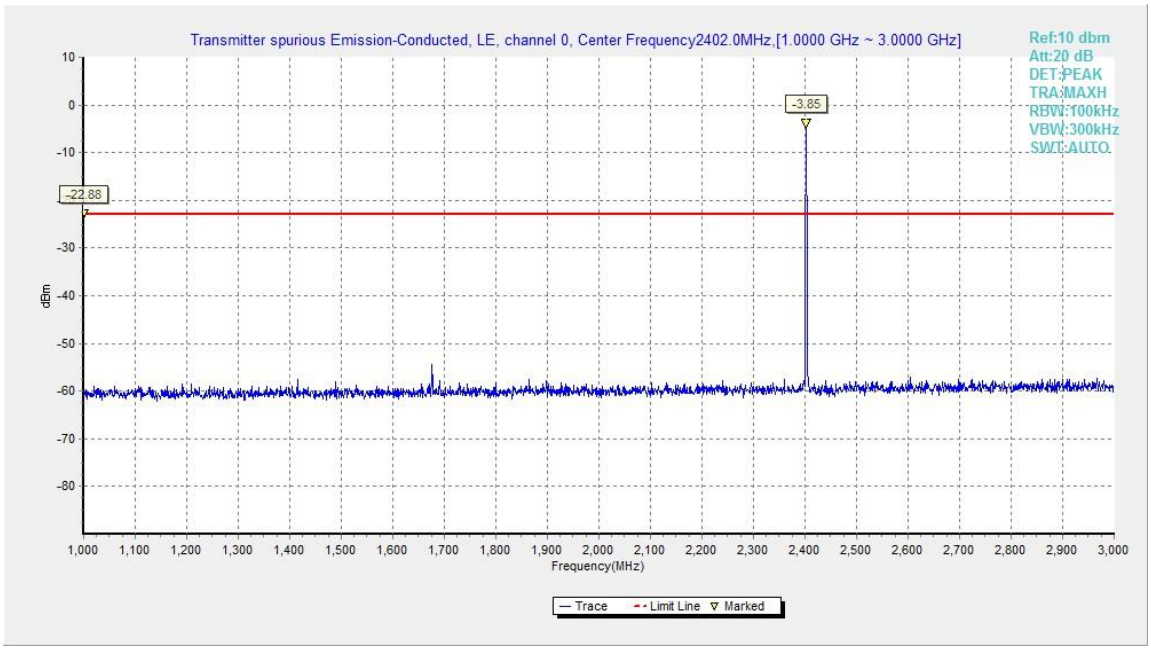

Fig.5. Transmitter Spurious Emission - Conducted: GFSK, 2402 MHz,1GHz - 3GHz

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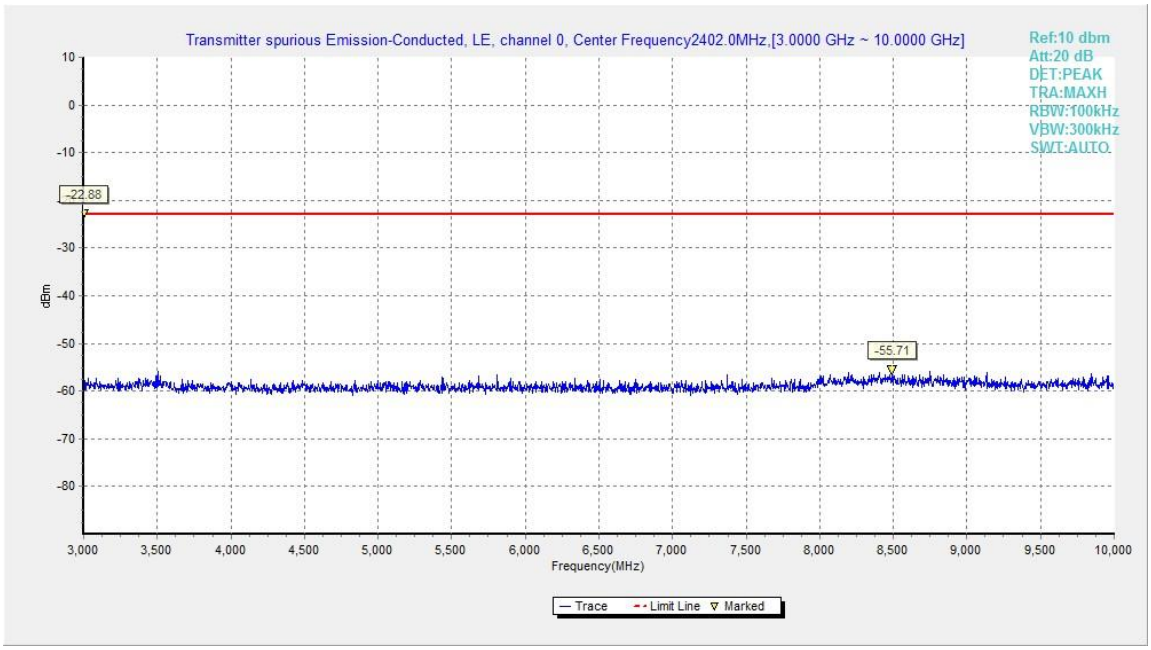

Fig.6. Transmitter Spurious Emission - Conducted: GFSK, 2402 MHz,3GHz - 10GHz

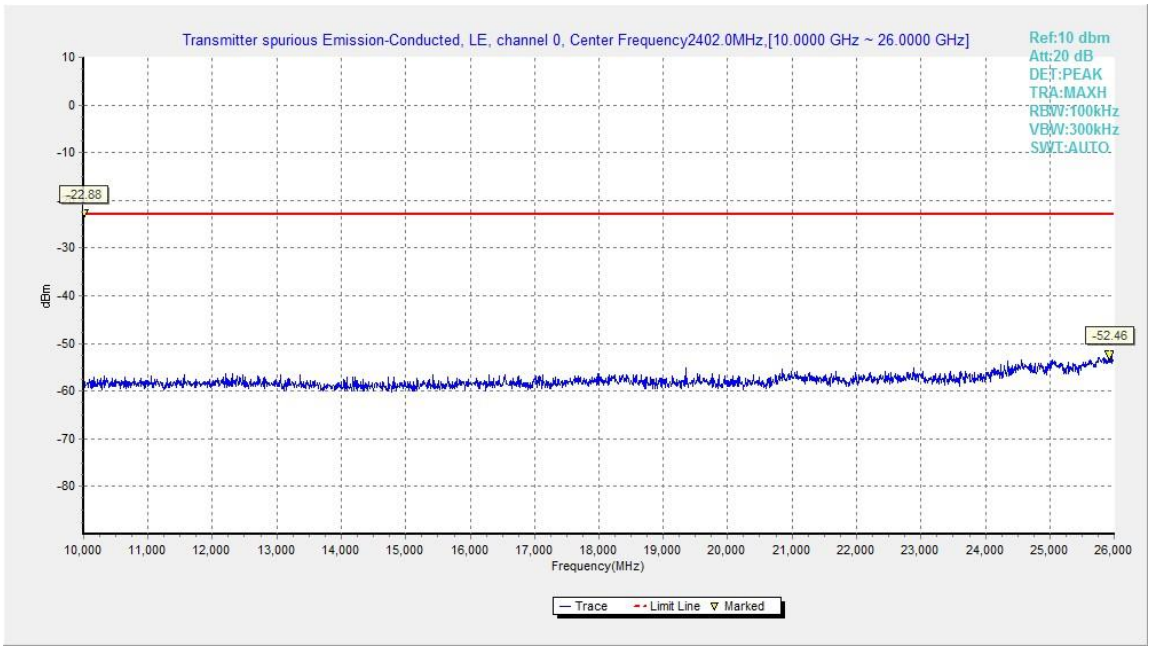

Fig.7. Transmitter Spurious Emission - Conducted: GFSK, 2402 MHz,10GHz - 26GHz

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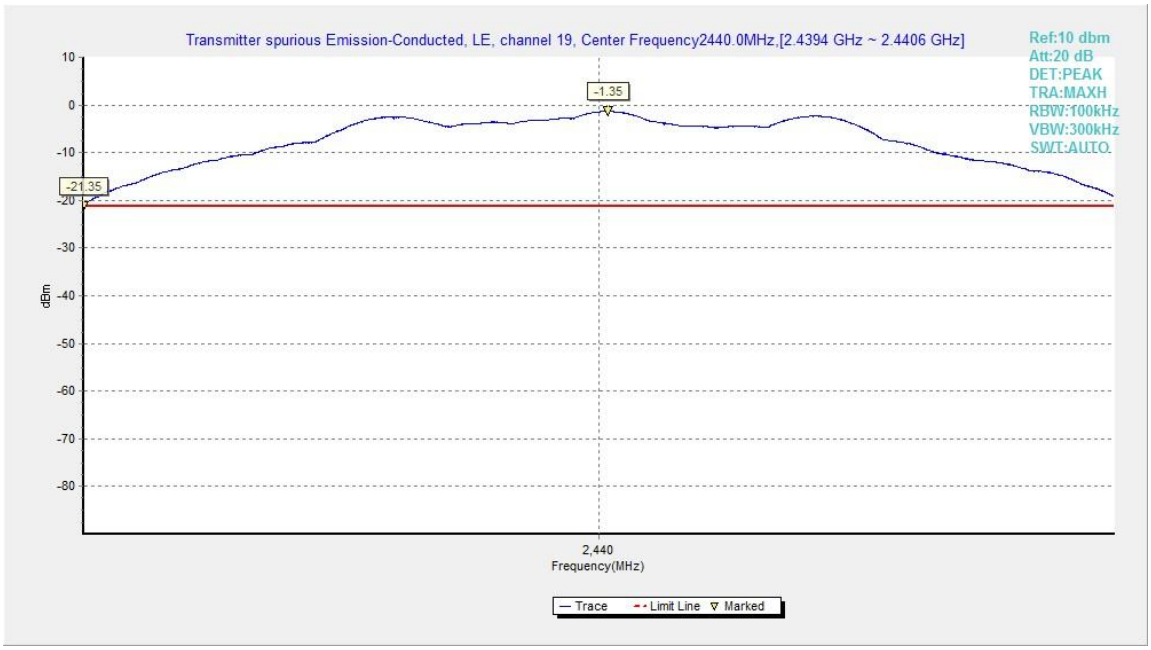

Fig.8. Transmitter Spurious Emission - Conducted: GFSK, 2440MHz

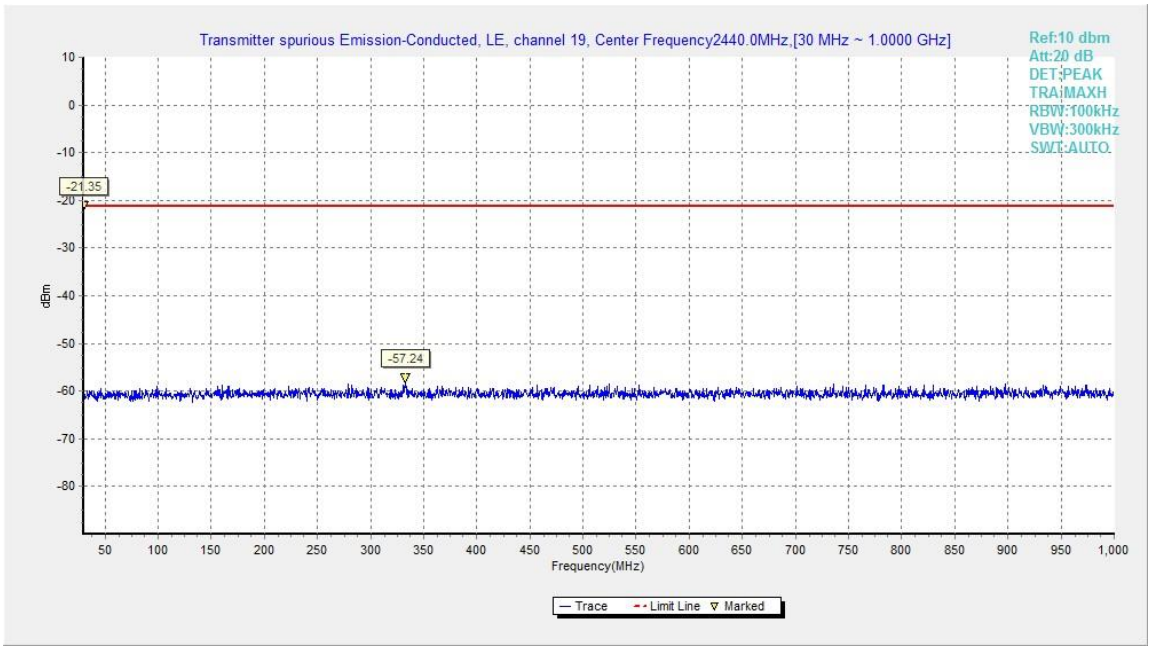

Fig.9. Transmitter Spurious Emission - Conducted: GFSK, 2440 MHz, 30MHz - 1GHz

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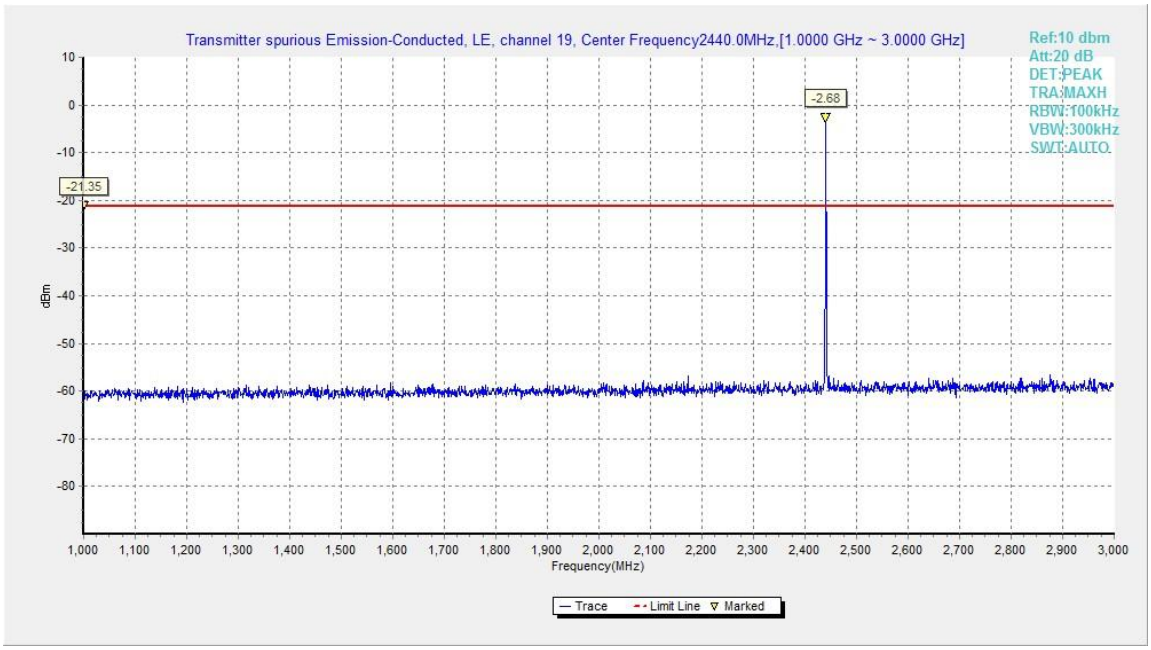

Fig.10. Transmitter Spurious Emission - Conducted: GFSK, 2440 MHz, 1GHz – 3GHz

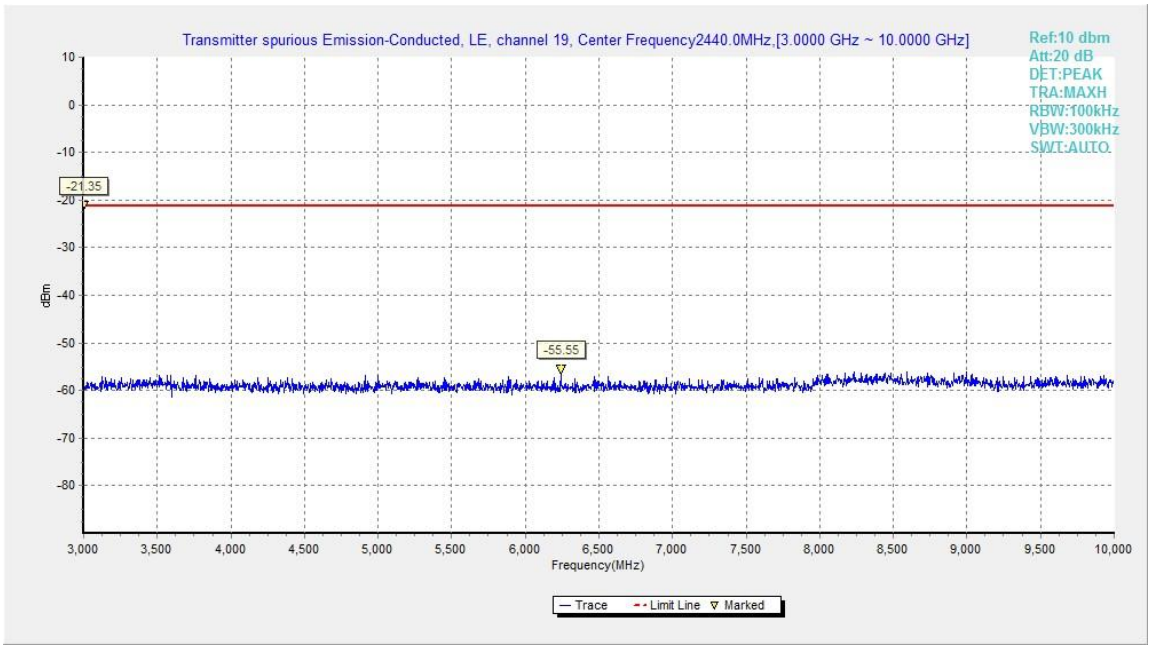

Fig.11. Transmitter Spurious Emission - Conducted: GFSK, 2440 MHz, 3GHz – 10GHz

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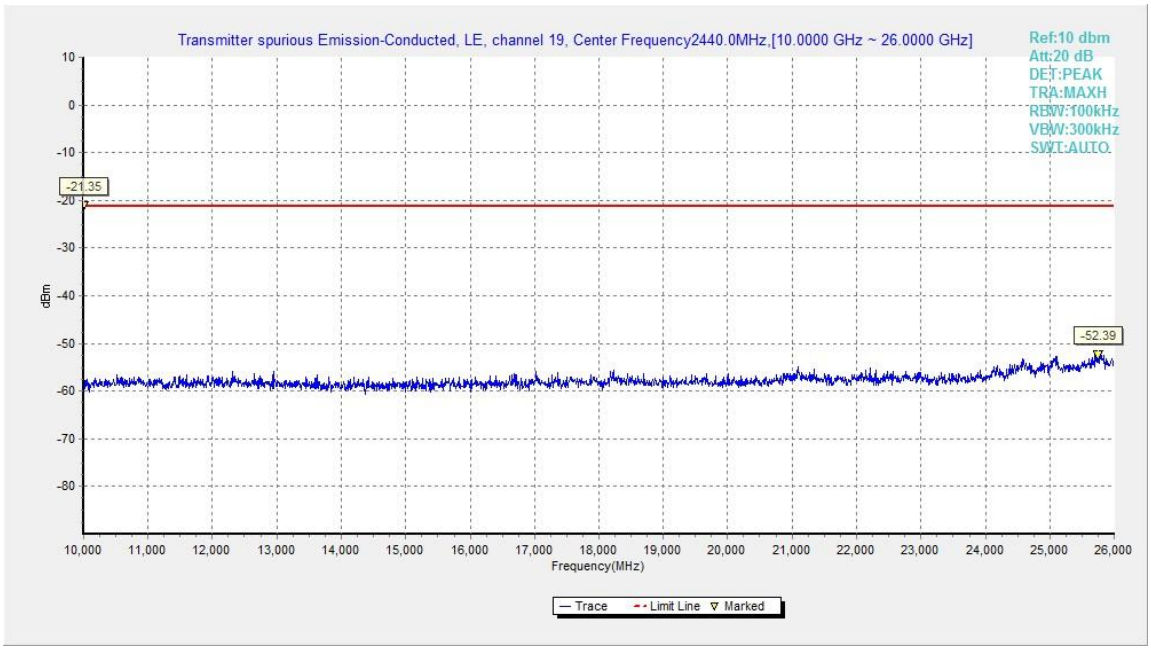

Fig.12. Transmitter Spurious Emission - Conducted: GFSK, 2440 MHz, 10GHz – 26GHz

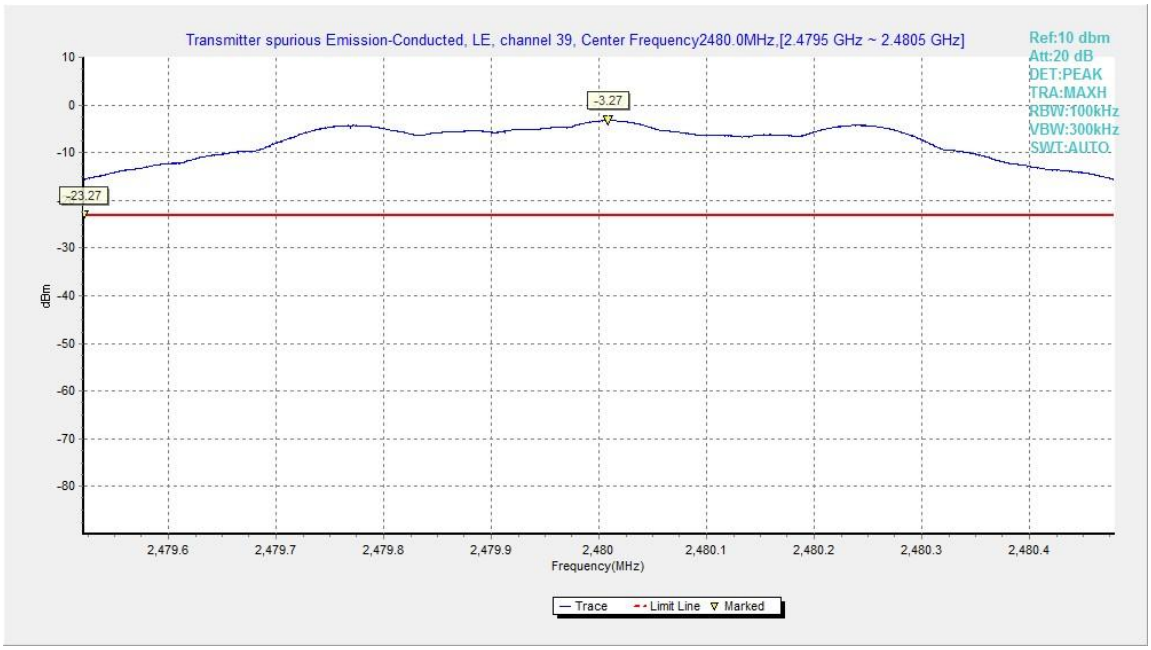

Fig.13. Transmitter Spurious Emission - Conducted: GFSK, 2480 MHz

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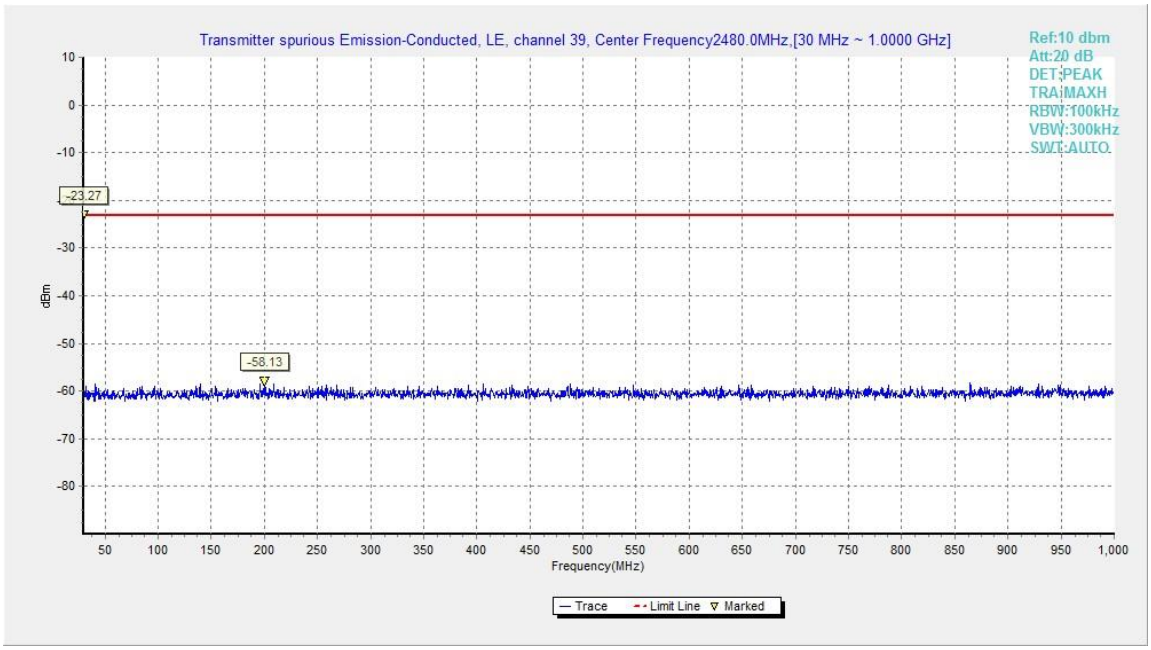

Fig.14. Transmitter Spurious Emission - Conducted: GFSK, 2480 MHz, 30MHz - 1GHz

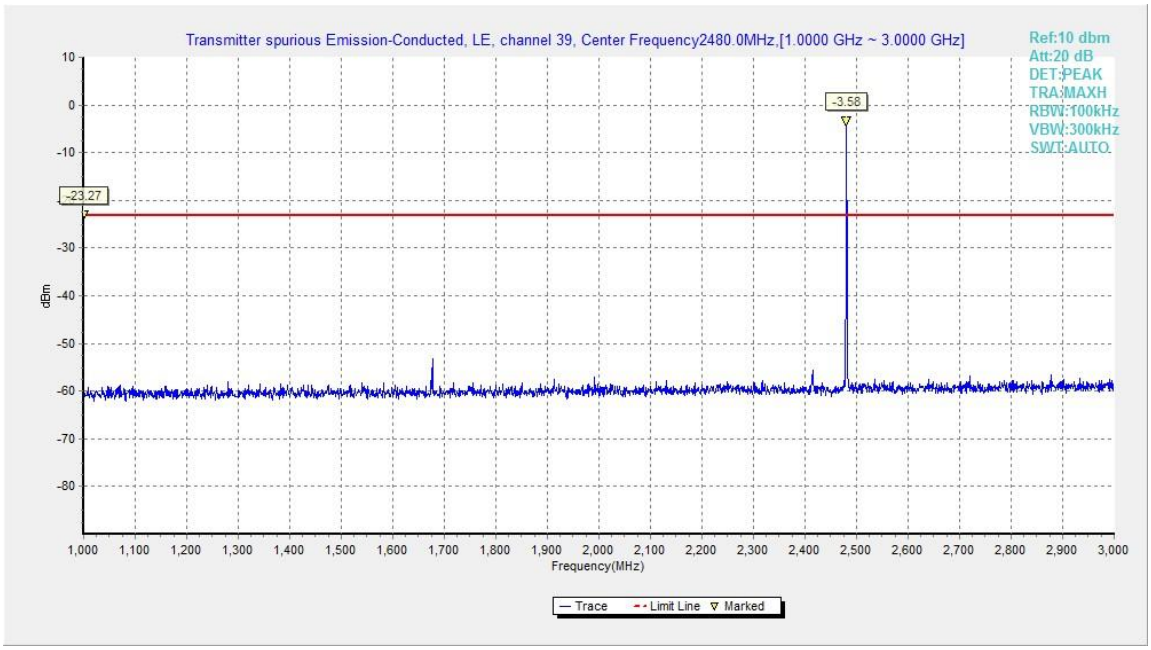

Fig.15. Transmitter Spurious Emission - Conducted: GFSK, 2480 MHz, 1GHz - 3GHz

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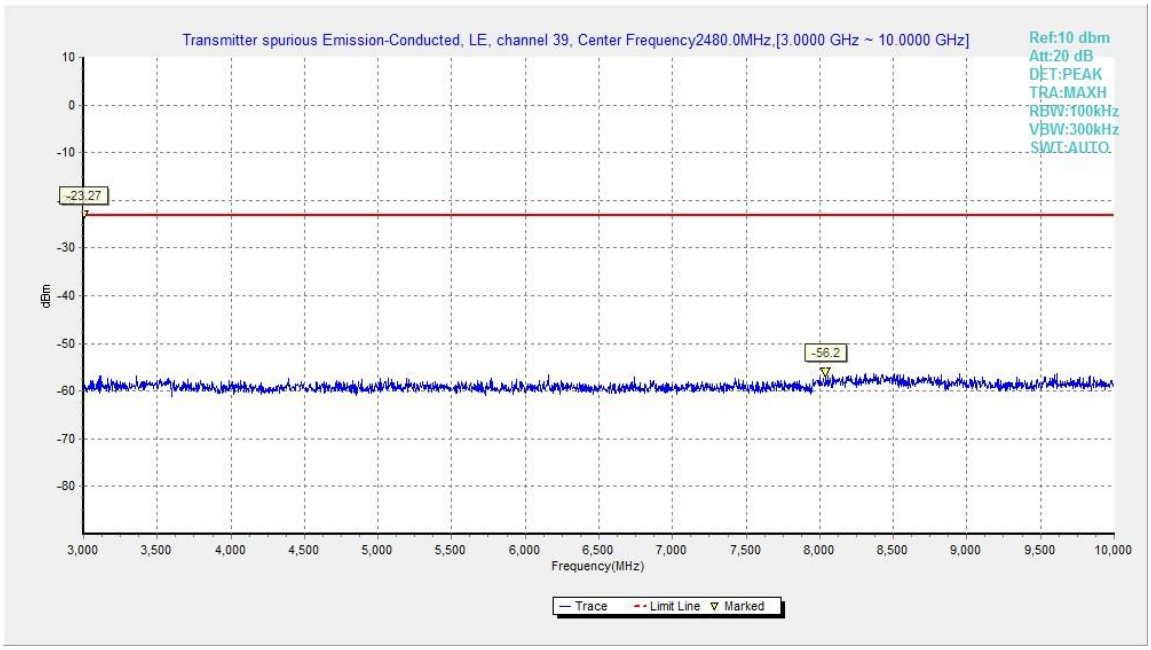

Fig.16. Transmitter Spurious Emission - Conducted: GFSK, 2480 MHz, 3GHz - 10GHz

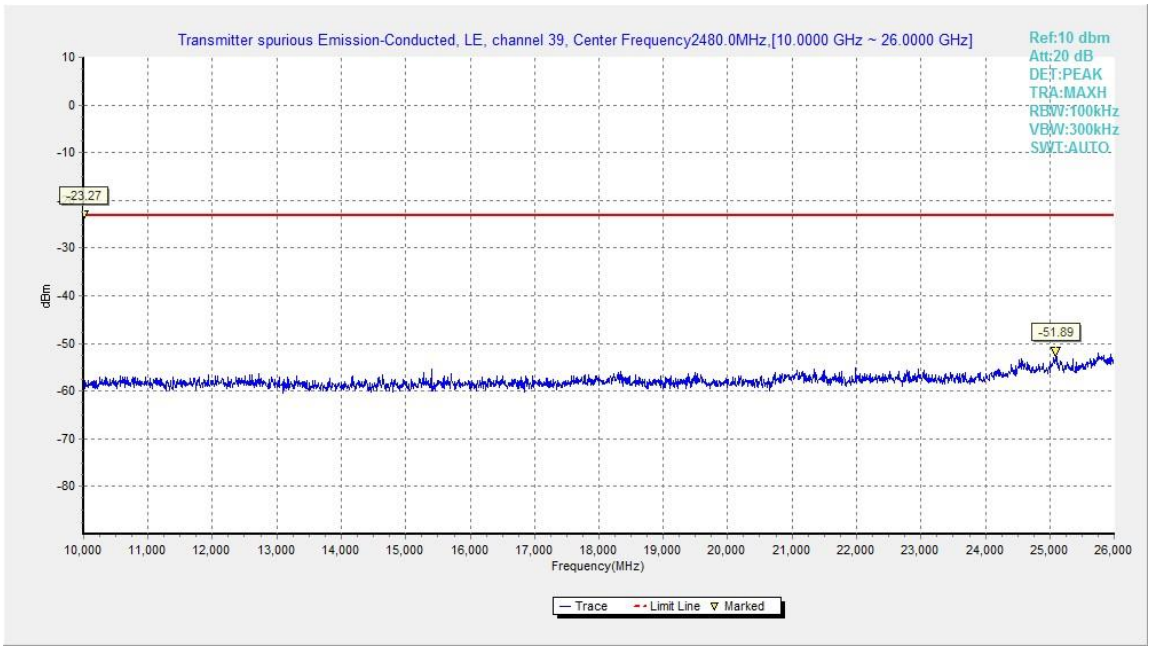

Fig.17. Transmitter Spurious Emission - Conducted: GFSK, 2480 MHz, 10GHz - 26GHz

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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/3MHz	15
4000-18000	1MHz/3MHz	40
18000-26500	1MHz/3MHz	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
Power	2.31GHz~2.4GHz---L	Fig.18	P
Power	2.45GHz~2.5GHz---H	Fig.19	P

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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)	Antenna Height (cm)	Turntable angle (deg)
2386.500	46.04	2.9	32.0	11.22	54.0	8.0	H	155	180
2390.000	46.03	2.9	32.0	11.20	54.0	8.0	H	155	200
4804.500	33.67	-35.0	34.1	34.62	54.0	20.3	H	155	225
7206.000	37.70	-32.4	35.8	34.29	54.0	16.3	H	155	202
9607.500	41.92	-29.7	36.7	34.87	54.0	12.1	H	155	245
12010.500	42.46	-30.5	38.9	34.06	54.0	11.5	H	155	268

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)	Antenna Height (cm)	Turntable angle (deg)
2434.375	46.14	2.9	32.0	11.27	54.0	7.9	H	155	20
2442.750	46.70	2.9	32.0	11.82	54.0	7.3	H	155	248
4882.500	33.26	-35.5	34.1	34.71	54.0	20.7	H	155	49
7323.000	38.81	-31.3	35.8	34.32	54.0	15.2	H	155	82
9763.500	40.21	-31.4	36.9	34.69	54.0	13.8	H	155	168
12205.500	44.26	-28.9	39.0	34.13	54.0	9.7	H	155	8

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)	Antenna Height (cm)	Turntable angle (deg)
2483.625	46.23	2.9	32.0	11.31	54.0	7.8	H	155	92
2485.375	46.20	2.9	32.0	11.28	54.0	7.8	H	155	115
4960.500	33.89	-34.9	34.1	34.67	54.0	20.1	H	155	135
7440.000	37.83	-32.2	35.8	34.21	54.0	16.2	H	155	168
9919.500	42.07	-29.6	37.1	34.61	54.0	11.9	H	155	184
12400.500	43.57	-30.0	39.1	34.54	54.0	10.4	H	155	202

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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)	Antenna Height (cm)	Turntable angle (deg)
2376.304	60.19	2.9	32.0	25.38	74.0	13.8	H	155	176
2386.454	60.18	2.9	32.0	25.36	74.0	13.8	H	155	198
4804.000	40.74	-35.0	34.1	41.68	74.0	33.3	H	155	220
7206.000	42.76	-32.4	35.8	39.35	74.0	31.2	H	155	198
9608.000	46.13	-29.7	36.7	39.06	74.0	27.9	V	155	242
12010.000	45.75	-30.5	38.9	37.34	74.0	28.3	H	155	264

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)	Antenna Height (cm)	Turntable angle (deg)
2341.800	47.16	-27.7	31.9	42.89	74.0	26.8	H	155	22
2526.800	47.63	-26.8	32.0	42.42	74.0	26.4	V	155	242
4882.000	40.58	-35.5	34.1	42.03	74.0	33.4	H	155	44
7323.000	43.70	-31.3	35.8	39.21	74.0	30.3	V	155	88
9764.000	44.59	-31.4	36.9	39.08	74.0	29.4	V	155	176
12205.000	46.84	-28.8	39.0	36.71	74.0	27.2	V	155	0

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)	Antenna Height (cm)	Turntable angle (deg)
2483.550	59.55	2.9	32.0	24.63	74.0	14.4	H	155	88
2484.010	60.24	2.9	32.0	25.31	74.0	13.8	H	155	110
4960.000	41.02	-34.9	34.1	41.81	74.0	33.0	V	155	132
7440.000	42.35	-32.2	35.8	38.72	74.0	31.7	V	155	154
9920.000	47.47	-29.7	37.1	40.03	74.0	26.5	H	155	176
7440.000	46.42	-32.2	35.8	42.80	74.0	27.6	V	155	198

Conclusion: PASS

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Test graphs as below:

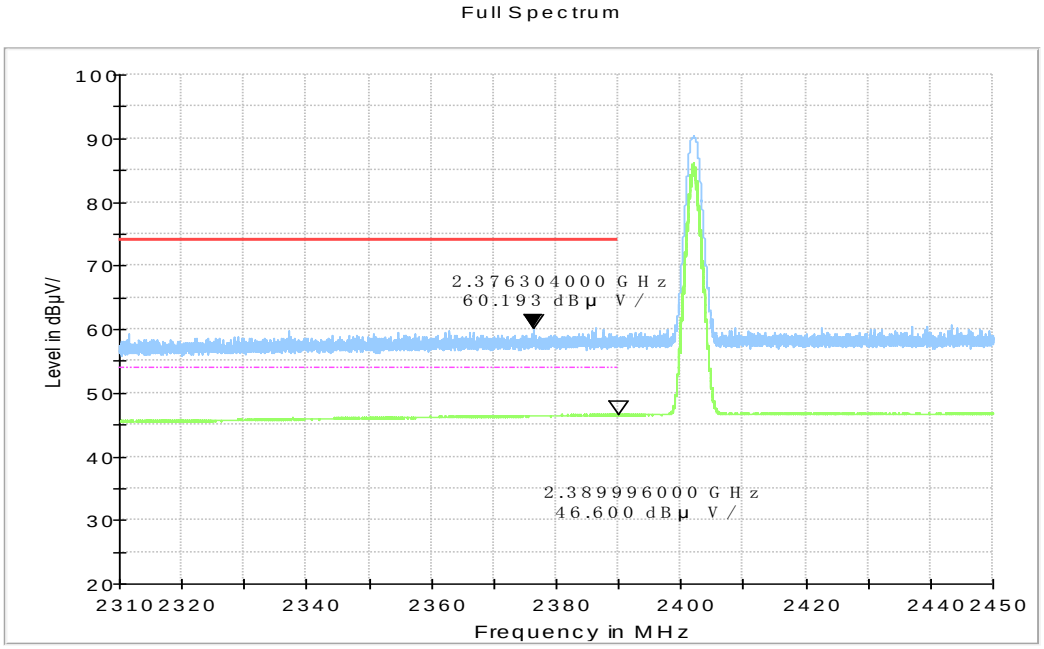

Fig.18. Transmitter Spurious Emission - Radiated (Power): GFSK low channel

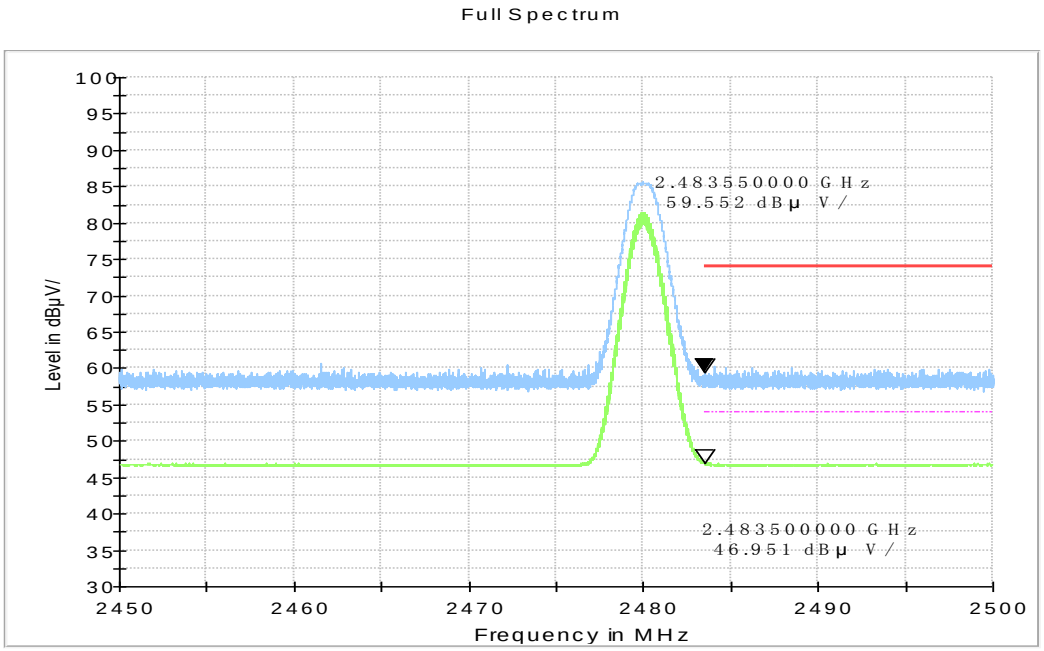

Fig.19. Transmitter Spurious Emission - Radiated (Power): GFSK high channel

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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	663.50	P
19	2440	Fig.21	659.00	P
39	2480	Fig.22	659.00	P

Conclusion: PASS

Test graphs as below:

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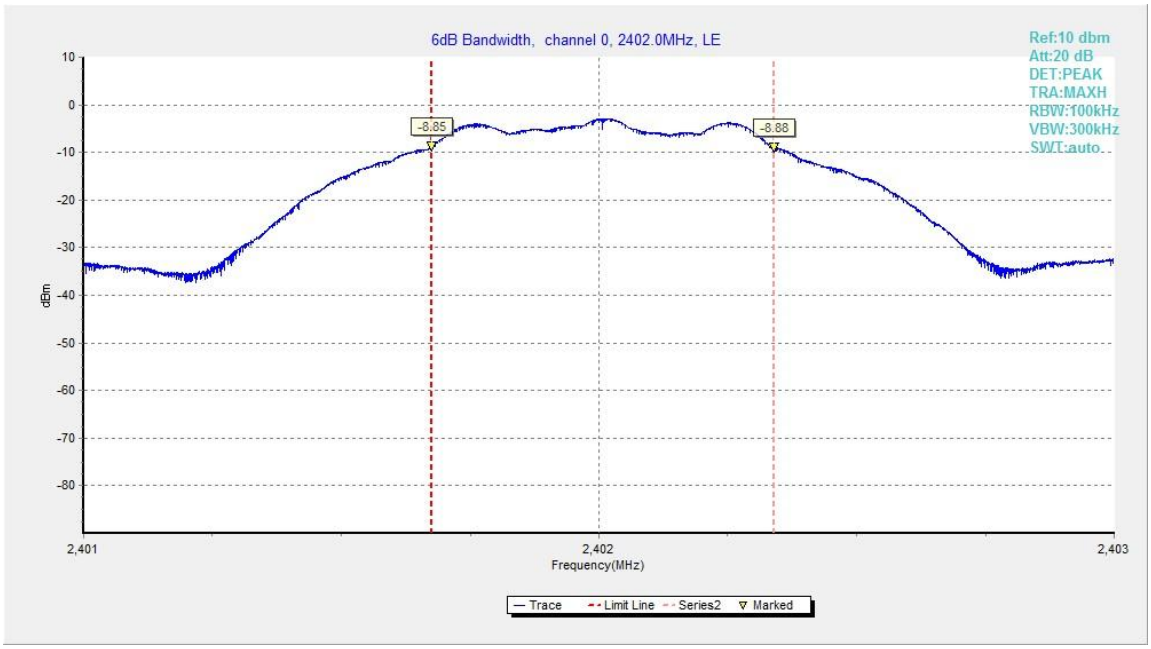

Fig.20. 6dB Bandwidth: GFSK, 2402 MHz

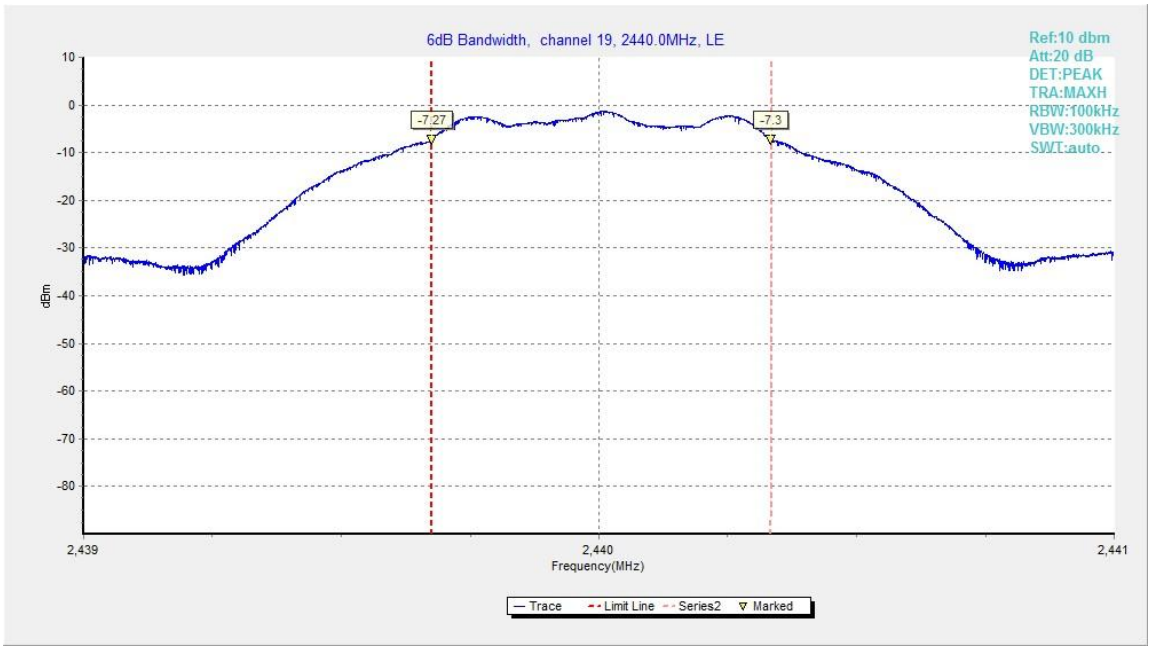

Fig.21. 6dB Bandwidth: GFSK, 2440 MHz

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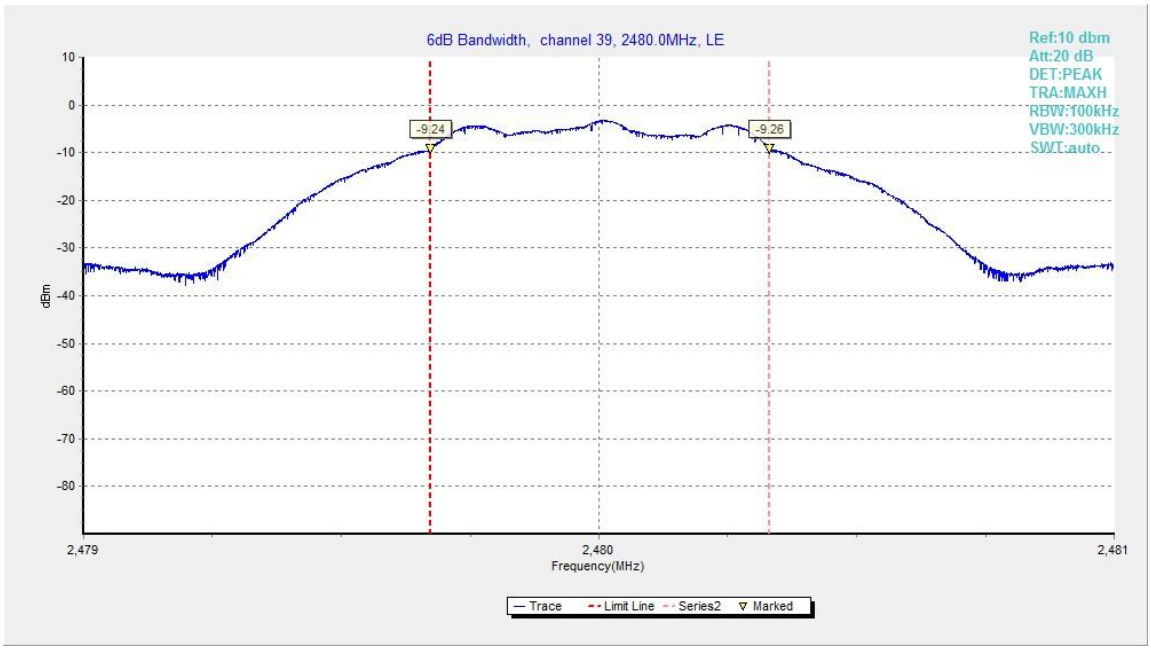

Fig.22. 6dB Bandwidth: GFSK, 2480 MHz

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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	-18.32	P
19	2440	Fig.24	-16.70	P
39	2480	Fig.25	-18.55	P

Test graphs as below:

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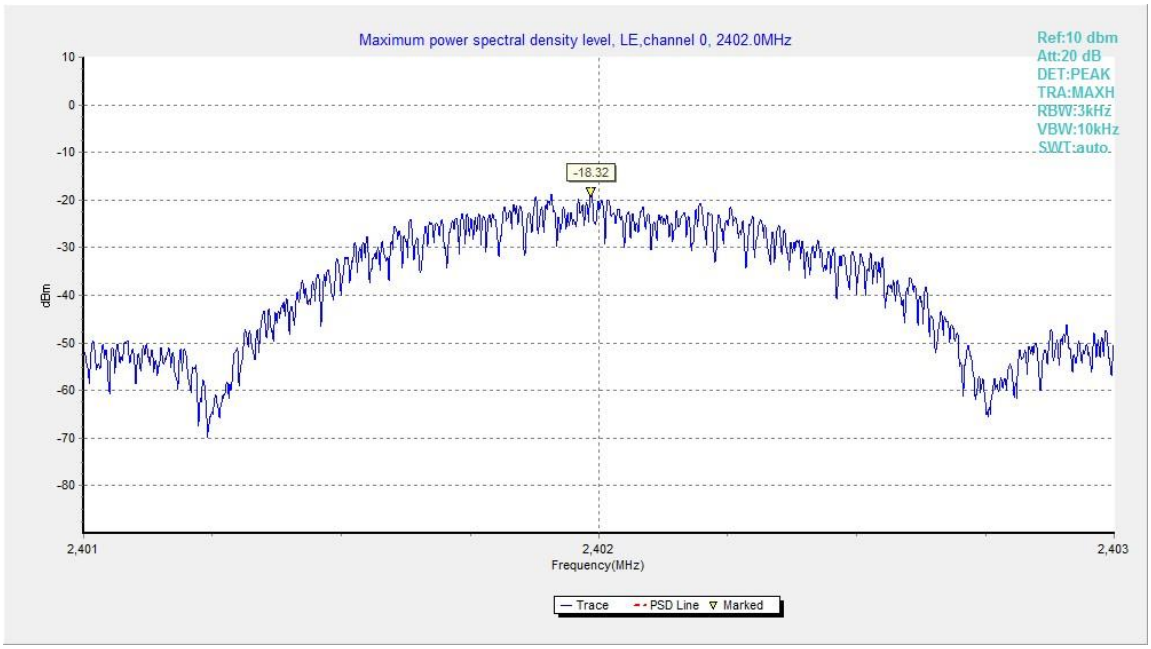

Fig.23. Maximum Power Spectral Density Level Function: GFSK, 2402 MHz

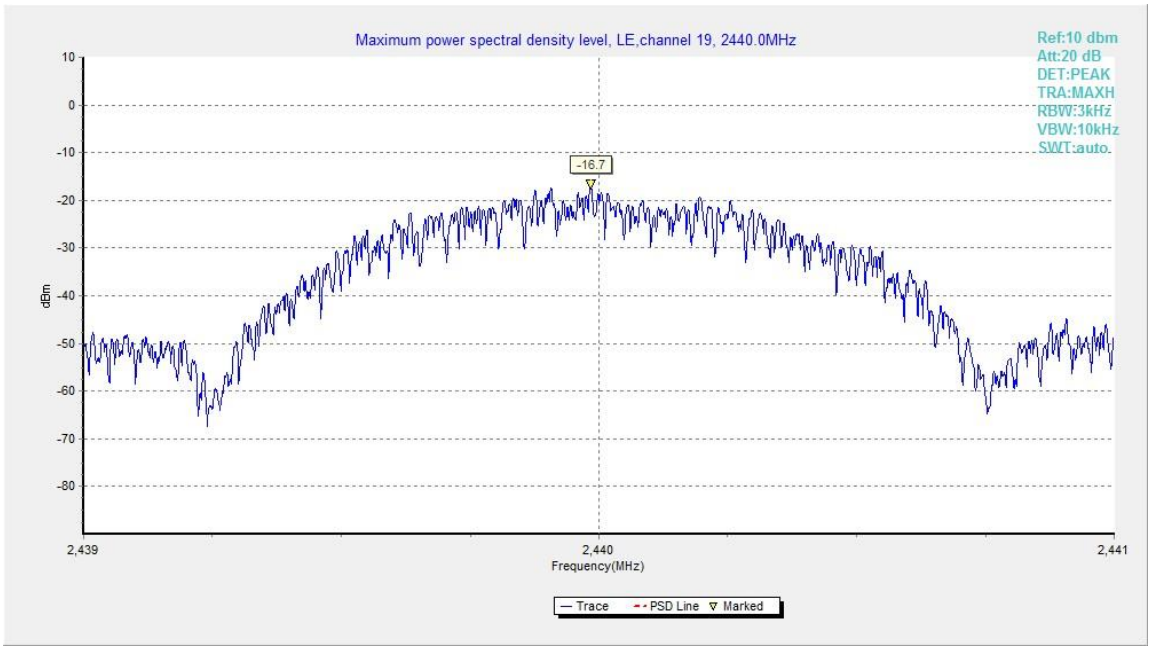

Fig.24. Maximum Power Spectral Density Level Function: GFSK, 2440 MHz

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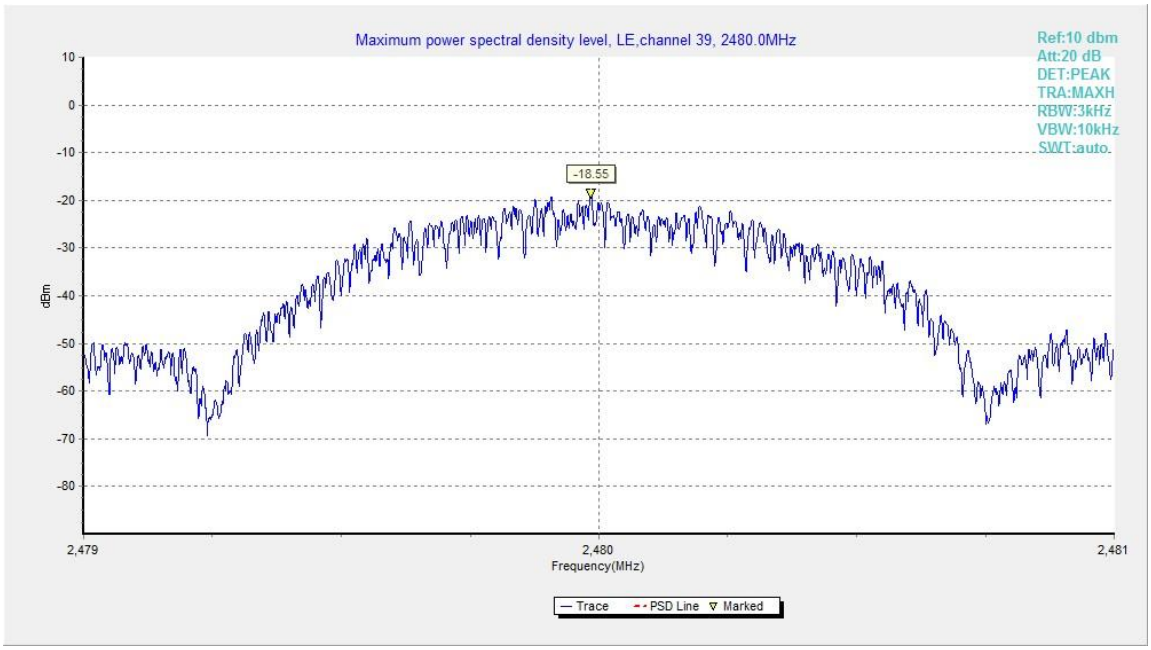

Fig.25. Maximum Power Spectral Density Level Function: GFSK, 2480 MHz

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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.		

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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:

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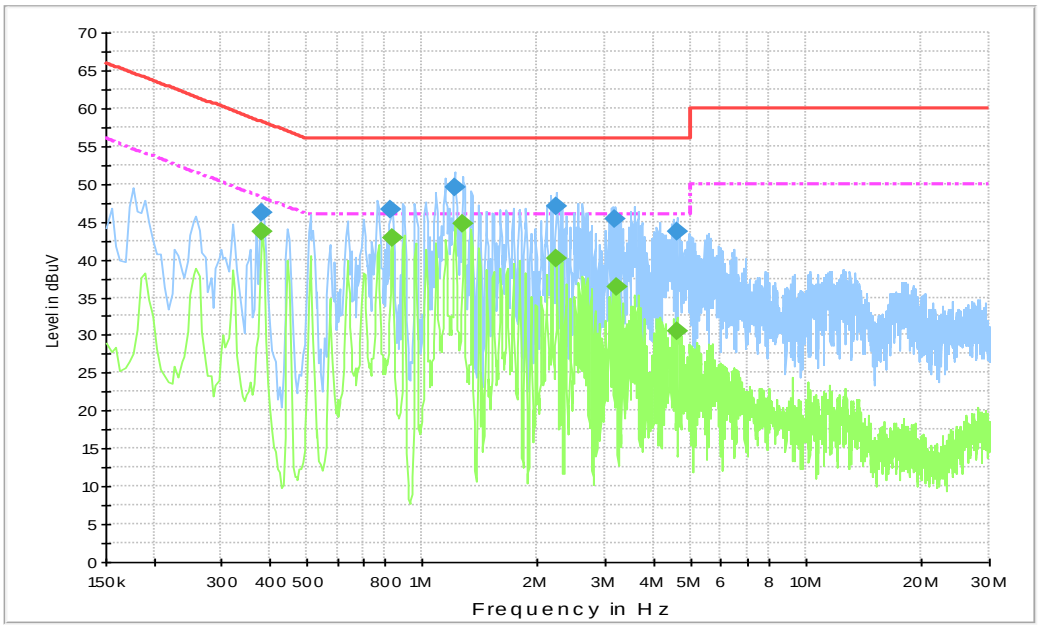
Traffic (With AE2):



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)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.384000	46.1	10000.0	9.000	On	N	20.0	12.1	58.2
0.829500	46.6	10000.0	9.000	On	N	19.9	9.4	56.0
1.212000	49.4	10000.0	9.000	On	N	19.8	6.6	56.0
2.233500	46.9	10000.0	9.000	On	N	19.8	9.1	56.0
3.192000	45.3	10000.0	9.000	On	N	19.8	10.7	56.0
4.596000	43.7	10000.0	9.000	On	N	19.8	12.3	56.0

Final Result 2

Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.384000	43.6	10000.0	9.000	On	N	20.0	4.6	48.2
0.834000	42.8	10000.0	9.000	On	N	19.9	3.2	46.0
1.279500	44.8	10000.0	9.000	On	N	19.8	1.2	46.0
2.238000	40.2	10000.0	9.000	On	N	19.8	5.8	46.0
3.196500	36.4	10000.0	9.000	On	N	19.8	9.6	46.0
4.591500	30.5	10000.0	9.000	On	N	19.8	15.5	46.0

Note: The measurement results showed here are worst cases of the combinations of different USB cables.

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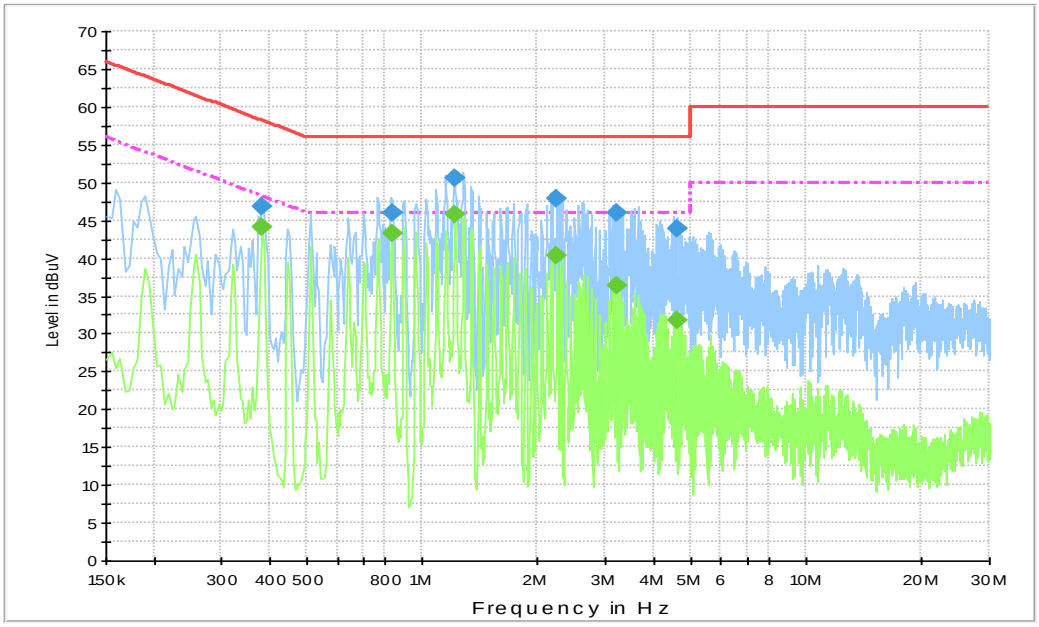
Idle (With AE2):



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)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.384000	46.8	10000.0	9.000	On	N	20.0	11.4	58.2
0.834000	45.9	10000.0	9.000	On	N	19.9	10.1	56.0
1.212000	50.6	10000.0	9.000	On	N	19.8	5.4	56.0
2.238000	47.7	10000.0	9.000	On	N	19.8	8.3	56.0
3.196500	45.9	10000.0	9.000	On	N	19.8	10.1	56.0
4.600500	43.9	10000.0	9.000	On	N	19.8	12.1	56.0

Final Result 2

Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.384000	44.2	10000.0	9.000	On	N	20.0	4.0	48.2
0.834000	43.4	10000.0	9.000	On	N	19.9	2.6	46.0
1.216500	45.8	10000.0	9.000	On	N	19.8	0.2	46.0
2.242500	40.4	10000.0	9.000	On	N	19.8	5.6	46.0
3.196500	36.4	10000.0	9.000	On	N	19.8	9.6	46.0
4.600500	31.8	10000.0	9.000	On	N	19.8	14.2	46.0

Note: The measurement results showed here are worst cases of the combinations of different USB cables.

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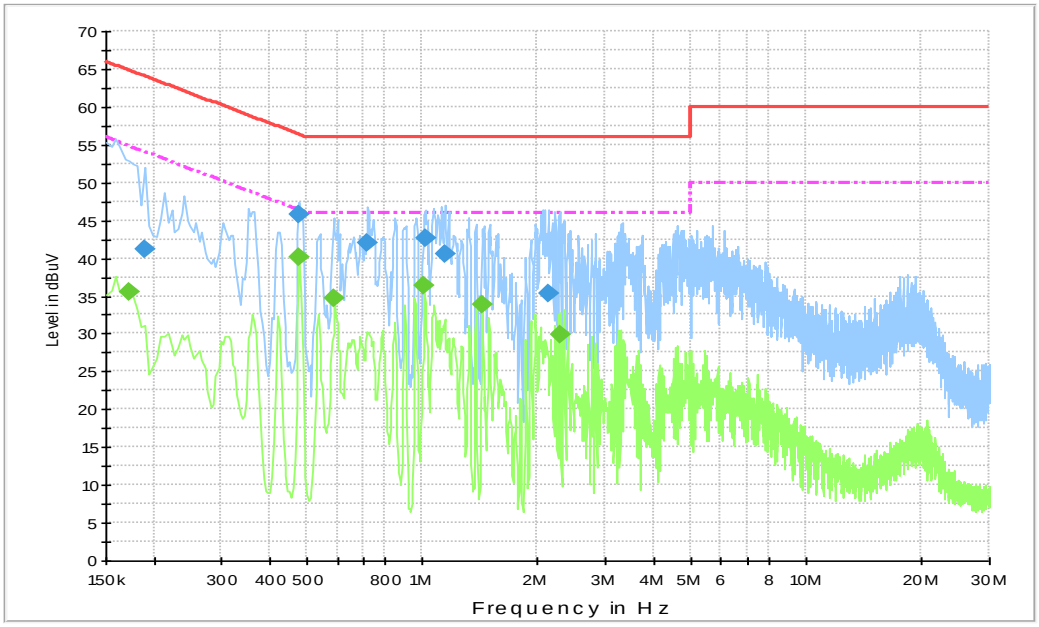
Traffic (With AE3):



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)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.190500	41.1	10000.0	9.000	On	N	21.5	22.9	64.0
0.478500	45.9	10000.0	9.000	On	L1	20.0	10.5	56.4
0.721500	41.9	10000.0	9.000	On	N	20.0	14.1	56.0
1.018500	42.7	10000.0	9.000	On	L1	19.8	13.3	56.0
1.149000	40.5	10000.0	9.000	On	N	19.8	15.5	56.0
2.130000	35.4	10000.0	9.000	On	L1	19.8	20.6	56.0

Final Result 2

Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.172500	35.5	10000.0	9.000	On	L1	24.6	19.4	54.8
0.478500	40.1	10000.0	9.000	On	L1	20.0	6.2	46.4
0.591000	34.6	10000.0	9.000	On	L1	20.0	11.4	46.0
1.014000	36.4	10000.0	9.000	On	L1	19.8	9.6	46.0
1.432500	33.9	10000.0	9.000	On	L1	19.8	12.1	46.0
2.278500	30.0	10000.0	9.000	On	L1	19.8	16.0	46.0

Note: The measurement results showed here are worst cases of the combinations of different USB cables.

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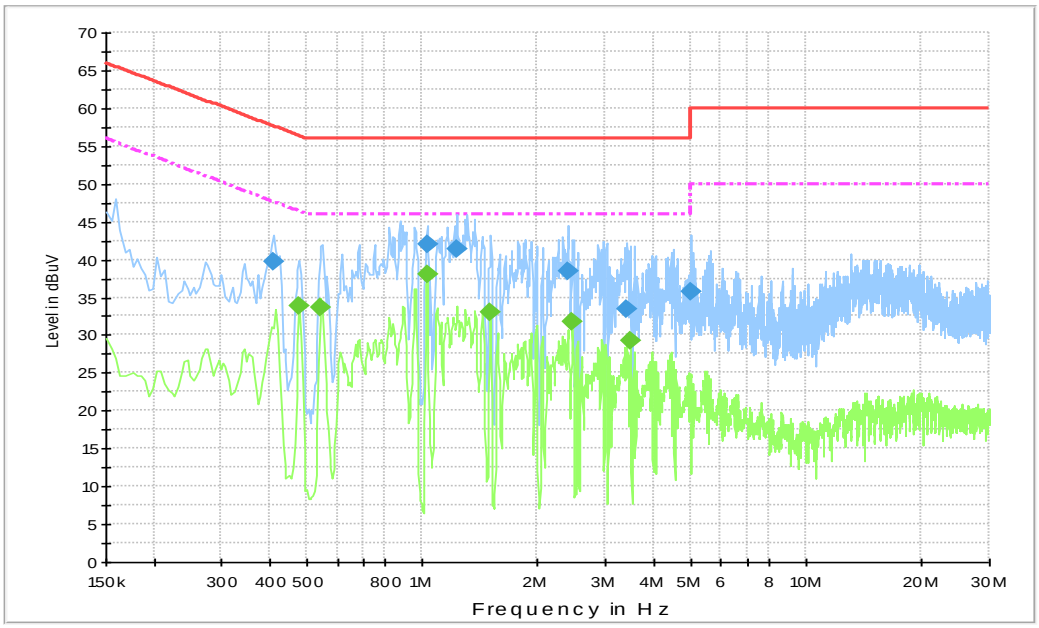
Traffic (With AE4):



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)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.411000	39.6	10000.0	9.000	On	L1	20.0	18.0	57.6
1.027500	42.1	10000.0	9.000	On	L1	19.9	13.9	56.0
1.230000	41.3	10000.0	9.000	On	L1	19.9	14.7	56.0
2.400000	38.4	10000.0	9.000	On	L1	19.8	17.6	56.0
3.394500	33.4	10000.0	9.000	On	L1	19.8	22.6	56.0
5.001000	35.7	10000.0	9.000	On	L1	19.8	24.3	60.0

Final Result 2

Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.478500	33.8	10000.0	9.000	On	L1	20.0	12.6	46.4
0.546000	33.7	10000.0	9.000	On	L1	20.0	12.3	46.0
1.027500	38.0	10000.0	9.000	On	L1	19.9	8.0	46.0
1.504500	33.1	10000.0	9.000	On	L1	19.8	12.9	46.0
2.463000	31.8	10000.0	9.000	On	L1	19.8	14.2	46.0
3.489000	29.2	10000.0	9.000	On	L1	19.8	16.8	46.0

Note: The measurement results showed here are worst cases of the combinations of different USB cables.

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ANNEX B: 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).

2019-09-26 through 2020-09-30
Effective Dates

DEPARTMENT OF COMMERCE * UNITED STATES OF AMERICA *

For the National Voluntary Laboratory Accreditation Program

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

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