



FCC PART 15C TEST REPORT No.I21Z70658-EMC08

for

Samsung Electronics Co., Ltd.

Notebook PC

NP750XED

with

FCC ID: ZCANP750XED

Hardware Version: REV1.0

Software Version: Windows11

Issued Date: 2022-01-18

Note:

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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.

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REPORT HISTORY

Report Number	Revision	Description	Issue Date
I21Z70658-EMC08	Rev.0	1st edition	2022-01-18

CONTENTS

1. TEST LABORATORY	4
1.1. INTRODUCTION & ACCREDITATION	4
1.2. TESTING LOCATION	4
1.3. TESTING ENVIRONMENT	4
1.4. PROJECT DATA	4
1.5. SIGNATURE	4
2. CLIENT INFORMATION.....	5
2.1. APPLICANT INFORMATION	5
2.2. MANUFACTURER INFORMATION	5
3. PRODUCT INFORMATION	6
3.1. ABOUT EUT	6
3.2. INTERNAL IDENTIFICATION OF EUT	6
3.3. INTERNAL IDENTIFICATION OF AE.....	6
3.4. GENERAL DESCRIPTION.....	7
3.5. TEST CONFIGURATION	7
3.6. INTERPRETATION OF THE TEST ENVIRONMENT.....	7
4. REFERENCE DOCUMENTS.....	8
4.1. DOCUMENTS SUPPLIED BY APPLICANT	8
4.2. REFERENCE DOCUMENTS FOR TESTING.....	8
5. TEST RESULTS	9
5.1. SUMMARY OF TEST RESULTS	9
5.2. STATEMENTS.....	9
5.3. TEST CONDITIONS	9
6. TEST FACILITIES UTILIZED.....	10
7. MEASUREMENT UNCERTAINTY	11
ANNEX A: EUT PARAMETERS	12
ANNEX B: ANTENNA REQUIREMENTS	12
ANNEX C: DETAILED TEST RESULTS.....	13
C.1. RADIATED SPURIOUS EMISSION	13
C.1.1 RADIATED SPURIOUS EMISSION- ABOVE 1GHZ	15
C.1.2 RADIATED SPURIOUS EMISSION- BELOW 1GHZ	27
C.1.3 BAND EDGES COMPLIANCE– RADIATED	28
C.2. AC POWERLINE CONDUCTED EMISSION	35

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

Location2: CTTL (Huayuan North Road)

Address: No. 52 Huayuan North Road, Haidian District, Beijing 100191, P.R. China

Testing Environment

Normal Temperature: 15-35°C

Relative Humidity: 20-75%

1.3. Project data

Testing Start Date: 2021-12-10

Testing End Date: 2022-01-15

1.4. Signature



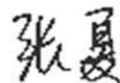
Li Yan

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(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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2.2. Manufacturer Information

Company Name: Samsung Electronics Co., Ltd.
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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	NP750XED
FCC ID	ZCANP750XED

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	2170658UT11a	REV1.0	Windows11
EUT2	2170658UT16a	REV1.0	Windows11
EUT3	2170658UT21a	REV1.0	Windows11

*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	Travel Adapter	/	/
AE3	Data Cable	/	/
AE4	battery	/	Inbuilt

AE1

Model	EP-TA845
Manufacturer	SOLUM CO.,LTD.
Length of cable	/

AE2

Model	EP-TA845
Manufacturer	DONGYANG E&P Inc
Length of cable	/

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)	INNOWAVE	/	EUT1/EUT3
	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

Test Mode		Transmitting Frequency (MHz)		
GFSK	Antenna INNOWAVE(EUT1)	2402(CH0)	2441 (CH39)	2480 (CH78)
	Antenna SPEED(EUT2)	2402(CH0)	2441 (CH39)	2480 (CH78)
$\pi/4$ DQPSK	Antenna INNOWAVE(EUT1)	2402(CH0)	2441 (CH39)	2480 (CH78)
	Antenna SPEED(EUT2)	2402(CH0)	2441 (CH39)	2480 (CH78)
8DPSK	Antenna INNOWAVE(EUT1)	2402(CH0)	2441 (CH39)	2480 (CH78)
	Antenna SPEED(EUT2)	2402(CH0)	2441 (CH39)	2480 (CH78)

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: 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.	2021
ANSI C63.10	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices Federal Communications Commission Office of Engineering and Technology Laboratory Division	2013
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	100376	R&S	1 year	2022-09-15
2	EMI Antenna	VULB9163	9163-514	Schwarzbeck	1 year	2022-03-22
3	EMI Antenna	LB-7180-NF	203001300041	A-INFO	1 year	2022-02-28
4	EMI Antenna	3117	00119024	ETS-Lindgren	1 year	2022-04-11
5	EMI Antenna	LB-180400-25-C-KF	211008400006	A-INFO	1 year	2022-02-28
7	Loop Antenna	HFH2-Z2	829324/007	R&S	1 year	2022-12-22
8	Test Receiver	ESW44	103023	R&S	1 year	2022-06-02
9	Analytical Spectrometer	FSV40	101047	R&S	1 year	2022-06-02
10	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

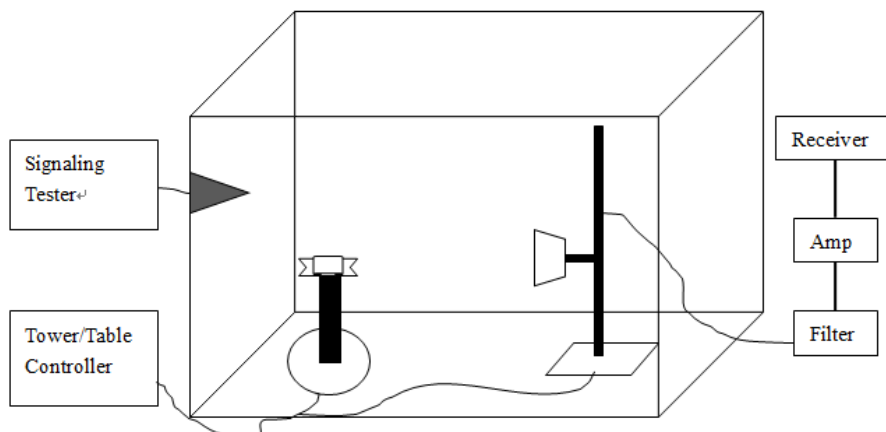
Specification Reference

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 the 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($\mu\text{V}/\text{m}$)	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

INNOWAVE

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)
2317.157	59.76	3.47	27.63	28.66	74.00	14.24	V
2354.406	59.47	3.33	27.65	28.49	74.00	14.53	V
4804.000	40.72	-25.82	33.92	32.61	74.00	33.28	V
7206.000	42.62	-24.63	35.60	31.64	74.00	31.38	V
9608.500	49.27	-24.02	36.93	36.36	74.00	24.73	H
12010.000	48.08	-22.87	38.90	32.05	74.00	25.92	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)
2341.000	45.94	-31.63	31.82	45.75	74.00	28.06	H
2523.200	49.29	-30.18	32.04	47.43	74.00	24.71	V
4882.000	41.32	-26.31	33.95	33.67	74.00	32.68	H
7323.000	42.55	-24.90	35.60	31.85	74.00	31.45	V
9764.000	47.82	-24.04	37.12	34.73	74.00	26.18	V
12205.000	47.58	-22.51	38.90	31.19	74.00	26.42	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)
2483.944	60.11	3.41	27.69	29.00	74.00	13.89	H
2488.666	59.47	3.37	27.70	28.41	74.00	14.53	V
4960.000	42.57	-26.70	33.98	35.28	74.00	31.43	V
7440.000	43.11	-24.60	35.60	32.12	74.00	30.89	V
9920.000	45.49	-24.02	37.31	32.21	74.00	28.51	V
12400.000	48.00	-22.24	38.90	31.34	74.00	26.00	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)
2339.654	59.74	3.40	27.64	28.70	74.00	14.26	H
2379.352	59.51	3.47	27.66	28.39	74.00	14.49	V
4804.000	40.99	-25.82	33.92	32.88	74.00	33.01	V
7206.000	43.15	-24.63	35.60	32.18	74.00	30.85	H
9608.000	47.31	-24.02	36.93	34.40	74.00	26.69	H
12010.000	48.51	-22.87	38.90	32.48	74.00	25.49	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)
2340.200	47.05	-31.64	31.82	46.87	74.00	26.95	H
2517.200	48.99	-30.11	32.03	47.07	74.00	25.01	V
4882.000	40.39	-26.31	33.95	32.74	74.00	33.61	V
7323.000	43.13	-24.90	35.60	32.43	74.00	30.87	H
9764.000	46.15	-24.04	37.12	33.06	74.00	27.85	H
12205.000	48.83	-22.51	38.90	32.44	74.00	25.17	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)
2483.759	59.92	3.41	27.69	28.81	74.00	14.08	V
2486.887	59.78	3.38	27.70	28.70	74.00	14.22	H
4960.000	40.73	-26.70	33.98	33.45	74.00	33.27	V
7440.000	43.62	-24.60	35.60	32.62	74.00	30.38	H
9920.000	46.09	-24.02	37.31	32.81	74.00	27.91	V
12400.000	49.02	-22.24	38.90	32.36	74.00	24.98	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)
2325.811	59.80	3.41	27.64	28.75	74.00	14.20	V
2365.895	59.08	3.32	27.65	28.10	74.00	14.92	V
4804.000	40.97	-25.82	33.92	32.86	74.00	33.03	V
7206.000	42.52	-24.63	35.60	31.54	74.00	31.48	H
9608.000	49.12	-24.02	36.93	36.21	74.00	24.88	V
12010.000	49.87	-22.87	38.90	33.83	74.00	24.13	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)
2338.400	46.35	-31.66	31.82	46.19	74.00	27.65	H
2514.000	48.49	-30.07	32.02	46.54	74.00	25.51	V
4882.000	40.86	-26.31	33.95	33.21	74.00	33.14	H
7323.000	43.03	-24.90	35.60	32.33	74.00	30.97	H
9764.000	48.34	-24.04	37.12	35.26	74.00	25.66	H
12205.000	48.36	-22.51	38.90	31.97	74.00	25.64	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)
2484.463	59.59	3.41	27.69	28.49	74.00	14.41	H
2485.469	60.14	3.40	27.69	29.05	74.00	13.86	V
4960.000	40.73	-26.70	33.98	33.45	74.00	33.27	V
7440.000	43.53	-24.60	35.60	32.53	74.00	30.47	H
9920.000	46.32	-24.02	37.31	33.04	74.00	27.68	V
12400.000	49.03	-22.24	38.90	32.37	74.00	24.97	V

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)
2388.707	44.28	3.48	27.66	13.14	54.00	9.72	V
2389.990	44.39	3.48	27.66	13.25	54.00	9.61	V
4803.750	30.95	-25.82	33.92	22.84	54.00	23.05	V
7206.000	32.07	-24.63	35.60	21.09	54.00	21.93	H
9607.500	39.46	-24.02	36.93	26.54	54.00	14.54	H
12009.750	37.33	-22.87	38.90	21.29	54.00	16.67	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)
2438.523	44.49	3.46	27.68	13.36	54.00	9.51	V
2443.321	44.78	3.47	27.68	13.63	54.00	9.22	V
4881.750	30.75	-26.31	33.95	23.10	54.00	23.25	H
7323.000	32.44	-24.90	35.60	21.74	54.00	21.56	H
9764.250	39.37	-24.03	37.12	26.29	54.00	14.63	H
12204.750	37.14	-22.52	38.90	20.75	54.00	16.86	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)
2483.506	44.80	3.42	27.69	13.69	54.00	9.20	V
2485.358	44.93	3.40	27.69	13.84	54.00	9.07	V
4959.750	31.00	-26.70	33.98	23.72	54.00	23.00	V
7440.000	32.64	-24.60	35.60	21.64	54.00	21.36	H
9919.500	36.59	-24.02	37.31	23.30	54.00	17.41	V
12399.750	37.26	-22.23	38.90	20.58	54.00	16.74	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)
2388.684	44.45	3.48	27.66	13.31	54.00	9.55	V
2389.990	44.27	3.48	27.66	13.13	54.00	9.73	V
4803.750	31.59	-25.82	33.92	23.48	54.00	22.41	H
7206.000	32.38	-24.63	35.60	21.40	54.00	21.62	H
9607.500	36.98	-24.02	36.93	24.07	54.00	17.02	H
12009.750	37.59	-22.87	38.90	21.56	54.00	16.41	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)
2438.250	45.26	3.46	27.68	14.12	54.00	8.74	V
2443.487	45.52	3.47	27.68	14.37	54.00	8.48	V
4881.750	31.23	-26.31	33.95	23.58	54.00	22.77	H
7323.000	32.71	-24.90	35.60	22.01	54.00	21.29	H
9763.500	36.91	-24.04	37.12	23.83	54.00	17.09	V
12204.750	37.30	-22.52	38.90	20.92	54.00	16.70	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)
2483.506	45.00	3.42	27.69	13.89	54.00	9.00	V
2484.847	45.11	3.40	27.69	14.01	54.00	8.89	V
4959.750	30.91	-26.70	33.98	23.63	54.00	23.09	V
7440.000	32.70	-24.60	35.60	21.70	54.00	21.30	H
9920.250	35.53	-24.02	37.31	22.25	54.00	18.47	H
12399.750	37.39	-22.23	38.90	20.72	54.00	16.61	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)
2387.223	44.41	3.48	27.66	13.27	54.00	9.59	V
2389.990	44.37	3.48	27.66	13.23	54.00	9.63	V
4803.750	31.77	-25.82	33.92	23.66	54.00	22.23	H
7206.000	32.59	-24.63	35.60	21.61	54.00	21.41	H
9607.500	37.59	-24.02	36.93	24.68	54.00	16.41	V
12009.750	37.59	-22.87	38.90	21.56	54.00	16.41	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)
2438.143	45.31	3.46	27.68	14.17	54.00	8.69	V
2443.629	45.49	3.47	27.68	14.35	54.00	8.51	V
4881.750	30.99	-26.31	33.95	23.35	54.00	23.01	H
7323.000	32.60	-24.90	35.60	21.89	54.00	21.40	H
9763.500	36.92	-24.04	37.12	23.84	54.00	17.08	H
12204.750	37.21	-22.52	38.90	20.82	54.00	16.79	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)
2483.506	45.03	3.42	27.69	13.92	54.00	8.97	V
2484.004	45.10	3.41	27.69	14.00	54.00	8.90	V
4959.750	31.37	-26.70	33.98	24.08	54.00	22.63	V
7440.000	32.97	-24.60	35.60	21.98	54.00	21.03	V
9920.250	35.59	-24.02	37.31	22.31	54.00	18.41	V
12399.750	37.50	-22.23	38.90	20.83	54.00	16.50	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)
2361.441	59.80	3.38	27.65	28.77	74.00	14.20	H
2373.997	59.92	3.35	27.65	28.91	74.00	14.08	H
4804.000	41.22	-25.82	33.92	33.12	74.00	32.78	V
7206.000	42.47	-24.63	35.60	31.50	74.00	31.53	V
9608.000	44.06	-24.02	36.93	31.15	74.00	29.94	H
12010.000	47.27	-22.87	38.90	31.24	74.00	26.73	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)
2337.400	47.16	-31.67	31.82	47.02	74.00	26.84	H
2528.800	48.74	-30.25	32.05	46.94	74.00	25.26	H
4882.000	41.95	-26.31	33.95	34.30	74.00	32.05	V
7323.000	43.24	-24.90	35.60	32.54	74.00	30.76	H
9764.000	45.50	-24.04	37.12	32.42	74.00	28.50	H
12205.000	47.83	-22.51	38.90	31.44	74.00	26.17	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)
2486.959	59.53	3.38	27.70	28.45	74.00	14.47	H
2492.772	60.07	3.39	27.70	28.98	74.00	13.93	V
4960.000	40.62	-26.70	33.98	33.34	74.00	33.38	H
7440.000	43.29	-24.60	35.60	32.29	74.00	30.71	H
9920.000	45.88	-24.02	37.31	32.59	74.00	28.12	H
12400.000	47.64	-22.24	38.90	30.97	74.00	26.36	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)
2336.539	60.02	3.38	27.64	29.00	74.00	13.98	V
2374.085	59.76	3.36	27.65	28.75	74.00	14.24	V
4804.000	42.18	-25.82	33.92	34.08	74.00	31.82	V
7206.000	42.44	-24.63	35.60	31.46	74.00	31.56	H
9608.000	44.93	-24.02	36.93	32.02	74.00	29.07	V
12010.000	47.41	-22.87	38.90	31.37	74.00	26.59	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)
2345.400	46.83	-31.59	31.83	46.59	74.00	27.17	V
2507.600	48.35	-30.00	32.01	46.33	74.00	25.65	V
4882.000	40.24	-26.31	33.95	32.59	74.00	33.76	H
7323.000	44.17	-24.90	35.60	33.47	74.00	29.83	V
9764.000	45.90	-24.04	37.12	32.82	74.00	28.10	H
12205.000	47.64	-22.51	38.90	31.25	74.00	26.36	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)
2486.691	59.89	3.38	27.70	28.81	74.00	14.11	V
2492.056	59.96	3.38	27.70	28.89	74.00	14.04	H
4960.000	40.18	-26.70	33.98	32.90	74.00	33.82	H
7440.000	43.02	-24.60	35.60	32.02	74.00	30.98	H
9920.000	45.41	-24.02	37.31	32.12	74.00	28.59	H
12400.000	48.62	-22.24	38.90	31.96	74.00	25.38	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)
2363.060	59.50	3.36	27.65	28.49	74.00	14.50	V
2388.855	59.32	3.48	27.66	28.18	74.00	14.68	V
4804.000	41.48	-25.82	33.92	33.37	74.00	32.52	H
7206.000	42.50	-24.63	35.60	31.53	74.00	31.50	H
9608.000	44.94	-24.02	36.93	32.03	74.00	29.06	H
12010.000	49.20	-22.87	38.90	33.16	74.00	24.80	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)
2348.600	47.24	-31.55	31.83	46.96	74.00	26.76	V
2546.200	49.08	-30.46	32.08	47.46	74.00	24.92	V
4882.000	41.14	-26.31	33.95	33.49	74.00	32.86	V
7323.000	43.12	-24.90	35.60	32.41	74.00	30.88	V
9764.000	45.69	-24.04	37.12	32.60	74.00	28.31	H
12205.000	48.36	-22.51	38.90	31.97	74.00	25.64	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)
2483.528	60.13	3.42	27.69	29.02	74.00	13.87	H
2483.997	59.83	3.41	27.69	28.73	74.00	14.17	H
4960.000	41.56	-26.70	33.98	34.27	74.00	32.44	V
7440.000	43.01	-24.60	35.60	32.01	74.00	30.99	H
9920.000	46.24	-24.02	37.31	32.96	74.00	27.76	H
12400.000	48.63	-22.24	38.90	31.97	74.00	25.37	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)
2382.604	44.75	3.48	27.66	13.61	54.00	9.25	V
2389.966	44.38	3.48	27.66	13.24	54.00	9.62	V
4804.150	31.30	-25.82	33.92	23.20	54.00	22.70	H
7205.800	32.07	-24.63	35.60	21.10	54.00	21.93	H
9607.900	34.19	-24.02	36.93	21.28	54.00	19.81	V
12010.000	36.97	-22.87	38.90	20.93	54.00	17.03	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)
2438.286	44.93	3.46	27.68	13.80	54.00	9.07	V
2443.677	44.96	3.47	27.68	13.82	54.00	9.04	V
4882.000	31.19	-26.31	33.95	23.54	54.00	22.81	H
7322.800	32.42	-24.90	35.60	21.71	54.00	21.58	H
9764.050	34.45	-24.04	37.12	21.37	54.00	19.55	H
12204.850	36.83	-22.51	38.90	20.44	54.00	17.17	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)
2485.227	45.07	3.40	27.69	13.98	54.00	8.93	V
2488.303	45.05	3.37	27.70	13.99	54.00	8.95	V
4959.850	30.53	-26.70	33.98	23.25	54.00	23.47	V
7439.800	32.74	-24.60	35.60	21.74	54.00	21.26	V
9920.000	34.75	-24.02	37.31	21.47	54.00	19.25	H
12400.150	37.00	-22.23	38.90	20.33	54.00	17.00	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)
2380.241	44.83	3.48	27.66	13.69	54.00	9.17	V
2383.043	44.77	3.48	27.66	13.63	54.00	9.23	V
4804.150	31.55	-25.82	33.92	23.45	54.00	22.45	H
7205.800	32.32	-24.63	35.60	21.35	54.00	21.68	H
9607.900	34.35	-24.02	36.93	21.44	54.00	19.65	V
12010.000	37.13	-22.87	38.90	21.10	54.00	16.87	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)
2437.431	45.01	3.46	27.68	13.87	54.00	8.99	V
2444.401	45.24	3.47	27.68	14.09	54.00	8.76	V
4882.000	31.22	-26.31	33.95	23.57	54.00	22.78	V
7322.800	32.63	-24.90	35.60	21.93	54.00	21.37	V
9764.050	34.65	-24.04	37.12	21.56	54.00	19.35	H
12204.850	36.95	-22.51	38.90	20.57	54.00	17.05	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)
2484.147	45.29	3.41	27.69	14.18	54.00	8.71	V
2485.536	45.14	3.40	27.69	14.05	54.00	8.86	V
4959.850	30.81	-26.70	33.98	23.53	54.00	23.19	H
7439.800	33.05	-24.60	35.60	22.05	54.00	20.95	H
9920.200	34.91	-24.02	37.31	21.63	54.00	19.09	V
12400.150	37.36	-22.23	38.90	20.69	54.00	16.64	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)
2380.015	44.77	3.48	27.66	13.63	54.00	9.23	V
2388.969	44.45	3.48	27.66	13.31	54.00	9.55	V
4804.150	32.13	-25.82	33.92	24.03	54.00	21.87	H
7205.800	32.82	-24.63	35.60	21.85	54.00	21.18	V
9607.900	35.03	-24.02	36.93	22.12	54.00	18.97	V
12010.000	37.55	-22.87	38.90	21.52	54.00	16.45	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)
2437.953	45.66	3.46	27.68	14.53	54.00	8.34	V
2444.461	45.20	3.47	27.68	14.05	54.00	8.80	V
4882.000	31.84	-26.31	33.95	24.20	54.00	22.16	H
7322.800	33.27	-24.90	35.60	22.57	54.00	20.73	H
9764.050	35.08	-24.04	37.12	21.99	54.00	18.92	H
12204.850	37.32	-22.51	38.90	20.93	54.00	16.68	H

8DPSK Ch 78

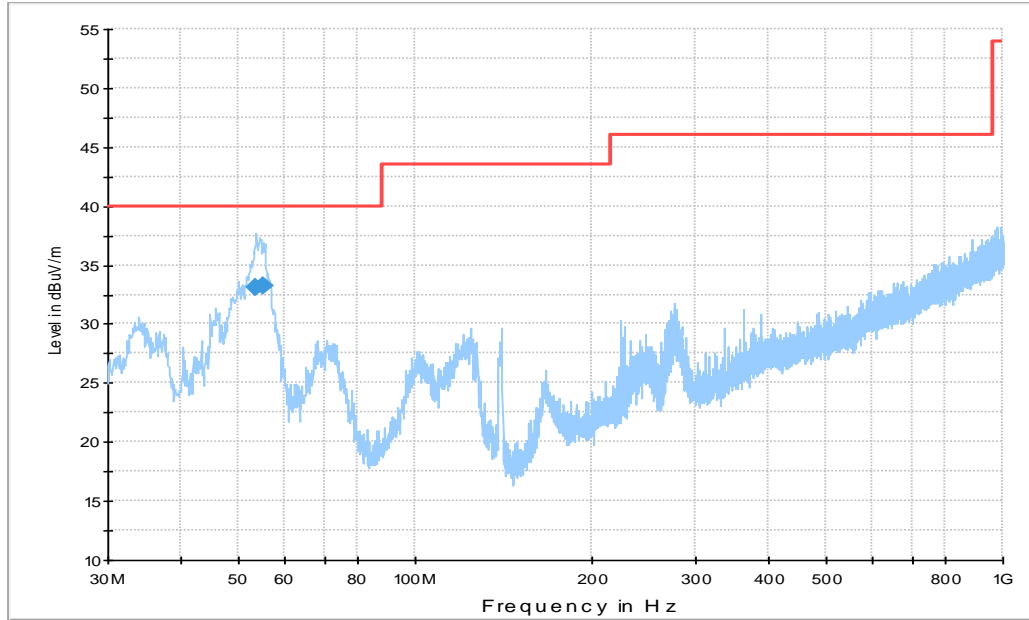
Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
2484.859	45.18	3.40	27.69	14.08	54.00	8.82	V
2486.415	45.19	3.39	27.70	14.11	54.00	8.81	V
4959.850	31.29	-26.70	33.98	24.01	54.00	22.71	V
7439.800	33.43	-24.60	35.60	22.43	54.00	20.57	V
9920.200	35.42	-24.02	37.31	22.14	54.00	18.58	H
12400.150	37.56	-22.23	38.90	20.89	54.00	16.44	V

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

Conclusion: Pass

C.1.2 Radiated Spurious Emission- Below 1GHz

WOSRT CASE BELOW 1GHz



Frequency (MHz)	QuasiPeak (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBuV/m)
53.668000	33.1	110.0	V	112.0	-0.1	6.9	40.0
55.317000	33.3	100.0	V	83.0	-0.2	6.7	40.0

BELOW 30MHz

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

C.1.3 Band Edges Compliance– Radiated

INNOWAVE

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

INNOWAVE

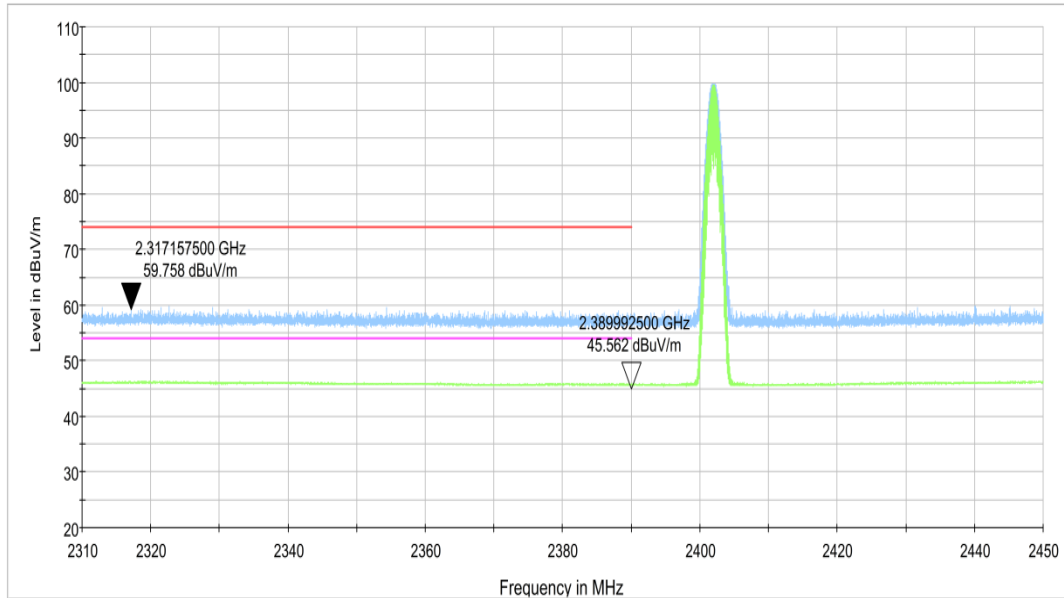


Fig.1. Frequency Band Edges: GFSK, Channel 0, 2.31 GHz – 2.45GHz

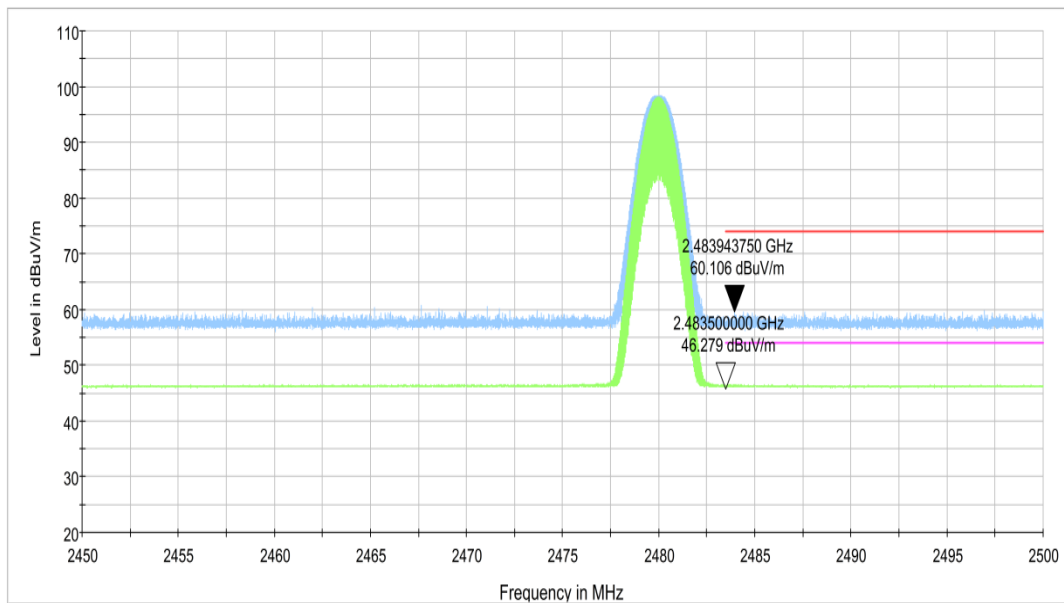


Fig.2. Frequency Band Edges: GFSK, Channel 78, 2.45 GHz - 2.50GHz

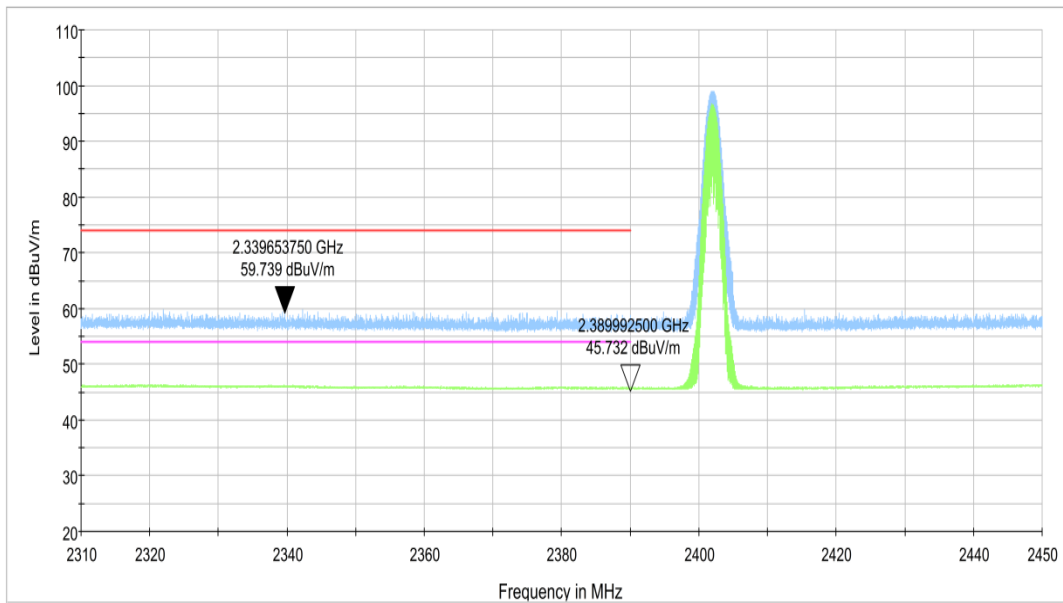


Fig.3. Frequency Band Edges: $\pi/4$ DQPSK, Channel 0, H2.31 GHz - 2.45GHz

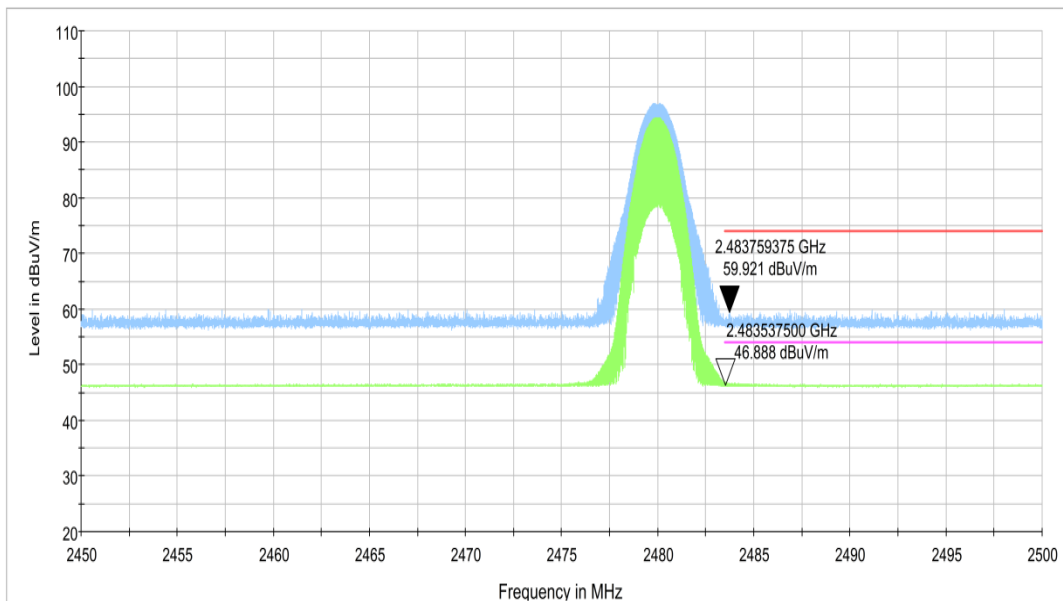


Fig.4. Frequency Band Edges: $\pi/4$ DQPSK, Channel 78, 2.45 GHz - 2.50GHz

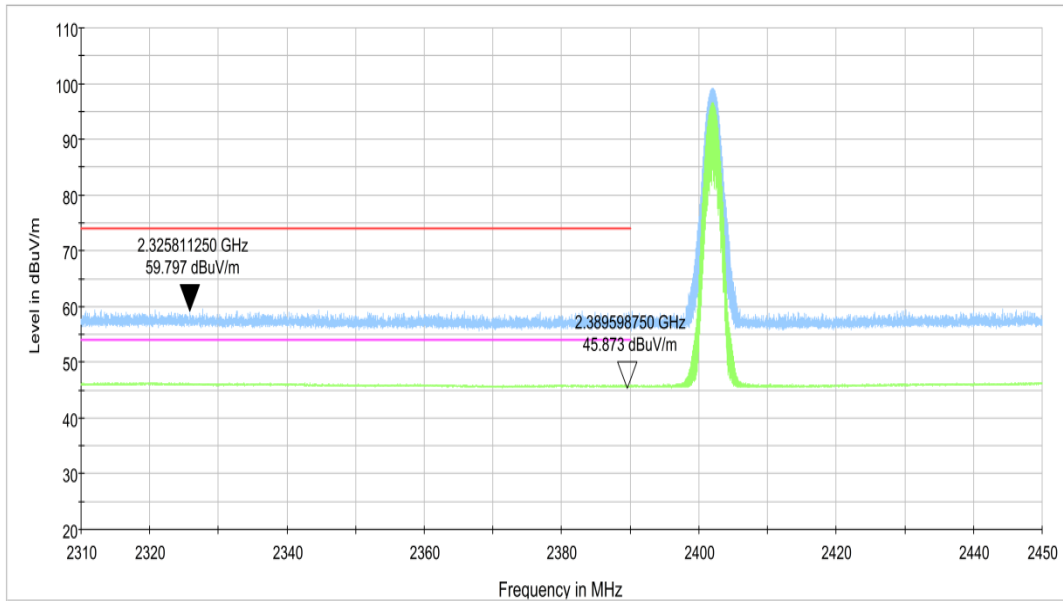


Fig.5. Frequency Band Edges: 8DPSK, Channel 0, 2.31 GHz - 2.45GHz

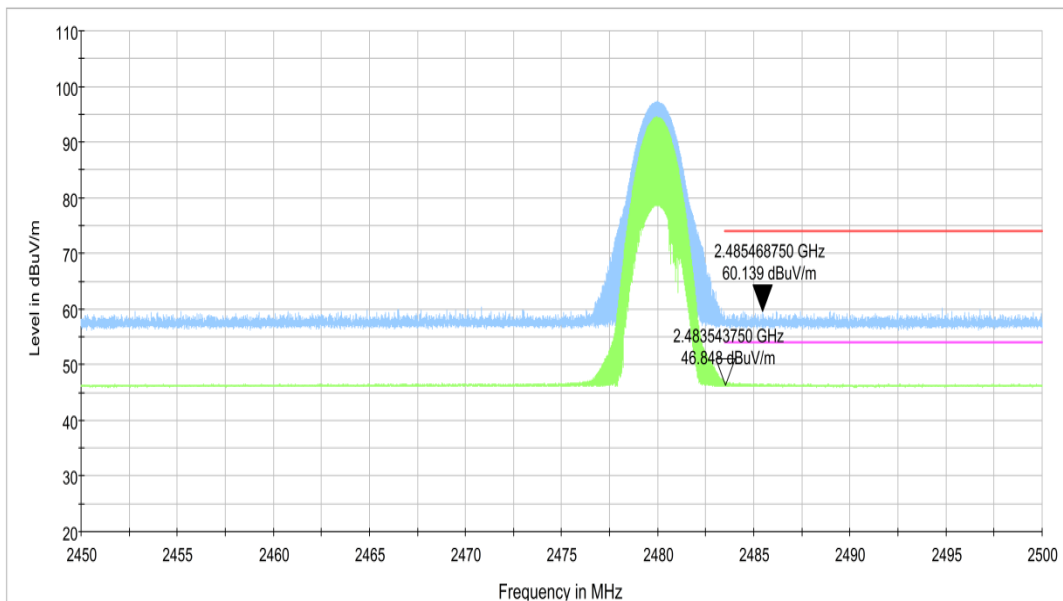


Fig.6. Frequency Band Edges: 8DPSK, Channel 78, 2.45 GHz - 2.50GHz

SPEED

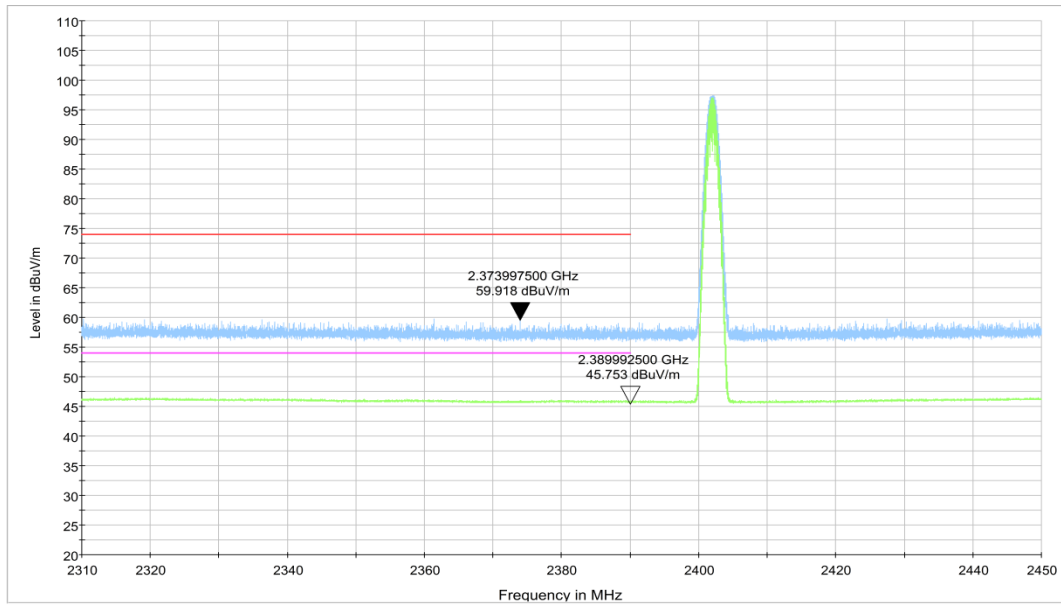


Fig.7. Frequency Band Edges: GFSK, Channel 0, Hopping Off, 2.31 GHz – 2.45GHz

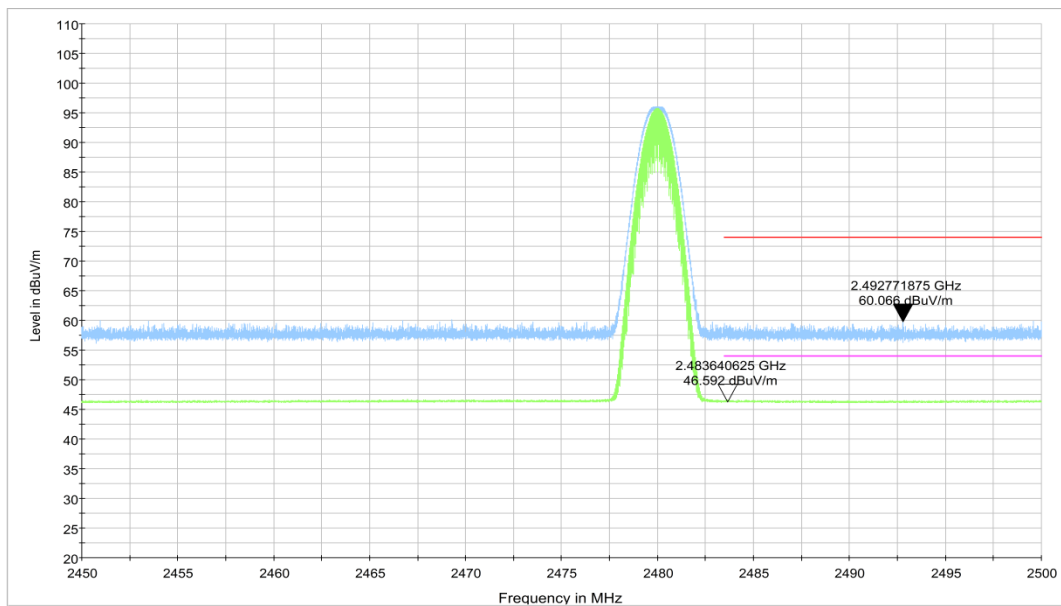


Fig.8. Frequency Band Edges: GFSK, Channel 78, Hopping Off, 2.45 GHz - 2.50GHz

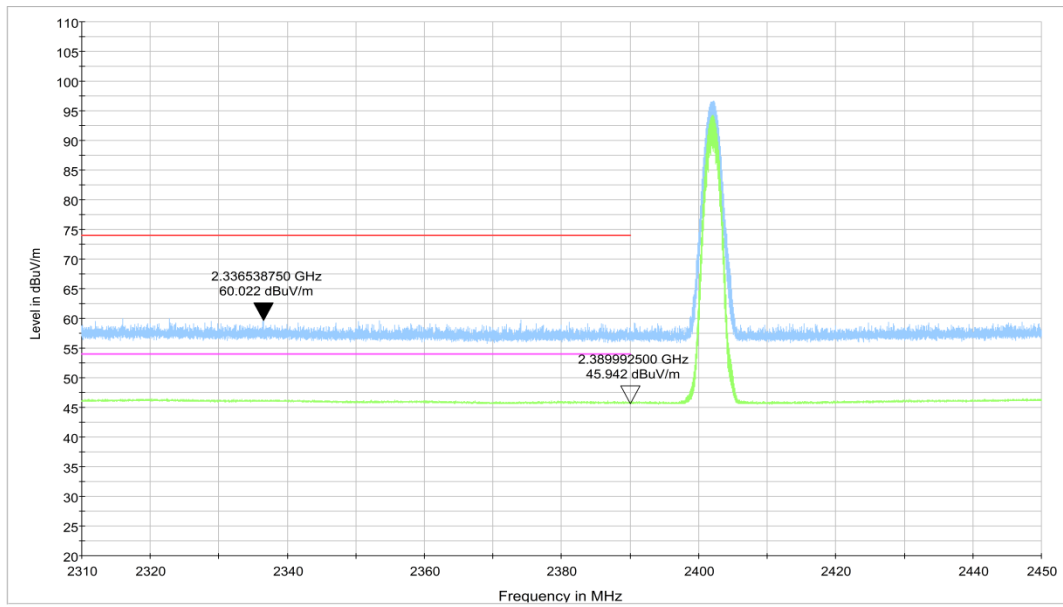


Fig.9. Frequency Band Edges: $\pi/4$ DQPSK, Channel 0, Hopping Off, 2.31 GHz - 2.45GHz

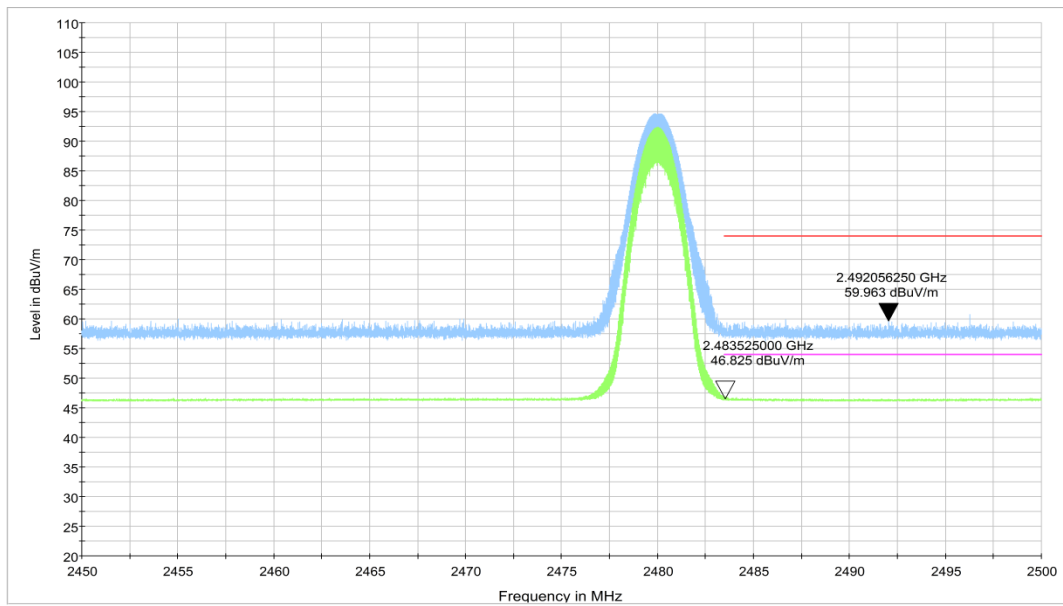


Fig.10. Frequency Band Edges: $\pi/4$ DQPSK, Channel 78, Hopping Off, 2.45 GHz - 2.50GHz

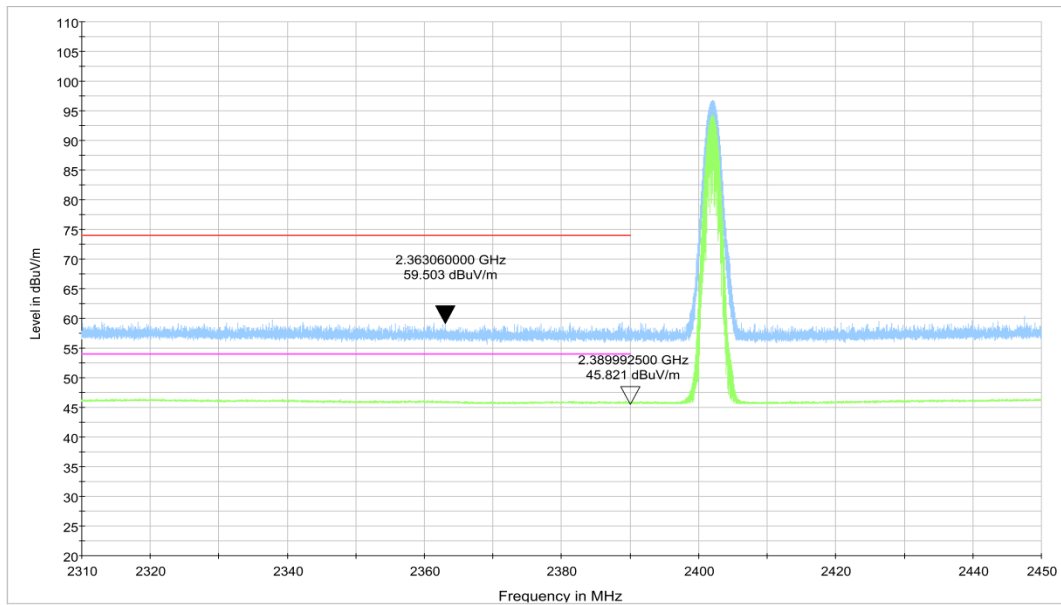


Fig.11. Frequency Band Edges: 8DPSK, Channel 0, 2.31 GHz - 2.45GHz

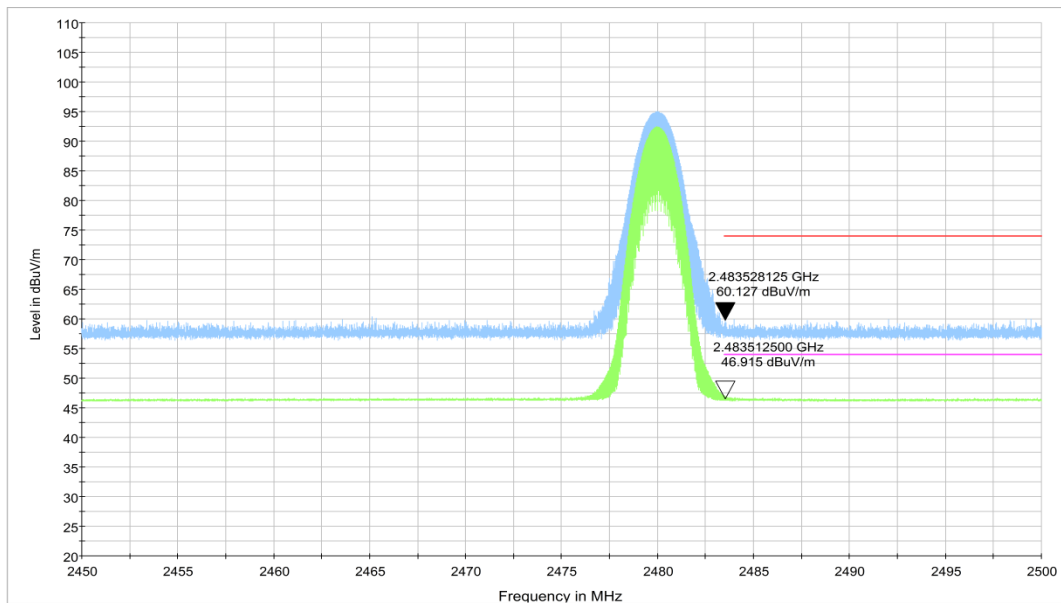


Fig.12. Frequency Band Edges: 8DPSK, Channel 78, 2.45 GHz - 2.50GHz

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.

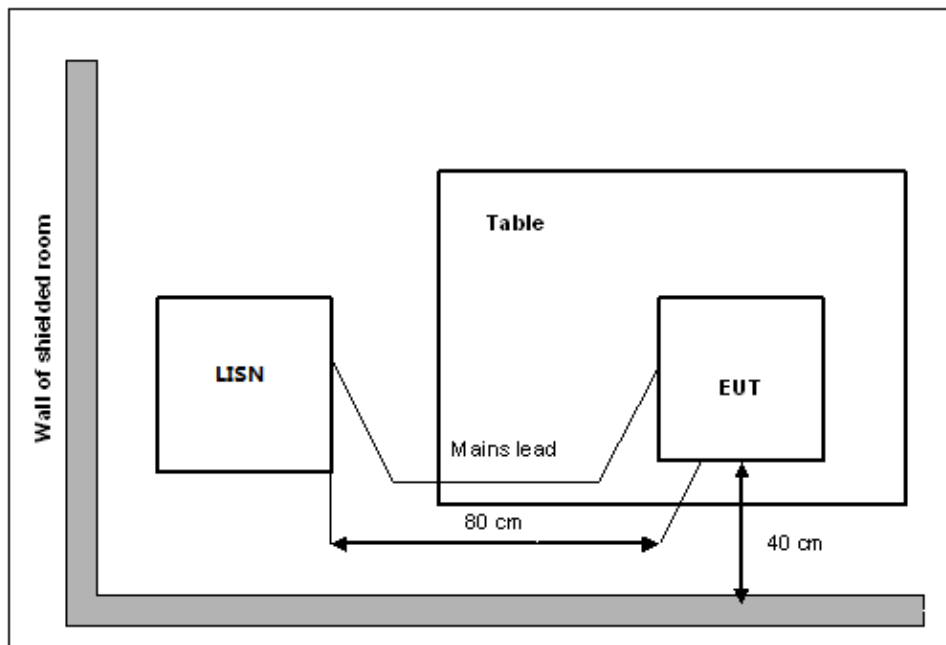
The measurement bandwidth is:

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 (dB μ V)	Result (dB μ V)		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 (dB μ V)	Result (dB μ V)		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:

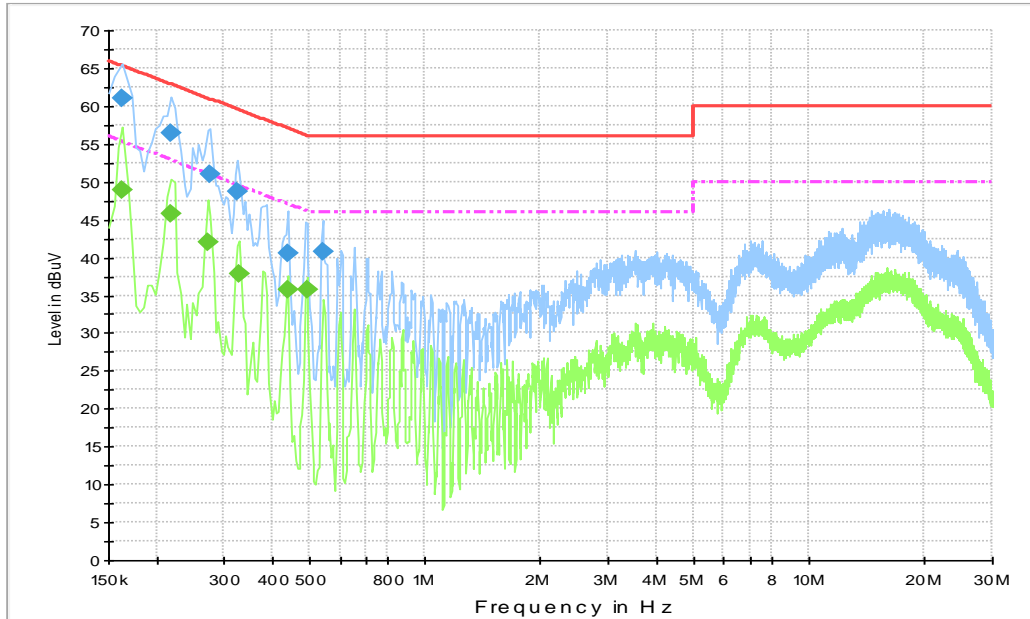


Fig.C.2.1 AC Power line Conducted Emission- Bluetooth

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)
0.163500	61.1	5000.	9.000	N	20.0	4.2	65.3
0.217500	56.4	5000.	9.000	N	19.9	6.5	62.9
0.276000	51.0	5000.	9.000	N	19.9	9.9	60.9
0.325500	48.7	5000.	9.000	L1	19.9	10.9	59.6
0.438000	40.6	5000.	9.000	N	19.9	16.5	57.1
0.541500	40.8	5000.	9.000	L1	19.8	15.2	56.0

Final Result 2

Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.163500	48.9	5000.0	9.000	N	20.0	6.4	55.3
0.217500	45.7	5000.0	9.000	L1	19.9	7.2	52.9
0.271500	42.0	5000.0	9.000	L1	19.8	9.1	51.1
0.330000	37.9	5000.0	9.000	L1	19.8	11.6	49.5
0.438000	35.7	5000.0	9.000	L1	19.9	11.4	47.1
0.492000	35.6	5000.0	9.000	L1	19.9	10.5	46.1

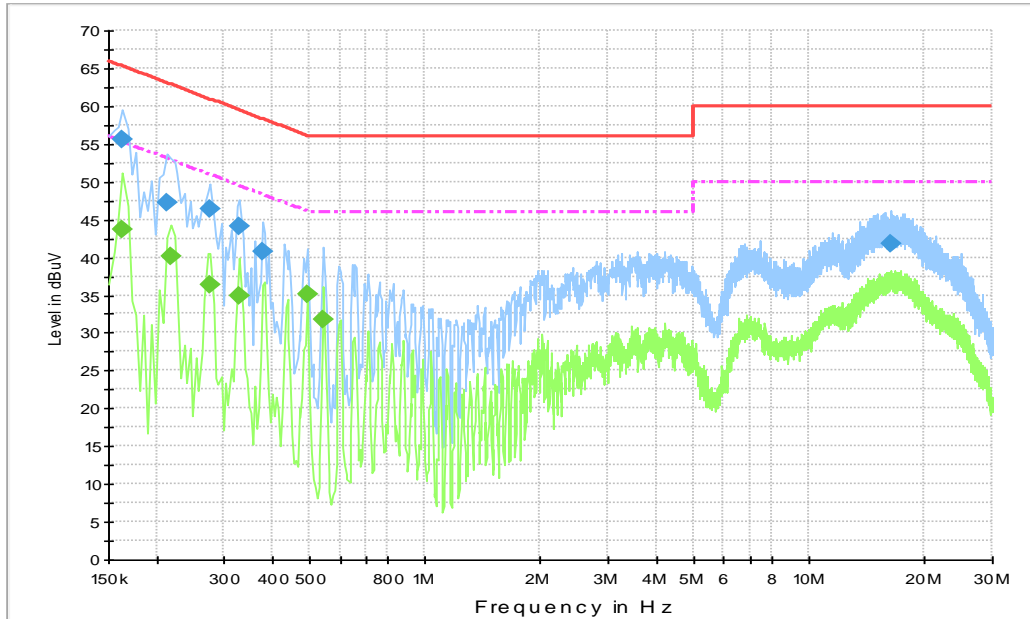


Fig.C.2.2 AC Power line Conducted Emission-Idle

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)
0.163500	55.5	5000.	9.000	L1	20.0	9.8	65.3
0.213000	47.2	5000.	9.000	N	19.9	15.9	63.1
0.276000	46.4	5000.	9.000	L1	19.9	14.5	60.9
0.330000	44.0	5000.	9.000	L1	19.8	15.4	59.5
0.379500	40.8	5000.	9.000	L1	19.9	17.5	58.3
16.327500	41.7	5000.	9.000	L1	19.8	18.3	60.0

Final Result 2

Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.163500	43.7	5000.0	9.000	N	20.0	11.6	55.3
0.217500	40.2	5000.0	9.000	L1	19.9	12.7	52.9
0.276000	36.4	5000.0	9.000	L1	19.9	14.6	50.9
0.330000	34.8	5000.0	9.000	L1	19.8	14.6	49.5
0.492000	35.1	5000.0	9.000	L1	19.9	11.0	46.1
0.546000	31.7	5000.0	9.000	N	19.9	14.3	46.0

END OF REPORT