FCC PART 15C
TEST REPORT

BLUETOOTH LOW ENERGY (BLE) PART

No. I21Z70555-IOT02

for

Samsung Electronics Co., Ltd.

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

Model Name: SM-A032F/DS，SM-A032F

FCC ID: ZCASMA032F

with

Hardware Version: REV1.0

Software Version: A032F.001

Issued Date: 2021-11-10

Note:

The test results in this test report relate only to the devices specified in this report.This report shall not be reproduced except in full without the written approval of CTTL.

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

Test Laboratory:

CTTL, Telecommunication Technology Labs, CAICT

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REPORT HISTORY

Report Number	Revision	Description	Issue Date
I21Z70555-IOT02	Rev.0	1st edition	2021-11-10

CONTENTS

1. Test Laboratory

1.1. Introduction &Accreditation

Telecommunication Technology Labs, CAICT is an ISO/IEC 17025:2017 accredited test laboratory under NATIONAL VOLUNTARY LABORATORY ACCREDITATION PROGRAM (NVLAP) with lab code 600118-0, and is also an FCC accredited test laboratory (CN5017), and ISED accredited test laboratory (ISED#: 24849). 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, 100176, P.R. China

1.3. Testing Environment

Normal Temperature: 15-35℃

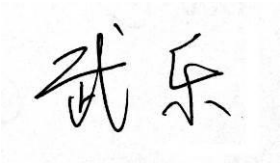
Relative Humidity: 20-75%

1.4. Project data

Testing Start Date: 2021-8-17

Testing End Date: 2021-11-10

1.5. Signature



Wu Le

(Prepared this test report)

Sun Zhenyu

(Reviewed this test report)

Zhu Liang

(Approved this test report)

2. Client Information

2.1. Applicant Information

Company Name:	Samsung Electronics Co., Ltd.
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Contact:	Jenni Chun
Email:	j1.chun@samsung.com
Tel.:	+1-201-937-4203
Fax:	/

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:	조성훈 (Sunghoon Cho)
Email:	ggobi.cho@samsung.com
Tel.:	+82-10-2722-4159
Fax:	/

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	SM-A032F/DS，SM-A032F
FCC ID	ZCASMA032F
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	-1.67dBi

3.2. Internal Identification of EUT

EUT ID*	SN or IMEI	HW Version	SW Version	Date of receipt
UT07a	/	REV1.0	A032F.001	/
UT09a(SM-A032F/DS)	I21Z70555UT09a	REV1.0	A032F.001	2021-8-17

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

3.3. Internal Identification of AE

AE ID*	Description		
AE1-1	Adapter1	/	/
AE1-2	Adapter2	/	/
AE1-3	Adapter3	/	/
AE2-1	Adapter4	/	/
AE2-2	Adapter5	/	/
AE2-3	Adapter6	/	/
AE2-4	Adapter7	/	/
AE2-5	Adapter8	/	/
AE3-1	Adapter9	/	/
AE3-2	Adapter10	/	/
AE3-3	Adapter11	/	/
AE3-4	Adapter12	/	/
AE3-11	Adapter13	/	/
AE4-1	Adapter14	/	/
AE4-4	Adapter15	/	/
AE5-1	USB Cable1	/	/
AE5-2	USB Cable2	/	/
AE5-3	USB Cable3	/	/
AE6	Headset1	/	/

AE7	Headset2	/	/
AE8	Battery	/	Inbuilt

AE1-1
- Model: EP-TA50EWE
- Manufacturer: RFTECH Co., Ltd.
- Length of cable: /

AE1-2
- Model: EP-TA50JWS
- Manufacturer: RFTECH Co., Ltd.
- Length of cable: /

AE1-3
- Model: EP-TA50JWE
- Manufacturer: RFTECH Co., Ltd.
- Length of cable: /

AE2-1
- Model: EP-TA50EWE
- Manufacturer: DONGYANG E&P Inc.
- Length of cable: /

AE2-2
- Model: EP-TA50JWS
- Manufacturer: DONGYANG E&P Inc.
- Length of cable: /

AE2-3
- Model: EP-TA50JWE
- Manufacturer: DONGYANG E&P Inc.
- Length of cable: /

AE2-4
- Model: EP-TA50UWE
- Manufacturer: DONGYANG E&P Inc.
- Length of cable: /

AE2-5
- Model: EP-TA50RWS
- Manufacturer: DONGYANG E&P Inc.
- Length of cable: /

AE3-1
- Model: EP-TA50EWE
- Manufacturer: HAEM Co.,Ltd
- Length of cable: /

AE3-2
- Model: EP-TA50JWS
- Manufacturer: HAEM Co.,Ltd
- Length of cable: /

AE3-3

Model	EP-TA50JWE
Manufacturer	HAEM Co.,Ltd
Length of cable	/
AE3-4	
Model	EP-TA50UWE
Manufacturer	HAEM Co.,Ltd
Length of cable	/
AE3-11	
Model	EP-TA50EWE
Manufacturer	HAEM Co.,Ltd
Length of cable	/
AE4-1	
Model	EP-TA50EWE
Manufacturer	Salcomp (Shenzhen) Co., Ltd.
Length of cable	/
AE4-4	
Model	EP-TA50UWE
Manufacturer	Salcomp (Shenzhen) Co., Ltd.
Length of cable	/
AE5-1	
Model	ECB-DU68WE(GH39-02004A)
Manufacturer	CRESYN HANOI Co., Ltd
Length	/
AE5-2	
Model	ECB-DU68WE(GH39-02004A)/ ECB-DU68WZ(GH39-02005A) / ECB-DU68WE(GH39-02004B)
Manufacturer	DONGGUAN KSD CO.,LTD
Length	/
AE5-3	
Model	ECB-DU68WE(GH39-02004A)/ ECB-DU68WZ(GH39-02005A) / ECB-DU68WE(GH39-02004B
Manufacturer	RFTECH Co., Ltd.
Length	/
AE6	
Model	GH59-15054A/ GH59-15071A
Manufacturer	DONGGUAN YOUNGBO ELECTRONICS CO.,LTD
Length	/
AE7	
Model	GH59-15054A/ GH59-15071A
Manufacturer	CRESYN HANOI Co., Ltd
Length	/
AE8	

TYPE	Secondary Li-ion Battery
SN	SLC-50
Manufacturer	Ningde Amperex Technology Limited

*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.

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; 15.247 Operation within the bands 902–928MHz, 2400–2483.5 MHz, and 5725–5850 MHz.	2019
ANSI C63.10	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices	June,2013

5. Test Results

5.1. Summary of Test Results

Abbreviations used in this clause:

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

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

NA Not Applicable, The test was not applicable

NP Not Performed, The test was not performed by CTTL

R Re-use test data from basic model report.

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

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

The measurement is made according to ANSI C63.10.

5.2. Statements

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

5.3. Explanation of re-use of test data

The Equipment Under Test (EUT) model SM-A032F/DS and SM-A032F (FCC ID: ZCASMA032F) are variant products of SM-A032M/DS (FCC ID: ZCASMA032M), according to the declaration of changes provided by the applicant and FCC KDB publication 484596 D01, spot check measurements(Peak Output Power-Conducted) were performed on this device, other test results are derived from test report No. I21Z70411-IOT04. Please refer Annex A for detail spot check verification data and reference data. the spot check test results are consistent with basic model. For detail differences between two models please refer the Declaration of Changes document.

6. Test Facilities Utilized

Conducted test system

No.	Equipment	Model	Serial Number	Manufacturer	Calibration Period	Calibration Due date
1	Vector Signal Analyzer	FSQ26	100024	Rohde & Schwarz	1 year	2022-03-25
2	LISN	ENV216	101459	R&S	1 year	2022-03-16
3	Test Receiver	ESCI	100766	R&S	1 year	2022-03-09
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	100235	R&S	1 year	2022-02-23
2	EMI Antenna	VULB9163	9163-482	Schwarzbeck	1 year	2021-11-04
3	EMI Antenna	LB-180-NF	203001300041	A-INFO	1 year	2022-02-28
4	EMI Antenna	LB-180400-25-C-KF	211008400006	A-INFO	1 year	2022-02-28
5	Analytical Spectrometer	FSV40	101047	R&S	1 year	2022-06-02

Note: The test dates were before the calibration due dates of equipment used (the EMI Antenna which series number is 9163-482)

7. Measurement Uncertainty

7.1. Peak Output Power - Conducted

Measurement Uncertainty:

Measurement Uncertainty (k=2)	0.66dB

7.2. Frequency Band Edges - Conducted

Measurement Uncertainty:

Measurement Uncertainty (k=2)	0.66dB

7.3. Frequency Band Edges - Radiated

Measurement Uncertainty:

Measurement Uncertainty (k=2)	/

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	/
30MHz ≤ f ≤ 1GHz	5.16
1GHz ≤ f ≤18GHz	5.44
18GHz ≤ f ≤40GHz	5.28

7.6. 6dB Bandwidth

Measurement Uncertainty:

Measurement Uncertainty (k=2)	61.936Hz

7.7. Maximum Power Spectral Density Level

Measurement Uncertainty:

Measurement Uncertainty (k=2)	0.66dB

7.8. AC Powerline Conducted Emission

Measurement Uncertainty:

Measurement Uncertainty (k=2)	3.08dB

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.

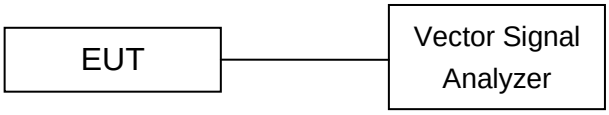
2). Set the EUT to the required work mode (Transmitter, receiver or transmitter & receiver).

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

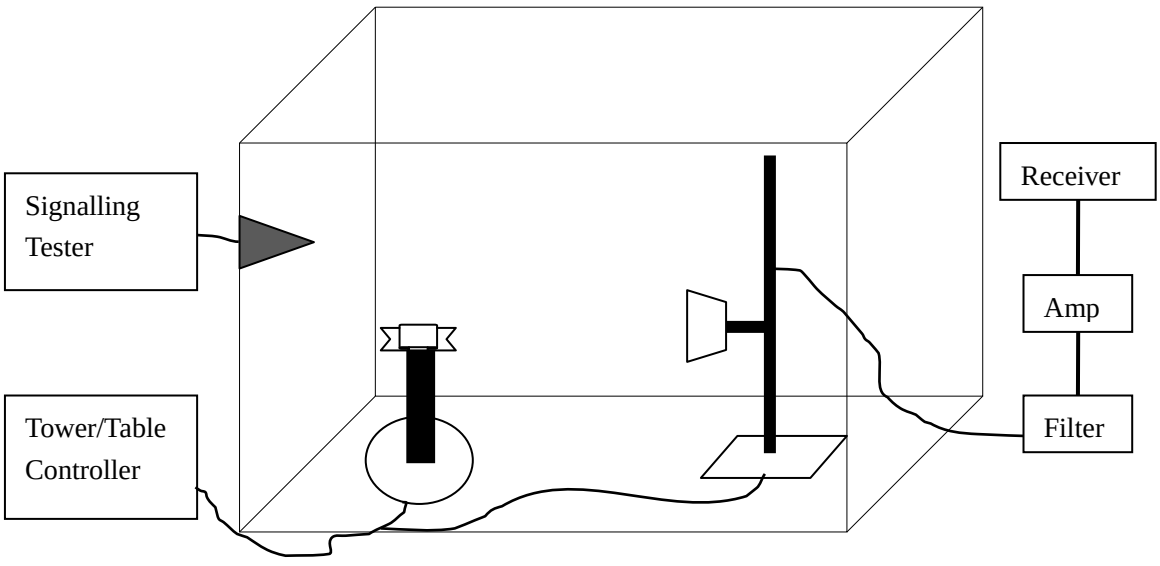
The measurement is made according to ANSI C63.10.

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.

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

Spot check Measurement Results:

For GFSK

Channel No.	Frequency (MHz)	Peak Conducted Output Power (dBm)	Conclusion
0	2402	3.48	P
19	2440	4.13	P
39	2480	4.06	P

Conclusion: PASS

Reference Measurement Results from basic model:

For GFSK

Channel No.	Frequency (MHz)	Peak Conducted Output Power (dBm)	Conclusion
0	2402	3.35	P
19	2440	3.77	P
39	2480	4.55	P

Conclusion: PASS

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

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

Antenna gain = -1.67dBi

Spot check Measurement Results:

For GFSK

Channel No.	Frequency (MHz)	E.I.R.P. (dBm)	Conclusion
0	2402	1.68	P
19	2440	2.10	P
39	2480	2.88	P

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

Conclusion: PASS

Reference Measurement Results from basic model:

For GFSK

Channel No.	Frequency (MHz)	E.I.R.P. (dBm)	Conclusion
0	2402	1.81	P
19	2440	2.46	P
39	2480	2.39	P

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

Conclusion: PASS

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.1	-57.61	P
39	2480	Hopping OFF	Fig.2	-59.17	P

Conclusion: PASS

Test graphs as below

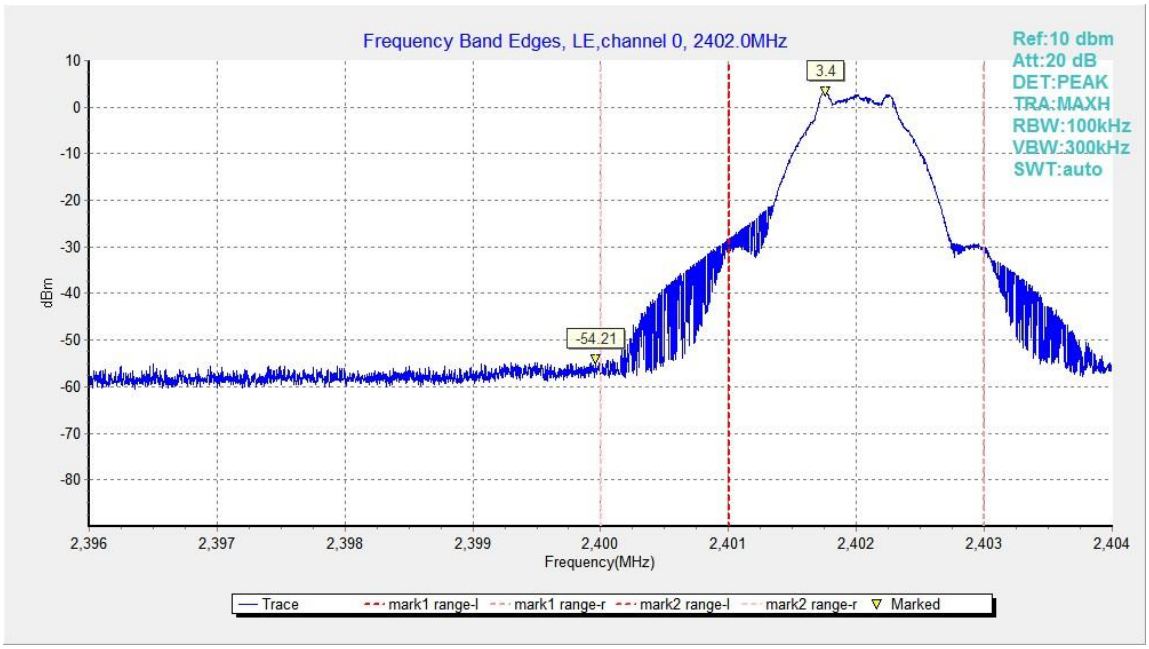


Fig.1. Frequency Band Edges: GFSK, 2402 MHz**,** Hopping Off

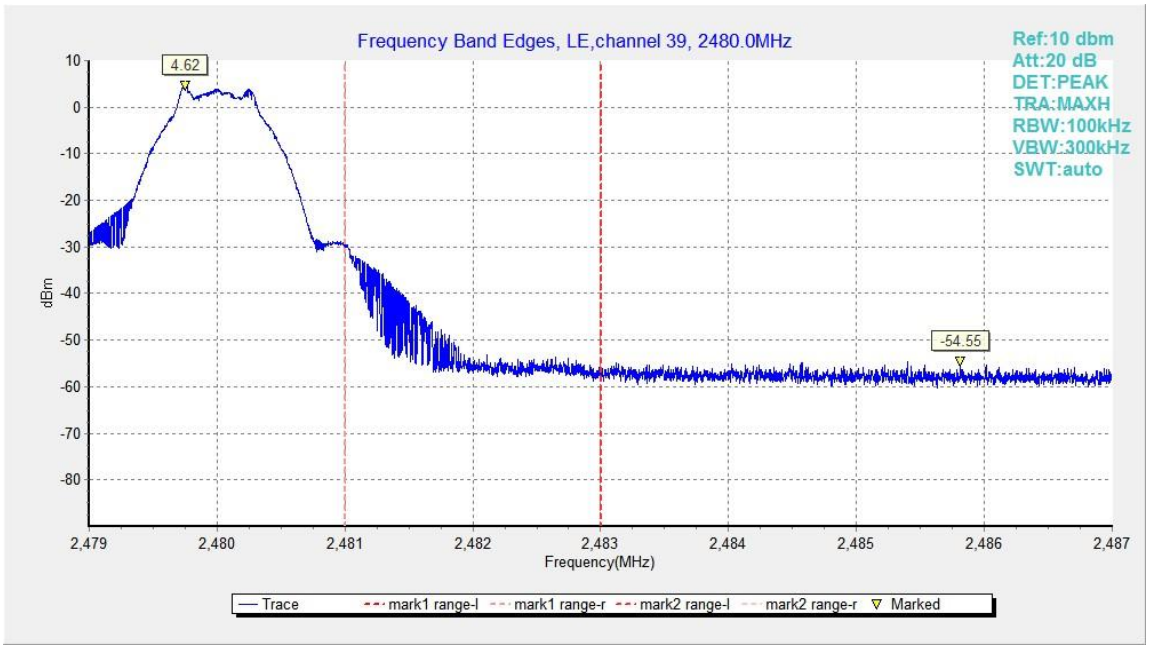


Fig.2. Frequency Band Edges: GFSK, 2480 MHz, Hopping Off

B.4. Frequency Band Edges –Radiated

Method of Measurement: See ANSI C63.10-2013-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 and the table height shall be 1.5 m.

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

Measurement Results:

EUT ID: UT07a

Mode	Channel	Frequency Range	Test Results	Conclusion
GFSK	0	2.31GHz ~2.45GHz	Fig.3	P
	39	2.45GHz ~2.5GHz	Fig.4	P

Conclusion: PASS

Test graphs as below

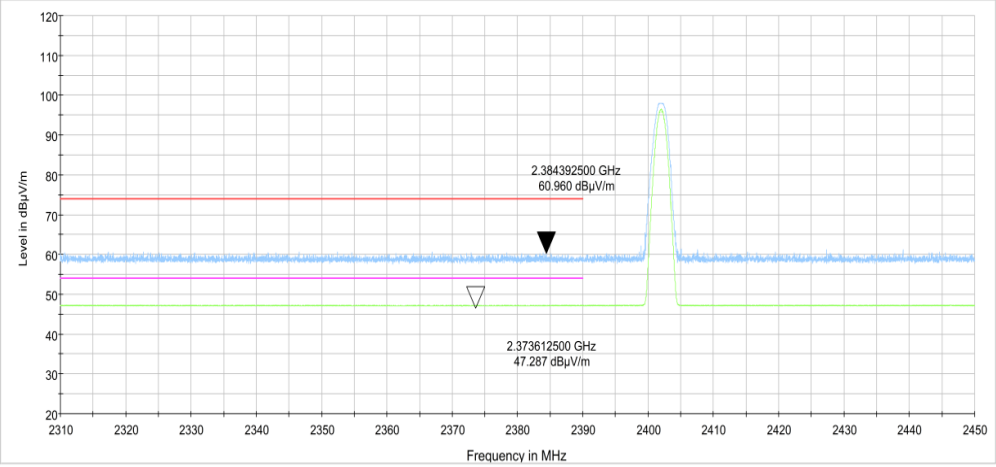


Fig.3. Frequency Band Edges: GFSK, 2402 MHz, 2.31 GHz – 2.45GHz

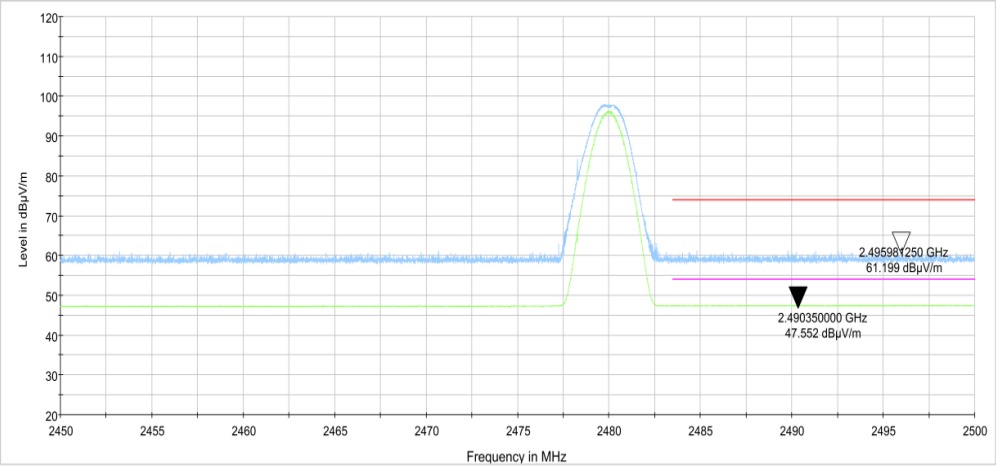


Fig.4. Frequency Band Edges: GFSK, 2480 MHz, 2.45 GHz - 2.50GHz

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 ≥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.5	P
		30 MHz ~ 1 GHz	Fig.6	P
		1 GHz ~ 3 GHz	Fig.7	P
		3 GHz ~ 10 GHz	Fig.8	P
		10GHz ~ 26 GHz	Fig.9	P
19	2440	Center Frequency	Fig.10	P
		30 MHz ~ 1 GHz	Fig.11	P
		1 GHz ~ 3 GHz	Fig.12	P
		3 GHz ~ 10 GHz	Fig.13	P
		10GHz ~ 26 GHz	Fig.14	P
39	2480	Center Frequency	Fig.15	P
		30 MHz ~ 1 GHz	Fig.16	P
		1 GHz ~ 3GHz	Fig.17	P
		3 GHz ~ 10 GHz	Fig.18	P
		10 GHz ~ 26 GHz	Fig.19	P

Conclusion: PASS

Test graphs as below

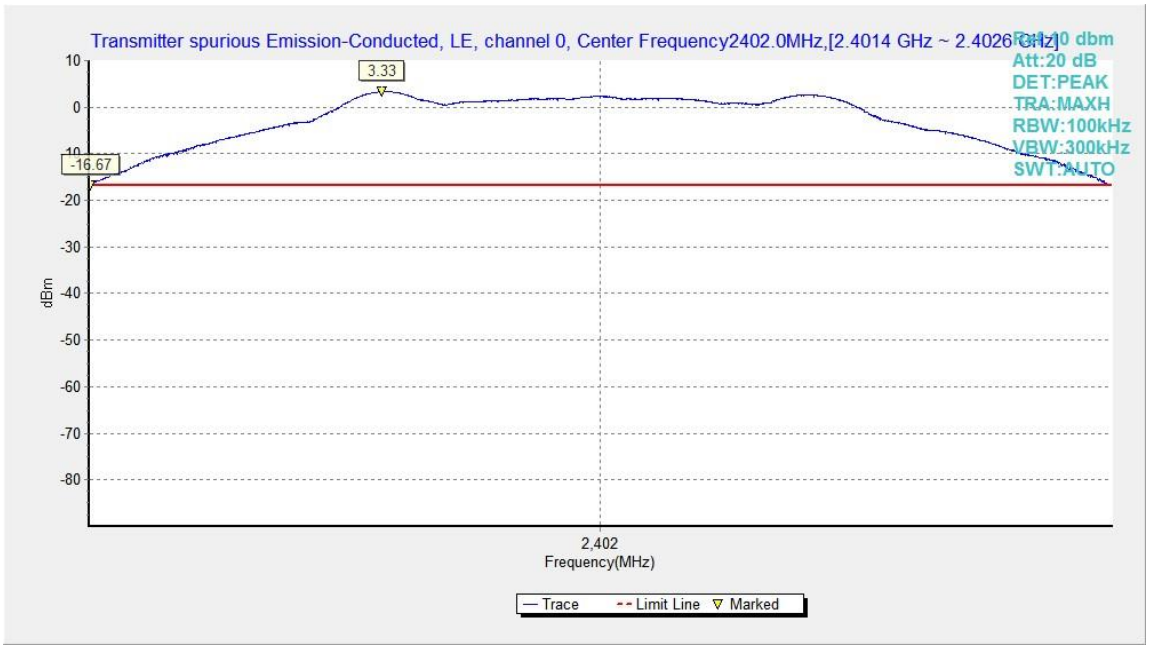


Fig.5. Transmitter Spurious Emission - Conducted: GFSK,2402MHz

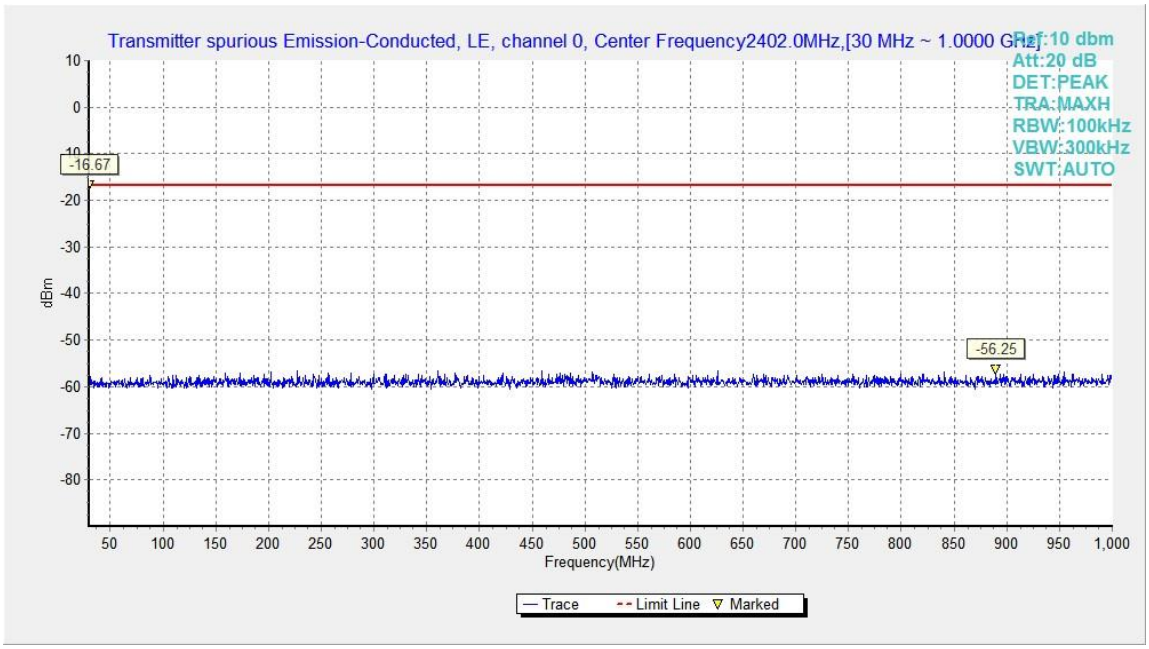


Fig.6. Transmitter Spurious Emission - Conducted: GFSK, 2402 MHz, 30MHz - 1GHz

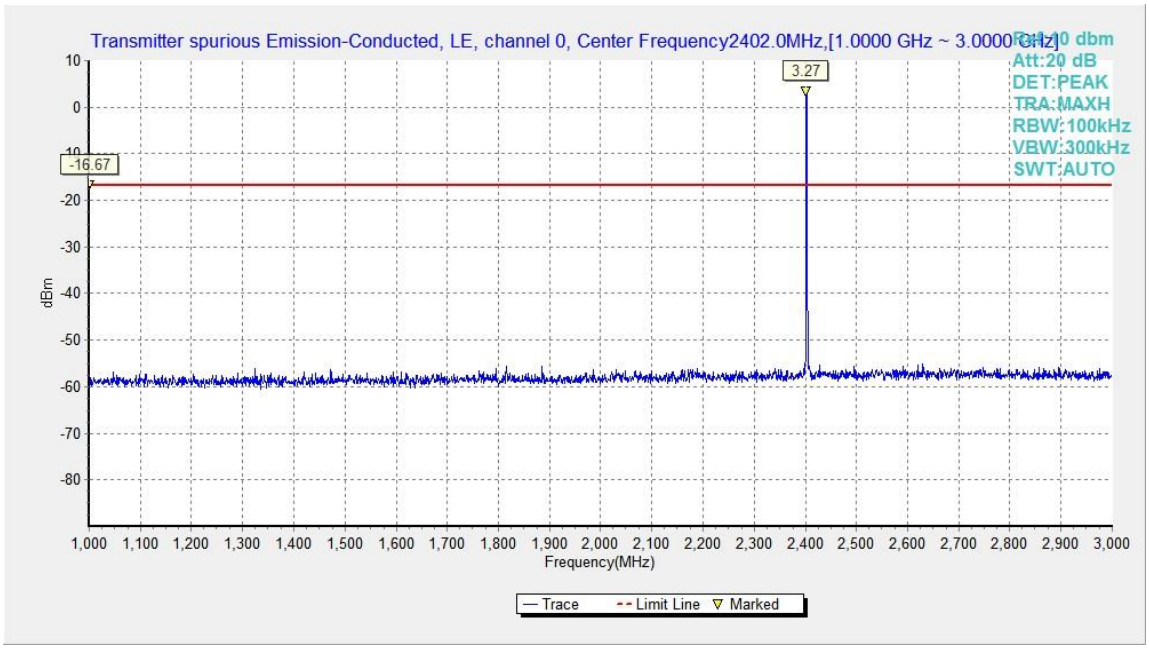


Fig.7. Transmitter Spurious Emission - Conducted: GFSK, 2402 MHz,1GHz - 3GHz

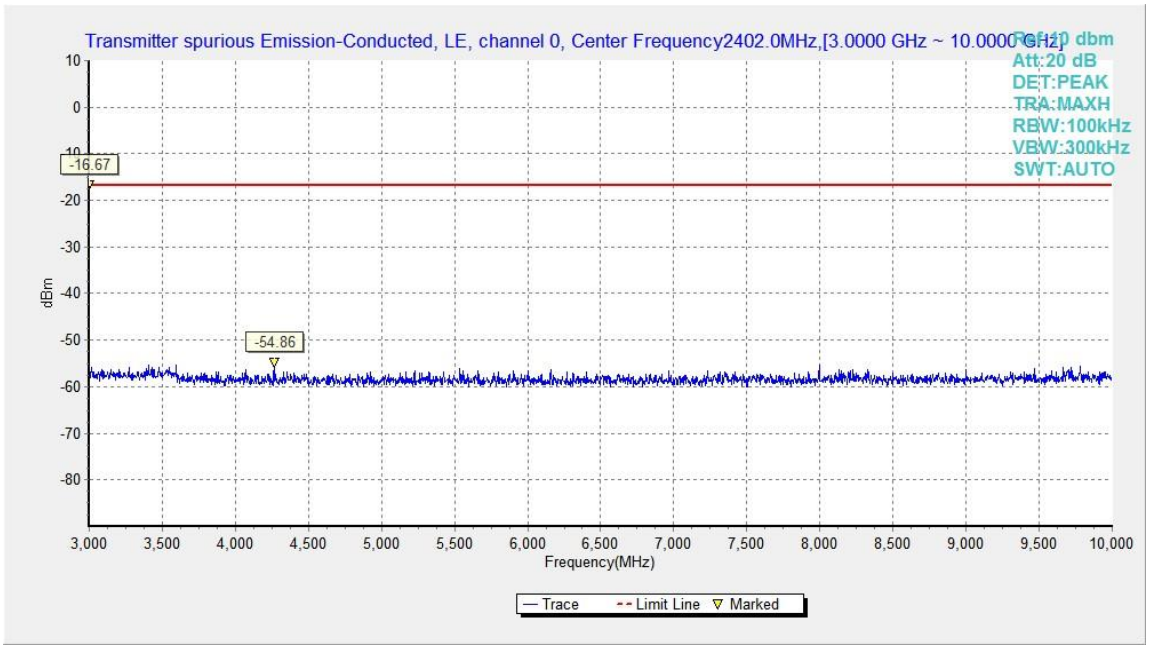


Fig.8. Transmitter Spurious Emission - Conducted: GFSK, 2402 MHz,3GHz - 10GHz

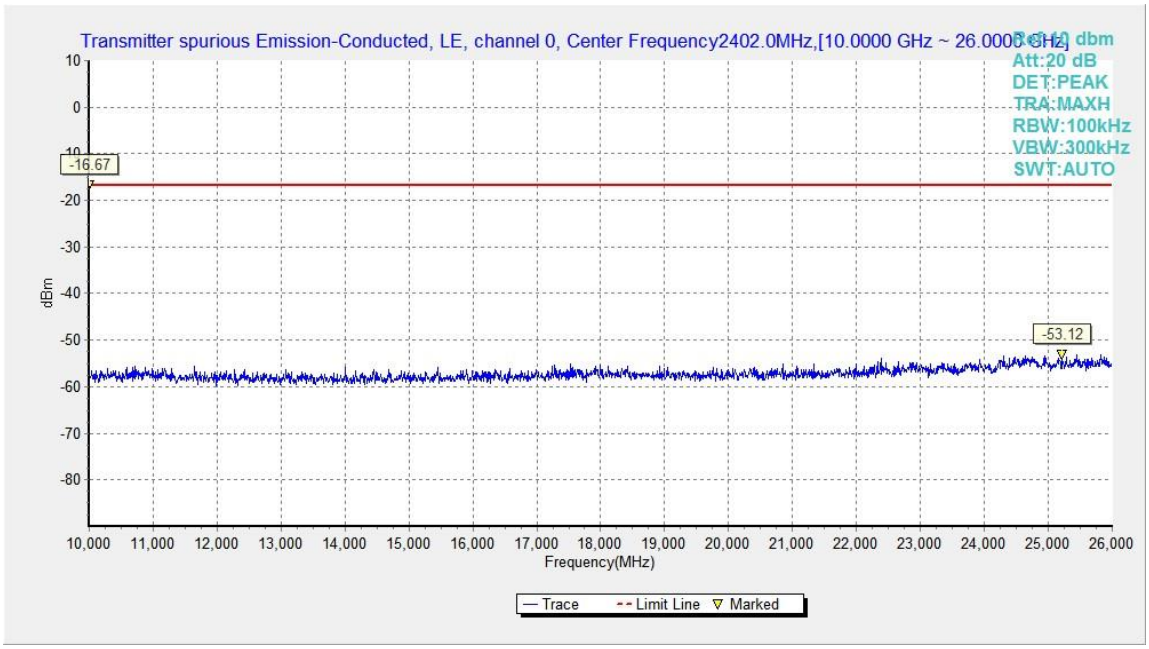


Fig.9. Transmitter Spurious Emission - Conducted: GFSK, 2402 MHz,10GHz - 26GHz

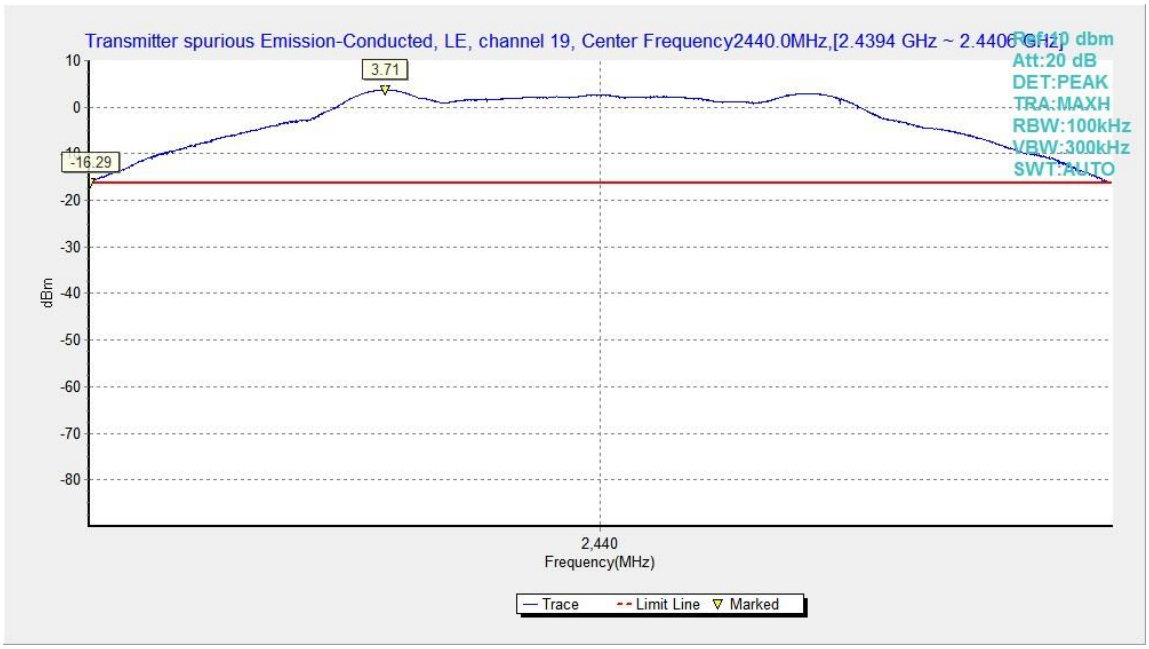


Fig.10. Transmitter Spurious Emission - Conducted: GFSK, 2440MHz

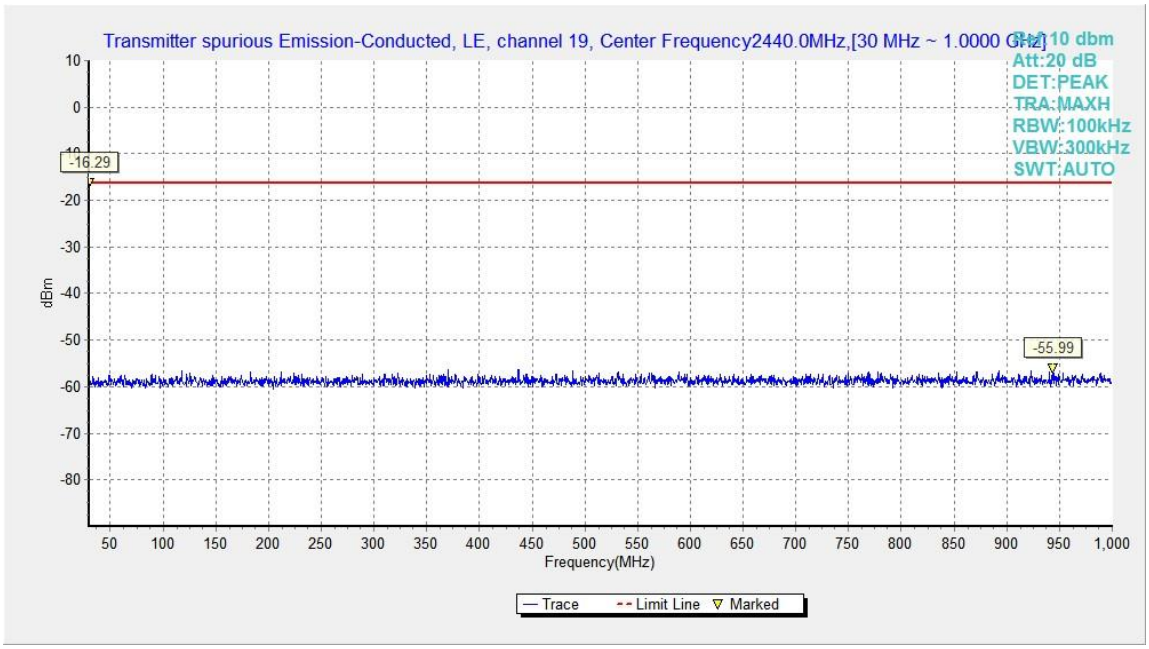


Fig.11. Transmitter Spurious Emission - Conducted: GFSK, 2440 MHz, 30MHz - 1GHz

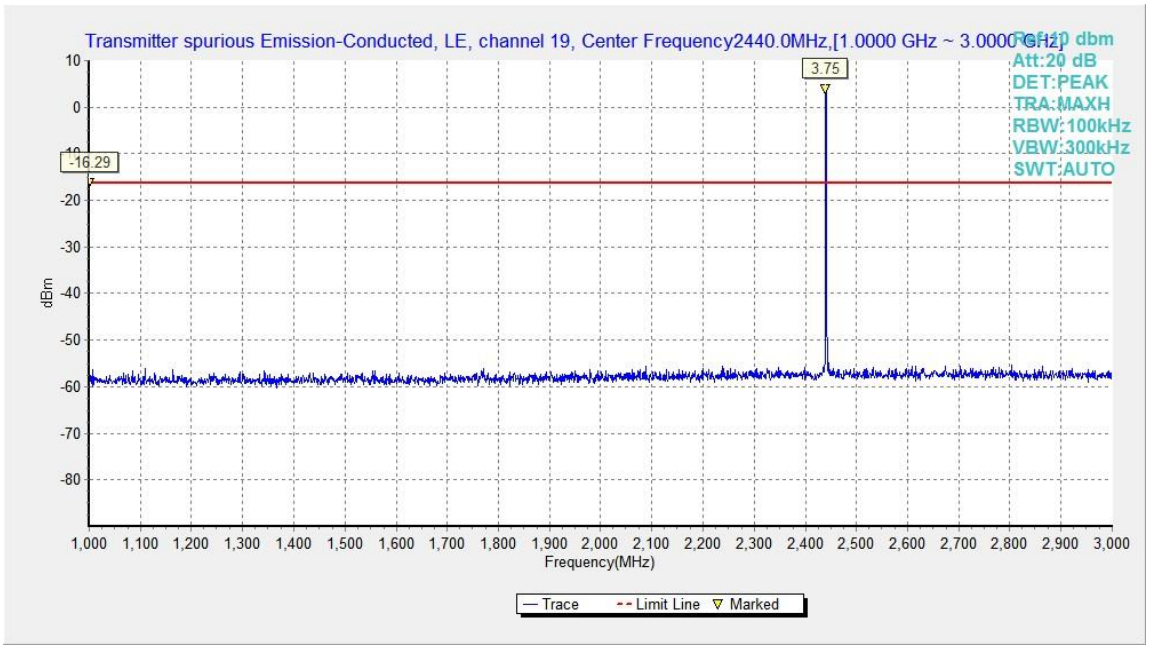


Fig.12. Transmitter Spurious Emission - Conducted: GFSK, 2440 MHz, 1GHz – 3GHz

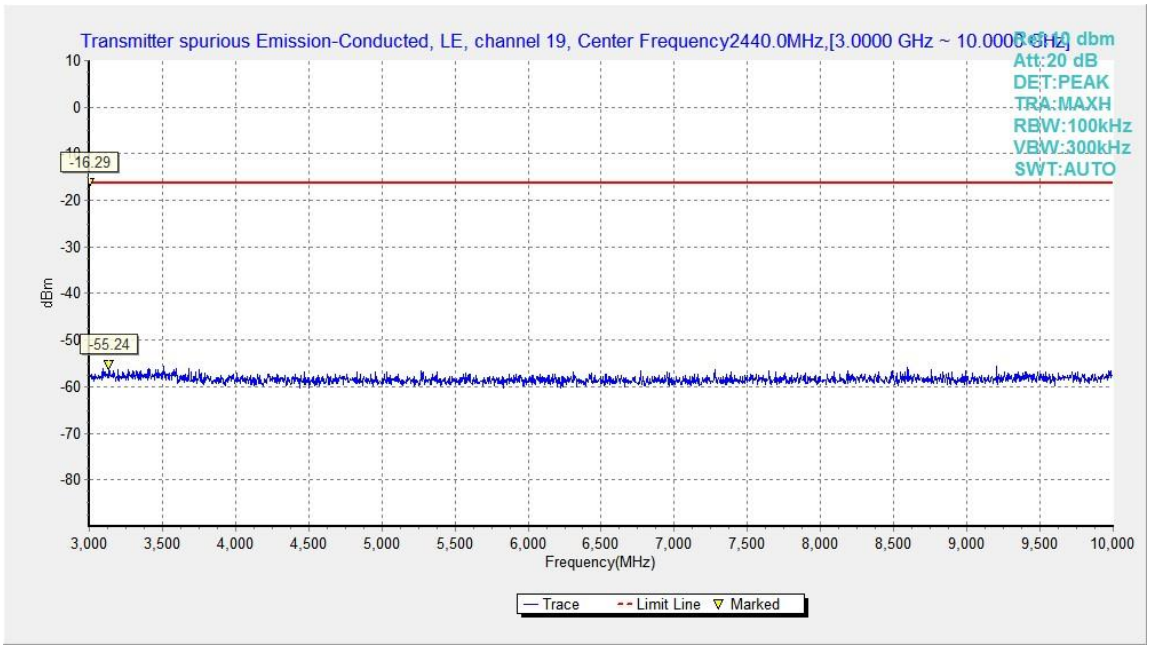


Fig.13. Transmitter Spurious Emission - Conducted: GFSK, 2440 MHz, 3GHz – 10GHz

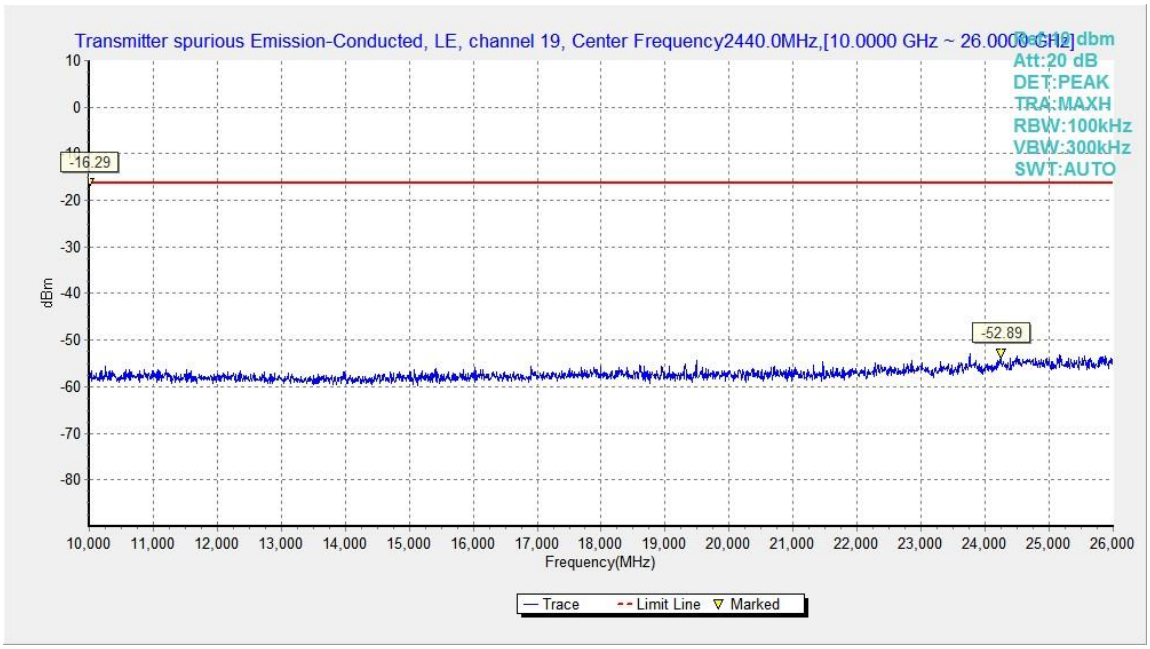


Fig.14. Transmitter Spurious Emission - Conducted: GFSK, 2440 MHz, 10GHz – 26GHz

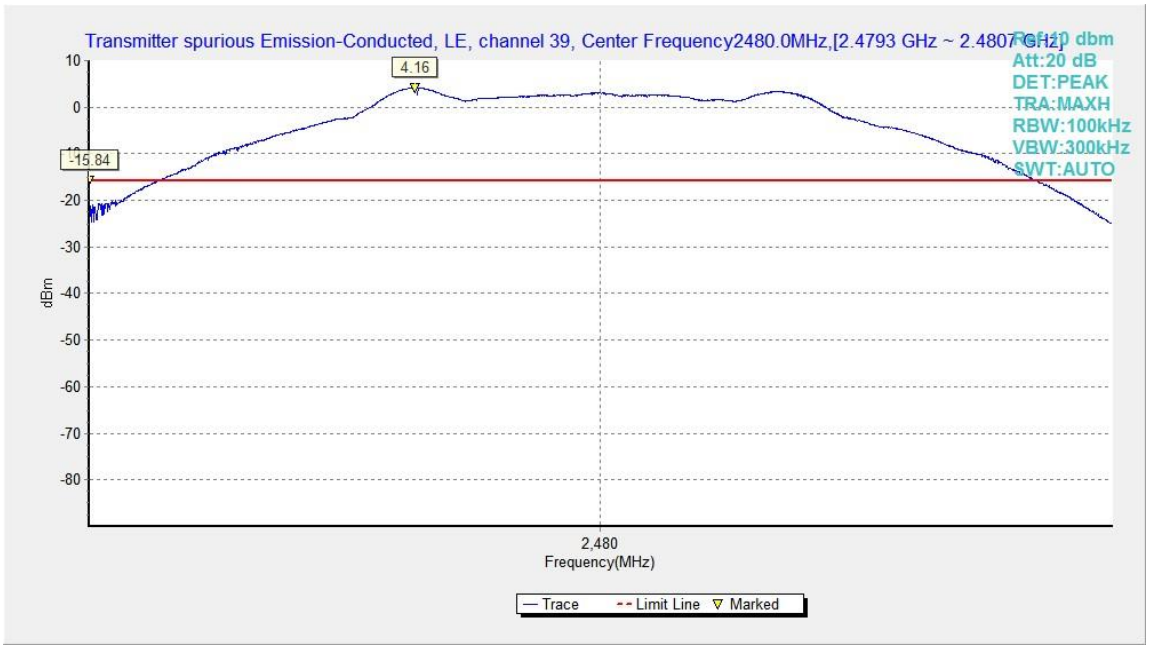


Fig.15. Transmitter Spurious Emission - Conducted: GFSK, 2480 MHz

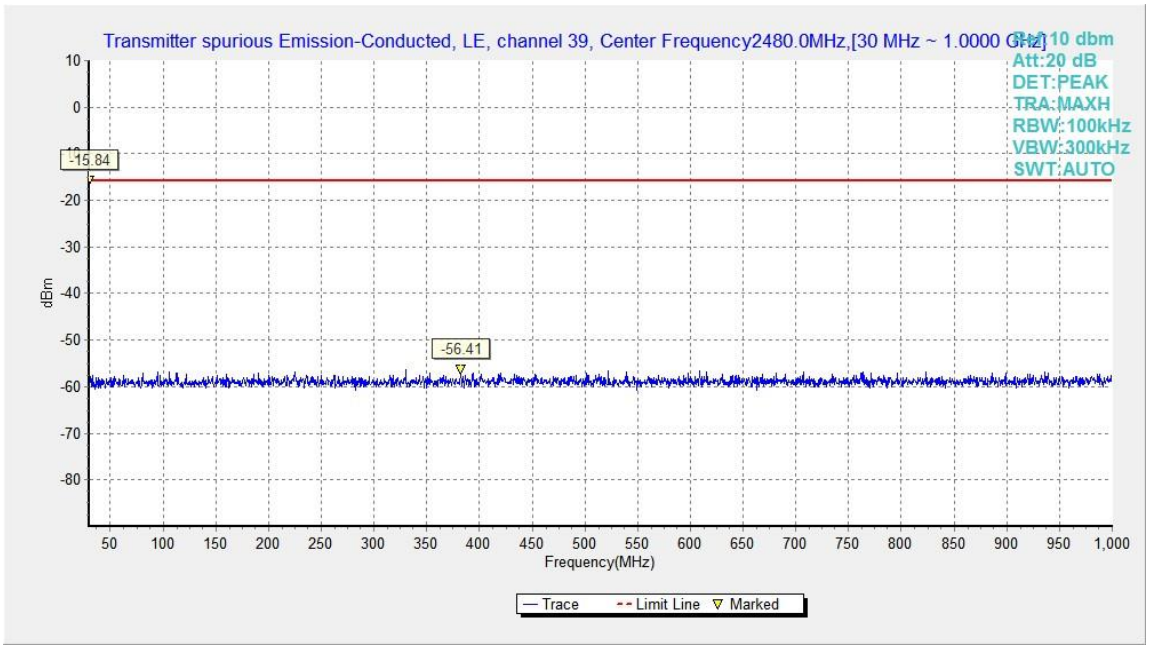


Fig.16. Transmitter Spurious Emission - Conducted: GFSK, 2480 MHz, 30MHz - 1GHz

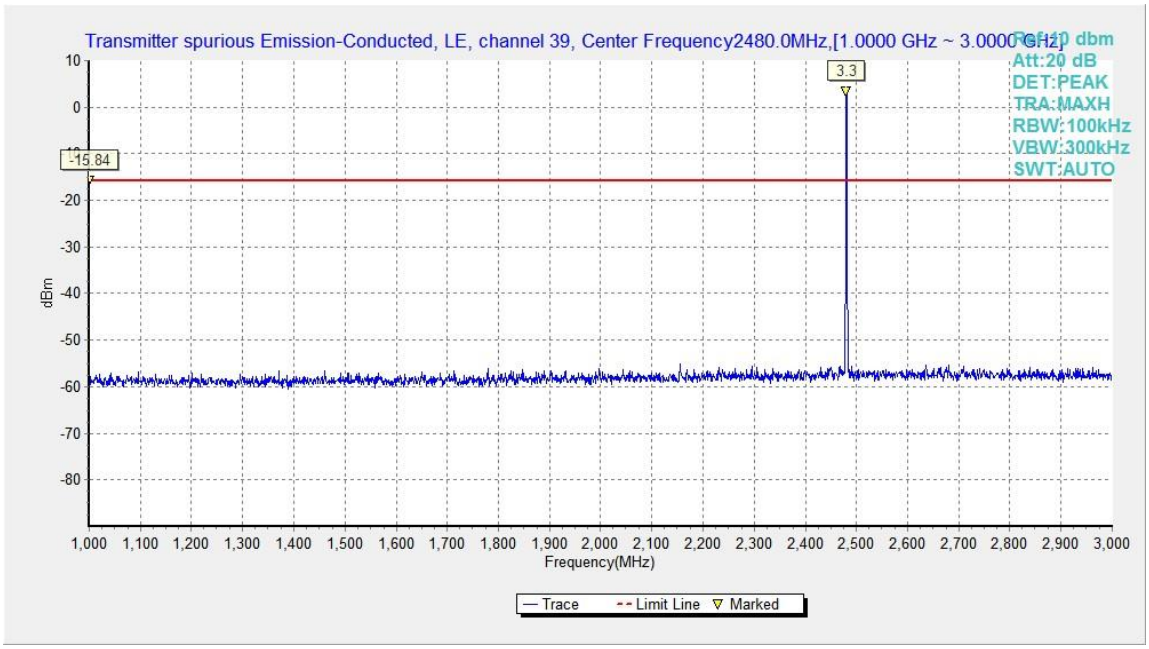


Fig.17. Transmitter Spurious Emission - Conducted: GFSK, 2480 MHz, 1GHz - 3GHz

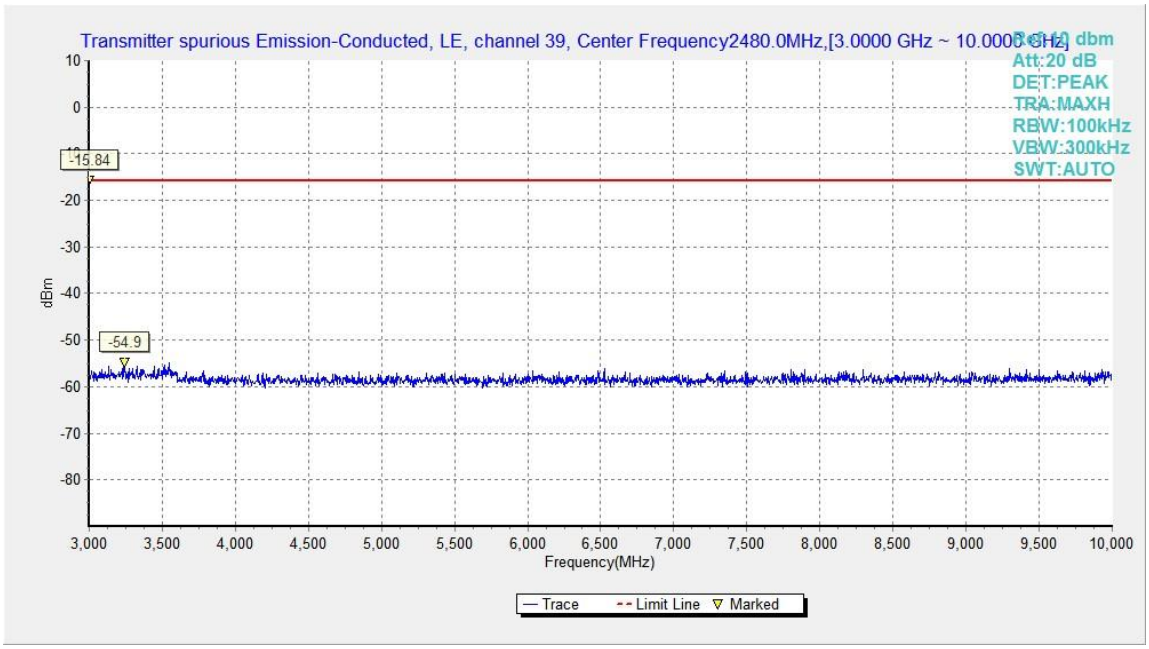


Fig.18. Transmitter Spurious Emission - Conducted: GFSK, 2480 MHz, 3GHz - 10GHz

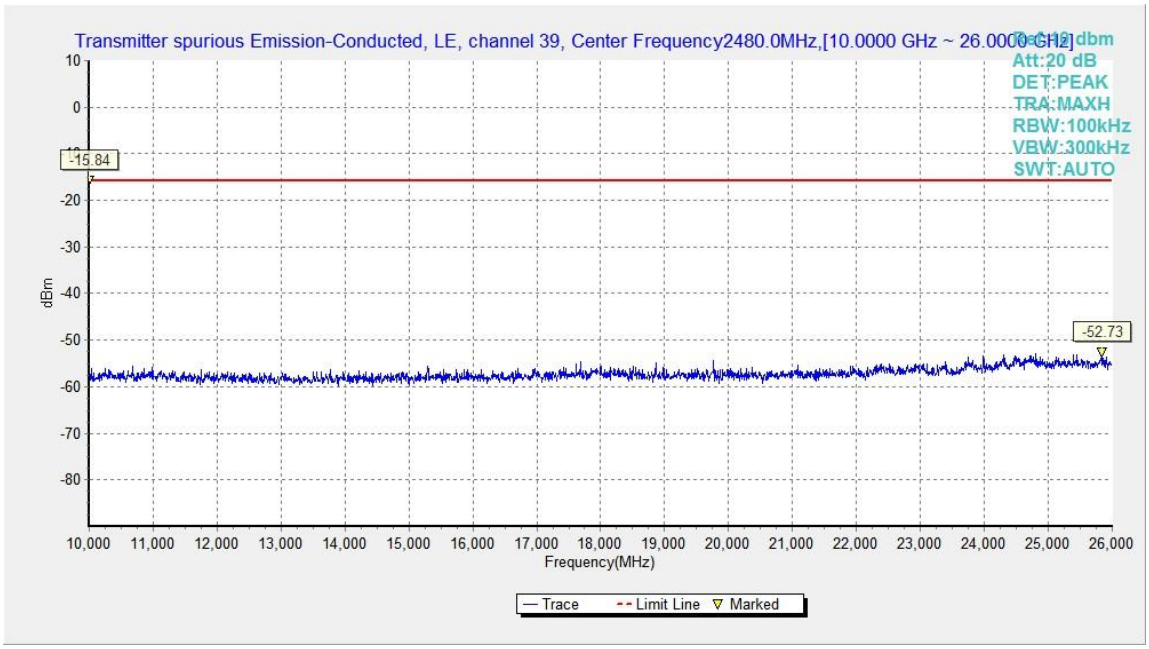


Fig.19. Transmitter Spurious Emission - Conducted: GFSK, 2480 MHz, 10GHz - 26GHz

B.6. Transmitter Spurious Emission - Radiated

Method of Measurement: See ANSI C63.10-2013-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)
2317.950	46.20	2.56	27.63	16.02	54.00	7.80	V
2388.800	46.18	2.62	27.66	15.90	54.00	7.82	V
4803.750	28.85	-37.55	32.01	34.39	54.00	25.15	V
7206.250	31.76	-36.97	35.71	33.02	54.00	22.24	V
9608.125	33.88	-36.06	37.80	32.14	54.00	20.12	H
12010.000	35.96	-34.85	39.09	31.72	54.00	18.04	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)
2435.150	46.21	2.63	27.68	15.90	54.00	7.79	V
2445.275	46.12	2.63	27.68	15.81	54.00	7.88	V
4881.875	28.69	-37.86	32.21	34.35	54.00	25.31	V
7320.625	33.59	-37.06	35.98	34.67	54.00	20.41	V
10261.875	36.84	-35.28	37.96	34.16	54.00	17.16	V
12205.000	37.04	-34.72	38.98	32.79	54.00	16.96	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)
2491.275	46.33	2.70	27.70	15.93	54.00	7.67	V
2495.475	46.26	2.74	27.70	15.82	54.00	7.74	V
4960.000	28.15	-38.13	32.40	33.88	54.00	25.85	H
7440.000	43.46	-36.86	36.26	44.06	54.00	10.54	H
9920.000	34.58	-35.82	37.80	32.59	54.00	19.42	V
12400.000	36.08	-34.57	38.86	31.79	54.00	17.92	V

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)
2346.540	60.58	2.61	27.64	30.33	74.00	13.42	H
2384.392	60.96	2.62	27.66	30.68	74.00	13.04	V
4804.219	40.32	-37.55	32.01	45.86	74.00	33.68	H
7206.094	42.77	-36.97	35.70	44.04	74.00	31.23	H
9607.969	46.24	-36.06	37.80	44.50	74.00	27.76	V
12009.844	48.67	-34.85	39.09	44.43	74.00	25.33	V

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)
2366.375	38.85	-39.62	27.65	50.81	74.00	35.15	V
2501.875	39.24	-39.07	27.71	50.61	74.00	34.76	H
4882.031	40.26	-37.86	32.21	45.92	74.00	33.74	V
7322.812	43.92	-37.05	35.98	44.99	74.00	30.08	H
9764.062	46.95	-35.31	37.80	44.46	74.00	27.05	H
12204.844	51.10	-34.72	38.98	46.85	74.00	22.90	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)
2484.819	61.11	2.65	27.69	30.76	74.00	12.89	H
2495.981	61.20	2.74	27.70	30.76	74.00	12.80	H
4959.844	40.62	-38.13	32.40	46.35	74.00	33.38	V
7440.000	48.51	-36.86	36.26	49.11	74.00	25.49	V
9920.156	46.31	-35.82	37.80	44.33	74.00	27.69	V
12399.844	47.48	-34.57	38.86	43.18	74.00	26.52	H

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)	>= 500KHz

Measurement Results:

For GFSK

Channel No.	Frequency (MHz)	6dB Bandwidth (kHz)		Conclusion
0	2402	Fig.20	665.50	P
19	2440	Fig.21	664.50	P
39	2480	Fig.22	665.00	P

Conclusion: PASS

Test graphs as below:

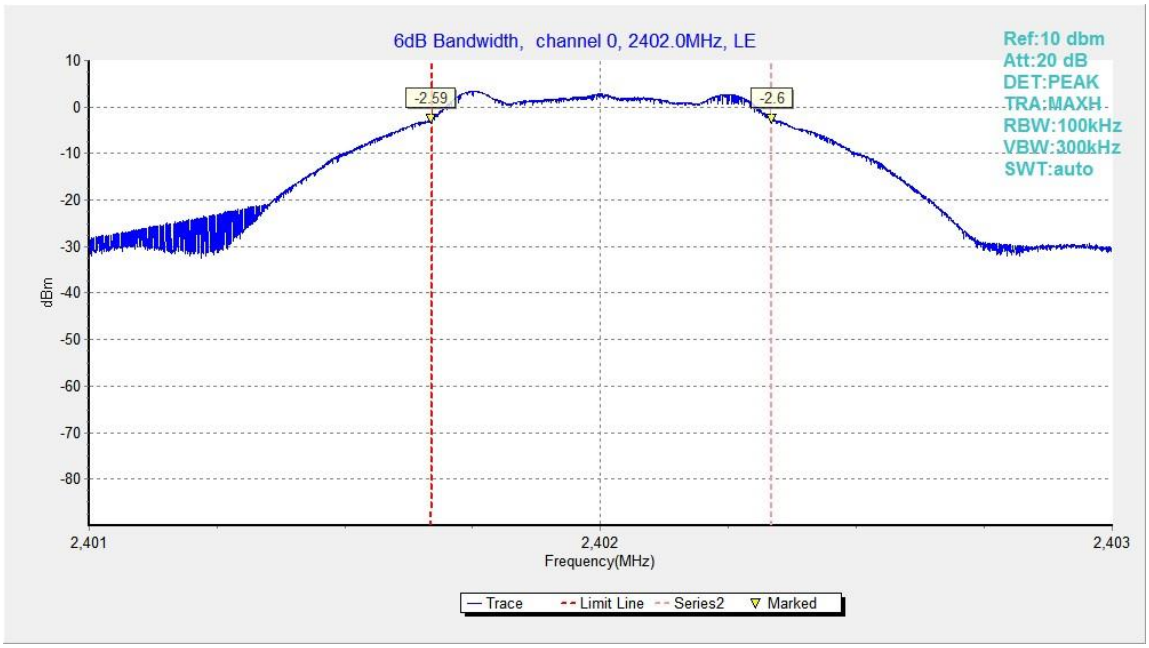


Fig.20. 6dB Bandwidth: GFSK, 2402 MHz

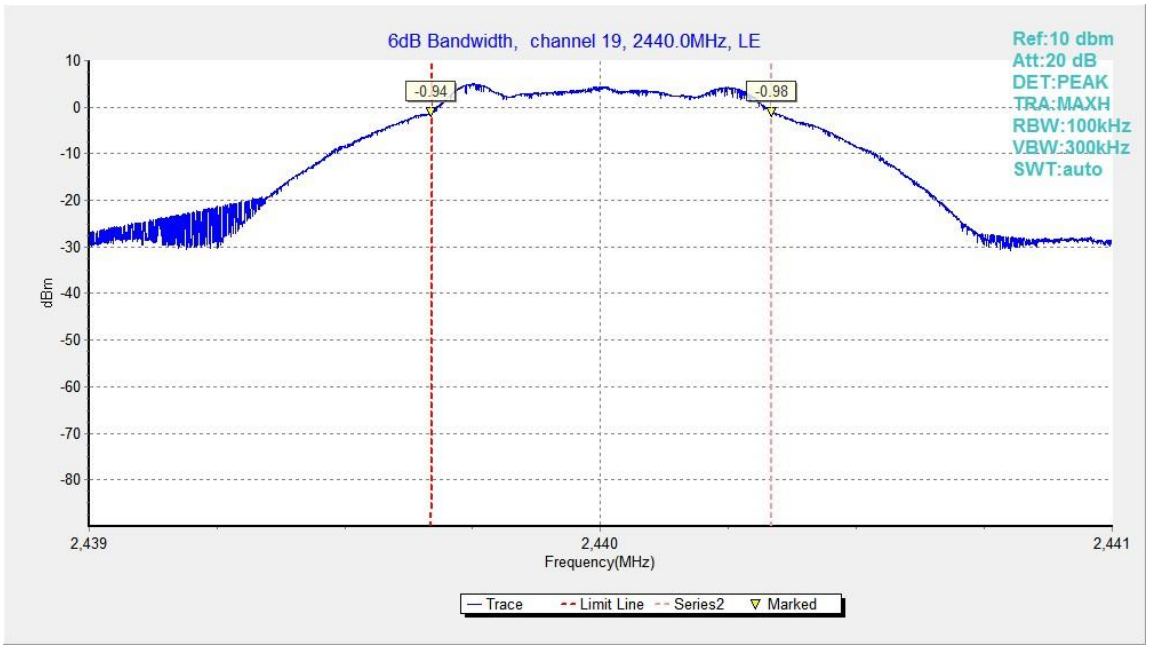


Fig.21. 6dB Bandwidth: GFSK, 2440 MHz

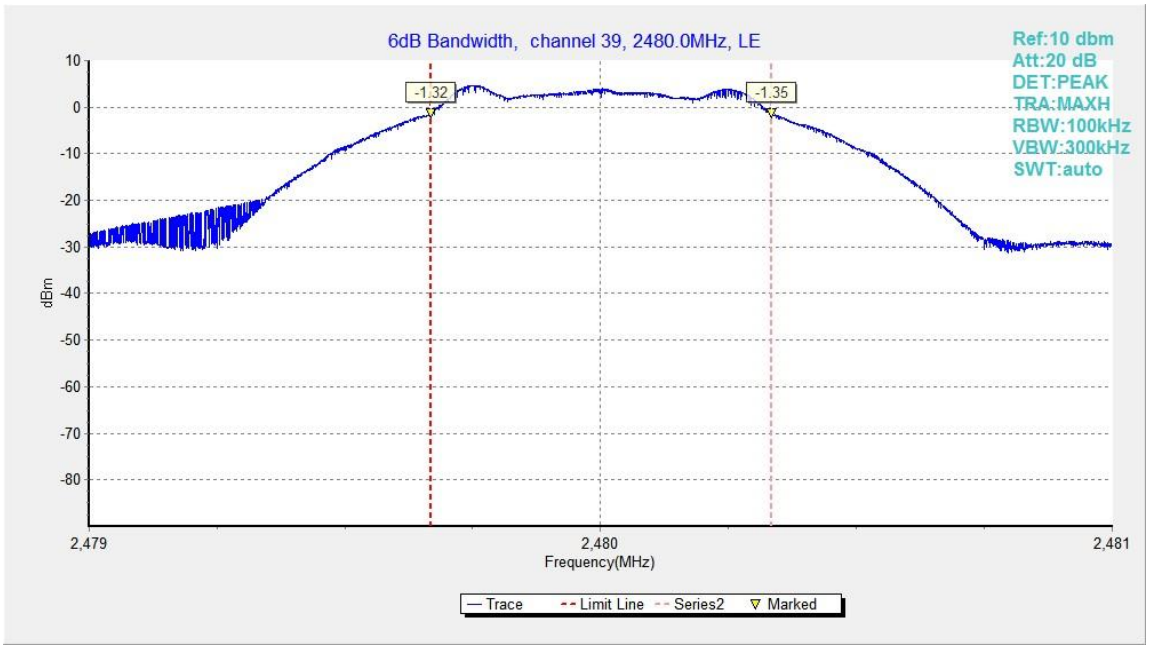


Fig.22. 6dB Bandwidth: GFSK, 2480 MHz

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)	<=8.0dBm/3kHz

Measurement Results:

For GFSK

Channel No.	Frequency (MHz)	Maximum Power Spectral Density Level(dBm/3kHz)		Conclusion
0	2402	Fig.23	-12.66	P
19	2440	Fig.24	-11.15	P
39	2480	Fig.25	-11.56	P

Test graphs as below:

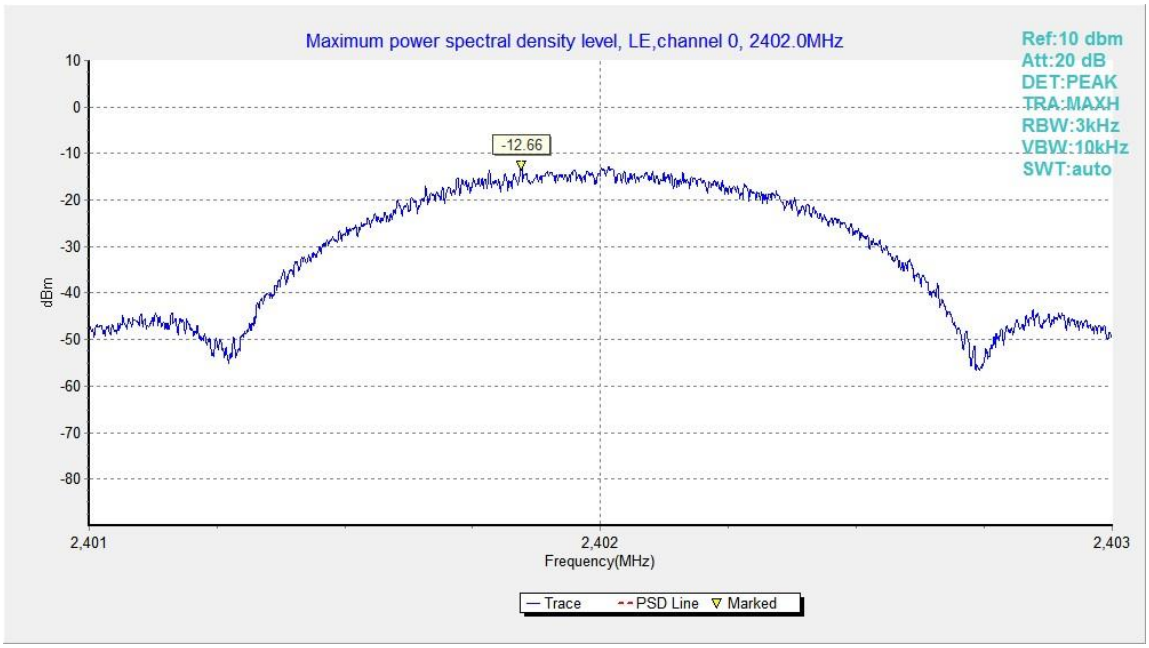


Fig.23. Maximum Power Spectral Density Level Function: GFSK, 2402 MHz

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

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

B.9. AC Powerline Conducted Emission

Method of Measurement:

See Clause 6.2 of ANSI C63.10-2013 specifically.

See Clause 4 and Clause 5 of ANSI C63.10-2013 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.

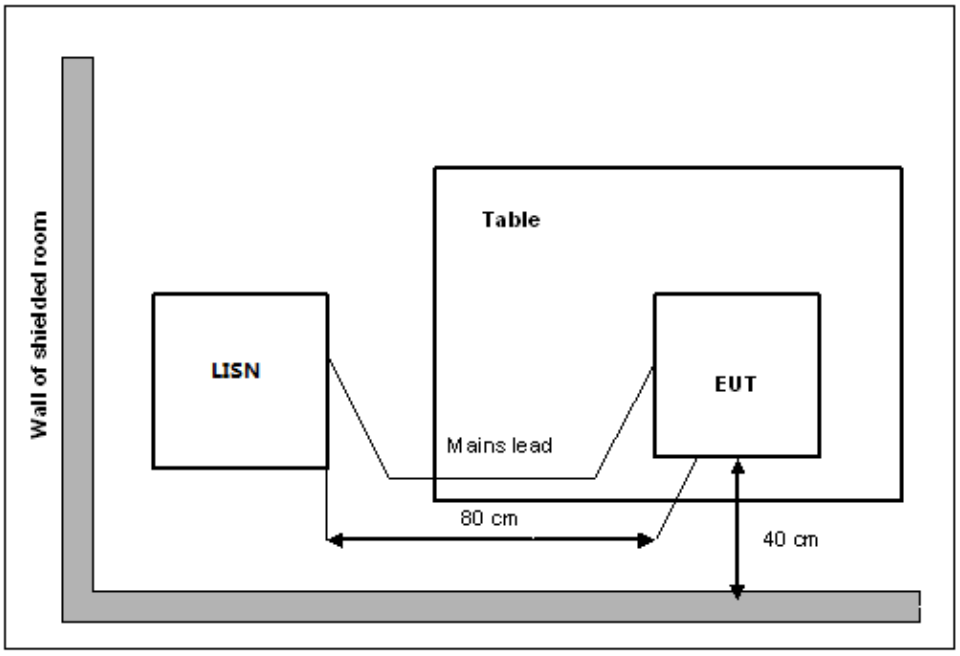
The measurement bandwidth is:

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: UT07a

Bluetooth (Quasi-peak Limit)

Frequency range (MHz)	Quasi-peak Limit (dBμV)	Result (dBμV)		Conclusion
		With charger		
		bluetooth	Idle	
0.15 to 0.5	66 to 56	Fig.B.9.1	Fig.B.9.2	P
0.5 to 5	56			
5 to 30	60			
NOTE: The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.5 MHz.				

Bluetooth (Average Limit)

Frequency range (MHz)	Average Limit (dBμV)	Result (dBμV)		Conclusion
		With charger		
		bluetooth	Idle	
0.15 to 0.5	56 to 46	Fig.B.9.1	Fig.B.9.2	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.				

Conclusion: Pass

Test graphs as below:

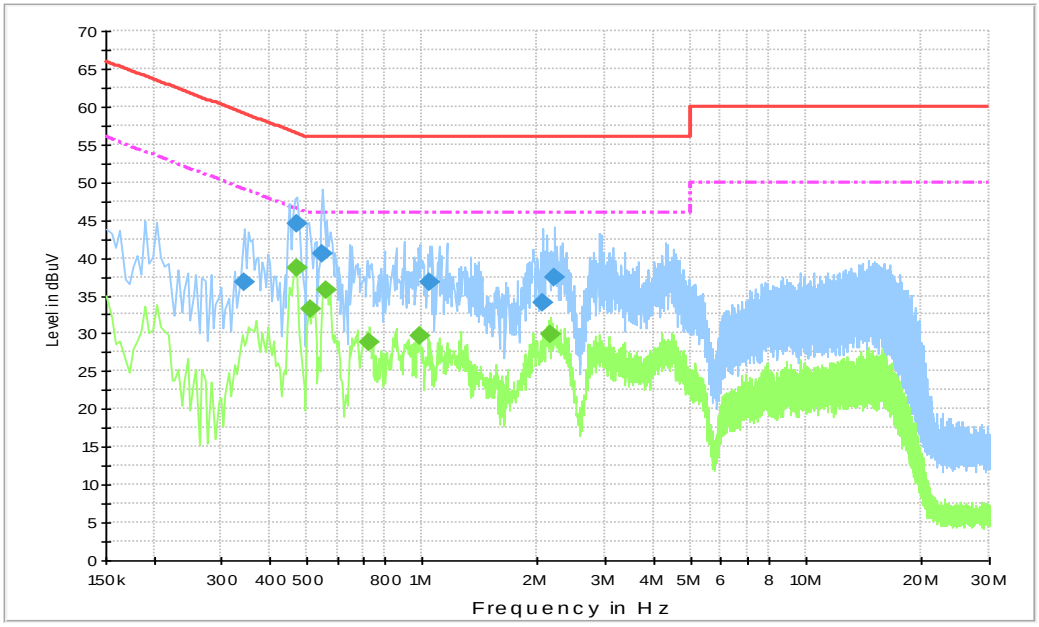


Fig.B.9.1 AC Powerline Conducted Emission- bluetooth

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

Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.343500	36.7	3000.0	9.000	On	N	25.1	22.4	59.1
0.469500	44.6	3000.0	9.000	On	L1	23.7	11.9	56.5
0.550500	40.6	3000.0	9.000	On	L1	23.0	15.4	56.0
1.045500	36.7	3000.0	9.000	On	N	20.2	19.3	56.0
2.053500	34.0	3000.0	9.000	On	L1	20.0	22.0	56.0
2.206500	37.3	3000.0	9.000	On	N	19.9	18.7	56.0

Final Result 2

Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.469500	38.6	3000.0	9.000	On	N	23.7	7.9	46.5
0.514500	33.2	3000.0	9.000	On	L1	23.3	12.8	46.0
0.564000	35.7	3000.0	9.000	On	N	22.8	10.3	46.0
0.730500	28.9	3000.0	9.000	On	L1	21.7	17.1	46.0
0.987000	29.7	3000.0	9.000	On	N	20.3	16.3	46.0
2.170500	29.8	3000.0	9.000	On	N	20.0	16.2	46.0

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

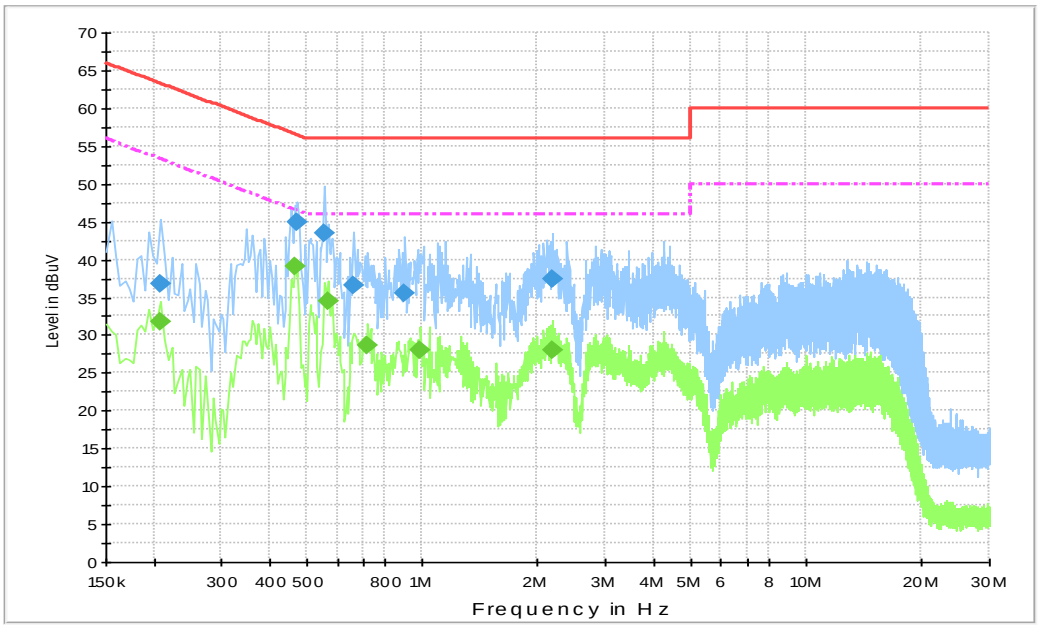


Fig.B.9.2 AC Powerline Conducted Emission-Idle

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

Final Result 1

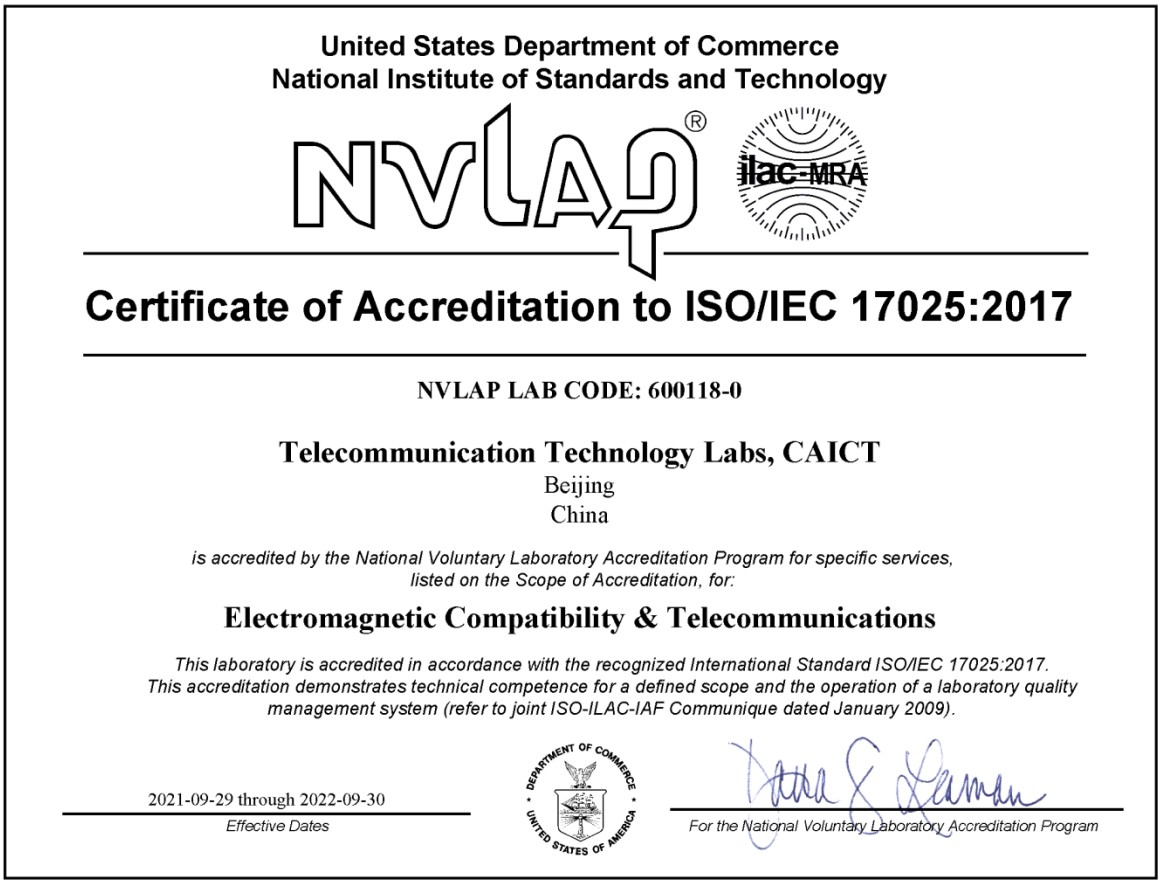
Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.208500	36.7	3000.0	9.000	On	N	27.4	26.5	63.3
0.474000	45.0	3000.0	9.000	On	N	23.6	11.5	56.4
0.555000	43.5	3000.0	9.000	On	N	22.9	12.5	56.0
0.663000	36.5	3000.0	9.000	On	N	22.1	19.5	56.0
0.901500	35.6	3000.0	9.000	On	N	20.7	20.4	56.0
2.188500	37.5	3000.0	9.000	On	N	20.0	18.5	56.0

Final Result 2

Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.208500	31.8	3000.0	9.000	On	L1	27.4	21.5	53.3
0.465000	39.0	3000.0	9.000	On	N	23.7	7.6	46.6
0.568500	34.5	3000.0	9.000	On	N	22.8	11.5	46.0
0.721500	28.6	3000.0	9.000	On	L1	21.7	17.4	46.0
0.991500	28.0	3000.0	9.000	On	L1	20.3	18.0	46.0
2.188500	27.9	3000.0	9.000	On	L1	20.0	18.1	46.0

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

ANNEX C: Accreditation Certificate



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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 17025:2017. 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).

2021-09-29 through 2022-09-30
Effective Dates

DEPARTMENT OF COMMERCE · UNITED STATES OF AMERICA ·

For the National Voluntary Laboratory Accreditation Program

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