FCC Test Report

Equipment	:	Liberty Wireless Module
Brand Name	:	Bowers & Wilkins
Model No.	:	CC72036
FCC ID	:	2ACIX-LWM
Standard	:	47 CFR FCC Part 15.247
Frequency	:	2400 MHz – 2483.5 MHz
Function	:	☒Point-to-multipoint; ☐Point-to-point
Applicant	:	B&W Group Ltd. Dale Road Worthing, West Sussex BN11 2BH, United Kingdom
Manufacturer	:	B&W Group Ltd. Dale Road Worthing, West Sussex BN11 2BH, United Kingdom

The product sample received on Sep. 15, 2017 and completely tested on Nov. 17, 2017. We, SPORTON, would like to declare that the tested sample has been evaluated in accordance with the procedures given in ANSI C63.10-2013 and shown compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONALINC., the test report shall not be reproduced except in full.

Cliff Chang
SPORTON INTERNATIONAL INC.

Testing Laboratory
1190

Table of Contents

Summary of Test Result

Conformance Test Specifications				
Report Clause	**Ref. Std. Clause**	**Description**	**Limit**	**Result**
1.1.2	15.203	Antenna Requirement	FCC 15.203	Complied
3.1	15.207	AC Power-line Conducted Emissions	FCC 15.207	Complied
3.2	15.247(a)	DTS Bandwidth	≥500kHz	Complied
3.3	15.247(b)	Maximum Conducted Output Power	Power [dBm]:30	Complied
3.4	15.247(e)	Power Spectral Density	PSD [dBm/3kHz]:8	Complied
3.5	15.247(d)	Emissions in Non-restricted Frequency Bands	Non-Restricted Bands: >30 dBc	Complied
3.6	15.247(d)	Emissions in Restricted Frequency Bands	Restricted Bands: FCC 15.209	Complied

Revision History

Report No.	Version	Description	Issued Date
FR790630AD	Rev. 01	Initial issue of report	Dec. 15, 2017
FR790630AD	Rev. 02	Adding twelve dipole antennas	Jan. 08, 2018

1 General Description

1.1 Information

1.1.1 RF General Information

Frequency Range (MHz)	Bluetooth Mode	Ch. Frequency (MHz)	Channel Number
2400-2483.5	LE	2402-2480	0-39 [40]

Band	Mode	BWch (MHz)	Nant
2.4G	BT-LE	1	1

Note:
- Bluetooth LE uses a GFSK (1Mbps) modulation for DSSS.
- BWch is the nominal channel bandwidth.
- Nss-Min is the minimum number of spatial streams.
- Nant is the number of outputs. e.g., 2(2, 3) means have 2 outputs for port 2 and port 3. 2 means have 2 outputs for port 1 and port 2.

1.1.2 Antenna Information

Ant.	Port	Radio	Brand	P/N	Antenna Type	Connector	Gain (dBi)		
							WLAN 2.4GHz	WLAN 5GHz	BT
1	1	R1	LUXSHARE ICT	DCIW303	Dipole Antenna	I-PEX	2.02	3.06	-
2	2	R1	LUXSHARE ICT	DCIW303	Dipole Antenna	I-PEX	2.02	-	-
3	1	R2	LUXSHARE ICT	DCIW303	Dipole Antenna	I-PEX	-	3.06	-
4	2	R2	LUXSHARE ICT	DCIW303	Dipole Antenna	I-PEX	-	3.06	-
5	1	R3/R4	LUXSHARE ICT	DCIW303	Dipole Antenna	I-PEX	-	3.06	2.02
6	2	R3	LUXSHARE ICT	DCIW303	Dipole Antenna	I-PEX	-	3.06	-
7	-	R2/R3	ACON	ZZ35343	Dipole Antenna	I-PEX 20670-001R-37	-	1.28	-
8	-	R1/R2/R3	ACON	ZZ35351	Dipole Antenna	I-PEX 20670-001R-37	1.92	2	-
9	-	R2/R3	ACON	ZZ35378	Dipole Antenna	I-PEX 20670-001R-37	-	1.77	-
10	-	R2/R3	ACON	ZZ35386	Dipole Antenna	I-PEX 20670-001R-37	-	2.93	-
11	-	R1	ACON	ZZ35394	Dipole Antenna	I-PEX 20670-001R-37	1.53	NA	-
12	-	R1/R2/R3/R4	ACON	ZZ35408	Dipole Antenna	I-PEX 20670-001R-37	1.92	1.52	1.92
13	-	R2/R3	ACON	ZZ35491	Dipole Antenna	I-PEX 20670-001R-37	-	2.12	-
14	-	R1/R2/R3	ACON	ZZ35505	Dipole Antenna	I-PEX 20670-001R-37	1.94	2.88	-
15	-	R2/R3	ACON	ZZ35513	Dipole Antenna	I-PEX 20670-001R-37	-	1.73	-
16	-	R2/R3	ACON	ZZ35521	Dipole Antenna	I-PEX 20670-001R-37	-	1.41	-
17	-	R1	ACON	ZZ35548	Dipole Antenna	I-PEX 20670-001R-37	1.91	-	-
18	-	R1/R2/R3/R4	ACON	ZZ35556	Dipole Antenna	I-PEX 20670-001R-37	1.62	0.46	1.62

Note:There are 18 antennas in the antenna table list, antenna 1~6 are the highest gain antennas.

They were selected to perform the test and recorded in this report.

For 2.4GHz function:

Radio 1

For IEEE 802.11b/g/n/ac mode (2TX/2RX)

Ant.1 (Port 1) and Ant.2 (Port 2) could transmit/receive simultaneously.

For 5GHz function:

Radio 1 (For B1~B4)

For IEEE 802.11a/n/ac mode (1RX)

Only Ant.1 (Port 1) can be used as receiving antenna.

Radio 2 (For B3~B4)

For IEEE 802.11a/n/ac mode (2TX/2RX)

Ant.3 (Port 1) and Ant.4 (Port 2) could transmit/receive simultaneously.

Radio 3 (For B1~B2)

For IEEE 802.11a/n mode (2TX/2RX)

Ant.5 (Port 1) and Ant.6 (Port 2) could transmit/receive simultaneously.

For bluetooth function:

Radio 4

For bluetooth mode (1TX/1RX)

Only Ant.5 (Port 1) can be used as transmitting/receiving antenna.

1.1.3 Mode Test Duty Cycle

Mode	DC	DCF(dB)	T(s)	VBW(Hz) ≥ 1/T
BT-LE(1Mbps)	0.661	1.798	412.969u	3k

1.1.4 EUT Operational Condition

EUT Power Type	From host system
Test Software Version	Blue Test3

1.1.5 Table for EUT functions

Radio	2.4GHz & 5GHz (B1~B4) (5GHz Scanning only)	5GHz (B1&B2)	5GHz (B3&B4)	Bluetooth
1	V	-	-	-
2	-	-	V	-
3	-	V	-	-
4	-	-	-	V

Type of function	2.4GHz (Radio 1)	5GHz (B1&B2) (Radio 3)	5GHz (B3&B4) (Radio 2)	5GHz (Radio 1) (B1~B4) (Scanning only)	Bluetooth (Radio 4)
AP Mode (Master)	N/A	V	V	V	V
Station Mode (Slave without radar detection)	V	V	V	N/A	V
Station Mode (Slave without radar detection)	N/A	V	V	V	V
Test Mode	**2.4GHz (Radio 1)**	**5GHz (B1&B2) (Radio 3)**	**5GHz (B3&B4) (Radio 2)**	**5GHz (Radio 1) (B1~B4) (Scanning only)**	**Bluetooth (Radio 4)**
AP Mode (For lisn and Emissions in Non-restricted Frequency Bands below 1GHz)	Station Mode	AP Mode	AP Mode	Not work (Note)	Not work (Note)
Station Mode	Station Mode	Station Mode	Station Mode	Not work (Note)	Not work (Note)
For Radiated Emission Co-location					
AP Mode	Station Mode	AP Mode	AP Mode	Not work (Note)	AP Mode

Note: Normal link does not support BT link and RX Scanning function.

1.2 Testing Applied Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- 47 CFR FCC Part 15
- ANSI C63.10-2013
- FCC KDB 558074 D01 v04

1.3 Testing Location Information

Testing Location			
☐	HWA YA	ADD :	No. 52, Hwa Ya 1st Rd., Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C.
		TEL :	886-3-327-3456 FAX : 886-3-318-0055
☒	JHUBEI	ADD :	No.8, Lane 724, Bo-ai St., Jhubei City, HsinChu County 302, Taiwan, R.O.C.
		TEL :	886-3-656-9065 FAX : 886-3-656-9085

Test Condition	Test Site No.	Test Engineer	Test Environment	Test Date
RF Conducted	TH01-CB	Brian Sun & Eddie Weng	22°C / 54%	Sep. 26, 2017 ~ Nov. 16, 2017
Radiated	03CH01-CB	Paul Chen & DK Chang & Justin Lin & Joy Tseng & Zero Chen & Mason Chen	22°C / 54%	Sep. 28, 2017 ~ Oct. 06, 2017
AC Conduction	CO01-CB	Max Lin	25°C / 59%	Nov. 17, 2017

Test site Designation No. TW0006 with FCC.
Test site registered number IC 4086D with Industry Canada.

1.4 Measurement Uncertainty

ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence level (based on a coverage factor (k=2)

Test Items	Uncertainty	Remark
Conducted Emission (150kHz ~ 30MHz)	3.2 dB	Confidence levels of 95%
Radiated Emission (30MHz ~ 1,000MHz)	3.6 dB	Confidence levels of 95%
Radiated Emission (1GHz ~ 18GHz)	3.7 dB	Confidence levels of 95%
Radiated Emission (18GHz ~ 40GHz)	3.5 dB	Confidence levels of 95%
Conducted Emission	1.7 dB	Confidence levels of 95%
Output Power Measurement	1.33 dB	Confidence levels of 95%
Power Density Measurement	1.27 dB	Confidence levels of 95%
Bandwidth Measurement	9.74×10^{-8}	Confidence levels of 95%

2 Test Configuration of EUT

2.1 Test Channel Mode

Mode	Power Setting
BT-LE(1Mbps)	-
2402MHz	Default
2440MHz	Default
2480MHz	Default

2.2 The Worst Case Measurement Configuration

The Worst Case Mode for Following Conformance Tests	
Tests Item	AC power-line conducted emissions
Condition	AC power-line conducted measurement for line and neutral
Operating Mode	Normal Link
1	AP Mode
2	Station Mode
Mode 2 generated the worst test result, so it was recorded in this report.	

The Worst Case Mode for Following Conformance Tests	
Tests Item	DTS Bandwidth Maximum Conducted Output Power Power Spectral Density Emissions in Non-restricted Frequency Bands
Test Condition	Conducted measurement at transmit chains

The Worst Case Mode for Following Conformance Tests	
Tests Item	Emissions in Restricted Frequency Bands
Test Condition	Radiated measurement If EUT consist of multiple antenna assembly (multiple antenna are used in EUT regardless of spatial multiplexing MIMO configuration), the radiated test should be performed with highest antenna gain of each antenna type.
Operating Mode < 1GHz	Normal Link
1	AP Mode-EUT in Y axis
2	AP Mode-EUT in Z axis
Mode 1 has been evaluated to be the worst case among Mode 1~2, thus measurement for Mode 3 will follow this same test mode.	
3	Station Mode-EUT in Y axis
Mode 1 generated the worst test result, so it was recorded in this report.	
Operating Mode > 1GHz	CTX
	The EUT was performed at X axis, Y axis and Z axis position for Emissions in Restricted Frequency Bands above 1GHz test, and the worst case was found at Z axis. So the measurement will follow this same test configuration.
1	EUT in Z axis

The Worst Case Mode for Following Conformance Tests	
Tests Item	Simultaneous Transmission Analysis - Radiated Emission Co-location
Test Condition	Radiated measurement
Operating Mode	Normal Link
1	EUT in X axis - R1 (2.4G / Station mode) + R3 (5G B1~B2 / AP mode) + R2 (5G B3~B4 / AP mode) + R4 (BT / AP mode)
2	EUT in Y axis - R1 (2.4G / Station mode) + R3 (5G B1~B2 / AP mode) + R2 (5G B3~B4 / AP mode) + R4 (BT / AP mode)
3	EUT in Z axis - R1 (2.4G / Station mode) + R3 (5G B1~B2 / AP mode) + R2 (5G B3~B4 / AP mode) + R4 (BT / AP mode)
Mode 3 generated the worst test result, so it was recorded in this report.	
Refer to Appendix G for Radiated Emission Co-location.	

The Worst Case Mode for Following Conformance Tests	
Tests Item	Simultaneous Transmission Analysis - Co-location RF Exposure Evaluation
Operating Mode	
1	R1 (2.4G) + R3 (5G B1~B2) + R2 (5G B3~B4) + R4 (BT)
Refer to Sporton Test Report No.: FA790630 for Co-location RF Exposure Evaluation.	

Note: All the specification of test configurations and test modes were based on customer's request.

2.3 EUT Operation during Test

For CTX Mode:

The EUT was programmed to be in continuously transmitting mode.

For Normal Link:

During the test, the EUT operation to normal function.

2.4 Accessories

N/A

2.5 Support Equipment

For Test Site No: CO01-CB

Support Equipment				
No.	**Equipment**	**Brand Name**	**Model Name**	**FCC ID**
1	NB*4	DELL	E6430	DoC
2	AP Router*3	Planex	GW-AP54SGX	KA220030603014-1
3	Mouse	Logitech	M-U0026	DoC
4	Earphone	e-Power	S90W	DoC
5	Test fixture	Arcadyan	WN9722BTBAC22-WB JIG TEST	N/A

For Test Site No: 03CH01-CB (below 1GHz)

Support Equipment				
No.	**Equipment**	**Brand Name**	**Model Name**	**FCC ID**
1	NB*4	DELL	E4300	DoC
2	WLAN AP	D-LINK	DIR860L	KA2IR860LA1
3	Mouse	Logitech	M-U0026	DoC
4	Earphone	SHYARO CHI	MIC-04	N/A
5	Test fixture	Arcadyan	WN9722BTBAC22-WB JIG TEST	N/A

For Test Site No: 03CH01-CB (above 1GHz)

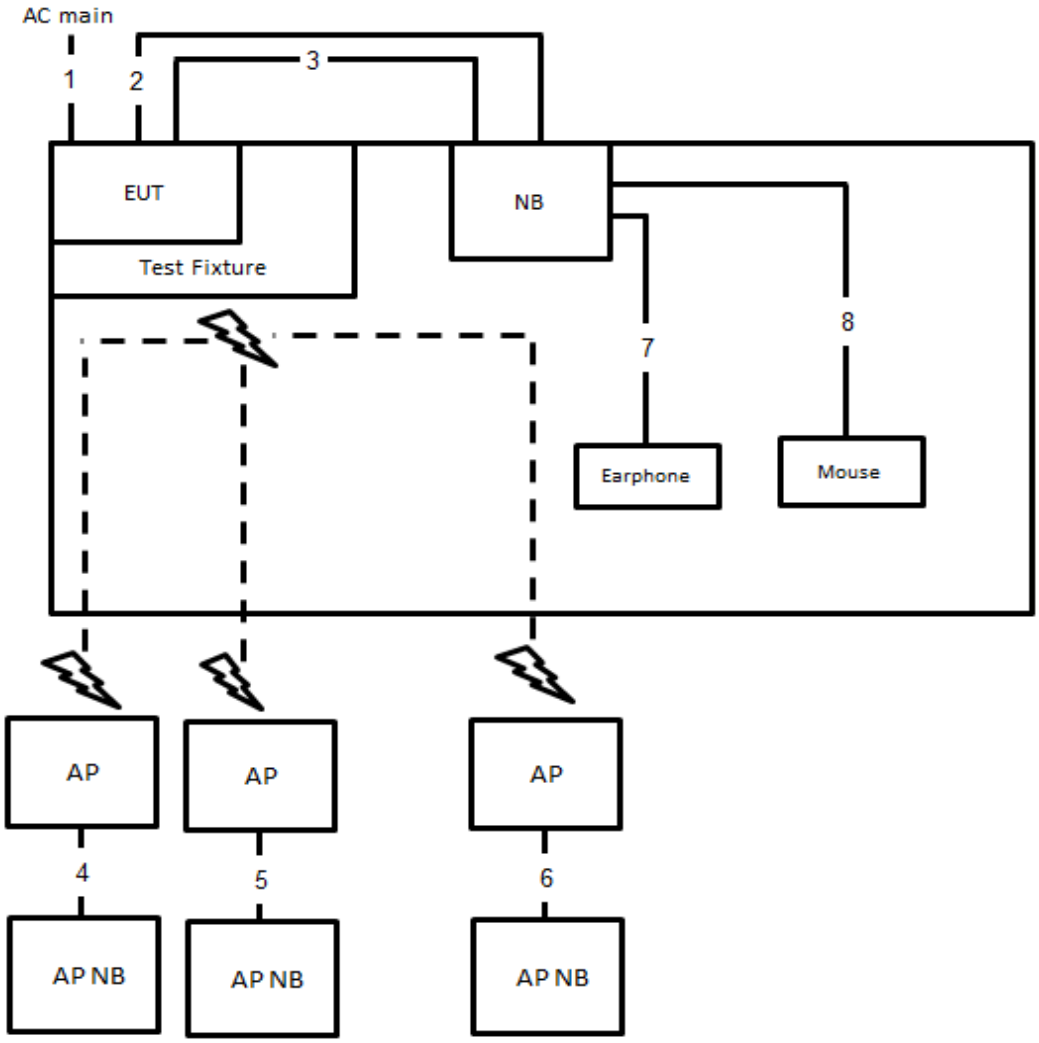
Support Equipment				
No.	**Equipment**	**Brand Name**	**Model Name**	**FCC ID**
1	NB	DELL	E4300	DoC
2	Test fixture	Arcadyan	WN9722BTBAC22-WB JIG TEST	N/A

For Test Site No: TH01-CB

Support Equipment				
No.	**Equipment**	**Brand Name**	**Model Name**	**FCC ID**
1	NB	DELL	E4300	DoC
2	Test fixture	Arcadyan	WN9722BTBAC22-WB JIG TEST	N/A

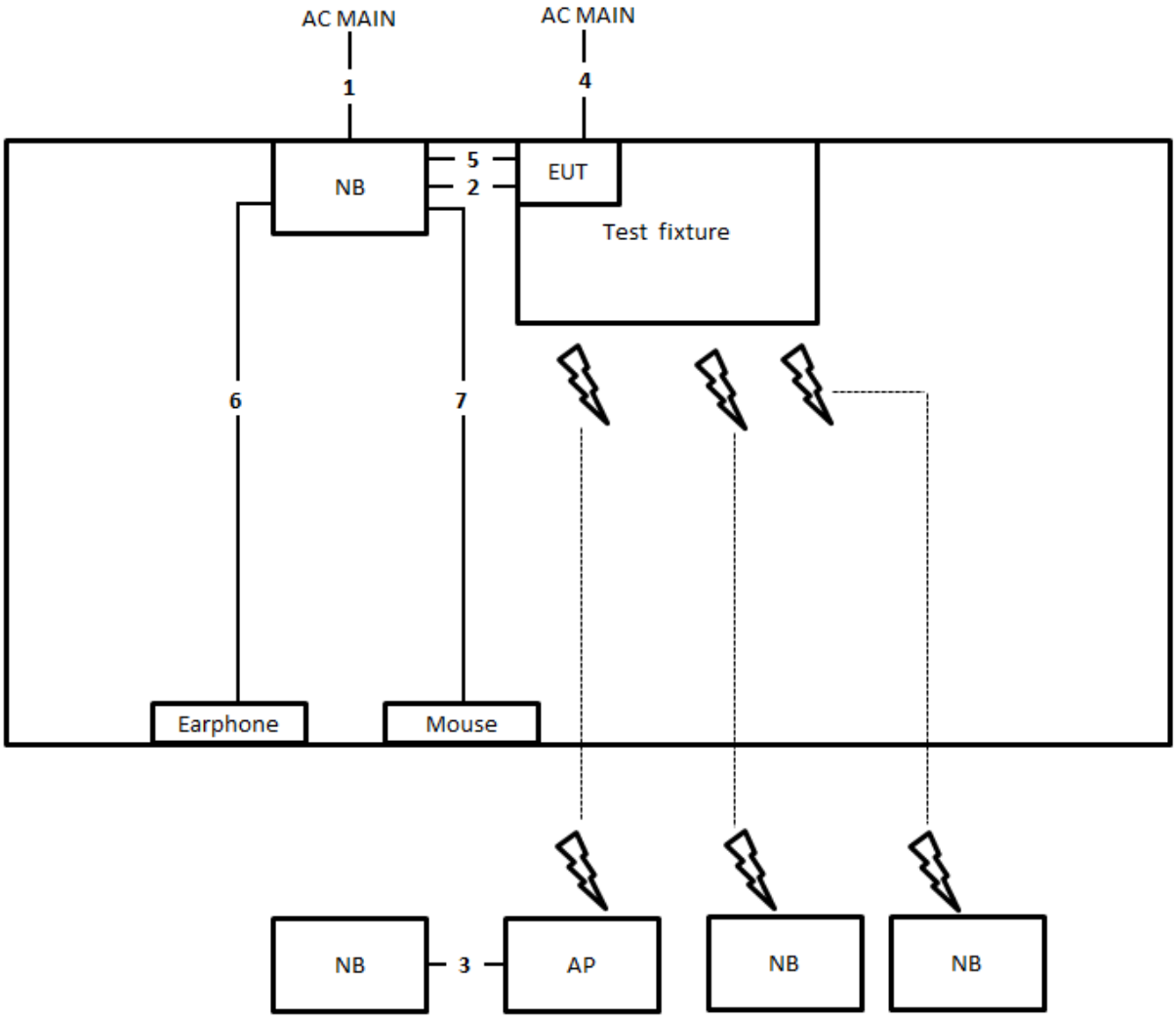
2.6 Test Setup Diagram

Test Setup Diagram – AC Line Conducted Emission Test



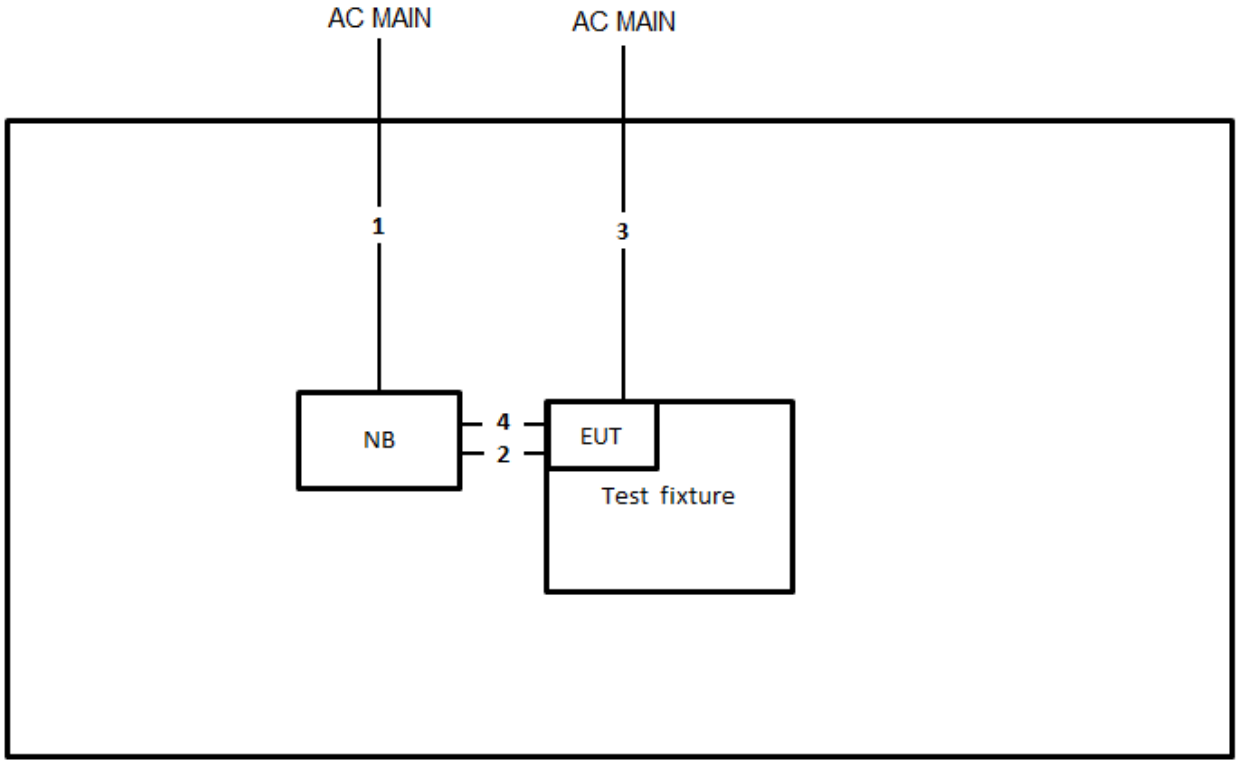
Item	Connection	Shielded	Length
1	Power cable	No	3m
2	RJ-45 cable	No	1m
3	USB cable	Yes	1m
4	RJ-45 cable	No	1.5m
5	RJ-45 cable	No	1.5m
6	RJ-45 cable	No	1.5m
7	Audio cable	No	1.4m
8	USB cable	Yes	1.8m

Test Setup Diagram - Radiated Test < 1GHz



Item	Connection	Shielded	Length
1	Power cable	No	3m
2	USB cable	Yes	1m
3	RJ-45 cable	No	1.5m
4	Power cable	No	1.3m
5	USB cable	Yes	1m
6	Audio cable	No	1.1m
7	USB cable	Yes	1.8m

Test Setup Diagram - Radiated Test > 1GHz



Item	Connection	Shielded	Length
1	Power cable	No	3m
2	USB cable	Yes	1m
3	Power cable	No	1.3m
4	USB cable	Yes	1m

3 Transmitter Test Result

3.1 AC Power-line Conducted Emissions

3.1.1 AC Power-line Conducted Emissions Limit

AC Power-line Conducted Emissions Limit		
Frequency Emission (MHz)	**Quasi-Peak**	**Average**
0.15-0.5	66 - 56 *	56 - 46 *
0.5-5	56	46
5-30	60	50
Note 1: * Decreases with the logarithm of the frequency.		

3.1.2 Measuring Instruments

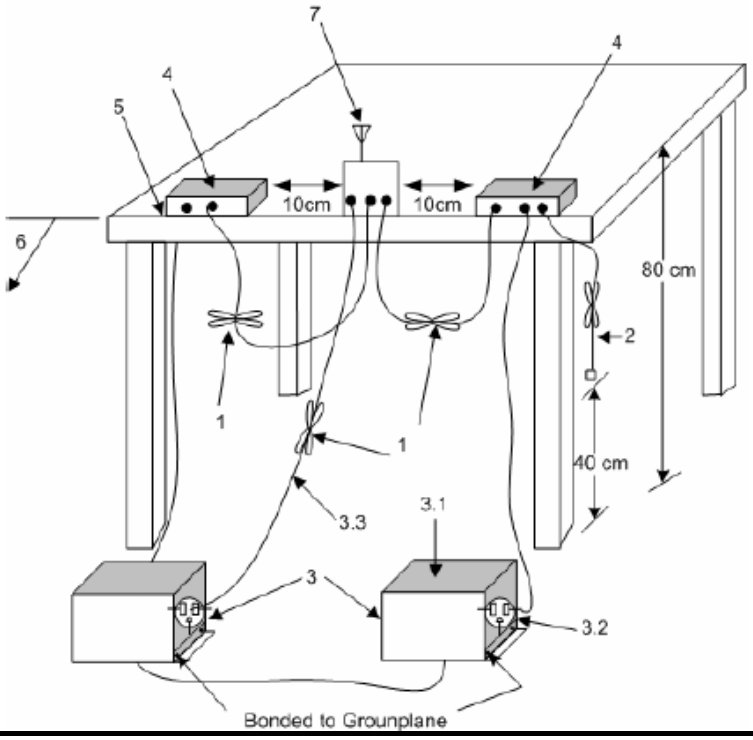
Refer a test equipment and calibration data table in this test report.

3.1.3 Test Procedures

Test Method
▪ Refer as ANSI C63.10-2013, clause 6.2 for AC power-line conducted emissions.

3.1.4 Test Setup

AC Power-line Conducted Emissions



3.1.5 Test Result of AC Power-line Conducted Emissions

Refer as Appendix A

3.2 DTS Bandwidth

3.2.1 6dB Bandwidth Limit

6dB Bandwidth Limit
Systems using digital modulation techniques:
▪ 6 dB bandwidth ≥ 500 kHz.

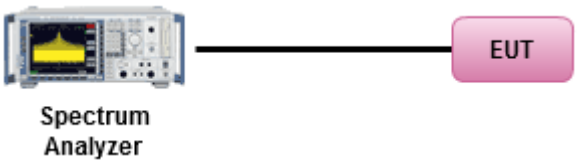
3.2.2 Measuring Instruments

Refer a test equipment and calibration data table in this test report.

3.2.3 Test Procedures

Test Method	
▪ For the emission bandwidth shall be measured using one of the options below:	
	☒ Refer as FCC KDB 558074, clause 8.1 Option 1 for6 dB bandwidth measurement.
	☐ Refer as FCC KDB 558074, clause 8.2 Option 2 for6 dB bandwidth measurement.
	☐ Refer as ANSI C63.10, clause 6.9.1 for occupied bandwidth testing.

3.2.4 Test Setup

Emission Bandwidth


3.2.5 Test Result of Emission Bandwidth

Refer as Appendix B

3.3 Maximum Conducted Output Power

3.3.1 Maximum Conducted Output Power Limit

Maximum Conducted Output Power Limit		
	▪ If $G_{TX} \leq 6$ dBi, then $P_{Out} \leq 30$ dBm (1 W)	
	▪ Point-to-multipoint systems (P2M): If $G_{TX} > 6$ dBi, then $P_{Out} = 30 – (G_{TX} – 6)$ dBm	
	▪ Point-to-point systems (P2P): If $G_{TX} > 6$ dBi, then $P_{Out} = 30 – (G_{TX} – 6)/3$ dBm	
	▪ Smart antenna system (SAS):	
		- Single beam: If $G_{TX} > 6$ dBi, then $P_{Out} = 30 – (G_{TX} – 6)/3$ dBm
		- Overlap beam: If $G_{TX} > 6$ dBi, then $P_{Out} = 30 – (G_{TX} – 6)/3$ dBm
		- Aggregate power on all beams: If $G_{TX} > 6$ dBi, then $P_{Out} = 30 – (G_{TX} – 6)/3 + 8$dB dBm
P_{Out} = maximum peak conducted output power or maximum conducted output power in dBm, **G_{TX}** = the maximum transmitting antenna directional gain in dBi.		

3.3.2 Measuring Instruments

Refer a test equipment and calibration data table in this test report.

3.3.3 Test Procedures

Test Method	
▪ Maximum Peak Conducted Output Power	
	☐ Refer as FCC KDB 558074, clause 9.1.1 Option 1 (RBW ≥ EBW method).
	☐ Refer as FCC KDB 558074, clause 9.1.2 Option 2 (peak power meter for VBW ≥ DTS BW)
▪ Maximum Conducted Output Power	
	[duty cycle ≥ 98% or external video / power trigger]
	☐ Refer as FCC KDB 558074, clause 9.2.2.2 Method AVGSA-1 (spectral trace averaging).
	☐ Refer as FCC KDB 558074, clause 9.2.2.3 Method AVGSA-1 Alt. (slow sweep speed)
	duty cycle < 98% and average over on/off periods with duty factor
	☐ Refer as FCC KDB 558074, clause 9.2.2.4 Method AVGSA-2 (spectral trace averaging).
	☐ Refer as FCC KDB 558074, clause 9.2.2.5 Method AVGSA-2 Alt. (slow sweep speed)
	RF power meter and average over on/off periods with duty factor or gated trigger
	☒ Refer as FCC KDB 558074, clause 9.2.3 Method AVGPM-G (using an RF average power meter).
▪ For conducted measurement.	
	▪ If the EUT supports multiple transmit chains using options given below: Refer as FCC KDB 662911, In-band power measurements. Using the measure-and-sum approach, measured all transmit ports individually. Sum the power (in linear power units e.g., mW) of all ports for each individual sample and save them.
	▪ If multiple transmit chains, EIRP calculation could be following as methods: $P_{total} = P_1 + P_2 + \ldots + P_n$ (calculated in linear unit [mW] and transfer to log unit [dBm]) $EIRP_{total} = P_{total} + DG$

3.3.4 Test Setup

Maximum Conducted Output Power (Power Meter)


3.3.5 Test Result of Maximum Conducted Output Power

Refer as Appendix C

3.4 Power Spectral Density

3.4.1 Power Spectral Density Limit

Power Spectral Density Limit
▪ Power Spectral Density (PSD)≤8 dBm/3kHz

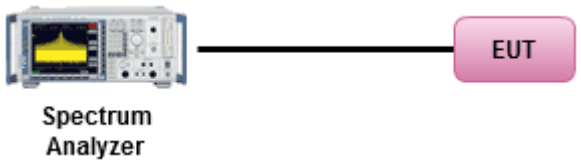
3.4.2 Measuring Instruments

Refer a test equipment and calibration data table in this test report.

3.4.3 Test Procedures

Test Method		
▪ Peak power spectral density procedures that the same method as used to determine the conducted output power. If maximum peak conducted output power was measured to demonstrate compliance to the output power limit, then the peak PSD procedure below (Method PKPSD) shall be used. If maximum conducted output power was measured to demonstrate compliance to the output power limit, then one of the average PSD procedures shall be used, as applicable based on the following criteria (the peak PSD procedure is also an acceptable option).		
	☒ Refer as FCC KDB 558074, clause 10.2 Method PKPSD (RBW=3-100kHz; Detector=peak).	
	[duty cycle ≥ 98% or external video / power trigger]	
	☐ Refer as FCC KDB 558074, clause 10.3 Method AVGPSD-1 (spectral trace averaging).	
	☐ Refer as FCC KDB 558074, clause 10.4 Method AVGPSD-2 (slow sweep speed)	
	duty cycle < 98% and average over on/off periods with duty factor	
	☐ Refer as FCC KDB 558074, clause 10.5 Method AVGPSD-1 Alt (spectral trace averaging).	
	☐ Refer as FCC KDB 558074, clause 10.6 Method AVGPSD-2 Alt. (slow sweep speed)	
▪ For conducted measurement.		
	▪ If The EUT supports multiple transmit chains using options given below:	
		☒ Option 1: Measure and sum the spectra across the outputs. Refer as FCC KDB 662911, In-band power spectral density (PSD). Sample all transmit ports simultaneously using a spectrum analyzer for each transmit port. Where the trace bin-by-bin of each transmit port summing can be performed. (i.e., in the first spectral bin of output 1 is summed with that in the first spectral bin of output 2 and that from the first spectral bin of output 3, and so on up to the NTX output to obtain the value for the first frequency bin of the summed spectrum.). Add up the amplitude (power) values for the different transmit chains and use this as the new data trace.
		☐ Option 2: Measure and sum spectral maxima across the outputs. With this technique, spectra are measured at each output of the device at the required resolution bandwidth. The maximum value (peak) of each spectrum is determined. These maximum values are then summed mathematically in linear power units across the outputs. These operations shall be performed separately over frequency spans that have different out-of-band or spurious emission limits,
		☐ Option 3: Measure and add 10 log(N) dB, where N is the number of transmit chains. Refer as FCC KDB 662911, In-band power spectral density (PSD). Performed at each transmit chains and each transmit chains shall be compared with the limit have been reduced with 10 log(N). Or each transmit chains shall be add 10 log(N) to compared with the limit.

3.4.4 Test Setup

Power Spectral Density


3.4.5 Test Result of Power Spectral Density

Refer as Appendix D

3.5 Emissions in Non-restricted Frequency Bands

3.5.1 Emissions in Non-restricted Frequency Bands Limit

Un-restricted Band Emissions Limit	
RF output power procedure	**Limit (dB)**
Peak output power procedure	20
Average output power procedure	30
Note 1: If the peak output power procedure is used to measure the fundamental emission power to demonstrate compliance to requirements, then the peak conducted output power measured within any 100 kHz outside the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum measured in-band peak PSD level. Note 2: If the average output power procedure is used to measure the fundamental emission power to demonstrate compliance to requirements, then the power in any 100 kHz outside of the authorized frequency band shall be attenuated by at least 30 dB relative to the maximum measured in-band average PSD level.	

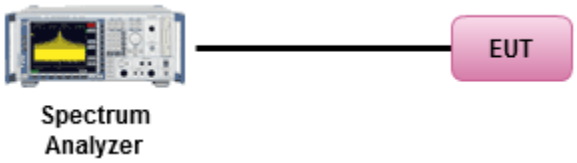
3.5.2 Measuring Instruments

Refer a test equipment and calibration data table in this test report.

3.5.3 Test Procedures

Test Method
▪ Refer as FCC KDB 558074, clause 11 for unwanted emissions into non-restricted bands.

3.5.4 Test Setup

Emissions in Non-restricted Frequency Bands


3.5.5 Test Result of Emissions in Non-restricted Frequency Bands

Refer as Appendix E

3.6 Emissions in Restricted Frequency Bands

3.6.1 Emissions in Restricted Frequency Bands Limit

Restricted Band Emissions Limit			
Frequency Range (MHz)	**Field Strength (uV/m)**	**Field Strength (dBuV/m)**	**Measure Distance (m)**
0.009~0.490	2400/F(kHz)	48.5 - 13.8	300
0.490~1.705	24000/F(kHz)	33.8 - 23	30
1.705~30.0	30	29	30
30~88	100	40	3
88~216	150	43.5	3
216~960	200	46	3
Above 960	500	54	3

Note 1: Test distance for frequencies at or above 30 MHz, measurements may be performed at a distance other than the limit distance provided they are not performed in the near field and the emissions to be measured can be detected by the measurement equipment. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade (inverse of linear distance for field-strength measurements, inverse of linear distance-squared for power-density measurements).

Note 2: Test distance for frequencies at below 30 MHz, measurements may be performed at a distance closer than the EUT limit distance; however, an attempt should be made to avoid making measurements in the near field. When performing measurements below30 MHz at a closer distance than the limit distance, the results shall be extrapolated to the specified distance by either making measurements at a minimum of two or more distances on at least one radial to determine the proper extrapolation factor or by using the square of an inverse linear distance extrapolation factor (40 dB / decade). The test report shall specify the extrapolation method used to determine compliance of the EUT.

Note 3: Using the distance of 1m during the test for above 18 GHz, and the test value to correct for the distance factor at 3m.

3.6.2 Measuring Instruments

Refer a test equipment and calibration data table in this test report.

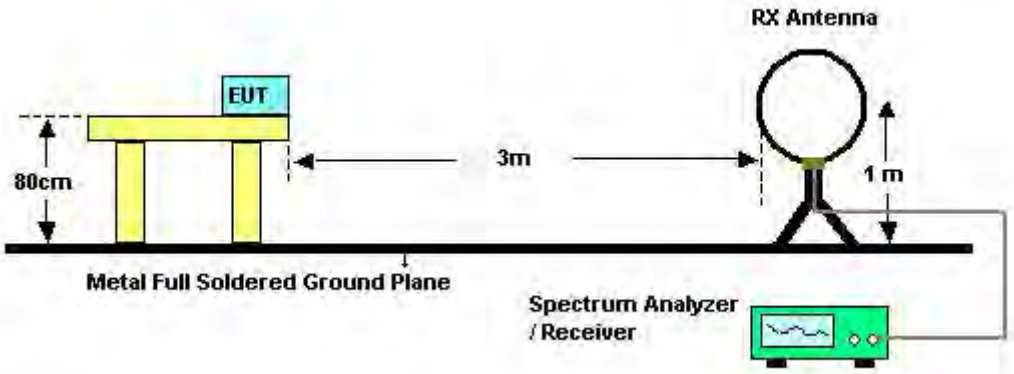
3.6.3 Test Procedures

Test Method		
▪ The average emission levels shall be measured in [duty cycle ≥ 98 or duty factor].		
▪ Refer as ANSI C63.10, clause 6.9.2.2 band-edge testing shall be performed at the lowest frequency channel and highest frequency channel within the allowed operating band.		
▪ For the transmitter unwanted emissions shall be measured using following options below:		
	▪ Refer as FCC KDB 558074, clause 12 for unwanted emissions into restricted bands.	
		☐ Refer as FCC KDB 558074, clause 12.2.5.1 Option 1 (trace averaging for duty cycle ≥98%)
		☐ Refer as FCC KDB 558074, clause 12.2.5.2 Option 2 (trace averaging + duty factor).
		☒ Refer as FCC KDB 558074, clause 12.2.5.3 Option 3 (Reduced VBW≥1/T).
		☐ Refer as ANSI C63.10, clause 4.2.3.2.3 (Reduced VBW). VBW ≥ 1/T, where T is pulse time.
		☐ Refer as ANSI C63.10, clause 4.2.3.2.4 average value of pulsed emissions.
		☒ Refer as FCC KDB 558074, clause 12.2.4 measurement procedure peak limit.
▪ For the transmitter band-edge emissions shall be measured using following options below:		
	▪ Refer as FCC KDB 558074 clause 13.1, When the performing peak or average radiated measurements, emissions within 2 MHz of the authorized band edge may be measured using the marker-delta method described below.	
	▪ Refer as FCC KDB 558074, clause 13.2 (ANSI C63.10, clause 6.9.3) for marker-delta method for band-edge measurements.	
	▪ Refer as FCC KDB 558074, clause 13.3 for narrower resolution bandwidth (100kHz) using the band power and summing the spectral levels (i.e., 1 MHz).	
▪ For conducted and cabinet radiation measurement, refer as FCC KDB 558074, clause 12.2.2.		
	▪ For conducted unwanted emissions into restricted bands (absolute emission limits). Devices with multiple transmit chains using options given below: (1) Measure and sum the spectra across the outputs or (2) Measure and add 10 log(N) dB	
	▪ For FCC KDB 662911 The methodology described here may overestimate array gain, thereby resulting in apparent failures to satisfy the out-of-band limits even if the device is actually compliant. In such cases, compliance may be demonstrated by performing radiated tests around the frequencies at which the apparent failures occurred.	

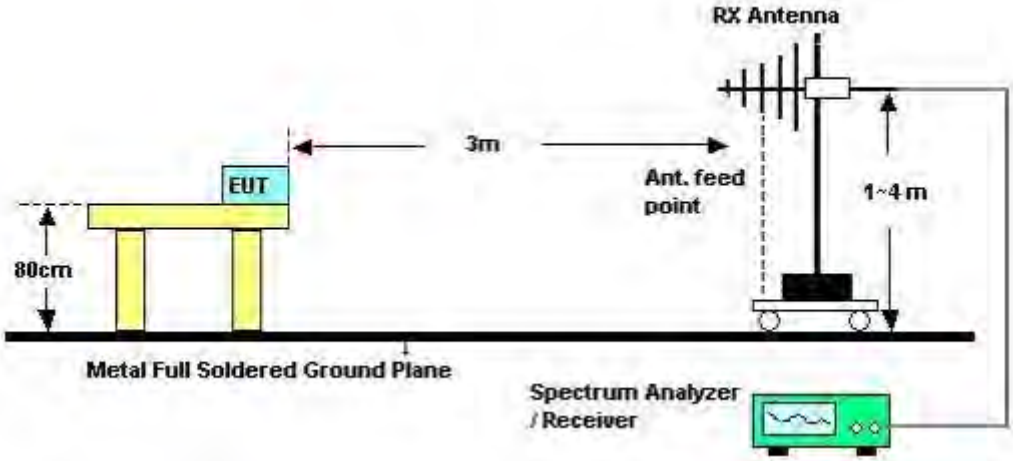
3.6.4 Test Setup

Transmitter Radiated Emissions

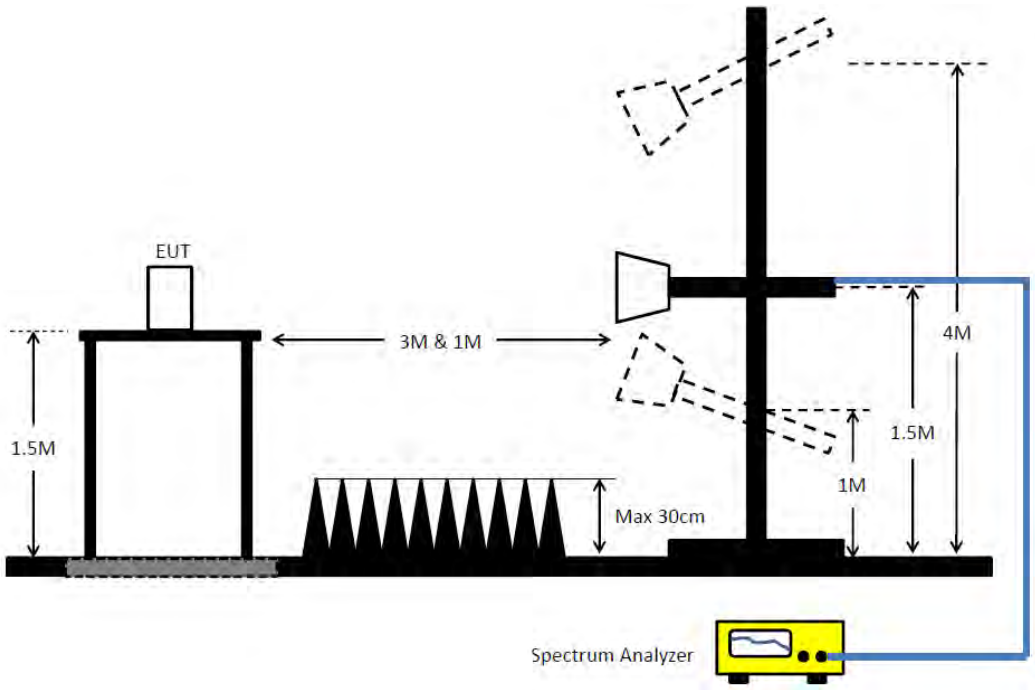
9kHz ~30MHz



30MHz~1GHz



Above 1GHz



3.6.5 Transmitter Radiated Unwanted Emissions (Below 30MHz)

All amplitude of spurious emissions that are attenuated by more than 20 dB below the permissible value has no need to be reported.

3.6.6 Transmitter Radiated Unwanted Emissions

Refer as Appendix F

4 Test Equipment and Calibration Data

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Calibration Due Date	Remark
EMI Receiver	Agilent	N9038A	My52260123	9kHz ~ 8.45GHz	Jan. 23, 2017	Jan. 22, 2018	Conduction (CO01-CB)
LISN	F.C.C.	FCC-LISN-50-16-2	04083	150kHz~100MHz	Dec. 14, 2016	Dec. 13, 2017	Conduction (CO01-CB)
LISN	Schwarzbeck	NSLK 8127	8127647	9kHz ~ 30MHz	Dec. 21, 2016	Dec. 20, 2017	Conduction (CO01-CB)
COND Cable	Woken	Cable	01	150kHz ~ 30MHz	May 23, 2017	May 22, 2018	Conduction (CO01-CB)
Software	Audix	E3	6.120210n	-	N.C.R.	N.C.R.	Conduction (CO01-CB)
BILOG ANTENNA with 6dB Attenuator	TESEQ & EMCI	CBL6112D & N-6-06	37880 & AT-N0609	20MHz ~ 2GHz	Aug. 30, 2017	Aug. 29, 2018	Radiation (03CH01-CB)
Loop Antenna	Teseq	HLA 6120	24155	9kHz - 30 MHz	Mar. 16, 2016*	Mar. 15, 2018*	Radiation (03CH01-CB)
Horn Antenna	EMCO	3115	00075790	750MHz~ 8GHz	Nov. 10, 2016	Nov. 09, 2017	Radiation (03CH01-CB)
Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170252	15GHz ~ 40GHz	Jul. 05, 2017	Jul. 04, 2018	Radiation (03CH01-CB)
Pre-Amplifier	EMCI	EMC330N	980332	20MHz ~ 3GHz	May 02, 2017	May 01, 2018	Radiation (03CH01-CB)
Pre-Amplifier	Agilent	8449B	3008A02310	1GHz ~ 26.5GHz	Jan. 16, 2017	Jan. 15, 2018	Radiation (03CH01-CB)
Pre-Amplifier	MITEQ	TTA1840-35-HG	1864479	18GHz ~ 40GHz	Jul. 10, 2017	Jul. 09, 2018	Radiation (03CH01-CB)
Spectrum Analyzer	R&S	FSP40	100056	9kHz ~ 40GHz	Nov. 22, 2016	Nov. 21, 2017	Radiation (03CH01-CB)
EMI Test	R&S	ESCS	100355	9kHz ~ 2.75GHz	May 06, 2017	May 05, 2018	Radiation (03CH01-CB)
RF Cable-low	Woken	Low Cable-16+17	N/A	30 MHz ~ 1 GHz	Oct. 24, 2016	Oct. 23, 2017	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-16	N/A	1 GHz ~ 18 GHz	Oct. 24, 2016	Oct. 23, 2017	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-16+17	N/A	1 GHz ~ 18 GHz	Oct. 24, 2016	Oct. 23, 2017	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-40G#1	N/A	18GHz ~ 40 GHz	Oct. 24, 2016	Oct. 23, 2017	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-40G#2	N/A	18GHz ~ 40 GHz	Oct. 24, 2016	Oct. 23, 2017	Radiation (03CH01-CB)
Test Software	Audix	E3	6.2009-l0-7	N/A	N/A	N/A	Radiation (03CH01-CB)
Spectrum analyzer	R&S	FSV40	100979	9kHz~40GHz	Dec. 26, 2016	Dec. 25, 2017	Conducted (TH01-CB)

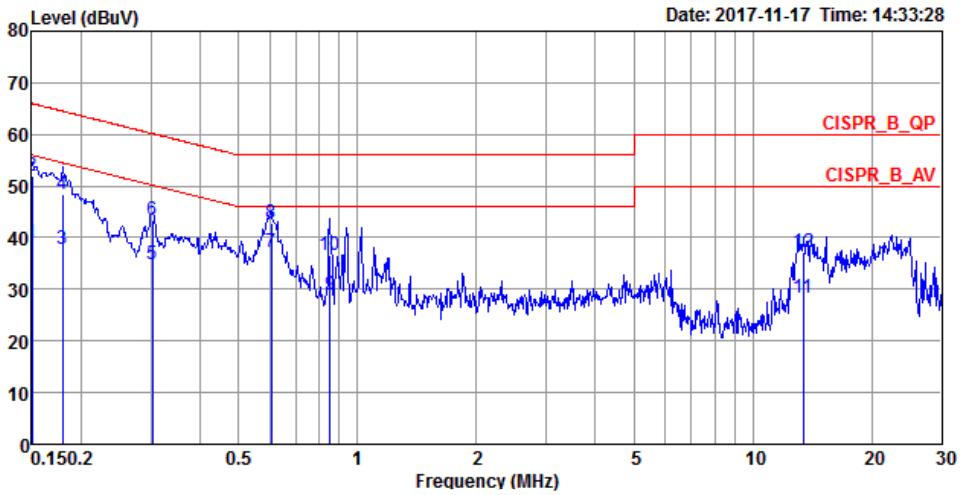
Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Calibration Due Date	Remark
RF Cable-high	Woken	RG402	High Cable-6	1 GHz –26.5 GHz	Oct. 24, 2016	Oct. 23, 2017	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-06	1 GHz –26.5 GHz	Oct. 11, 2017	Oct. 10, 2018	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-7	1 GHz –26.5 GHz	Oct. 24, 2016	Oct. 23, 2017	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-07	1 GHz –26.5 GHz	Oct. 11, 2017	Oct. 10, 2018	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-8	1 GHz –26.5 GHz	Oct. 24, 2016	Oct. 23, 2017	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-08	1 GHz –26.5 GHz	Oct. 11, 2017	Oct. 10, 2018	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-9	1 GHz –26.5 GHz	Oct. 24, 2016	Oct. 23, 2017	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-09	1 GHz –26.5 GHz	Oct. 11, 2017	Oct. 10, 2018	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-10	1 GHz –26.5 GHz	Oct. 24, 2016	Oct. 23, 2017	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-10	1 GHz –26.5 GHz	Oct. 11, 2017	Oct. 10, 2018	Conducted (TH01-CB)
Power Sensor	Agilent	U2021XA	MY53410001	50MHz~18GHz	Nov. 22, 2016	Nov. 21, 2017	Conducted (TH01-CB)

Note: Calibration Interval of instruments listed above is one year.

"*" Calibration Interval of instruments listed above is two years.

N.C.R. means Non-Calibration required.

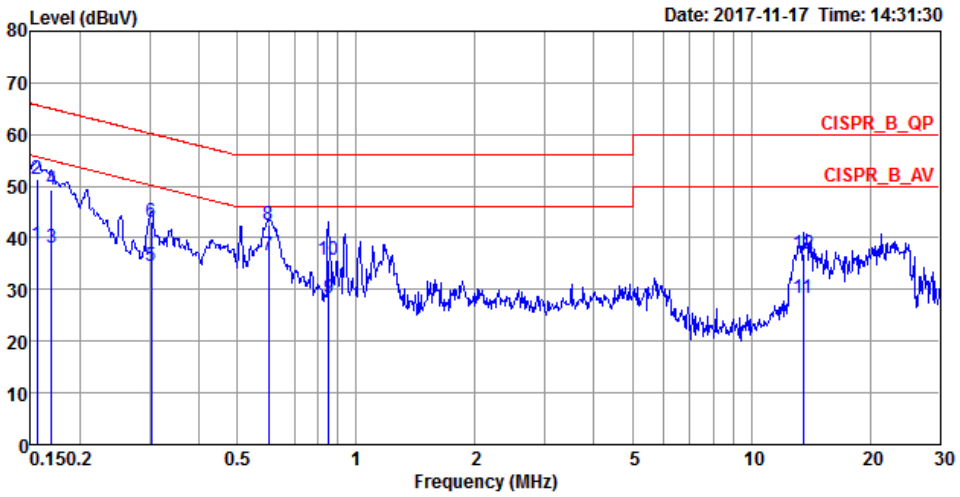
AC Power-line Conducted Emissions Result			
Operating Mode	2	**Power Phase**	Neutral
Operating Function	Normal Link - Station Mode		



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark	Pol/Phase
	MHz	dBuV	dB	dBuV	dBuV	dB	dB		
1	0.1500	39.11	-16.89	56.00	28.85	10.10	0.16	Average	NEUTRAL
2	0.1500	51.90	-14.10	66.00	41.64	10.10	0.16	QP	NEUTRAL
3	0.1796	37.87	-16.63	54.50	27.72	10.01	0.14	Average	NEUTRAL
4	0.1796	48.48	-16.02	64.50	38.33	10.01	0.14	QP	NEUTRAL
5	0.3035	34.72	-15.43	50.15	24.51	10.15	0.06	Average	NEUTRAL
6	0.3035	43.33	-16.82	60.15	33.12	10.15	0.06	QP	NEUTRAL
7	0.6043	37.13	-8.87	46.00	26.85	10.19	0.09	Average	NEUTRAL
8	0.6043	42.92	-13.08	56.00	32.64	10.19	0.09	QP	NEUTRAL
9	0.8528	28.96	-17.04	46.00	18.70	10.10	0.16	Average	NEUTRAL
10	0.8528	36.72	-19.28	56.00	26.46	10.10	0.16	QP	NEUTRAL
11	13.4080	28.33	-21.67	50.00	17.90	10.25	0.18	Average	NEUTRAL
12	13.4080	37.12	-22.88	60.00	26.69	10.25	0.18	QP	NEUTRAL

Note 1: ">20dB" means emission levels that exceed the level of 20 dB below the applicable limit.
Note 2: "N/F" means Nothing Found emissions (No emissions were detected.)

AC Power-line Conducted Emissions Result			
Operating Mode	2	**Power Phase**	Line
Operating Function	Normal Link - Station Mode		



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark	Pol/Phase
	MHz	dBuV	dB	dBuV	dBuV	dB	dB		
1	0.1557	38.77	-16.92	55.69	28.61	10.00	0.16	Average	LINE
2	0.1557	51.46	-14.23	65.69	41.30	10.00	0.16	QP	LINE
3	0.1694	38.17	-16.82	54.99	28.02	10.00	0.15	Average	LINE
4	0.1694	49.31	-15.68	64.99	39.16	10.00	0.15	QP	LINE
5	0.3035	34.51	-15.64	50.15	24.52	9.93	0.06	Average	LINE
6	0.3035	43.15	-17.00	60.15	33.16	9.93	0.06	QP	LINE
7	0.6011	36.75	-9.25	46.00	26.71	9.95	0.09	Average	LINE
8	0.6011	42.63	-13.37	56.00	32.59	9.95	0.09	QP	LINE
9	0.8528	28.44	-17.56	46.00	18.32	9.96	0.16	Average	LINE
10	0.8528	35.82	-20.18	56.00	25.70	9.96	0.16	QP	LINE
11	13.5509	28.40	-21.60	50.00	18.02	10.20	0.18	Average	LINE
12	13.5509	36.99	-23.01	60.00	26.61	10.20	0.18	QP	LINE

Note 1: “>20dB” means emission levels that exceed the level of 20 dB below the applicable limit.
Note 2: “N/F” means Nothing Found emissions (No emissions were detected.)

Summary

Mode	Max-N dB (Hz)	Max-OBW (Hz)	ITU-Code	Min-N dB (Hz)	Min-OBW (Hz)
2.4-2.4835GHz	-	-	-	-	-
BT-LE(1Mbps)	697.5k	1.033M	1M03F1D	695k	1.027M

Max-N dB = Maximum 6dB down bandwidth; **Max-OBW** = Maximum 99% occupied bandwidth;
Min-N dB = Minimum 6dB down bandwidth; **Min-OBW** = Minimum 99% occupied bandwidth;

Result

Mode	Result	Limit (Hz)	Port 1-N dB (Hz)	Port 1-OBW (Hz)
BT-LE(1Mbps)	-	-	-	-
2402MHz	Pass	500k	695k	1.032M
2440MHz	Pass	500k	695k	1.033M
2480MHz	Pass	500k	697.5k	1.027M

Port X-N dB = Port **X** 6dB down bandwidth; **Port X-OBW** = Port **X** 99% occupied bandwidth;

Summary

Mode	Power	Power
	(dBm)	(W)
2.4-2.4835GHz	-	-
BT-LE(1Mbps)	9.32	0.00855

Result

Mode	Result	Gain (dBi)	Power (dBm)	Power Limit (dBm)
BT-LE(1Mbps)	-	-	-	-
2402MHz	Pass	2.02	8.20	30.00
2440MHz	Pass	2.02	8.95	30.00
2480MHz	Pass	2.02	9.32	30.00

Summary

Mode	PD (dBm/RBW)
2.4-2.4835GHz	-
BT-LE(1Mbps)	-5.52

RBW=3kHz.

Result

Mode	Result	Gain (dBi)	PD (dBm/RBW)	PD Limit (dBm/RBW)
BT-LE(1Mbps)	-	-	-	-
2402MHz	Pass	2.02	-6.71	8.00
2440MHz	Pass	2.02	-5.86	8.00
2480MHz	Pass	2.02	-5.52	8.00

RBW=3kHz.

Summary

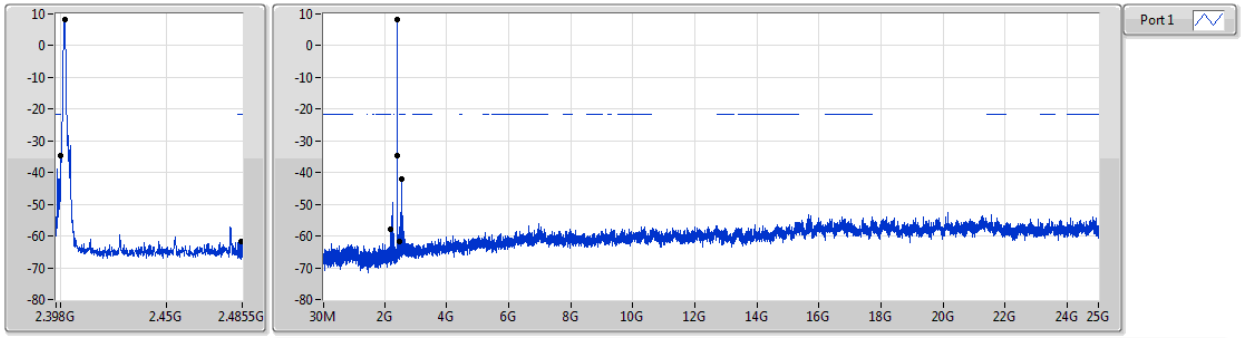
Mode	Result	Ref (Hz)	Ref (dBm)	Limit (dBm)	Freq (Hz)	Level (dBm)	Freq (Hz)	Level (dBm)	Freq (Hz)	Level (dBm)	Freq (Hz)	Level (dBm)	Port
2.4-2.4835GHz	-	-	-	-	-	-	-	-	-	-	-	-	-
BT-LE(1Mbps)	Pass	2.402004G	8.23	-21.77	2.194352G	-58.00	2.399992G	-34.71	2.485172G	-61.84	2.555858G	-42.01	1

Result

Mode	Result	Ref (Hz)	Ref (dBm)	Limit (dBm)	Freq (Hz)	Level (dBm)	Freq (Hz)	Level (dBm)	Freq (Hz)	Level (dBm)	Freq (Hz)	Level (dBm)	Port
BT-LE(1Mbps)	-	-	-	-	-	-	-	-	-	-	-	-	-
2402MHz	Pass	2.402004G	8.23	-21.77	2.194352G	-58.00	2.399992G	-34.71	2.485172G	-61.84	2.555858G	-42.01	1
2440MHz	Pass	2.439746G	7.96	-22.04	1.967024G	-62.03	2.399948G	-61.62	2.485028G	-61.88	2.595258G	-48.40	1
2480MHz	Pass	2.479993G	8.59	-21.41	855.248M	-62.06	2.399208G	-61.63	2.483504G	-46.99	2.634659G	-45.14	1

BT-LE(1Mbps) **CSE NdB**

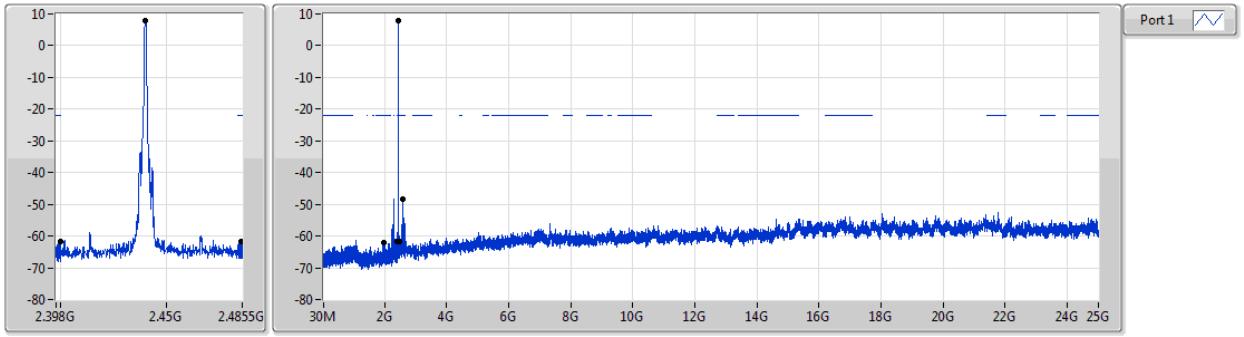
2402MHz



Ref(Hz)	Ref(dBm)	Limit(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Port
2.402004G	8.23	-21.77	2.194352G	-58.00	2.399992G	-34.71	2.485172G	-61.84	2.555858G	-42.01	1

BT-LE(1Mbps) **CSE NdB**

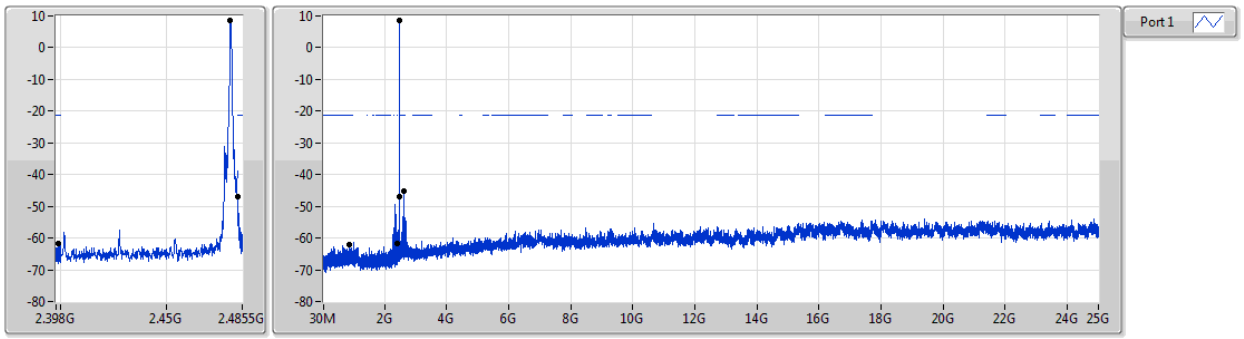
2440MHz



Ref(Hz)	Ref(dBm)	Limit(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Port
2.439746G	7.96	-22.04	1.967024G	-62.03	2.399948G	-61.62	2.485028G	-61.88	2.595258G	-48.40	1

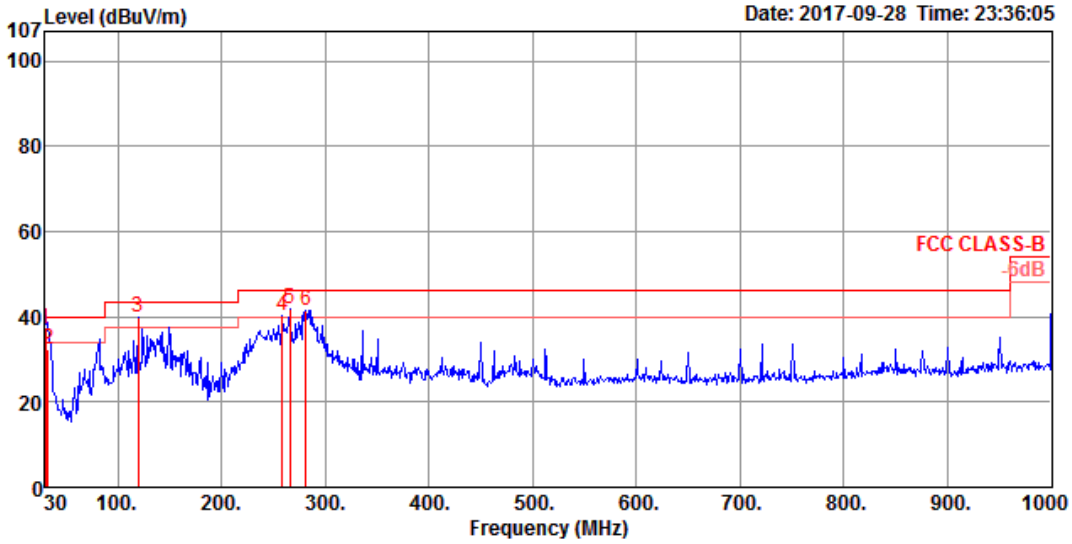
BT-LE(1Mbps) **CSE NdB**

2480MHz



Ref(Hz)	Ref(dBm)	Limit(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Port
2.479993G	8.59	-21.41	855.248M	-62.06	2.399208G	-61.63	2.483504G	-46.99	2.634659G	-45.14	1

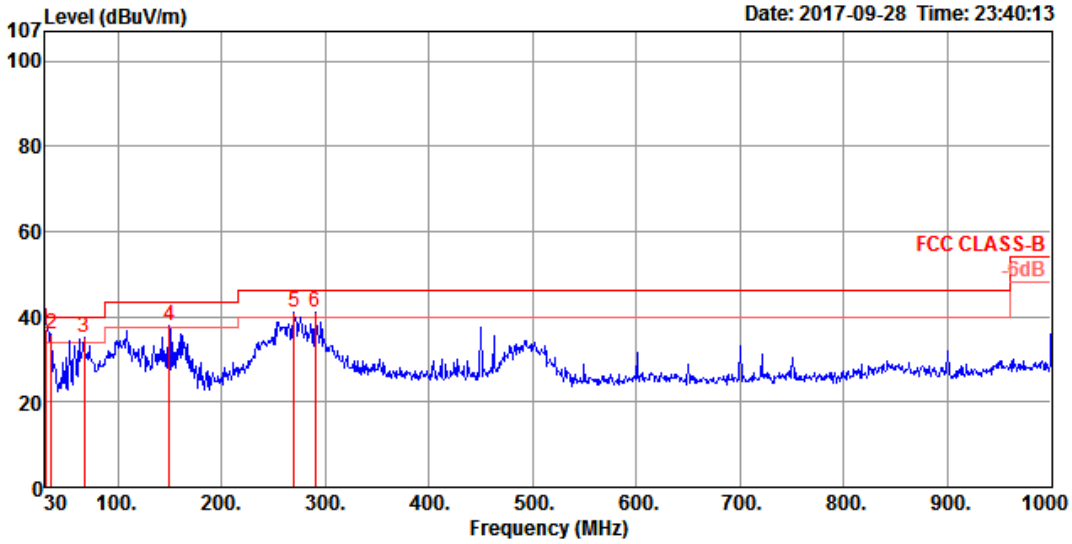
RSE below 1GHz Result			
Operating Mode	1	**Polarization**	Horizontal
Operating Function	Normal Link - AP mode: EUT in Y axis		



	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	30.00	36.92	40.00	-3.08	43.40	0.53	24.45	31.46	150	357	QP	HORIZONTAL
2	32.91	32.33	40.00	-7.67	40.70	0.53	22.62	31.52	200	197	QP	HORIZONTAL
3	119.24	40.06	43.50	-3.44	52.75	0.87	18.29	31.85	300	248	Peak	HORIZONTAL
4	258.92	40.38	46.00	-5.62	51.77	1.27	19.30	31.96	125	237	Peak	HORIZONTAL
5	265.71	41.69	46.00	-4.31	53.19	1.29	19.20	31.99	150	305	Peak	HORIZONTAL
6	281.23	41.64	46.00	-4.36	53.55	1.33	18.76	32.00	125	181	Peak	HORIZONTAL

Note 1: “>20dB” means emission levels that exceed the level of 20 dB below the applicable limit.
Note 2: “N/F” means Nothing Found emissions (No emissions were detected.)

RSE below 1GHz Result			
Operating Mode	1	**Polarization**	Vertical
Operating Function	Normal Link - AP mode: EUT in Y axis		



	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	30.00	36.99	40.00	-3.01	43.34	0.66	24.45	31.46	150	104	QP	VERTICAL
2	35.82	36.11	40.00	-3.89	46.18	0.67	20.84	31.58	300	159	Peak	VERTICAL
3	67.83	35.16	40.00	-4.84	53.63	1.03	12.32	31.82	100	207	Peak	VERTICAL
4	149.31	37.88	43.50	-5.62	51.87	1.50	16.40	31.89	100	207	Peak	VERTICAL
5	269.59	41.10	46.00	-4.90	52.00	2.03	19.08	32.01	200	266	Peak	VERTICAL
6	289.96	40.89	46.00	-5.11	51.92	2.08	18.90	32.01	200	266	Peak	VERTICAL

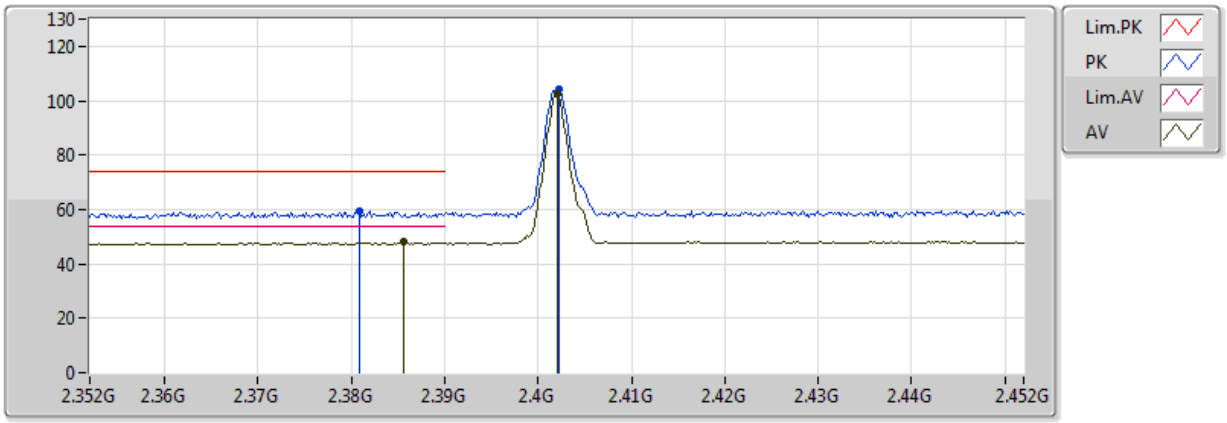
Note 1: “>20dB” means emission levels that exceed the level of 20 dB below the applicable limit.
Note 2: “N/F” means Nothing Found emissions (No emissions were detected.)

Summary

Mode	Result	Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Pol. (H/V)	Azimuth (°)	Height (m)	Comments
BT-LE(1Mbps)	-	-	-	-	-	-	-	-	-	-	-	-
2.4-2.4835GHz	Pass	AV	2.483502G	52.43	54.00	-1.57	30.86	3	H	0	1.05	-

BT-LE(1Mbps)

2402MHz_TX

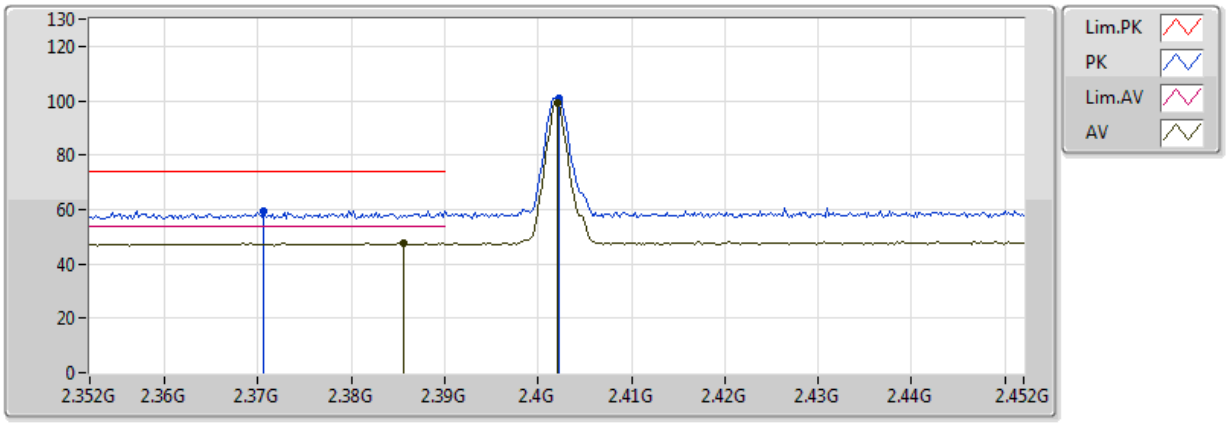


20170929
EUT Z_1TX
Setting Default
02-J-6
FSU

Type	Freq(Hz)	Level(dBuV/m)	Limit(dBuV/m)	Margin(dB)	Factor(dB)	Dist(m)	Pol.(H/V)	Azimuth(°)	Height(m)	Comments
AV	2.3856G	47.91	54.00	-6.09	32.12	3	V	5	1.49	-
AV	2.402G	102.31	Inf	-Inf	32.17	3	V	5	1.49	-
PK	2.3808G	59.59	74.00	-14.41	32.10	3	V	5	1.49	-
PK	2.4022G	104.34	Inf	-Inf	32.17	3	V	5	1.49	-

BT-LE(1Mbps)

2402MHz_TX

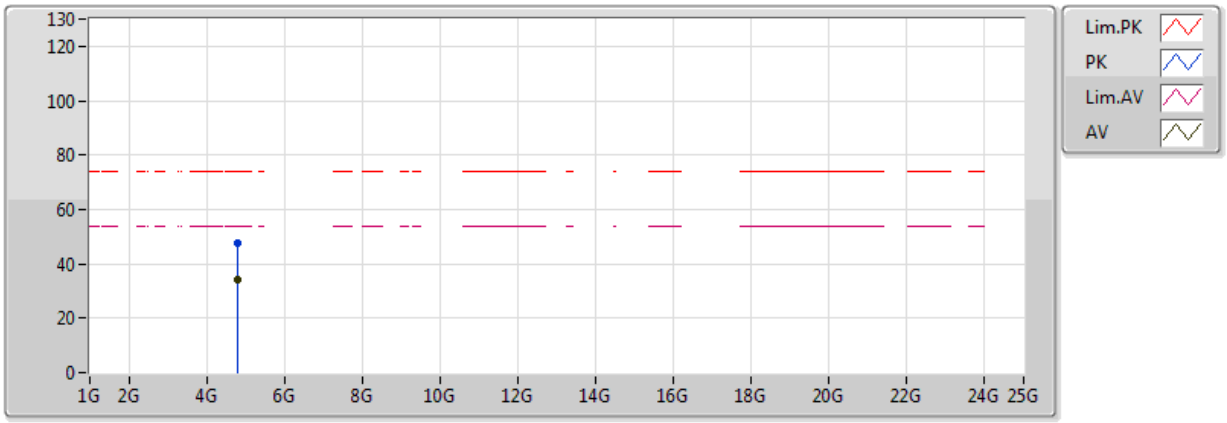


20170929
EUT Z_1TX
Setting Default
02-J-6
FSU

Type	Freq(Hz)	Level(dBuV/m)	Limit(dBuV/m)	Margin(dB)	Factor(dB)	Dist(m)	Pol.(H/V)	Azimuth(°)	Height(m)	Comments
AV	2.3856G	47.80	54.00	-6.20	31.93	3	H	276	1.01	-
AV	2.402G	99.37	Inf	-Inf	31.98	3	H	276	1.01	-
PK	2.3706G	59.55	74.00	-14.45	31.88	3	H	276	1.01	-
PK	2.4022G	101.00	Inf	-Inf	31.98	3	H	276	1.01	-

BT-LE(1Mbps)

2402MHz_TX

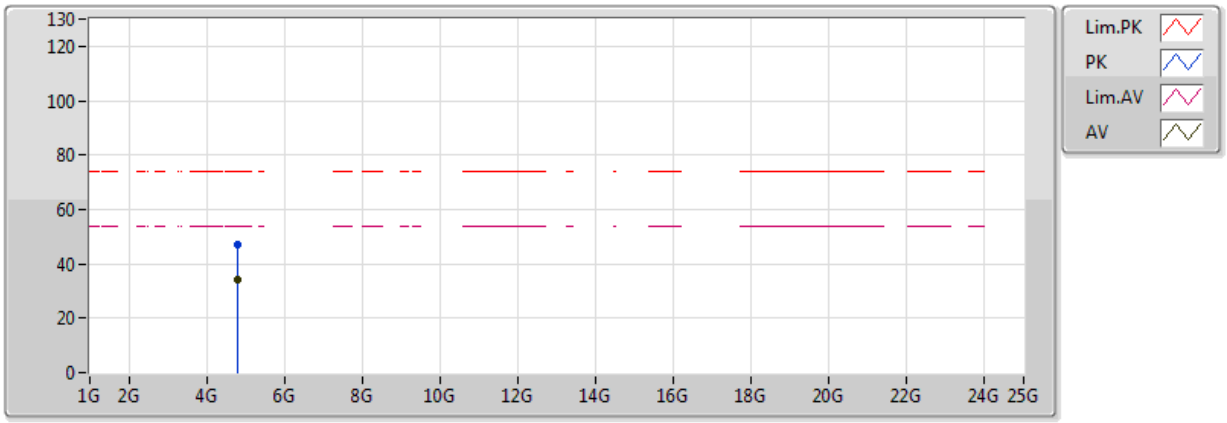


20170929
EUT Z_1TX
Setting Default
02-J-6
FSU

Type	Freq(Hz)	Level(dBuV/m)	Limit(dBuV/m)	Margin(dB)	Factor(dB)	Dist(m)	Pol.(H/V)	Azimuth(°)	Height(m)	Comments
AV	4.80392G	34.29	54.00	-19.71	8.02	3	V	179	1.04	-
PK	4.8069G	47.38	74.00	-26.62	8.03	3	V	179	1.04	-

BT-LE(1Mbps)

2402MHz_TX

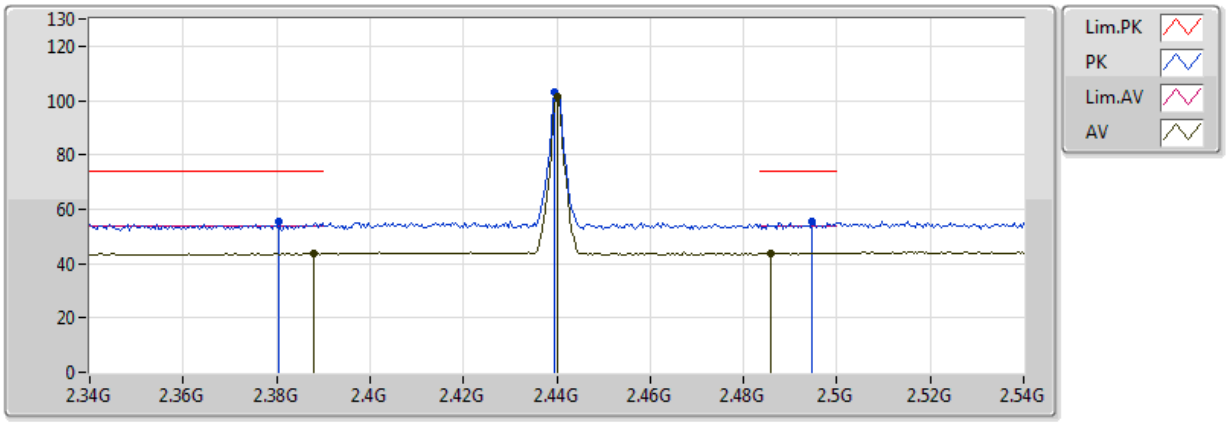


20170929
EUT Z_1TX
Setting Default
02-J-6
FSU

Type	Freq(Hz)	Level(dBuV/m)	Limit(dBuV/m)	Margin(dB)	Factor(dB)	Dist(m)	Pol.(H/V)	Azimuth(°)	Height(m)	Comments
AV	4.80896G	34.12	54.00	-19.88	8.04	3	H	66	1.05	-
PK	4.8057G	47.13	74.00	-26.87	8.03	3	H	66	1.05	-

BT-LE(1Mbps)

2440MHz_TX

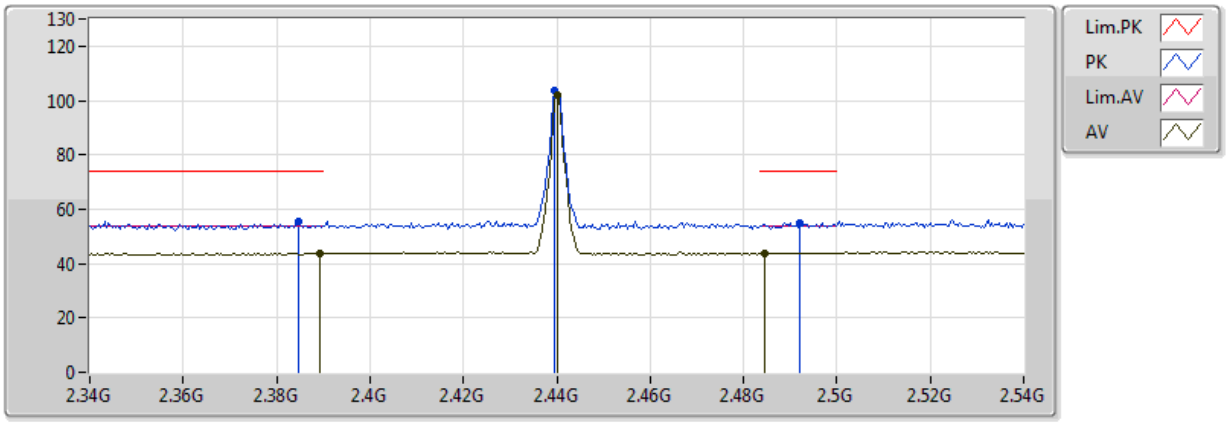


20171002
EUT Z_1TX
Setting Default
01-M-01
FSU

Type	Freq(Hz)	Level(dBuV/m)	Limit(dBuV/m)	Margin(dB)	Factor(dB)	Dist(m)	Pol.(H/V)	Azimuth(°)	Height(m)	Comments
AV	2.388G	43.89	54.00	-10.11	30.96	3	V	68	1.50	-
AV	2.44G	101.48	Inf	-Inf	30.90	3	V	68	1.50	-
AV	2.486G	43.97	54.00	-10.03	30.86	3	V	68	1.50	-
PK	2.3804G	55.74	74.00	-18.26	30.97	3	V	68	1.50	-
PK	2.4396G	102.95	Inf	-Inf	30.90	3	V	68	1.50	-
PK	2.4948G	55.48	74.00	-18.52	30.85	3	V	68	1.50	-

BT-LE(1Mbps)

2440MHz_TX

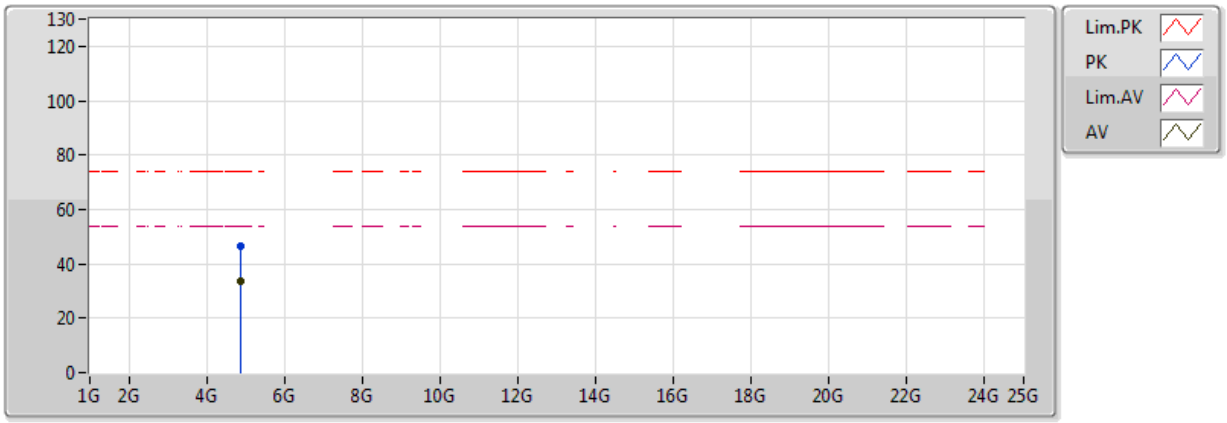


20171002
EUT Z_1TX
Setting Default
01-M-01
FSU

Type	Freq(Hz)	Level(dBuV/m)	Limit(dBuV/m)	Margin(dB)	Factor(dB)	Dist(m)	Pol.(H/V)	Azimuth(°)	Height(m)	Comments
AV	2.3892G	43.82	54.00	-10.18	30.95	3	H	5	1.38	-
AV	2.44G	101.94	Inf	-Inf	30.90	3	H	5	1.38	-
AV	2.4844G	43.93	54.00	-10.07	30.86	3	H	5	1.38	-
PK	2.3848G	55.21	74.00	-18.79	30.96	3	H	5	1.38	-
PK	2.4396G	103.44	Inf	-Inf	30.90	3	H	5	1.38	-
PK	2.492G	55.10	74.00	-18.90	30.86	3	H	5	1.38	-

BT-LE(1Mbps)

2440MHz_TX

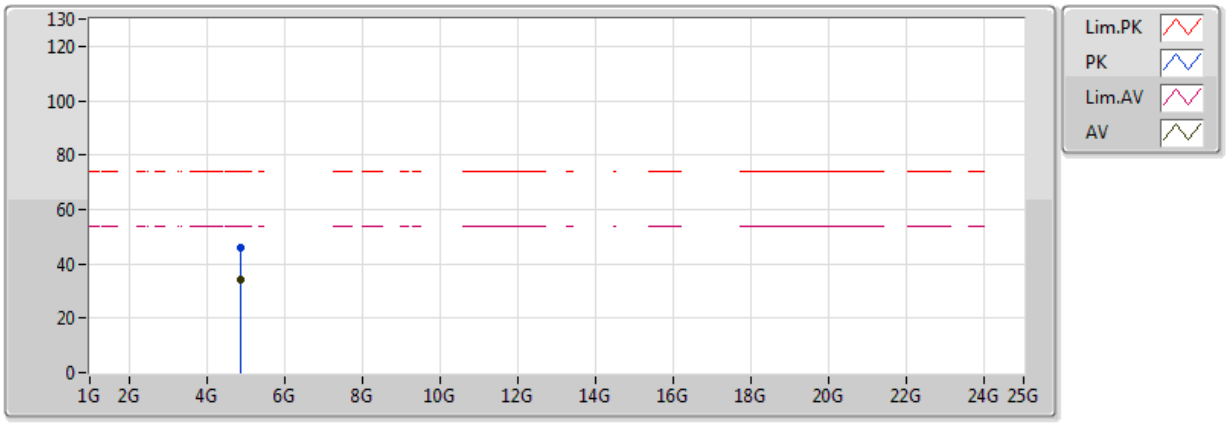


20170929
EUT Z_1TX
Setting Default
02-J-6
FSU

Type	Freq(Hz)	Level(dBuV/m)	Limit(dBuV/m)	Margin(dB)	Factor(dB)	Dist(m)	Pol.(H/V)	Azimuth(°)	Height(m)	Comments
AV	4.88182G	33.80	54.00	-20.20	8.26	3	V	223	1.94	-
PK	4.88314G	46.33	74.00	-27.67	8.27	3	V	223	1.94	-

BT-LE(1Mbps)

2440MHz_TX

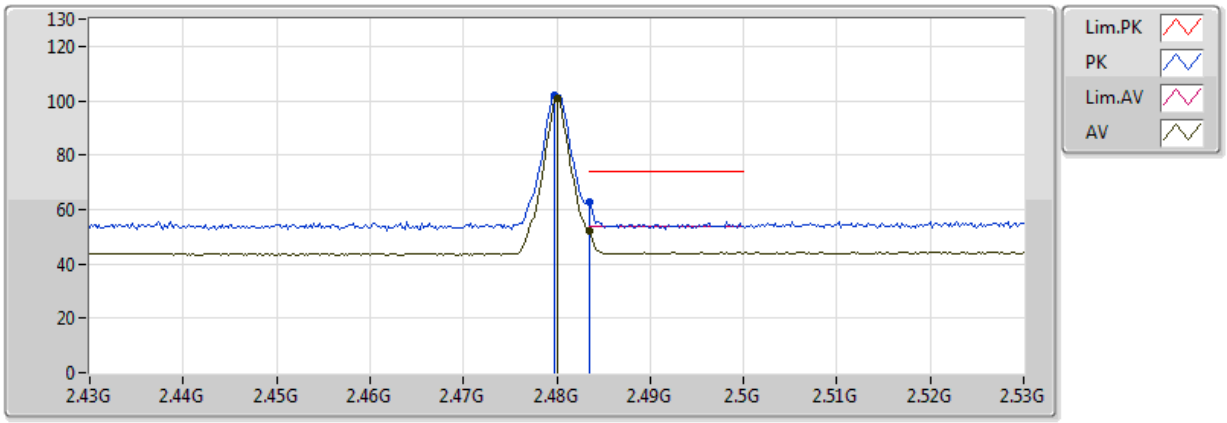


20170929
EUT Z_1TX
Setting Default
02-J-6
FSU

Type	Freq(Hz)	Level(dBuV/m)	Limit(dBuV/m)	Margin(dB)	Factor(dB)	Dist(m)	Pol.(H/V)	Azimuth(°)	Height(m)	Comments
AV	4.88304G	33.97	54.00	-20.03	8.27	3	H	93	1.16	-
PK	4.87506G	46.17	74.00	-27.83	8.24	3	H	93	1.16	-

BT-LE(1Mbps)

2480MHz_TX

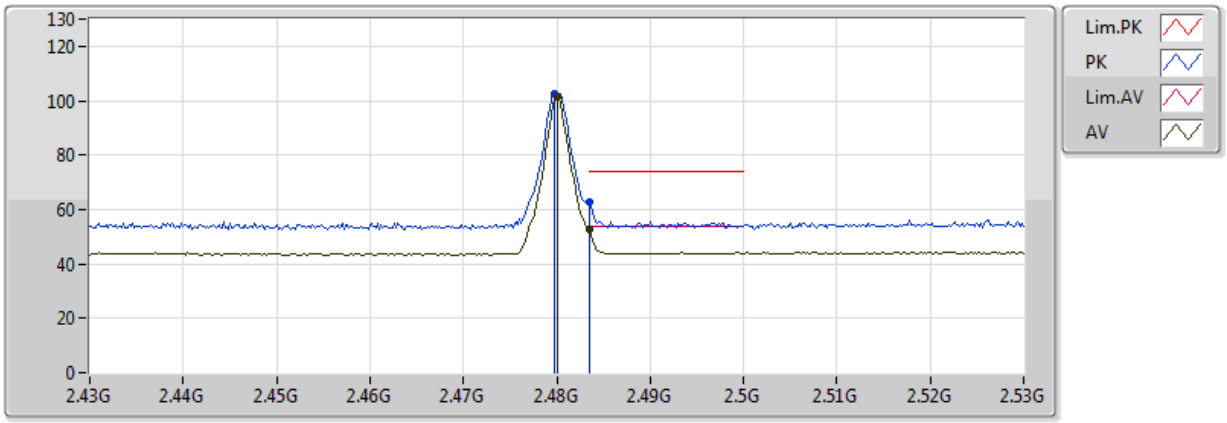


20171002
EUT Z_1TX
Setting Default
01-M-01
FSU

Type	Freq(Hz)	Level(dBuV/m)	Limit(dBuV/m)	Margin(dB)	Factor(dB)	Dist(m)	Pol.(H/V)	Azimuth(°)	Height(m)	Comments
AV	2.48G	100.73	Inf	-Inf	30.87	3	V	69	1.02	-
AV	2.483502G	52.31	54.00	-1.69	30.86	3	V	69	1.02	-
PK	2.4798G	102.24	Inf	-Inf	30.87	3	V	69	1.02	-
PK	2.483502G	62.64	74.00	-11.36	30.86	3	V	69	1.02	-

BT-LE(1Mbps)

2480MHz_TX

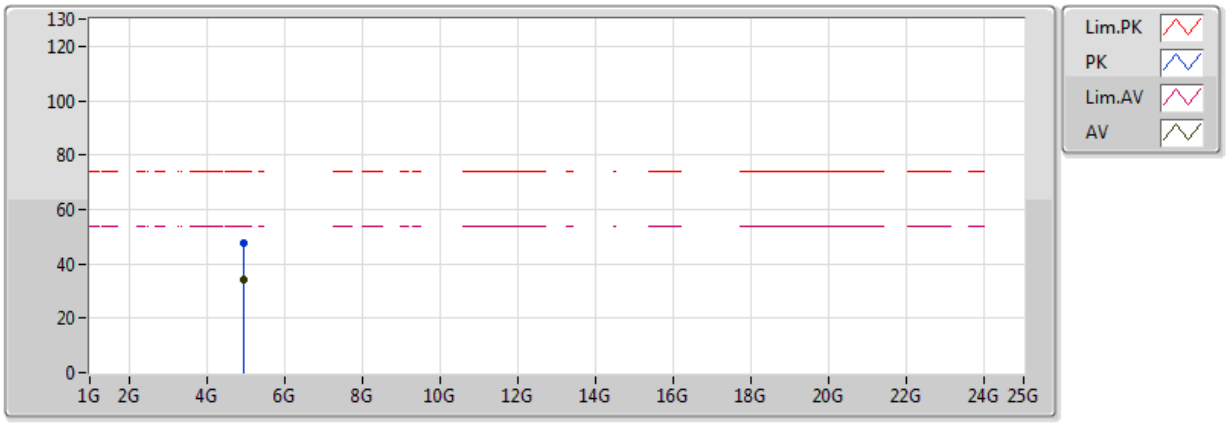


20171002
EUT Z_1TX
Setting Default
01-M-01
FSU

Type	Freq(Hz)	Level(dBuV/m)	Limit(dBuV/m)	Margin(dB)	Factor(dB)	Dist(m)	Pol.(H/V)	Azimuth(°)	Height(m)	Comments
AV	2.48G	101.25	Inf	-Inf	30.87	3	H	0	1.05	-
AV	2.483502G	52.43	54.00	-1.57	30.86	3	H	0	1.05	-
PK	2.4798G	102.73	Inf	-Inf	30.87	3	H	0	1.05	-
PK	2.483502G	62.93	74.00	-11.07	30.86	3	H	0	1.05	-

BT-LE(1Mbps)

2480MHz_TX

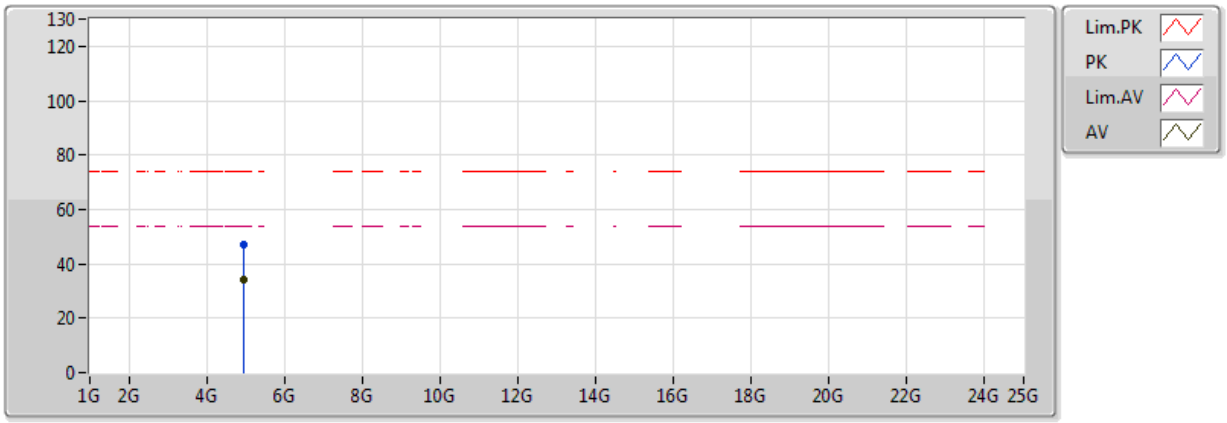


20170929
EUT Z_1TX
Setting Default
02-J-6
FSU

Type	Freq(Hz)	Level(dBuV/m)	Limit(dBuV/m)	Margin(dB)	Factor(dB)	Dist(m)	Pol.(H/V)	Azimuth(°)	Height(m)	Comments
AV	4.95508G	34.26	54.00	-19.74	8.49	3	V	188	1.74	-
PK	4.96334G	47.55	74.00	-26.45	8.52	3	V	188	1.74	-

BT-LE(1Mbps)

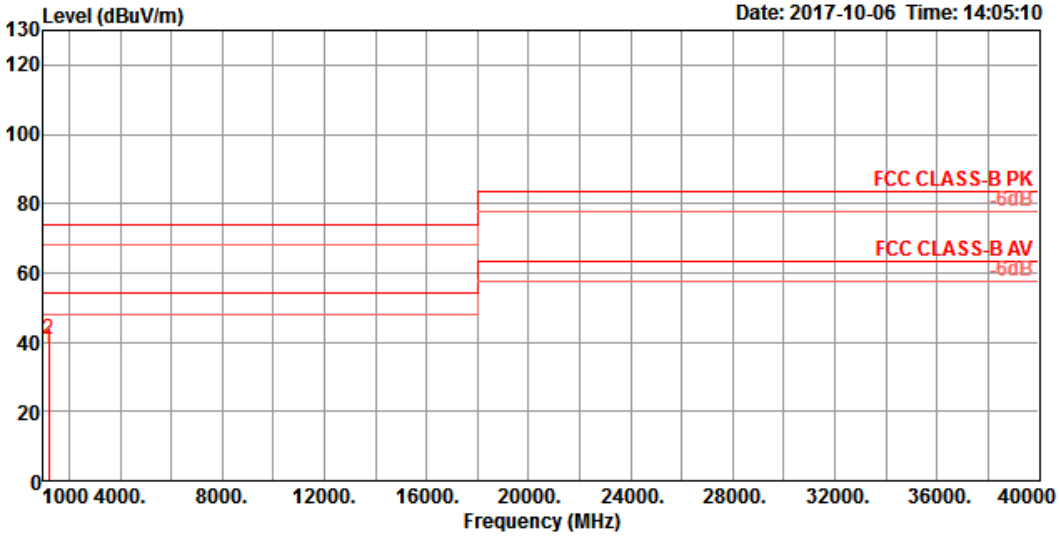
2480MHz_TX



20170929
EUT Z_1TX
Setting Default
02-J-6
FSU

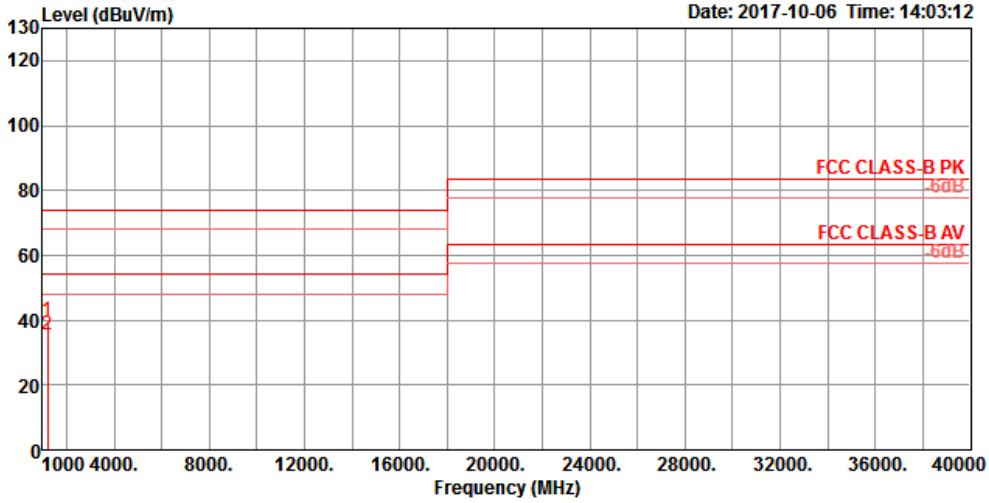
Type	Freq(Hz)	Level(dBuV/m)	Limit(dBuV/m)	Margin(dB)	Factor(dB)	Dist(m)	Pol.(H/V)	Azimuth(°)	Height(m)	Comments
AV	4.96492G	34.20	54.00	-19.80	8.52	3	H	120	1.43	-
PK	4.965G	46.96	74.00	-27.04	8.52	3	H	120	1.43	-

RSE Co-location Result			
Operating Mode	3	**Polarization**	Horizontal
Operating Function	Normal Link - EUT in Z axis - R1 (2.4G / Station mode) + R3 (5G B1~B2 / AP mode) + R2 (5G B3~B4 / AP mode) + R4 (BT / AP mode)		



	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	1200.01	37.67	54.00	-16.33	46.83	3.69	24.55	37.40	195	197	Average	HORIZONTAL
2	1200.09	40.85	74.00	-33.15	50.01	3.69	24.55	37.40	195	197	Peak	HORIZONTAL

RSE Co-location Result			
Operating Mode	3	**Polarization**	Vertical
Operating Function	Normal Link - EUT in Z axis - R1 (2.4G / Station mode) + R3 (5G B1~B2 / AP mode) + R2 (5G B3~B4 / AP mode) + R4 (BT / AP mode)		



	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	1197.94	39.95	74.00	-34.05	49.12	3.69	24.54	37.40	166	294	Peak	VERTICAL
2	1200.01	35.26	54.00	-18.74	44.42	3.69	24.55	37.40	166	294	Average	VERTICAL