

FCC Test Report

Equipment : Wireless Module
Brand Name : WNC
Model No. : SWA19
FCC ID : NKR-SWA19
Standard : 47 CFR FCC Part 15.247
Operating Band : 2400 MHz – 2483.5 MHz
Applicant : Wistron NeWeb Corporation
20 Park Avenue II, Hsinchu Science Park, Hsinchu
308, Taiwan, R.O.C.
Manufacturer : Wistron NeWeb Corporation
20 Park Avenue II, Hsinchu Science Park, Hsinchu
308, Taiwan, R.O.C.

The product sample received on Jun. 12, 2017 and completely tested on Oct. 09, 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.


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



SPORTON INTERNATIONAL INC.
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FCC ID: NKR-SWA19

1 General Description

1.1 Information

1.1.1 RF General Information

Frequency Range (MHz)	Mode	Ch. Frequency (MHz)	Channel Number
2400-2483.5	QPSK	2403.35-2477.35	1-38 [38]

Band	Mode	BWch (MHz)	Nant
2.4-2.4835GHz	QPSK	2	1TX

Note:

- ♦ Use QPSK modulation.
- ♦ 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.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)
1	TDK	ANT016008LCS2442MA2	Chip Antenna	N/A	-2.68
2	TDK	ANT016008LCS2442MA2	Chip Antenna	N/A	-1.61

Note: The EUT supports the antenna with TX and RX diversity functions.

Both Port 1 (Ant. 2) and Port 2 (Ant. 1) support transmit and receive functions, but only one of them will be used at one time.

The Port 1(Ant. 2) generated the worst case, so it was selected to test and record in the report.

1.1.3 Mode Test Duty Cycle

Mode	DC	DCF(dB)	T(s)	VBW(Hz) $\geq 1/T$
QPSK	1	0	n/a (DC $\geq$ 0.98)	n/a (DC $\geq$ 0.98)

1.1.4 EUT Operational Condition

EUT Power Type	From DC 5V+-10%
----------------	-----------------

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	Gino Huang	22°C / 60%	Aug. 18, 2017
Radiated	03CH01-CB	Justin Lin / Jay Chen	22°C / 54%	Aug. 09, 2017~Oct. 09, 2017
AC Conduction	CO01-CB	Howard Liu	24°C / 54%	Sep. 07, 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	Power Setting
QPSK	-
2403.35MHz	Default
2441.35MHz	Default
2477.35MHz	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	Normal Link

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	CTX
Operating Mode > 1GHz	CTX
The EUT was performed in X axis, Y axis and Z axis position. The worst case was found in Y axis, so it was selected to perform test and its test result was written in the report.	
1	CTX - EUT in Y axis

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	Smart phone	Samsung	Galaxy J2	DoC
2	Earphone	Sumsung	GH59-1129H	DoC
3	Device	WNC	SWA13	DoC
4	TX Fixture	N/A	N/A	N/A
5	RX Fixture	N/A	N/A	N/A

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

Support Equipment				
No.	Equipment	Brand Name	Model Name	FCC ID
1	NB	DELL	E4300	DoC
2	Test Fixture	WNC	48SWA19B.SGA	N/A

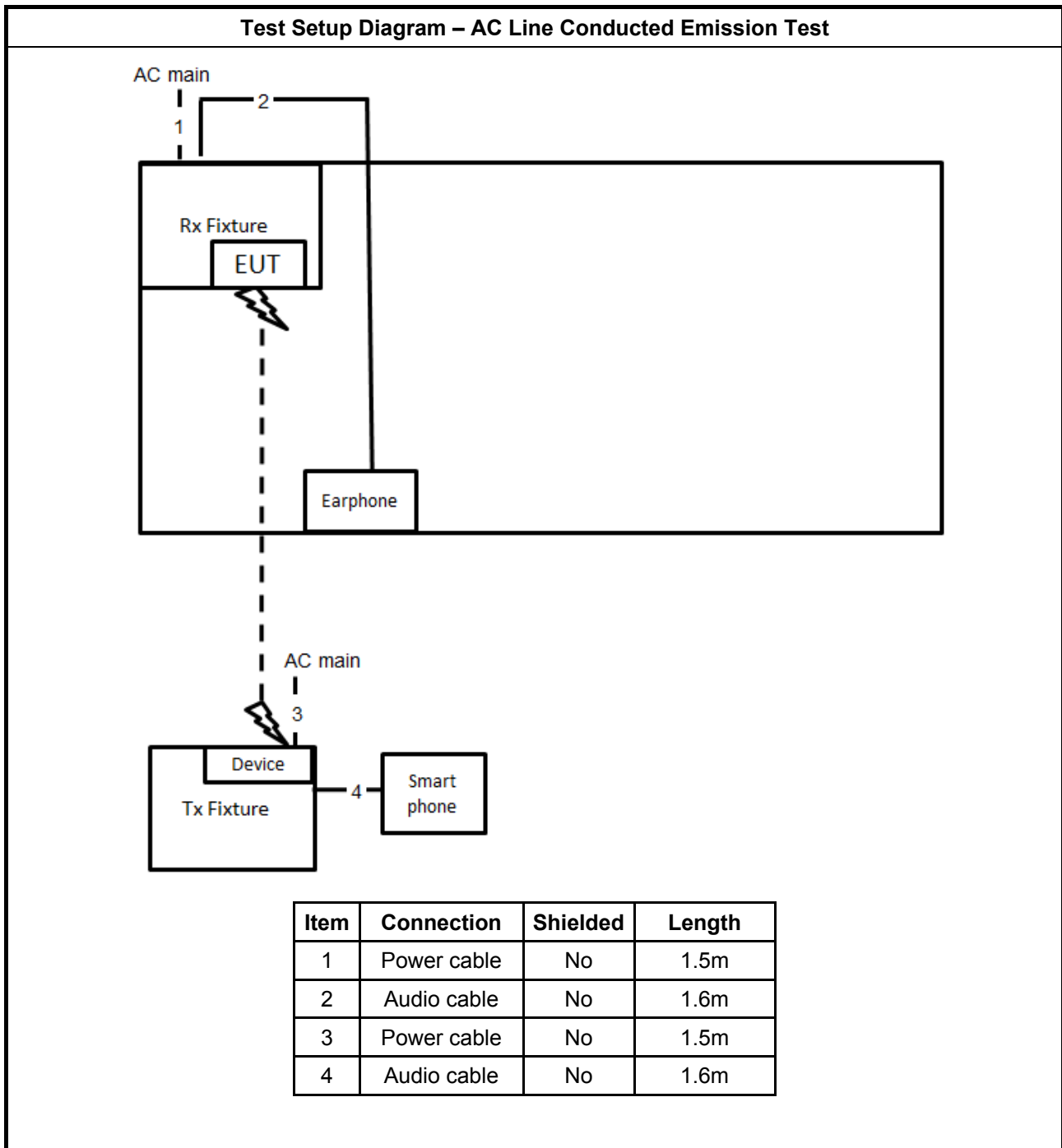
For Test Site No: 03CH01-CB (Above 1GHz)

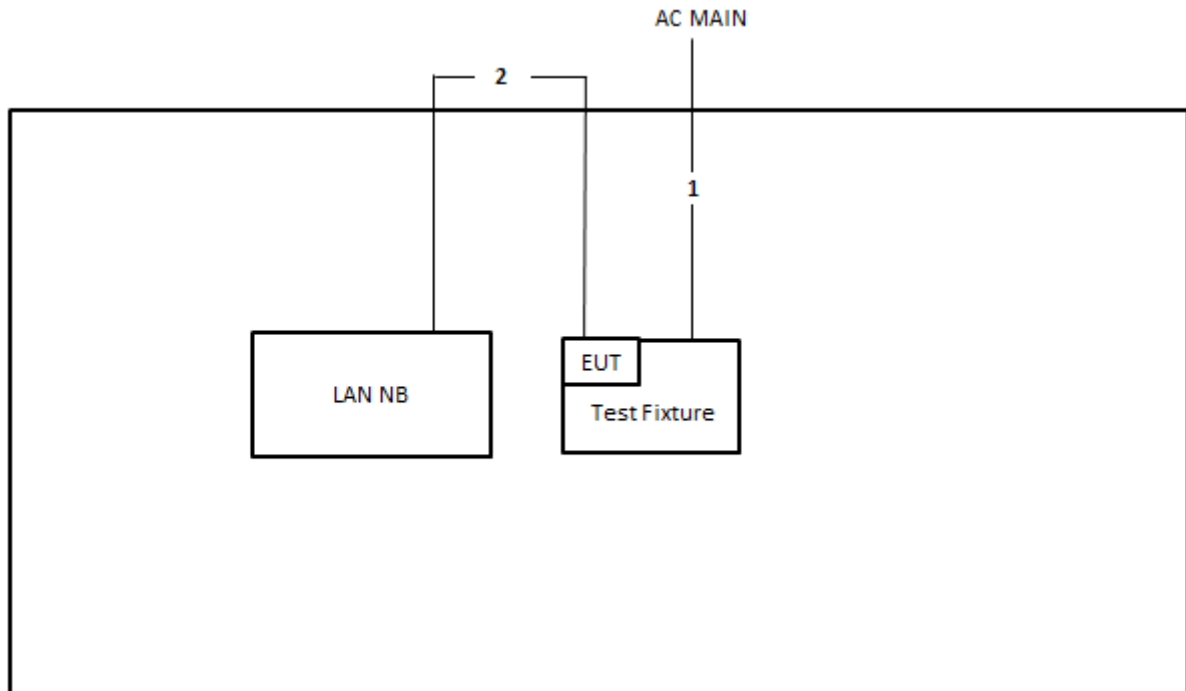
Support Equipment				
No.	Equipment	Brand Name	Model Name	FCC ID
1	Test Fixture	WNC	48SWA19B.SGA	N/A

For Test Site No: TH01-CB

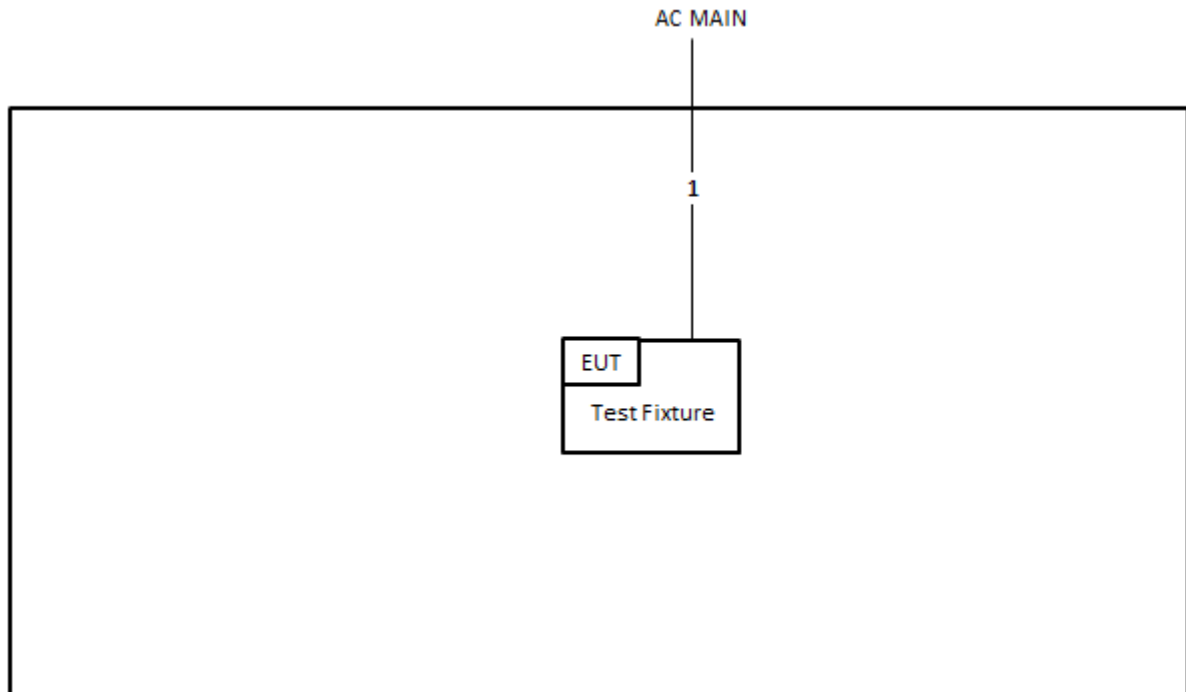
Support Equipment				
No.	Equipment	Brand Name	Model Name	FCC ID
1	NB	DELL	E4300	DoC
2	Test Fixture	WNC	48SWA19B.SGA	N/A

2.6 Test Setup Diagram



Test Setup Diagram - Radiated Test < 1GHz


Item	Connection	Shielded	Length
1	Power cable	No	1.5m
2	USB cable	Yes	1.5m

Test Setup Diagram - Radiated Test > 1GHz


Item	Connection	Shielded	Length
1	Power cable	No	1.5m

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.

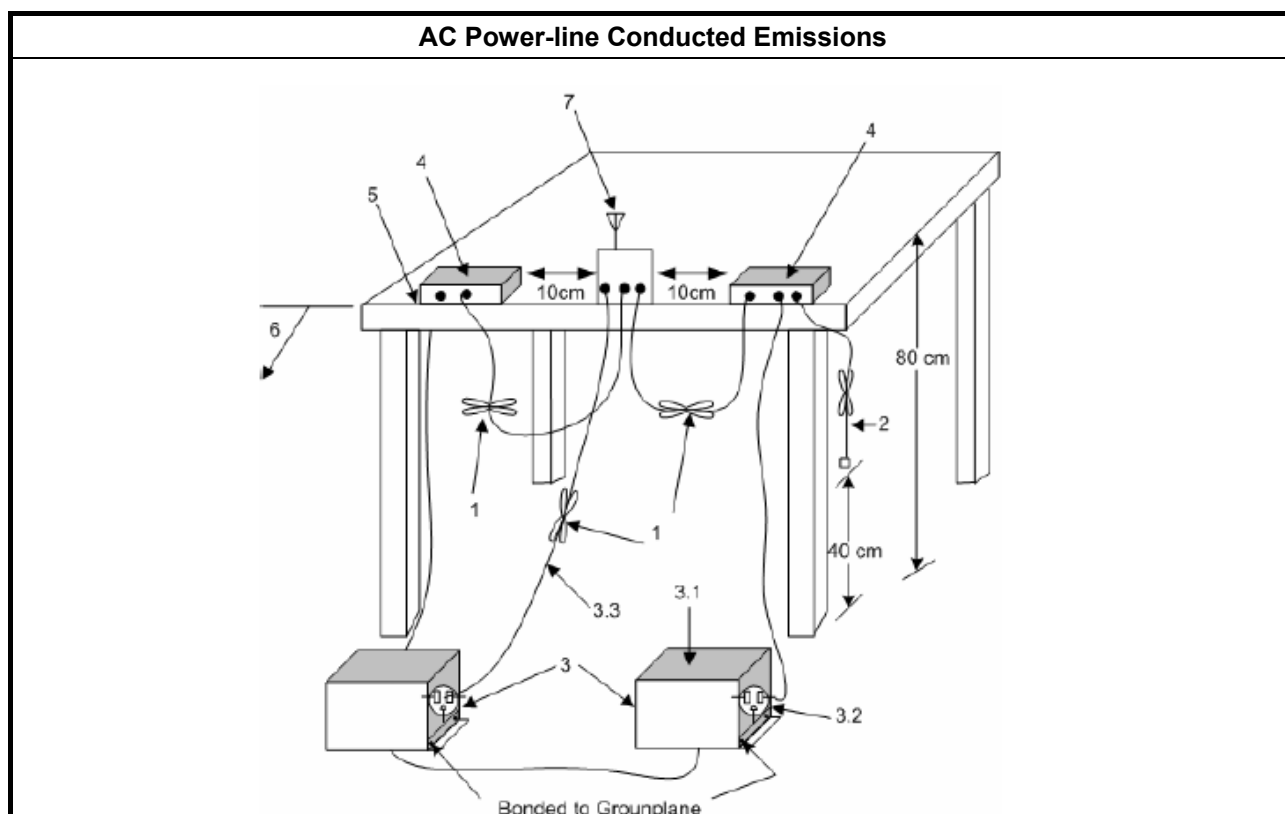
3.1.2 Measuring Instruments

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





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 $\geq$ 500 kHz.

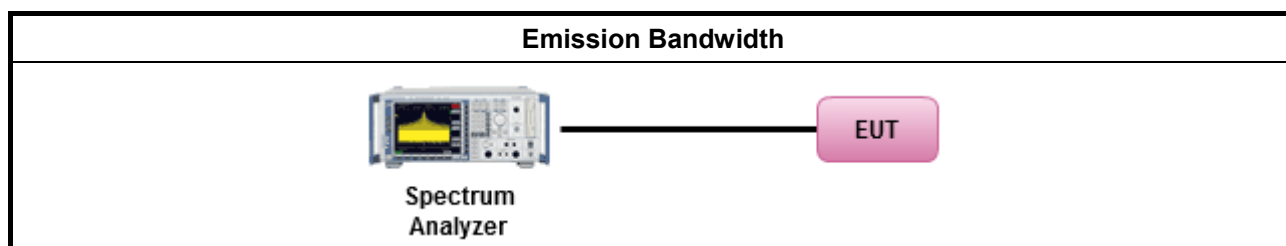
3.2.2 Measuring Instruments

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



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.	

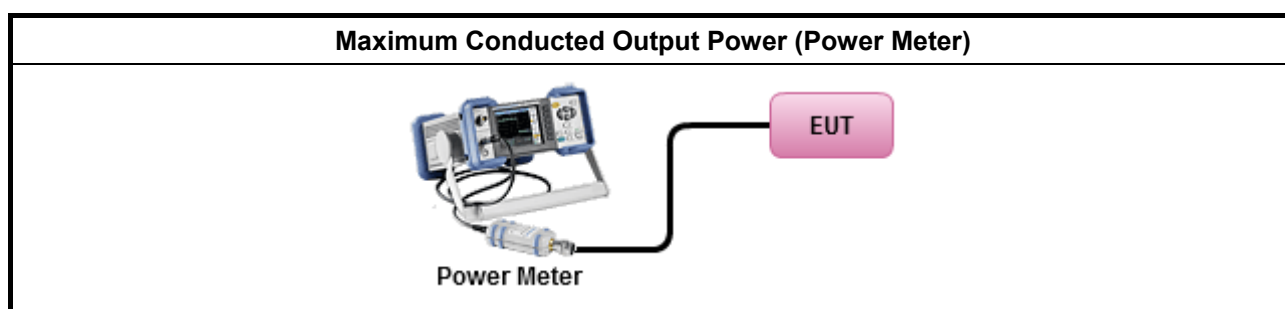
3.3.2 Measuring Instruments

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: $P_{total} = P_1 + P_2 + \dots + P_n$ (calculated in linear unit [mW] and transfer to log unit [dBm]) $EIRP_{total} = P_{total} + DG$	

3.3.4 Test Setup



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) $\leq$ 8 dBm/3kHz

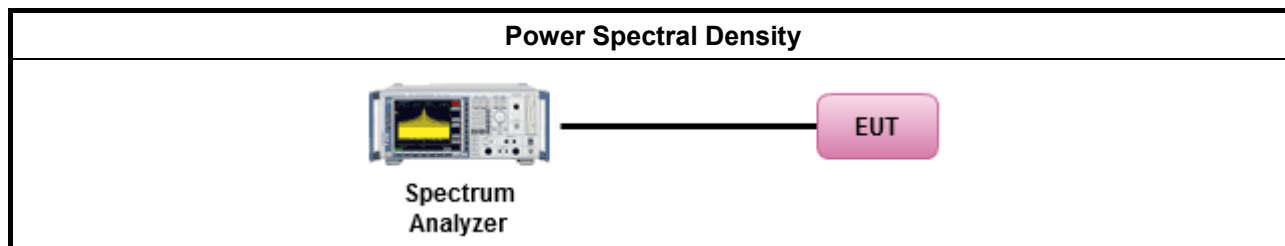
3.4.2 Measuring Instruments

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 $\geq$ 98% or external video / power trigger]
☐	Refer as FCC KDB 558074, clause 10.3 Method AVGPS-1 (spectral trace averaging).
☐	Refer as FCC KDB 558074, clause 10.4 Method AVGPS-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 AVGPS-1 Alt (spectral trace averaging).
☐	Refer as FCC KDB 558074, clause 10.6 Method AVGPS-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



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.	

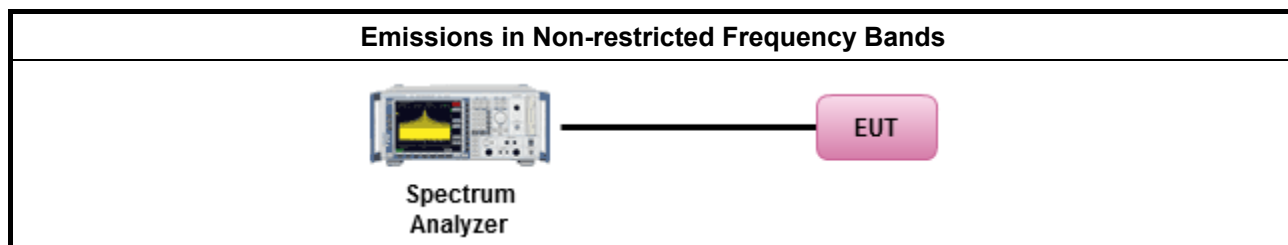
3.5.2 Measuring Instruments

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



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.

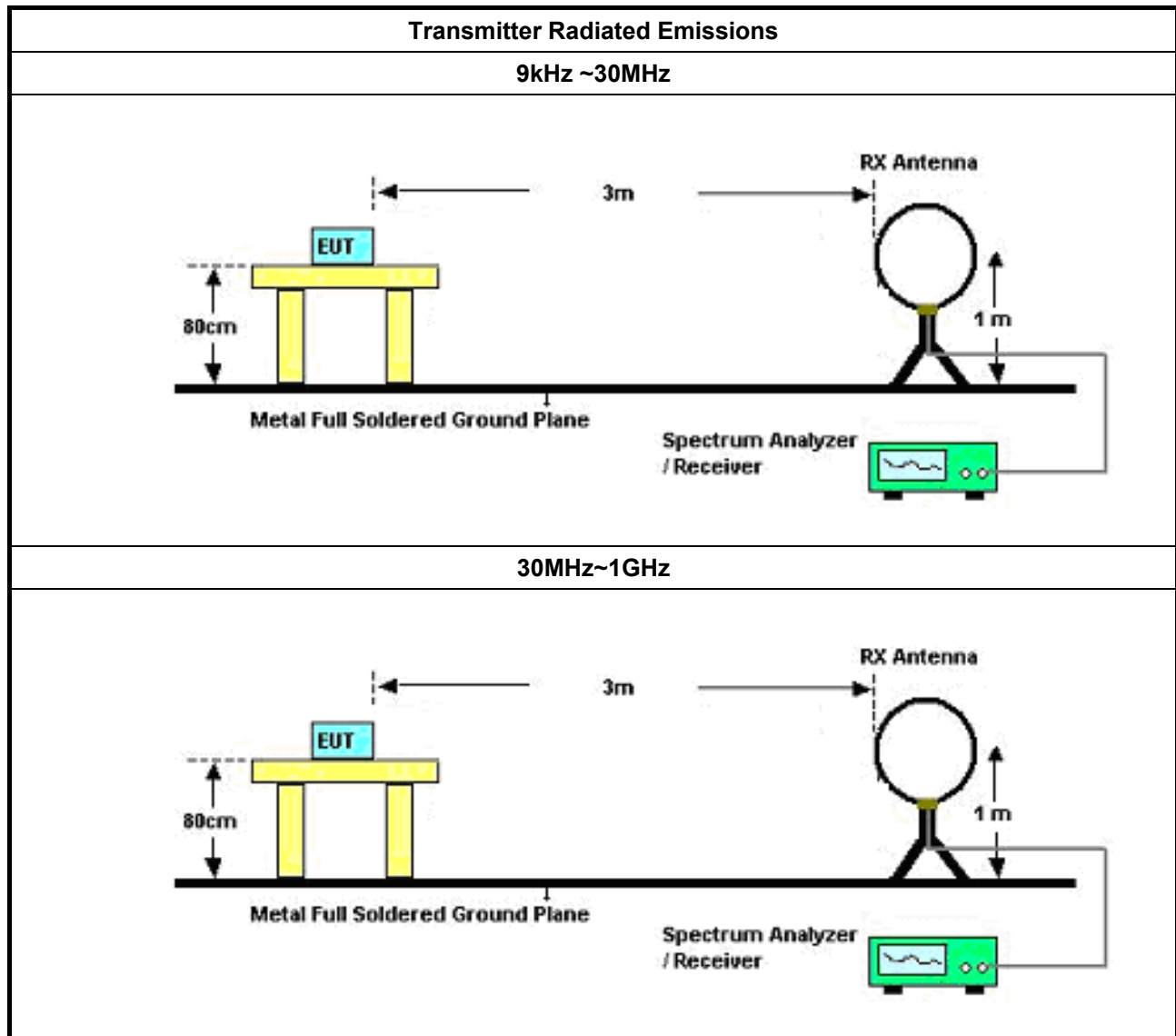
3.6.2 Measuring Instruments

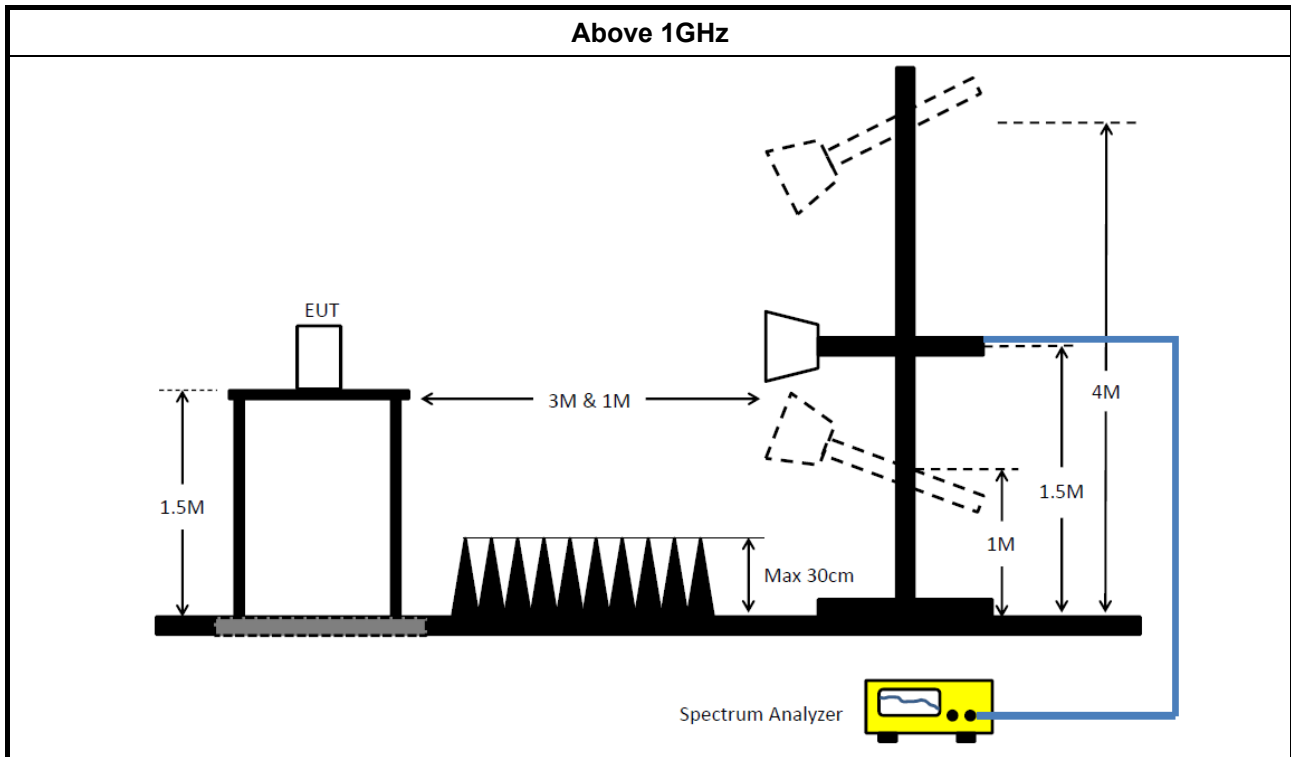
Refer a test equipment and calibration data table in this test report.

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 $\geq 98\%$)
	☐ 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 $\geq 1/T$).
	☐ Refer as ANSI C63.10, clause 4.2.3.2.3 (Reduced VBW). VBW $\geq 1/T$, 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





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-5 0-16-2	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, 2016	Aug. 29, 2017	Radiation (03CH01-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	BBHA91702 52	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)
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-I0-7	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)



FCC Test Report

Report No. : FR780429

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Calibration Due Date	Remark
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)
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)

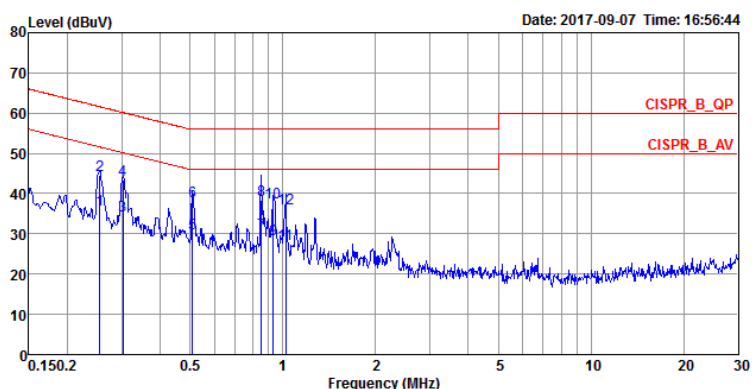
Note: Calibration Interval of instruments listed above is one year.

“*” Calibration Interval of instruments listed above is two years.

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

AC Power-line Conducted Emissions Result

Operating Mode	1	Power Phase	Neutral
Operating Function	Normal Link		



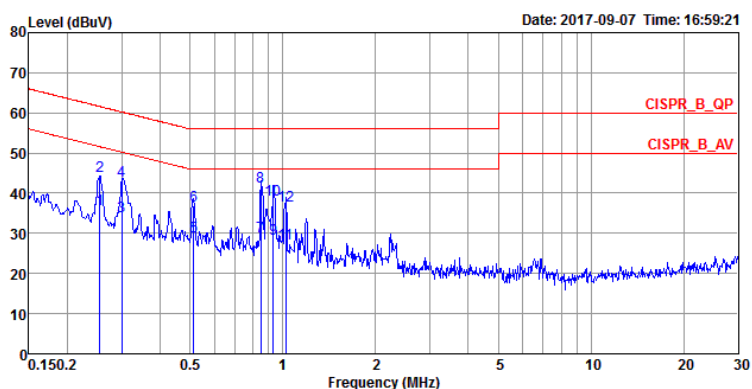
	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark	Pol/Phase
	MHz	dBuV	dB	dBuV	dBuV	dB	dB		
1	0.2548	36.13	-15.47	51.60	25.96	10.08	0.09	Average	NEUTRAL
2	0.2548	44.54	-17.06	61.60	34.37	10.08	0.09	QP	NEUTRAL
3	0.3035	34.46	-15.69	50.15	24.25	10.15	0.06	Average	NEUTRAL
4	0.3035	43.44	-16.71	60.15	33.23	10.15	0.06	QP	NEUTRAL
5	0.5101	30.05	-15.95	46.00	19.77	10.22	0.06	Average	NEUTRAL
6	0.5101	38.07	-17.93	56.00	27.79	10.22	0.06	QP	NEUTRAL
7	0.8528	30.11	-15.89	46.00	19.85	10.10	0.16	Average	NEUTRAL
8	0.8528	38.45	-17.55	56.00	28.19	10.10	0.16	QP	NEUTRAL
9	0.9331	28.66	-17.34	46.00	18.41	10.07	0.18	Average	NEUTRAL
10	0.9331	37.72	-18.28	56.00	27.47	10.07	0.18	QP	NEUTRAL
11	1.0211	27.41	-18.59	46.00	17.17	10.05	0.19	Average	NEUTRAL
12	1.0211	36.34	-19.66	56.00	26.10	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	1	Power Phase	Line
Operating Function	Normal Link		



	Freq	Level	Over	Limit	Read	LISN	Cable	Remark	Pol/Phase
	MHz	dBuV	Limit	Line	Level	Factor	Loss		
			dB	dBuV	dBuV	dB	dB		
1	0.2548	35.96	-15.64	51.60	25.95	9.92	0.09	Average	LINE
2	0.2548	44.32	-17.28	61.60	34.31	9.92	0.09	QP	LINE
3	0.3003	34.34	-15.90	50.24	24.35	9.93	0.06	Average	LINE
4	0.3003	42.97	-17.27	60.24	32.98	9.93	0.06	QP	LINE
5	0.5128	29.26	-16.74	46.00	19.25	9.95	0.06	Average	LINE
6	0.5128	36.94	-19.06	56.00	26.93	9.95	0.06	QP	LINE
7	0.8483	29.33	-16.67	46.00	19.21	9.96	0.16	Average	LINE
8	0.8483	41.49	-14.51	56.00	31.37	9.96	0.16	QP	LINE
9	0.9331	28.62	-17.38	46.00	18.48	9.96	0.18	Average	LINE
10	0.9331	38.26	-17.74	56.00	28.12	9.96	0.18	QP	LINE
11	1.0211	27.56	-18.44	46.00	17.41	9.96	0.19	Average	LINE
12	1.0211	37.04	-18.96	56.00	26.89	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.)

Summary

Mode	Max-N dB (Hz)	Max-OBW (Hz)	ITU-Code	Min-N dB (Hz)	Min-OBW (Hz)
QPSK	-	-	-	-	-
2.4-2.4835GHz	1.653M	1.939M	1M94G7D	1.59M	1.919M

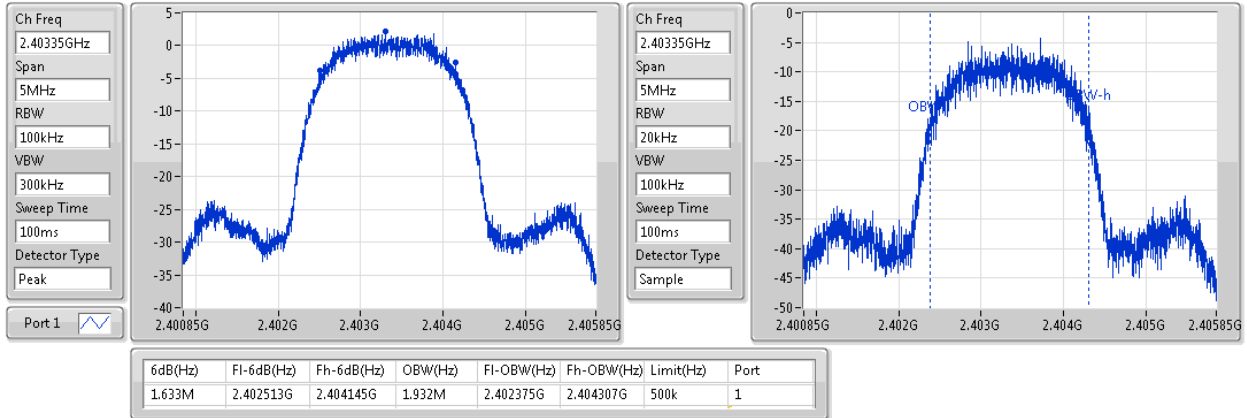
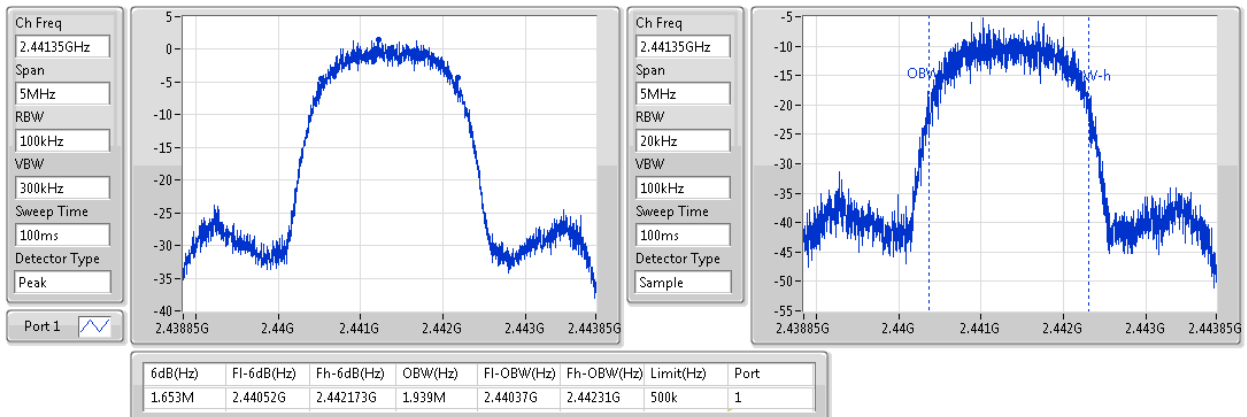
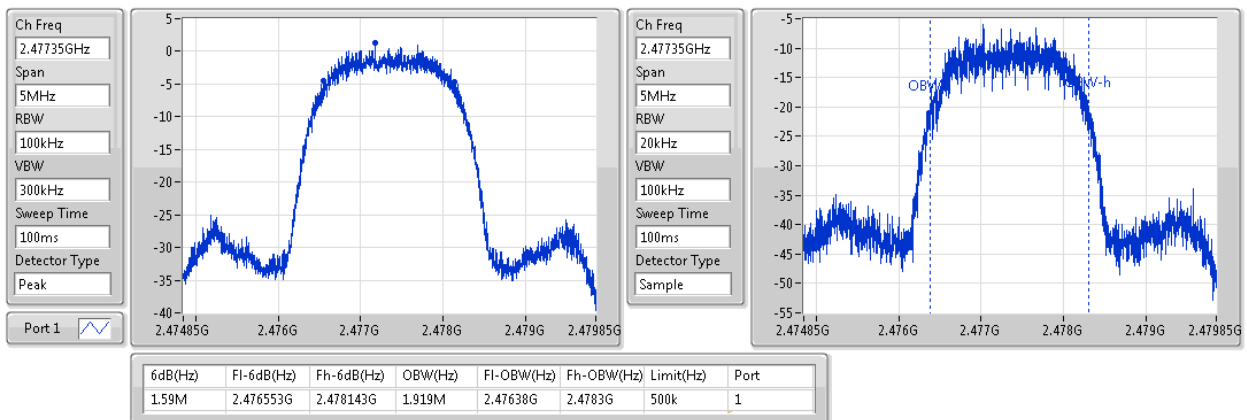
Max-N dB = Maximum 6dB down bandwidth; **Max-OBW** = Maximum 99% occupied bandwidth;

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)
QPSK	-	-	-	-
2403.35MHz	Pass	500k	1.633M	1.932M
2441.35MHz	Pass	500k	1.653M	1.939M
2477.35MHz	Pass	500k	1.59M	1.919M

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

QPSK
EBW
2403.35MHz

QPSK
EBW
2441.35MHz

QPSK
EBW
2477.35MHz


Summary

Mode	Power	Power
	(dBm)	(W)
QPSK	-	-
2.4-2.4835GHz	7.33	0.00541

Result

Mode	Result	Gain (dBi)	Power (dBm)	Power Limit (dBm)
QPSK	-	-	-	-
2403.35MHz	Pass	-1.61	7.33	30.00
2441.35MHz	Pass	-1.61	6.45	30.00
2477.35MHz	Pass	-1.61	5.98	30.00

Summary

Mode	PD (dBm/RBW)
QPSK	-
2.4-2.4835GHz	-13.26

RBW=3kHz.

Result

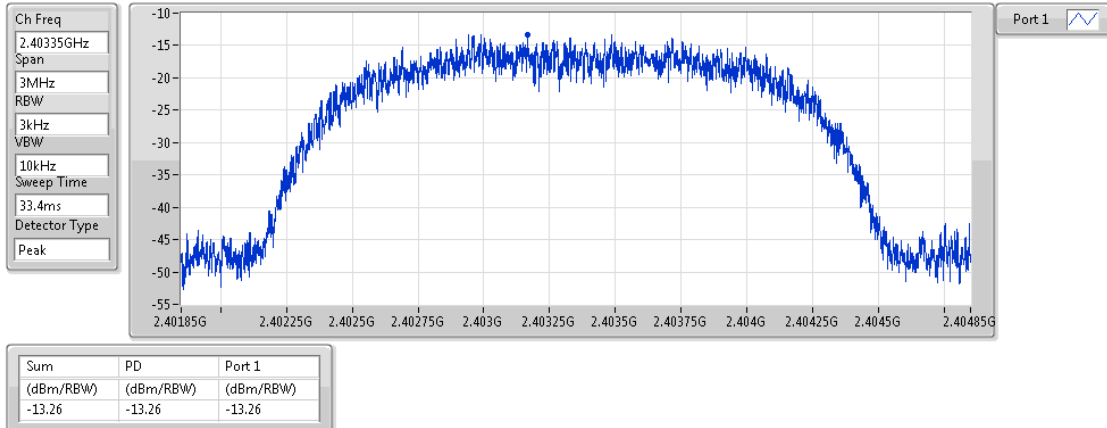
Mode	Result	Gain (dBi)	PD (dBm/RBW)	PD Limit (dBm/RBW)
QPSK	-	-	-	-
2403.35MHz	Pass	-1.61	-13.26	8.00
2441.35MHz	Pass	-1.61	-13.27	8.00
2477.35MHz	Pass	-1.61	-13.85	8.00

RBW=3kHz.

QPSK

PSD

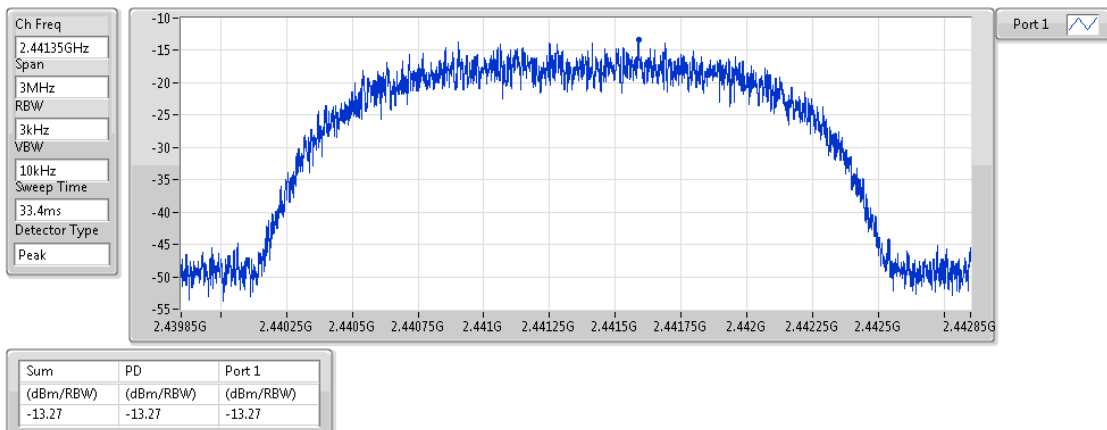
2403.35MHz



QPSK

PSD

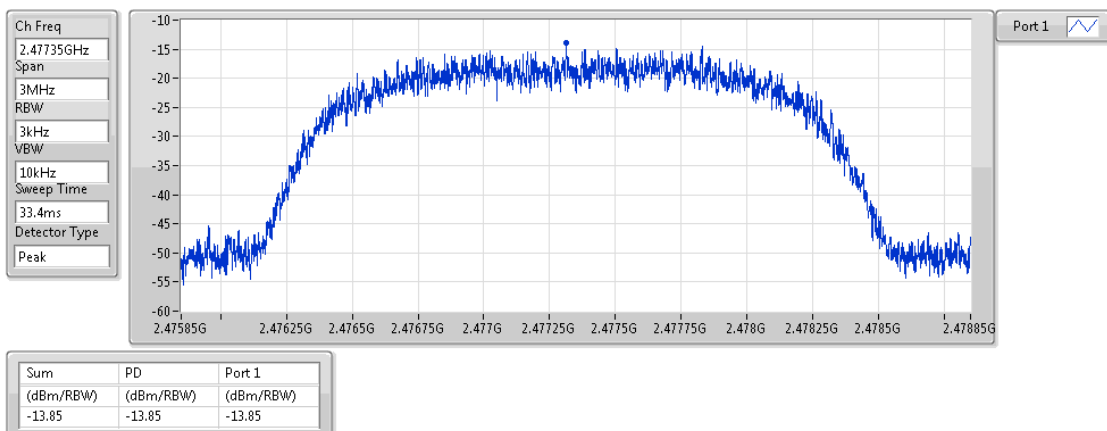
2441.35MHz



QPSK

PSD

2477.35MHz



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
QPSK	-	-	-	-	-	-	-	-	-	-	-	-	-
2.4-2.4835GHz	Pass	2.403507G	0.26	-29.74	2.396G	-47.97	2.397896G	-35.06	2.48646G	-59.38	7.209497G	-48.66	1

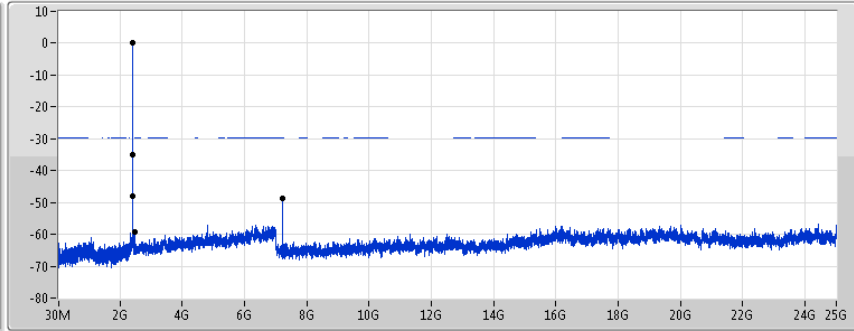
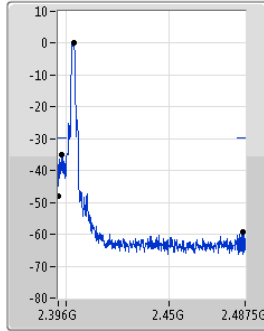
Result

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
QPSK	-	-	-	-	-	-	-	-	-	-	-	-	-
2403.35MHz	Pass	2.403507G	0.26	-29.74	2.396G	-47.97	2.397896G	-35.06	2.48646G	-59.38	7.209497G	-48.66	1
2441.35MHz	Pass	2.403507G	0.26	-29.74	47.745M	-60.70	2.397072G	-59.40	2.483732G	-59.87	6.362464G	-56.75	1
2477.35MHz	Pass	2.403507G	0.26	-29.74	2.393634G	-60.28	2.397456G	-57.84	2.484084G	-46.11	6.469398G	-56.84	1

QPSK

CSE NdB

2403.35MHz

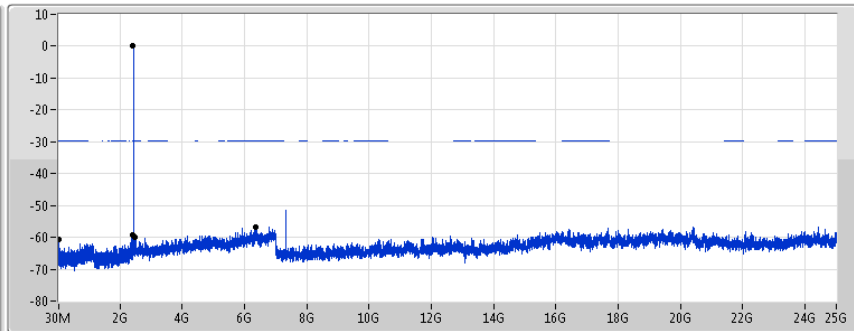
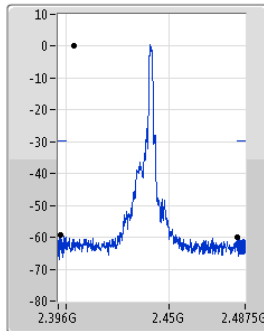


Ref(Hz)	Ref(dBm)	Limit(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Port
2.403507G	0.26	-29.74	2.396G	-47.97	2.397896G	-35.06	2.48646G	-59.38	7.209497G	-48.66	1

QPSK

CSE NdB

2441.35MHz

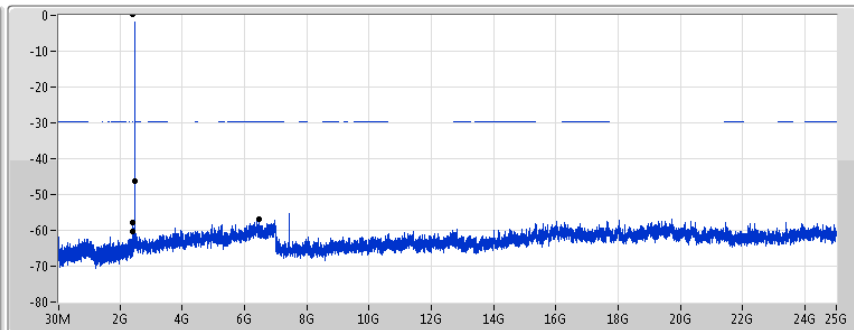
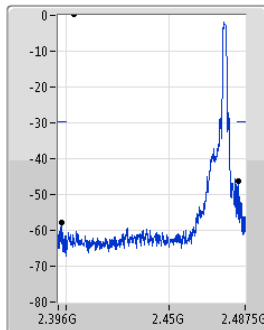


Ref(Hz)	Ref(dBm)	Limit(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Port
2.403507G	0.26	-29.74	47.745M	-60.70	2.397072G	-59.40	2.483732G	-59.87	6.362464G	-56.75	1

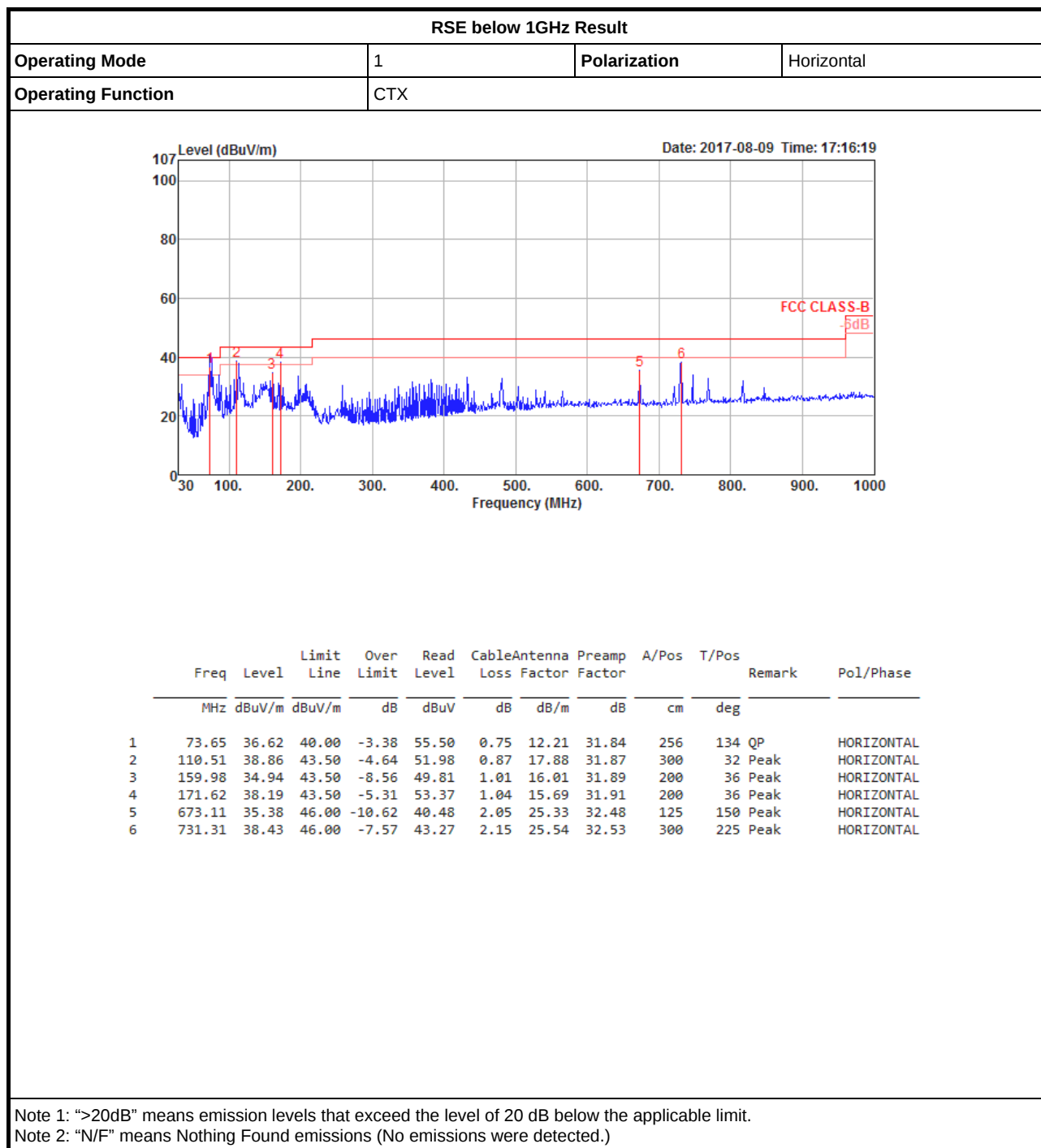
QPSK

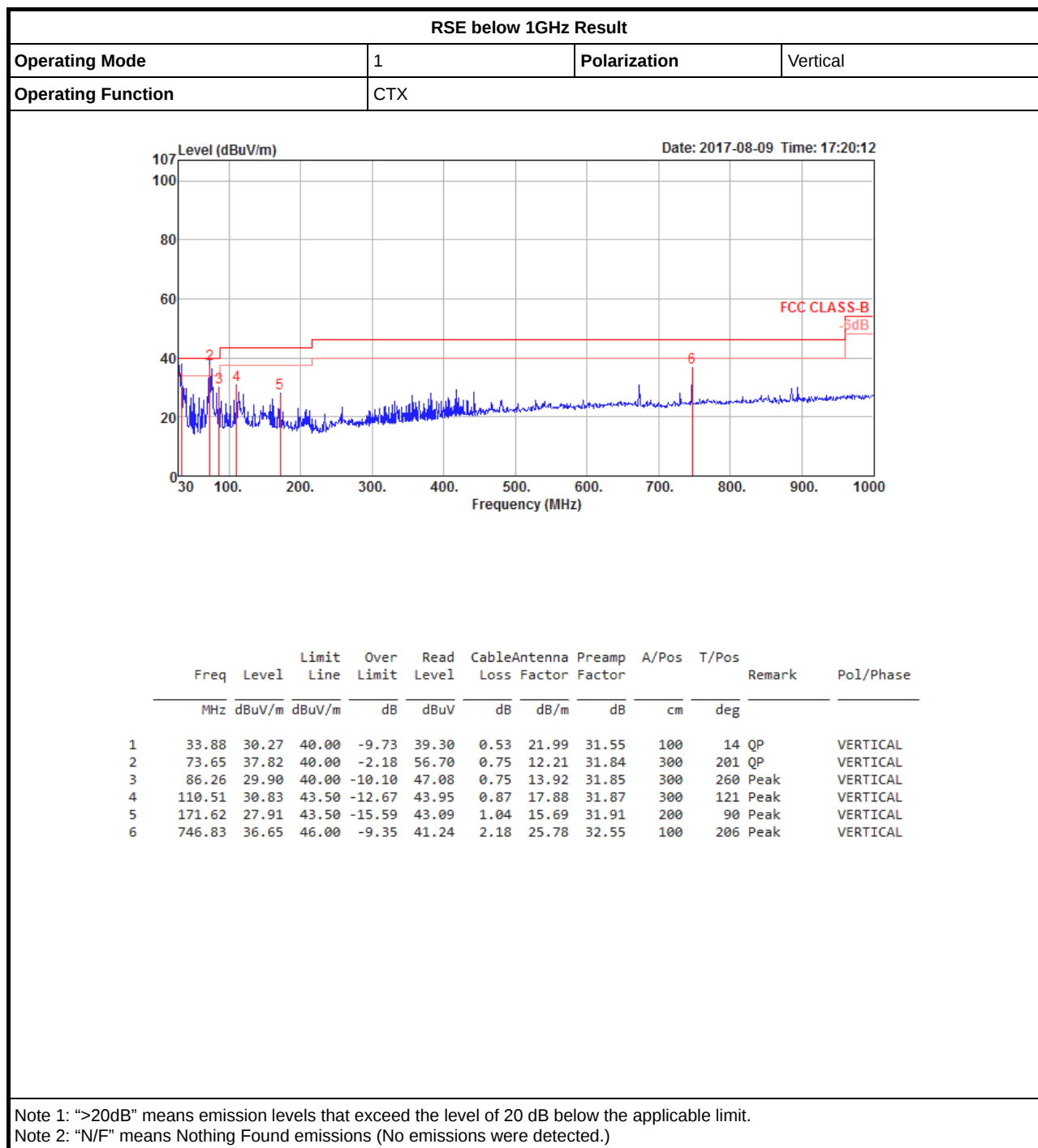
CSE NdB

2477.35MHz



Ref(Hz)	Ref(dBm)	Limit(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Port
2.403507G	0.26	-29.74	2.393634G	-60.28	2.397456G	-57.84	2.484084G	-46.11	6.469398G	-56.84	1







RSE TX above 1GHz Result

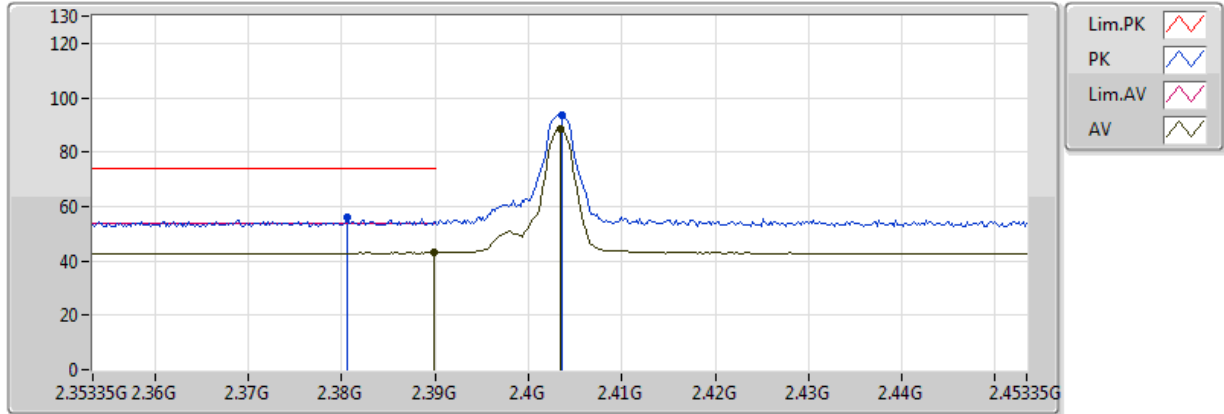
Appendix F.2

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
QPSK_Nss1_1TX	-	-	-	-	-	-	-	-	-	-	-	-
2.4-2.4835GHz	Pass	AV	7.32405G	50.94	54.00	-3.06	3.57	3	H	241	2.09	-

QPSK_Nss1_1TX

2403.35MHz_TX

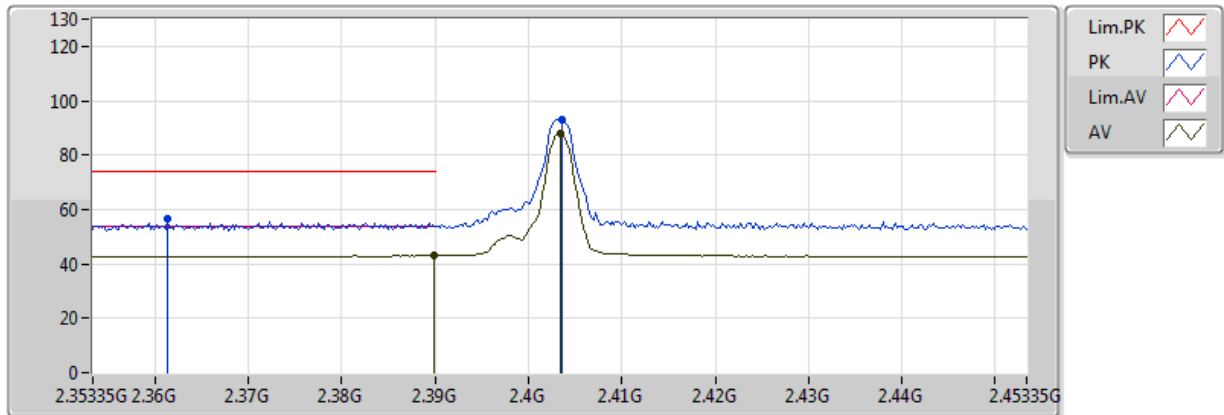


20170817
EUT Y_1TX_ANT1
Setting Default
01-J-4
FSP(100056)

Type	Freq(Hz)	Level(dBuV/m)	Limit(dBuV/m)	Margin(dB)	Factor(dB)	Dist(m)	Pol.(H/V)	Azimuth(°)	Height(m)	Comments
AV	2.38995G	42.96	54.00	-11.04	31.04	3	V	257	1.29	-
AV	2.40335G	88.45	Inf	-Inf	31.02	3	V	257	1.29	-
PK	2.38055G	56.08	74.00	-17.92	31.05	3	V	257	1.29	-
PK	2.40355G	93.54	Inf	-Inf	31.02	3	V	257	1.29	-

QPSK_Nss1_1TX

2403.35MHz_TX

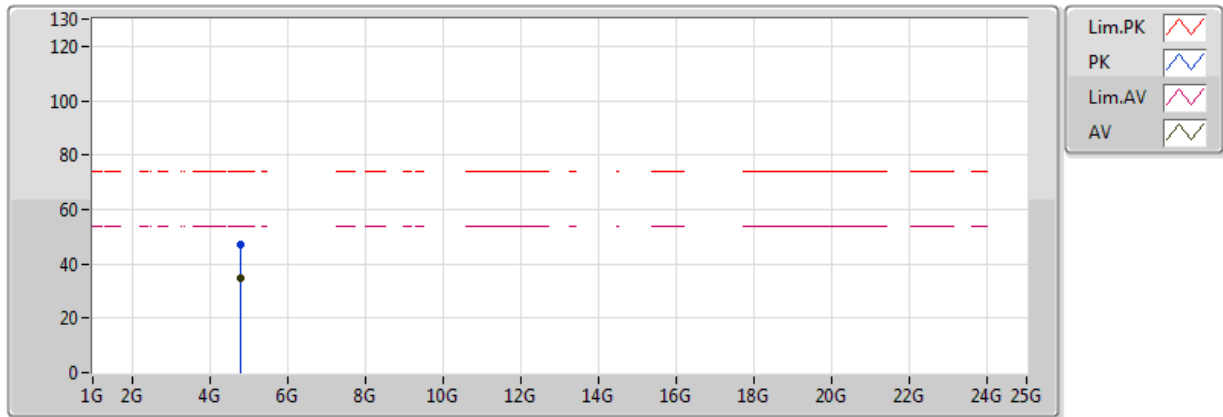


20170817
EUT Y_1TX_ANT1
Setting Default
01-J-4
FSP(100056)

Type	Freq(Hz)	Level(dBuV/m)	Limit(dBuV/m)	Margin(dB)	Factor(dB)	Dist(m)	Pol.(H/V)	Azimuth(°)	Height(m)	Comments
AV	2.38995G	43.02	54.00	-10.98	31.04	3	H	45	2.39	-
AV	2.40335G	88.14	Inf	-Inf	31.02	3	H	45	2.39	-
PK	2.36135G	56.36	74.00	-17.64	31.08	3	H	45	2.39	-
PK	2.40355G	93.17	Inf	-Inf	31.02	3	H	45	2.39	-

QPSK_Nss1_1TX

2403.35MHz_TX

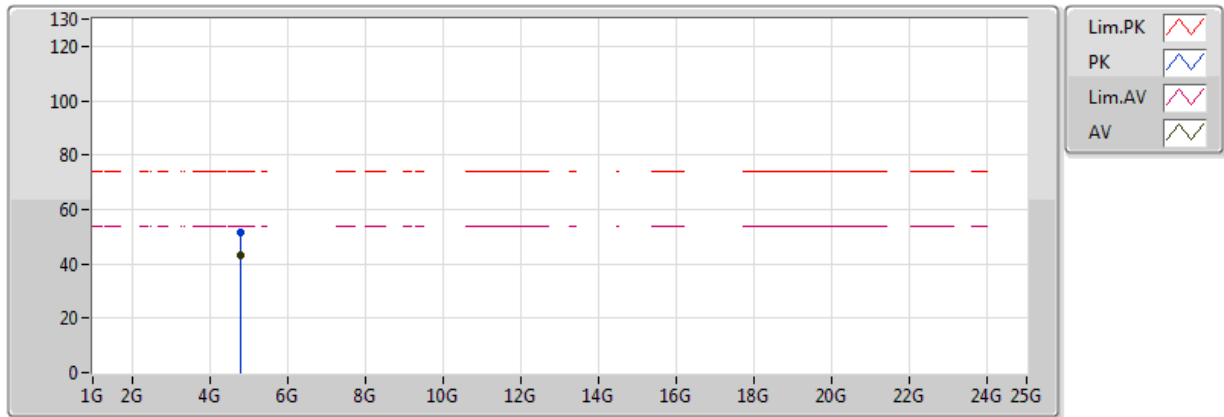


20170817
EUT Y_1TX_ANT1
Setting Default
01-J-4
FSP(100056)

Type	Freq(Hz)	Level(dBuV/m)	Limit(dBuV/m)	Margin(dB)	Factor(dB)	Dist(m)	Pol.(H/V)	Azimuth(°)	Height(m)	Comments
AV	4.80396G	34.60	54.00	-19.40	3.34	3	V	135	1.24	-
PK	4.80684G	47.04	74.00	-26.96	3.35	3	V	135	1.24	-

QPSK_Nss1_1TX

2403.35MHz_TX

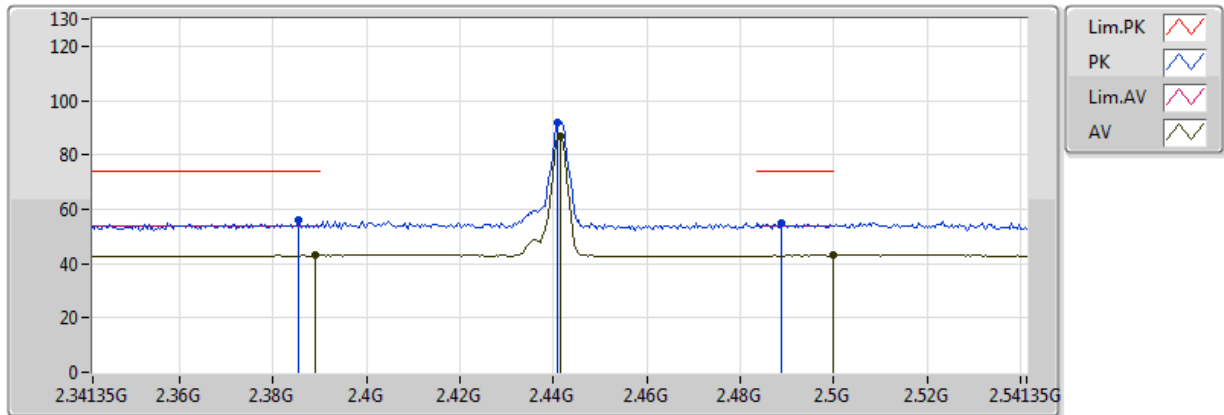


20170817
EUT Y_1TX_ANT1
Setting Default
01-J-4
FSP(100056)

Type	Freq(Hz)	Level(dBuV/m)	Limit(dBuV/m)	Margin(dB)	Factor(dB)	Dist(m)	Pol.(H/V)	Azimuth(°)	Height(m)	Comments
AV	4.80396G	43.01	54.00	-10.99	3.34	3	H	243	1.98	-
PK	4.80702G	51.34	74.00	-22.66	3.35	3	H	243	1.98	-

QPSK_Nss1_1TX

2441.35MHz_TX

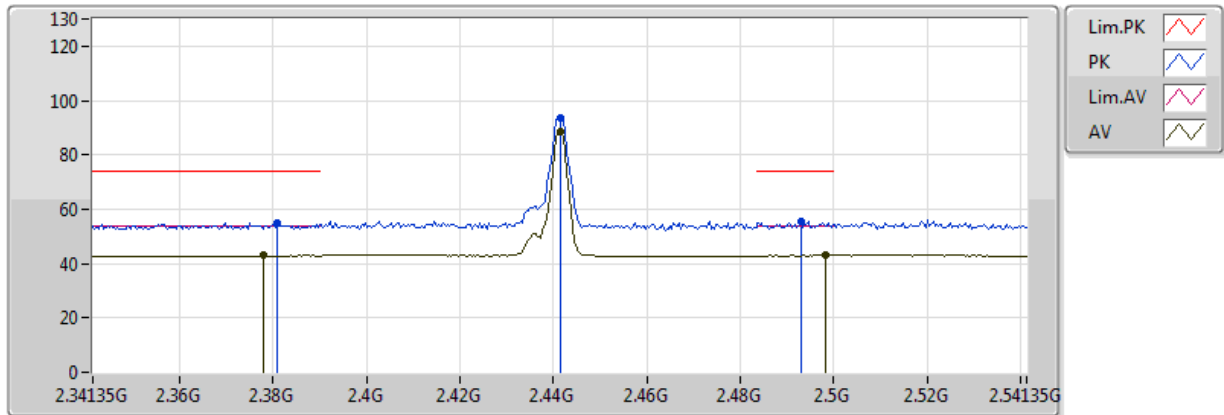


20170817
EUT Y_1TX_ANT1
Setting Default
01-J-4
FSP(100056)

Type	Freq(Hz)	Level(dBuV/m)	Limit(dBuV/m)	Margin(dB)	Factor(dB)	Dist(m)	Pol.(H/V)	Azimuth(°)	Height(m)	Comments
AV	2.38895G	42.91	54.00	-11.09	31.04	3	V	265	1.50	-
AV	2.44135G	86.86	Inf	-Inf	30.97	3	V	265	1.50	-
AV	2.499998G	43.05	54.00	-10.95	30.90	3	V	265	1.50	-
PK	2.38535G	55.95	74.00	-18.05	31.04	3	V	265	1.50	-
PK	2.44095G	91.90	Inf	-Inf	30.97	3	V	265	1.50	-
PK	2.48895G	54.95	74.00	-19.05	30.91	3	V	265	1.50	-

QPSK_Nss1_1TX

2441.35MHz_TX

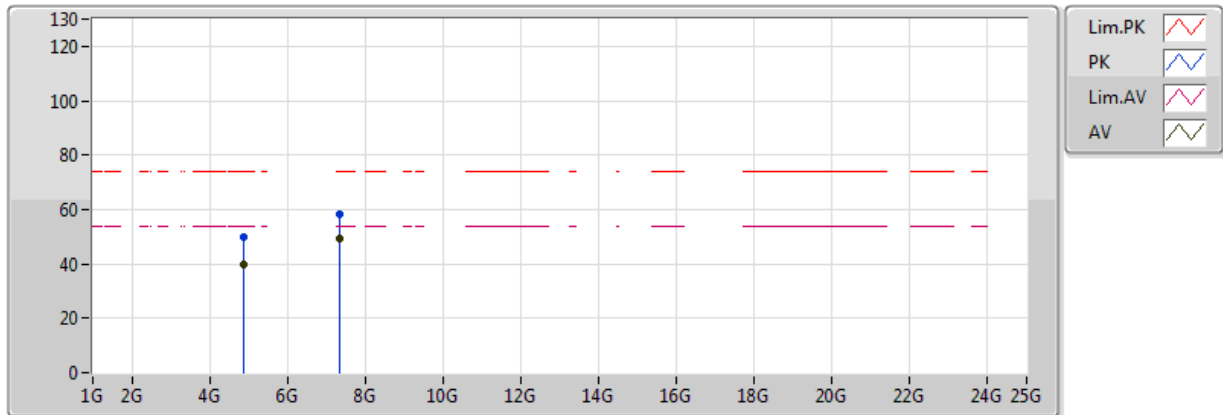


20170817
EUT Y_1TX_ANT1
Setting Default
01-J-4
FSP(100056)

Type	Freq(Hz)	Level(dBuV/m)	Limit(dBuV/m)	Margin(dB)	Factor(dB)	Dist(m)	Pol.(H/V)	Azimuth(°)	Height(m)	Comments
AV	2.37775G	42.92	54.00	-11.08	31.05	3	H	45	2.60	-
AV	2.44135G	88.74	Inf	-Inf	30.97	3	H	45	2.60	-
AV	2.49815G	42.98	54.00	-11.02	30.90	3	H	45	2.60	-
PK	2.38095G	54.84	74.00	-19.16	31.05	3	H	45	2.60	-
PK	2.44135G	93.79	Inf	-Inf	30.97	3	H	45	2.60	-
PK	2.49295G	55.47	74.00	-18.53	30.91	3	H	45	2.60	-

QPSK_Nss1_1TX

2441.35MHz_TX

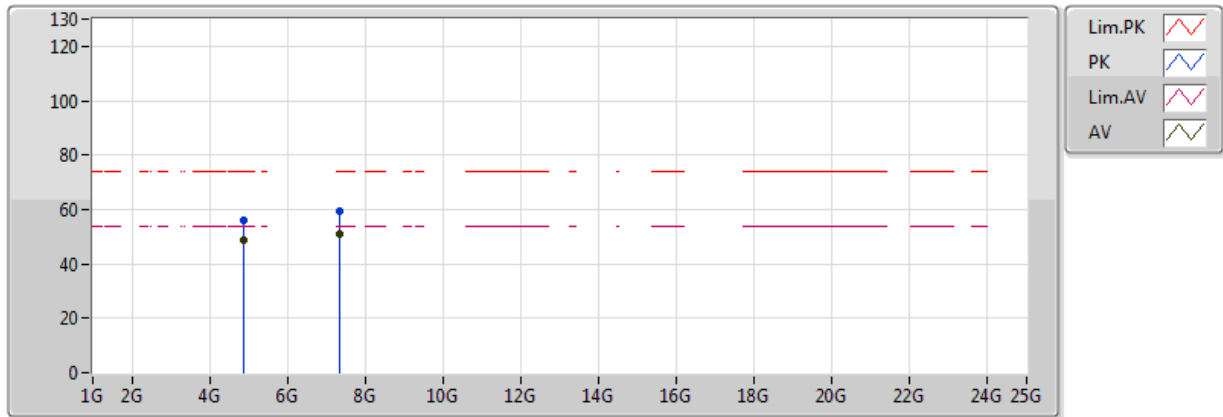


20170817
EUT Y_1TX_ANT1
Setting Default
01-J-4
FSP(100056)

Type	Freq(Hz)	Level(dBuV/m)	Limit(dBuV/m)	Margin(dB)	Factor(dB)	Dist(m)	Pol.(H/V)	Azimuth(°)	Height(m)	Comments
AV	4.87996G	39.60	54.00	-14.40	3.57	3	V	139	1.31	-
AV	7.32401G	49.47	54.00	-4.53	8.78	3	V	291	1.50	-
PK	4.88186G	49.69	74.00	-24.31	3.58	3	V	139	1.31	-
PK	7.32459G	58.18	74.00	-15.82	8.78	3	V	291	1.50	-

QPSK_Nss1_1TX

2441.35MHz_TX

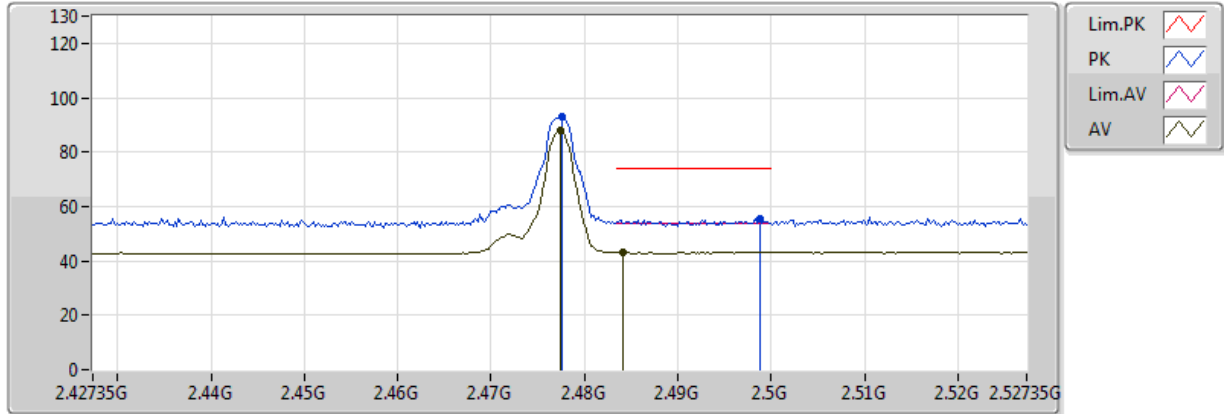


20170817
EUT Y_1TX_ANT1
Setting Default
01-J-4
FSP(100056)

Type	Freq(Hz)	Level(dBuV/m)	Limit(dBuV/m)	Margin(dB)	Factor(dB)	Dist(m)	Pol.(H/V)	Azimuth(°)	Height(m)	Comments
AV	4.87998G	48.95	54.00	-5.05	3.57	3	H	241	2.09	-
AV	7.32405G	50.94	54.00	-3.06	8.78	3	H	187	2.99	-
PK	4.88228G	55.84	74.00	-18.16	3.58	3	H	241	2.09	-
PK	7.32459G	59.48	74.00	-14.52	8.78	3	H	187	2.99	-

QPSK_Nss1_1TX

2477.35MHz_TX

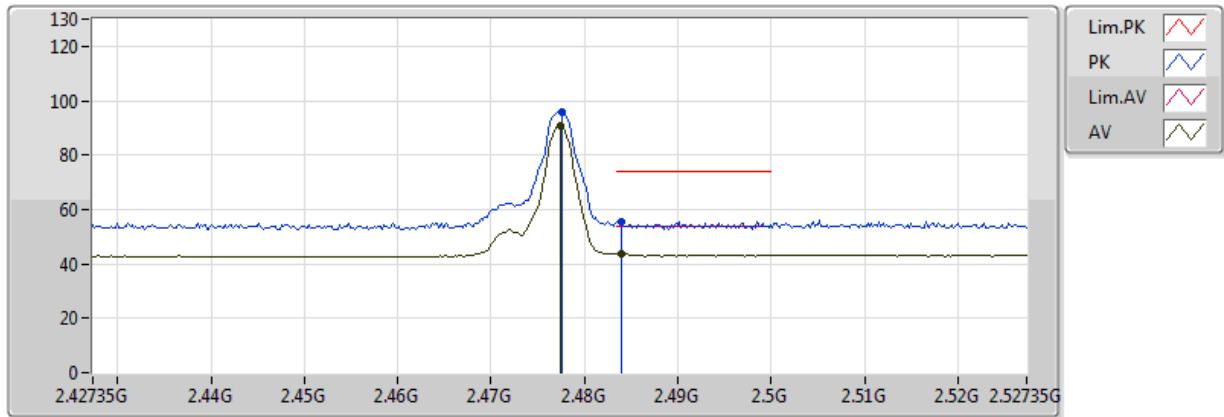


20170817
EUT Y_1TX_ANT1
Setting Default
01-J-4
FSP(100056)

Type	Freq(Hz)	Level(dBuV/m)	Limit(dBuV/m)	Margin(dB)	Factor(dB)	Dist(m)	Pol.(H/V)	Azimuth(°)	Height(m)	Comments
AV	2.47735G	87.76	Inf	-Inf	30.93	3	V	267	1.29	-
AV	2.48415G	43.32	54.00	-10.68	30.92	3	V	267	1.29	-
PK	2.47755G	92.78	Inf	-Inf	30.93	3	V	267	1.29	-
PK	2.49875G	55.64	74.00	-18.36	30.90	3	V	267	1.29	-

QPSK_Nss1_1TX

2477.35MHz_TX

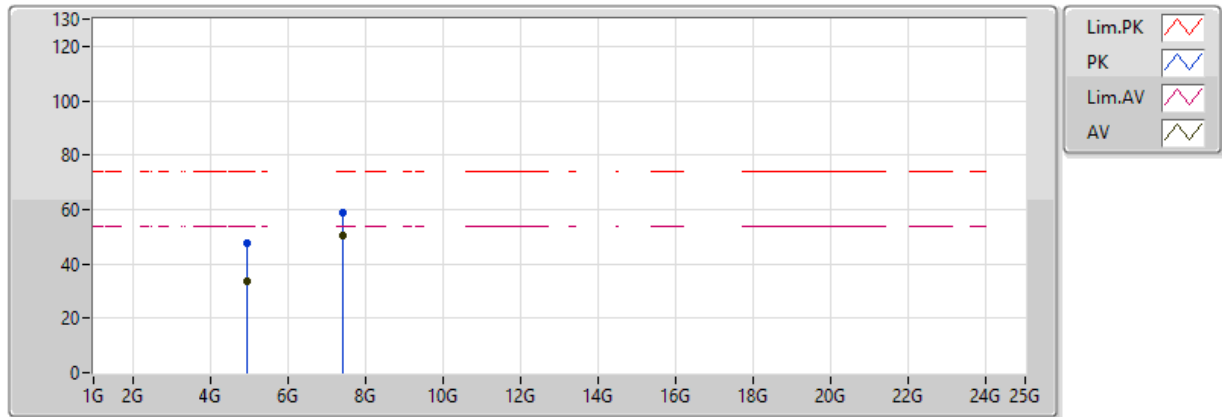


20170817
EUT Y_1TX_ANT1
Setting Default
01-J-4
FSP(100056)

Type	Freq(Hz)	Level(dBuV/m)	Limit(dBuV/m)	Margin(dB)	Factor(dB)	Dist(m)	Pol.(H/V)	Azimuth(°)	Height(m)	Comments
AV	2.47735G	90.67	Inf	-Inf	30.93	3	H	61	2.05	-
AV	2.48395G	43.88	54.00	-10.12	30.92	3	H	61	2.05	-
PK	2.47755G	95.69	Inf	-Inf	30.93	3	H	61	2.05	-
PK	2.48395G	55.54	74.00	-18.46	30.92	3	H	61	2.05	-

QPSK_Nss1_1TX

2477.35MHz_TX

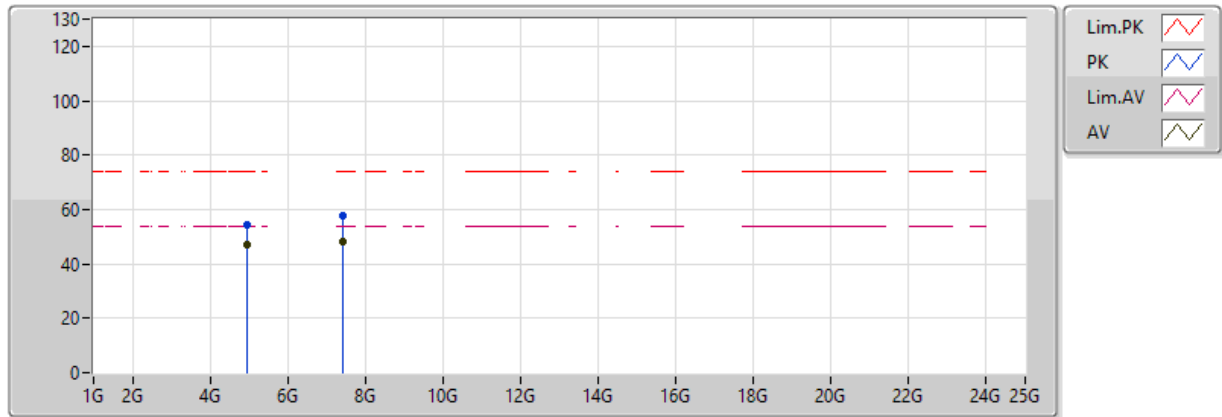


EUT Y_1TX_ANT1
Setting Default
J-4
FSP(100056)

Type	Freq(Hz)	Level(dBuV/m)	Limit(dBuV/m)	Margin(dB)	Factor(dB)	Dist(m)	Pol.(H/V)	Azimuth(°)	Height(m)	Comments
AV	4.95468G	32.56	54.00	-18.74	4.59	3	V	135	2.91	-
AV	7.43203G	50.52	54.00	-3.48	9.00	3	V	260	1.52	-
PK	4.954828G	48.10	74.00	-25.90	4.59	3	V	135	2.91	-
PK	7.43151G	59.05	74.00	-14.95	9.00	3	V	260	1.52	-

QPSK_Nss1_1TX

2477.35MHz_TX



EUT Y_1TX_ANT1
Setting Default
J-4
FSP(100056)

Type	Freq(Hz)	Level(dBuV/m)	Limit(dBuV/m)	Margin(dB)	Factor(dB)	Dist(m)	Pol.(H/V)	Azimuth(°)	Height(m)	Comments
AV	4.9547G	46.81	54.00	-7.19	4.59	3	H	261	2.03	-
AV	7.43205G	48.45	54.00	-5.55	9.00	3	H	63	1.87	-
PK	4.95434G	54.20	74.00	-19.80	4.59	3	H	261	2.03	-
PK	7.43267G	57.98	74.00	-16.02	9.01	3	H	63	1.87	-