FCC PART 15C
TEST REPORT

BLUETOOTH LOW ENERGY (BLE) PART

No. I21Z70342-IOT02

for

Samsung Electronics Co., Ltd.

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

Model Name: SM-A037F/DS,SM-A037F

FCC ID: ZCASMA037F

with

Hardware Version: REV1.0

Software Version: A037F.001

Issued Date: 2021-7-13

Test Laboratory:

CTTL, Telecommunication Technology Labs, CAICT

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

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Email:cttl_terminals@caict.ac.cn, website: www.chinattl.com

REPORT HISTORY

Report Number	Revision	Description	Issue Date
I21Z70342-IOT02	Rev.0	1st edition	2021-7-13

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(huayuan North Road)

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

CTTL(BDA)

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

1.3. Testing Environment

Normal Temperature: 15-35℃

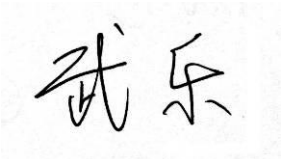
Relative Humidity: 20-75%

1.4. Project data

Testing Start Date: 2021-5-26

Testing End Date: 2021-7-13

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.
Address	19 Chapin Rd.,Building D Pine Brook, NJ 07058
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	Samsung R5, Maetan dong 129, Samsung ro Youngtong gu, Suwon city 443 742, Korea
Contact:	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-A037F/DS,SM-A037F
FCC ID	ZCASMA037F
Frequency Band	ISM 2400MHz~2483.5MHz
Type of Modulation(LE mode)	GFSK (Bluetooth Low Energy)
Number of Channels(LE mode)	40
Power Supply	4V DC by Battery
Antenna gain	-0.80dBi

3.2. Internal Identification of EUT

EUT ID*	SN or IMEI	HW Version	SW Version	Date of receipt
UT30a	/	REV1.0	A037F.001	/
UT27a(SM-A037F/DS)	I21Z70342UT27a	REV1.0	A037F.001	2021-07-02

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

3.3. Internal Identification of AE

AE ID*	Description	Remarks	
AE1	Charger1	/	/
AE2	Charger2	/	/
AE3	Charger3	/	/
AE4	Charger4	/	/
AE5	Charger5	/	/
AE6	USB cable	/	/
AE7	Headset1	/	/
AE8	Headset2	/	/
AE9	battery	/	/
AE10	Charger6	No test	
AE11	Charger7	No test	
AE12	Charger8	No test	
AE13	Charger9	No test	
AE14	Charger10	No test	

AE1

Model	EP-TA50JWE
Manufacturer	HAEM Co.,Ltd
Length of cable	/

AE2

Model	EP-TA50JWE
Manufacturer	RFTech Electronics(HuiZhou)Co.,LTD
Length of cable	/

AE3

Model	EP-TA50UWE
Manufacturer	Dong Yang
Length of cable	/

AE4

Model	EP-TA50UWE
Manufacturer	HAEM Co.,Ltd
Length of cable	/

AE5

Model	EP-TA50UWE
Manufacturer	Salcomp
Length of cable	/

AE6

Model	EP-DR140AWE
Manufacturer	Samsung Electronics Co., Ltd.
Length of cable	/

AE7

Model	EHS61ASFWE
Manufacturer	DONGGUAN YOUNGBO ELECTRONICS CO.,LTD
Length of cable	/

AE8

Model	EHS61ASFWE
Manufacturer	WATA ELECTRONICS CO.,LTD
Length of cable	/

AE9

Type	Secondary Li-ion Battery
SN	HQ-50S
Manufacturer	SUCD(FUJIAN) Electronics Co.,Ltd

AE10

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

AE11

Model	EP-TA50JWS
Manufacturer	RFTech Electronics(HuiZhou)Co.,LTD
Length of cable	/

AE12

Model	EP-TA50UWS
Manufacturer	Dong Yang
Length of cable	/

AE13

Model	EP-TA50JWE
Manufacturer	Dong Yang
Length of cable	/

AE14

Model	EP-TA50UWE
Manufacturer	RFTech Electronics(HuiZhou)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.

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.	2018
ANSI C63.10	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 A) 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

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.

5.3. 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

5.4. Explanation of re-use of test data

The Equipment Under Test (EUT) model SM-A037F/DS,SM-A037F (FCC ID: ZCASMA037F) are variant product of SM-A037M/DS (FCC ID: ZCASMA037M), 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 SM-A037F/DS, other test results are derived from test report No. I21Z70258-IOT02. Please refer Annex A for detail spot check verification data and reference data. the spot check test results are consistent with basic model.

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

6. Test Facilities Utilized

Conducted test system

No.	Equipment	Model	Serial Number	Manufacturer	Calibration Period	Calibration Due date
1	Vector Signal Analyzer	FSQ26	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	Rohde & Schwarz	1 year	2022-02-23
2	BiLog Antenna	VULB9163	9163-483	Schwarzbeck	1 year	2021-08-27
3	Antenna	3115	6914	ETS-Lindgren	1 year	2022-02-03
4	Dual-Ridge Waveguide Horn Antenna	3116	2663	ETS-Lindgren	1 year	2021-08-05
5	Vector Signal Analyzer	FSV40	101047	R&S	1 year	2022-05-17

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)	3.10dB

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.

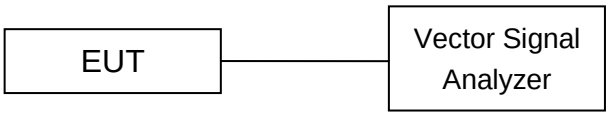
2). Set the EUT to the required work mode (Transmitter, receiver or transmitter & receiver).

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

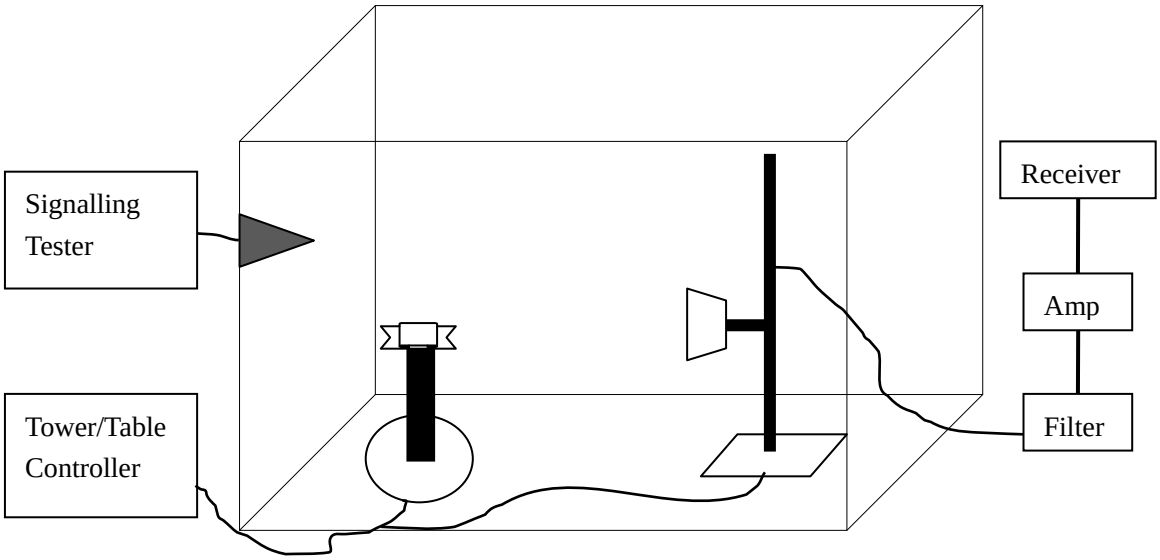
The measurement is made according to ANSI C63.10.

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 = 1MHz;



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 = 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

Spot check Measurement Results:

For GFSK

Sample Rate	Channel No.	Frequency (MHz)	Peak Conducted Output Power (dBm)	Conclusion
1Mbps	0	2402	-2.08	P
	19	2440	-2.35	P
	39	2480	-2.28	P
2Mbps	0	2402	-2.27	P
	19	2440	-2.52	P
	39	2480	-2.44	P

Conclusion: PASS

Reference Measurement Results from basic model:

For GFSK

Sample Rate	Channel No.	Frequency (MHz)	Peak Conducted Output Power (dBm)	Conclusion
1Mbps	0	2402	-2.83	P
	19	2440	-3.04	P
	39	2480	-3.01	P
2Mbps	0	2402	-2.87	P
	19	2440	-3.11	P
	39	2480	-3.19	P

Conclusion: PASS

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

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

Antenna gain = -0.80dBi

Spot check Measurement Results:

For GFSK

Sample Rate	Channel No.	Frequency (MHz)	E.I.R.P. (dBm)	Conclusion
1Mbps	0	2402	-2.88	P
	19	2440	-3.15	P
	39	2480	-3.08	P
2Mbps	0	2402	-3.07	P
	19	2440	-3.32	P
	39	2480	-3.24	P

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

Conclusion: PASS

Reference Measurement Results from basic model:

For GFSK

Sample Rate	Channel No.	Frequency (MHz)	E.I.R.P. (dBm)	Conclusion
1Mbps	0	2402	-3.63	P
	19	2440	-3.84	P
	39	2480	-3.81	P
2Mbps	0	2402	-3.67	P
	19	2440	-3.91	P
	39	2480	-3.99	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	-52.33	P
39	2480	Hopping OFF	Fig.2	-51.23	P

Conclusion: PASS

Test graphs as below

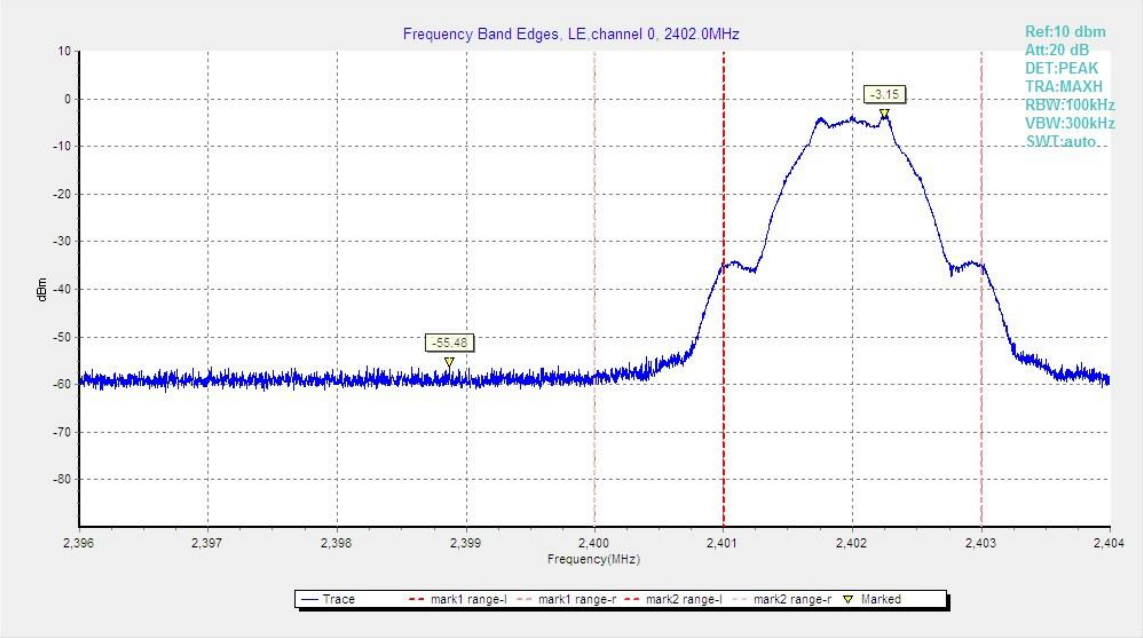


Fig.1. Frequency Band Edges: GFSK, 2402 MHz**,** Hopping Off

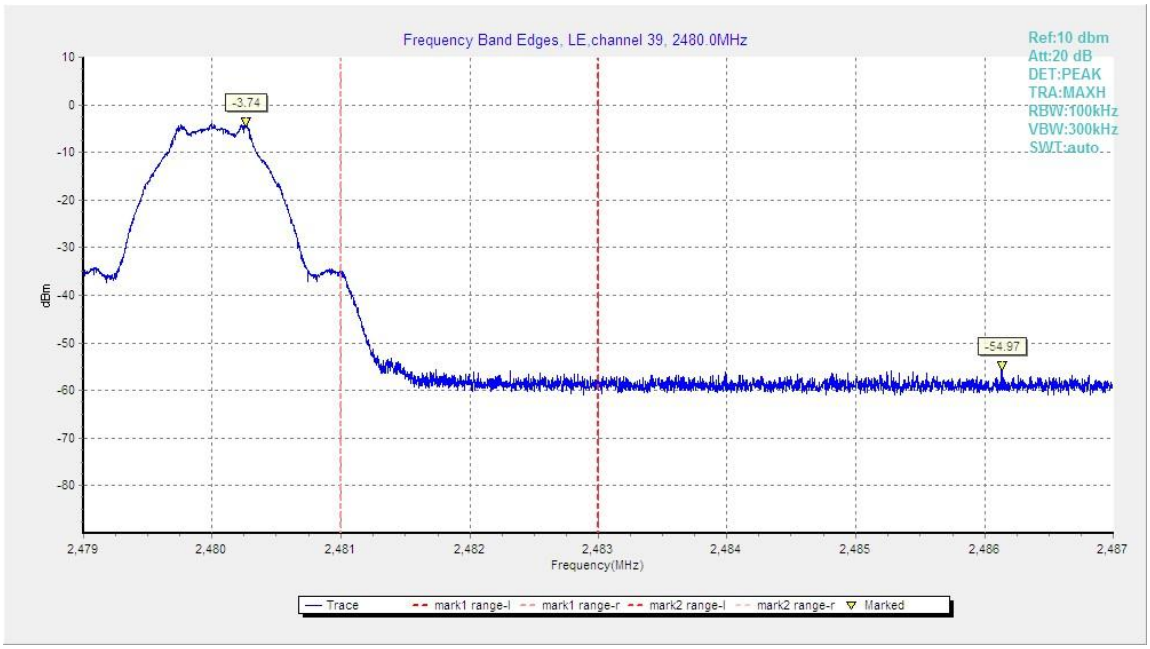


Fig.2. Frequency Band Edges: GFSK, 2480 MHz, Hopping Off

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)
30-88	100	40
88-216	150	43.5
216-960	200	46
Above 960	500	54

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.

Test Procedure

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.

The receiver references:

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

EUT ID: UT30a

Measurement Results:

Mode	Channel	Frequency Range	Test Results	Conclusion
GFSK	0	2.38GHz ~2.45GHz	Fig.3	P
	39	2.45GHz ~2.5GHz	Fig.4	P

Conclusion: PASS

Test graphs as below

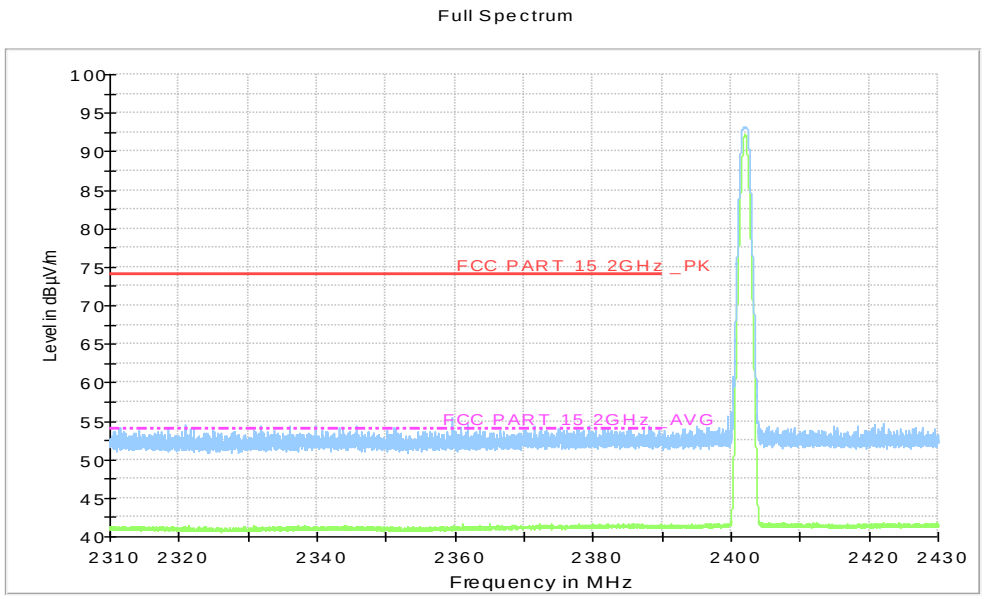


Fig.3. Frequency Band Edges: GFSK, 2402 MHz, 2.31 GHz – 2.45GHz

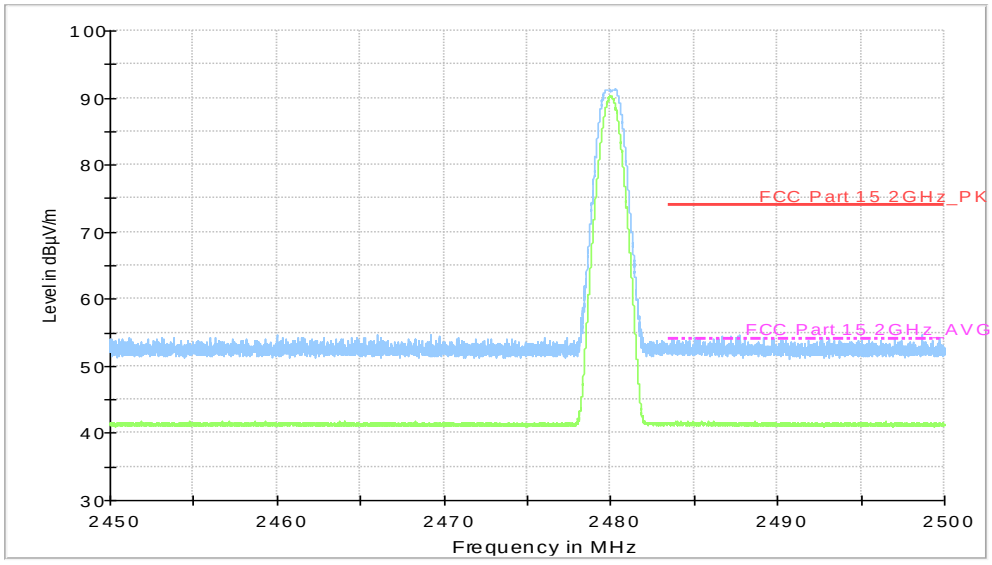


Fig.4. Frequency Band Edges: GFSK, 2480 MHz, 2.45 GHz - 2.50GHz

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

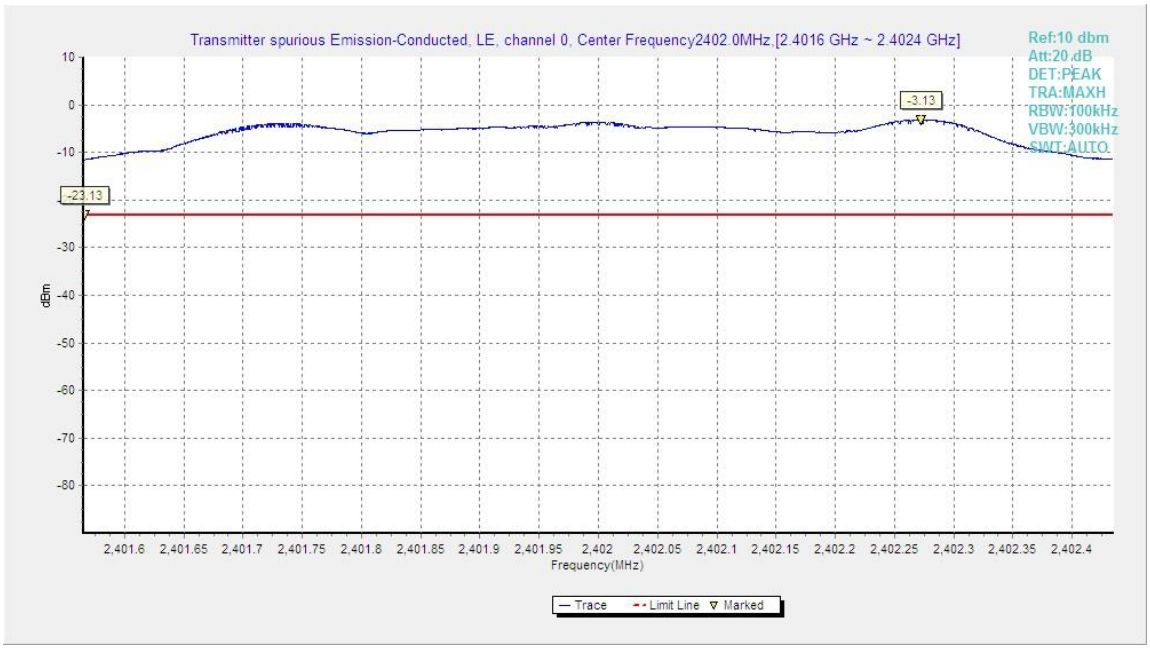


Fig.5. Transmitter Spurious Emission - Conducted: GFSK,2402MHz

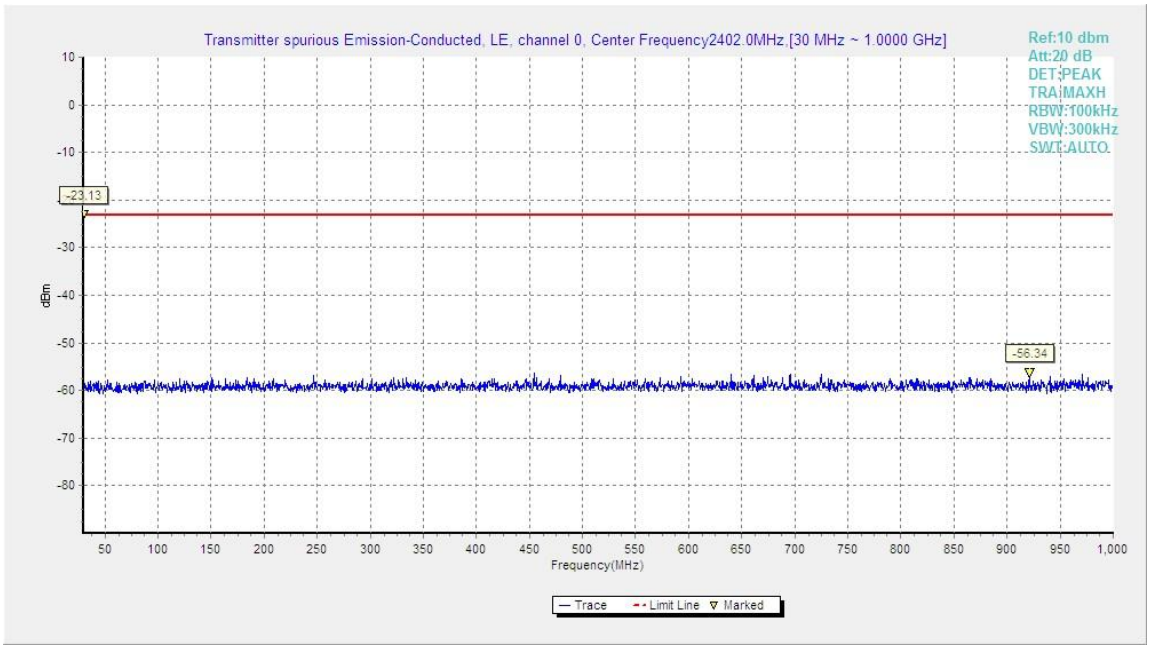


Fig.6. Transmitter Spurious Emission - Conducted: GFSK, 2402 MHz, 30MHz - 1GHz

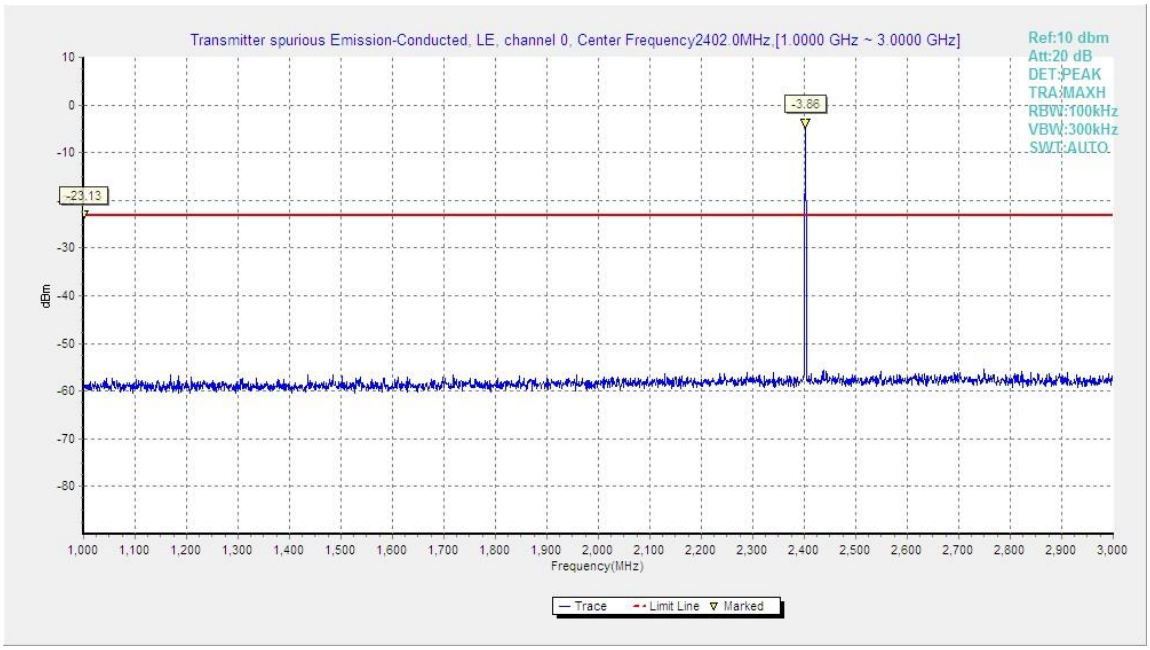


Fig.7. Transmitter Spurious Emission - Conducted: GFSK, 2402 MHz,1GHz - 3GHz

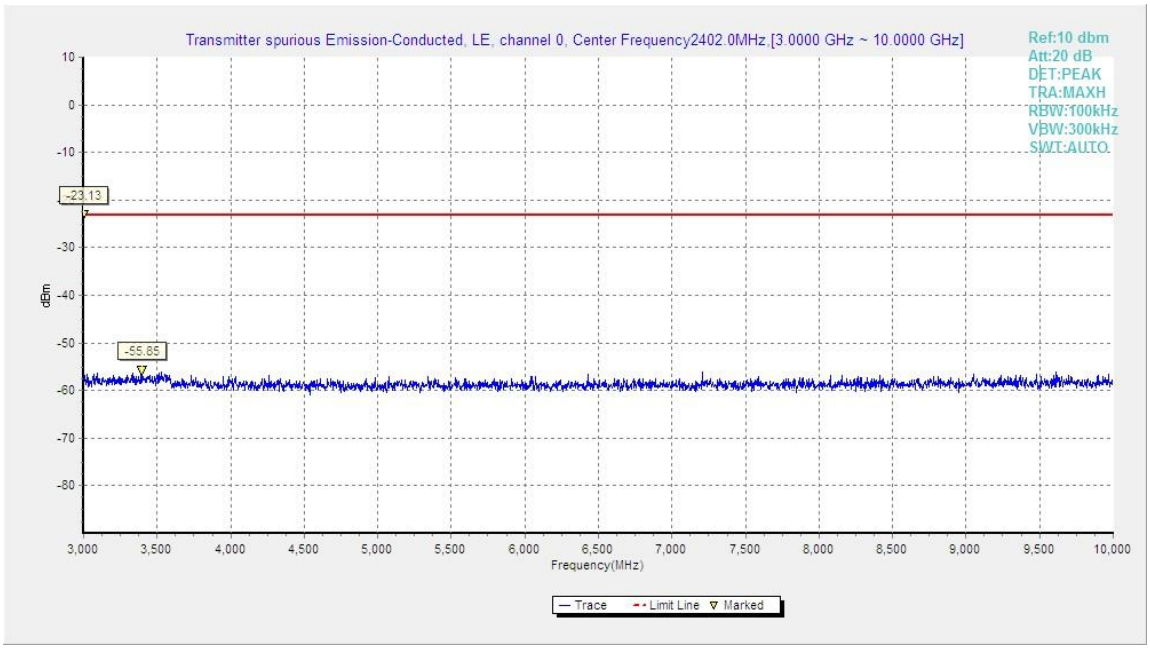


Fig.8. Transmitter Spurious Emission - Conducted: GFSK, 2402 MHz,3GHz - 10GHz

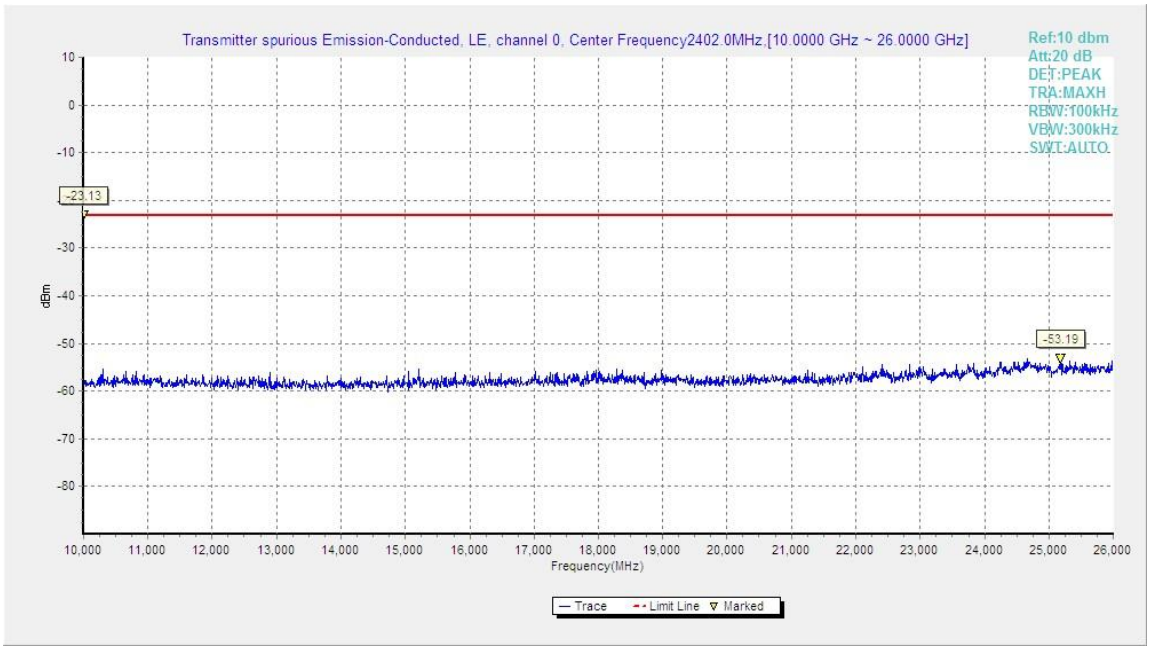


Fig.9. Transmitter Spurious Emission - Conducted: GFSK, 2402 MHz,10GHz - 26GHz

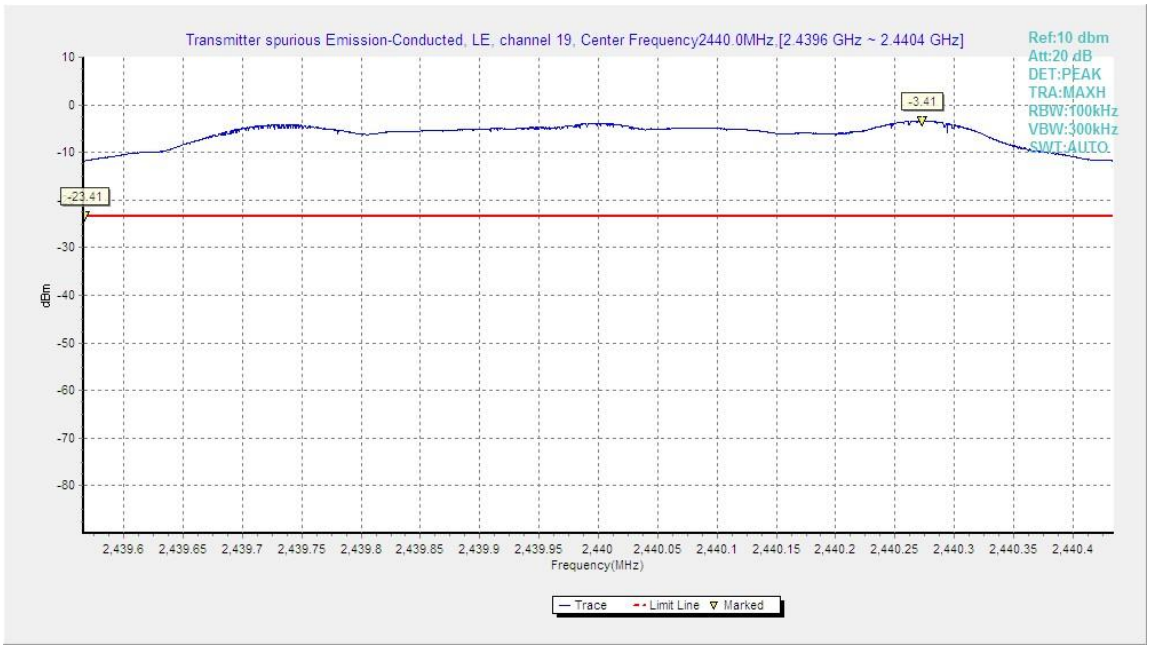


Fig.10. Transmitter Spurious Emission - Conducted: GFSK, 2440MHz

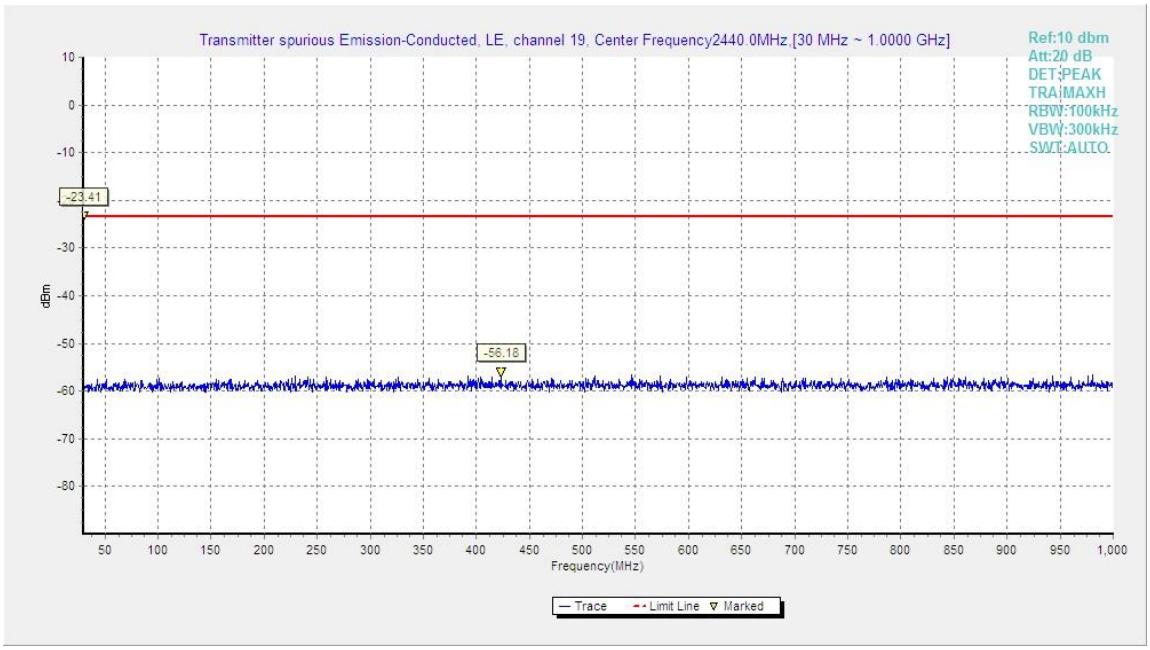


Fig.11. Transmitter Spurious Emission - Conducted: GFSK, 2440 MHz, 30MHz - 1GHz

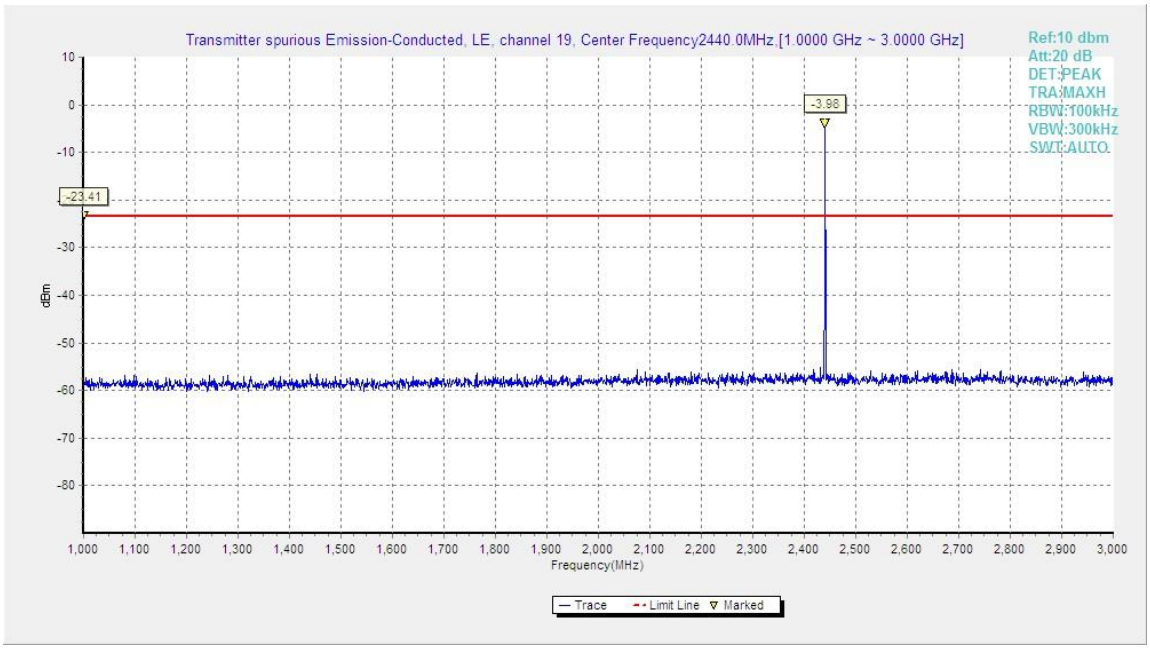


Fig.12. Transmitter Spurious Emission - Conducted: GFSK, 2440 MHz, 1GHz – 3GHz

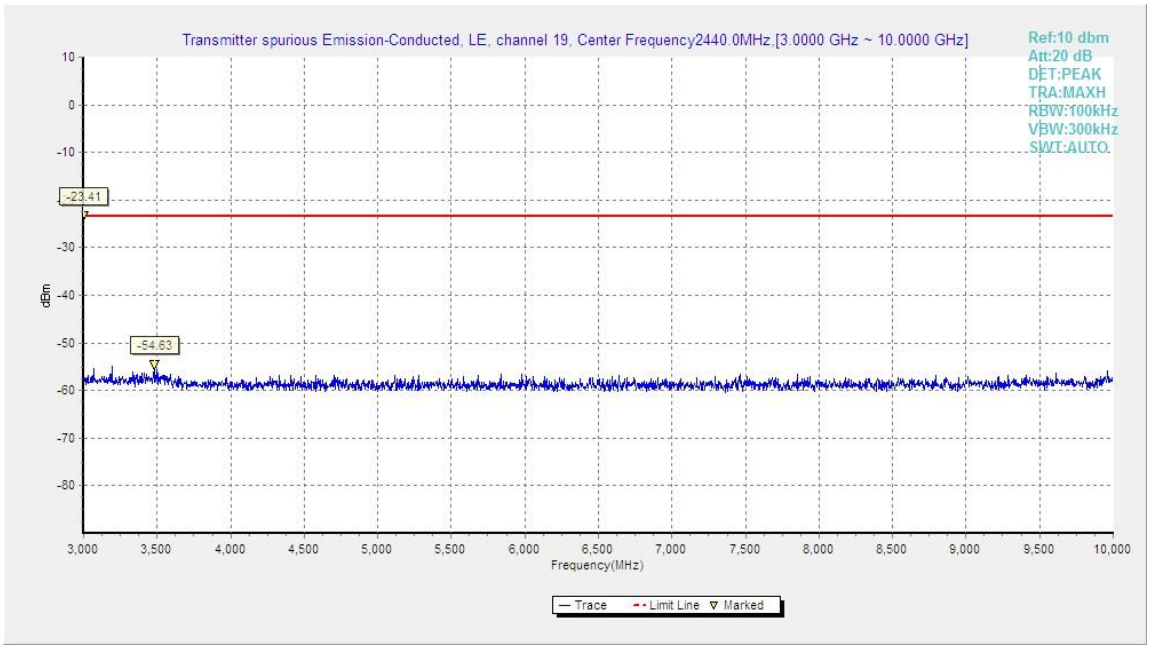


Fig.13. Transmitter Spurious Emission - Conducted: GFSK, 2440 MHz, 3GHz – 10GHz

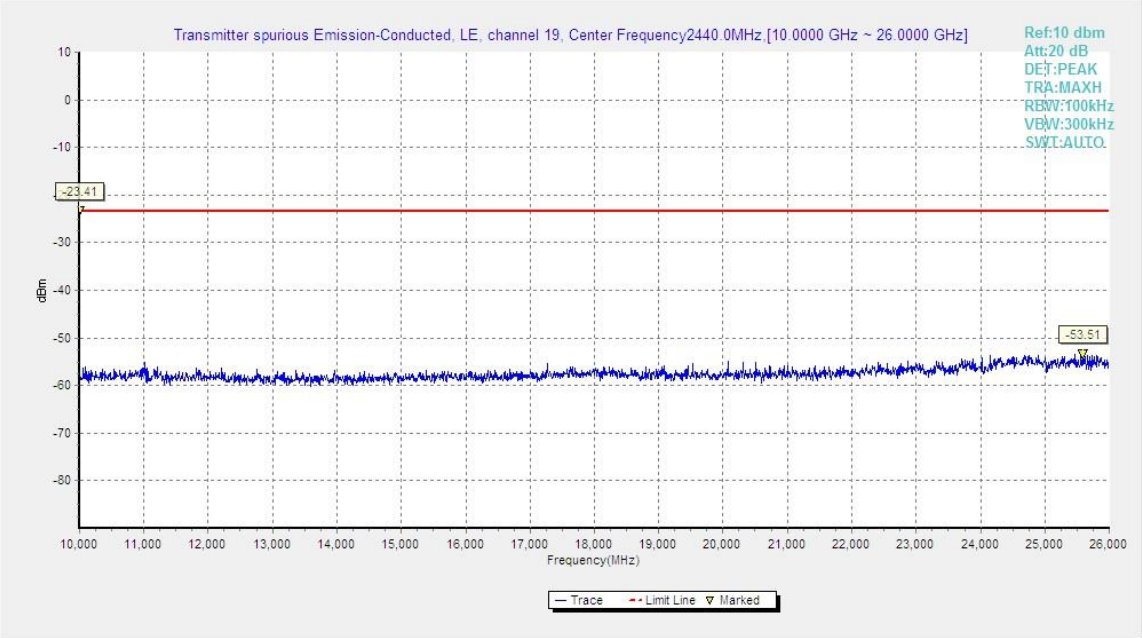


Fig.14. Transmitter Spurious Emission - Conducted: GFSK, 2440 MHz, 10GHz – 26GHz

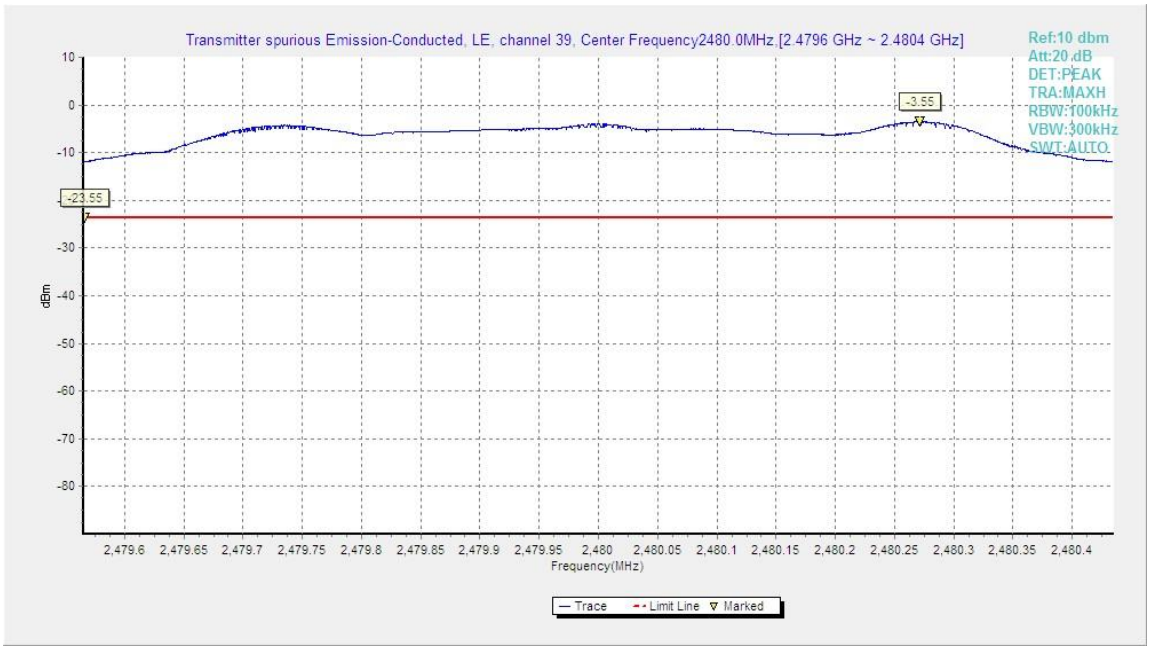


Fig.15. Transmitter Spurious Emission - Conducted: GFSK, 2480 MHz

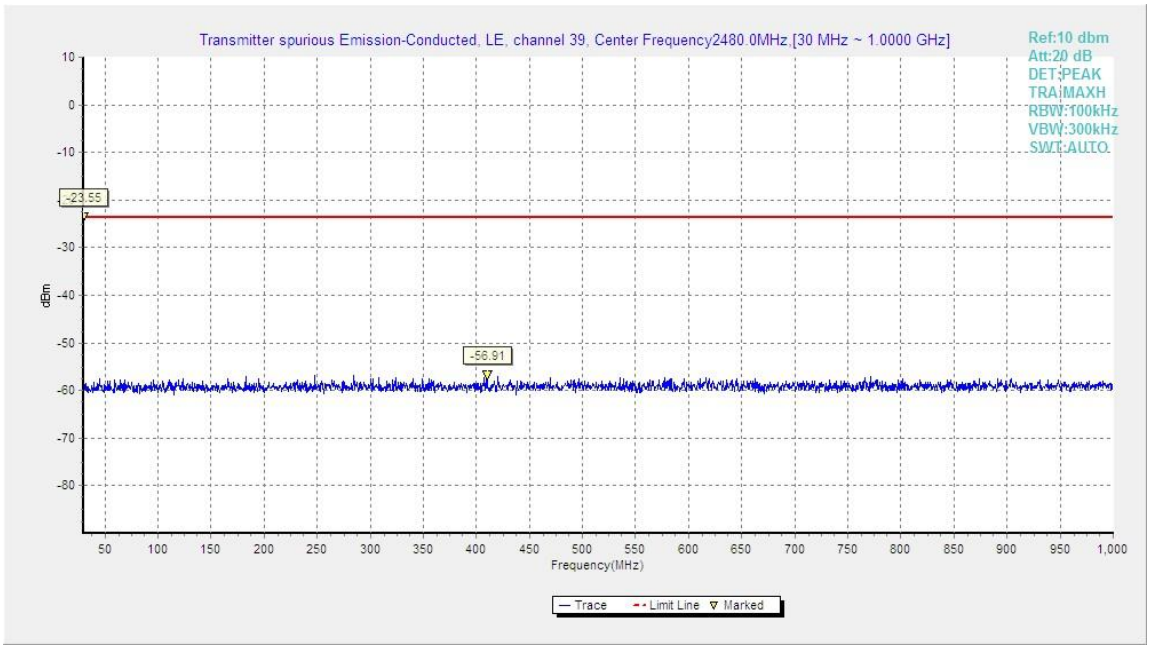


Fig.16. Transmitter Spurious Emission - Conducted: GFSK, 2480 MHz, 30MHz - 1GHz

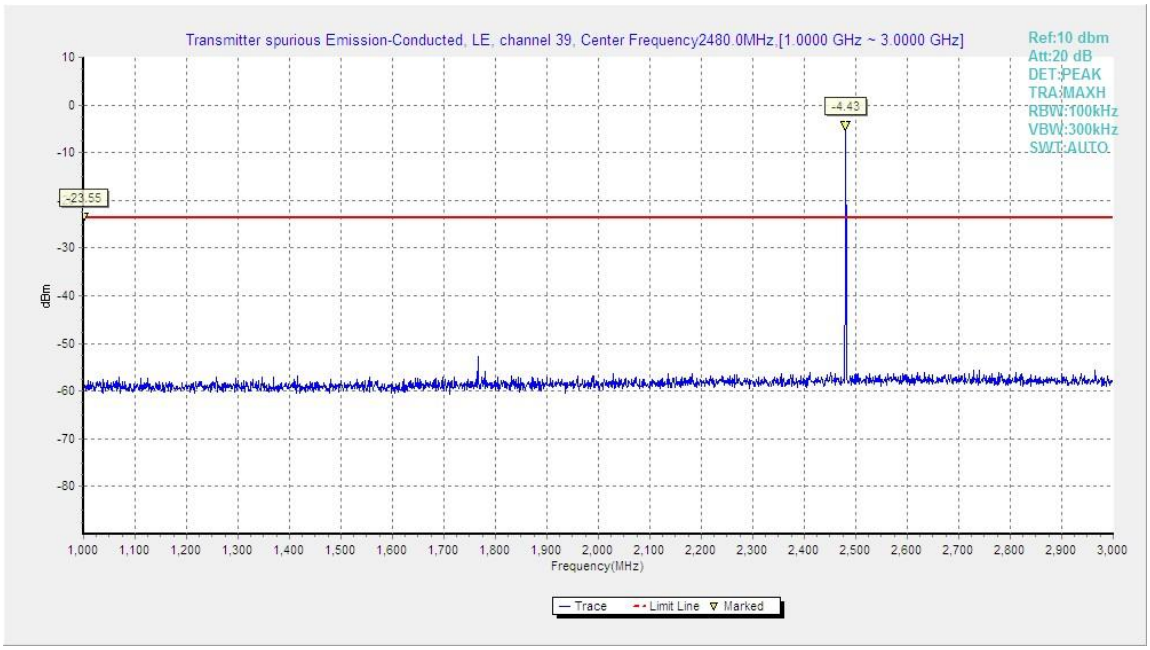


Fig.17. Transmitter Spurious Emission - Conducted: GFSK, 2480 MHz, 1GHz - 3GHz

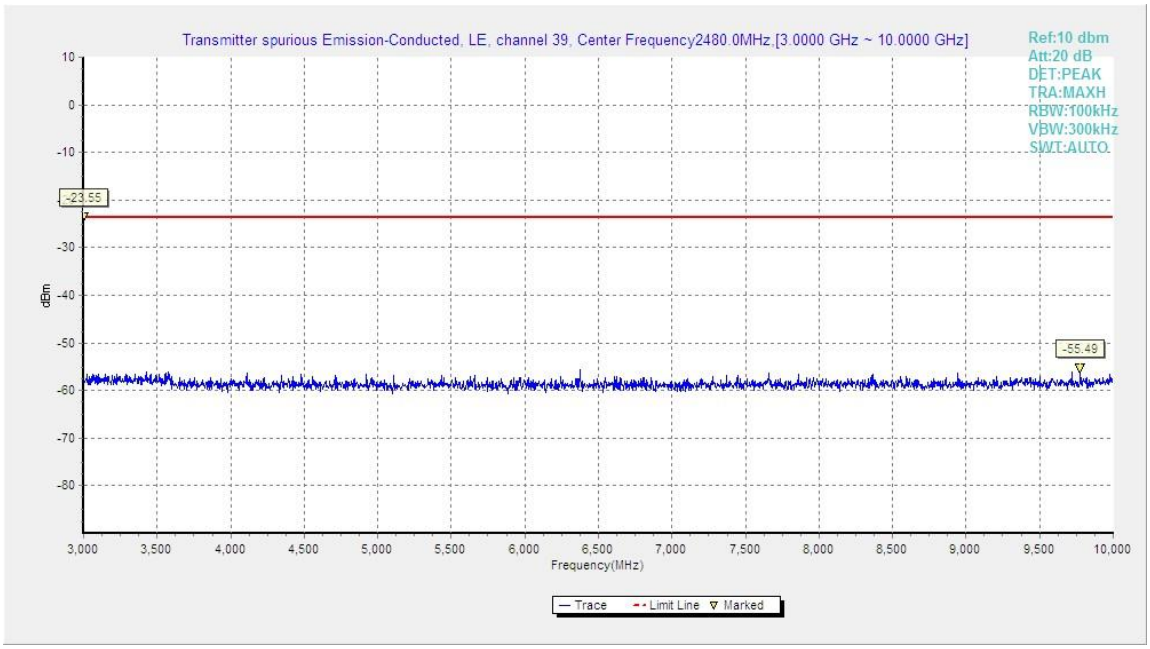


Fig.18. Transmitter Spurious Emission - Conducted: GFSK, 2480 MHz, 3GHz - 10GHz

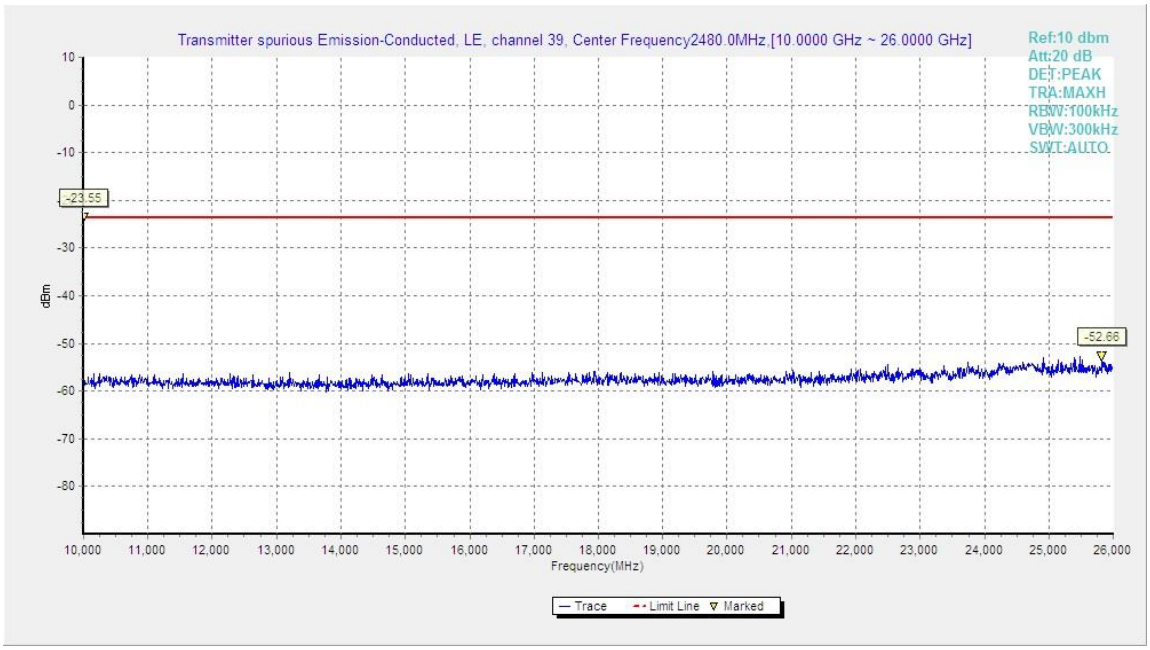


Fig.19. Transmitter Spurious Emission - Conducted: GFSK, 2480 MHz, 10GHz - 26GHz

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)
30-88	100	40
88-216	150	43.5
216-960	200	46
Above 960	500	54

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.

Test Procedure

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.

The receiver references:

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

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 show only up to 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)
17985	45.64	-25.5	46.7	24.44	54	8.36	H
14497.5	39.99	-28.6	42.5	26.09	54	14.01	H
12962.5	35.85	-30.5	39.2	27.15	54	18.15	H
9204	33.21	-33.7	38	28.91	54	20.79	H
7995	32.05	-34.8	37.1	29.75	54	21.95	V
2374.1	41.62	-20.1	28	33.62	54	12.38	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)
17995	45.5	-25.5	46.7	24.3	54	8.5	V
14351.5	40.05	-28.4	42.3	26.15	54	13.95	H
12648.5	36.38	-30.5	39.1	27.78	54	17.62	H
9199.5	33.33	-33.7	38	29.03	54	20.67	H
7559	31.91	-35	36.9	30.11	54	22.09	H
4855.5	28.11	-37.5	33.1	32.41	54	25.89	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)
17990	45.71	-25.5	46.7	24.51	54	8.29	H
14392.5	40.05	-28.6	42.5	26.15	54	13.95	H
12671.5	36.35	-30.5	39.1	27.75	54	17.65	H
8876	33.67	-33.5	38.1	29.07	54	20.33	H
7993	32.37	-34.8	37.1	30.07	54	21.63	H
2488.6	41.85	-20	28.3	33.55	54	12.15	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)
17931.5	57.68	-25.5	46.7	36.48	74	16.32	V
14466	51.97	-28.6	42.5	38.07	74	22.03	V
12679	48.31	-30.5	39.1	39.71	74	25.69	H
8778	45.01	-33.9	38.1	40.81	74	28.99	V
7514	44.06	-34.5	36.8	41.76	74	29.94	H
2359.6	55.39	-20.1	28	47.39	74	18.61	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)
17977	56.7	-25.5	46.7	35.5	74	17.3	H
14130.5	51.94	-29	42	38.94	74	22.06	V
12906.5	47.3	-30.5	39.2	38.6	74	26.7	V
8988.5	45.46	-33.3	38.2	40.56	74	28.54	V
7565	44.64	-35	36.9	42.84	74	29.36	V
4862	40	-37.5	33.1	44.3	74	34	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)
17980	57	-25.5	46.7	35.8	74	17	V
14373	52.37	-28.4	42.3	38.47	74	21.63	H
12988.5	47.45	-30.5	39.2	38.75	74	26.55	H
9078.5	45.44	-33.8	38.1	41.04	74	28.56	H
7542	43.5	-35	36.9	41.7	74	30.5	H
2487.8	54.7	-20	28.3	46.4	74	19.3	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	665.00	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

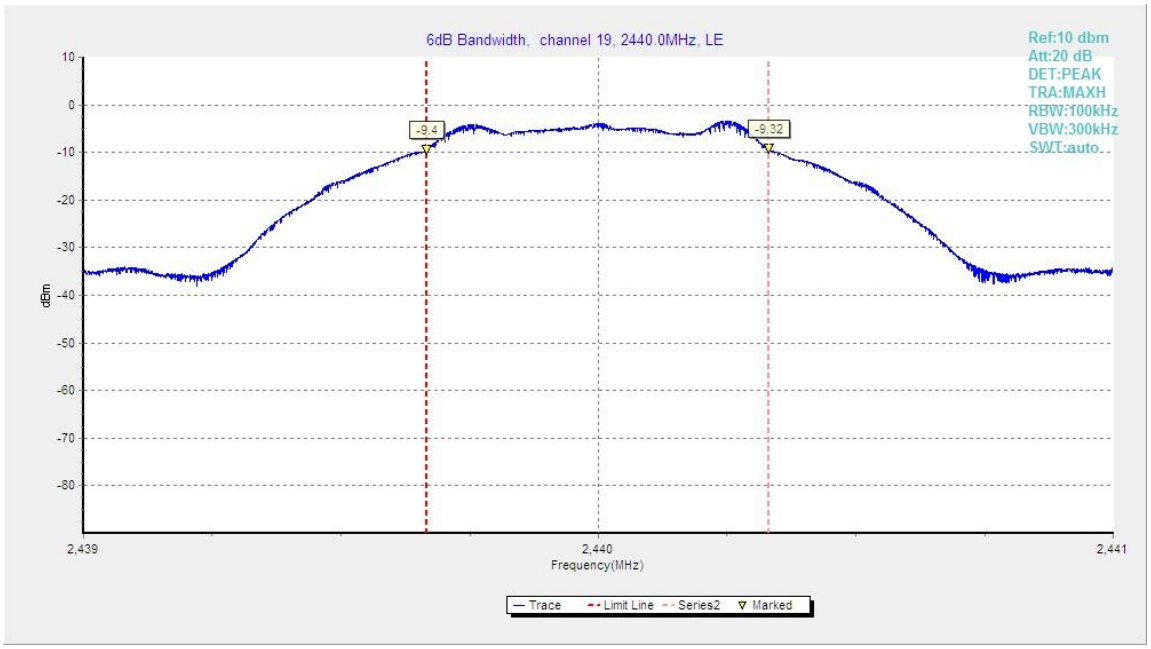


Fig.21. 6dB Bandwidth: GFSK, 2440 MHz

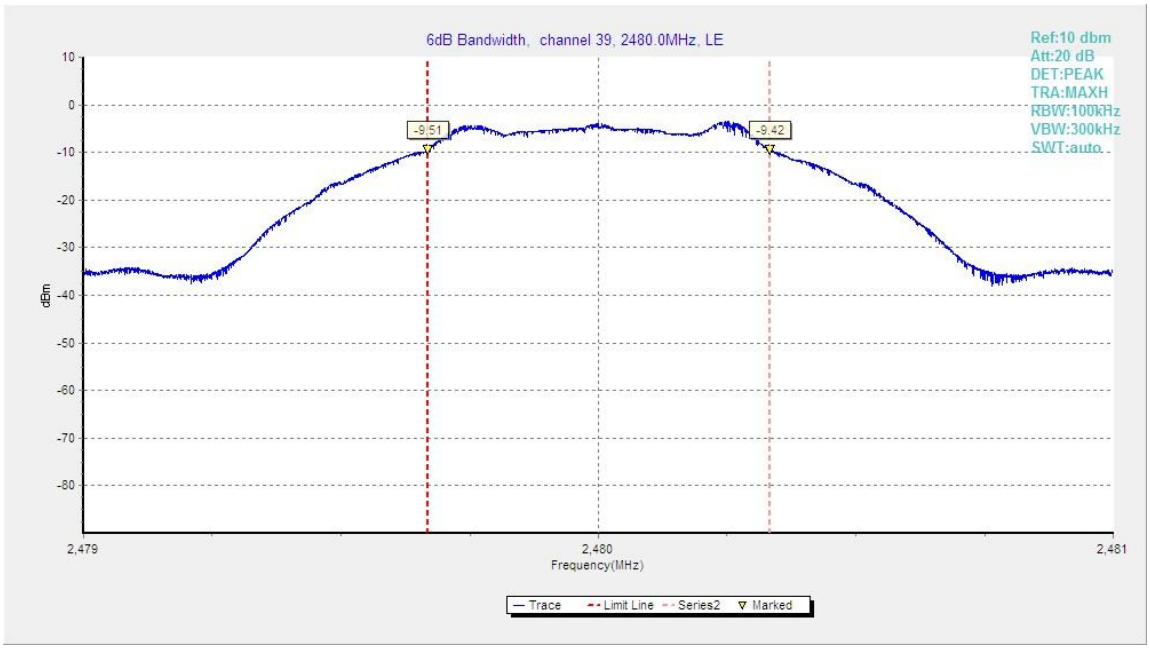


Fig.22. 6dB Bandwidth: GFSK, 2480 MHz

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	-19.41	P
19	2440	Fig.24	-19.67	P
39	2480	Fig.25	-19.80	P

Test graphs as below:

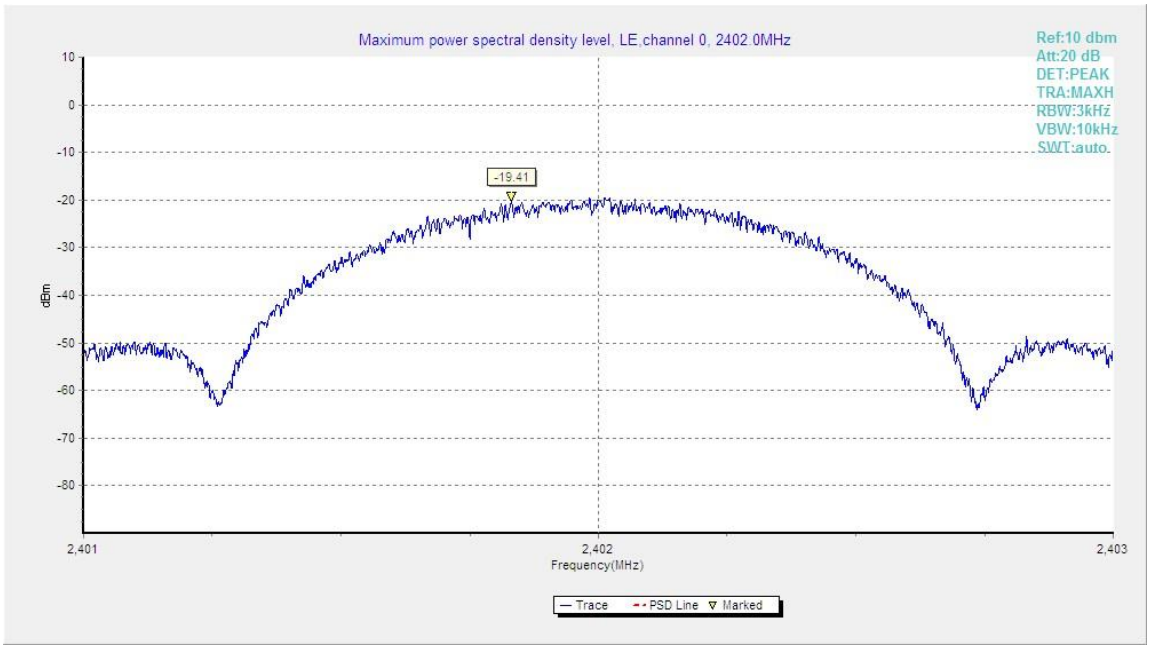


Fig.23. Maximum Power Spectral Density Level Function: GFSK, 2402 MHz

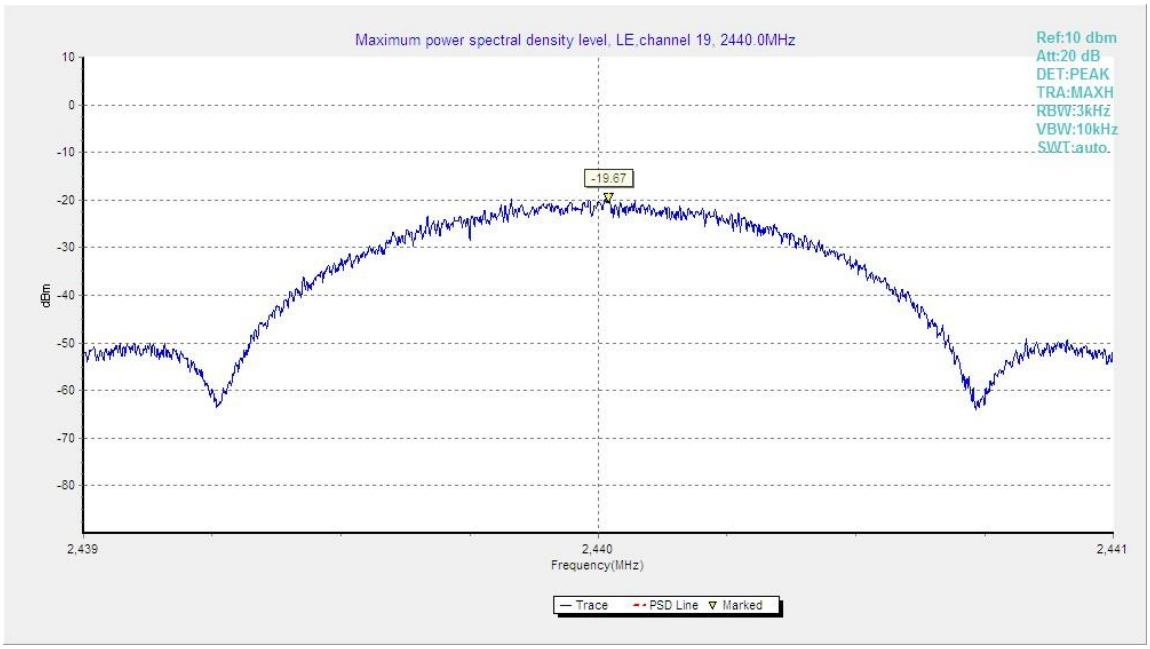


Fig.24. Maximum Power Spectral Density Level Function: GFSK, 2440 MHz

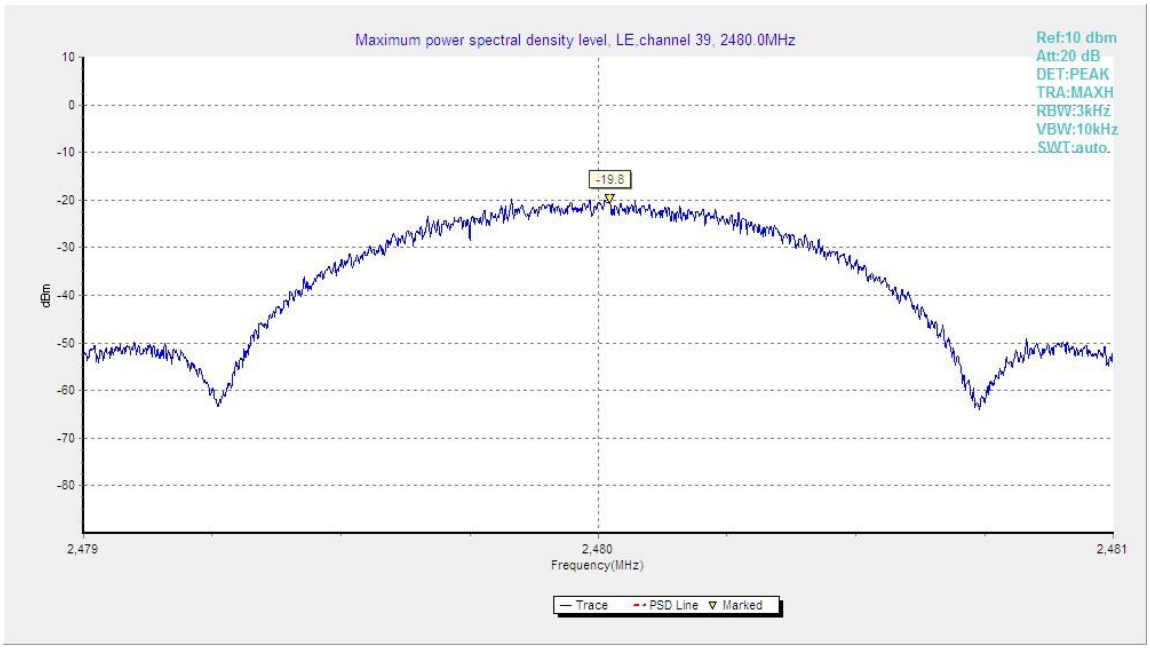


Fig.25. Maximum Power Spectral Density Level Function: GFSK, 2480 MHz

B.9. AC Powerline Conducted Emission

Method of Measurement: See 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:

EUT ID: UT30a

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:

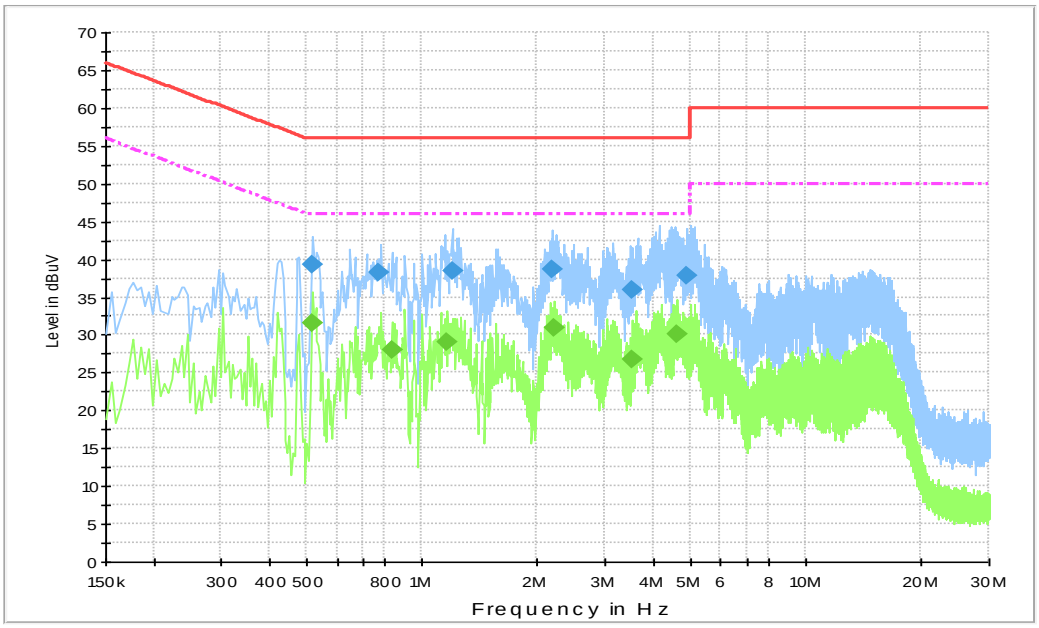


Fig.B.9.1 AC Powerline Conducted Emission- bluetooth

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)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.519000	39.2	1000.	9.000	L1	19.8	16.8	56.0
0.775500	38.2	1000.	9.000	L1	19.7	17.8	56.0
1.198500	38.4	1000.	9.000	L1	19.6	17.6	56.0
2.188500	38.6	1000.	9.000	L1	19.6	17.4	56.0
3.511500	35.9	1000.	9.000	L1	19.6	20.1	56.0
4.897500	37.8	1000.	9.000	L1	19.7	18.2	56.0

Final Result 2

Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.519000	31.5	1000.0	9.000	L1	19.8	14.5	46.0
0.834000	28.0	1000.0	9.000	L1	19.7	18.0	46.0
1.167000	29.1	1000.0	9.000	L1	19.7	16.9	46.0
2.206500	30.9	1000.0	9.000	L1	19.6	15.1	46.0
3.529500	26.7	1000.0	9.000	L1	19.6	19.3	46.0
4.600500	30.1	1000.0	9.000	L1	19.6	16.0	46.0

Note2: The measurement results showed here are worst cases of the combinations of different chargers.

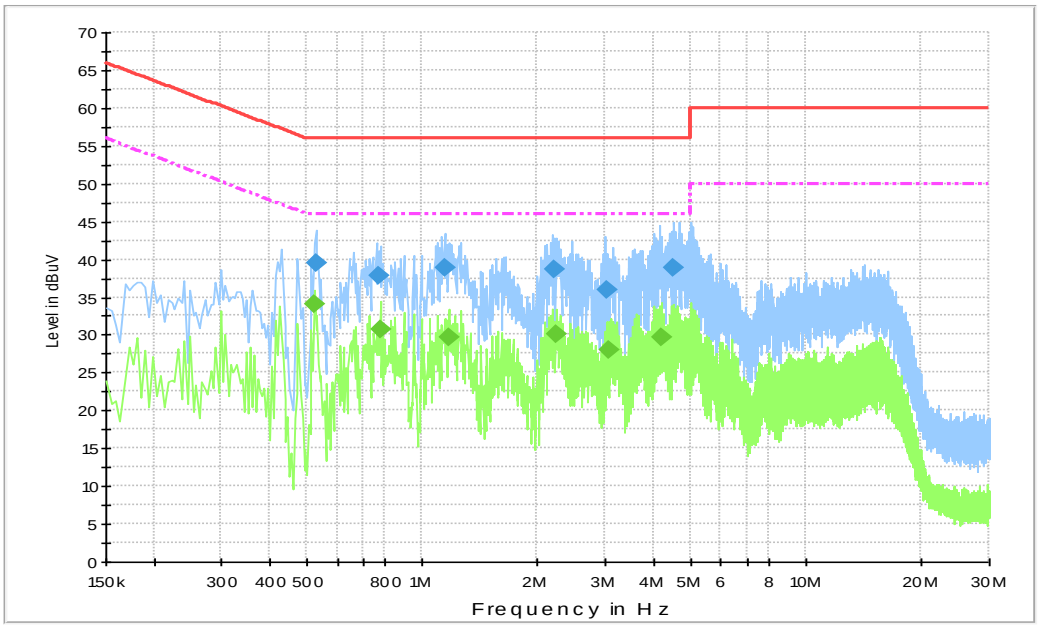


Fig.B.9.2 AC Powerline Conducted Emission-Idle

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

Final Result 1

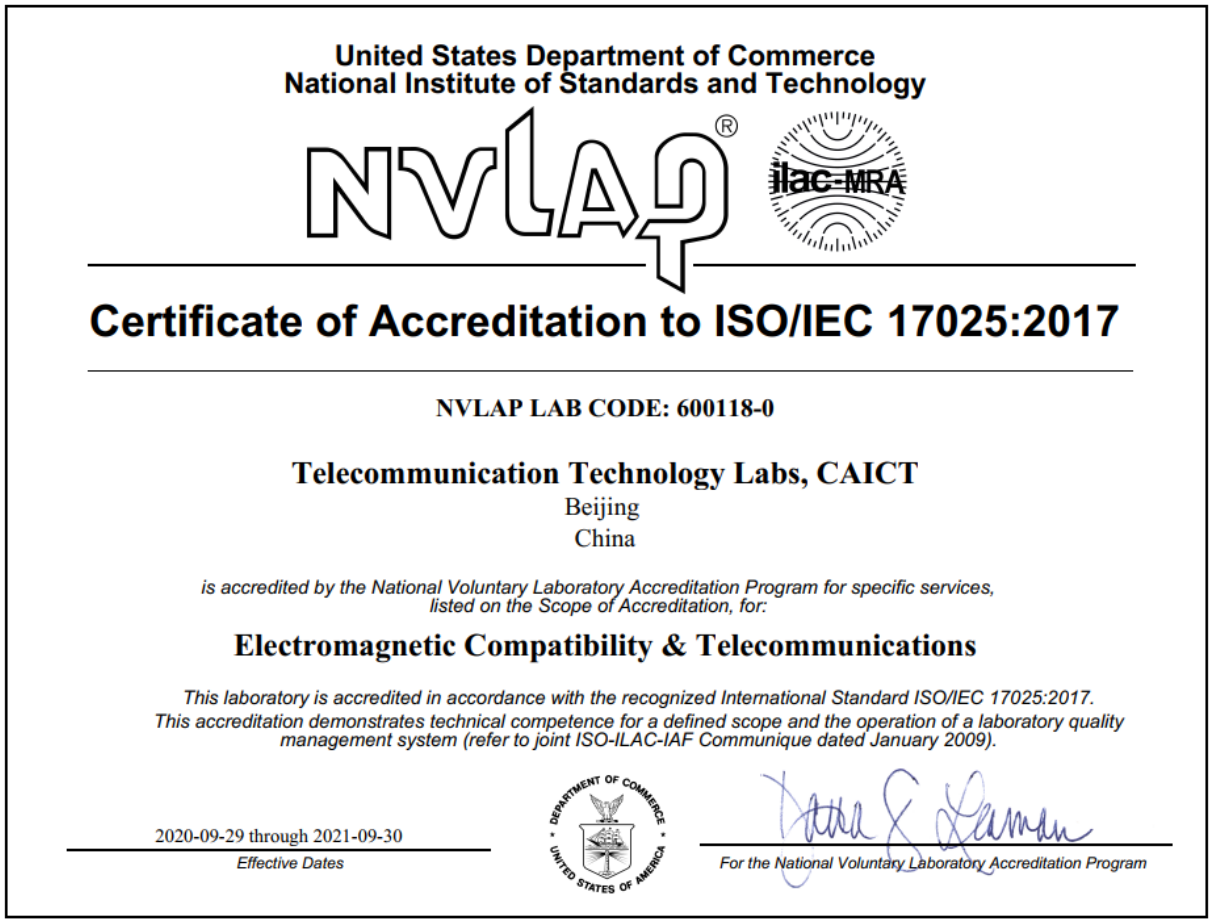
Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.528000	39.4	1000.	9.000	L1	19.8	16.6	56.0
0.771000	37.8	1000.	9.000	L1	19.7	18.2	56.0
1.144500	38.9	1000.	9.000	L1	19.7	17.1	56.0
2.197500	38.6	1000.	9.000	L1	19.6	17.4	56.0
3.039000	36.0	1000.	9.000	L1	19.6	20.0	56.0
4.515000	38.9	1000.	9.000	L1	19.6	17.1	56.0

Final Result 2

Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.523500	34.0	1000.0	9.000	L1	19.8	12.0	46.0
0.780000	30.8	1000.0	9.000	L1	19.7	15.2	46.0
1.171500	29.7	1000.0	9.000	L1	19.6	16.3	46.0
2.247000	30.1	1000.0	9.000	L1	19.6	15.9	46.0
3.079500	28.0	1000.0	9.000	L1	19.7	18.0	46.0
4.204500	29.7	1000.0	9.000	L1	19.6	16.3	46.0

Note2: The measurement results showed here are worst cases of the combinations of different chargers.

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).

2020-09-29 through 2021-09-30
Effective Dates

DEPARTMENT OF COMMERCE * UNITED STATES OF AMERICA *

For the National Voluntary Laboratory Accreditation Program

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