



FCC PART 15C TEST REPORT No.I21Z70396-EMC02

for

Samsung Electronics Co., Ltd.

Notebook PC

NP750TDA

with

FCC ID: ZCANP750TDA

Hardware Version: REV1.0

Software Version: Windows11-Pro

Issued Date: 2021-09-10

Note:

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REPORT HISTORY

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I21Z70396-EMC02	Rev.0	1st edition	2021-09-10

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1. Test Laboratory

1.1. Introduction & Accreditation

Telecommunication Technology Labs, CAICT is an ISO/IEC 17025:2017 accredited test laboratory under 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

Location1: 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°C

Relative Humidity: 20-75%

1.4. Project data

Testing Start Date: 2021-08-10

Testing End Date: 2021-09-08

1.5. Signature



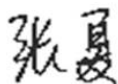
Li Yan

(Prepared this test report)



Zhang Ying

(Reviewed this test report)



Zhang Xia

Deputy Director of the laboratory

(Approved this test report)

2. Client Information

2.1. Applicant Information

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Contact: Jenni Chun
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Telephone: +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
Telephone: +82-10-2722-4159
Fax: /

3. PRODUCT INFORMATION

3.1. About EUT

Description	Notebook PC
Model name	NP750TDA
FCC ID	ZCANP750TDA

Note: Components list, please refer to documents of the manufacturer; it is also included in the original test record of T CTTL-Telecommunication Technology Labs, CAICT

3.2. Internal Identification of EUT

EUT ID*	SN or IMEI	HW Version	SW Version
EUT1	2170396UT15a	REV1.0	Windows11-Pro
EUT2	2170396UT23a	REV1.0	Windows11-Pro

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

3.3. Internal Identification of AE

AE ID*	Description	SN	Remarks
AE1	Travel Adapter	/	/
AE2	Data Cable	/	/
AE3	battery	/	Inbuilt

AE1

Model	EP-TA865
Manufacturer	DONGYANG E&P Inc
Length of cable	/

AE2

Model	GH39-02097A
Manufacturer	RFTech Thai Nguyen Co., Ltd.

AE3

Model	/
Manufacturer	/

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

3.4. General Description

The Equipment Under Test (EUT) was a Notebook PC with Bluetooth, Bluetooth Low Energy and 802.11 a/b/g/n/ac/ax capabilities in the 2.4 GHz and 5 GHz bands.

Antenna information

Item	Spec.	Vendor	Vendor P/N	Sample under test
Antenna	Main antenna (Chain A)	INPAQ	/	EUT1
	Auxiliary antenna (Chain B)			
Antenna	Main antenna (Chain A)	SPEED	/	EUT2
	Auxiliary antenna (Chain B)			

Manual and specifications of the EUT were provided to fulfil the test.

Samples undergoing test were selected by the Client.

For more EUT information please refers to the manufacturer's specifications or user's manual.

3.5. Test Configuration

For Bluetooth mode the EUT can transmit only at CHAIN A RF output.

The software DRTU provided by client to enable the EUT under transmission condition continuously at specific channel frequencies individually.

3.6. Interpretation of the Test Environment

For the test methods, the test environment uncertainty figures correspond to an expansion factor $k=2$.

Measurement Uncertainty

Parameter	Uncertainty
temperature	0.48°C
humidity	2 %
DC voltages	0.003V

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:	2019
	15.205 Restricted bands of operation;	
	15.209 Radiated emission limits, general requirements;	
ANSI C63.10	15.247 Operation within the bands 902-928MHz, 2400-2483.5 MHz, and 5725-5850 MHz.	2013
	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices	
	Federal Communications Commission Office of Engineering and Technology Laboratory Division	
KDB 558074 D01	GUIDANCE FOR COMPLIANCE MEASUREMENTS ON DIGITAL TRANSMISSION SYSTEM, FREQUENCY HOPPING SPREAD SPECTRUM SYSTEM, AND HYBRID SYSTEM DEVICES OPERATING UNDER SECTION 15.247 OF THE FCC RULES	2019

Note: The test methods have no deviation with standards.

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 of Part15C	Verdict
Radiated Spurious Emission	15.247, 15.205, 15.209	P
AC Power line Conducted Emission	15.107, 15.207	P

Please refer to **ANNEX C** 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. Test Conditions

T nom	Normal Temperature
T min	Low Temperature
T max	High Temperature
V nom	Normal Voltage

For this report, if the test cases listed above are tested under normal temperature and normal voltage, and also under norm humidity, the specific condition is shown as follows:

Temperature	T nom	26°C
Voltage	V nom	4.0V
Humidity	H nom	20-75%

6. Test Facilities Utilized

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	3117	00139065	ETS-Lindgren	1 year	2021-10-11
5	EMI Antenna	LB-180400-25-C-KF	211008400006	A-INFO	1 year	2022-02-28
6	Loop Antenna	HFH2-Z2	829324/007	R&S	1 year	2021-12-10
7	Analytical Spectrometer	FSV40	101047	R&S	1 year	2022-06-02
8	Universal Radio Communication Tester	CMW500	159048	R&S	1 Year	2022-03-03

AC Powerline Conducted Emission

No.	Equipment	Model	Serial Number	Manufacturer	Calibration Period	Calibration Due date
1	LISN	ENV216	101459	R&S	1 year	2022-03-16
2	Test Receiver	ESCI	100766	R&S	1 year	2022-03-09
3	Universal Radio Communication Tester	CMW500	159048	R&S	1 Year	2022-03-03

7. Measurement Uncertainty

Radiated Spurious Emission

Measurement Uncertainty:

Frequency Range	Uncertainty(dBm) (k=2)
9kHz-30MHz	/
$30\text{MHz} \leq f \leq 1\text{GHz}$	5.40
$1\text{GHz} \leq f \leq 18\text{GHz}$	4.32
$18\text{GHz} \leq f \leq 40\text{GHz}$	5.26

AC Power-line Conducted Emission

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

Disclaimer: The antenna gain and setting power 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: Antenna Requirements

According to FCC 47 CFR § 15.203:

“An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.”

- (1) The antennas of the EUT are permanently attached.
- (2) The EUT complies with the requirement of §15.203

ANNEX C: Detailed Test Results

C.1. Radiated Spurious Emission

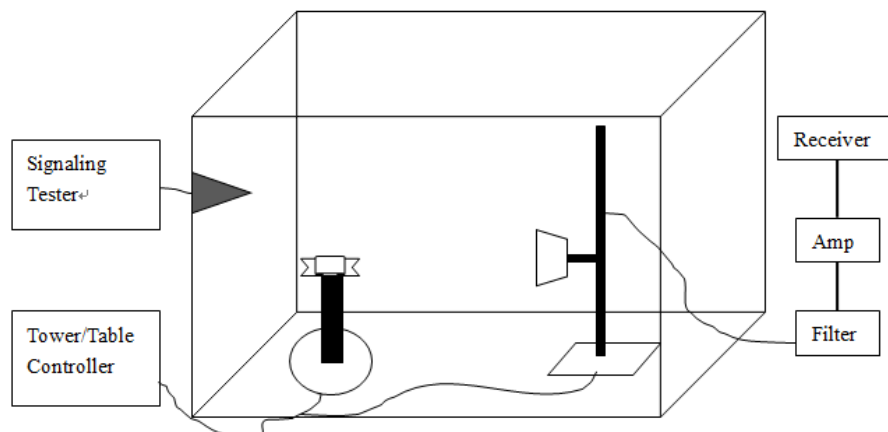
Specification Reference

FCC 47 CFR Part 15.247, 15.205, 15.209

Method of Measurement

Testing was performed in accordance with ANSI C63.10-2013 and KDB 558074.

The radiated emission test is performed in a 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 the 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.



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)).

Limit in restricted band:

Frequency (MHz)	Field strength($\mu\text{V/m}$)	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

Test settings

Frequency of emission (MHz)	RBW/VBW
30-1000	100kHz/300kHz
1000-4000	1MHz/3MHz
4000-18000	1MHz/3MHz
18000-26500	1MHz/3MHz

Sample Calculation

The measurement results are obtained as described below:

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

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.

Test Notes

1. The EUT is operating at its maximum duty cycle and its maximum power control level.
2. Investigation has been done on all channel, modes and modulations/data rates. Only the radiated emissions of the configurations that produced the worst case emissions are reported in this section.

C.1.1 Radiated Spurious Emission- above 1GHz

INPAQ

Peak Measurement results

GFSK Ch 0

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)
2364.166	60.77	2.85	31.97	25.94	74.00	13.23	V
2380.686	60.97	2.86	31.99	26.12	74.00	13.03	H
4804.000	43.17	-33.27	34.12	42.32	74.00	30.83	V
7206.000	44.92	-31.17	35.78	40.30	74.00	29.08	V
9608.000	46.25	-30.55	36.65	40.15	74.00	27.75	H
12010.000	47.01	-28.93	38.71	37.23	74.00	26.99	V

GFSK Ch 39

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)
2357.600	48.10	-35.33	31.97	51.46	74.00	25.90	H
2504.800	49.15	-35.01	32.11	52.05	74.00	24.85	V
4882.000	43.33	-33.32	34.15	42.50	74.00	30.67	H
7323.000	45.15	-30.91	35.83	40.22	74.00	28.85	V
9764.000	44.81	-30.33	36.87	38.27	74.00	29.19	H
12205.000	46.82	-28.02	38.82	36.02	74.00	27.18	H

GFSK Ch 78

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)
2484.175	61.72	2.93	32.09	26.71	74.00	12.28	H
2484.755	61.09	2.93	32.09	26.08	74.00	12.91	H
4960.000	41.96	-33.60	34.18	41.38	74.00	32.04	V
7440.000	42.80	-31.69	35.88	38.62	74.00	31.20	V
9920.000	44.29	-30.00	37.09	37.20	74.00	29.71	V
12400.000	46.89	-28.10	38.94	36.04	74.00	27.11	V

$\pi/4$ DQPSK Ch 0

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)
2343.222	60.95	2.83	31.95	26.16	74.00	13.05	H
2385.768	61.04	2.86	32.00	26.18	74.00	12.96	H
4804.000	42.09	-33.27	34.12	41.24	74.00	31.91	V
7206.000	44.48	-31.17	35.78	39.87	74.00	29.52	H
9608.000	44.15	-30.55	36.65	38.05	74.00	29.85	V
12010.000	46.92	-28.93	38.71	37.15	74.00	27.08	H

$\pi/4$ DQPSK Ch 39

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)
2086.000	48.37	-35.91	31.69	52.59	74.00	25.63	V
2539.200	48.66	-34.76	32.18	51.25	74.00	25.34	V
4882.000	42.22	-33.32	34.15	41.39	74.00	31.78	H
7323.000	44.17	-30.91	35.83	39.25	74.00	29.83	V
9764.000	44.85	-30.33	36.87	38.31	74.00	29.15	H
12205.000	47.43	-28.02	38.82	36.62	74.00	26.57	V

$\pi/4$ DQPSK Ch 78

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)
2486.245	61.60	2.93	32.09	26.58	74.00	12.40	V
2496.575	60.95	2.94	32.10	25.92	74.00	13.05	H
4960.000	42.20	-33.60	34.18	41.62	74.00	31.80	V
7440.000	42.88	-31.69	35.88	38.70	74.00	31.12	H
9920.000	44.95	-30.00	37.09	37.86	74.00	29.05	H
12400.000	47.38	-28.10	38.94	36.54	74.00	26.62	V

8DPSK Ch 0

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)
2356.046	61.08	2.84	31.97	26.27	74.00	12.92	V
2373.686	60.96	2.85	31.98	26.12	74.00	13.04	H
4804.000	43.11	-33.27	34.12	42.26	74.00	30.89	H
7206.000	45.40	-31.17	35.78	40.78	74.00	28.60	V
9608.000	44.56	-30.55	36.65	38.46	74.00	29.44	V
12010.000	46.16	-28.93	38.71	36.38	74.00	27.84	H

8DPSK Ch 39

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)
2358.000	47.28	-35.33	31.97	50.64	74.00	26.72	V
2528.200	48.92	-34.74	32.16	51.50	74.00	25.08	H
4882.000	42.62	-33.32	34.15	41.78	74.00	31.38	H
7323.000	43.32	-30.91	35.83	38.40	74.00	30.68	V
9764.000	44.44	-30.33	36.87	37.90	74.00	29.56	H
12205.000	49.40	-28.02	38.82	38.60	74.00	24.60	V

8DPSK Ch 78

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)
2485.965	60.99	2.93	32.09	25.97	74.00	13.01	V
2487.000	60.99	2.93	32.09	25.97	74.00	13.01	V
4960.000	42.15	-33.60	34.18	41.56	74.00	31.85	V
7440.000	43.66	-31.69	35.88	39.48	74.00	30.34	V
9920.000	43.68	-30.00	37.09	36.59	74.00	30.32	V
12400.000	48.74	-28.10	38.94	37.90	74.00	25.26	H

Average Measurement results

GFSK Ch 0

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)
2387.580	47.15	2.86	32.00	12.29	54.00	6.85	V
2389.260	47.08	2.87	32.00	12.22	54.00	6.92	V
4803.700	31.96	-33.27	34.12	31.11	54.00	22.04	H
7205.800	33.48	-31.17	35.78	28.87	54.00	20.52	H
9607.900	33.90	-30.55	36.65	27.79	54.00	20.10	H
12010.000	35.60	-28.93	38.71	25.83	54.00	18.40	V

GFSK Ch 39

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)
2435.100	47.08	2.90	32.04	12.14	54.00	6.92	V
2446.800	47.12	2.91	32.05	12.16	54.00	6.88	V
4882.000	31.08	-33.32	34.15	30.24	54.00	22.92	V
7322.800	32.72	-30.91	35.83	27.80	54.00	21.28	H
9763.600	33.71	-30.33	36.87	27.17	54.00	20.29	H
12205.300	36.59	-28.02	38.82	25.78	54.00	17.41	V

GFSK Ch 78

Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
2483.520	50.33	2.93	32.09	15.31	54.00	3.67	V
2483.580	49.92	2.93	32.09	14.90	54.00	4.08	V
4960.300	31.59	-33.60	34.18	31.00	54.00	22.41	V
7439.800	32.36	-31.69	35.88	28.17	54.00	21.64	H
9920.200	33.58	-30.00	37.09	26.48	54.00	20.42	H
12399.700	36.36	-28.09	38.94	25.51	54.00	17.64	V

$\pi/4$ DQPSK Ch 0

Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
2389.920	47.06	2.87	32.00	12.20	54.00	6.94	V
2389.980	47.06	2.87	32.00	12.19	54.00	6.94	V
4803.700	32.00	-33.27	34.12	31.14	54.00	22.00	V
7205.800	33.55	-31.17	35.78	28.93	54.00	20.45	H
9607.900	34.01	-30.55	36.65	27.91	54.00	19.99	H
12010.000	35.65	-28.93	38.71	25.87	54.00	18.35	H

 $\pi/4$ DQPSK Ch 39

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)
2435.880	47.16	2.90	32.04	12.22	54.00	6.84	V
2445.060	47.55	2.90	32.05	12.59	54.00	6.45	V
4882.000	31.28	-33.32	34.15	30.44	54.00	22.72	V
7322.800	32.70	-30.91	35.83	27.77	54.00	21.30	V
9763.600	33.69	-30.33	36.87	27.15	54.00	20.31	V
12205.300	36.57	-28.02	38.82	25.76	54.00	17.43	H

 $\pi/4$ DQPSK Ch 78

Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
2483.520	48.82	2.93	32.09	13.80	54.00	5.18	V
2483.580	48.54	2.93	32.09	13.52	54.00	5.46	V
4960.300	31.64	-33.60	34.18	31.05	54.00	22.36	V
7439.800	32.30	-31.69	35.88	28.11	54.00	21.70	V
9920.200	33.66	-30.00	37.09	26.56	54.00	20.34	H
12399.700	36.41	-28.09	38.94	25.56	54.00	17.59	H

8DPSK Ch 0

Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
2389.440	47.02	2.87	32.00	12.15	54.00	6.98	V
2389.920	47.02	2.87	32.00	12.16	54.00	6.98	V
4803.700	31.97	-33.27	34.12	31.11	54.00	22.03	H
7205.800	33.49	-31.17	35.78	28.87	54.00	20.51	H
9607.900	33.93	-30.55	36.65	27.82	54.00	20.07	H
12010.000	35.52	-28.93	38.71	25.74	54.00	18.48	H

8DPSK Ch 39

Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
2436.480	47.10	2.90	32.04	12.16	54.00	6.90	V
2446.800	47.08	2.91	32.05	12.12	54.00	6.92	V
4882.000	31.27	-33.32	34.15	30.44	54.00	22.73	H
7322.800	32.72	-30.91	35.83	27.80	54.00	21.28	H
9763.600	33.76	-30.33	36.87	27.23	54.00	20.24	H
12205.300	36.55	-28.02	38.82	25.74	54.00	17.45	H

8DPSK Ch 78

Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
2483.520	50.67	2.93	32.09	15.65	54.00	3.33	V
2483.580	50.45	2.93	32.09	15.44	54.00	3.55	V
4960.300	31.58	-33.60	34.18	30.99	54.00	22.42	H
7439.800	32.29	-31.69	35.88	28.11	54.00	21.71	H
9920.200	33.57	-30.00	37.09	26.48	54.00	20.43	V
12399.700	36.40	-28.09	38.94	25.56	54.00	17.60	H

Note: the spurious emission above 18G is noise only.

Conclusion: Pass

SPEED

Peak Measurement results

GFSK Ch 0

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)
2385.582	60.22	2.62	27.66	29.94	74.00	13.78	H
2386.625	60.11	2.62	27.66	29.82	74.00	13.89	H
4804.219	40.18	-37.75	32.01	45.92	74.00	33.82	V
7206.938	43.84	-36.95	35.71	45.08	74.00	30.16	H
9607.969	45.97	-35.78	37.80	43.95	74.00	28.03	H
12009.844	47.18	-34.75	39.09	42.84	74.00	26.82	H

GFSK Ch 39

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)
1385.500	38.08	-41.09	24.59	54.58	74.00	35.92	H
2857.625	41.11	-40.01	28.65	52.47	74.00	32.89	H
4882.031	39.52	-37.76	32.21	45.07	74.00	34.48	V
7322.812	42.63	-36.91	35.98	43.55	74.00	31.37	H
9764.062	45.20	-35.67	37.80	43.07	74.00	28.80	H
12204.844	48.11	-34.82	38.98	43.95	74.00	25.89	V

GFSK Ch 78

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)
2486.713	60.54	2.67	27.70	30.17	74.00	13.46	H
2488.275	60.96	2.68	27.70	30.58	74.00	13.04	V
4959.844	37.74	-37.90	32.40	43.23	74.00	36.26	H
7440.000	44.31	-36.59	36.26	44.65	74.00	29.69	V
9920.156	45.92	-35.60	37.80	43.72	74.00	28.08	H
12399.844	46.99	-34.33	38.86	42.46	74.00	27.01	H

$\pi/4$ DQPSK Ch 0

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)
2317.543	61.24	2.56	27.63	31.05	74.00	12.76	V
2363.077	61.16	2.62	27.65	30.88	74.00	12.84	V
4804.219	40.14	-37.75	32.01	45.88	74.00	33.86	V
7206.094	42.02	-36.95	35.70	43.27	74.00	31.98	H
9607.969	44.10	-35.78	37.80	42.08	74.00	29.90	V
12009.844	45.66	-34.75	39.09	41.32	74.00	28.34	V

$\pi/4$ DQPSK Ch 39

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)
1373.250	38.73	-41.19	24.55	55.37	74.00	35.27	V
2561.125	41.26	-40.03	27.87	53.41	74.00	32.74	H
4882.031	39.33	-37.76	32.21	44.88	74.00	34.67	V
7322.812	43.22	-36.91	35.98	44.14	74.00	30.78	V
9764.062	46.44	-35.67	37.80	44.31	74.00	27.56	V
12204.844	47.94	-34.82	38.98	43.79	74.00	26.06	H

$\pi/4$ DQPSK Ch 78

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)
2485.887	60.62	2.66	27.69	30.26	74.00	13.38	H
2488.762	61.06	2.68	27.70	30.68	74.00	12.94	H
4959.844	39.02	-37.90	32.40	44.52	74.00	34.98	V
7440.000	44.62	-36.59	36.26	44.95	74.00	29.38	V
9920.156	45.39	-35.60	37.80	43.19	74.00	28.61	H
12399.844	46.60	-34.33	38.86	42.07	74.00	27.40	H

8DPSK Ch 0

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)
2366.665	61.21	2.62	27.65	30.93	74.00	12.79	V
2389.747	60.63	2.62	27.66	30.35	74.00	13.37	V
4804.219	39.34	-37.75	32.01	45.08	74.00	34.66	V
7206.094	42.18	-36.95	35.70	43.42	74.00	31.82	V
9607.969	44.78	-35.78	37.80	42.76	74.00	29.22	V
12009.844	46.07	-34.75	39.09	41.72	74.00	27.93	V

8DPSK Ch 39

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)
1372.250	38.85	-41.19	24.55	55.49	74.00	35.15	H
2560.750	40.49	-40.03	27.87	52.64	74.00	33.51	H
4882.031	39.13	-37.76	32.21	44.69	74.00	34.87	H
7322.812	42.60	-36.91	35.98	43.53	74.00	31.40	H
9764.062	46.52	-35.67	37.80	44.40	74.00	27.48	H
12204.844	47.81	-34.82	38.98	43.65	74.00	26.19	V

8DPSK Ch 78

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)
2486.156	60.61	2.66	27.70	30.25	74.00	13.39	H
2486.838	60.69	2.67	27.70	30.32	74.00	13.31	V
4959.844	38.92	-37.90	32.40	44.42	74.00	35.08	V
7440.000	42.65	-36.59	36.26	42.98	74.00	31.35	H
9920.156	44.52	-35.60	37.80	42.32	74.00	29.48	V
12399.844	46.70	-34.33	38.86	42.18	74.00	27.30	H

Average Measurement results

GFSK Ch 0

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)
2379.400	45.93	2.62	27.66	15.65	54.00	8.07	V
2385.600	45.89	2.62	27.66	15.61	54.00	8.11	V
4803.750	28.46	-37.75	32.01	34.20	54.00	25.54	V
7206.250	31.44	-36.95	35.71	32.68	54.00	22.56	V
9608.125	33.60	-35.78	37.80	31.58	54.00	20.40	H
12010.000	35.66	-34.75	39.09	31.31	54.00	18.34	H

GFSK Ch 39

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)
2434.050	46.10	2.63	27.68	15.79	54.00	7.90	V
2445.175	46.15	2.63	27.68	15.84	54.00	7.85	V
4881.875	28.07	-37.76	32.21	33.63	54.00	25.93	H
7323.125	31.38	-36.91	35.98	32.30	54.00	22.62	V
9763.750	34.82	-35.67	37.80	32.69	54.00	19.18	H
12205.000	36.69	-34.82	38.98	32.53	54.00	17.31	H

GFSK Ch 78

Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
2483.650	46.11	2.65	27.69	15.77	54.00	7.89	V
2484.075	46.15	2.65	27.69	15.80	54.00	7.85	V
4960.000	27.79	-37.89	32.40	33.28	54.00	26.21	V
7440.000	32.13	-36.59	36.26	32.46	54.00	21.87	H
9920.000	34.03	-35.60	37.80	31.83	54.00	19.97	V
12400.000	35.63	-34.33	38.86	31.10	54.00	18.37	H

$\pi/4$ DQPSK Ch 0

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)
2388.050	45.91	2.62	27.66	15.63	54.00	8.09	V
2389.250	45.85	2.62	27.66	15.56	54.00	8.15	V
4803.750	28.50	-37.75	32.01	34.24	54.00	25.50	H
7206.250	31.45	-36.95	35.71	32.70	54.00	22.55	V
9608.125	33.56	-35.78	37.80	31.54	54.00	20.44	V
12010.000	35.70	-34.75	39.09	31.35	54.00	18.30	V

 $\pi/4$ DQPSK Ch 39

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)
2437.150	46.09	2.63	27.68	15.78	54.00	7.91	V
2444.300	46.19	2.63	27.68	15.88	54.00	7.81	V
4881.875	28.29	-37.76	32.21	33.85	54.00	25.71	H
7323.125	31.48	-36.91	35.98	32.40	54.00	22.52	V
9763.750	34.70	-35.67	37.80	32.57	54.00	19.30	H
12205.000	36.65	-34.82	38.98	32.49	54.00	17.35	H

 $\pi/4$ DQPSK Ch 78

Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
2483.600	46.08	2.65	27.69	15.74	54.00	7.92	V
2484.900	46.13	2.66	27.69	15.78	54.00	7.87	V
4960.000	27.91	-37.89	32.40	33.41	54.00	26.09	V
7440.000	32.01	-36.59	36.26	32.35	54.00	21.99	V
9920.000	34.07	-35.60	37.80	31.87	54.00	19.93	H
12400.000	35.74	-34.33	38.86	31.21	54.00	18.26	H

8DPSK Ch 0

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)
2384.825	46.01	2.62	27.66	15.73	54.00	7.99	V
2386.125	45.99	2.62	27.66	15.71	54.00	8.01	V
4803.750	28.63	-37.75	32.01	34.38	54.00	25.37	V
7206.250	31.39	-36.95	35.71	32.63	54.00	22.61	V
9608.125	33.38	-35.78	37.80	31.36	54.00	20.62	V
12010.000	35.36	-34.75	39.09	31.02	54.00	18.64	H

8DPSK Ch 39

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)
2435.250	46.06	2.63	27.68	15.75	54.00	7.94	V
2445.075	46.10	2.63	27.68	15.79	54.00	7.90	V
4881.875	28.39	-37.76	32.21	33.95	54.00	25.61	H
7323.125	31.54	-36.91	35.98	32.46	54.00	22.46	H
9763.750	34.60	-35.67	37.80	32.47	54.00	19.40	H
12205.000	36.52	-34.82	38.98	32.36	54.00	17.48	V

8DPSK Ch 78

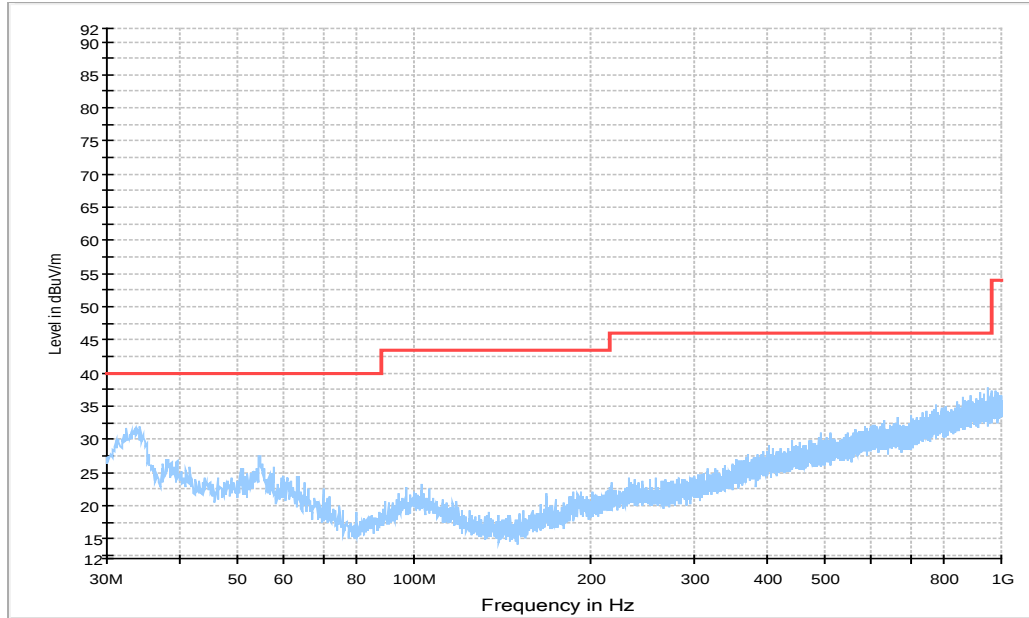
Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
2483.550	46.08	2.64	27.69	15.74	54.00	7.92	V
2486.625	46.07	2.67	27.70	15.70	54.00	7.93	V
4960.000	27.64	-37.89	32.40	33.13	54.00	26.36	H
7440.000	32.27	-36.59	36.26	32.60	54.00	21.73	H
9920.000	34.08	-35.60	37.80	31.88	54.00	19.92	H
12400.000	35.62	-34.33	38.86	31.09	54.00	18.38	H

Note: the spurious emission above 18G is noise only.

Conclusion: Pass

C.1.2 Radiated Spurious Emission- Below 1GHz

WOSRT CASE BELOW 1GHz



BELOW 30MHz

No emissions were found within 20dB of the limit below 30MHz.

C.1.3 Band Edges Compliance– Radiated

INPAQ

Mode	Channel	Frequency Range	Test Results	Conclusion
GFSK	0	2.31GHz ~2.45GHz	Fig.1	P
	78	2.45GHz ~2.5GHz	Fig.2	P

Mode	Channel	Frequency Range	Test Results	Conclusion
$\pi/4$ DQPSK	0	2.31GHz ~2.43GHz	Fig.3	P
	78	2.45GHz ~2.5GHz	Fig.4	P

Mode	Channel	Frequency Range	Test Results	Conclusion
8DPSK	0	2.31GHz ~2.45GHz	Fig.5	P
	78	2.45GHz ~2.5GHz	Fig.6	P

SPEED

Mode	Channel	Frequency Range	Test Results	Conclusion
GFSK	0	2.31GHz ~2.45GHz	Fig.7	P
	78	2.45GHz ~2.5GHz	Fig.8	P

Mode	Channel	Frequency Range	Test Results	Conclusion
$\pi/4$ DQPSK	0	2.31GHz ~2.43GHz	Fig.9	P
	78	2.45GHz ~2.5GHz	Fig.10	P

Mode	Channel	Frequency Range	Test Results	Conclusion
8DPSK	0	2.31GHz ~2.45GHz	Fig.11	P
	78	2.45GHz ~2.5GHz	Fig.12	P

Conclusion: PASS

Test graphs as below

INPAQ

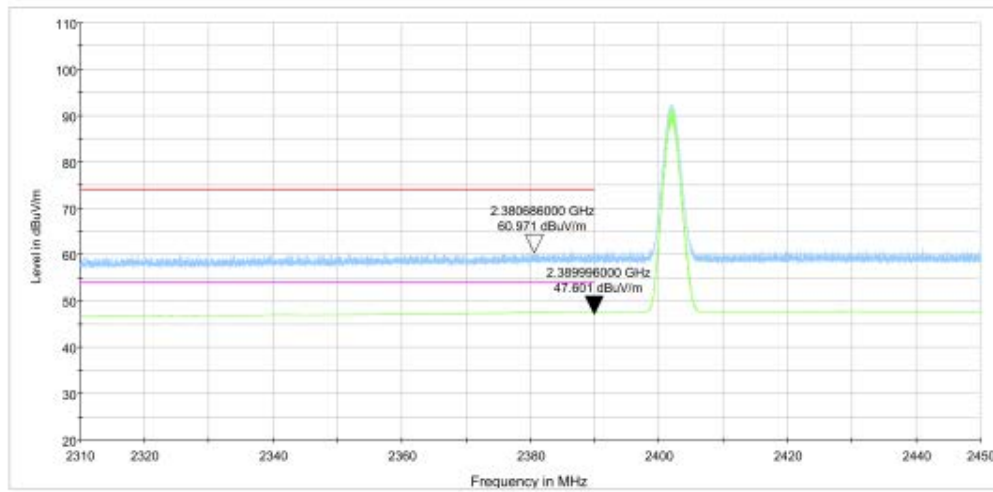


Fig.1. Frequency Band Edges: GFSK, Channel 0, 2.31 GHz – 2.45GHz

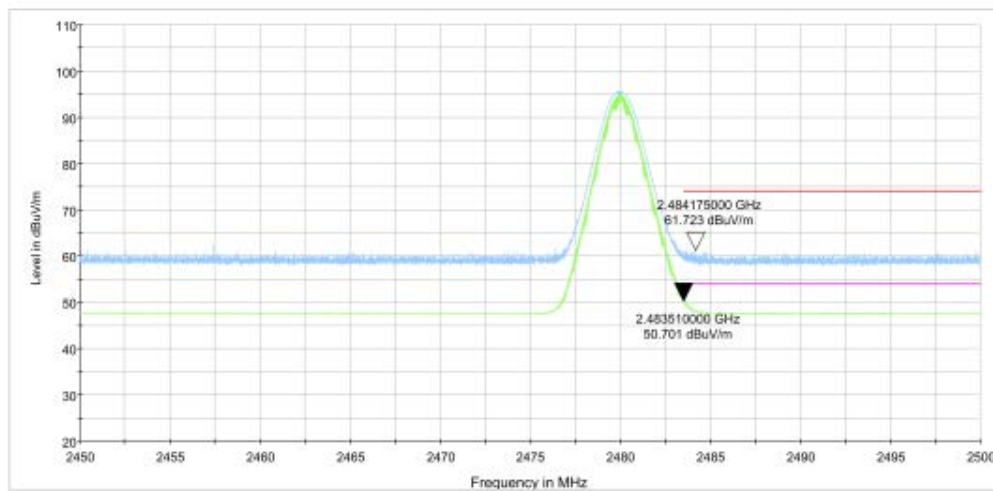


Fig.2. Frequency Band Edges: GFSK, Channel 78, 2.45 GHz - 2.50GHz

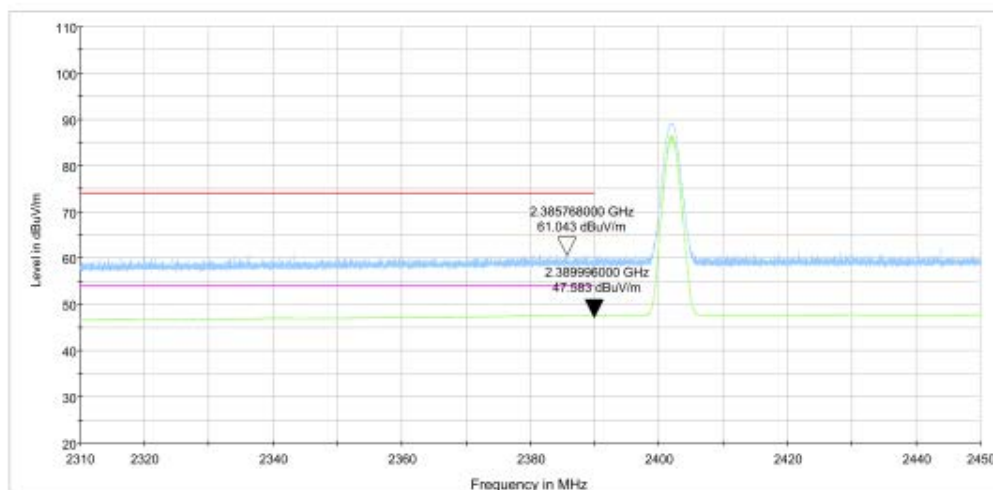


Fig.3. Frequency Band Edges: $\pi/4$ DQPSK, Channel 0, H2.31 GHz - 2.45GHz

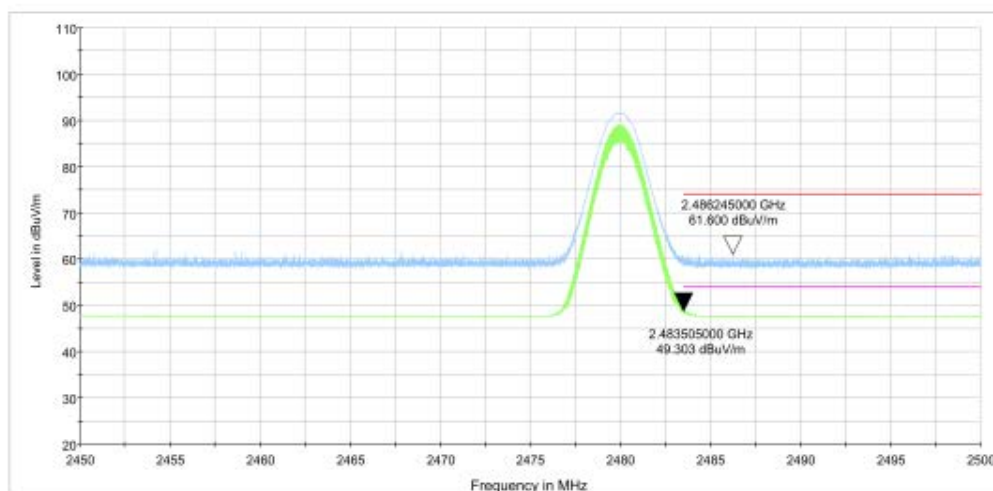


Fig.4. Frequency Band Edges: $\pi/4$ DQPSK, Channel 78, 2.45 GHz - 2.50GHz

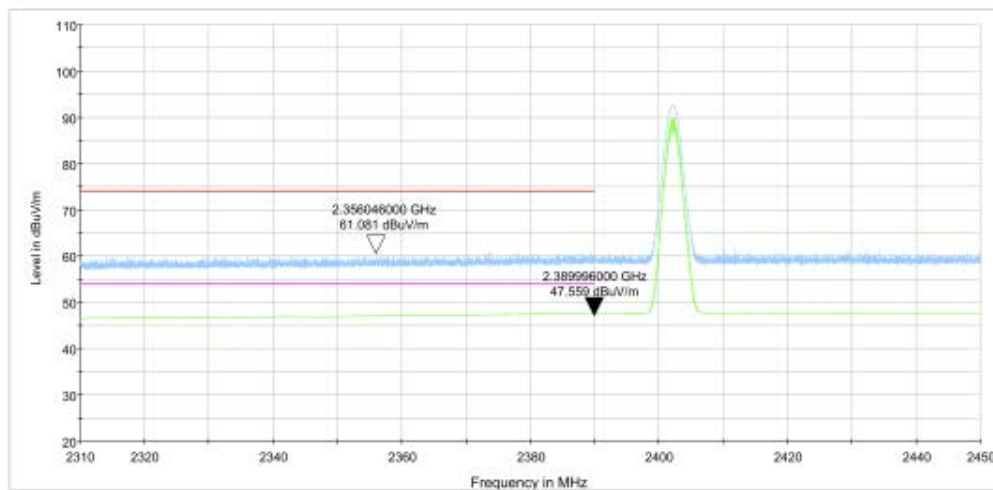


Fig.5. Frequency Band Edges: 8DPSK, Channel 0, 2.31 GHz - 2.45GHz

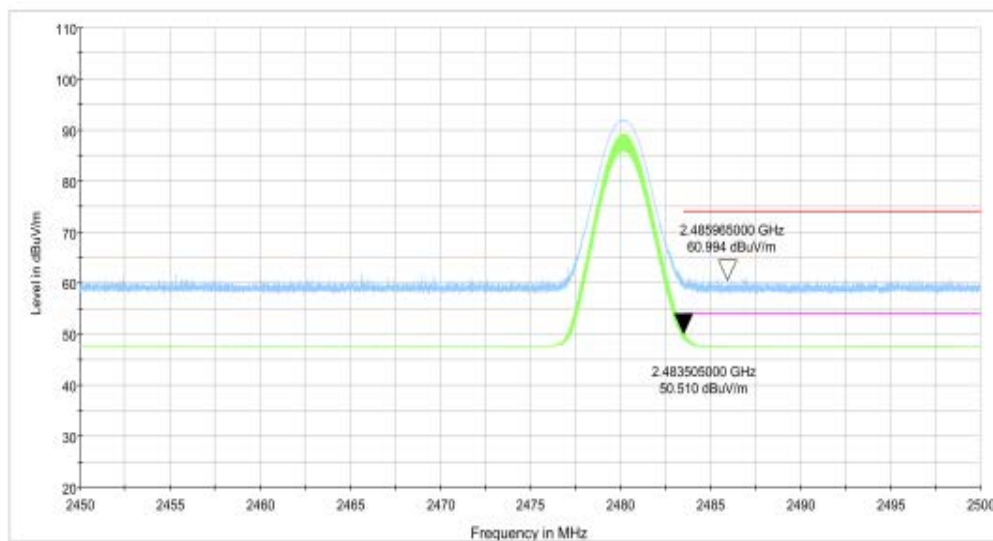


Fig.6. Frequency Band Edges: 8DPSK, Channel 78, 2.45 GHz - 2.50GHz

SPEED

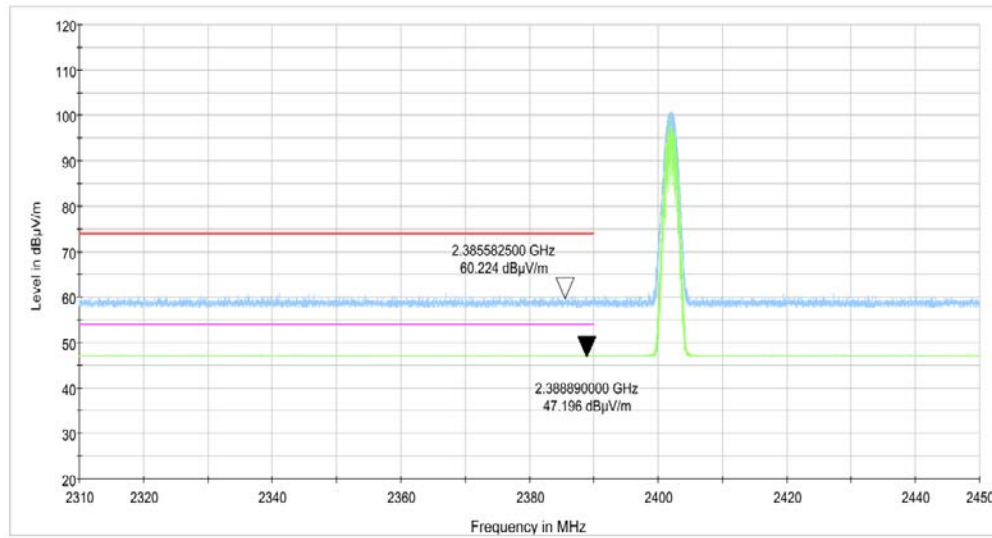


Fig.7. Frequency Band Edges: GFSK, Channel 0, Hopping Off, 2.31 GHz – 2.45GHz

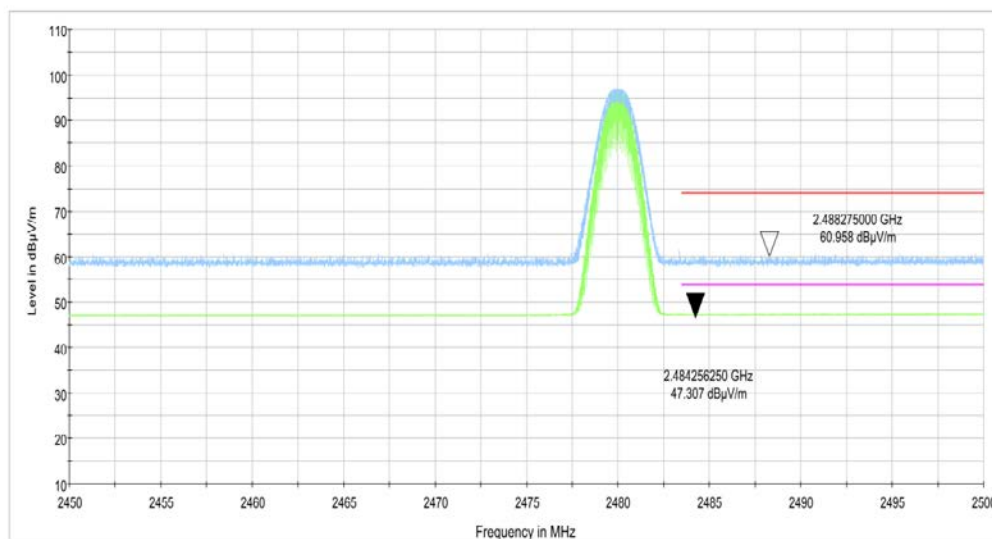


Fig.8. Frequency Band Edges: GFSK, Channel 78, Hopping Off, 2.45 GHz - 2.50GHz

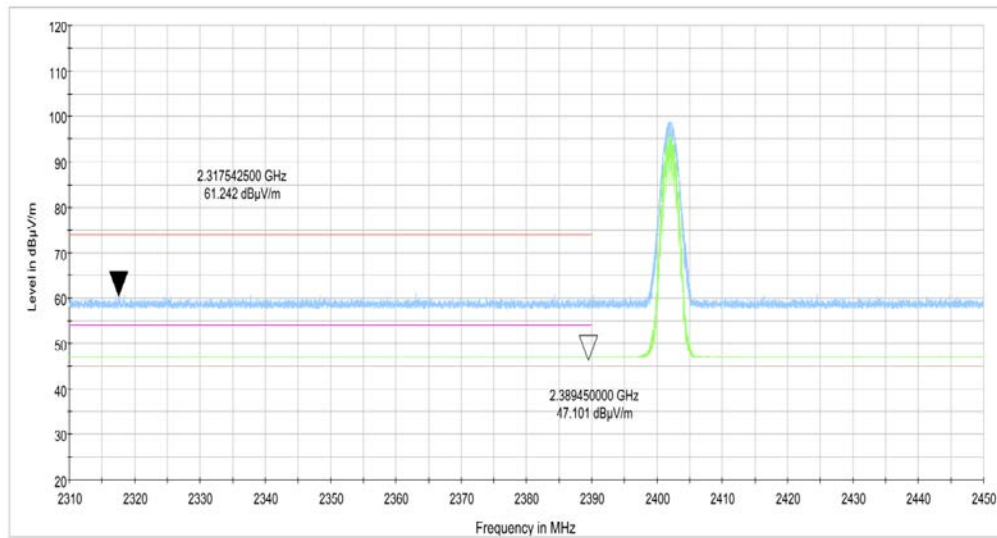


Fig.9. Frequency Band Edges: $\pi/4$ DQPSK, Channel 0, Hopping Off, 2.31 GHz - 2.45GHz

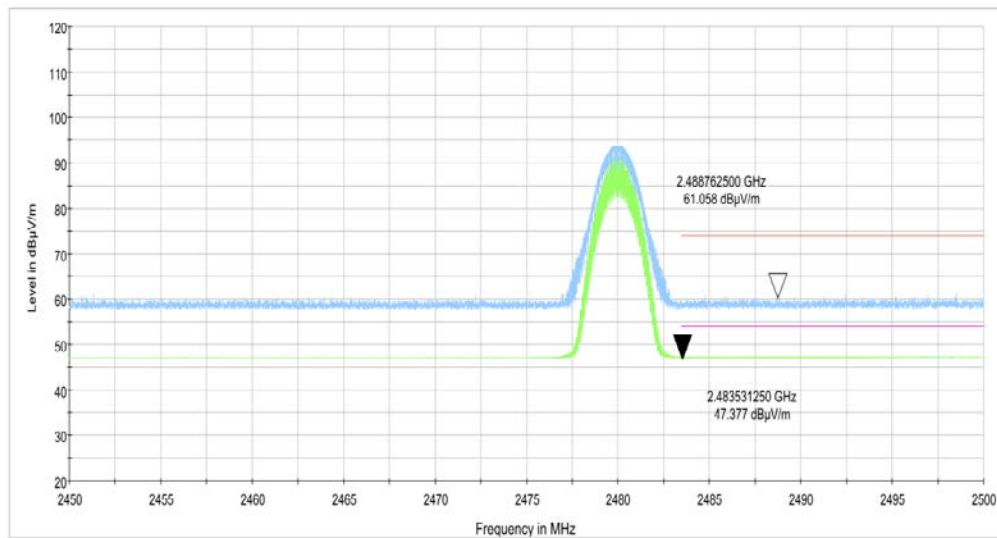


Fig.10. Frequency Band Edges: $\pi/4$ DQPSK, Channel 78, Hopping Off, 2.45 GHz - 2.50GHz

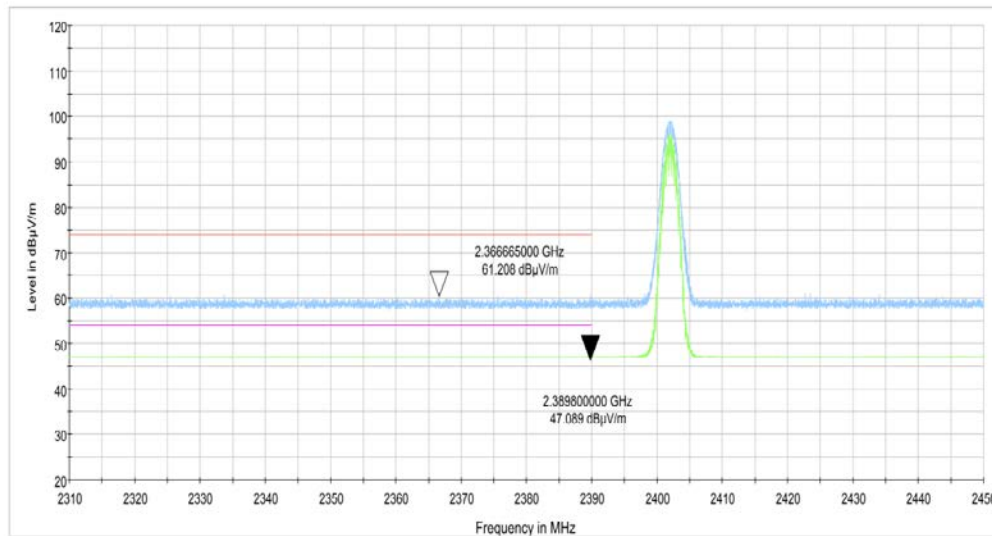


Fig.11. Frequency Band Edges: 8DPSK, Channel 0, 2.31 GHz - 2.45GHz

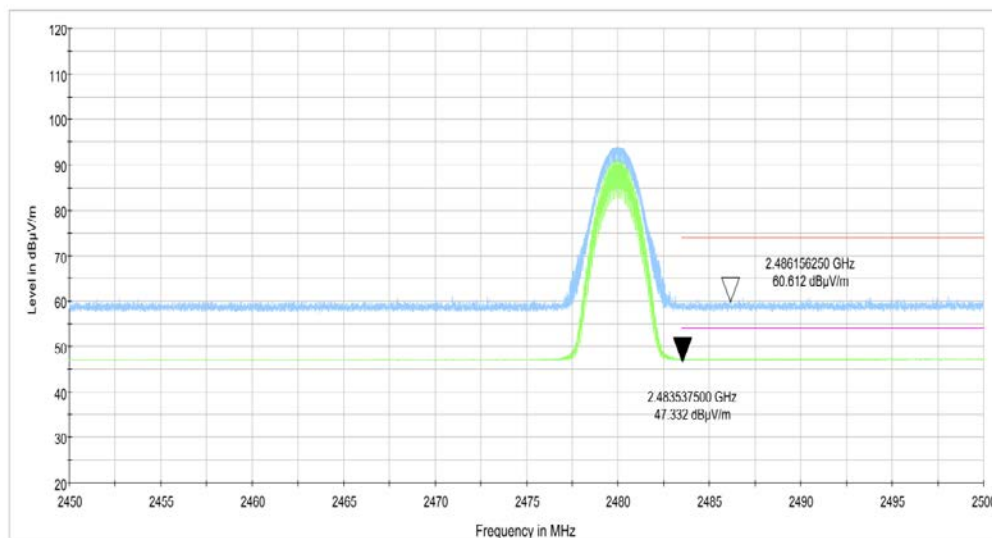


Fig.12. Frequency Band Edges: 8DPSK, Channel 78, 2.45 GHz - 2.50GHz

C.2. AC Powerline Conducted Emission

Specification Reference

FCC 47 CFR Part 15.207, 15.107

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.

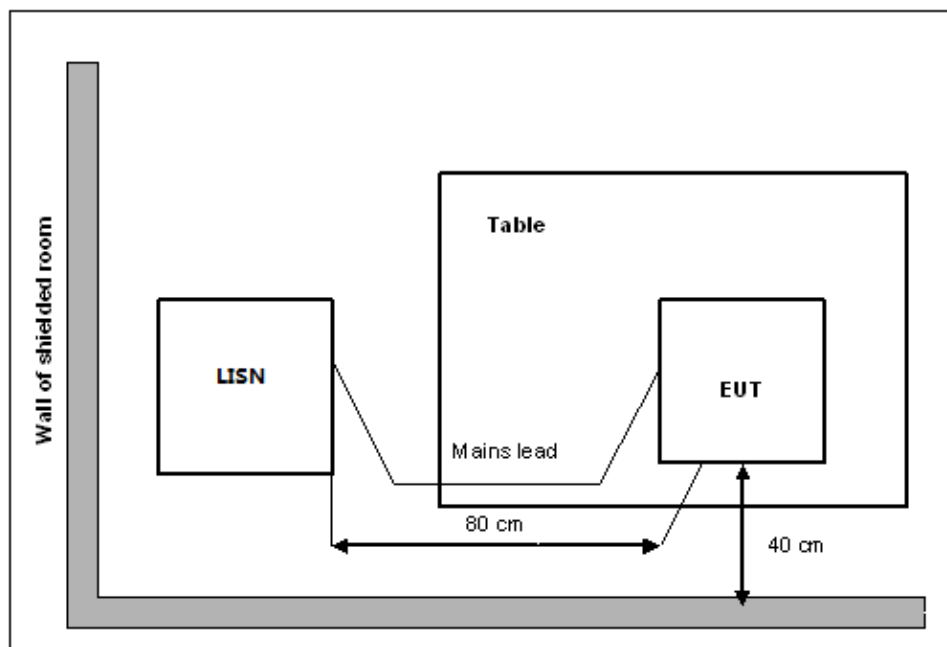
The measurement bandwidth is:

Frequency of Emission (MHz)	RBW/IF bandwidth	Sweep Time(s)
0.15-30	9kHz	1

Test Condition:

Voltage (V)	Frequency (Hz)
120	60

Measurement Setup



EUT Operating Mode and Test Conditions

The measurement of EUT is carried out under the transmit state.

The EUT is powered by an AC/travel adapter.

Measurement Result and limit:
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.C.2.1	Fig.C.2.2	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.C.2.1	Fig.C.2.2	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.				

Note: all modes have been tested and the worst results shown here.

Conclusion: Pass

Test graphs as below:

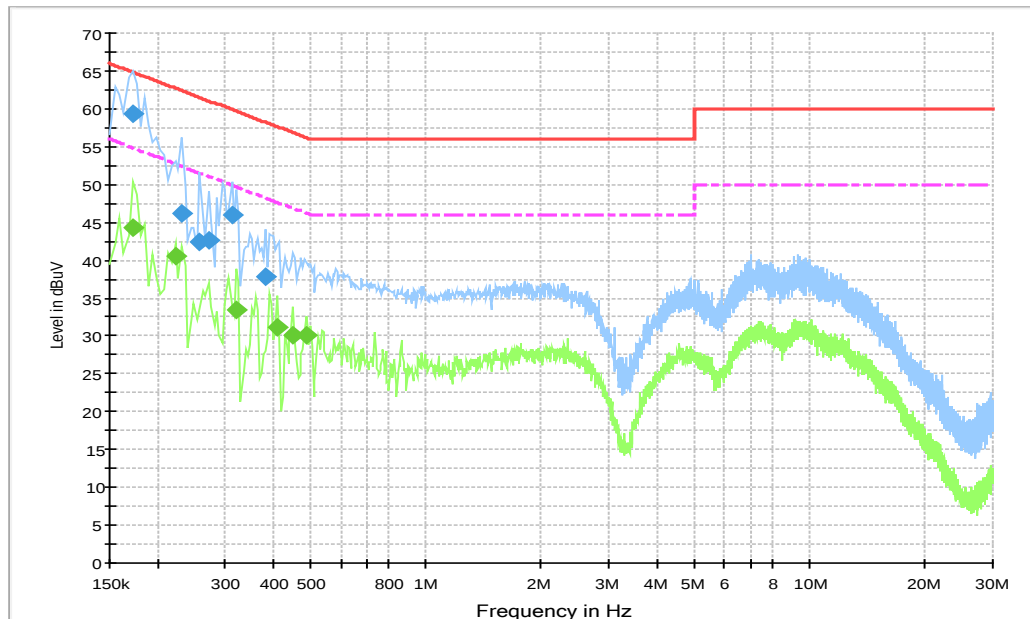


Fig.C.2.1 AC Power line Conducted Emission- Bluetooth

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)
0.172500	59.4	10000	9.000	N	28.2	5.4	64.8
0.231000	46.2	10000	9.000	N	26.9	16.2	62.4
0.258000	42.5	10000	9.000	L1	26.4	19.0	61.5
0.271500	42.7	10000	9.000	L1	26.2	18.4	61.1
0.312000	46.0	10000	9.000	L1	25.6	13.9	59.9
0.384000	37.9	10000	9.000	L1	24.6	20.3	58.2

Final Result 2

Frequency (MHz)	Average (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.172500	44.2	10000.	9.000	L1	28.3	10.6	54.8
0.222000	40.5	10000.	9.000	N	27.1	12.3	52.7
0.321000	33.5	10000.	9.000	L1	25.4	16.2	49.7
0.411000	31.1	10000.	9.000	L1	24.3	16.5	47.6
0.451500	30.0	10000.	9.000	N	23.9	16.8	46.8
0.487500	30.1	10000.	9.000	N	23.5	16.2	46.2

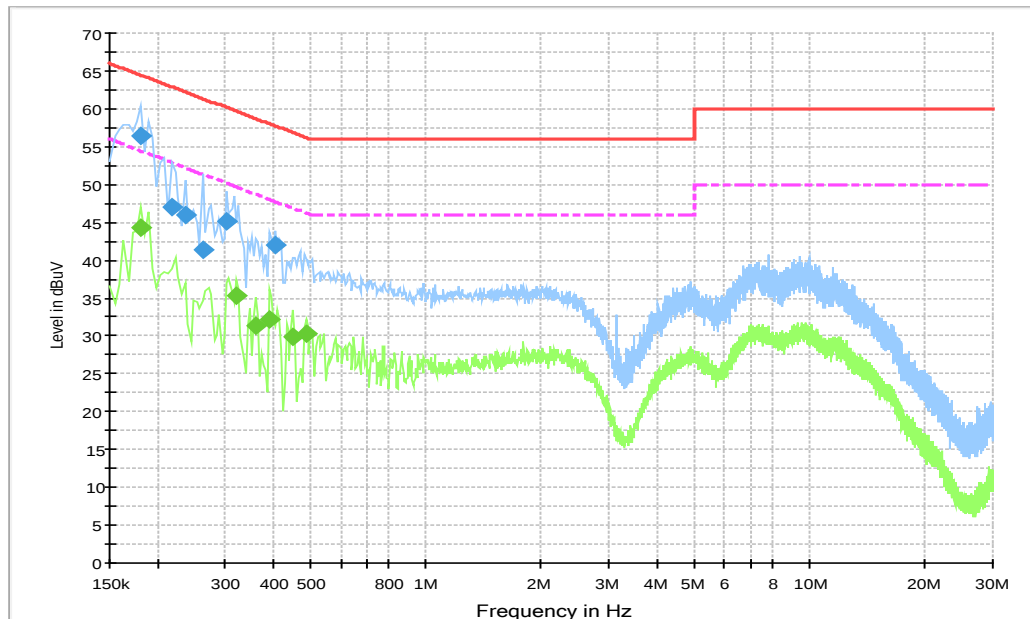


Fig.C.2.2 AC Power line Conducted Emission-Idle

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)
0.181500	56.3	10000	9.000	N	28.0	8.1	64.4
0.217500	47.1	10000	9.000	N	27.2	15.8	62.9
0.235500	45.9	10000	9.000	L1	26.8	16.3	62.3
0.262500	41.4	10000	9.000	N	26.3	19.9	61.4
0.303000	45.2	10000	9.000	L1	25.7	15.0	60.2
0.406500	42.1	10000	9.000	L1	24.3	15.7	57.7

Final Result 2

Frequency (MHz)	Average (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.181500	44.3	10000.	9.000	N	28.0	10.2	54.4
0.321000	35.3	10000.	9.000	N	25.4	14.4	49.7
0.361500	31.4	10000.	9.000	L1	24.9	17.3	48.7
0.393000	32.2	10000.	9.000	N	24.5	15.8	48.0
0.451500	29.9	10000.	9.000	N	23.9	16.9	46.8
0.487500	30.3	10000.	9.000	N	23.5	15.9	46.2

END OF REPORT