

RADIO PERFORMANCE TEST REPORT

Test Report No. : OT-264-RWD-032
Reception No. : 2602000614
Applicant : TELICA Inc.
Address : Tower A-411, 40 Imi-ro, Uiwang-Si, Gyeonggi-do, 16006, South Korea
Manufacturer : TELICA Inc.
Address : Tower A-411, 40 Imi-ro, Uiwang-Si, Gyeonggi-do, 16006, South Korea
Type of Equipment : Zigbee Module
FCC ID. : 2BN7U-MS200
Model Name : MS-R1E-XSX
Multiple Model Name : N/A
Serial number : N/A
Total page of Report : 31 pages (including this page)
Date of Incoming : February 06, 2026
Date of issue : April 09, 2026

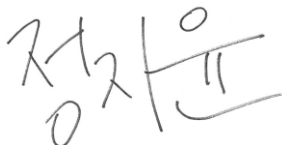
SUMMARY

The equipment complies with the regulation; **FCC PART 15 SUBPART C Section 15.247**

This test report only contains the result of a single test of the sample supplied for the examination.

It is not a generally valid assessment of the features of the respective products of the mass-production.

This test report is not associated with the accreditation granted by the Korean Laboratory Accreditation Scheme (KOLAS).





Tested by
 Ji-Yun, Jeong / Engineer
 ONETECH Corp.

Reviewed by
 Tae-Ho, Kim / Chief Engineer
 ONETECH Corp.

Approved by
 Jae-Ho, Lee / Director
 ONETECH Corp.

CONTENTS

PAGE

1. VERIFICATION OF COMPLIANCE	5
2. TEST SUMMARY	6
2.1 TEST ITEMS AND RESULTS	6
2.2 ADDITIONS, DEVIATIONS, EXCLUSIONS FROM STANDARDS	6
2.3 RELATED SUBMITTAL(S) / GRANT(S)	6
2.4 PURPOSE OF THE TEST	6
2.5 TEST METHODOLOGY	6
2.6 TEST FACILITY	6
3. GENERAL INFORMATION	7
3.1 PRODUCT DESCRIPTION	7
3.2 MAXIMUM PEAK OUTPUT POWER	7
3.3 ALTERNATIVE TYPE(S)/MODEL(S); ALSO COVERED BY THIS TEST REPORT	7
4. EUT MODIFICATIONS	7
5. SYSTEM TEST CONFIGURATION	8
5.1 JUSTIFICATION	8
5.2 PERIPHERAL EQUIPMENT	8
5.3 MODE OF OPERATION DURING THE TEST	8
5.4 CONFIGURATION OF TEST SYSTEM	9
5.5 ANTENNA REQUIREMENT	9
6. MEASUREMENT UNCERTAINTY	10
7. PRELIMINARY TEST	10
7.1 AC POWER LINE CONDUCTED EMISSIONS TESTS	10
7.2 GENERAL RADIATED EMISSIONS TESTS	10
7.3 LIST OF TEST EQUIPMENT	11
8. DESCRIPTION OF TEST	12
8.1 DUTY CYCLE	12
8.2 MINIMUM 6 dB BANDWIDTH	13
8.3 MAXIMUM PEAK OUTPUT POWER	14
8.4 POWER SPECTRAL DENSITY	15
8.5 100 kHz BANDWIDTH OUTSIDE THE FREQUENCY BAND	16
8.6 RADIATED TEST	17
8.7 AC POWER LINE CONDUCTED EMISSIONS	23

9. TEST RESULT	24
9.1 OPERATING ENVIRONMENT	24
9.2 TEST DATE	24
9.3 DUTY CYCLE	25
9.3.1 Test data	25
9.4 MINIMUM 6 dB BANDWIDTH	25
9.4.1 Test data	25
9.6 MAXIMUM PEAK OUTPUT POWER	25
9.6.1 Test data	25
9.7 POWER SPECTRAL DENSITY	25
9.7.1 Test data	25
9.8 100 kHz BANDWIDTH OUTSIDE THE FREQUENCY BAND	26
9.9 RADIATED SPURIOUS EMISSIONS	26
9.9.1 Frequency Range: Below 30 MHz	26
9.9.2 Frequency Range: Below 1 GHz	27
9.9.3 Frequency Range Above 1 GHz	28
9.10 RADIATED RESTRICTED BAND EDGE	29
9.10.1 Test data	29
9.11 AC POWER LINE CONDUCTED EMISSIONS	30

※ Please refer to the Annex section for All test plots

Revision History

Rev. No.	Issue Report No.	Issued Date	Revisions	Section Affected
0	OT-264-RWD-032	April 09, 2026	Initial Release	All

1. VERIFICATION OF COMPLIANCE

Applicant : TELICA Inc.
Address : Tower A-411, 40 Imi-ro, Uiwang-Si, Gyeonggi-do, 16006, South Korea
Contact Person : Aaron, Kim / Principal Research Engineer
Telephone No. : +82-10-9580-1067
FCC ID : 2BN7U-MS200
Model Name : MS-R1E-XSX
Brand Name : -
Serial Number : N/A
Date : April 09, 2026

EQUIPMENT CLASS	DTS – DIGITAL TRNSMISSION SYSTEM
E.U.T. DESCRIPTION	Zigbee Module
THIS REPORT CONCERNS	Original Grant
MEASUREMENT PROCEDURES	ANSI C63.10: 2020
TYPE OF EQUIPMENT TESTED	Pre-Production
KIND OF EQUIPMENT AUTHORIZATION REQUESTED	Certification
EQUIPMENT WILL BE OPERATED UNDER IC RULES PART(S)	FCC PART 15 SUBPART C Section 15.247 KDB 558074 D01 15.247 Meas Guidance v05r02
Modifications on the Equipment to Achieve Compliance	None
Final Test was Conducted On	3 m, Semi Anechoic Chamber

-. The above equipment was tested by ONETECH Corp. for compliance with the requirement set forth in the FCC Rules and Regulations. This said equipment in the configuration described in this report, shows the maximum emission levels emanating from equipment are within the compliance requirements.

2. TEST SUMMARY

2.1 Test items and results

SECTION	TEST ITEMS	RESULTS
15.247 (a) (2)	Minimum 6 dB Bandwidth	Met the Limit / PASS
15.247 (b) (3)	Maximum Conducted Output Power	Met the Limit / PASS
15.247 (d)	100 kHz Bandwidth Outside the Frequency Band	Met the Limit / PASS
15.247 (d)	Radiated Emission which fall in the Restricted Band	Met the Limit / PASS
15.247 (e)	Power Spectral Density	Met the Limit / PASS
15.209	Radiated Emission Limits	Met the Limit / PASS
15.207	Conducted Limits	Met the Limit / PASS
15.203	Antenna Requirement	Met requirement / PASS

2.2 Additions, deviations, exclusions from standards

No additions, deviations or exclusions have been made from standard.

2.3 Related Submittal(s) / Grant(s)

Original submittal only

2.4 Purpose of the test

To determine whether the equipment under test fulfills the requirements of the regulation stated in FCC PART 15 SUBPART C Section 15.247.

2.5 Test Methodology

Both conducted and radiated testing was performed according to the procedures in ANSI C63.10: 2020. Radiated testing was performed at a distance of 3 m from EUT to the antenna.

2.6 Test Facility

The Onetech Corp. has been designated to perform equipment testing in compliance with ISO/IEC 17025.

The Electromagnetic compatibility measurement facilities are located at 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea

-. Site Filing:

VCCI (Voluntary Control Council for Interference) – Registration No. R-20122/ C-14617/ G-10666/ T-11842

-. Lab Accreditation:

KOLAS (Korea Laboratory Accreditation Scheme) - Accreditation NO. KT085

ISED (Innovation, Science and Economic Development Canada) – Registration No. Site# 3736A-3

FCC (Federal Communications Commission) - Accreditation No. KR0013

RRA (Radio Research Agency) – Designation No. KR0013

3. GENERAL INFORMATION

3.1 Product Description

The TELICA Inc., Model MS-R1E-XXS (referred to as the EUT in this report) is a Zigbee Module. The product specification described herein was obtained from product data sheet or user's manual.

DEVICE TYPE	Zigbee Module
OPERATING FREQUENCY	2 405 MHz ~ 2 480 MHz
MODULATION TYPE	DSSS
RF OUTPUT POWER	-1.13 dBm
ANTENNA TYPE	Metal Antenna
ANTENNA GAIN	2.26 dBi
List of each Osc. or crystal Freq.(Freq. >= 1 MHz)	40 MHz
RATED SUPPLY VOLTAGE	DC 3.30 V

3.2 Maximum Peak Output Power

Mode	SISO
	Peak Output Power (dBm)
Zigbee	-1.13

3.3 Alternative type(s)/model(s); also covered by this test report.

-. None

4. EUT MODIFICATIONS

-. None

5. SYSTEM TEST CONFIGURATION

5.1 Justification

This device was configured for testing in a typical way as a normal customer is supposed to be used. During the test, the following components were installed inside of the EUT.

DEVICE TYPE	MANUFACTURER	MODEL/PART NUMBER	FCC ID
Main Board	TELICA Inc.	2.4G Module R0.2	N/A

5.2 Peripheral equipment

Defined as equipment needed for correct operation of the EUT, but not considered as tested:

Model	Manufacturer	Description	Connected to
MS-R1E-XSX	TELICA Inc.	Zigbee Module (EUT)	-
80UD	LENOVO	Notebook PC	EUT

5.3 Mode of operation during the test

For the testing, software used to control the EUT for staying in continuous transmitting is programmed.

-. Frequency / Channel Operations

Channel	Frequency
11	2 405
18	2 440
26	2 480

-. Power Level Setting

Mode	Channel No.	Frequency (MHz)	PLS Setting
Zigbee	11	2 405	-10.0
	18	2 440	-10.0
	26	2 480	-10.0

5.4 Configuration of Test System

Line Conducted Test:

The EUT is placed on the turntable, which is 0.8 m above ground plane. According to the requirements in Section 6.2 of ANSI C63.10: 2020 Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30 MHz using CISPR Quasi-peak and average Measurement Type or modes.

Radiated Emission Test:

Preliminary radiated emissions test were conducted using the procedure in ANSI C63.10: 2020 to determine the worse operating conditions. Final radiated emission tests were conducted at 3 meter Semi Anechoic Chamber.

The EUT is placed on a turn table, which is 0.8 m above ground plane below 1 GHz. Above 1 GHz with 1.5 m using absorbers between the EUT and receive antenna. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3 m away from the receiving antenna, which varied from 1 m to 4 m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.

In order to find out the max. emission, the relative positions of this EUT was rotated through three orthogonal axes according to the requirements in Section 6.6.5 of ANSI C63.10: 2020

5.5 Antenna Requirement

For intentional device, according to section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

Antenna Construction:

The EUT's antennas are a Metal Antenna, which are permanently attached to the EUT and cannot be replaced by the user.

6. MEASUREMENT UNCERTAINTY

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.10-2020.

All measurement uncertainty values are shown with a coverage factor of $k = 2$ to indicate a 95 % level of confidence.

The measurement data shown herein meets or exceeds the U_{CISPR} measurement uncertainty values specified in CISPR 16-4-2 and, thus, can be compared directly to specified limits to determine compliance.

Parameter	Expanded Uncertainty (dB)
Conducted Output Power	1.22
Conducted Spurious Emission < 26.5 GHz	1.40
Power Spectral Density	1.22
Line Conducted Disturbance (150 kHz ~ 30 MHz)	1.40
Radiated Disturbance (9 kHz ~ 30 MHz)	3.28
Radiated Disturbance (30 MHz ~ 1 GHz)	4.42
Radiated Disturbance (1 GHz ~ 18 GHz)	5.12
Radiated Disturbance (18 GHz ~ 40 GHz)	4.62

7. PRELIMINARY TEST

7.1 AC Power line Conducted Emissions Tests

During Preliminary Test, the following operating mode was investigated.

Operation Mode	The Worse operating condition (Please check one only)
Transmitting Mode	X

7.2 General Radiated Emissions Tests

During Preliminary Test, the following operating mode was investigated.

Operation Mode	The Worse operating condition (Please check one only)
Transmitting Mode	X

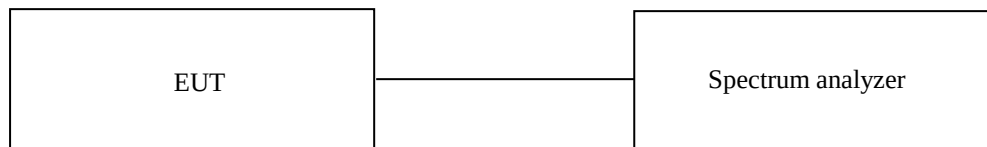
7.3 LIST OF TEST EQUIPMENT

Model Number	Manufacturer	Description	Serial Number	Last Cal.(Interval)
FSV30	Rohde & Schwarz	SIGNAL ANALYZER	101200	Feb. 02, 2026 (1Y)
SMBV100A	Rohde & Schwarz	VECTOR SIGNAL GENERATOR	260423	Jan 14, 2026 (1Y)
SMB100A	Rohde & Schwarz	SiGNAL GENERATOR	177648	Jan 14, 2026 (1Y)
GP-4303D	LG Precision Co.,Ltd	DC POWER SUPPLY (DC 30V / 3A)	5071069	Jan 04, 2026 (1Y)
ESR	Rohde & Schwarz	EMI Test Receiver	101470	Mar. 11, 2026 (1Y)
310N	Sonoma Instrument	Pre-Amplifier	312545	Mar. 11, 2026 (1Y)
SCU18	Rohde & Schwarz	Pre-Amplifer	102209	Jul. 02, 2025 (1Y)
DT5000	Innco System	Turn Table	N/A	N/A
MA-4000XPET	Innco System	Antenna Master	MA4000/509/37211215/L	N/A
CO3000	Innco System	Controller	N/A	N/A
FMZB 1519-60D	Schwarzbeck	Active Magnetic Loop Antenna	00113	Jan. 07, 2025 (2Y)
HLP-2008	TDK RF Solutions	TRILOG BROADBAND ANTENNA	131314	Mar. 01, 2025 (2Y)
BBHA9120D	Schwarzbeck	Horn Antenna	9120D-1366	Jun. 19, 2025 (1Y)
BBHA9170	Schwarzbeck	Horn Antenna	BBHA9170178	Jan. 04, 2026 (1Y)
HPF 3GHz	Rohde & Schwarz	High Pass Filter	N/A	Jan. 12, 2026 (1Y)
QFA1802-26-6-S	Qualwave	6dB Attenuator	225344	Jan. 13, 2026 (1Y)
ESCI	Rohde & Schwarz	EMI TEST RECEIVER	101012	Sep. 24, 2025 (1Y)
NSLK8126	Schwarzbeck	V - LISN (4*16/25A)	8126404	Mar. 11, 2026 (1Y)
ESH3-Z2	Rohde & Schwarz	PULSE LIMITER	100655	Mar. 11, 2026 (1Y)

8. DESCRIPTION OF TEST

8.1 Duty Cycle

1) Test Configuration



2) Test Procedure

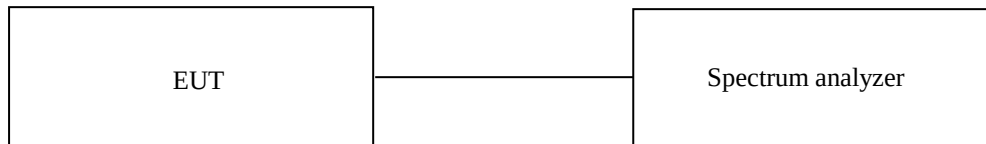
1. RBW = 28 MHz (the largest available value)
2. VBW = 28 MHz ($\geq$ RBW)
3. SPAN = 0 Hz
4. Measurement Type = Peak
5. Trace mode = Clear write
6. Calculate Duty Cycle = T_{on} / T_{total} and Duty Cycle Factor = $10\log(1/\text{Duty Cycle})$

8.2 Minimum 6 dB Bandwidth

1) Limit

According to §15.247(a)(2), The minimum 6 dB bandwidth shall be at least 500 kHz.

2) Test Configuration



3) Test Procedure

6 dB Bandwidth

We tested according to Procedure Section 11.8 in ANSI C63.10-2020.

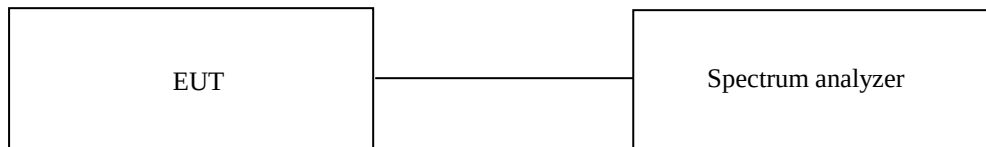
1. RBW: shall be in the range of 1 % to 5% of the OBW but not less than 100 kHz.
2. VBW $\geq 3 \times$ RBW
3. Sweep: No faster than coupled (auto) time
4. Detector: Peak
5. Trace mode: max hold
6. Allow the trace to stabilize.
7. Measure the maximum width of the emission by placing two markers, one at the lowest frequency and the other at the highest frequency of the envelope of the spectral display, such that each marker is at or slightly below the "-6 dB down amplitude". If a marker is below this "-6 dB down amplitude" value, then it shall be as close as possible to this value.

8.3 Maximum Peak Output Power

1) Limit

According to §15.247(b)(3), For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt.

2) Test Configuration



3) Test Procedure

We tested according to Procedure Section 11.9.1 in ANSI C63.10-2020.

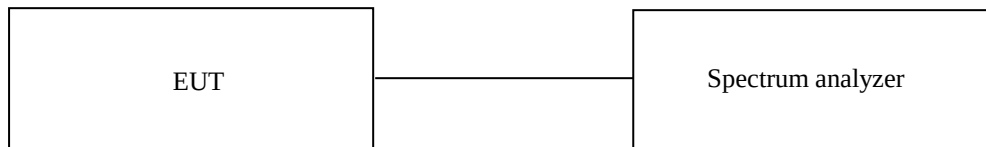
1. $RBW \geq DTS \text{ bandwidth}$
2. $VBW \geq 3 \times RBW$
3. $Span \geq 3 \times RBW$
4. Sweep: No faster than coupled (auto) time
5. Detector: Peak
6. Trace mode: max hold
7. Allow the trace to stabilize.
8. Use peak marker function to determine the peak amplitude level.

8.4 Power Spectral Density

1) Limit

According to §15.247(e), The power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

2) Test Configuration



3) Test Procedure

We tested according to Procedure Section 11.10.2 in ANSI C63.10-2020.

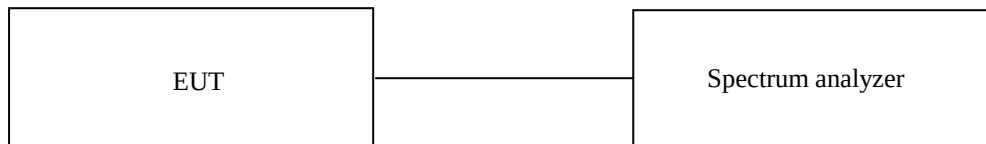
1. Set span to at least 1.5 times the DTS bandwidth
2. $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$
3. $\text{VBW} \geq 3 \times \text{RBW}$
4. Detector: Peak
5. Sweep: No faster than coupled (auto) time
6. Trace mode: max hold
7. Allow the trace to stabilize.
8. Use the peak marker function to determine the maximum amplitude level within the RBW.
9. If measured value exceeds requirement, then reduce RBW (but no less than 3 kHz) and repeat.

8.5 100 kHz Bandwidth Outside the Frequency Band

1) Limit

According to §15.247(d), In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits.

2) Test Configuration



3) Test Procedure

We tested according to Procedure Section 11.11 in ANSI C63.10-2020.

1. RBW: 100 kHz
2. VBW: 300 kHz
3. Sweep: No faster than coupled (auto) time
4. Detector: Peak
5. Trace mode: max hold
6. Allow the trace to stabilize.
7. Use the peak marker function to determine the maximum amplitude level.

8.6 Radiated Test

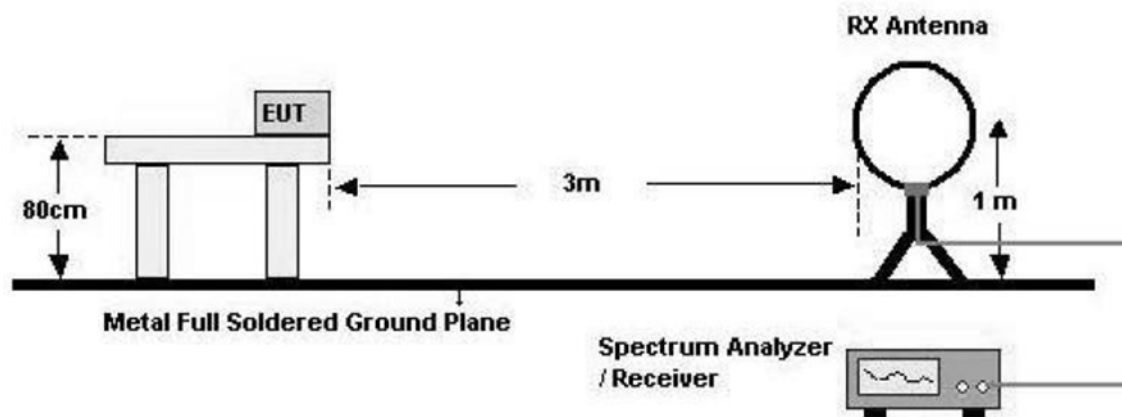
1) Limit

1. All out of band emissions appearing in a restricted band as specified in Section 15.205 of the Title 47 CFR must not exceed the limits shown in Section 15.209.

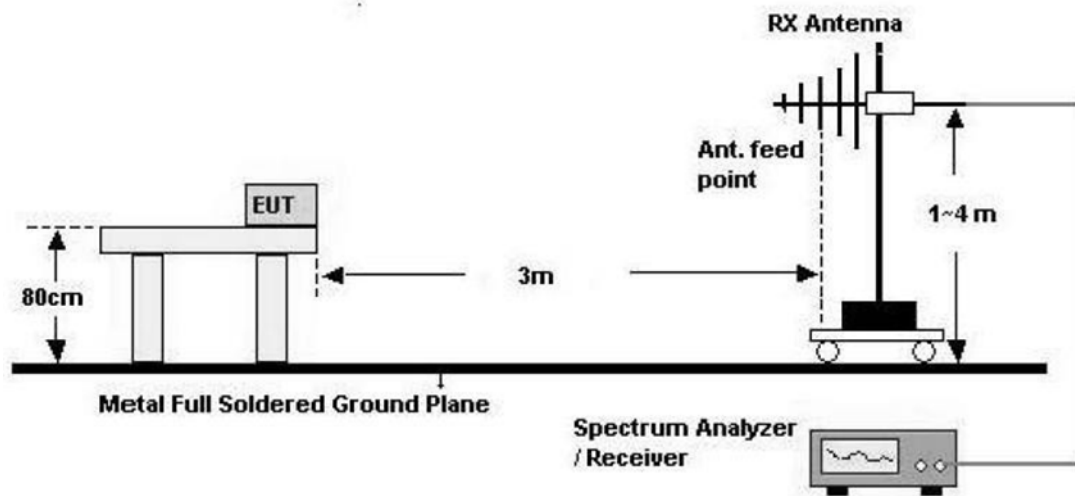
Frequency Range (MHz)	Field Strength ($\mu\text{V/m}$)	Measurement Distance (m)
0.009 ~ 0.490	$2400/F(\text{kHz})$	300
0.490 ~ 1.705	$24000/F(\text{kHz})$	30
1.705 ~ 30	30	30
30 ~ 88	100	3
88 ~ 216	150	3
216 ~ 860	200	3
Above 960	500	3

2) Test Configuration

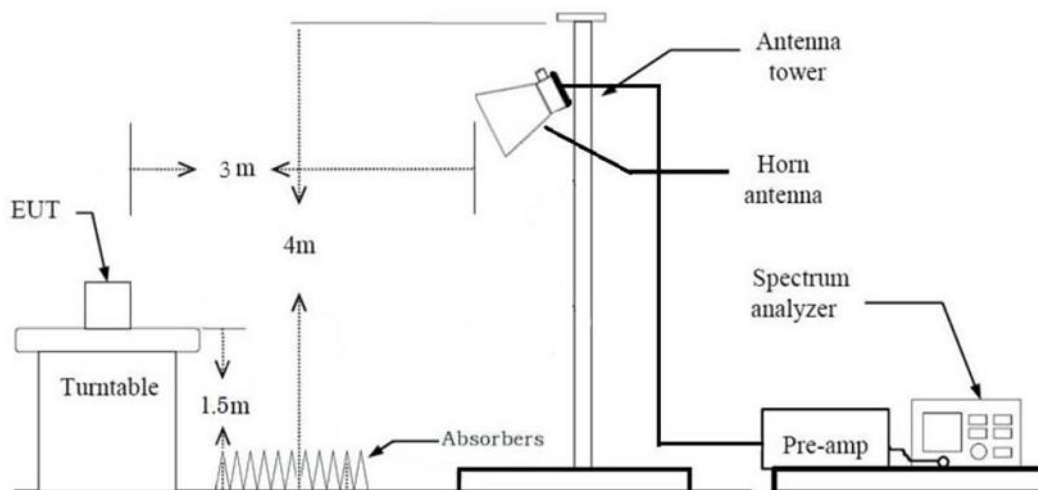
Below 30 MHz



30 MHz ~ 1 GHz



Above 1 GHz



3) Test Procedure

Radiated Spurious Emissions (Below 30 MHz)

We tested according to Procedure Section 6.4 in ANSI C63.10-2020.

1. The EUT was placed on a non-conductive table located on semi-anechoic chamber.
2. The loop antenna was placed at a location 3 m from the EUT
3. The EUT is placed on a turntable, which is 0.8m above ground plane.
4. We have done x, y, z planes in EUT and horizontal and vertical polarization and Parallel to the ground plane in detecting antenna.
5. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
6. Distance Correction Factor (0.009 MHz ~ 0.490 MHz) = $40 \cdot \log(3 \text{ m}/300 \text{ m}) = -80 \text{ dB}$
Measurement Distance: 3 m
7. Distance Correction Factor (0.490 MHz ~ 30 MHz) = $40 \cdot \log(3 \text{ m}/30 \text{ m}) = -40 \text{ dB}$
Measurement Distance: 3 m
8. Spectrum Setting
 - Frequency Range = 9 kHz ~ 30 MHz
 - Detector = Peak
 - Trace = Max Hold
 - RBW = 9 kHz
 - VBW $\geq 3 \times$ RBW
9. Measurement value only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.

Radiated Spurious Emissions (Below 1 GHz)

We tested according to Procedure Section 6.5 in ANSI C63.10-2020.

1. The EUT was placed on a non-conductive table located on semi-anechoic chamber.
2. The EUT is placed on a turntable, which is 0.8m above ground plane.
3. The Hybrid antenna was placed at a location 3 m from the EUT, which is varied from 1 m to 4 m to find out the highest emissions.
4. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
5. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
6. Spectrum Setting
 - 1) Measurement Type (Peak):
 - Measured Frequency Range: 30 MHz - 1 GHz
 - Detector = Peak
 - Trace = Max Hold
 - RBW = 100 kHz
 - VBW $\geq$ 3 x RBW
 - 2) Measurement Type (Quasi-peak):
 - Measured Frequency Range: 30 MHz - 1 GHz
 - Detector = Quasi-Peak
 - RBW = 120 kHz
7. Measurement value only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.

Radiated Spurious Emissions (Above 1 GHz)

We tested according to Procedure Section 6.6 & 11.12 in ANSI C63.10-2020.

1. The EUT is placed on a turntable, which is 1.5 m above ground plane.
2. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
3. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
4. EUT is set 3 m away from the receiving antenna, which is varied from 1 m to 4 m to find out the highest emissions.
5. Each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Spectrum Setting
 - 1) Measurement Type (Peak)
 - Measured Frequency Range: Center frequency was set to the frequency of the Radiated Spurious emission of interest
 - Detector = Peak
 - Trace = Max Hold
 - RBW = 1 MHz
 - VBW $\geq$ 3 x RBW
 - Sweep time = Auto
 - 2) Measurement Type (Method AD – Average Detection)
 - Measured Frequency Range: Center frequency was set to the frequency of the Radiated Spurious emission of interest
 - Detector = RMS (power average)
 - Averaging type = power averaging (RMS)
 - RBW = 1 MHz
 - VBW $\geq$ 3 x RBW
 - Sweep time = auto
 - Trace average at least 100 traces in power averaging (RMS) mode
7. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency
8. Distance extrapolation factor = $20\log(\text{test distance} / \text{specific distance})$ (dB)

Radiated Restricted Band Edge

We tested according to Procedure Section 6.10 & 11.12 in ANSI C63.10-2020.

1. The EUT is placed on a turntable, which is 1.5 m above ground plane.
2. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
3. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
4. EUT is set 3 m away from the receiving antenna, which is varied from 1 m to 4 m to find out the highest emissions.
5. Each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Spectrum Setting
 - 3) Measurement Type (Peak)
 - Detector = Peak
 - Trace = Max Hold
 - RBW = 1 MHz
 - VBW $\geq$ 3 x RBW
 - Sweep time = Auto
 - 4) Measurement Type (Method AD – Average Detection)
 - Detector = RMS (power average)
 - Averaging type = power averaging (RMS)
 - RBW = 1 MHz
 - VBW $\geq$ 3 x RBW
 - Sweep time = auto
 - Trace average at least 100 traces in power averaging (RMS) mode
7. Measured Frequency Range:
 - 1) 2 310 MHz ~ 2 390 MHz
 - 2) 2 483.5 MHz ~ 2 500 MHz
8. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency
9. Distance extrapolation factor = $20\log(\text{test distance} / \text{specific distance})$ (dB)

8.7 AC Power line Conducted Emissions

1) Limit

For an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 μ H/50 ohms line impedance stabilization network (LISN).

The limits are as specified in the tables below.

Frequency Range (MHz)	Limits (dB μ V)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56 ^(a)	56 to 46 ^(a)
0.50 to 5	56	46
5 to 30	60	50

^(a) Decreases with the logarithm of the frequency.

Compliance with this provision shall be based on the measurement of the radio frequency voltage between each power line (LINE and NEUTRAL) and ground at the power terminals.

2) Test Configuration

Setup according to ANSI C63.10:2020, Section 6.2.

Please refer to the attached test photos for the actual connection between the EUT and the supporting equipment.

3) Test Procedure

1. The EUT is placed on a wooden table 80 cm above the reference ground plane.
2. The EUT is connected via LISN to a test power supply.
3. The measurement results are obtained as described below:
4. Measurement Typeors : Quasi Peak and Average Measurement Type

9. TEST RESULT

9.1 Operating environment

Temperature : 24 °C
Relative humidity : 52 % R.H.

9.2 Test Date

February 06, 2026 ~ March 10, 2026

9.3 Duty Cycle

9.3.1 Test data

Mode	Tx On Time [ms]	Tx Off Time [ms]	Duty Cycle [%]	Correction Factor [dB]
Zigbee	4.246	0.755	84.91	0.71

9.4 Minimum 6 dB Bandwidth

Margin = Limit – Measured Value

9.4.1 Test data

Mode	Channel	Frequency (MHz)	Measured Value (kHz)	Limit (kHz)	Margin (kHz)
Zigbee	11	2 405.00	1 158.91	500.00	658.91
	18	2 440.00	1 398.78	500.00	898.78
	26	2 480.00	1 138.69	500.00	638.69

9.6 Maximum Peak Output Power

Margin = Limit – Measured Value (=Receiver Reading + Cable Loss)

9.6.1 Test data

Mode	Channel	Frequency (MHz)	Measured Value (dBm)	Limit (dBm)	Margin (dB)
Zigbee	11	2 405.00	-1.31	30.00	31.31
	18	2 440.00	-1.13	30.00	31.13
	26	2 480.00	-1.25	30.00	31.25

9.7 Power Spectral Density

Margin = Limit – Measured Value (=Receiver Reading + Cable Loss)

9.7.1 Test data

Mode	Channel	Frequency (MHz)	Measured Value (dBm)	Limit (dBm)	Margin (dB)
Zigbee	11	2 405.00	-15.30	8.00	23.30
	18	2 440.00	-14.71	8.00	22.71
	26	2 480.00	-16.11	8.00	24.11

9.8 100 kHz Bandwidth Outside the Frequency Band

For Test data for conducted emission, please refer to the Annex.

9.9 Radiated Spurious Emissions

9.9.1 Frequency Range: Below 30 MHz

Frequency (MHz)	Reading (dBμV)	Ant. Pol. (H/V)	Ant. Height (m)	Angle (°)	Ant. Factor (dB/m)	Cable Loss	Emission Level(dBμV/m)	Limits (dBμV/m)	Margin (dB)
No Critical peaks found									

- Resolution bandwidth : 200 Hz (from 9 kHz to 0.15 MHz), 9 kHz (from 0.15 MHz to 30 MHz)
- Frequency range : 9 kHz ~ 30 MHz
- Measurement distance : 3 m

Note:

1. The Measured Value of emissions are attenuated more than 20 dB below the permissible limits or the field strength is too small to be measured.
2. Distance extrapolation factor = $40\log(\text{specific distance} / \text{test distance})$ (dB)
3. Limit line = specific Limits (dBμV) + Distance extrapolation factor

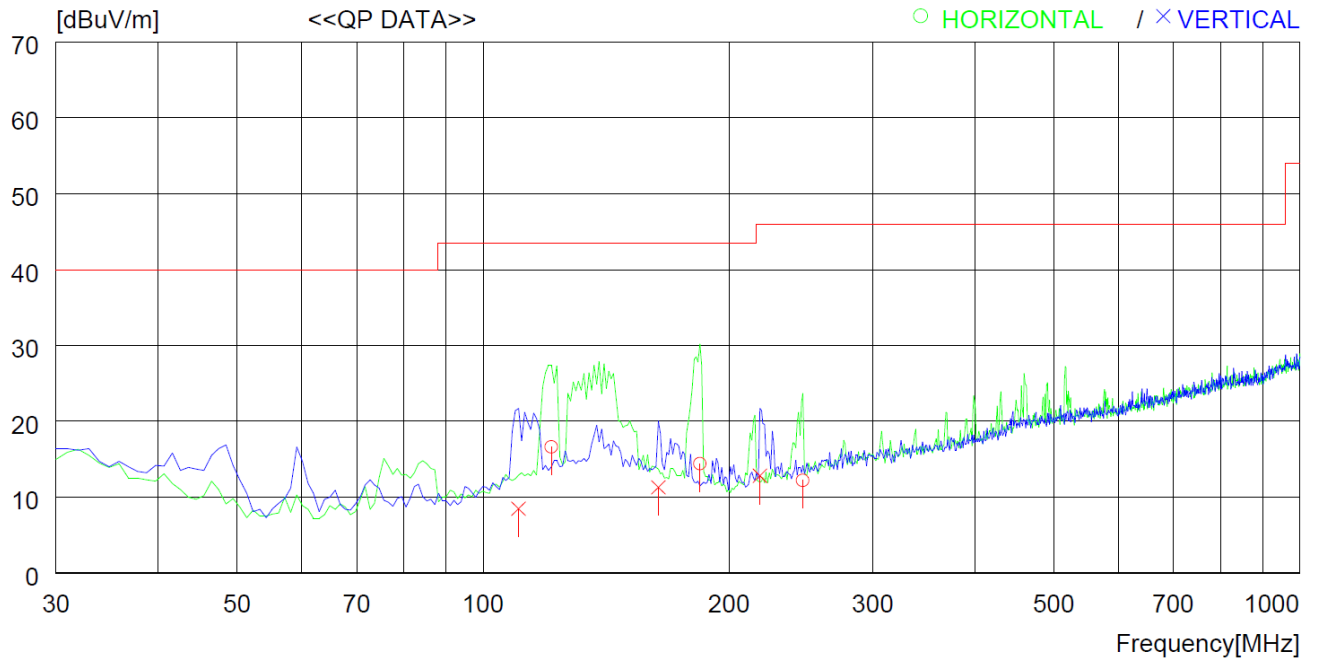
9.9.2 Frequency Range: Below 1 GHz

Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.247

Result : PASSED

EUT : Zigbee Module

Detector : CISPR Quasi-Peak (6 dB Bandwidth: 120 kHz)



No.	FREQ	READING	ANT	LOSS	GAIN	RESULT	LIMIT	MARGIN	ANTENNA	TABLE
	[MHz]	QP	FACTOR							
		[dBuV]	[dB]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[cm]	[DEG]
----- Horizontal -----										
1	121.180	28.3	18.6	2.0	32.3	16.6	43.5	26.9	200	0
2	184.230	27.7	16.5	2.4	32.2	14.4	43.5	29.1	100	359
3	246.310	24.0	17.6	2.8	32.2	12.2	46.0	33.8	100	359
----- Vertical -----										
4	110.510	21.5	17.4	1.9	32.3	8.5	43.5	35.0	100	229
5	163.860	23.4	17.8	2.3	32.2	11.3	43.5	32.2	100	69
6	218.180	25.9	16.4	2.7	32.2	12.8	46.0	33.2	100	37

9.9.3 Frequency Range Above 1 GHz

- Remark: “H”: Horizontal, “V”: Vertical

- Margin (dB) = Limits (dB μ V/m) - Emission Level (dB μ V/m)

- D.F (dB) = Duty Factor(dB)

9.9.3.1 Test data

Channel	CH 11		Frequency(MHz)		2 405			Mode	Zigbee	
Frequency (MHz)	Reading (dB μ V)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	AMP Gain	D.F (dB)	Total (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)
4 803.96	51.95	Peak	H	31.50	7.03	42.24	-	48.24	74.00	25.76
4 809.00	41.17	Average	H	31.50	7.03	42.24	0.71	38.17	54.00	15.83
4 804.31	53.20	Peak	V	31.50	7.03	42.24	-	49.49	74.00	24.51
4 809.10	42.24	Average	V	31.50	7.03	42.24	0.71	39.24	54.00	14.76

Channel	CH 18		Frequency(MHz)		2 440			Mode	Zigbee	
Frequency (MHz)	Reading (dB μ V)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	AMP Gain	D.F (dB)	Total (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)
4 881.00	52.38	Peak	H	31.50	7.08	42.24	-	48.72	74.00	25.28
4 880.90	40.50	Average	H	31.50	7.08	42.24	0.71	37.55	54.00	16.45
4 881.00	52.08	Peak	V	31.50	7.08	42.24	-	48.42	74.00	25.58
4 879.35	41.98	Average	V	31.50	7.08	42.24	0.71	39.03	54.00	14.97

Channel	CH 26		Frequency(MHz)		2 480			Mode	Zigbee	
Frequency (MHz)	Reading (dB μ V)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	AMP Gain	D.F (dB)	Total (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)
4 954.16	51.40	Peak	H	31.62	7.26	42.24	-	48.04	74.00	25.96
4 977.83	39.24	Average	H	31.71	7.26	42.24	0.71	36.68	54.00	17.32
4 958.95	53.00	Peak	V	31.64	7.26	42.24	-	49.66	74.00	24.34
4 959.25	43.25	Average	V	31.64	7.26	42.24	0.71	40.62	54.00	13.38

9.10 Radiated Restricted Band Edge

- Remark: “H”: Horizontal, “V”: Vertical
- Margin (dB) = Limits (dB μ V/m) - Emission Level (dB μ V/m)
- D.F (dB) = Duty Factor(dB)

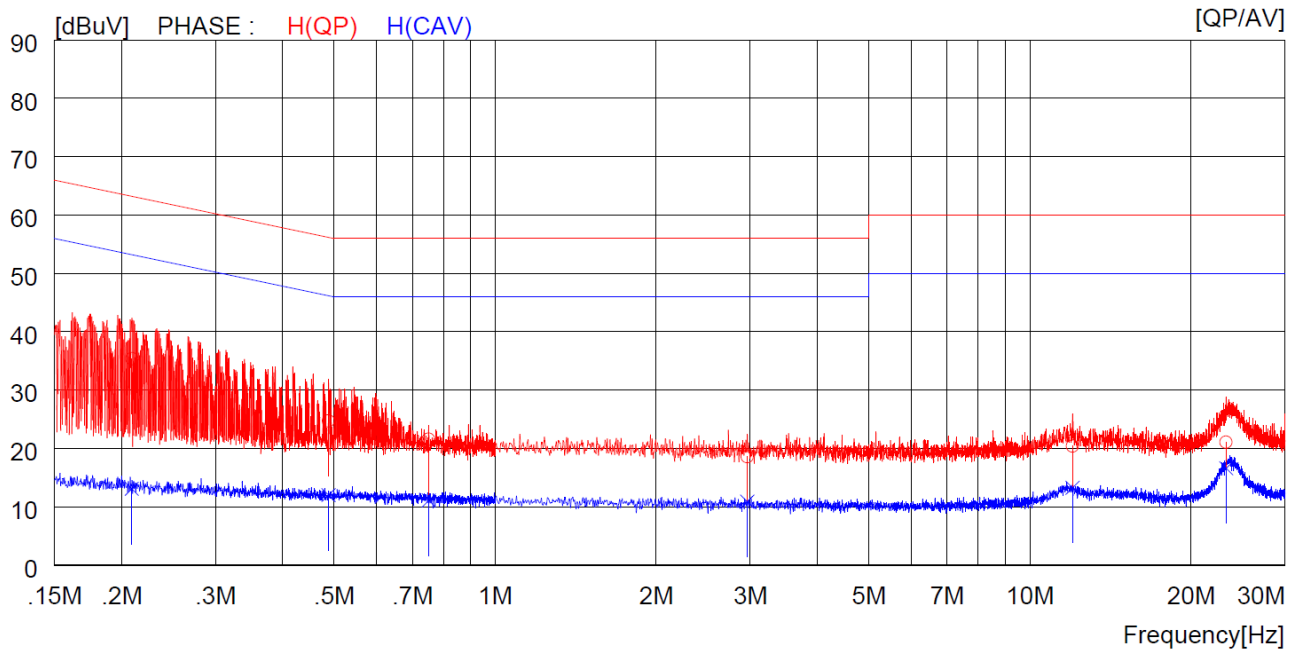
9.10.1 Test data

Channel	CH 11		Frequency(MHz)			2 405			Mode	Zigbee	
Frequency (MHz)	Reading (dB μ V)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	AMP Gain	ATT (dB)	D.F (dB)	Total (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)
2 317.36	55.34	Peak	H	27.83	4.62	42.77	6.03	-	51.05	74.00	22.95
2 316.22	42.97	Average	H	27.84	4.62	42.77	6.03	0.71	39.40	54.00	14.60
2 339.85	54.36	Peak	V	27.74	4.62	42.77	6.03	-	49.98	74.00	24.02
2 313.56	43.06	Average	V	27.85	4.62	42.77	6.03	0.71	39.50	54.00	14.50

Channel	CH 26		Frequency(MHz)			2 480			Mode	Zigbee	
Frequency (MHz)	Reading (dB μ V)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	AMP Gain	ATT (dB)	D.F (dB)	Total (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)
2 483.690	60.93	Peak	H	27.60	5.52	42.73	6.03	-	57.35	74.00	16.65
2 483.510	53.59	Average	H	27.60	5.52	42.73	6.03	0.71	50.72	54.00	3.28
2 483.650	58.69	Peak	V	27.60	5.52	42.73	6.03	-	55.11	74.00	18.89
2 483.530	50.44	Average	V	27.60	5.52	42.73	6.03	0.71	47.57	54.00	6.43

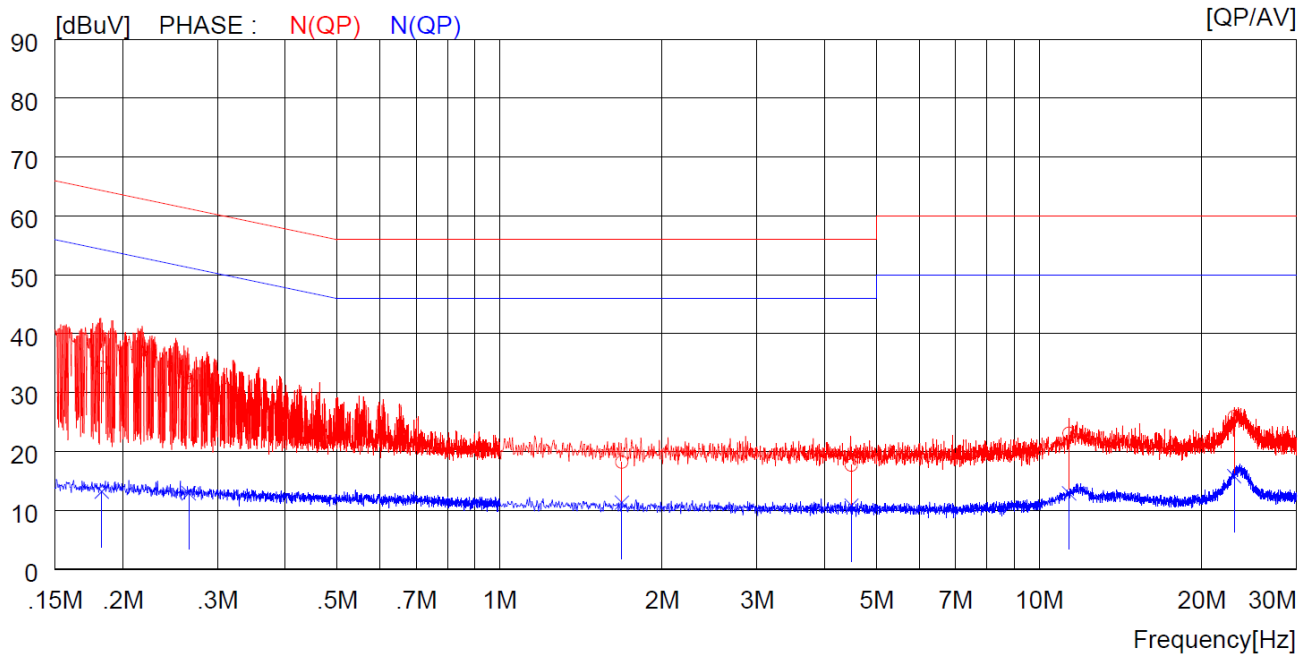
9.11 AC Power line Conducted Emissions

-. Tested Line : HOT LINE



NO	FREQ [MHz]	READING		C.FACTOR [dB]	RESULT		LIMIT		MARGIN		PHASE
		QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	
1	0.20900	25.4	----	10.0	35.4	----	63.2	----	27.8	----	H (QP)
2	0.48800	14.7	----	10.0	24.7	----	56.2	----	31.5	----	H (QP)
3	0.75100	11.6	----	10.0	21.6	----	56.0	----	34.4	----	H (QP)
4	2.96000	8.5	----	10.1	18.6	----	56.0	----	37.4	----	H (QP)
5	12.01000	10.0	----	10.4	20.4	----	60.0	----	39.6	----	H (QP)
6	23.28000	10.3	----	10.8	21.1	----	60.0	----	38.9	----	H (QP)
7	0.20900	----	3.1	10.0	----	13.1	----	53.2	----	40.1	H (CAV)
8	0.48800	----	2.0	10.0	----	12.0	----	46.2	----	34.2	H (CAV)
9	0.75100	----	1.1	10.0	----	11.1	----	46.0	----	34.9	H (CAV)
10	2.96000	----	0.8	10.1	----	10.9	----	46.0	----	35.1	H (CAV)
11	12.01000	----	2.9	10.4	----	13.3	----	50.0	----	36.7	H (CAV)
12	23.28000	----	5.8	10.8	----	16.6	----	50.0	----	33.4	H (CAV)

-. Tested Line : NEUTRAL LINE



NO	FREQ [MHz]	READING		C.FACTOR [dB]	RESULT		LIMIT		MARGIN		PHASE
		QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	
1	0.18300	24.3	----	10.0	34.3	----	64.3	----	30.0	----	N (QP)
2	0.26500	21.7	----	10.0	31.7	----	61.3	----	29.6	----	N (QP)
3	1.68400	8.1	----	10.1	18.2	----	56.0	----	37.8	----	N (QP)
4	4.48800	7.6	----	10.1	17.7	----	56.0	----	38.3	----	N (QP)
5	11.37000	12.8	----	10.3	23.1	----	60.0	----	36.9	----	N (QP)
6	22.99000	15.1	----	10.8	25.9	----	60.0	----	34.1	----	N (QP)
7	0.18300	----	3.2	10.0	----	13.2	----	54.3	----	41.1	N (CAV)
8	0.26500	----	2.9	10.0	----	12.9	----	51.3	----	38.4	N (CAV)
9	1.68400	----	1.2	10.1	----	11.3	----	46.0	----	34.7	N (CAV)
10	4.48800	----	0.7	10.1	----	10.8	----	46.0	----	35.2	N (CAV)
11	11.37000	----	2.6	10.3	----	12.9	----	50.0	----	37.1	N (CAV)
12	22.99000	----	5.0	10.8	----	15.8	----	50.0	----	34.2	N (CAV)

Remark: Margin (dB) = Limit – Level (Result)

The emission level in above table is included the transducer factor that means insertion loss (LISN), cable loss and attenuator.