



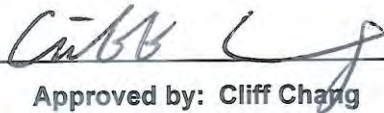
# FCC RADIO TEST REPORT

FCC ID : RAXWN8122B  
Equipment : Wi-Fi MODU  
Brand Name : Arcadyan  
Model Name : WN8122BTEAC-HF-CP  
Applicant : Arcadyan Technology Corporation  
No.8, Sec.2, Guangfu Rd.,Hsinchu,30071 Taiwan  
Manufacturer : Arcadyan Technology Corporation  
No.8, Sec.2, Guangfu Rd.,Hsinchu,30071 Taiwan  
Standard : 47 CFR FCC Part 15.247

The product was received on Apr. 20, 2018, and testing was started from Apr. 20, 2018 and completed on Jun. 04, 2018. We, SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory, 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 report must not be used by the client to claim product certification, approval, or endorsement by TAF or any agency of government.

The test results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory, the test report shall not be reproduced except in full.

  
Approved by: Cliff Chang

**SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory**  
No. 52, Huaya 1st Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.)



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### History of this test report

Report No.	Version	Description	Issued Date
FR842718AD	01	Initial issue of report	Jun. 21, 2018



### Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
1.1.2	15.203	Antenna Requirement	PASS	-
3.1	15.207	AC Power-line Conducted Emissions	PASS	-
3.2	15.247(a)	DTS Bandwidth	PASS	-
3.3	15.247(b)	Maximum Conducted Output Power	PASS	-
3.4	15.247(e)	Power Spectral Density	PASS	-
3.5	15.247(d)	Emissions in Non-restricted Frequency Bands	PASS	-
3.6	15.247(d)	Emissions in Restricted Frequency Bands	PASS	-

Reviewed by: **Sam Chen**  
Report Producer: **Viola Huang**



# 1 General Description

## 1.1 Information

### 1.1.1 RF General Information

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

Band	Mode	BWch (MHz)	Nant
2.4-2.4835GHz	BT-LE(1Mbps)	1.0	1TX

Note:

- ♦ Bluetooth LE uses a GFSK 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	P/N	Antenna Type	Connector	Gain (dBi)			Remark
						WLAN 2.4GHz	WLAN 5GHz	BT	
1	1	arcadyan	-	Printed Antenna	N/A	3.5	4.7	-	Internal antenna
2	2	arcadyan	-	Printed Antenna	N/A	0.8	3.8	-	
3	1	arcadyan	120800060900J	PIFA Antenna	I-PEX	0.1	3.16	-	External antenna
4	2	arcadyan	120800060400J	PIFA Antenna	I-PEX	-0.7	3.25	-	
5	1	arcadyan	120800060300J	PIFA Antenna	I-PEX	-	-	2.04	

Note: The EUT has five antennas.

**For 2.4GHz function:**

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

Port 1 and Port 2 could transmit/receive simultaneously.

**For 5GHz function:**

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

Port 1 and Port 2 could transmit/receive simultaneously.

**For Bluetooth function:**

For Bluetooth mode (1TX/1RX)

Port 1 can be used as transmitting/receiving antenna.



1.1.3 Mode Test Duty Cycle

Mode	DC	DCF(dB)	T(s)	VBW(Hz) ≥ 1/T
BT-LE(1Mbps)	0.608	2.161	380u	3k

1.1.4 EUT Operational Condition

<b>EUT Power Type</b>	From host system		
<b>Function</b>	<input checked="" type="checkbox"/> Point-to-multipoint	<input type="checkbox"/> Point-to-point	
<b>Test Software Version</b>	QA Tool_Dbg Version:0.0.1.85		
<b>Support Mode</b>	<input checked="" type="checkbox"/> LE 1M PHY: 1 Mb/s		
	<input type="checkbox"/> LE Coded PHY (S=2): 500 Kb/s		
	<input type="checkbox"/> LE Coded PHY (S=8): 125 Kb/s		
	<input type="checkbox"/> LE 2M PHY: 2 Mb/s		

1.1.5 Table for Multiple Listing

Brand Name	Model Name	EUT No.	Description
Arcadyan	WN8122BTEAC-HF-CP	EUT 1	The EUT equips internal antenna for WLAN function.
		EUT 2	The EUT equips external antenna for WLAN function.



### 1.2 Testing Applied Standards

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

- ♦ 47 CFR FCC Part 15
- ♦ ANSI C63.10-2013
- ♦ FCC KDB 558074 D01 v04
- ♦ FCC KDB 412172 D01 v01r01

### 1.3 Testing Location Information

Testing Location		
<input type="checkbox"/>	HWA YA	ADD : No. 52, Huaya 1st Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.) TEL : 886-3-327-3456 FAX : 886-3-327-0973
<input checked="" type="checkbox"/>	JHUBEI	ADD : No.8, Lane 724, Bo-ai St., Jhubei City, HsinChu County 302, Taiwan, R.O.C. TEL : 886-3-656-9065 FAX : 886-3-656-9085

Test Condition	Test Site No.	Test Engineer	Test Environment	Test Date
RF Conducted	TH01-CB	Brian Sun & Serway Li & Owen Hsu	22°C / 52%	May 09, 2018~May 10, 2018
Radiated (Below 1GHz)	03CH01-CB	Cola Fan & Eddie Weng & Mason Chen & Stim Sung	25°C / 56%	May 30, 2018
Radiated (Above 1GHz)	03CH01-CB	Cola Fan & Eddie Weng & Mason Chen & Stim Sung	25°C / 56%	Apr. 20, 2018~May 30, 2018
AC Conduction	CO02-CB	Tony Chang	23°C / 60%	Jun. 04, 2018

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 <sup>-8</sup>	Confidence levels of 95%



## **2 Test Configuration of EUT**

### **2.1 Test Channel Mode**

<b>Mode</b>	<b>PowerSetting</b>
BT-LE(1Mbps)	-
2402MHz	Default
2440MHz	Default
2480MHz	Default





## 2.2 The Worst Case Measurement Configuration

The Worst Case Mode for Following Conformance Tests	
<b>Tests Item</b>	AC power-line conducted emissions
<b>Condition</b>	AC power-line conducted measurement for line and neutral
<b>Operating Mode</b>	Normal Link
1	EUT 1: 2.4GHz + Bluetooth
2	EUT 1: 5GHz + Bluetooth
3	EUT 2: 2.4GHz + Bluetooth
4	EUT 2: 5GHz + Bluetooth

For operating mode 1 is the worst case and it was record in this test report.

The Worst Case Mode for Following Conformance Tests	
<b>Tests Item</b>	DTS Bandwidth Maximum Conducted Output Power Power Spectral Density Emissions in Non-restricted Frequency Bands
<b>Test Condition</b>	Conducted measurement at transmit chains
<b>Operating Mode</b>	CTX
1	EUT 2



The Worst Case Mode for Following Conformance Tests	
<b>Tests Item</b>	Emissions in Restricted Frequency Bands
<b>Test Condition</b>	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.
<b>Operating Mode &lt; 1GHz</b>	Normal Link
1	EUT 1 in Z axis: 2.4GHz + Bluetooth
2	EUT 1 in Z axis: 5GHz + Bluetooth
3	EUT 2 in Z axis: 2.4GHz + Bluetooth
4	EUT 2 in Z axis: 5GHz + Bluetooth
For operating mode 3 is the worst case and it was record in this test report.	
<b>Operating Mode &gt; 1GHz</b>	CTX
	The EUT was performed at X axis, Y axis and Z axis position for Emissions in Restricted Frequency Bands, and the worst case was found at Y axis. So the measurement will follow this same test configuration.
1	EUT 2 in Y axis

The Worst Case Mode for Following Conformance Tests	
<b>Tests Item</b>	Simultaneous Transmission Analysis - Co-location RF Exposure Evaluation
<b>Operating Mode</b>	
1	EUT 1: 2.4GHz + Bluetooth
2	EUT 1: 5GHz + Bluetooth
3	EUT 2: 2.4GHz + Bluetooth
4	EUT 2: 5GHz + Bluetooth
Refer to Sporton Test Report No.: FA842718 for Co-location RF Exposure Evaluation.	

Note: For conducted test and Radiated measurement above 1GHz, only the EUT 2 was tested and recorded in the test report.

### 2.3 EUT Operation during Test

For CTX Mode:

The EUT was programmed to be in continuously transmitting mode.

For Normal Link:

During the test, the EUT operation to normal function.

### 2.4 Accessories

N/A



## 2.5 Support Equipment

For Test Site No: CO01-CB

Support Equipment				
No.	Equipment	Brand Name	Model Name	FCC ID
1	NB	DELL	E6430	N/A
2	NB	ASUS	PRO88Q	N/A
3	AP Router	ASUS	RP-N53	MSQ-RPN53
4	iPhone 4	Apple	A1332	BCG-E2380A
5	Earphone	SHYARO CHI	MIC-04	N/A
6	Mouse	Logitech	M-U0026	N/A

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

Support Equipment				
No.	Equipment	Brand Name	Model Name	FCC ID
1	NB	DELL	E4300	N/A
2	NB	ASUS	PRO88Q	N/A
3	WLAN AP	D-LINK	DIR860L	KA2IR860LA1
4	iPhone 4	Apple	A1332	BCG-E2380A
5	Earphone	SHYARO CHI	MIC-04	N/A
6	Mouse	Logitech	M-U0026	N/A

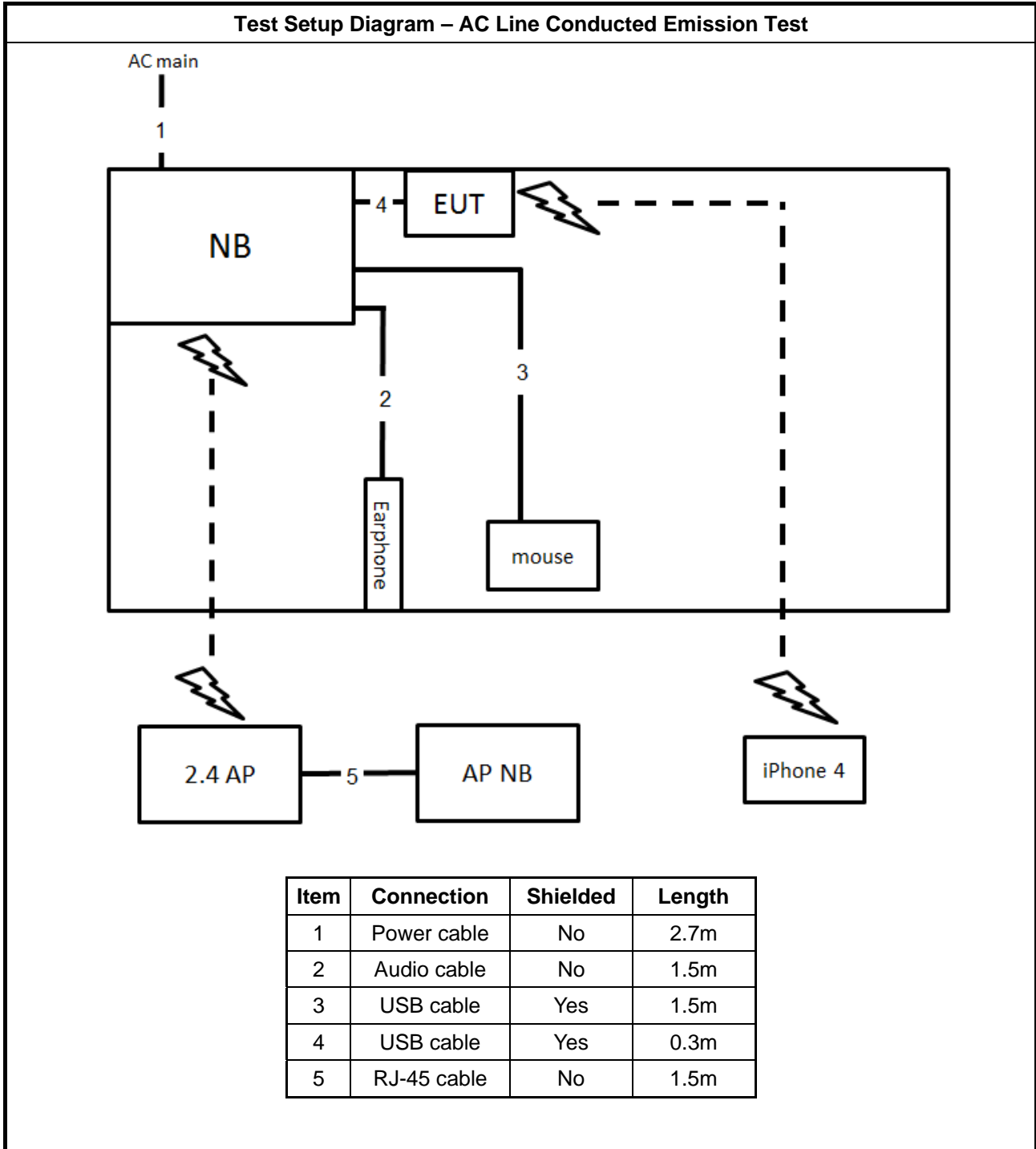
For Test Site No: 03CH01-CB (above 1GHz)

Support Equipment				
No.	Equipment	Brand Name	Model Name	FCC ID
1	NB	DELL	E4300	N/A

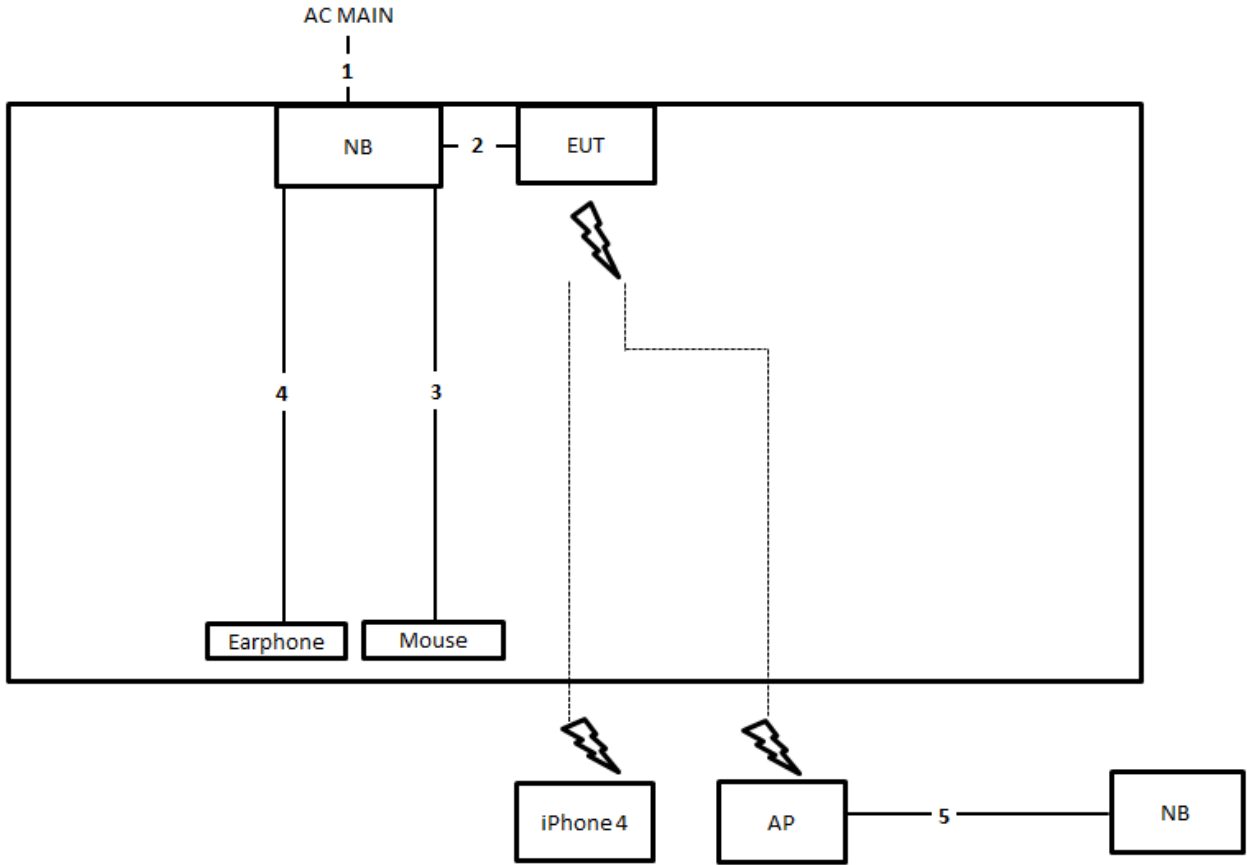
For Test Site No: TH01-CB

Support Equipment				
No.	Equipment	Brand Name	Model Name	FCC ID
1	NB	DELL	E4300	N/A

## 2.6 Test Setup Diagram



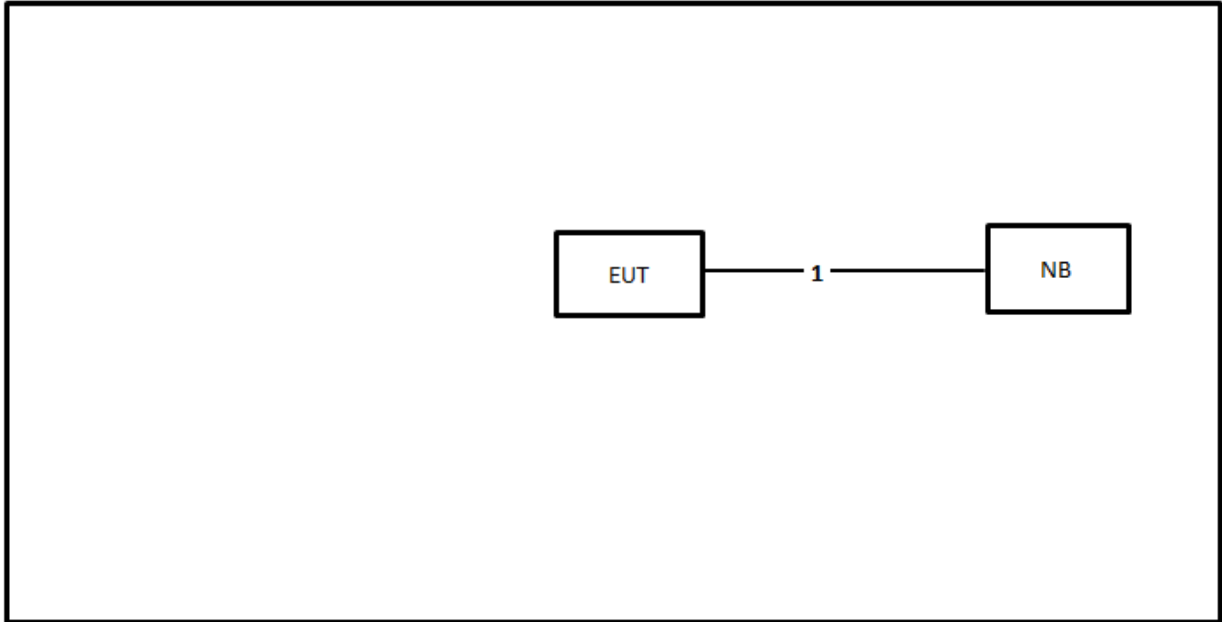
**Test Setup Diagram - Radiated Test < 1GHz**



Item	Connection	Shielded	Length
1	Power cable	No	2.5m
2	USB cable	Yes	1.5m
3	USB cable	Yes	1.8m
4	Audio cable	No	1.1m
5	RJ-45 cable	No	1.5m



Test Setup Diagram - Radiated Test > 1GHz



Item	Connection	Shielded	Length
1	USB cable	Yes	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.

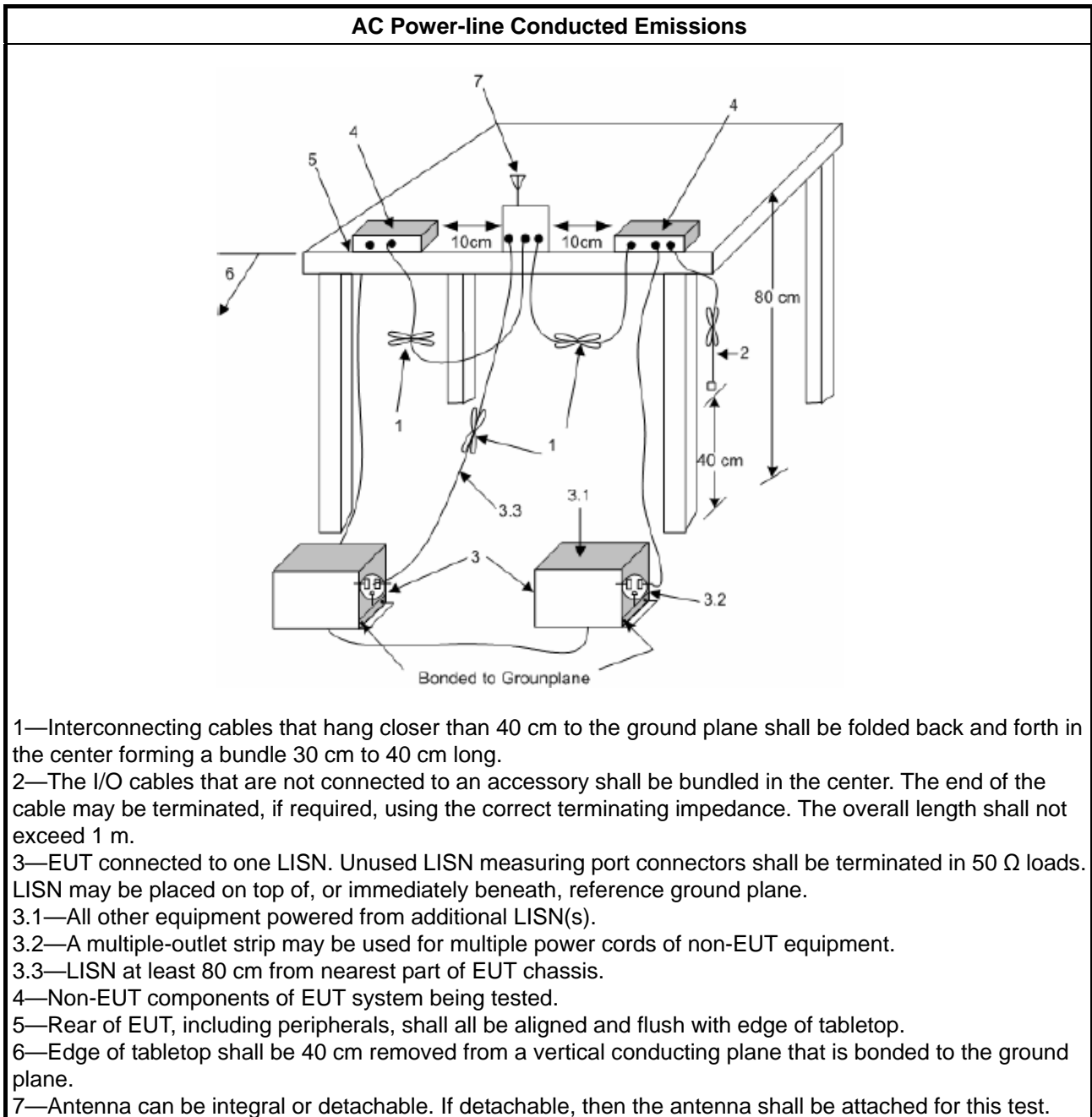
##### 3.1.2 Measuring Instruments

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

##### 3.1.3 Test Procedures

Test Method
▪ Refer as <b>ANSI C63.10-2013</b> , 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
<b>Systems using digital modulation techniques:</b>
<ul style="list-style-type: none"> <li>▪ 6 dB bandwidth <math>\geq</math> 500 kHz.</li> </ul>

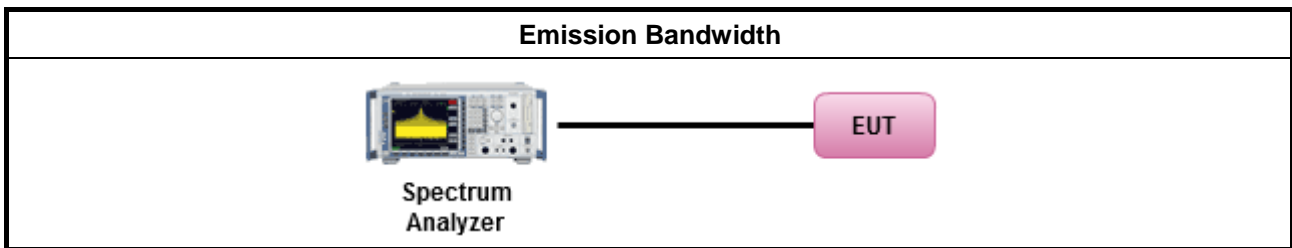
#### 3.2.2 Measuring Instruments

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

#### 3.2.3 Test Procedures

Test Method
<ul style="list-style-type: none"> <li>▪ For the emission bandwidth shall be measured using one of the options below:</li> </ul>
<input checked="" type="checkbox"/> Refer as FCC KDB 558074, clause 8.1 Option 1 for 6 dB bandwidth measurement.
<input type="checkbox"/> Refer as FCC KDB 558074, clause 8.2 Option 2 for 6 dB bandwidth measurement.
<input type="checkbox"/> 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	
	<ul style="list-style-type: none"><li>▪ If <math>G_{TX} \leq 6</math> dBi, then <math>P_{Out} \leq 30</math> dBm (1 W)</li></ul>
	<ul style="list-style-type: none"><li>▪ Point-to-multipoint systems (P2M): If <math>G_{TX} &gt; 6</math> dBi, then <math>P_{Out} = 30 - (G_{TX} - 6)</math> dBm</li></ul>
	<ul style="list-style-type: none"><li>▪ Point-to-point systems (P2P): If <math>G_{TX} &gt; 6</math> dBi, then <math>P_{Out} = 30 - (G_{TX} - 6)/3</math> dBm</li></ul>
	<ul style="list-style-type: none"><li>▪ Smart antenna system (SAS):</li></ul>
	<ul style="list-style-type: none"><li>- Single beam: If <math>G_{TX} &gt; 6</math> dBi, then <math>P_{Out} = 30 - (G_{TX} - 6)/3</math> dBm</li></ul>
	<ul style="list-style-type: none"><li>- Overlap beam: If <math>G_{TX} &gt; 6</math> dBi, then <math>P_{Out} = 30 - (G_{TX} - 6)/3</math> dBm</li></ul>
	<ul style="list-style-type: none"><li>- Aggregate power on all beams: If <math>G_{TX} &gt; 6</math> dBi, then <math>P_{Out} = 30 - (G_{TX} - 6)/3 + 8</math> dB dBm</li></ul>
$P_{Out}$ = maximum peak conducted output power or maximum conducted output power in dBm, $G_{TX}$ = the maximum transmitting antenna directional gain in dBi.	

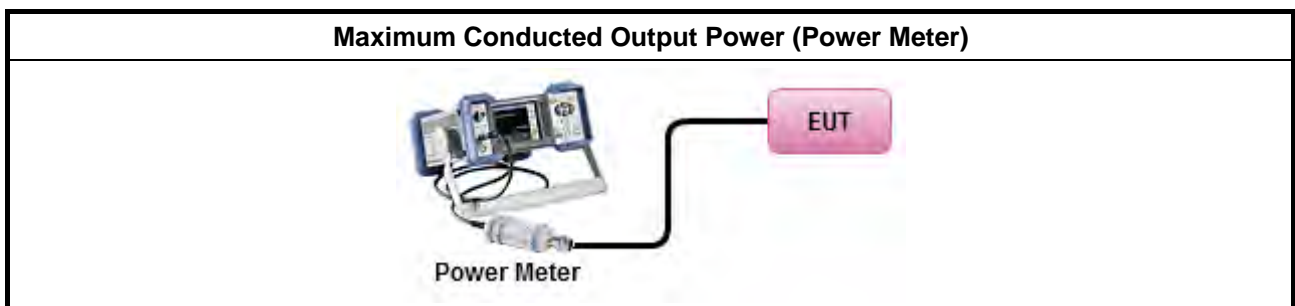
#### 3.3.2 Measuring Instruments

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

### 3.3.3 Test Procedures

Test Method	
<ul style="list-style-type: none"> <li>▪ Maximum Peak Conducted Output Power</li> </ul>	
	<input type="checkbox"/> Refer as FCC KDB 558074, clause 9.1.1 Option 1 (RBW ≥ EBW method).
	<input type="checkbox"/> Refer as FCC KDB 558074, clause 9.1.3 (peak power meter for VBW ≥ DTS BW)
<ul style="list-style-type: none"> <li>▪ Maximum Conducted Output Power</li> </ul>	
[duty cycle ≥ 98% or external video / power trigger]	
	<input type="checkbox"/> Refer as FCC KDB 558074, clause 9.2.2.2 Method AVGSA-1 (spectral trace averaging).
	<input type="checkbox"/> 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	
	<input type="checkbox"/> Refer as FCC KDB 558074, clause 9.2.2.4 Method AVGSA-2 (spectral trace averaging).
	<input type="checkbox"/> Refer as FCC KDB 558074, clause 9.2.2.5 Method AVGSA-2 Alt. (slow sweep speed)
Measurement using a power meter (PM)	
	<input checked="" type="checkbox"/> Refer as FCC KDB 558074, clause 9.2.3 Method AVGPM (using an RF average power meter).
	<input type="checkbox"/> Refer as FCC KDB 558074, clause 9.2.3.2 Method AVGPM-G (using an gate RF average power meter).
<ul style="list-style-type: none"> <li>▪ For conducted measurement.</li> </ul>	
<ul style="list-style-type: none"> <li>▪ 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.</li> </ul>	
<ul style="list-style-type: none"> <li>▪ If multiple transmit chains, EIRP calculation could be following as methods:  <math>P_{total} = P_1 + P_2 + \dots + P_n</math>            (calculated in linear unit [mW] and transfer to log unit [dBm])  <math>EIRP_{total} = P_{total} + DG</math> </li> </ul>	

### 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
<ul style="list-style-type: none"> <li>Power Spectral Density (PSD) ≤ 8 dBm/3kHz</li> </ul>

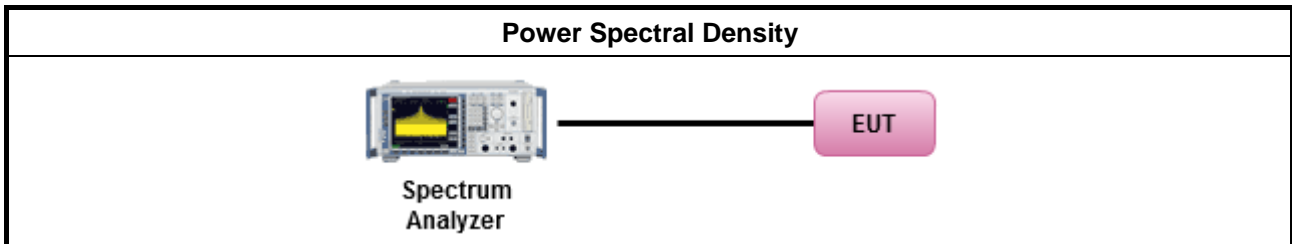
#### 3.4.2 Measuring Instruments

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

#### 3.4.3 Test Procedures

Test Method
<ul style="list-style-type: none"> <li>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).</li> </ul>
<input checked="" type="checkbox"/> Refer as FCC KDB 558074, clause 10.2 Method PKPSD (RBW=3-100kHz; Detector=peak). [duty cycle ≥ 98% or external video / power trigger]
<input type="checkbox"/> Refer as FCC KDB 558074, clause 10.3 Method AVGPSD-1 (spectral trace averaging).
<input type="checkbox"/> 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
<input type="checkbox"/> Refer as FCC KDB 558074, clause 10.5 Method AVGPSD-1 Alt (spectral trace averaging).
<input type="checkbox"/> Refer as FCC KDB 558074, clause 10.6 Method AVGPSD-2 Alt. (slow sweep speed)
<ul style="list-style-type: none"> <li>For conducted measurement.</li> </ul>
<ul style="list-style-type: none"> <li>If The EUT supports multiple transmit chains using options given below: </li> </ul>
<input checked="" type="checkbox"/> 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.
<input type="checkbox"/> 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,
<input type="checkbox"/> 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.

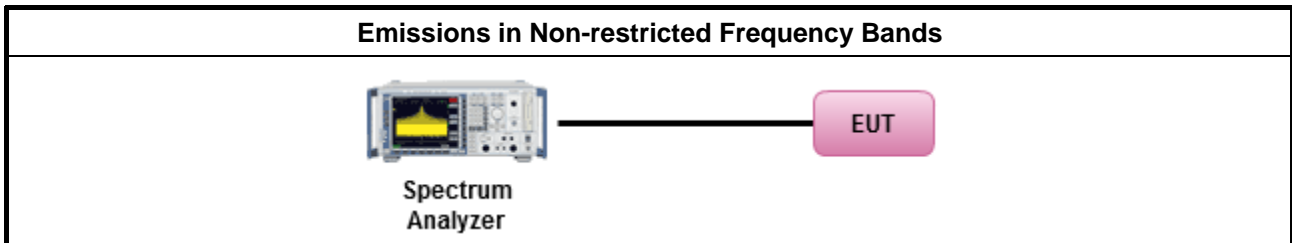
#### 3.5.2 Measuring Instruments

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

#### 3.5.3 Test Procedures

Test Method
<ul style="list-style-type: none"> <li>Refer as FCC KDB 558074, clause 11 for unwanted emissions into non-restricted bands.</li> </ul>

#### 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.

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.

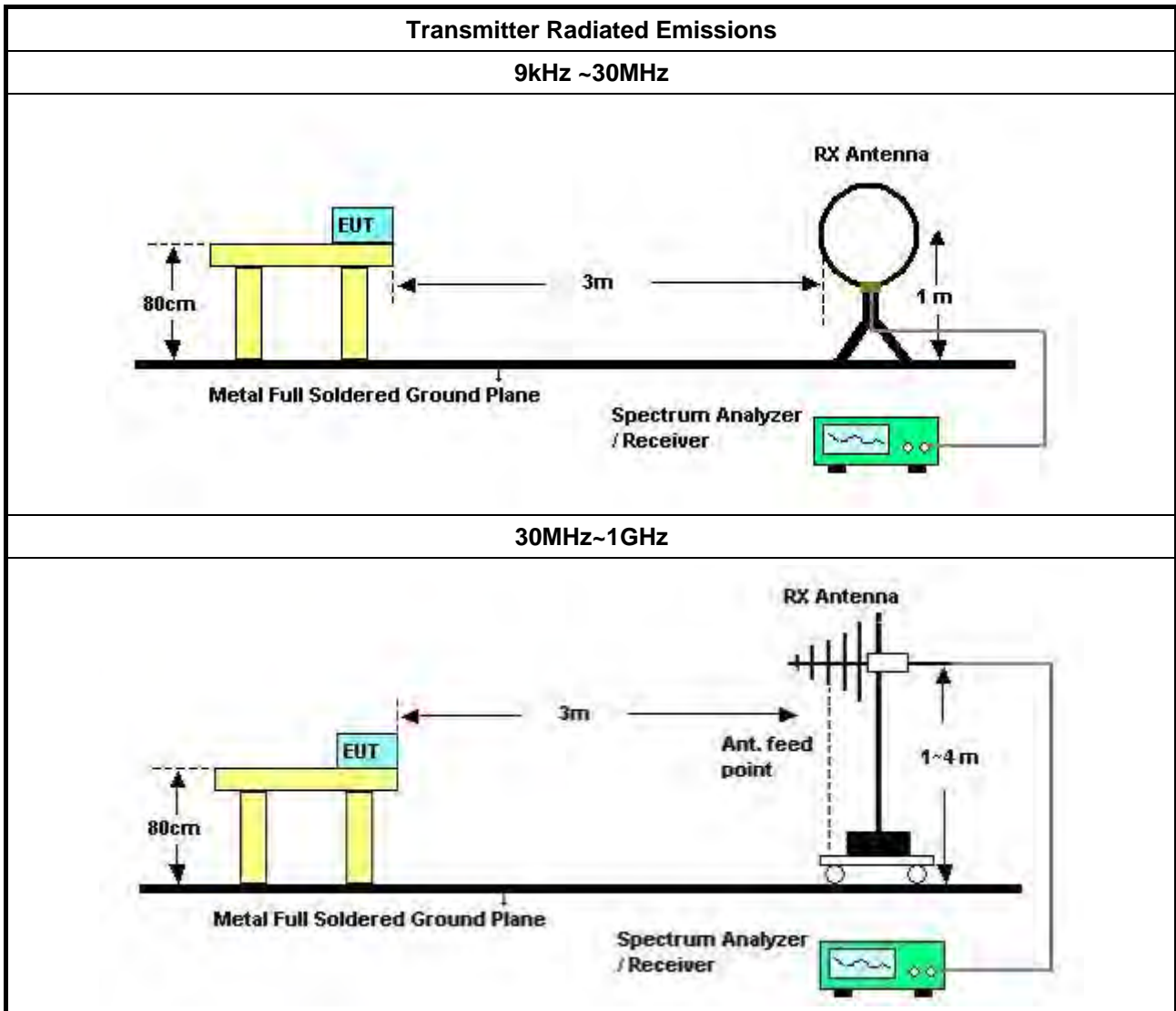


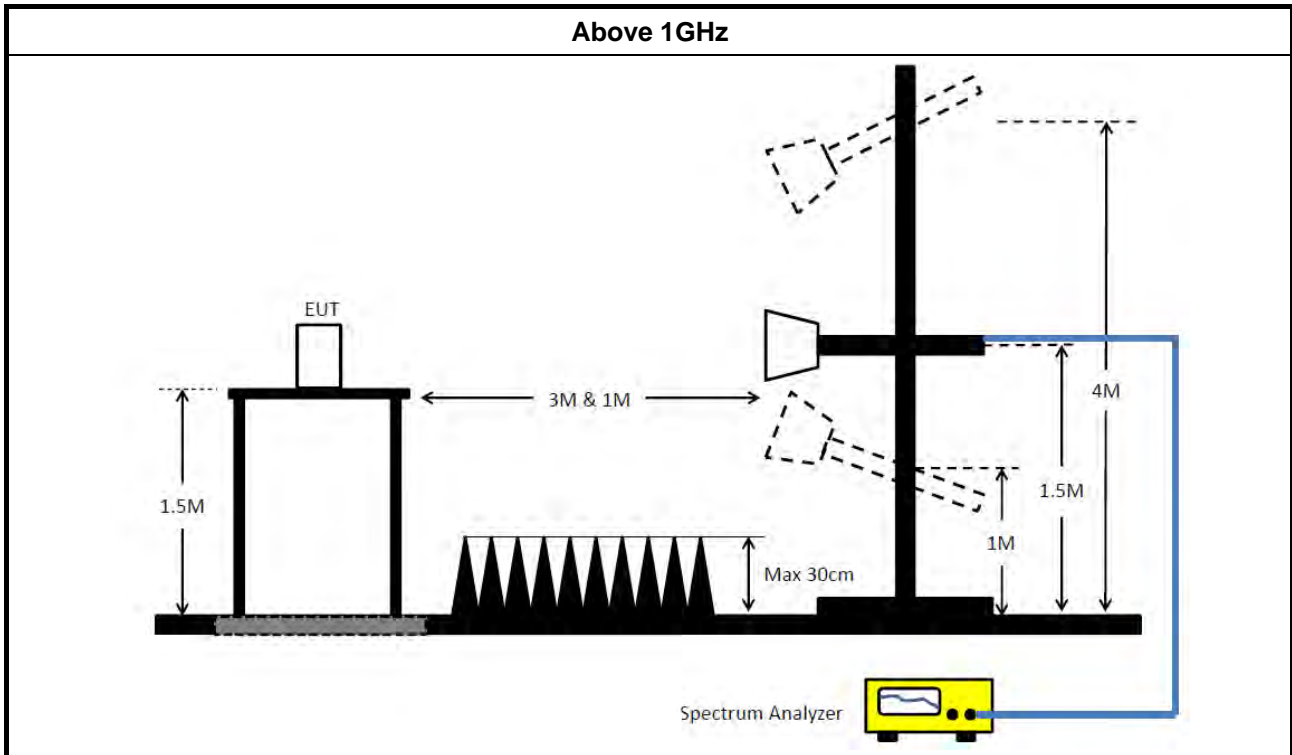
3.6.3 Test Procedures

Test Method	
<ul style="list-style-type: none"> <li>▪ The average emission levels shall be measured in [duty cycle <math>\geq</math> 98 or duty factor].</li> </ul>	
<ul style="list-style-type: none"> <li>▪ 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.</li> </ul>	
<ul style="list-style-type: none"> <li>▪ For the transmitter unwanted emissions shall be measured using following options below:</li> </ul>	
	<ul style="list-style-type: none"> <li>▪ Refer as FCC KDB 558074, clause 12 for unwanted emissions into restricted bands.</li> </ul>
	<input type="checkbox"/> Refer as FCC KDB 558074, clause 12.2.5.1 Option 1 (trace averaging for duty cycle $\geq$ 98%)
	<input type="checkbox"/> Refer as FCC KDB 558074, clause 12.2.5.2 Option 2 (trace averaging + duty factor).
	<input checked="" type="checkbox"/> Refer as FCC KDB 558074, clause 12.2.5.3 Option 3 (Reduced VBW $\geq$ 1/T).
	<input type="checkbox"/> Refer as ANSI C63.10, clause 4.2.3.2.3 (Reduced VBW). VBW $\geq$ 1/T, where T is pulse time.
	<input type="checkbox"/> Refer as ANSI C63.10, clause 4.2.3.2.4 average value of pulsed emissions.
	<input checked="" type="checkbox"/> Refer as FCC KDB 558074, clause 12.2.4 measurement procedure peak limit.
<ul style="list-style-type: none"> <li>▪ For the transmitter band-edge emissions shall be measured using following options below:</li> </ul>	
	<ul style="list-style-type: none"> <li>▪ 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.</li> </ul>
	<ul style="list-style-type: none"> <li>▪ Refer as FCC KDB 558074, clause 13.2 (ANSI C63.10, clause 6.9.3) for marker-delta method for band-edge measurements.</li> </ul>
	<ul style="list-style-type: none"> <li>▪ 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).</li> </ul>
<ul style="list-style-type: none"> <li>▪ For conducted and cabinet radiation measurement, refer as FCC KDB 558074, clause 12.2.2.</li> </ul>	
	<ul style="list-style-type: none"> <li>▪ 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</li> </ul>
	<ul style="list-style-type: none"> <li>▪ 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.</li> </ul>



### 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.

The radiated emissions were investigated from 9 kHz or the lowest frequency generated within the device, up to the 10 harmonic or 40 GHz, whichever is appropriate.

### 3.6.6 Transmitter Radiated Unwanted Emissions

Refer as Appendix F



## 4 Test Equipment and Calibration Data

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Calibration Due Date	Remark
LISN	Schwarzbeck	NSLK 8127	8127650	9kHz ~ 30MHz	Nov. 24, 2017	Nov. 23, 2018	Conduction (CO02-CB)
LISN	Schwarzbeck	NSLK 8127	8127478	9kHz ~ 30MHz	Nov. 13, 2017	Nov. 12, 2018	Conduction (CO02-CB)
EMI Receiver	Agilent	N9038A	MY52260140	9kHz ~ 8.4GHz	Jan. 17, 2018	Jan. 16, 2019	Conduction (CO02-CB)
COND Cable	Woken	Cable	2	0.15MHz~30MHz	Nov. 10, 2017	Nov. 09, 2018	Conduction (CO02-CB)
Software	Audix	E3	6.120210n	-	N.C.R.	N.C.R.	Conduction (CO02-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, 2018	Mar. 15, 2019	Radiation (03CH01-CB)
Horn Antenna	EMCO	3115	00075790	750MHz ~ 18GHz	Nov. 20, 2017	Nov. 19, 2018	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, 2018	May 01, 2019	Radiation (03CH01-CB)
Pre-Amplifier	Agilent	8449B	3008A02310	1GHz ~ 26.5GHz	Jan. 09, 2018	Jan. 08, 2019	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. 23, 2017	Nov. 22, 2018	Radiation (03CH01-CB)
EMI Test	R&S	ESCS	100354	9kHz ~ 2.75GHz	Dec. 08, 2017	Dec. 07, 2018	Radiation (03CH01-CB)
RF Cable-low	Woken	Low Cable-16+17	N/A	30 MHz ~ 1 GHz	Oct. 11, 2017	Oct. 10, 2018	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-16	N/A	1 GHz ~ 18 GHz	Oct. 11, 2017	Oct. 10, 2018	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-16+17	N/A	1 GHz ~ 18 GHz	Oct. 11, 2017	Oct. 10, 2018	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-40G#1	N/A	18GHz ~ 40 GHz	Oct. 11, 2017	Oct. 10, 2018	Radiation (03CH01-CB)



Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Calibration Due Date	Remark
RF Cable-high	Woken	High Cable-40G#2	N/A	18GHz ~ 40 GHz	Oct. 11, 2017	Oct. 10, 2018	Radiation (03CH01-CB)
Spectrum analyzer	R&S	FSV40	100979	9kHz~40GHz	Dec. 21, 2017	Dec. 20, 2018	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-06	1 GHz ~26.5 GHz	Oct. 11, 2017	Oct. 10, 2018	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-07	1 GHz ~26.5 GHz	Oct. 11, 2017	Oct. 10, 2018	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-08	1 GHz ~26.5 GHz	Oct. 11, 2017	Oct. 10, 2018	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-09	1 GHz ~26.5 GHz	Oct. 11, 2017	Oct. 10, 2018	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-10	1 GHz ~26.5 GHz	Oct. 11, 2017	Oct. 10, 2018	Conducted (TH01-CB)
Power Sensor	Agilent	U2021XA	MY53410001	50MHz~18GHz	Nov. 20, 2017	Nov. 19, 2018	Conducted (TH01-CB)

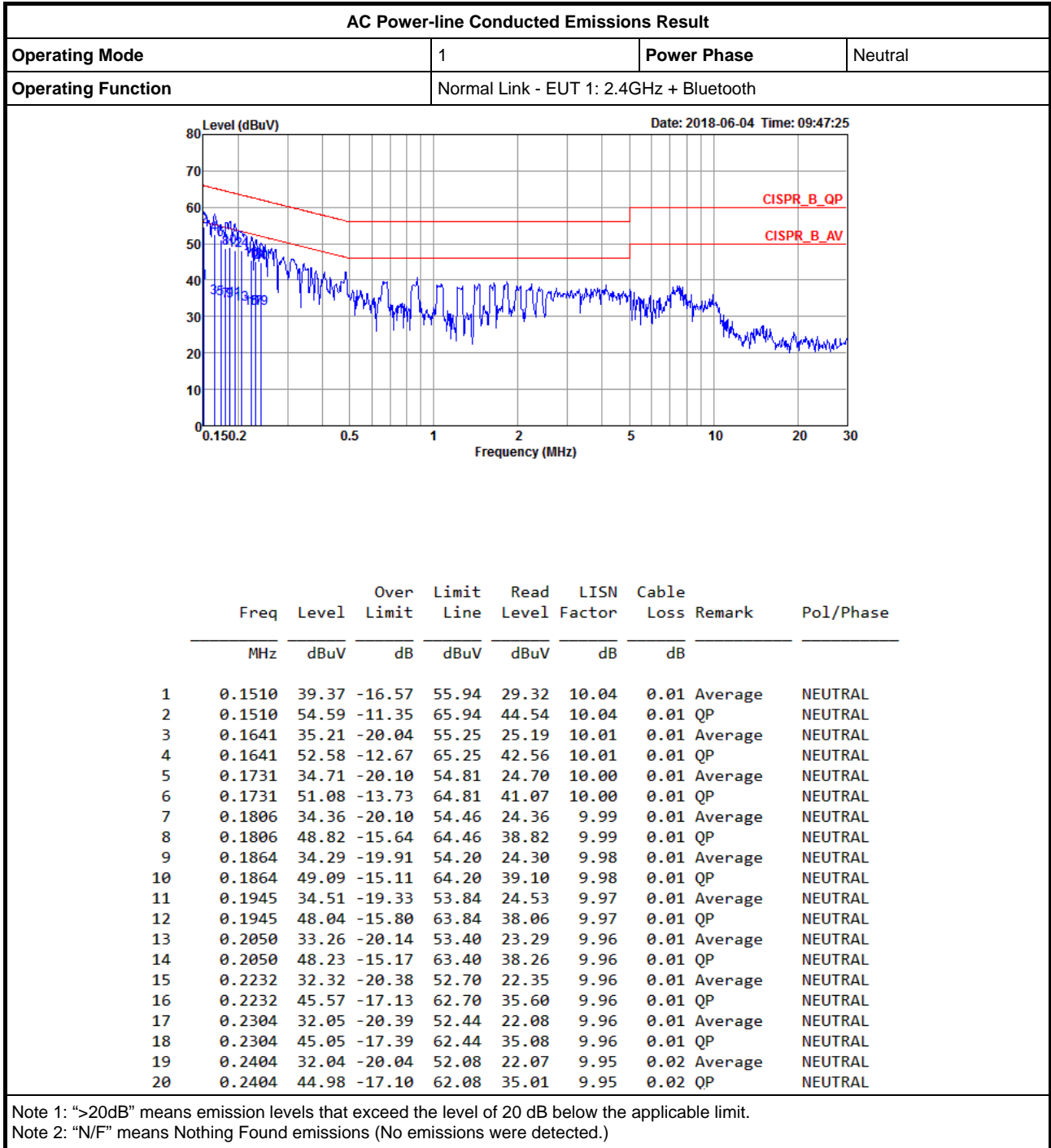
Note: Calibration Interval of instruments listed above is one year.

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



# AC Power-line Conducted Emissions Result

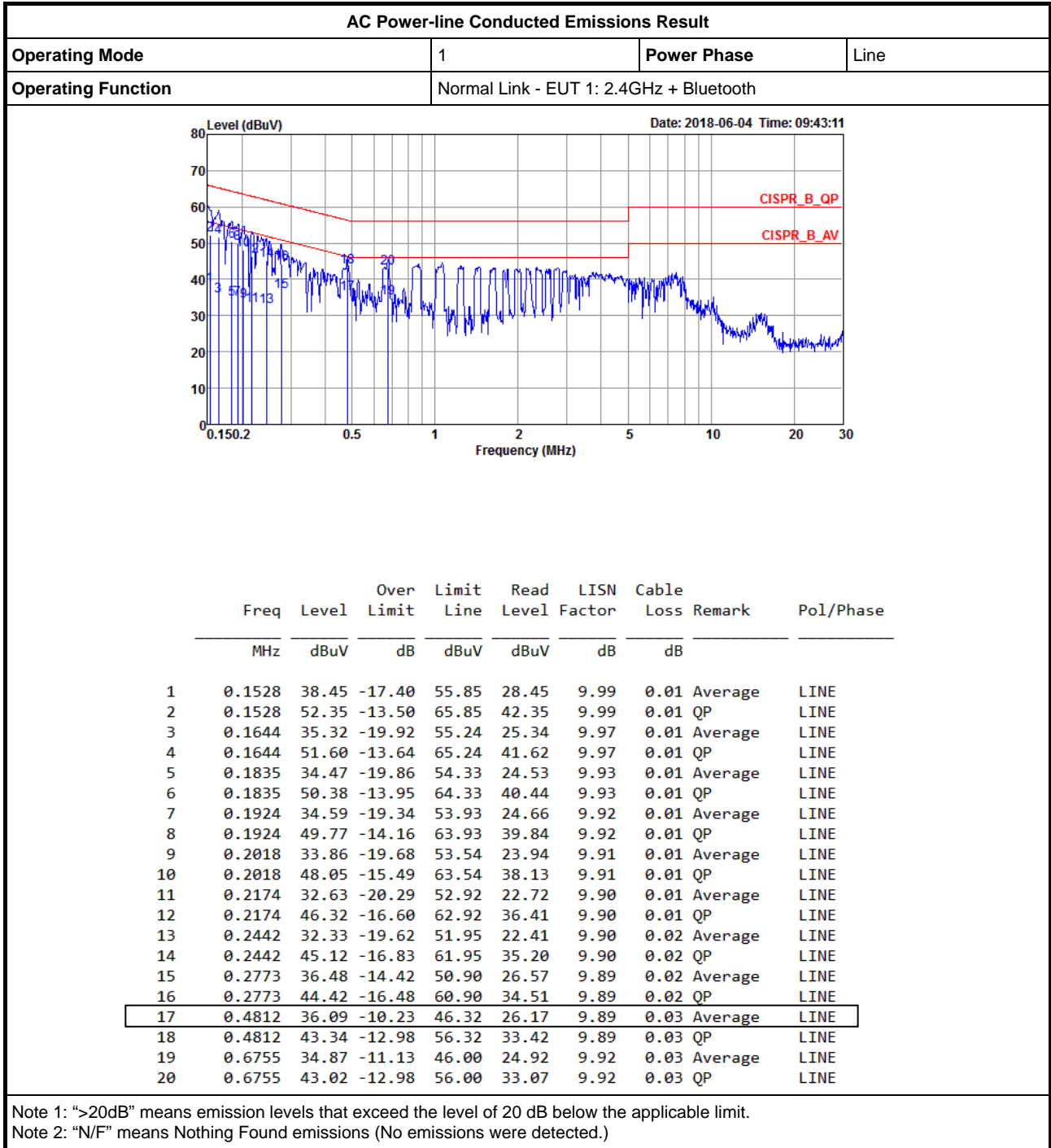
Appendix A





# AC Power-line Conducted Emissions Result

Appendix A





**Summary**

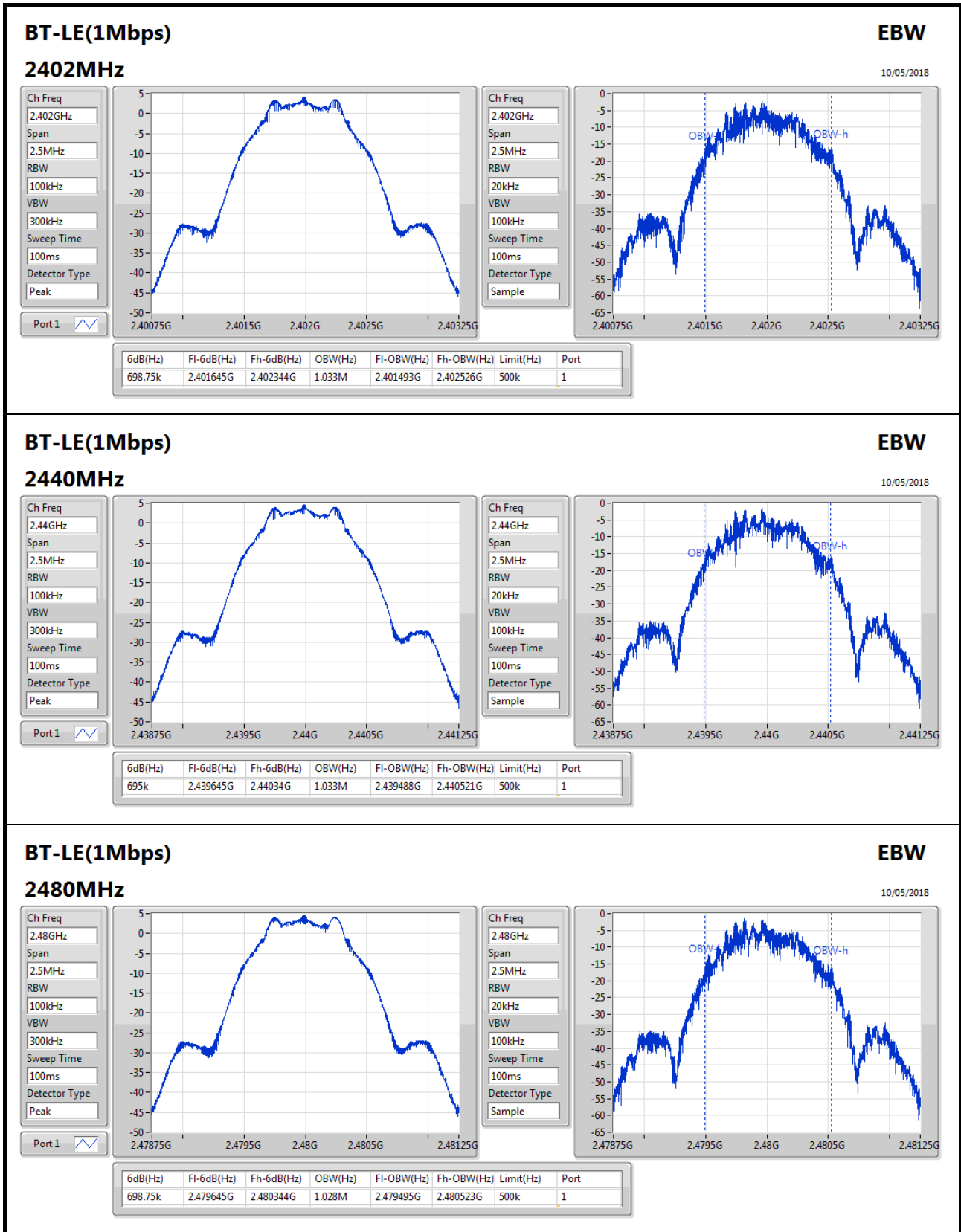
Mode	Max-N dB (Hz)	Max-OBW (Hz)	ITU-Code	Min-N dB (Hz)	Min-OBW (Hz)
2.4-2.4835GHz	-	-	-	-	-
BT-LE(1Mbps)	698.75k	1.033M	1M03F1D	695k	1.028M

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

**Result**

Mode	Result	Limit (Hz)	Port 1-N dB (Hz)	Port 1-OBW (Hz)
BT-LE(1Mbps)	-	-	-	-
2402MHz	Pass	500k	698.75k	1.033M
2440MHz	Pass	500k	695k	1.033M
2480MHz	Pass	500k	698.75k	1.028M

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







**Summary**

Mode	Power (dBm)	Power (W)
2.4-2.4835GHz	-	-
BT-LE(1Mbps)	5.19	0.00330

**Result**

Mode	Result	Gain (dBi)	Power (dBm)	Power Limit (dBm)
BT-LE(1Mbps)	-	-	-	-
2402MHz	Pass	2.04	4.71	30.00
2440MHz	Pass	2.04	5.15	30.00
2480MHz	Pass	2.04	5.19	30.00



**Summary**

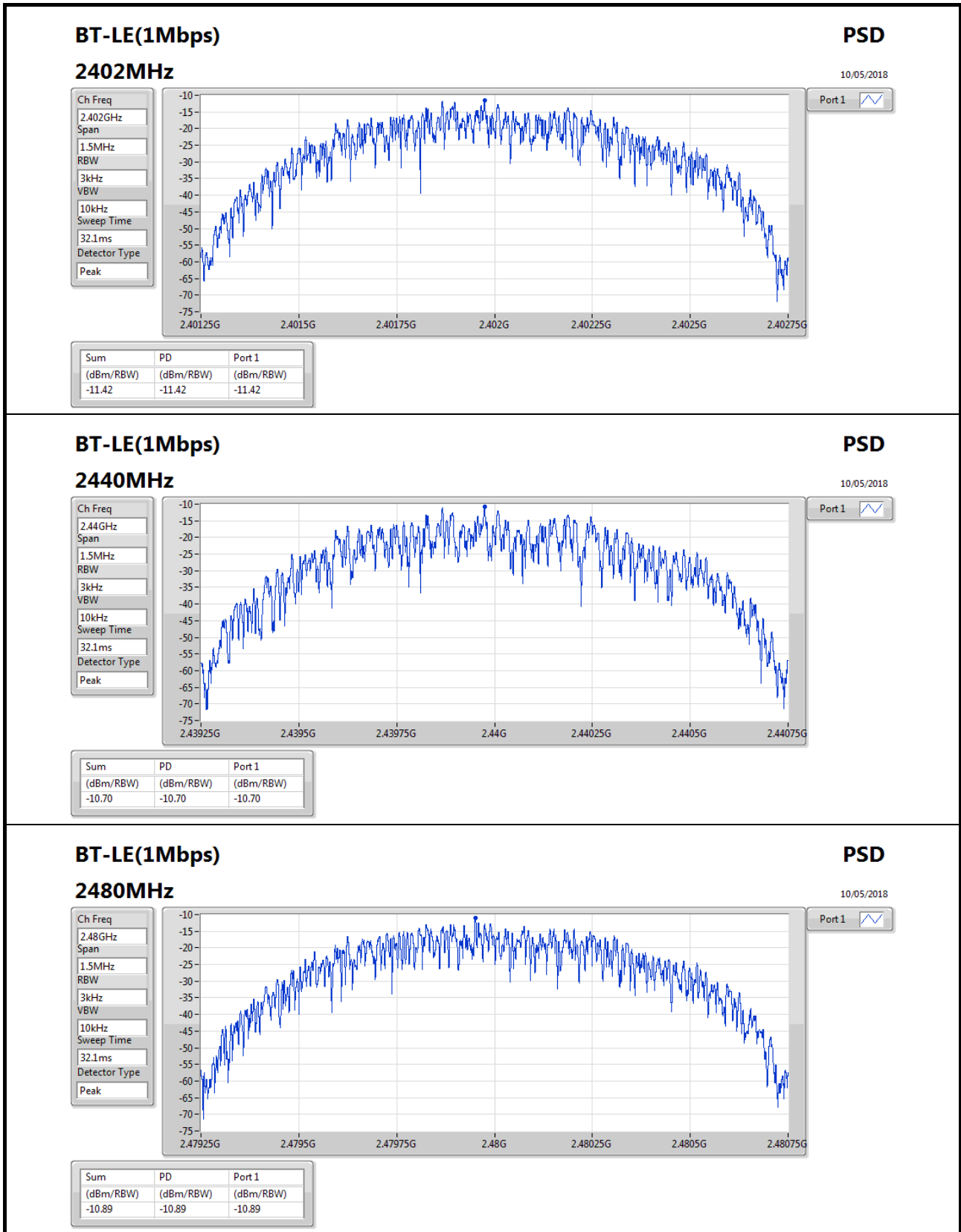
Mode	PD (dBm/RBW)
2.4-2.4835GHz	-
BT-LE(1Mbps)	-10.70

RBW=3kHz.

**Result**

Mode	Result	Gain (dBi)	PD (dBm/RBW)	PD Limit (dBm/RBW)
BT-LE(1Mbps)	-	-	-	-
2402MHz	Pass	2.04	-11.42	8.00
2440MHz	Pass	2.04	-10.70	8.00
2480MHz	Pass	2.04	-10.89	8.00

RBW=3kHz.



### BT-LE(1Mbps)

#### 2480MHz

### PSD

10/05/2018

Ch Freq  
2.48GHz

Span  
1.5MHz

RBW  
3kHz

VBW  
10kHz

Sweep Time  
32.1ms

Detector Type  
Peak

Port 1

Sum	PD	Port 1
(dBm/RBW)	(dBm/RBW)	(dBm/RBW)
-10.89	-10.89	-10.89

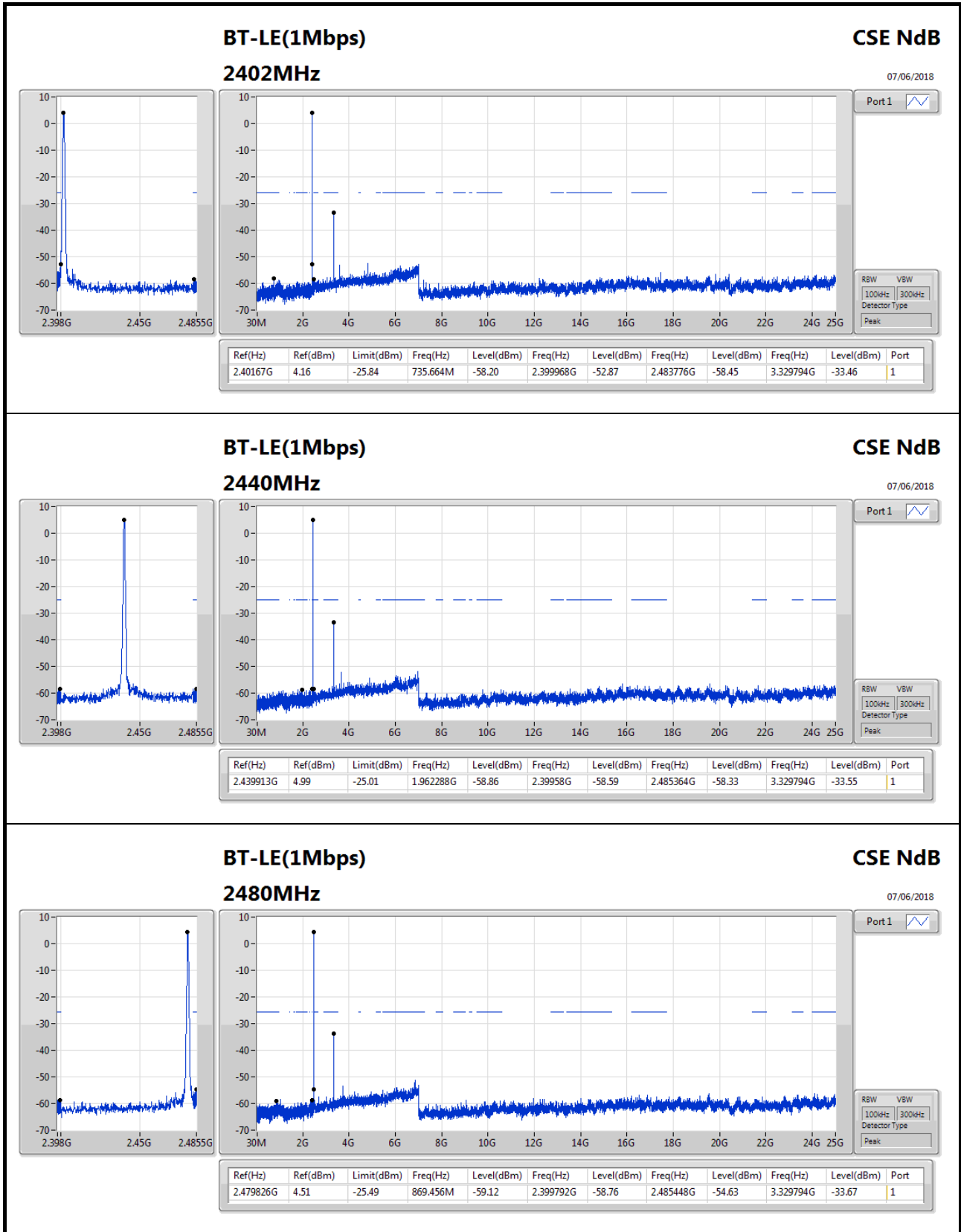


**Summary**

Mode	Result	Ref (Hz)	Ref (dBm)	Limit (dBm)	Freq (Hz)	Level (dBm)	Freq (Hz)	Level (dBm)	Freq (Hz)	Level (dBm)	Freq (Hz)	Level (dBm)	Port
2.4-2.4835GHz	-	-	-	-	-	-	-	-	-	-	-	-	-
BT-LE(1Mbps)	Pass	2.40167G	4.16	-25.84	735.664M	-58.20	2.399968G	-52.87	2.483776G	-58.45	3.329794G	-33.46	1

**Result**

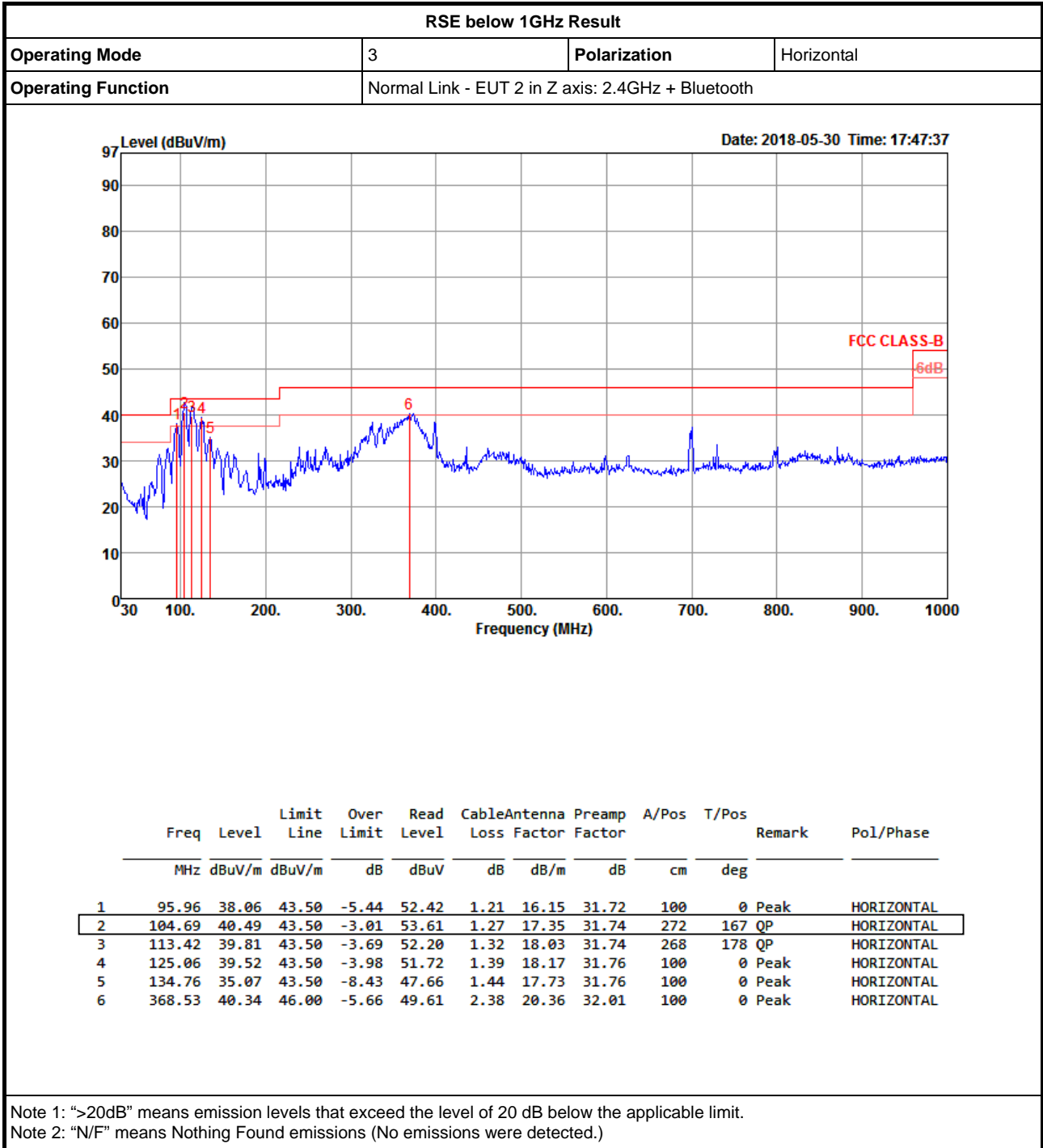
Mode	Result	Ref (Hz)	Ref (dBm)	Limit (dBm)	Freq (Hz)	Level (dBm)	Freq (Hz)	Level (dBm)	Freq (Hz)	Level (dBm)	Freq (Hz)	Level (dBm)	Port
BT-LE(1Mbps)	-	-	-	-	-	-	-	-	-	-	-	-	-
2402MHz	Pass	2.40167G	4.16	-25.84	735.664M	-58.20	2.399968G	-52.87	2.483776G	-58.45	3.329794G	-33.46	1
2440MHz	Pass	2.439913G	4.99	-25.01	1.962288G	-58.86	2.39958G	-58.59	2.485364G	-58.33	3.329794G	-33.55	1
2480MHz	Pass	2.479826G	4.51	-25.49	869.456M	-59.12	2.399792G	-58.76	2.485448G	-54.63	3.329794G	-33.67	1





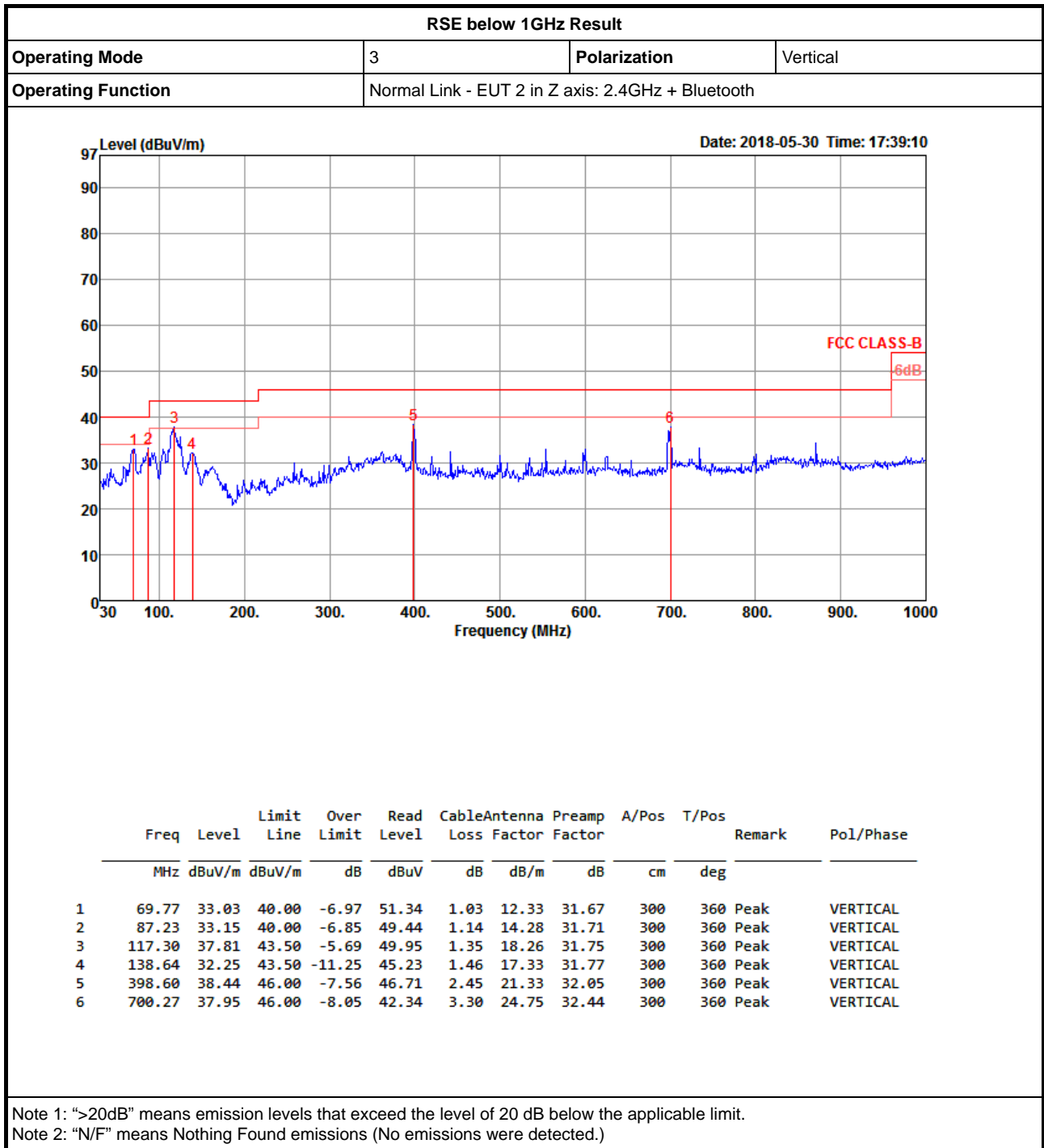
# RSE below 1GHz Result

Appendix F.1





# RSE below 1GHz Result





Summary

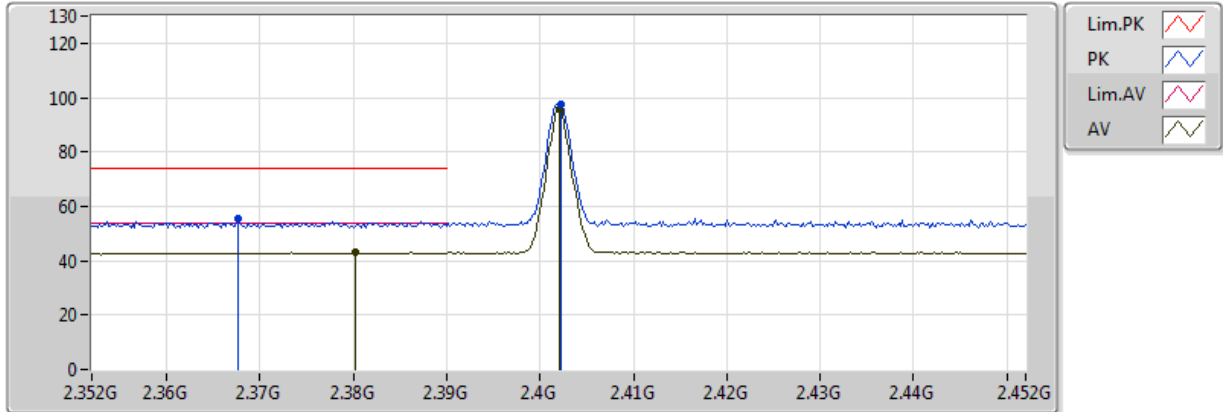
Mode	Result	Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
2.4-2.4835GHz	-	-	-	-	-	-	-	-	-	-	-	-
BT-LE(1Mbps)	Pass	AV	2.483502G	47.75	54.00	-6.25	31.17	3	Horizontal	321	1.51	-



**BT-LE(1Mbps)**

**2402MHz\_TX**

06/05/2018



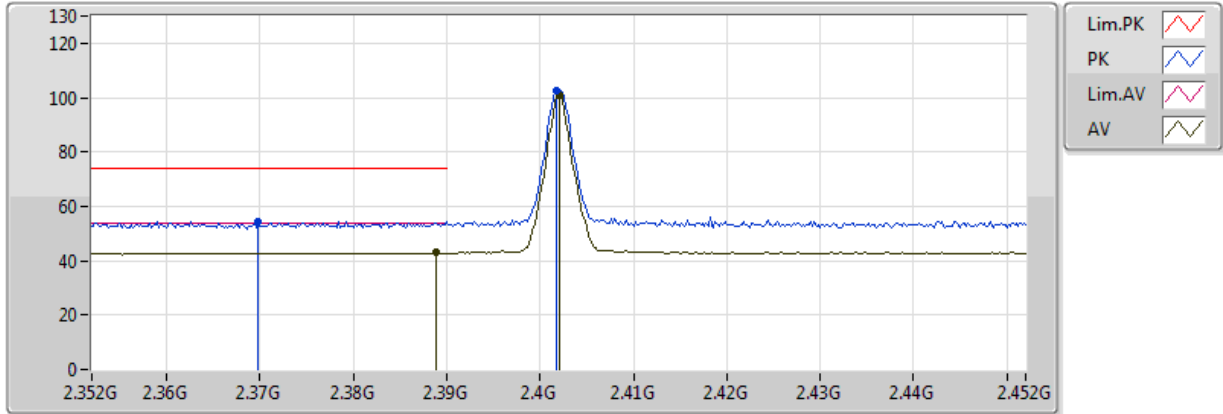
EUT Y\_1TX  
Setting Default  
01-J-1  
FSP

Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
PK	2.3676G	55.37	74.00	-18.63	31.03	3	Vertical	172	1.41	-
AV	2.3802G	43.02	54.00	-10.98	30.99	3	Vertical	172	1.41	-
PK	2.4022G	97.30	Inf	-Inf	30.94	3	Vertical	172	1.41	-
AV	2.402G	95.80	Inf	-Inf	30.94	3	Vertical	172	1.41	-

### BT-LE(1Mbps)

### 2402MHz\_TX

06/05/2018



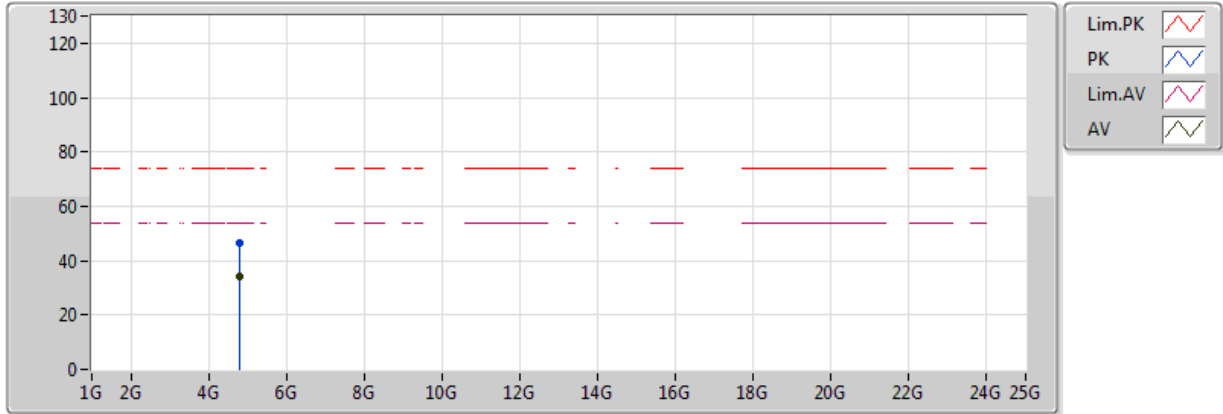
EUT Y\_1TX  
Setting Default  
01-J-1  
FSP

Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
PK	2.3698G	54.51	74.00	-19.49	31.03	3	Horizontal	0	1.49	-
AV	2.3888G	42.91	54.00	-11.09	30.97	3	Horizontal	0	1.49	-
PK	2.4018G	102.39	Inf	-Inf	30.94	3	Horizontal	0	1.49	-
AV	2.402G	100.93	Inf	-Inf	30.94	3	Horizontal	0	1.49	-

### BT-LE(1Mbps)

### 2402MHz\_TX

06/05/2018



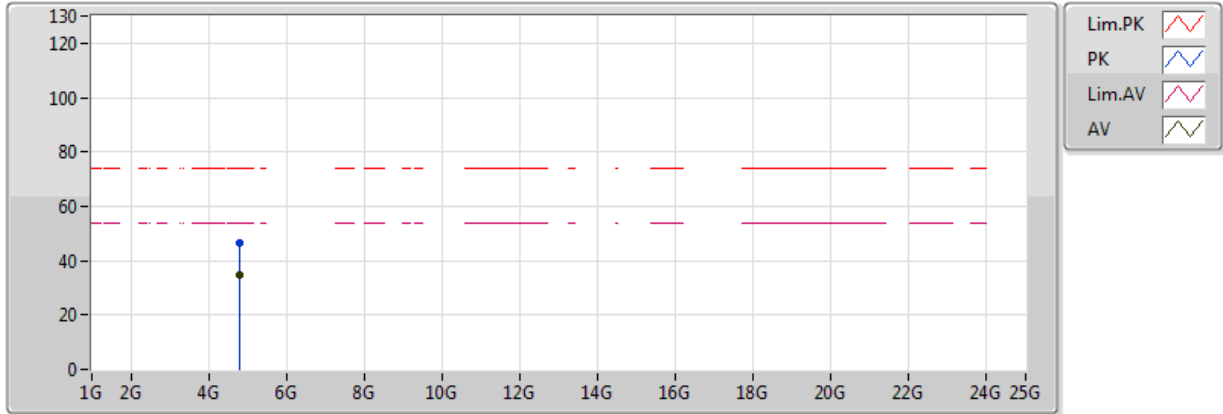
EUT Y\_1TX  
Setting Default  
01-J-1  
FSP

Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
PK	4.80453G	46.58	74.00	-27.42	3.92	3	Vertical	124	2.72	-
AV	4.80396G	34.21	54.00	-19.79	3.92	3	Vertical	124	2.72	-

### BT-LE(1Mbps)

### 2402MHz\_TX

06/05/2018



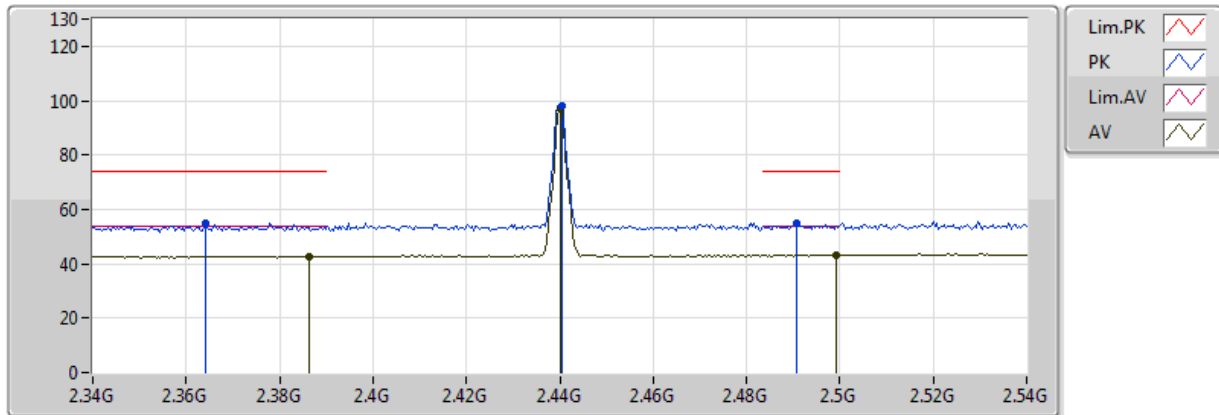
EUT Y\_1TX  
Setting Default  
01-J-1  
FSP

Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
PK	4.80407G	46.78	74.00	-27.22	3.92	3	Horizontal	0	2.61	-
AV	4.80399G	35.01	54.00	-18.99	3.92	3	Horizontal	0	2.61	-

### BT-LE(1Mbps)

### 2440MHz\_TX

06/05/2018



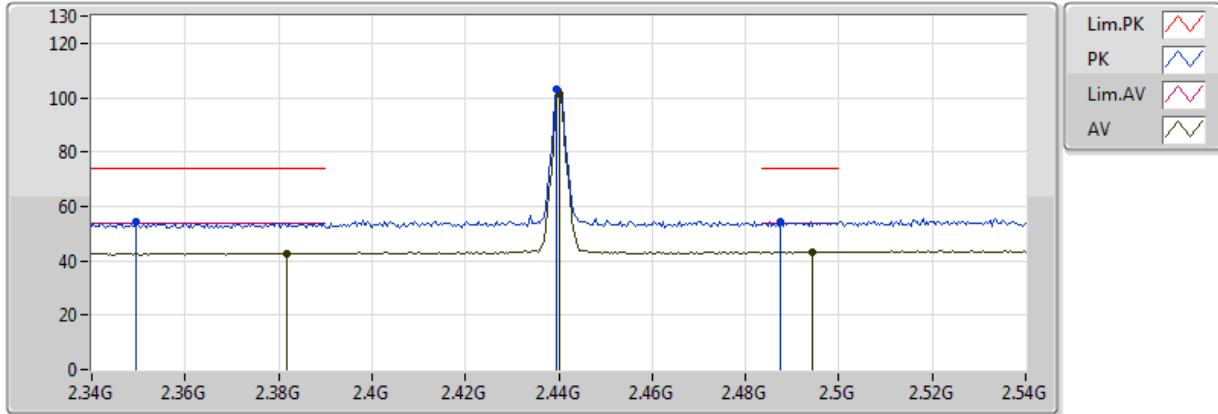
EUT Y\_1TX  
Setting Default  
01-J-1  
FSP

Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
PK	2.364G	55.02	74.00	-18.98	31.03	3	Vertical	167	1.51	-
AV	2.3864G	42.78	54.00	-11.22	30.97	3	Vertical	167	1.51	-
PK	2.4404G	98.32	Inf	-Inf	31.05	3	Vertical	167	1.51	-
AV	2.44G	96.95	Inf	-Inf	31.05	3	Vertical	167	1.51	-
PK	2.4908G	54.77	74.00	-19.23	31.19	3	Vertical	167	1.51	-
AV	2.4992G	43.36	54.00	-10.64	31.22	3	Vertical	167	1.51	-

### BT-LE(1Mbps)

### 2440MHz\_TX

06/05/2018



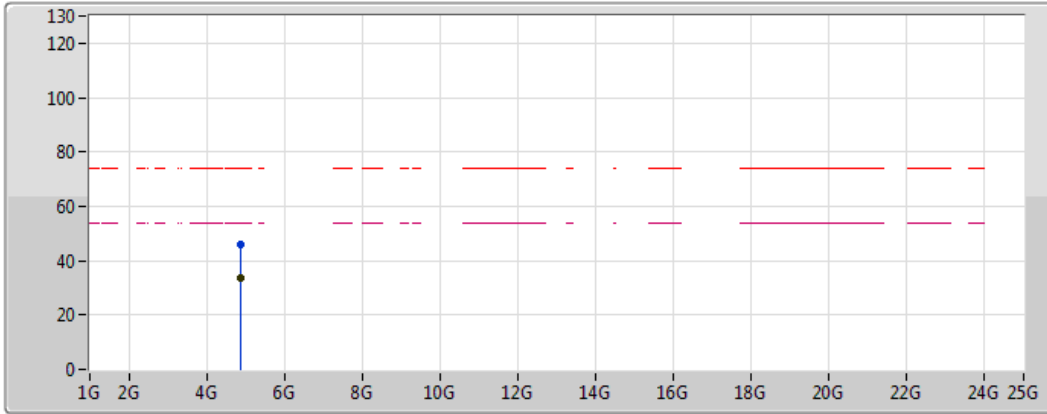
EUT Y\_1TX  
Setting Default  
01-J-1  
FSP





Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
PK	2.3496G	54.37	74.00	-19.63	31.09	3	Horizontal	5	1.49	-
AV	2.3816G	42.84	54.00	-11.16	30.99	3	Horizontal	5	1.49	-
PK	2.4396G	103.09	Inf	-Inf	31.04	3	Horizontal	5	1.49	-
AV	2.44G	101.58	Inf	-Inf	31.05	3	Horizontal	5	1.49	-
PK	2.4876G	54.37	74.00	-19.63	31.19	3	Horizontal	5	1.49	-
AV	2.4944G	43.29	54.00	-10.71	31.21	3	Horizontal	5	1.49	-

### BT-LE(1Mbps)

### 2440MHz\_TX

06/05/2018



- Lim.PK 
- PK 
- Lim.AV 
- AV 

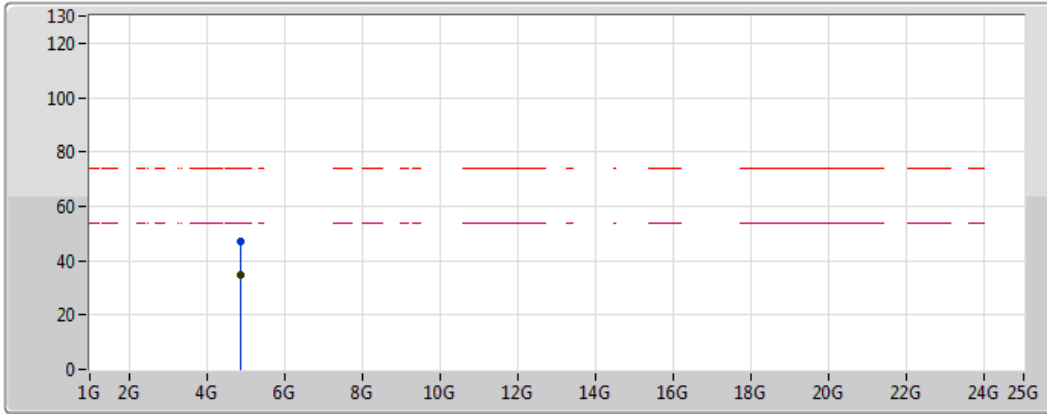
EUT Y\_1TX  
Setting Default  
01-J-1  
FSP

Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
PK	4.87582G	45.74	74.00	-28.26	4.21	3	Vertical	319	1.50	-
AV	4.88018G	33.58	54.00	-20.42	4.23	3	Vertical	319	1.50	-

### BT-LE(1Mbps)

### 2440MHz\_TX

06/05/2018



Legend:

- Lim.PK (Red dashed line)
- PK (Blue line)
- Lim.AV (Magenta dashed line)
- AV (Black line)

EUT Y\_1TX  
Setting Default  
01-J-1  
FSP

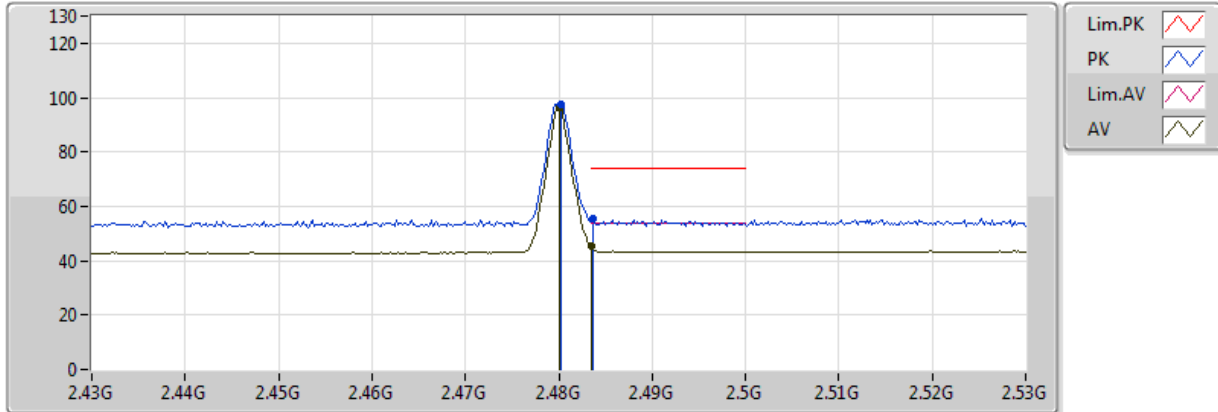
Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
PK	4.87846G	46.88	74.00	-27.12	4.22	3	Horizontal	20	1.34	-
AV	4.87992G	34.51	54.00	-19.49	4.23	3	Horizontal	20	1.34	-



### BT-LE(1Mbps)

### 2480MHz\_TX

06/05/2018



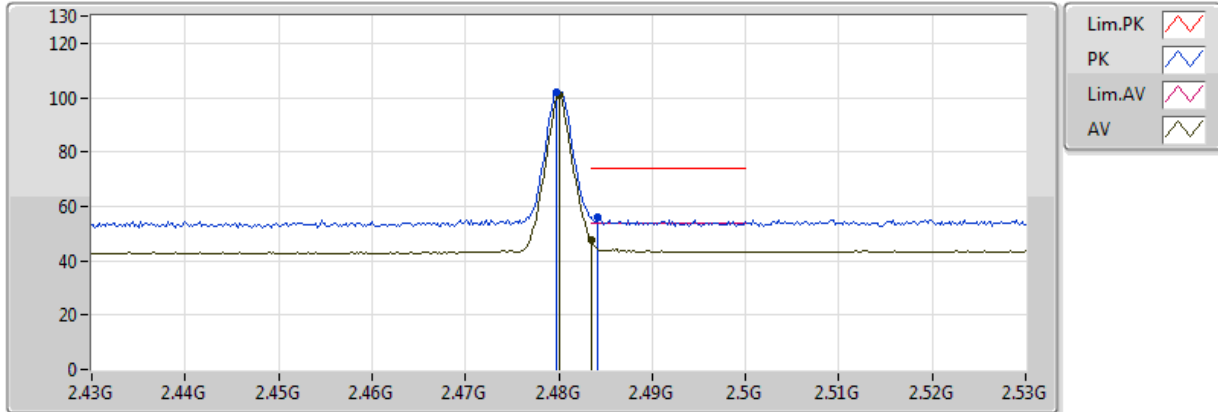
EUT Y\_1TX  
Setting Default  
01-J-1  
FSP

Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
PK	2.4802G	97.78	Inf	-Inf	31.16	3	Vertical	171	1.37	-
AV	2.48G	96.32	Inf	-Inf	31.16	3	Vertical	171	1.37	-
PK	2.4836G	55.49	74.00	-18.51	31.17	3	Vertical	171	1.37	-
AV	2.483502G	45.30	54.00	-8.70	31.17	3	Vertical	171	1.37	-

### BT-LE(1Mbps)

### 2480MHz\_TX

06/05/2018



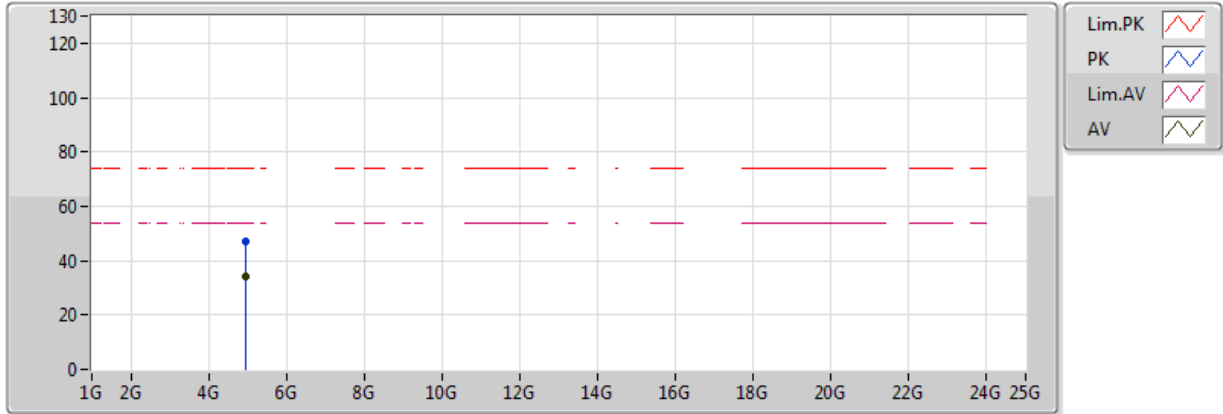
EUT Y\_1TX  
Setting Default  
01-J-1  
FSP

Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
PK	2.4798G	102.09	Inf	-Inf	31.16	3	Horizontal	321	1.51	-
AV	2.48G	100.64	Inf	-Inf	31.16	3	Horizontal	321	1.51	-
PK	2.4842G	55.92	74.00	-18.08	31.17	3	Horizontal	321	1.51	-
AV	2.483502G	47.75	54.00	-6.25	31.17	3	Horizontal	321	1.51	-

### BT-LE(1Mbps)

### 2480MHz\_TX

06/05/2018



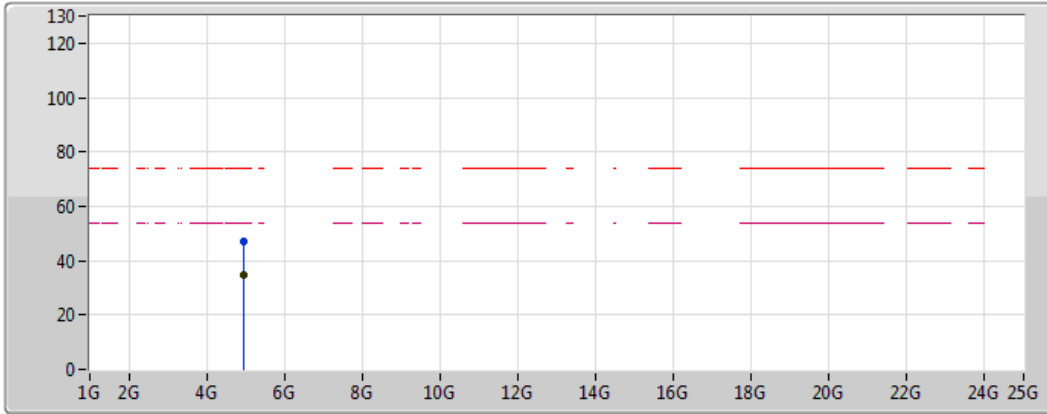
EUT Y\_1TX  
Setting Default  
01-J-1  
FSP

Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
PK	4.96229G	47.33	74.00	-26.67	4.55	3	Vertical	52	2.79	-
AV	4.9598G	34.33	54.00	-19.67	4.54	3	Vertical	52	2.79	-

### BT-LE(1Mbps)

### 2480MHz\_TX

06/05/2018



Legend for the spectrum plot:

- Lim.PK: Red dashed line with a peak icon
- PK: Blue line with a peak icon
- Lim.AV: Magenta dashed line with a peak icon
- AV: Black line with a peak icon

EUT Y\_1TX  
Setting Default  
01-J-1  
FSP

Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
PK	4.96033G	46.95	74.00	-27.05	4.55	3	Horizontal	18	1.50	-
AV	4.95999G	34.81	54.00	-19.19	4.54	3	Horizontal	18	1.50	-