FCC Test Report

Equipment	:	**EFR32 802.15.4 Module**
Brand Name	:	**MMB Networks**
Model No.	:	**BSB03PA1XXXXX**
FCC ID	:	**XFF-BSB03PA1X**
Standard	:	**47 CFR FCC Part 15.247**
Operating Band	:	**2400 MHz – 2483.5 MHz**
Function	:	**☒ Point-to-multipoint; ☐ Point-to-point**
Applicant	:	**MMB RESEARCH INC.** **243 College St, Suite 500, Toronto, M5T1R5 Canada**
Manufacturer	:	**CyberTAN Technology, Inc.** **No. 99, Park Avenue III, Science-based Industrial Park, Hsinchu, 308 Taiwan**

The product sample received on Sep. 04, 2017 and completely tested on Sep. 25, 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 INTERNATIONAL INC., the test report shall not be reproduced except in full.

Testing Laboratory
1190

Cliff Chang
SPORTON INTERNATIONAL INC.

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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
FR783135	Rev. 01	Initial issue of report	Jan. 29, 2018

1 General Description

1.1 Information

1.1.1 RF General Information

Frequency Range (MHz)	IEEE Std.	Ch. Frequency (MHz)	Channel Number
2400-2483.5	802.15.4	2405-2480	11-26 [16]

Band	Mode	BWch (MHz)	Nant
2.4-2.4835GHz	Zigbee	5	1TX

Note:
- Zigbee uses a O-QPSK (250kbps) 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	Brand	Model Name (P/N)	Antenna Type	Connector	Gain (dBi)	EVB Trace loss (dB)	True Gain (dBi)
1	1	INPAQ	ACA-2012-A1-CC-S	Chip	N/A	1.72	0.5	1.22
Ant.	**Port**	**Brand Holder**	**Model Name (P/N)**	**Antenna Type**	**Connector**	**Gain (dBi)**	**EVB Trace loss (dB)**	**True Gain (dBi)**
2	1	MAG. LAYERS SCIENTIFIC-TECH NICS CO., LTD	EDA-1713-2G4C1-A2	Dipole	U.FL	5	0.5	4.5
3	1	Bondale Electronics Ltd.	G-RA0K13200284-SZ478		U.FL	5	0.5	4.5

Note: Only Port 1 can be used as transmitting/receiving antenna.

1.1.3 Mode Test Duty Cycle

<Mode 1: EUT 1 + Ant. 1>

Mode	DC	DCF(dB)	T(s)	VBW(Hz) ≥ 1/T
Zigbee	1	0	n/a (DC>=0.98)	n/a (DC>=0.98)

<Mode 2: EUT 2 + Ant. 3>

Mode	DC	DCF(dB)	T(s)	VBW(Hz) ≥ 1/T
Zigbee	1	0	n/a (DC>=0.98)	n/a (DC>=0.98)

1.1.4 EUT Operational Condition

EUT Power Type	From Host System

1.1.5 Table for Multiple Listing

All models are identical except for the antenna type. The different antenna type equips different output power. The detail antenna information as below:

Model Name	Antenna Type	Antenna	EUT	Description
BSB03PA1XXXXX	Chip	Ant. 1	EUT 1 with internal antenna	The first "X" in model name can be 0 or 1 or 2. The others "XXXX" in model name can be 0 to 9, A to Z, a to z, dash or blank.
	Dipole	Ant. 2	EUT 2 with external antenna	
		Ant. 3		

From the above models, EUT 1 (BSB03PA10-CHP) + Ant. 1 and EUT 2 (BSB03PA10-RFC) + Ant. 2, Ant. 3 were selected as representative models for AC Power Line Conducted Emissions and Radiated Emissions <below 1GHz> tests and EUT 1 (BSB03PA10-CHP) + Ant. 1 and EUT 2 (BSB03PA10-RFC) + Ant. 3 were selected as representative model for other tests. (Because Ant.2 & Ant.3 are the same type and same gain antennas, only the antenna “Ant.3” was tested.)

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
- FCC KDB 662911 D01 v02r01
- FCC KDB 412172 D01 v01r01

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	Ron Huang	22℃ / 55%	Sep. 21, 2017
Radiated	03CH01-CB	Joy Tseng / Mars Lin	22°C / 54%	Sep. 04, 2017
AC Conduction	CO01-CB	Ryo Fan	25℃ / 65%	Sep. 25, 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 x10^{-8}	Confidence levels of 95%

2 Test Configuration of EUT

2.1 Test Channel Mode

<Mode 1: EUT 1 + Ant. 1>

Mode	Power Setting
Zigbee	-
2405MHz	14
2440MHz	14
2480MHz	7

<Mode 2: EUT 2 + Ant. 3>

Mode	Power Setting
Zigbee	-
2405MHz	14
2440MHz	14
2480MHz	9

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	Normal Link + EUT 1 + Ant. 1
2	Normal Link + EUT 2 + Ant. 2
3	Normal Link + EUT 2 + Ant. 3
For operating mode 2 is the worst case and it was record in this test 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
Operating Mode	
1	EUT 1 + Ant. 1
2	EUT 2 + Ant. 3

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	Place EUT in Z axis + EUT 1 + Ant. 1
2	Place EUT in Y axis + EUT 1 + Ant. 1
3	Place EUT in X axis + EUT 1 + Ant. 1
Mode 1 has been evaluated to be the worst case among Mode 1~3, thus measurement for Mode 4~5 will follow this same test mode.	
4	Place EUT in Z axis + EUT 2 + Ant. 2
5	Place EUT in Z axis + EUT 2 + Ant. 3
For operating mode 1 is the worst case and it was record in this test report.	

Operating Mode > 1GHz	CTX
The EUT can be placed in X-axis, Y-axis and Z-axis. After evaluating, Z-axis was the worst case, so it's recorded in this report.	
1	Place EUT in Z axis + EUT 1 + Ant. 1
2	Place EUT in Z axis + EUT 2 + Ant. 3

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	AP	LINKSYS	BEFSR41	DoC
2	IOU	Cybertan	ZE250-A-IN	N89-ZE250
3	NB	DELL	E6430	DoC
4	Mouse	Logitech	M-U0026	DoC
5	Earphone	e-Power	S90W	DoC
6	Test Fixture	Cybertan	EFR32 Zigbee module EVB	DoC

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

Support Equipment				
No.	**Equipment**	**Brand Name**	**Model Name**	**FCC ID**
1	NB	DELL	E4300	DoC
2	Mouse	Logitech	M-U0026	DoC
3	Earphone	e-Power	S90W	N/A
4	IOT	INTEL	ZE250	N89-ZE250
5	AP	LINKSYS	BEFSR41	N/A
6	Test Fixture	Cybertan	EFR32 Zigbee module EVB	DoC

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

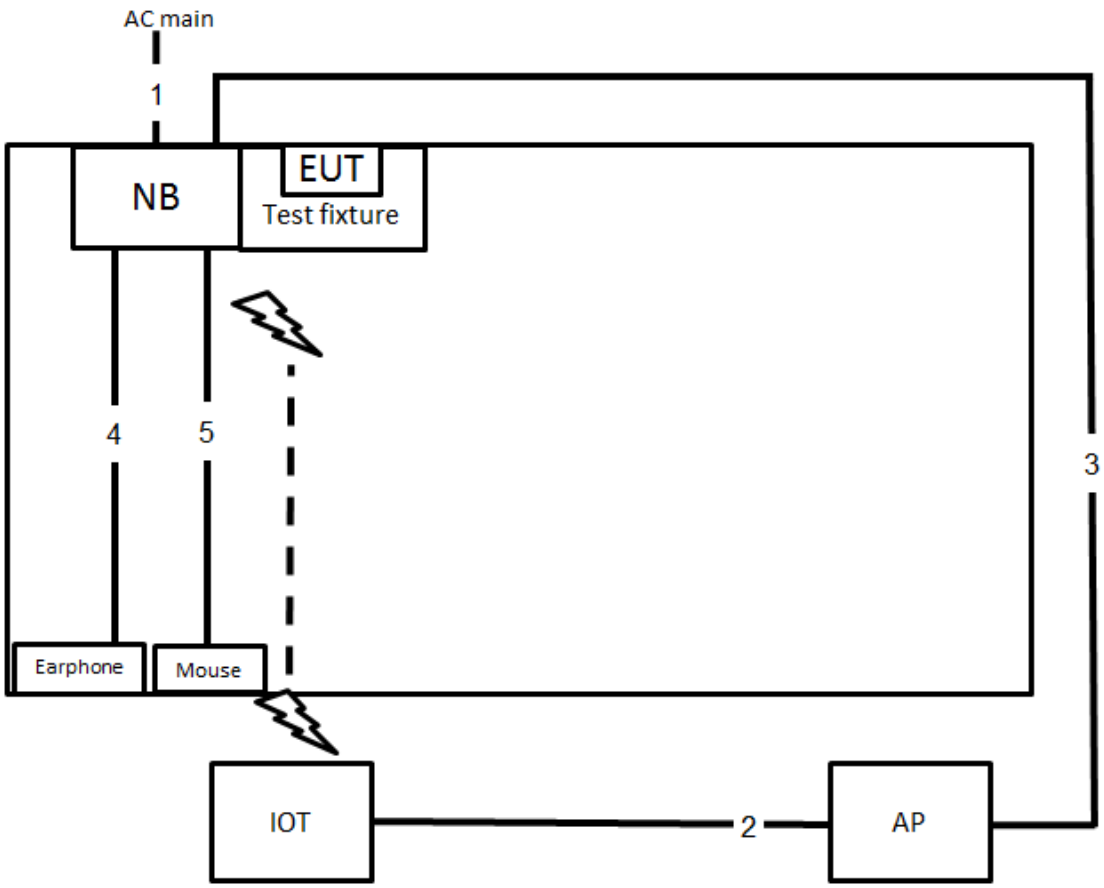
Support Equipment				
No.	**Equipment**	**Brand Name**	**Model Name**	**FCC ID**
1	NB	DELL	E4300	DoC
2	Test Fixture	Cybertan	EFR32 Zigbee module EVB	DoC

For Test Site No: TH01-CB

Support Equipment				
No.	**Equipment**	**Brand Name**	**Model Name**	**FCC ID**
1	NB	DELL	E4300	DoC
2	Test Fixture	Cybertan	EFR32 Zigbee module EVB	DoC

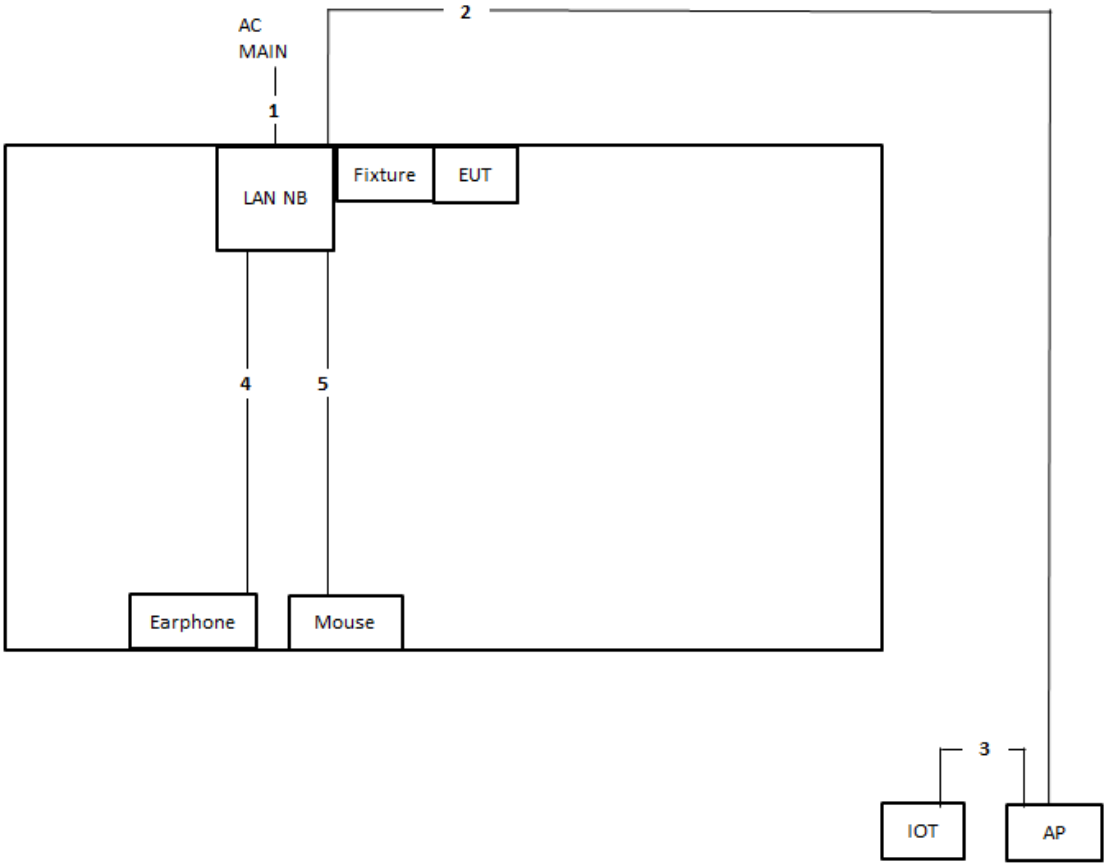
2.6 Test Setup Diagram

Test Setup Diagram – AC Line Conducted Emission Test



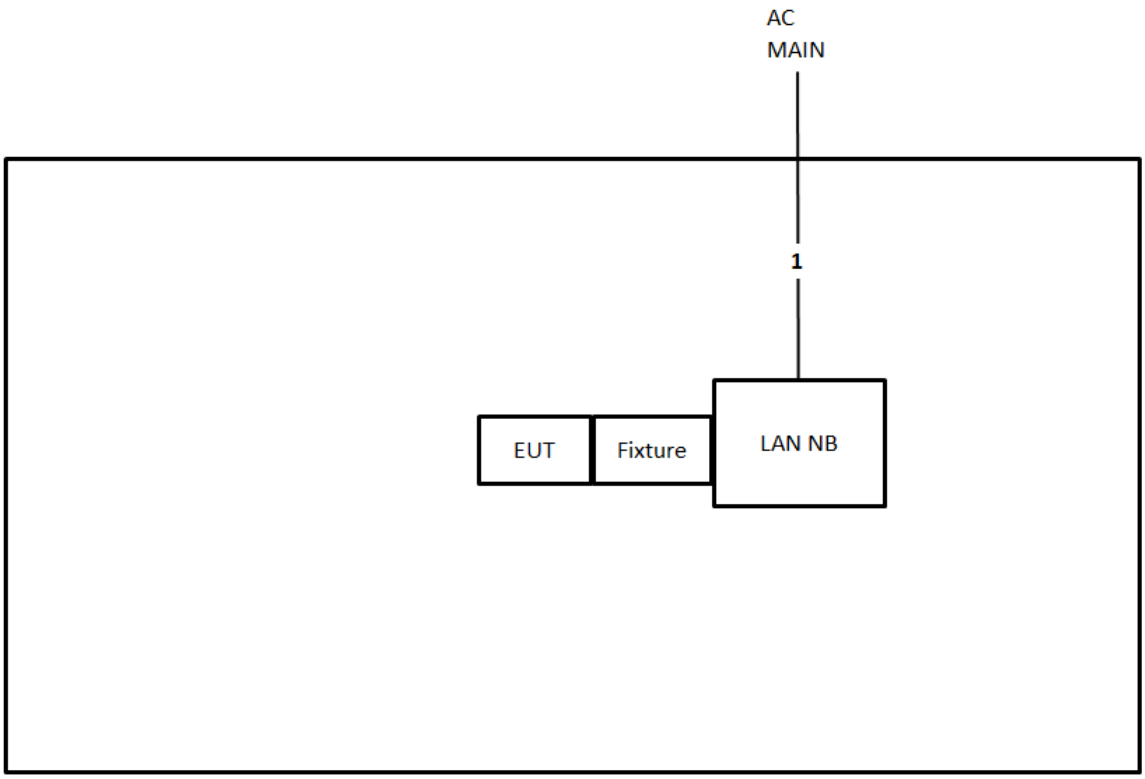
Item	Connection	Shielded	Length
1	Power cable	No	2.6m
2	RJ-45 cable	No	1m
3	RJ-45 cable	No	10m
4	Audio cable	No	1.4m
5	USB cable	Yes	1.8m

Test Setup Diagram - Radiated Test < 1GHz



Item	Connection	Shielded	Length
1	Power cable	No	2.6m
2	RJ-45 cable	No	10m
3	RJ-45 cable	No	1.5m
4	Audio Cable	No	1.4m
5	USB Cable	No	1.8m

Test Setup Diagram - Radiated Test > 1GHz



Item	Connection	Shielded	Length
1	Power cable	No	2.6m

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

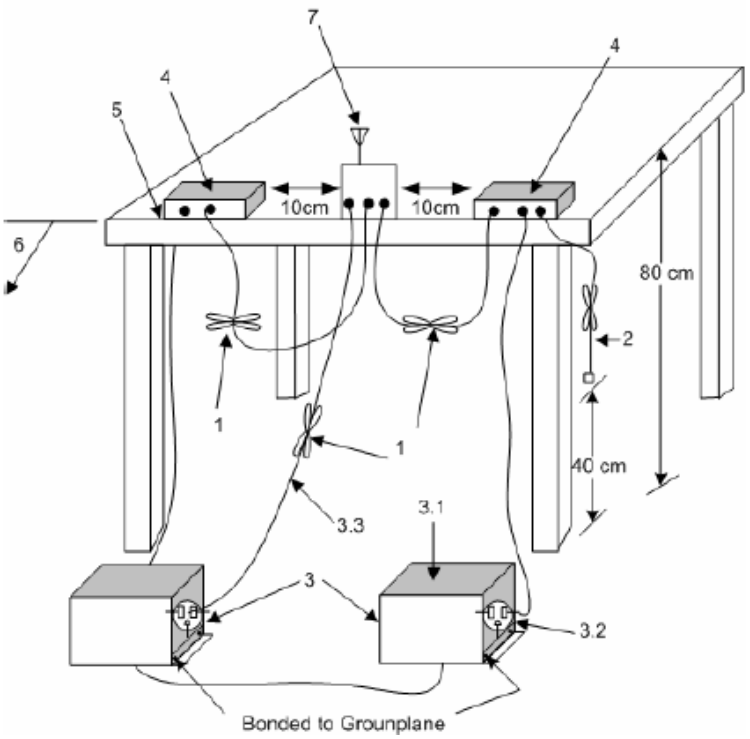
Refer a test equipment and calibration data table in this test report.

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



1—Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 cm to 40 cm long.
2—The I/O cables that are not connected to an accessory shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
3—EUT connected to one LISN. Unused LISN measuring port connectors shall be terminated in 50 Ω loads. LISN may be placed on top of, or immediately beneath, reference ground plane.
3.1—All other equipment powered from additional LISN(s).
3.2—A multiple-outlet strip may be used for multiple power cords of non-EUT equipment.
3.3—LISN at least 80 cm from nearest part of EUT chassis.
4—Non-EUT components of EUT system being tested.
5—Rear of EUT, including peripherals, shall all be aligned and flush with edge of tabletop.
6—Edge of tabletop shall be 40 cm removed from a vertical conducting plane that is bonded to the ground plane.
7—Antenna can be integral or detachable. If detachable, then the antenna shall be attached for this test.

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.

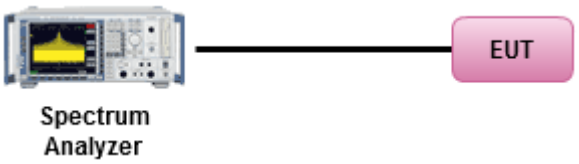
3.2.2 Measuring Instruments

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 for 6 dB bandwidth measurement.
	☐ Refer as FCC KDB 558074, clause 8.2 Option 2 for 6 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

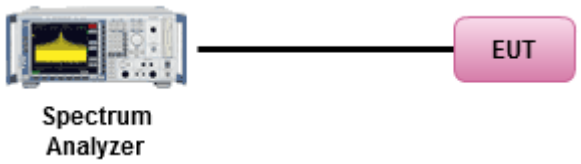
3.4.2 Measuring Instruments

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
 Spectrum Analyzer

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.	

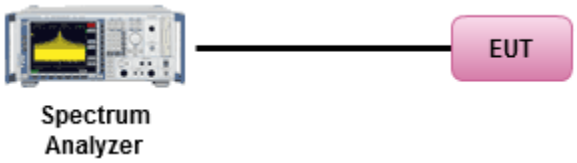
3.5.2 Measuring Instruments

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 below 30 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.

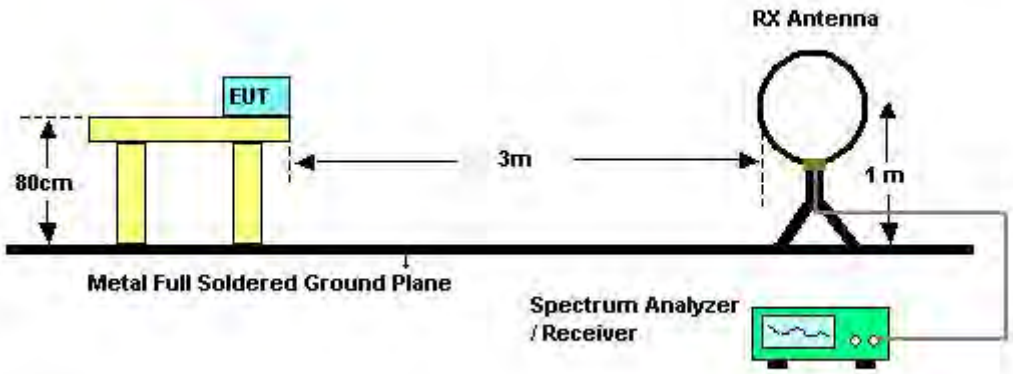
3.6.3 Test Procedures

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.	

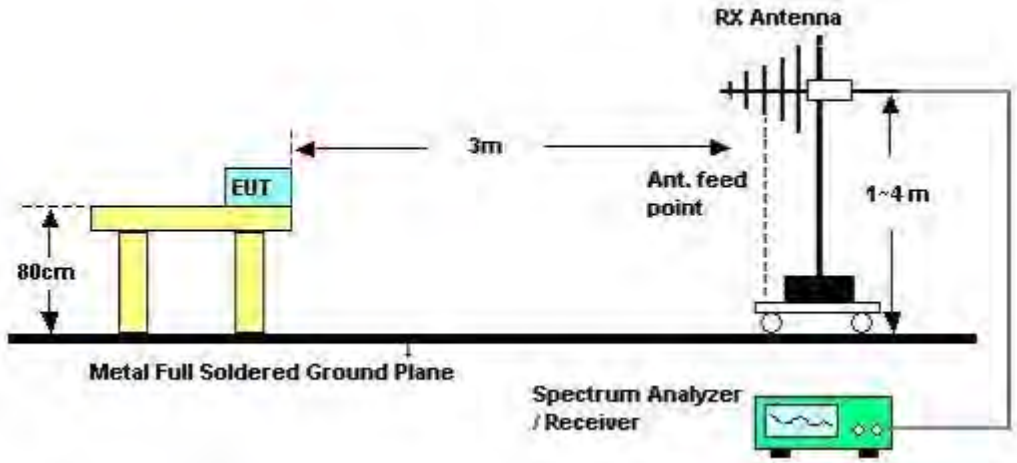
3.6.4 Test Setup

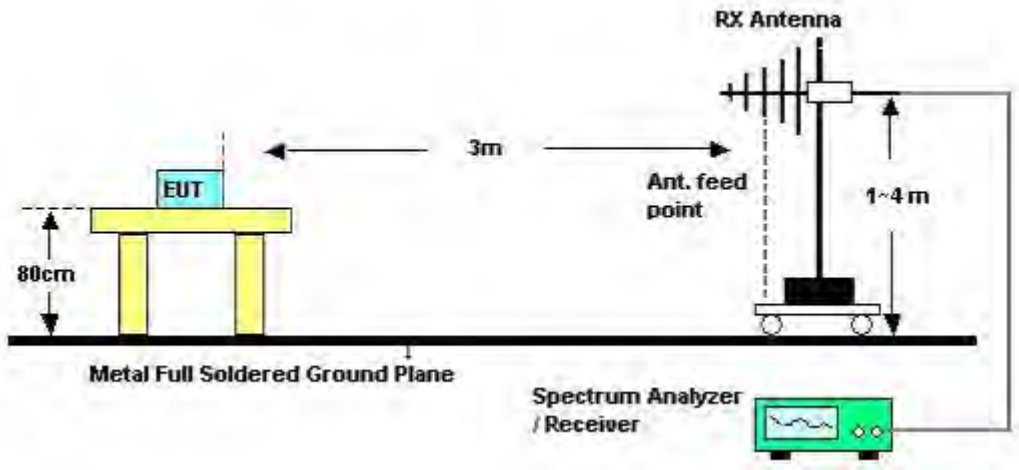
Transmitter Radiated Emissions

9kHz ~30MHz

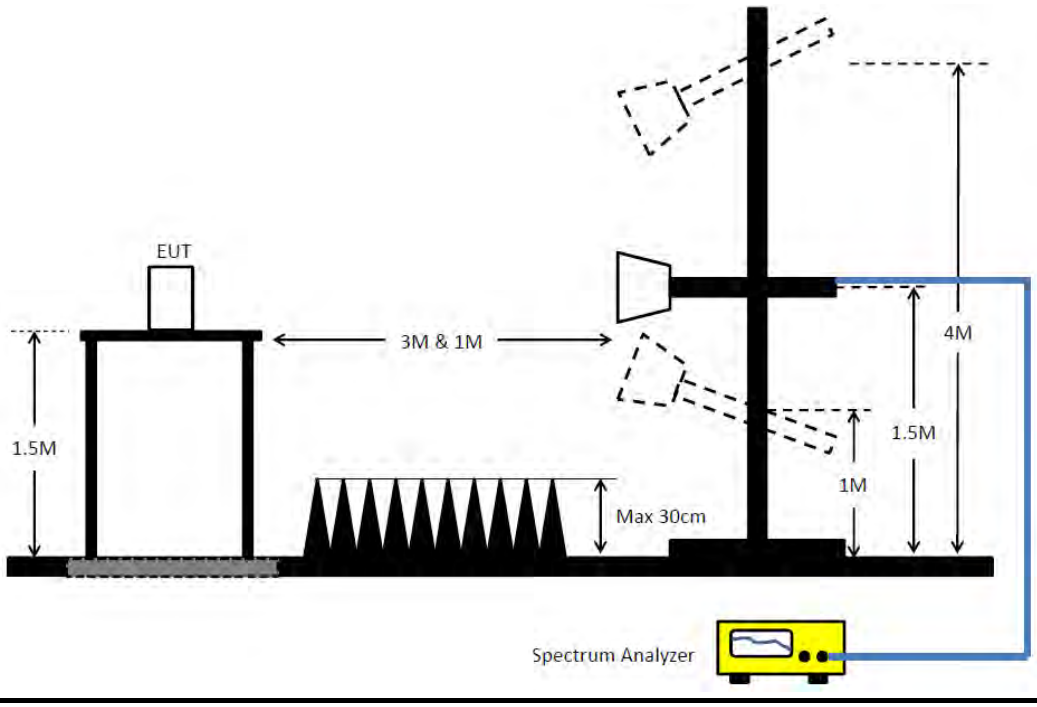


30MHz~1GHz





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 Test Result of 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 ~ 18GHz	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)
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-7	1 GHz –26.5 GHz	Oct. 24, 2016	Oct. 23, 2017	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)

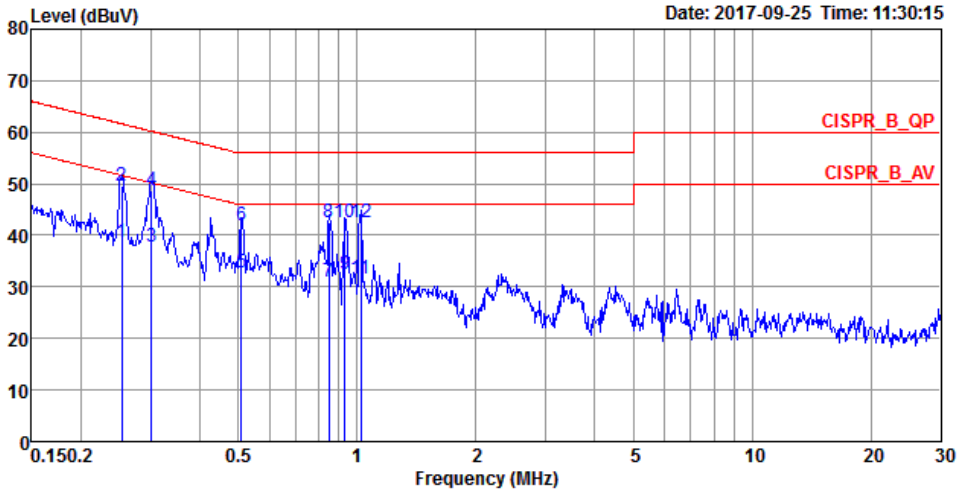
Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Calibration Due Date	Remark
RF Cable-high	Woken	RG402	High Cable-9	1 GHz –26.5 GHz	Oct. 24, 2016	Oct. 23, 2017	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-10	1 GHz –26.5 GHz	Oct. 24, 2016	Oct. 23, 2017	Conducted (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.

NCR means Non-Calibration required.

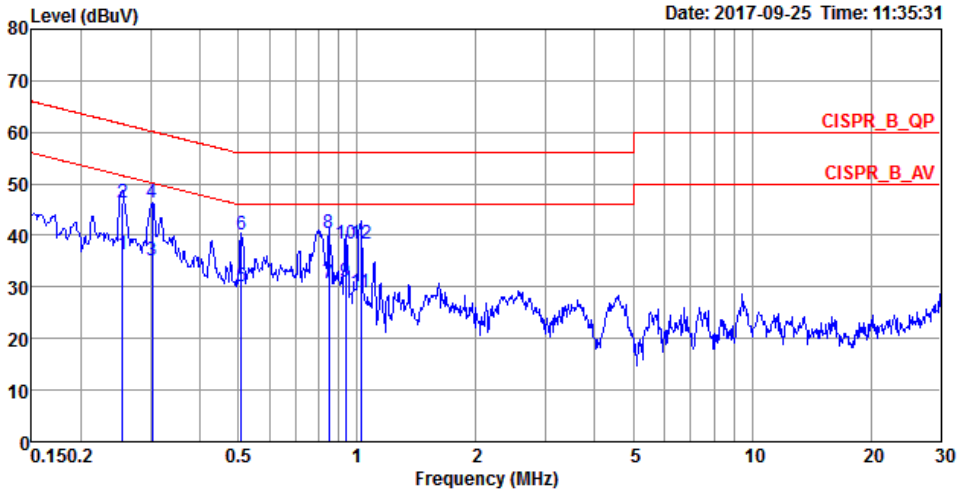
AC Power-line Conducted Emissions Result			
Operating Mode	2	**Power Phase**	Neutral
Operating Function	Normal Link		



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark	Pol/Phase
	MHz	dBuV	dB	dBuV	dBuV	dB	dB		
1	0.2537	38.55	-13.09	51.64	28.38	10.08	0.09	Average	NEUTRAL
2	0.2537	49.51	-12.13	61.64	39.34	10.08	0.09	QP	NEUTRAL
3	0.3013	37.83	-12.38	50.21	27.62	10.15	0.06	Average	NEUTRAL
4	0.3013	48.58	-11.63	60.21	38.37	10.15	0.06	QP	NEUTRAL
5	0.5093	32.75	-13.25	46.00	22.47	10.22	0.06	Average	NEUTRAL
6	0.5093	42.05	-13.95	56.00	31.77	10.22	0.06	QP	NEUTRAL
7	0.8479	31.02	-14.98	46.00	20.76	10.10	0.16	Average	NEUTRAL
8	0.8479	42.61	-13.39	56.00	32.35	10.10	0.16	QP	NEUTRAL
9	0.9329	32.50	-13.50	46.00	22.25	10.07	0.18	Average	NEUTRAL
10	0.9329	42.53	-13.47	56.00	32.28	10.07	0.18	QP	NEUTRAL
11	1.0207	31.71	-14.29	46.00	21.47	10.05	0.19	Average	NEUTRAL
12	1.0207	42.49	-13.51	56.00	32.25	10.05	0.19	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		



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark	Pol/Phase
	MHz	dBuV	dB	dBuV	dBuV	dB	dB		
1	0.2544	36.37	-15.24	51.61	26.36	9.92	0.09	Average	LINE
2	0.2544	46.22	-15.39	61.61	36.21	9.92	0.09	QP	LINE
3	0.3029	35.19	-14.97	50.16	25.20	9.93	0.06	Average	LINE
4	0.3029	46.36	-13.80	60.16	36.37	9.93	0.06	QP	LINE
5	0.5101	30.14	-15.86	46.00	20.13	9.95	0.06	Average	LINE
6	0.5101	40.27	-15.73	56.00	30.26	9.95	0.06	QP	LINE
7	0.8483	30.72	-15.28	46.00	20.60	9.96	0.16	Average	LINE
8	0.8483	40.42	-15.58	56.00	30.30	9.96	0.16	QP	LINE
9	0.9371	30.85	-15.15	46.00	20.71	9.96	0.18	Average	LINE
10	0.9371	38.32	-17.68	56.00	28.18	9.96	0.18	QP	LINE
11	1.0201	28.88	-17.12	46.00	18.73	9.96	0.19	Average	LINE
12	1.0201	38.34	-17.66	56.00	28.19	9.96	0.19	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.)

<Mode 1: EUT 1 + Ant. 1>

Summary

Mode	Max-N dB (Hz)	Max-OBW (Hz)	ITU-Code	Min-N dB (Hz)	Min-OBW (Hz)
2.4-2.4835GHz	-	-	-	-	-
Zigbee	1.638M	2.261M	2M26G1D	1.625M	2.23M

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;

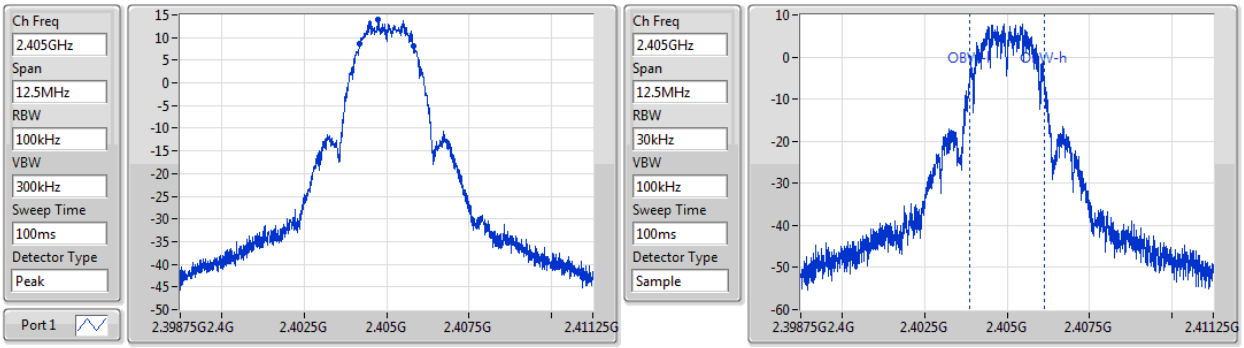
Result

Mode	Result	Limit (Hz)	Port 1-N dB (Hz)	Port 1-OBW (Hz)
Zigbee	-	-	-	-
2405MHz	Pass	500k	1.625M	2.261M
2440MHz	Pass	500k	1.638M	2.255M
2480MHz	Pass	500k	1.631M	2.23M

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

Zigbee **EBW**

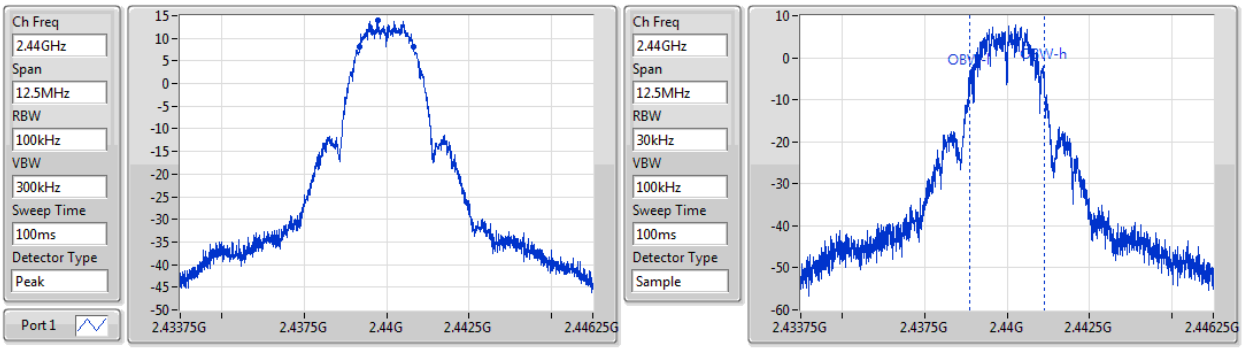
2405MHz



6dB(Hz)	Fl-6dB(Hz)	Fh-6dB(Hz)	OBW(Hz)	Fl-OBW(Hz)	Fh-OBW(Hz)	Limit(Hz)	Port
1.625M	2.404194G	2.405819G	2.261M	2.403857G	2.406118G	500k	1

Zigbee **EBW**

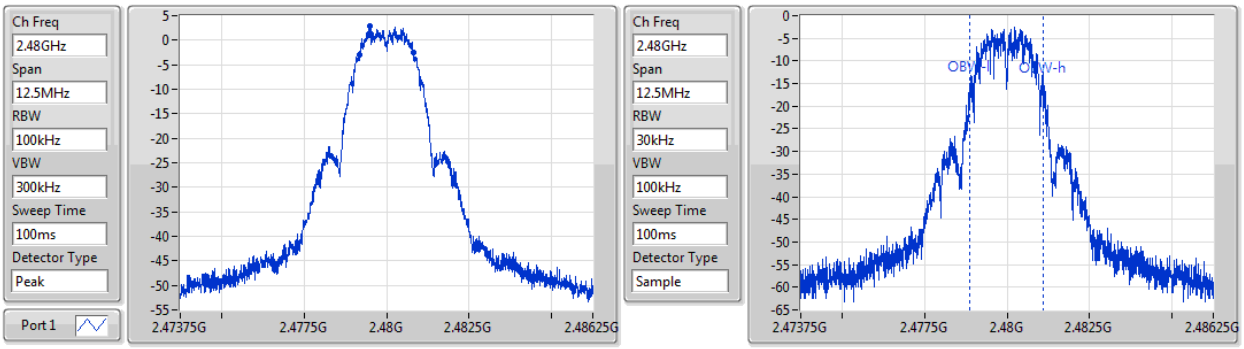
2440MHz



6dB(Hz)	Fl-6dB(Hz)	Fh-6dB(Hz)	OBW(Hz)	Fl-OBW(Hz)	Fh-OBW(Hz)	Limit(Hz)	Port
1.638M	2.439175G	2.440813G	2.255M	2.438863G	2.441118G	500k	1

Zigbee **EBW**

2480MHz



6dB(Hz)	Fl-6dB(Hz)	Fh-6dB(Hz)	OBW(Hz)	Fl-OBW(Hz)	Fh-OBW(Hz)	Limit(Hz)	Port
1.631M	2.479175G	2.480806G	2.23M	2.478876G	2.481106G	500k	1

<Mode 2: EUT 2 + Ant. 3>

Summary

Mode	Max-N dB (Hz)	Max-OBW (Hz)	ITU-Code	Min-N dB (Hz)	Min-OBW (Hz)
2.4-2.4835GHz	-	-	-	-	-
Zigbee	1.644M	2.249M	2M25G1D	1.625M	2.249M

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;

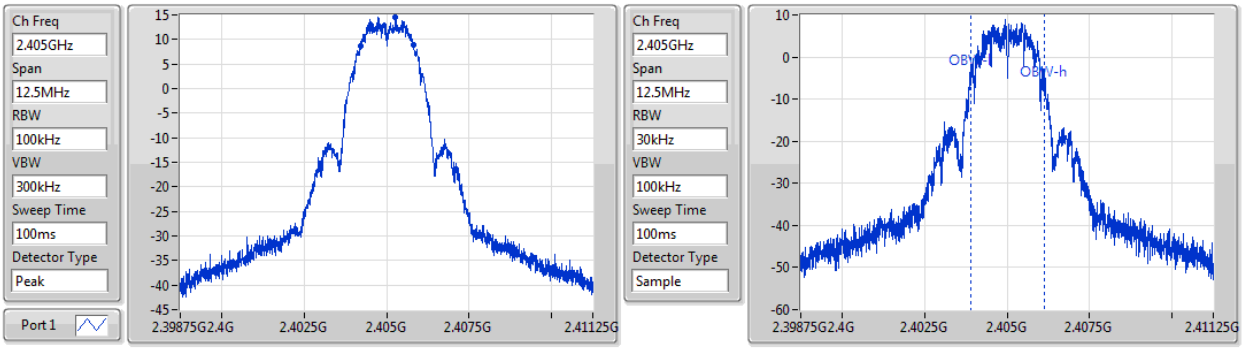
Result

Mode	Result	Limit (Hz)	Port 1-N dB (Hz)	Port 1-OBW (Hz)
Zigbee	-	-	-	-
2405MHz	Pass	500k	1.625M	2.249M
2440MHz	Pass	500k	1.644M	2.249M
2480MHz	Pass	500k	1.631M	2.249M

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

Zigbee **EBW**

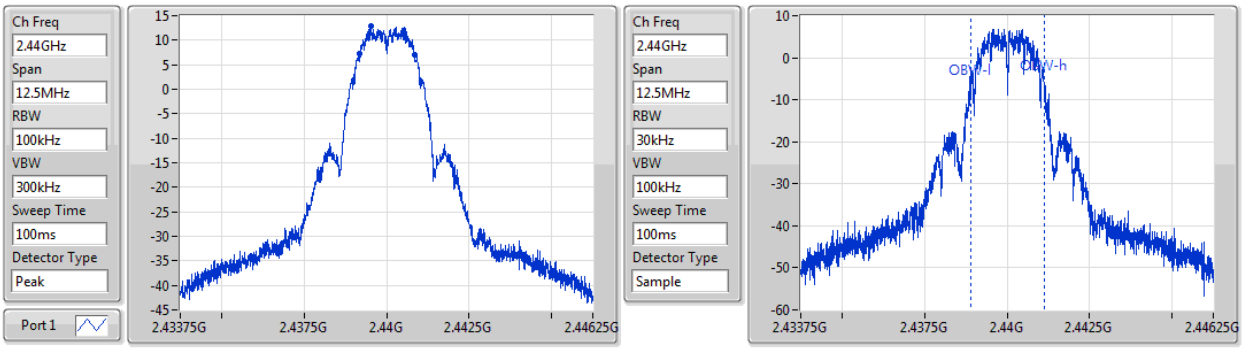
2405MHz



6dB(Hz)	Fl-6dB(Hz)	Fh-6dB(Hz)	OBW(Hz)	Fl-OBW(Hz)	Fh-OBW(Hz)	Limit(Hz)	Port
1.625M	2.4042G	2.405825G	2.249M	2.403888G	2.406137G	500k	1

Zigbee **EBW**

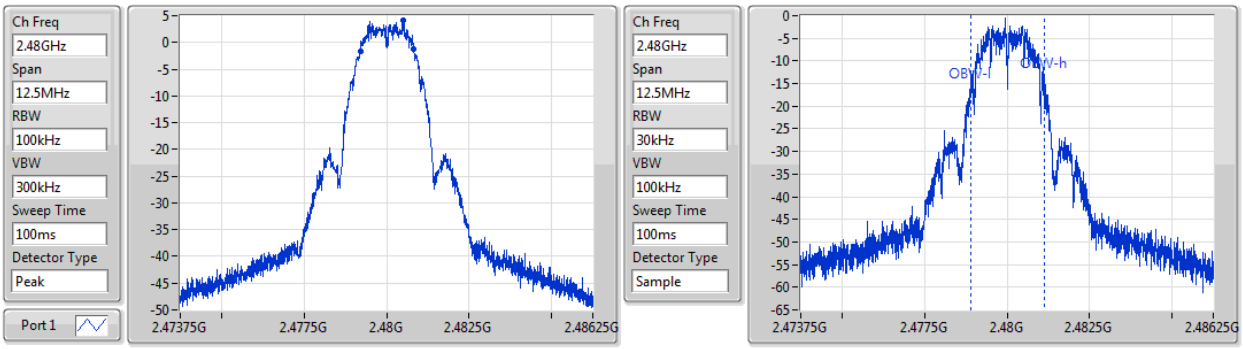
2440MHz



6dB(Hz)	Fl-6dB(Hz)	Fh-6dB(Hz)	OBW(Hz)	Fl-OBW(Hz)	Fh-OBW(Hz)	Limit(Hz)	Port
1.644M	2.439194G	2.440838G	2.249M	2.438888G	2.441137G	500k	1

Zigbee **EBW**

2480MHz



6dB(Hz)	Fl-6dB(Hz)	Fh-6dB(Hz)	OBW(Hz)	Fl-OBW(Hz)	Fh-OBW(Hz)	Limit(Hz)	Port
1.631M	2.4792G	2.480831G	2.249M	2.478894G	2.481143G	500k	1

<Mode 1: EUT 1 + Ant. 1>

Summary

Mode	Total Power (dBm)	Total Power (W)
2.4-2.4835GHz	-	-
Zigbee	19.15	0.08222

Result

Mode	Result	DG (dBi)	Port 1 (dBm)	Total Power (dBm)	Power Limit (dBm)
Zigbee	-	-	-	-	-
2405MHz	Pass	1.22	19.15	19.15	30.00
2440MHz	Pass	1.22	18.9	18.90	30.00
2480MHz	Pass	1.22	6.64	6.64	30.00

DG = Directional Gain; **Port X** = Port X output power

<Mode 2: EUT 2 + Ant. 3>

Summary

Mode	Total Power (dBm)	Total Power (W)
2.4-2.4835GHz	-	-
Zigbee	18.20	0.06607

Result

Mode	Result	DG (dBi)	Port 1 (dBm)	Total Power (dBm)	Power Limit (dBm)
Zigbee	-	-	-	-	-
2405MHz	Pass	4.50	17.61	17.61	30.00
2440MHz	Pass	4.50	18.20	18.20	30.00
2480MHz	Pass	4.50	7.77	7.77	30.00

DG = Directional Gain; **Port X** = Port X output power

<Mode 1: EUT 1 + Ant. 1>

Summary

Mode	PD (dBm/RBW)
2.4-2.4835GHz	-
Zigbee	0.26

RBW=3kHz.

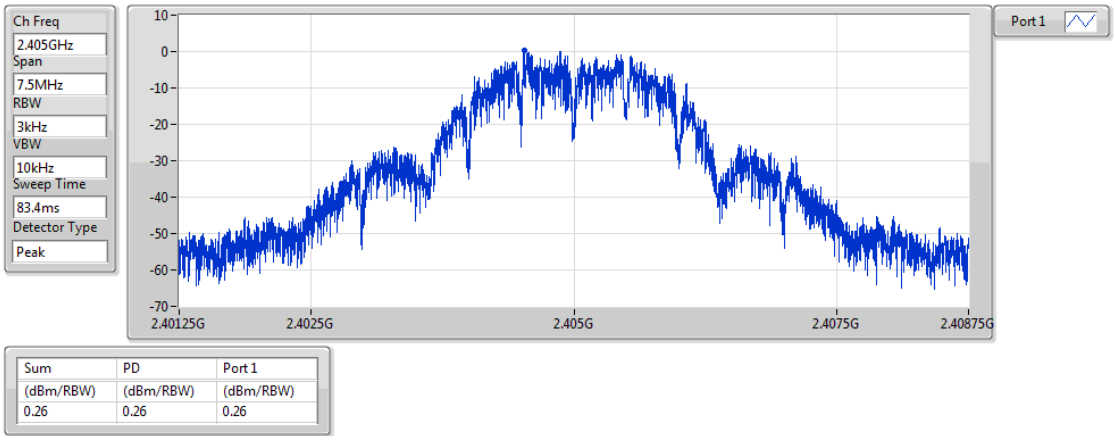
Result

Mode	Result	DG (dBi)	Port 1 (dBm/RBW)	PD (dBm/RBW)	PD Limit (dBm/RBW)
Zigbee	-	-	-	-	-
2405MHz	Pass	1.22	0.26	0.26	8.00
2440MHz	Pass	1.22	-0.79	-0.79	8.00
2480MHz	Pass	1.22	-9.80	-9.80	8.00

DG = Directional Gain; RBW=3kHz;
PD = trace bin-by-bin of each transmits port summing can be performed maximum power density; **Port X** = Port X power density;

Zigbee **PSD**

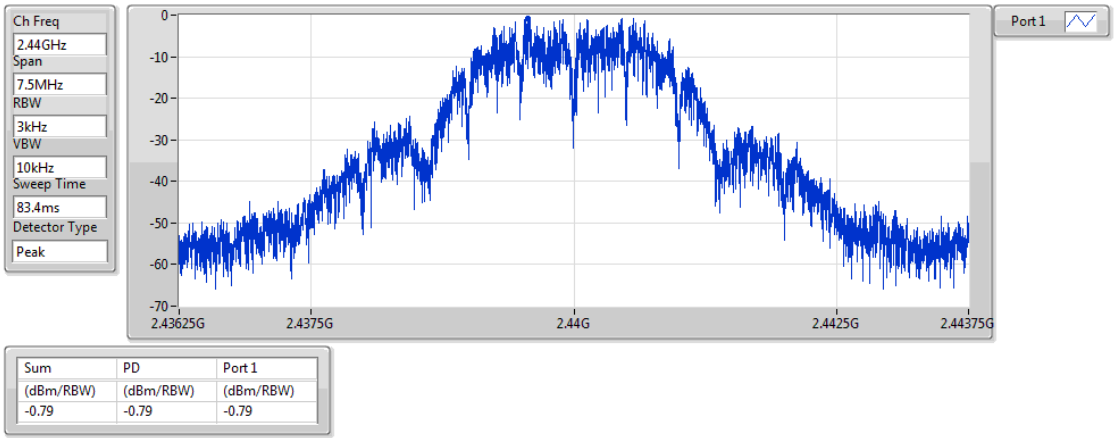
2405MHz



Sum	PD	Port 1
(dBm/RBW)	(dBm/RBW)	(dBm/RBW)
0.26	0.26	0.26

Zigbee **PSD**

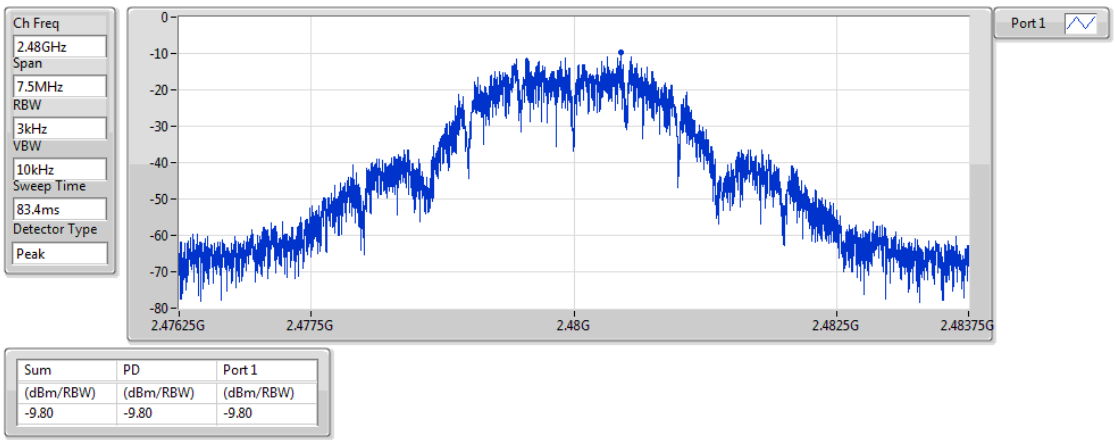
2440MHz



Sum	PD	Port 1
(dBm/RBW)	(dBm/RBW)	(dBm/RBW)
-0.79	-0.79	-0.79

Zigbee **PSD**

2480MHz



Sum	PD	Port 1
(dBm/RBW)	(dBm/RBW)	(dBm/RBW)
-9.80	-9.80	-9.80

<Mode 2: EUT 2 + Ant. 3>

Summary

Mode	PD (dBm/RBW)
2.4-2.4835GHz	-
Zigbee	1.83

RBW=3kHz.

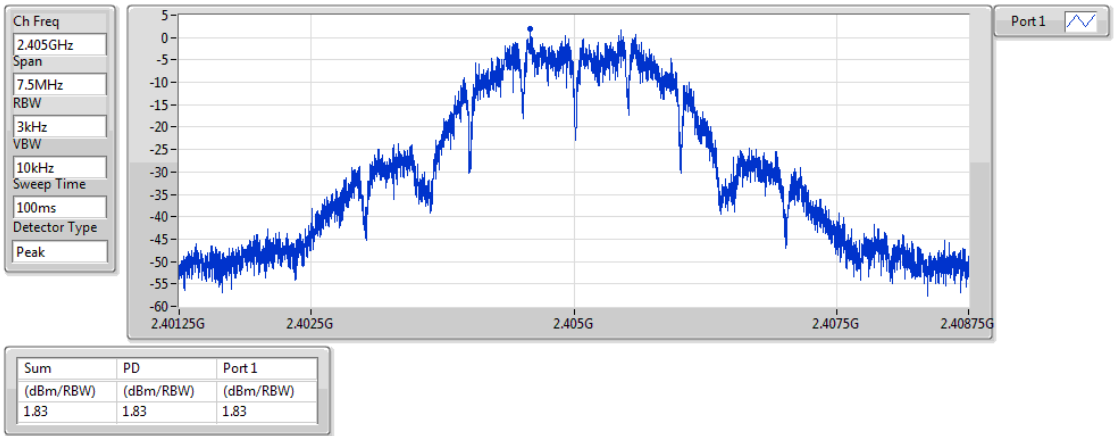
Result

Mode	Result	DG (dBi)	Port 1 (dBm/RBW)	PD (dBm/RBW)	PD Limit (dBm/RBW)
Zigbee	-	-	-	-	-
2405MHz	Pass	4.50	1.83	1.83	8.00
2440MHz	Pass	4.50	0.73	0.73	8.00
2480MHz	Pass	4.50	-8.34	-8.34	8.00

DG = Directional Gain; RBW=3kHz;
PD = trace bin-by-bin of each transmits port summing can be performed maximum power density; **Port X** = Port X power density;

Zigbee **PSD**

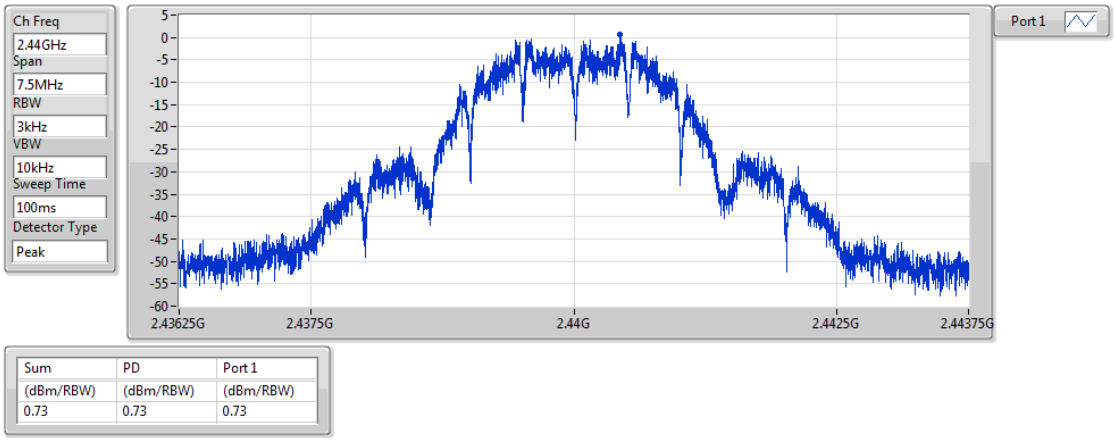
2405MHz



Sum	PD	Port 1
(dBm/RBW)	(dBm/RBW)	(dBm/RBW)
1.83	1.83	1.83

Zigbee **PSD**

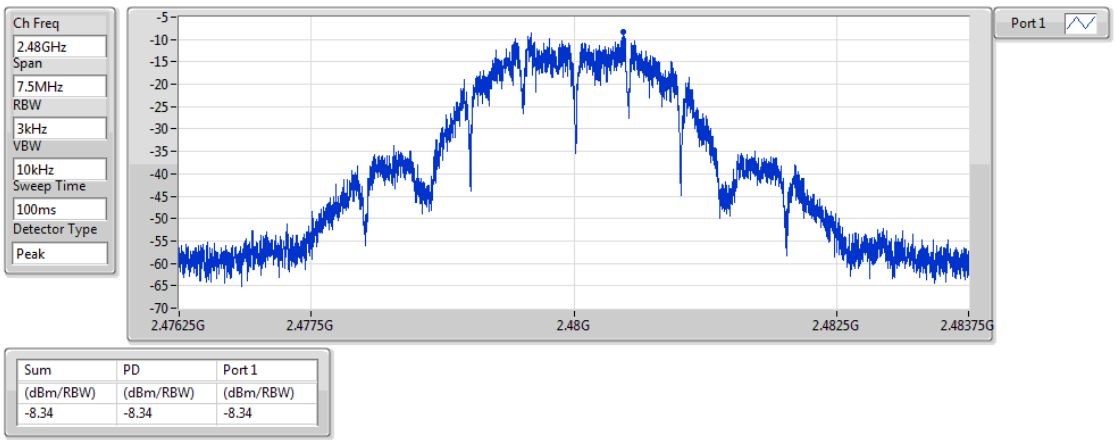
2440MHz



Sum	PD	Port 1
(dBm/RBW)	(dBm/RBW)	(dBm/RBW)
0.73	0.73	0.73

Zigbee **PSD**

2480MHz



Sum	PD	Port 1
(dBm/RBW)	(dBm/RBW)	(dBm/RBW)
-8.34	-8.34	-8.34

<Mode 1: EUT 1 + Ant. 1>

Summary

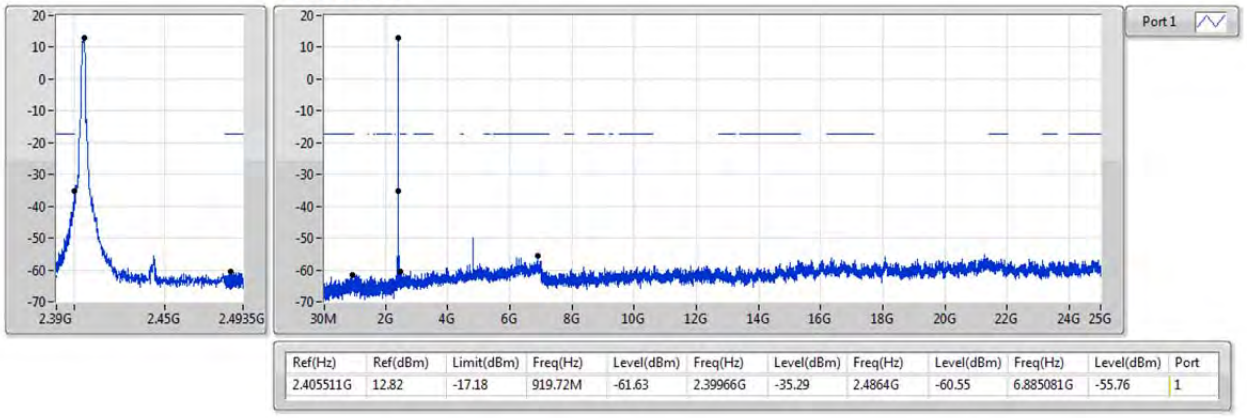
Mode	Result	Ref (Hz)	Ref (dBm)	Limit (dBm)	Freq (Hz)	Level (dBm)	Freq (Hz)	Level (dBm)	Freq (Hz)	Level (dBm)	Freq (Hz)	Level (dBm)	Port
2.4-2.4835GHz	-	-	-	-	-	-	-	-	-	-	-	-	-
Zigbee	Pass	2.479826G	3.21	-26.79	2.3074G	-61.98	2.39328G	-61.66	2.48398G	-44.23	16.38845G	-55.28	1

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
Zigbee	-	-	-	-	-	-	-	-	-	-	-	-	-
2405MHz	Pass	2.405511G	12.82	-17.18	919.72M	-61.63	2.39966G	-35.29	2.4864G	-60.55	6.885081G	-55.76	1
2440MHz	Pass	2.439412G	11.81	-18.19	892.58M	-61.92	2.39482G	-60.54	2.48732G	-60.27	15.308138G	-55.20	1
2480MHz	Pass	2.479826G	3.21	-26.79	2.3074G	-61.98	2.39328G	-61.66	2.48398G	-44.23	16.38845G	-55.28	1

Zigbee **CSE NdB**

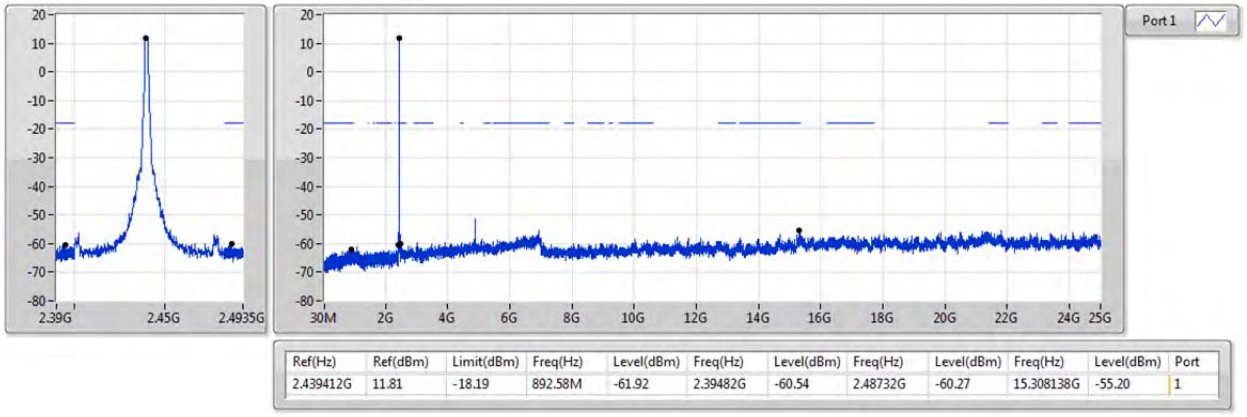
2405MHz



Ref(Hz)	Ref(dBm)	Limit(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Port
2.405511G	12.82	-17.18	919.72M	-61.63	2.39966G	-35.29	2.4864G	-60.55	6.885081G	-55.76	1

Zigbee **CSE NdB**

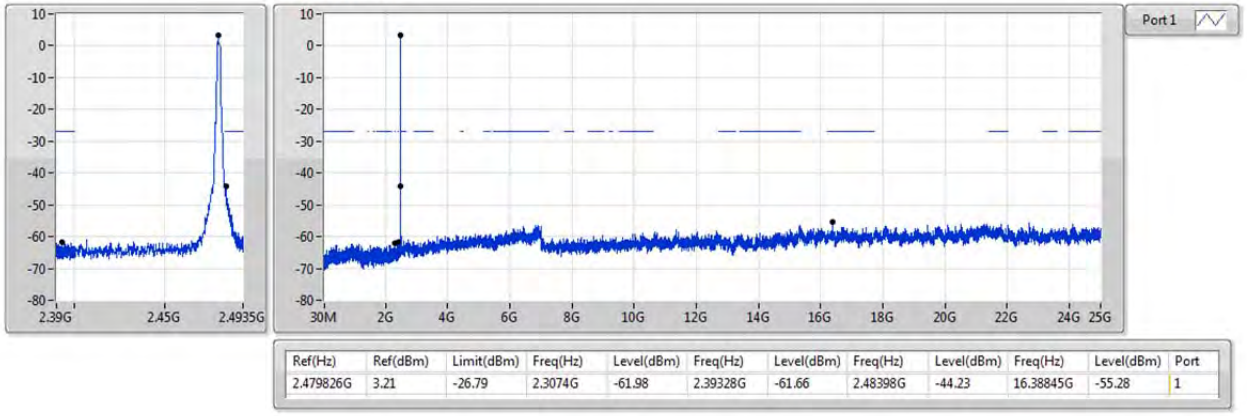
2440MHz



Ref(Hz)	Ref(dBm)	Limit(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Port
2.439412G	11.81	-18.19	892.58M	-61.92	2.39482G	-60.54	2.48732G	-60.27	15.308138G	-55.20	1

Zigbee **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
2.479826G	3.21	-26.79	2.3074G	-61.98	2.39328G	-61.66	2.48398G	-44.23	16.38845G	-55.28	1

<Mode 2: EUT 2 + Ant. 3>

Summary

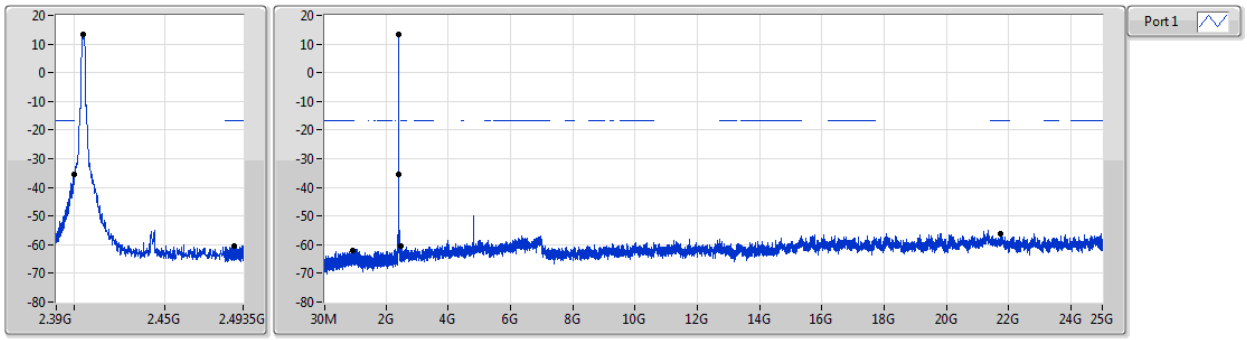
Mode	Result	Ref (Hz)	Ref (dBm)	Limit (dBm)	Freq (Hz)	Level (dBm)	Freq (Hz)	Level (dBm)	Freq (Hz)	Level (dBm)	Freq (Hz)	Level (dBm)	Port
2.4-2.4835GHz	-	-	-	-	-	-	-	-	-	-	-	-	-
Zigbee	Pass	2.480494G	2.64	-27.36	615.28M	-61.74	2.39866G	-61.60	2.48394G	-39.04	24.839641G	-56.30	1

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
Zigbee	-	-	-	-	-	-	-	-	-	-	-	-	-
2405MHz	Pass	2.404676G	13.20	-16.80	922.08M	-62.19	2.39996G	-35.36	2.48838G	-60.38	21.714051G	-56.06	1
2440MHz	Pass	2.439579G	12.44	-17.56	819.42M	-61.80	2.39184G	-59.12	2.49186G	-60.22	21.4074G	-56.05	1
2480MHz	Pass	2.480494G	2.64	-27.36	615.28M	-61.74	2.39866G	-61.60	2.48394G	-39.04	24.839641G	-56.30	1

Zigbee **CSE NdB**

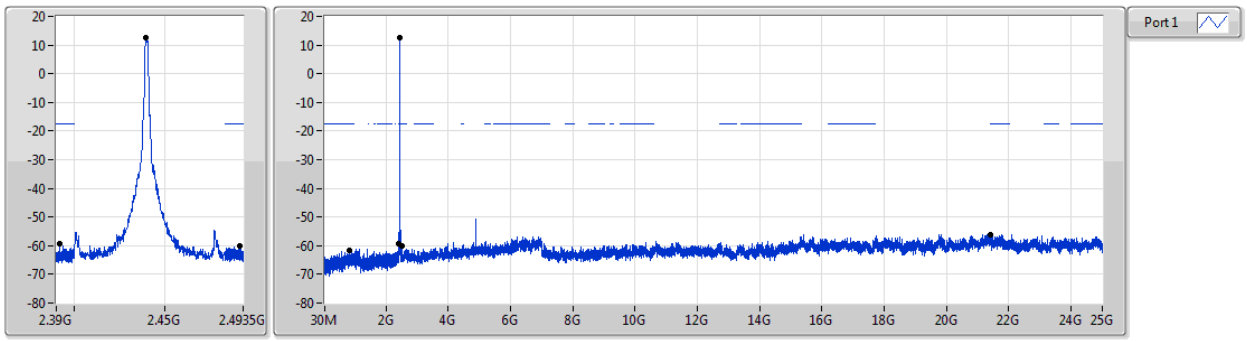
2405MHz



Ref(Hz)	Ref(dBm)	Limit(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Port
2.404676G	13.20	-16.80	922.08M	-62.19	2.39996G	-35.36	2.48838G	-60.38	21.714051G	-56.06	1

Zigbee **CSE NdB**

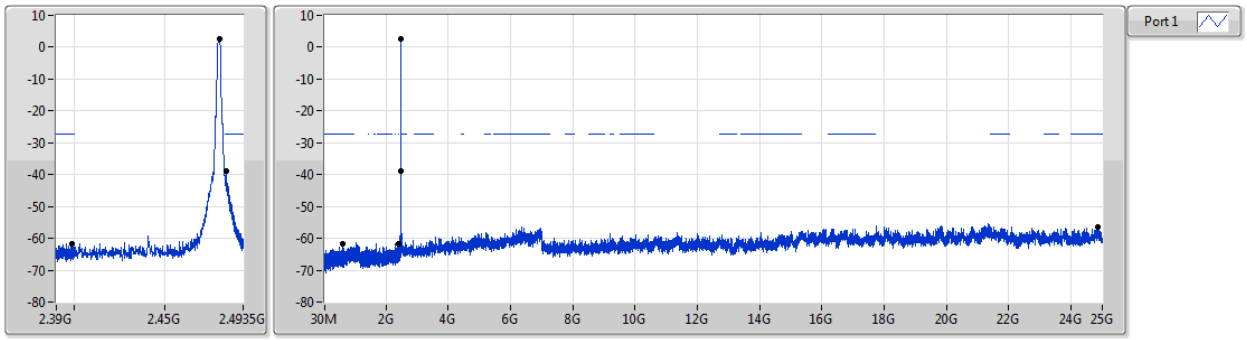
2440MHz



Ref(Hz)	Ref(dBm)	Limit(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Port
2.439579G	12.44	-17.56	819.42M	-61.80	2.39184G	-59.12	2.49186G	-60.22	21.4074G	-56.05	1

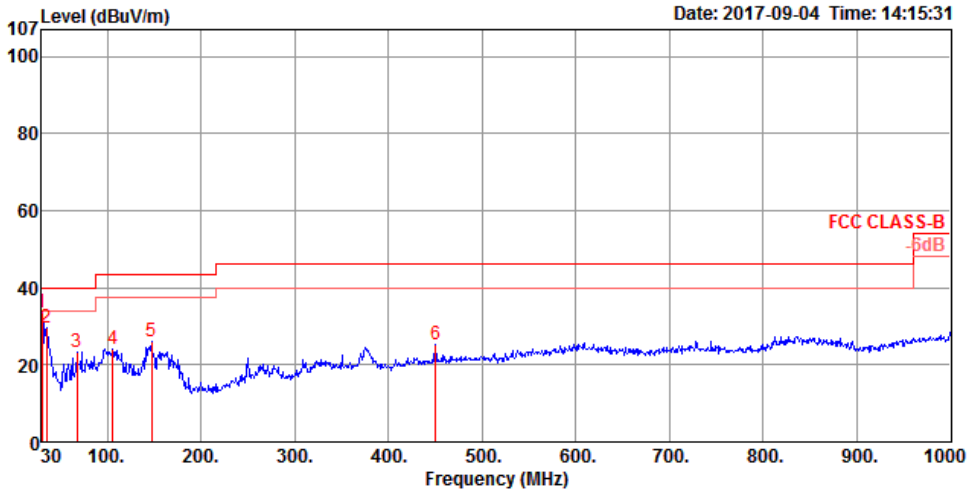
Zigbee **CSE NdB**

2480MHz



Ref(Hz)	Ref(dBm)	Limit(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Port
2.480494G	2.64	-27.36	615.28M	-61.74	2.39866G	-61.60	2.48394G	-39.04	24.839641G	-56.30	1

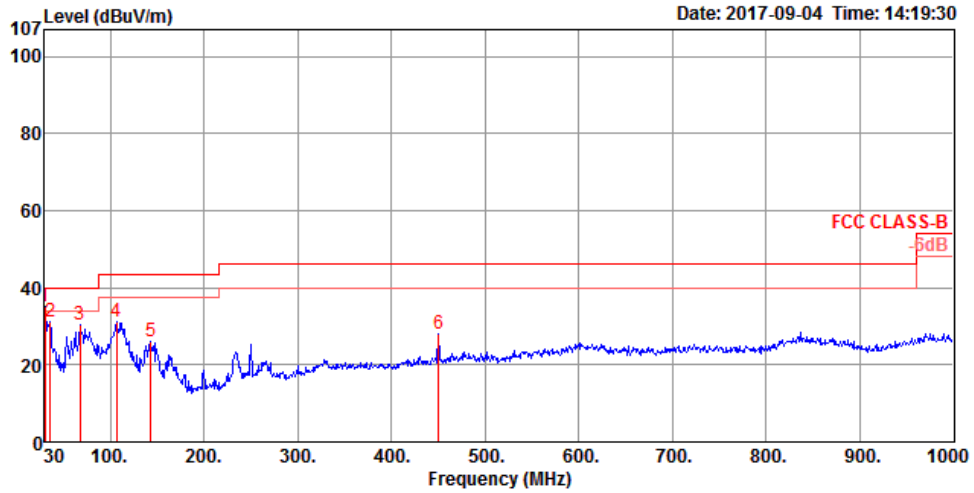
RSE below 1GHz Result			
Operating Mode	1	**Polarization**	Horizontal
Operating Function	Normal Link		



	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	33.50	40.00	-6.50	39.98	0.53	24.45	31.46	100	356	Peak	HORIZONTAL
2	34.85	29.66	40.00	-10.34	39.27	0.53	21.43	31.57	300	306	Peak	HORIZONTAL
3	67.83	23.36	40.00	-16.64	42.17	0.69	12.32	31.82	125	329	Peak	HORIZONTAL
4	105.66	23.96	43.50	-19.54	37.40	0.87	17.57	31.88	200	40	Peak	HORIZONTAL
5	147.37	26.09	43.50	-17.41	40.44	0.96	16.58	31.89	100	283	Peak	HORIZONTAL
6	450.01	25.18	46.00	-20.82	33.15	1.65	22.57	32.19	100	8	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		



	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	34.98	40.00	-5.02	41.46	0.53	24.45	31.46	100	327	Peak	VERTICAL
2	35.82	31.18	40.00	-8.82	41.39	0.53	20.84	31.58	200	165	Peak	VERTICAL
3	67.83	30.21	40.00	-9.79	49.02	0.69	12.32	31.82	100	135	Peak	VERTICAL
4	106.63	31.06	43.50	-12.44	44.44	0.87	17.63	31.88	100	267	Peak	VERTICAL
5	143.49	26.07	43.50	-17.43	40.10	0.94	16.92	31.89	125	200	Peak	VERTICAL
6	450.01	27.87	46.00	-18.13	35.84	1.65	22.57	32.19	100	240	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.)

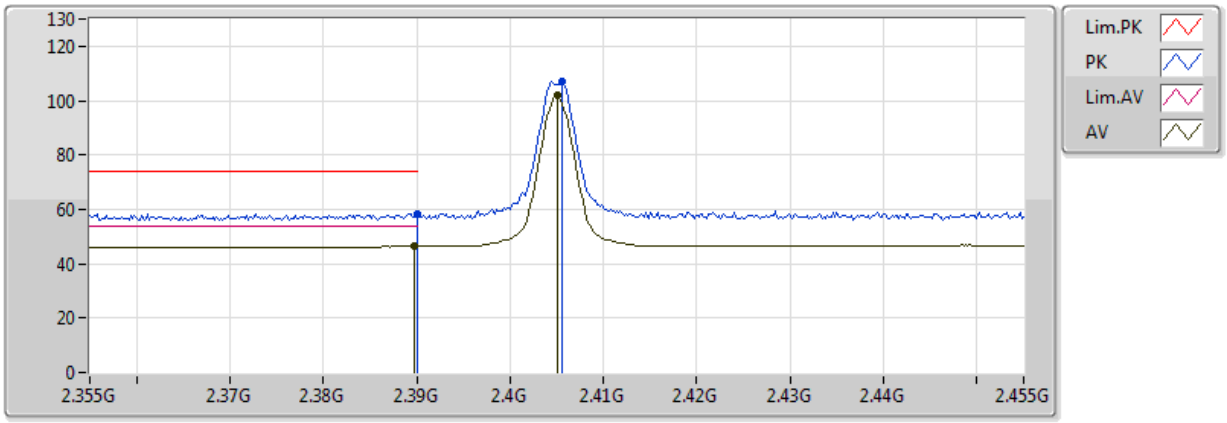
<Mode 1: EUT 1 + Ant. 1 + Z-axis>

Summary

Mode	Result	Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
2.4-2.4835GHz	-	-	-	-	-	-	-	-	-	-	-	-
Zigbee	Pass	AV	2.483502G	52.48	54.00	-1.52	32.22	3	Horizontal	230	1.36	-

Zigbee

2405MHz_TX

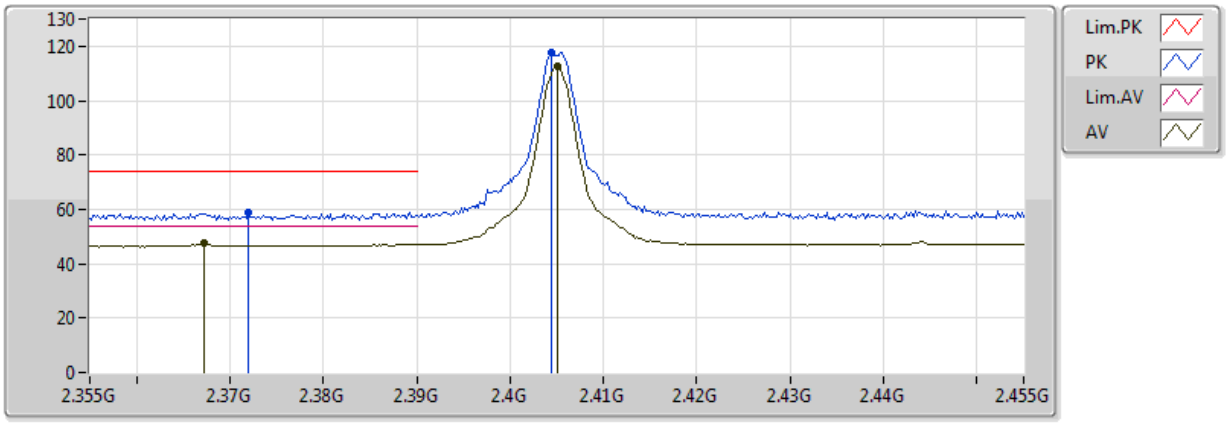


20170914
EUT Z_1TX
Setting 14
02-Z-1
FSU
Internal ANT

Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)
AV	2.3898G	46.30	54.00	-7.70	31.94	3	Vertical	319	2.76
AV	2.405G	101.83	Inf	-Inf	31.98	3	Vertical	319	2.76
PK	2.39G	58.43	74.00	-15.57	31.94	3	Vertical	319	2.76
PK	2.4056G	106.80	Inf	-Inf	31.99	3	Vertical	319	2.76

Zigbee

2405MHz_TX

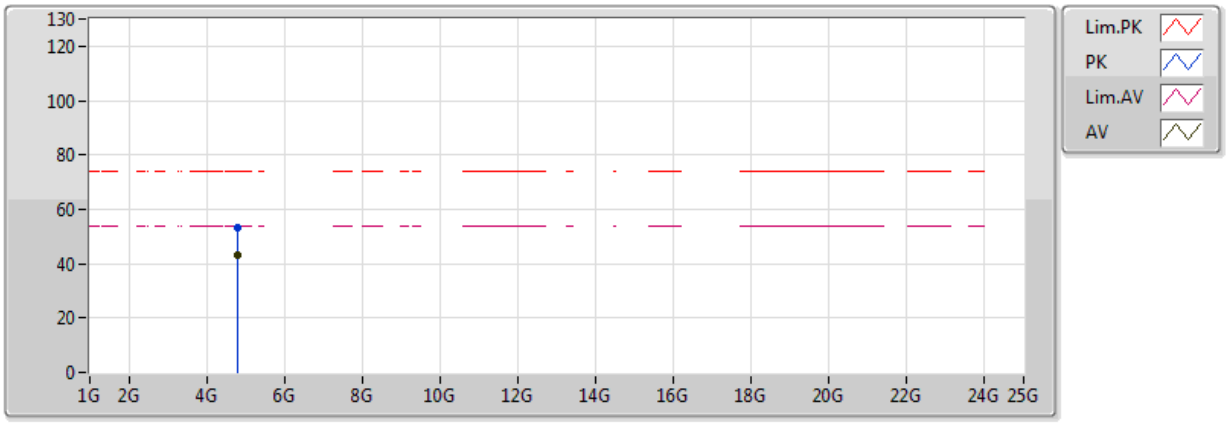


20170914
EUT Z_1TX
Setting 14
02-Z-1
FSU
Internal ANT

Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)
AV	2.3672G	47.80	54.00	-6.20	31.87	3	Horizontal	283	1.40
AV	2.405G	112.70	Inf	-Inf	31.98	3	Horizontal	283	1.40
PK	2.372G	58.76	74.00	-15.24	31.88	3	Horizontal	283	1.40
PK	2.4044G	117.49	Inf	-Inf	31.98	3	Horizontal	283	1.40

Zigbee

2405MHz_TX

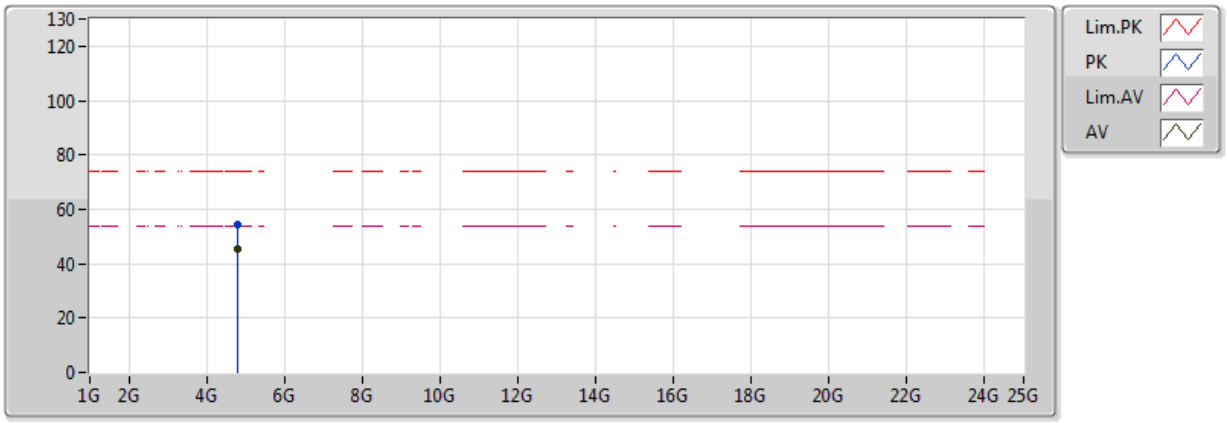


20170914
EUT Z_1TX
Setting 14
02-Z-1
FSU
Internal ANT

Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)
AV	4.81104G	43.22	54.00	-10.78	8.04	3	Vertical	130	1.28
PK	4.81104G	53.08	74.00	-20.92	8.04	3	Vertical	130	1.28

Zigbee

2405MHz_TX

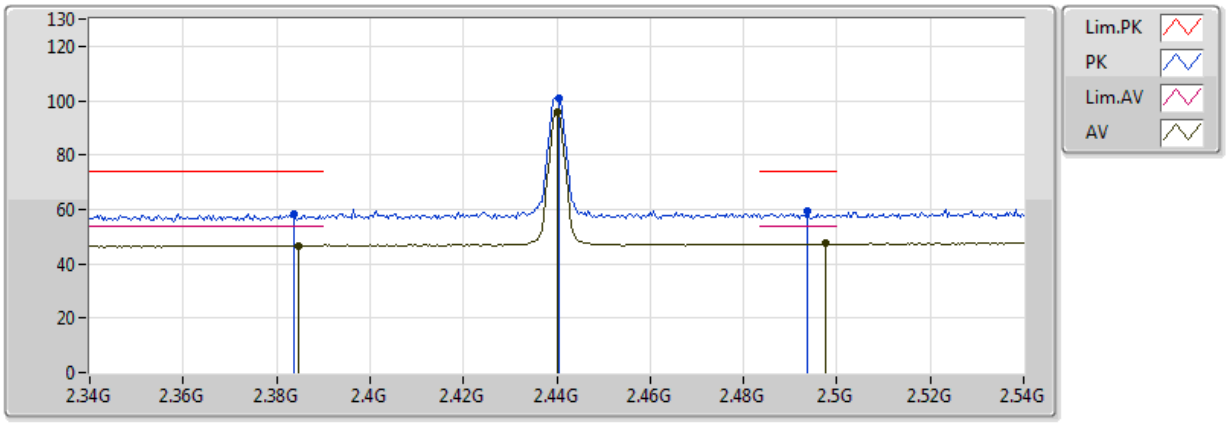


20170914
EUT Z_1TX
Setting 14
02-Z-1
FSU
Internal ANT

Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)
AV	4.81096G	45.39	54.00	-8.61	8.04	3	Horizontal	276	1.00
PK	4.80896G	54.63	74.00	-19.37	8.04	3	Horizontal	276	1.00

Zigbee

2440MHz_TX

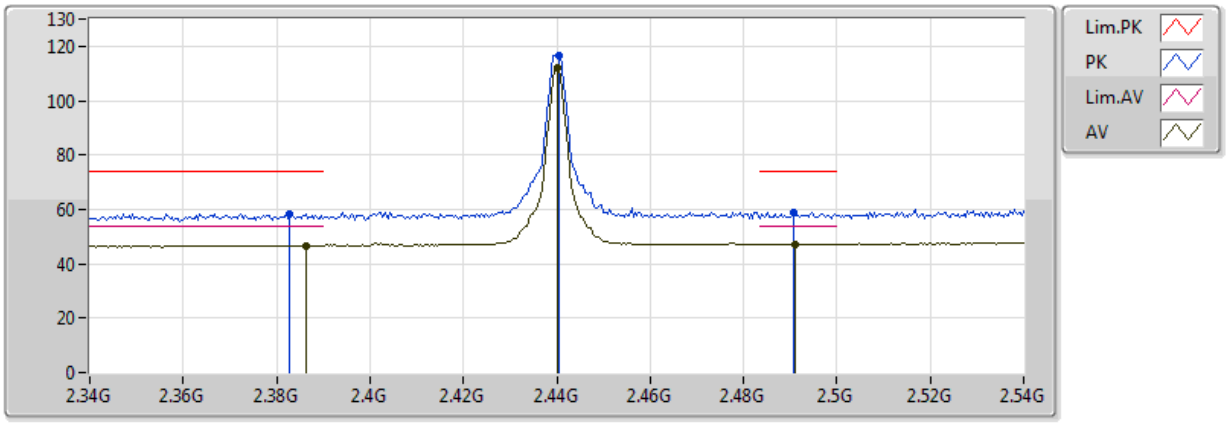


20170914
EUT Z_1TX
Setting 14
02-Z-1
FSU
Internal ANT

Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)
AV	2.3848G	46.74	54.00	-7.26	31.92	3	Vertical	157	1.50
AV	2.44G	95.88	Inf	-Inf	32.09	3	Vertical	157	1.50
AV	2.4976G	47.35	54.00	-6.65	32.26	3	Vertical	157	1.50
PK	2.3836G	58.49	74.00	-15.51	31.92	3	Vertical	157	1.50
PK	2.4404G	100.68	Inf	-Inf	32.09	3	Vertical	157	1.50
PK	2.4936G	59.17	74.00	-14.83	32.25	3	Vertical	157	1.50

Zigbee

2440MHz_TX

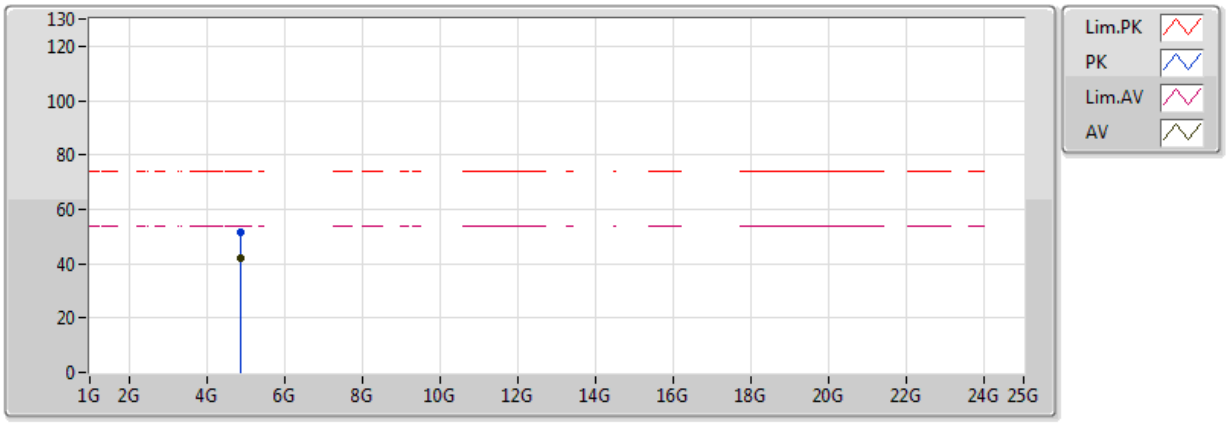


20170914
EUT Z_1TX
Setting 14
02-Z-1
FSU
Internal ANT

Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)
AV	2.3864G	46.77	54.00	-7.23	31.93	3	Horizontal	245	1.18
AV	2.44G	112.08	Inf	-Inf	32.09	3	Horizontal	245	1.18
AV	2.4912G	47.29	54.00	-6.71	32.24	3	Horizontal	245	1.18
PK	2.3828G	58.48	74.00	-15.52	31.92	3	Horizontal	245	1.18
PK	2.4404G	116.67	Inf	-Inf	32.09	3	Horizontal	245	1.18
PK	2.4908G	58.95	74.00	-15.05	32.24	3	Horizontal	245	1.18

Zigbee

2440MHz_TX



20170914
EUT Z_1TX
Setting 14
02-Z-1
FSU
Internal ANT

Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)
AV	4.87892G	42.03	54.00	-11.97	8.25	3	Vertical	111	1.05
PK	4.88108G	51.79	74.00	-22.21	8.26	3	Vertical	111	1.05

Zigbee

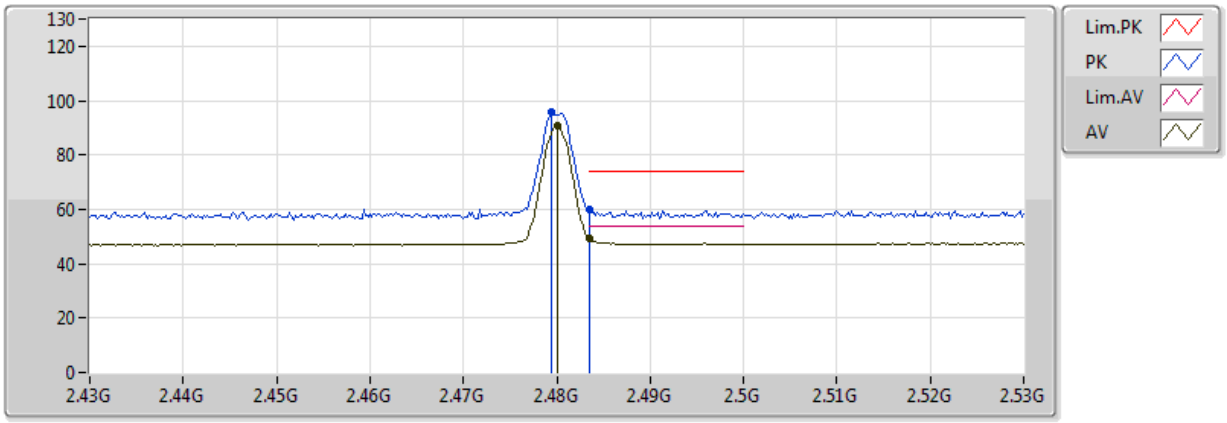
2440MHz_TX

20170914
EUT Z_1TX
Setting 14
02-Z-1
FSU
Internal ANT

Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)
AV	4.87896G	42.82	54.00	-11.18	8.25	3	Horizontal	261	1.02
PK	4.87892G	52.75	74.00	-21.25	8.25	3	Horizontal	261	1.02

Zigbee

2480MHz_TX

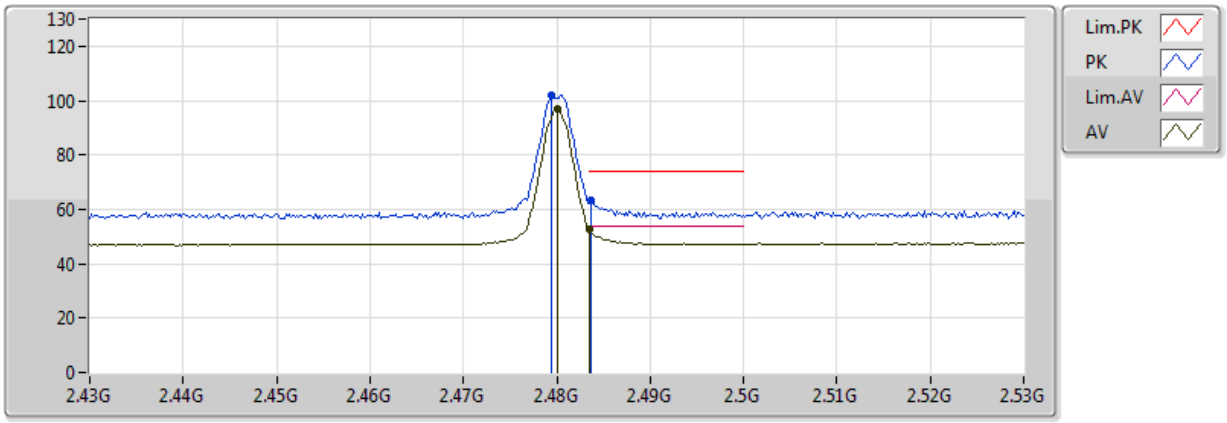


20170914
EUT Z_1TX
Setting 7
02-Z-1
FSU
Internal ANT

Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)
AV	2.48G	90.91	Inf	-Inf	32.21	3	Vertical	308	2.64
AV	2.483502G	49.16	54.00	-4.84	32.22	3	Vertical	308	2.64
PK	2.4794G	95.67	Inf	-Inf	32.21	3	Vertical	308	2.64
PK	2.483502G	59.90	74.00	-14.10	32.22	3	Vertical	308	2.64

Zigbee

2480MHz_TX

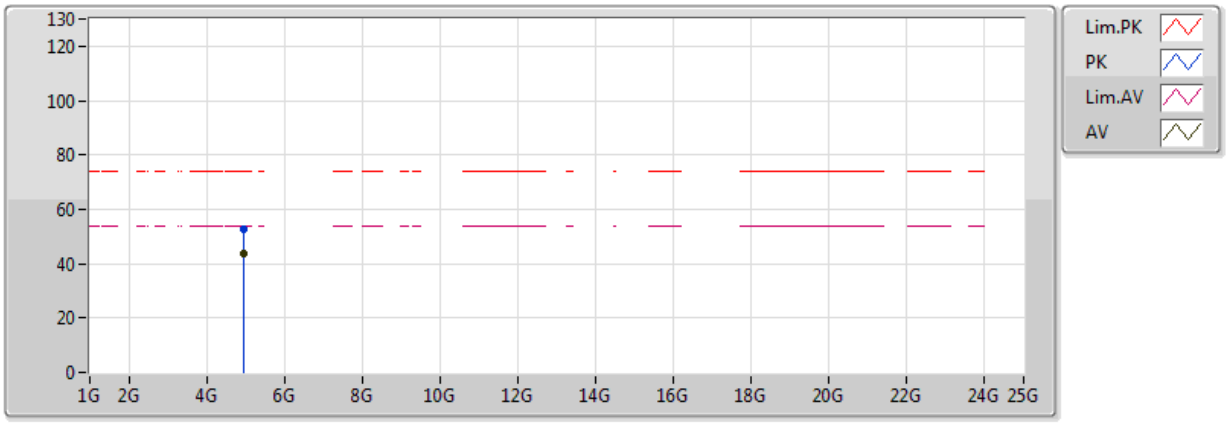


20170914
EUT Z_1TX
Setting 7
02-Z-1
FSU
Internal ANT

Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)
AV	2.48G	97.16	Inf	-Inf	32.21	3	Horizontal	230	1.36
AV	2.483502G	52.48	54.00	-1.52	32.22	3	Horizontal	230	1.36
PK	2.4794G	101.82	Inf	-Inf	32.21	3	Horizontal	230	1.36
PK	2.4836G	63.21	74.00	-10.79	32.22	3	Horizontal	230	1.36

Zigbee

2480MHz_TX

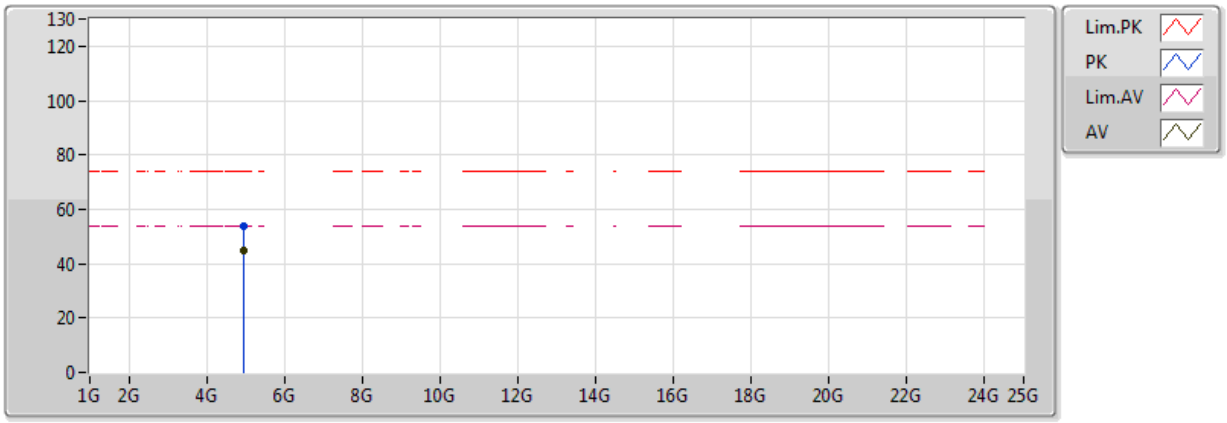


20170914
EUT Z_1TX
Setting 7
02-Z-1
FSU
Internal ANT

Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)
AV	4.96096G	43.49	54.00	-10.51	8.51	3	Vertical	289	1.20
PK	4.95892G	52.93	74.00	-21.07	8.50	3	Vertical	289	1.20

Zigbee

2480MHz_TX



20170914
EUT Z_1TX
Setting 7
02-Z-1
FSU
Internal ANT

Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)
AV	4.96092G	44.65	54.00	-9.35	8.51	3	Horizontal	199	2.75
PK	4.959G	53.93	74.00	-20.07	8.50	3	Horizontal	199	2.75

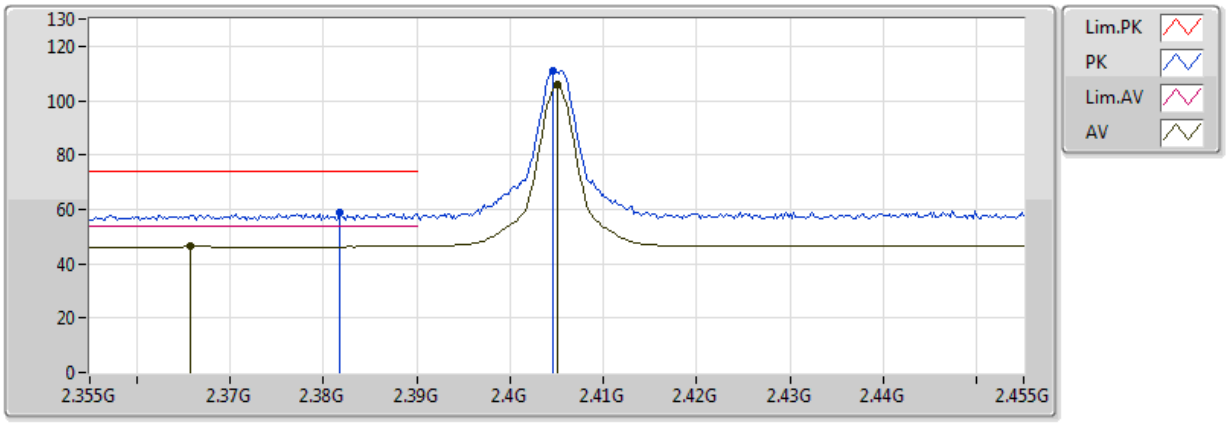
<Mode 2: EUT 2 + Ant. 3 + Z-axis>

Summary

Mode	Result	Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
2.4-2.4835GHz	-	-	-	-	-	-	-	-	-	-	-	-
Zigbee	Pass	AV	2.483502G	51.54	54.00	-2.46	32.22	3	Vertical	22	1.74	-

Zigbee

2405MHz_TX

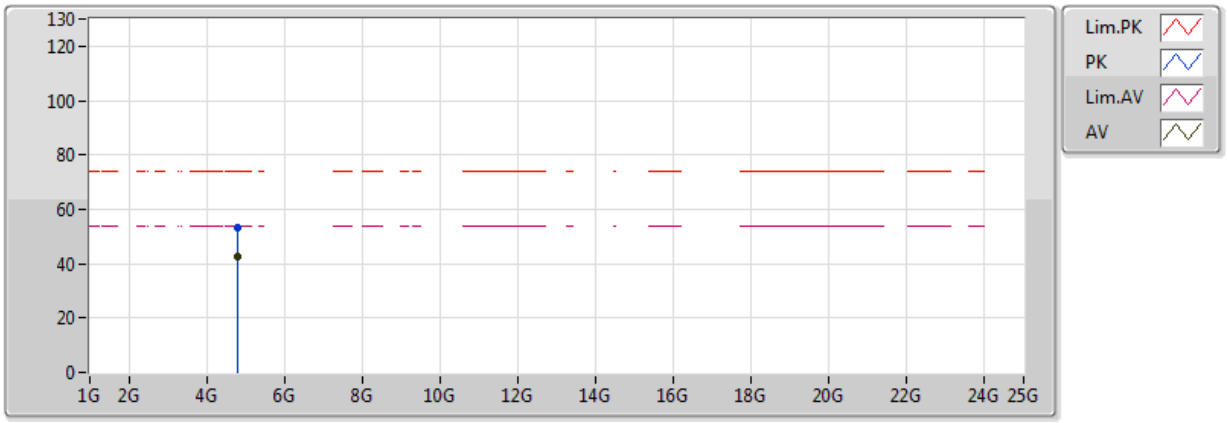


20170914
EUT Z_1TX
Setting 14
02-J-6
FSU
External ANT

Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)
AV	2.3658G	46.41	54.00	-7.59	31.86	3	Vertical	242	1.40
AV	2.405G	105.89	Inf	-Inf	31.98	3	Vertical	242	1.40
PK	2.3818G	58.63	74.00	-15.37	31.91	3	Vertical	242	1.40
PK	2.4046G	110.85	Inf	-Inf	31.98	3	Vertical	242	1.40

Zigbee

2405MHz_TX



20170914
EUT Z_1TX
Setting 14
02-J-6
FSU
External ANT

Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)
AV	4.81098G	42.66	54.00	-11.34	8.04	3	Vertical	298	2.27
PK	4.81114G	53.01	74.00	-20.99	8.04	3	Vertical	298	2.27

Zigbee

2405MHz_TX

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EUT Z_1TX
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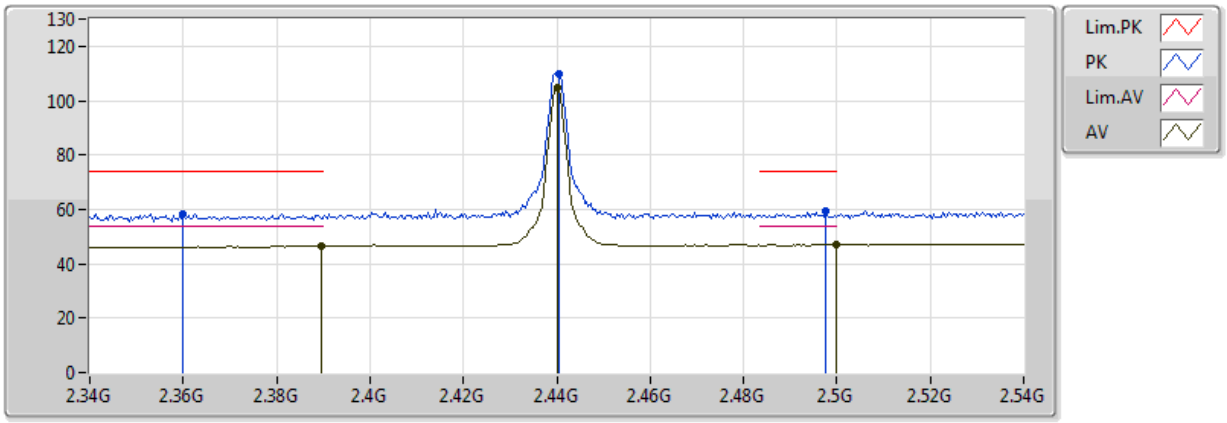
FSU
External ANT

Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)
AV	4.80906G	41.25	54.00	-12.75	8.04	3	Horizontal	7	1.10
PK	4.81104G	51.85	74.00	-22.15	8.04	3	Horizontal	7	1.10

Zigbee

2440MHz_TX

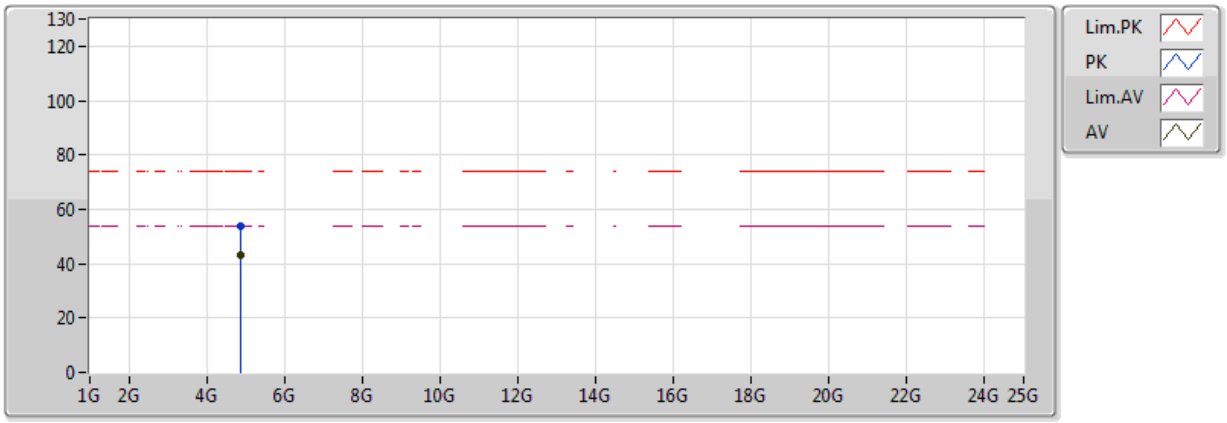


20170914
EUT Z_1TX
Setting 14
02-J-6
FSU
External ANT

Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)
AV	2.3896G	46.36	54.00	-7.64	31.94	3	Vertical	269	1.80
AV	2.44G	104.94	Inf	-Inf	32.09	3	Vertical	269	1.80
AV	2.5G	46.90	54.00	-7.10	32.27	3	Vertical	269	1.80
PK	2.36G	58.29	74.00	-15.71	31.85	3	Vertical	269	1.80
PK	2.4404G	109.90	Inf	-Inf	32.09	3	Vertical	269	1.80
PK	2.4976G	59.42	74.00	-14.58	32.26	3	Vertical	269	1.80

Zigbee

2440MHz_TX



20170914
EUT Z_1TX
Setting 14
02-J-6
FSU
External ANT

Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)
AV	4.88102G	42.97	54.00	-11.03	8.26	3	Vertical	296	1.19
PK	4.8789G	53.53	74.00	-20.47	8.25	3	Vertical	296	1.19

Zigbee

2440MHz_TX

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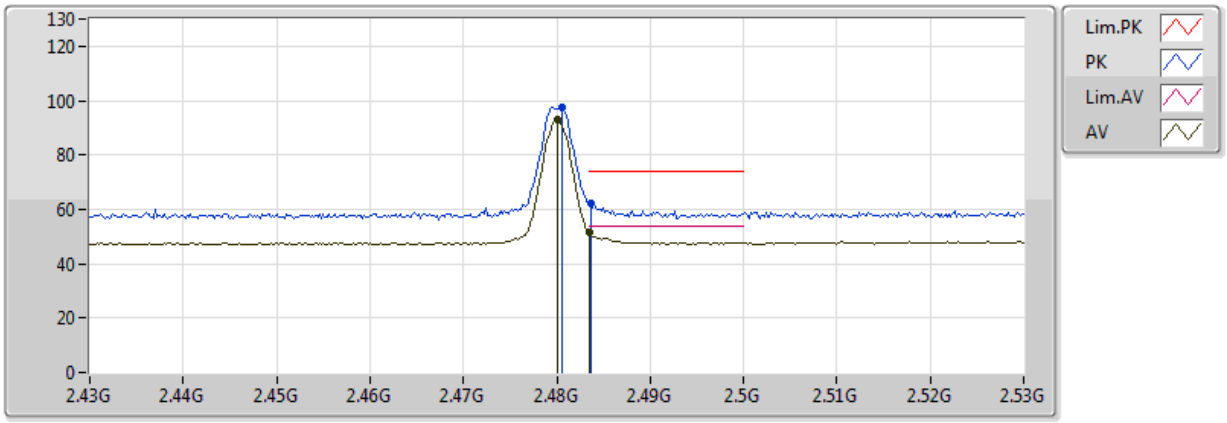
Setting 14
02-J-6
FSU
External ANT

Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)
AV	4.87906G	40.82	54.00	-13.18	8.26	3	Horizontal	235	1.08
PK	4.8791G	51.67	74.00	-22.33	8.26	3	Horizontal	235	1.08

Zigbee

2480MHz_TX

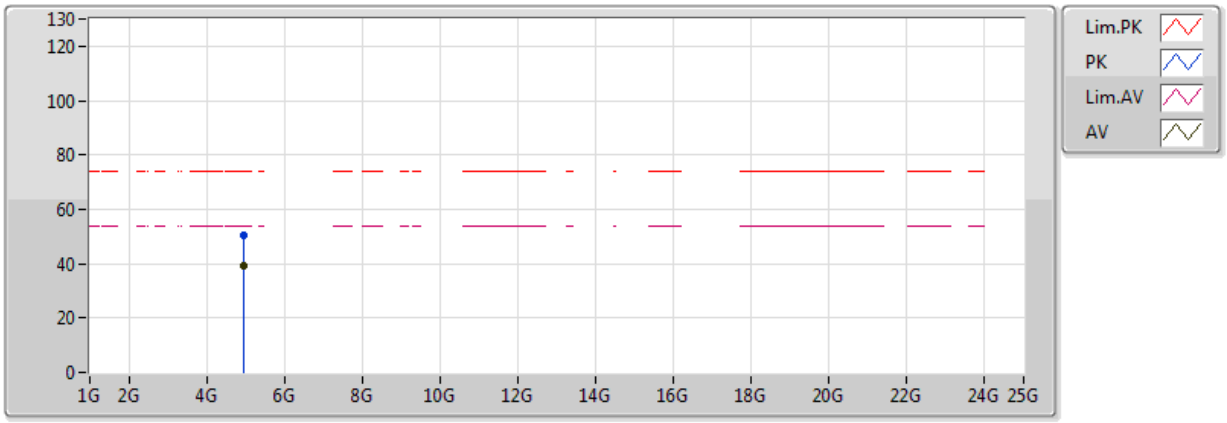


20170914
EUT Z_1TX
Setting 9
02-J-6
FSU
External ANT

Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)
AV	2.48G	93.06	Inf	-Inf	32.21	3	Vertical	22	1.74
AV	2.483502G	51.54	54.00	-2.46	32.22	3	Vertical	22	1.74
PK	2.4806G	97.61	Inf	-Inf	32.21	3	Vertical	22	1.74
PK	2.4836G	62.19	74.00	-11.81	32.22	3	Vertical	22	1.74

Zigbee

2480MHz_TX

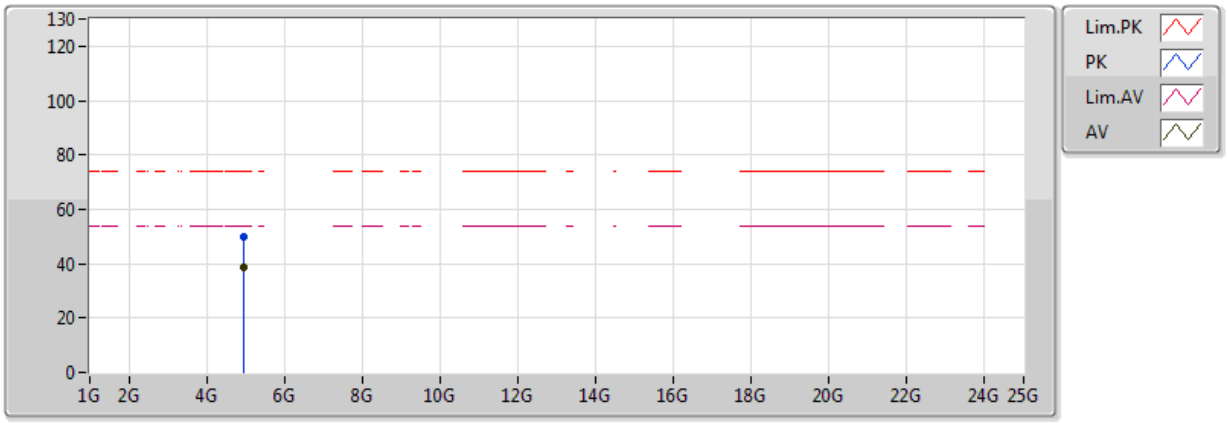


20170914
EUT Z_1TX
Setting 9
02-J-6
FSU
External ANT

Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)
AV	4.95904G	39.43	54.00	-14.57	8.50	3	Vertical	296	1.41
PK	4.96098G	50.44	74.00	-23.56	8.51	3	Vertical	296	1.41

Zigbee

2480MHz_TX



20170914
EUT Z_1TX
Setting 9
02-J-6
FSU
External ANT

Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)
AV	4.95902G	38.52	54.00	-15.48	8.50	3	Horizontal	241	1.13
PK	4.95904G	49.83	74.00	-24.17	8.50	3	Horizontal	241	1.13