



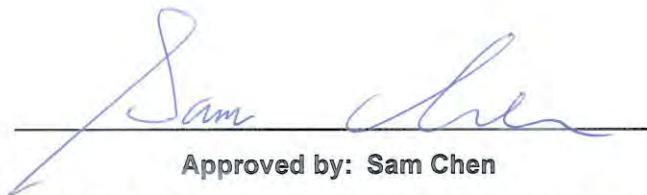
FCC RADIO TEST REPORT

FCC ID : UIDW31
Equipment : Wireless Router
Brand Name : ARRIS
Model Name : W31, W30
Applicant : ARRIS
3871 Lakefield Drive Suite 300, Suwanee, Georgia,
30024 United States
Manufacturer : ARRIS
3871 Lakefield Drive Suite 300, Suwanee, Georgia,
30024 United States
Standard : 47 CFR FCC Part 15.247

The product was received on Jul. 18, 2018, and testing was started from Dec. 21, 2018 and completed on Dec. 24, 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 variant 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: Sam Chen

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



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Appendix A. Test Results of AC Power-line Conducted Emissions**Appendix B. Test Results of Emissions in Restricted Frequency Bands****Appendix C. Test Photos****Photographs of EUT v01**



History of this test report



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(d)	Emissions in Restricted Frequency Bands	PASS	-

Declaration of Conformity:

The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.

Comments and Explanations:

1. The test configuration, test mode and test software were written in this test report are declared by the manufacturer.
2. The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.

Reviewed by: Sam Chen**Report Producer: Cindy Peng**



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
2.4-2.4835GHz	BT-2LE	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.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)
1	PEGATRON	RFPCA2620-01_Rev02	Dual band PCB dipole antenna	I-PEX	Note
2	PEGATRON	RFPCA2620-02_Rev02	Dual band PCB dipole antenna	I-PEX	
3	PEGATRON	RFPCA2620-03_Rev01	Dual band PCB dipole antenna	I-PEX	
4	PEGATRON	RFPCA2620-04_Rev02	Dual band PCB dipole antenna	I-PEX	
5	PEGATRON	RFPCA2307-02 Rev02	PCB dipole antenna	I-PEX	
6	PEGATRON	RFPCA2211-03 Rev01	PCB dipole antenna	I-PEX	
7	PEGATRON	RFPCA2211-04 Rev02	PCB dipole antenna	I-PEX	
8	PEGATRON	RFPCA1806-03 Rev01	PCB dipole antenna	I-PEX	
9	PEGATRON	RFPCA3508-05_Rev02	PCB antenna	I-PEX	
10	PEGATRON	RFPCA1806-03 Rev01	PCB dipole antenna	I-PEX	

Note:

Ant.	Port	Uncorrelated (dBi)			Correlated (dBi)			(dBi)
		2.4GHz	5GHz Band 1~2	5GHz Band 3~4	2.4GHz	5GHz Band 1~2	5GHz Band 3~4	
1	1	4.22	5.71	-	5.35	6.23		-
2	2	4.22	5.71	-	5.35	6.23		-
3	3	4.22	5.71	-	5.35	6.23		-
4	4	4.22	5.71	-	5.35	6.23		-
5	1	-	-	5.82	-	-	6.93	-
6	2	-	-	5.82	-	-	6.93	-
7	3	-	-	5.82	-	-	6.93	-
8	4	-	-	5.82	-	-	6.93	-
9	1	-	-	-	-	-	-	4.12
10	-	-	5.23	5.23	-	-	-	-

Note 1: The above information was declared by manufacturer.

Note 2: The EUT has ten antennas.

For Radio 1**WLAN 2.4GHz Functions****For IEEE 802.11b/g/n/ac/ax mode (4TX, 4RX):**

Port 1, Port 2, Port 3 and Port 4 could transmit/receive simultaneously.

WLAN 5GHz Functions (1RX):

Ant. 10 only supports the antenna receive function.

**For Radio 3****WLAN 5GHz Band 1~2 Functions****For IEEE 802.11a/n/ac/ax mode (4TX, 4RX):**

Port 1, Port 2, Port 3 and Port 4 could transmit/receive simultaneously.

For Radio 2**WLAN 5GHz Band 3~4 Functions****For IEEE 802.11a/n/ac/ax mode (4TX, 4RX):**

Port 1, Port 2, Port 3 and Port 4 could transmit/receive simultaneously.

For Radio 4**Bluetooth Functions (1TX, 1RX):**

Only Port 1 could transmit/receive simultaneously.

1.1.3 Table for Radio Type

Radio No.	2.4GHz	5GHz Band 1~2	5GHz Band 3~4	Bluetooth
Radio 1	V	Only RX function	Only RX function	-
Radio 2	-	-	V	-
Radio 3	-	V	-	-
Radio 4	-	-	-	V

1.1.4 EUT Operational Condition

EUT Power Type	From power adapter			
Function	<input checked="" type="checkbox"/>	Point-to-multipoint	<input type="checkbox"/>	Point-to-point
Test Software Version	Telnet v1.27.2			
Support Mode	<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 checked="" type="checkbox"/>	LE 2M PHY: 2 Mb/s		

1.1.5 Table for EUT Functions

Type of Function	2.4GHz	5GHz Band 1~2	5GHz Band 3~4
Master (AP Router)	V	V	V
Master (Extender)	-	-	V
Bridge (Client without radar detection)	-	-	V
Client without radar detection	-	-	V



1.1.6 Table for Multiple Listing

The model names in the following table are all refer to the identical product.

Model Name	Color of Device's Bottom
W31	Matte Black
W30	Silver

From the above models, model name "W31" was selected as representative model for the test and its data was recorded in this report.

1.1.7 Table for Class II Change

This product is an extension of original one reported under Sporton project number: FR842742AD

Below is the table for the change of the product with respect to the original one.

Modifications	Performance Checking
1. Adding an adapter (Model Name: NBS42D120350VU).	1. AC Power-line Conducted Emissions. 2. Emissions in Restricted Frequency Bands Below 1GHz.
2. Adding the 802.11ax mode for WLAN 2.4GHz and WLAN 5GHz. 3. Adding the 160MHz. 4. Adding the WLAN 5GHz band 2 and band 3 (5250~5350 MHz, 5470~5725 MHz) for this device. 5. Updating the WIFI chip (BCM43684KRFBG) version to B1 from A1. The difference between A1 (original) and B1 (new) as below: (1) No functional RF changes versus A1. (2) MAC/PHY related bug fixes and optimizations. (3) Power and yield optimizations.	It doesn't need to verify Bluetooth test.
6. Updating the 802.11ac data rate and data modulation of WLAN 2.4GHz to "MCS 0-11, 1024QAM" from "MCS 0-9, 256QAM".	It doesn't affect the test result.
7. Adding the Master (Extender), Bridge (Client without radar detection) and Client without radar detection modes for WLAN 5GHz band 3 and band 4 (5470~5725 MHz, 5725~5850 MHz).	It doesn't need to verify RF test.
8. Changing the internal structure of housing. 9. Changing the housing color to black from white. 10. Removing USB port. 11. Changing the equipment name to "Wireless Router" from "W31". Based on the modification above. 12. Adding a new model name "W30" which the color of device's bottom is silver.	It does not affect the test.



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 v05

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
Radiated Below 1GHz	03CH01-CB	Stim Sung	22°C / 54%	Dec. 24, 2018
AC Conduction	CO02-CB	Ryo Fan	22°C / 58%	Dec. 21, 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)	2.0 dB	Confidence levels of 95%
Radiated Emission (30MHz ~ 1,000MHz)	3.6 dB	Confidence levels of 95%



2 Test Configuration of EUT

2.1 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	CTX There are four modes as below: Mode 1: EUT - Radio 1 (WLAN 2.4GHz) Mode 2: EUT - Radio 3 (WLAN 5GHz Band 1~2) Mode 3: EUT - Radio 2 (WLAN 5GHz Band 3~4) Mode 4: EUT - Radio 4 (Bluetooth) The worst case was found from Mode 2 of original test. So the measurement will follow this same test configuration.
1	EUT - Radio 3 (WLAN 5GHz Band 1~2) + Adapter 2

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 There are four modes as below: Mode 1: EUT in Y axis - Radio 1 (WLAN 2.4GHz) Mode 2: EUT in Y axis - Radio 3 (WLAN 5GHz Band 1~2) Mode 3: EUT in Y axis - Radio 2 (WLAN 5GHz Band 3~4) Mode 4: EUT in Y axis - Radio 4 (Bluetooth) The worst case was found from Mode 1 of original test. So the measurement will follow this same test configuration.
1	EUT in Y axis - Radio 1 (WLAN 2.4GHz) + Adapter 2

The Worst Case Mode for Following Conformance Tests	
Tests Item	Simultaneous Transmission Analysis - Co-location RF Exposure Evaluation
Operating Mode	
1	Radio 1 (WLAN 2.4GHz) + Radio 3 (WLAN 5GHz Band 1~2) + Radio 2 (WLAN 5GHz Band 3~4) + Radio 4 (Bluetooth)

Refer to Sporton Test Report No.: FA842742-01 for Co-location RF Exposure Evaluation.

Note 1: The EUT can only be used at Y axis position.



2.2 EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

2.3 Accessories

Accessories					
No.	Equipment Name	Brand Name	Model Name	P/N	Rating
1	Adapter 1	APD	WA-36L12FU	AREP05681	INPUT: 100-120V ~, 60Hz, 0.9A Max OUTPUT: 12V, 3A
2	Adapter 2	NetBit	NBS42D120 350VU	AREP05751	INPUT: 100-120V ~, 50/60Hz, 1.0A OUTPUT: 12.0V, 3.5A

2.4 Support Equipment

For Test Site No: CO02-CB

Support Equipment				
No.	Equipment	Brand Name	Model Name	FCC ID
1	NB	DELL	E6430	N/A

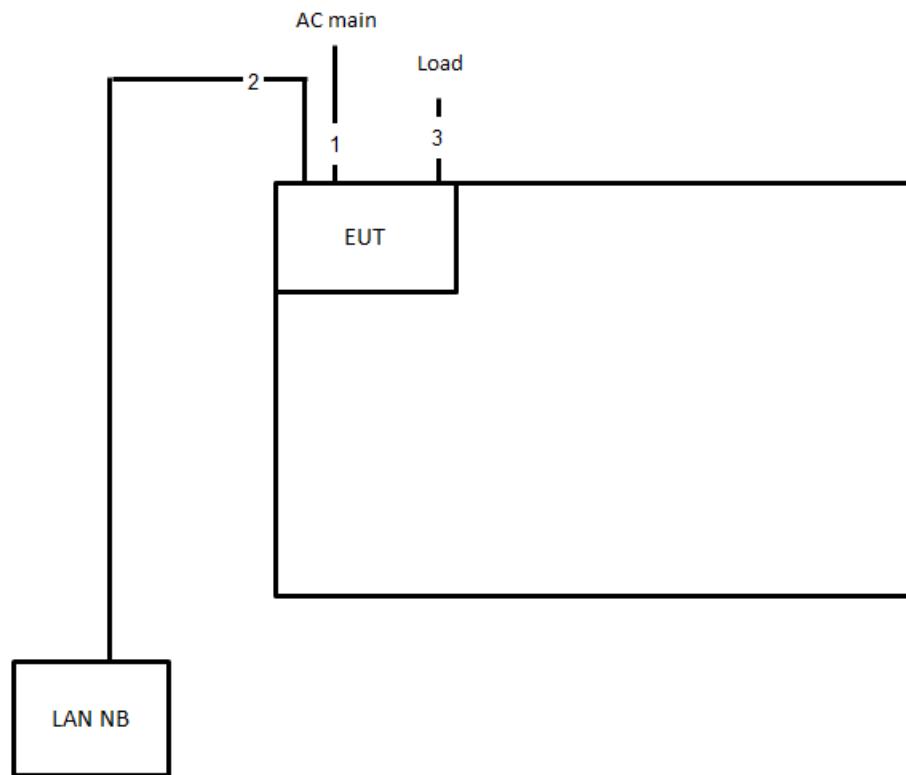
For Test Site No: 03CH01-CB

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



2.5 Test Setup Diagram

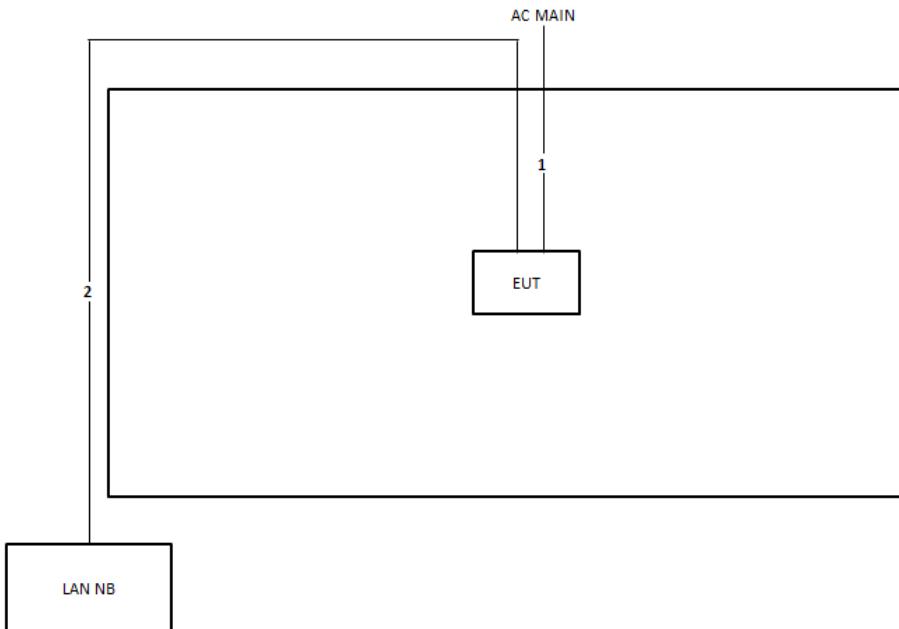
Test Setup Diagram – AC Line Conducted Emission Test



Item	Connection	Shielded	Length
1	Power cable	No	1.8m
2	RJ-45 cable	No	10m
3	RJ-45 cable*3	No	1.5m



Test Setup Diagram - Radiated Test



Item	Connection	Shielded	Length
1	Power cable	No	1.8m
2	RJ-45 cable	No	10m



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.

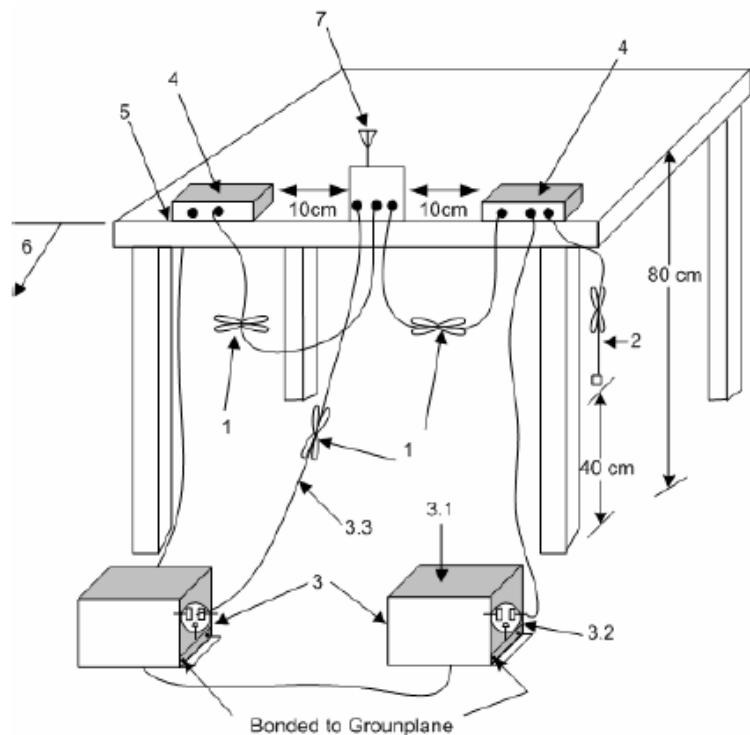
3.1.2 Measuring Instruments

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



- 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 $50\ \Omega$ 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 Emissions in Restricted Frequency Bands

3.2.1 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.

3.2.2 Measuring Instruments

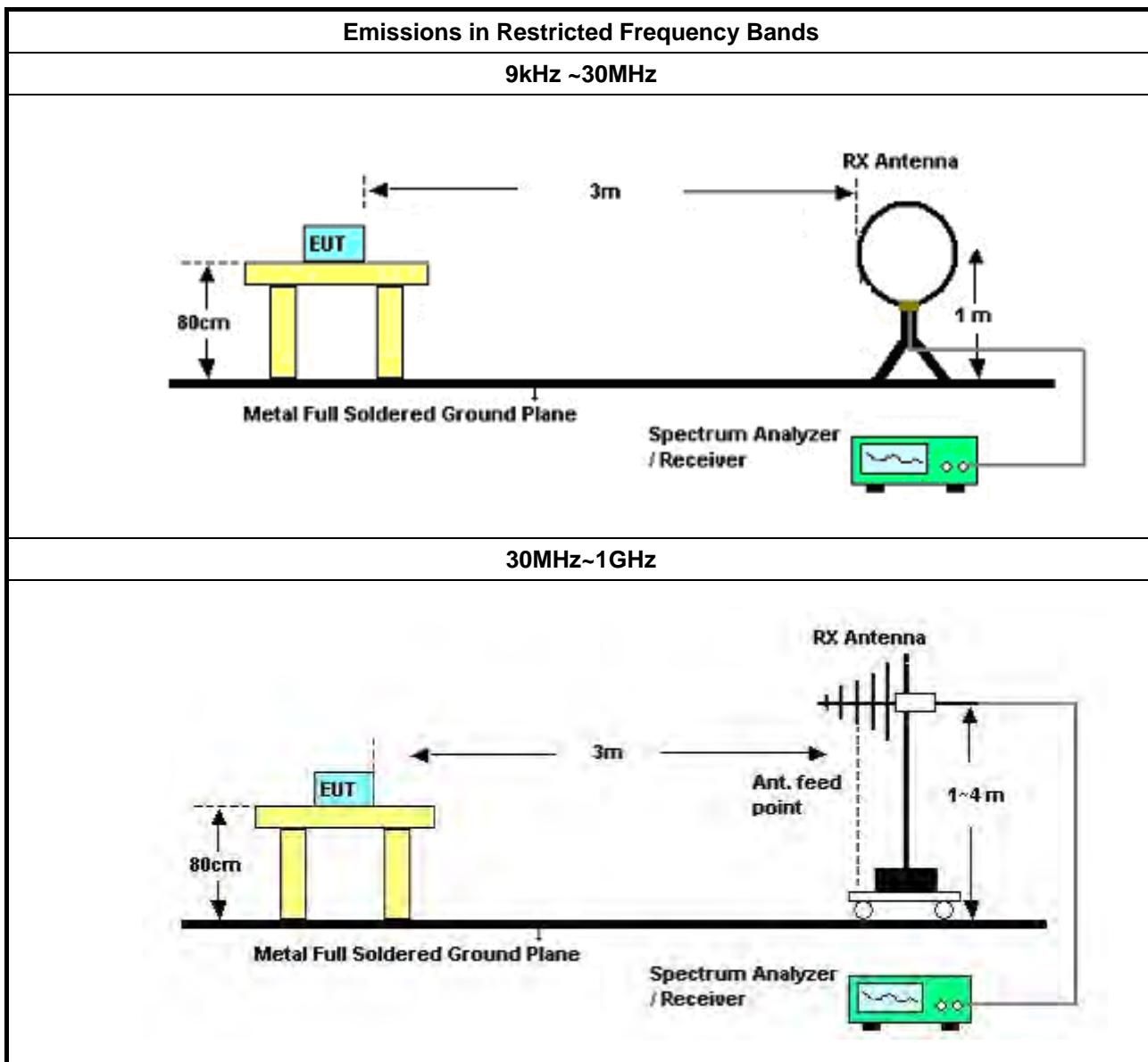
Refer a test equipment and calibration data table in this test report.



3.2.3 Test Procedures

Test Method	
▪ The average emission levels shall be measured in [duty cycle \geq 98 or duty factor].	
▪ Refer as ANSI C63.10, clause 6.10.3 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 8.6 for unwanted emissions into restricted bands.
	<input type="checkbox"/> Refer as FCC KDB 558074, clause 8.6 & C63.10 clause 11.12.2.5.1(trace averaging for duty cycle \geq 98%).
	<input type="checkbox"/> Refer as FCC KDB 558074, clause 8.6 & C63.10 clause 11.12.2.5.2(trace averaging + duty factor).
	<input checked="" type="checkbox"/> Refer as FCC KDB 558074, clause 8.6 & C63.10 clause 11.12.2.5.3(Reduced $VBW \geq 1/T$).
	<input type="checkbox"/> Refer as ANSI C63.10, clause 11.12.2.5.3 (Reduced VBW). $VBW \geq 1/T$, where T is pulse time.
	<input type="checkbox"/> Refer as ANSI C63.10, clause 7.5 average value of pulsed emissions.
	<input checked="" type="checkbox"/> Refer as FCC KDB 558074, clause 8.6 & C63.10 clause 11.12.2.4 measurement procedure peak limit.
▪ For the transmitter band-edge emissions shall be measured using following options below:	
	▪ Refer as FCC KDB 558074 clause 8.7 & c63.10 clause 11.13.1, 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 8.7 (ANSI C63.10, clause 6.10.6) for marker-delta method for band-edge measurements.
	▪ Refer as FCC KDB 558074, clause 8.7 for narrower resolution bandwidth (100kHz) using the band power and summing the spectral levels (i.e., 1 MHz).
	▪ 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.

3.2.4 Test Setup



3.2.5 Emissions in Restricted Frequency Bands (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.

3.2.6 Test Result of Emissions in Restricted Frequency Bands

Refer as Appendix B



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. 21, 2018	Nov. 20, 2019	Conduction (CO02-CB)
LISN	Schwarzbeck	NSLK 8127	8127478	9kHz ~ 30MHz	Nov. 05, 2018	Nov. 04, 2019	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. 06, 2018	Nov. 05, 2019	Conduction (CO02-CB)
Software	Audix	E3	6.120210n	-	N.C.R.	N.C.R.	Conduction (CO02-CB)
Loop Antenna	Teseq	HLA 6120	24155	9kHz - 30 MHz	Mar. 16, 2018	Mar. 15, 2019	Radiation (03CH01-CB)
BILOG ANTENNA with 6dB Attenuator	TESEQ & EMCI	CBL6112D & N-6-06	37880 & AT-N0609	20MHz ~ 2GHz	Aug. 27, 2018	Aug. 26, 2019	Radiation (03CH01-CB)
Pre-Amplifier	EMCI	EMC330N	980332	20MHz ~ 3GHz	May 02, 2018	May 01, 2019	Radiation (03CH01-CB)
Spectrum analyzer	R&S	FSP40	100080	9kHz~40GHz	Oct. 03, 2018	Oct. 02, 2019	Radiation (03CH01-CB)
EMI Test Receiver	R&S	ESCS	100359	9kHz ~ 2.75GHz	Jul. 03, 2018	Jul. 02, 2019	Radiation (03CH01-CB)
RF Cable-low	Woken	Low Cable-16+17	N/A	30 MHz ~ 1 GHz	Oct. 08, 2018	Oct. 07, 2019	Radiation (03CH01-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

Summary

Mode	Result	Type	Freq (Hz)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Factor (dB)	Condition
Mode 1	Pass	AV	280.5k	22.55	50.80	-28.25	10.05	Neutral

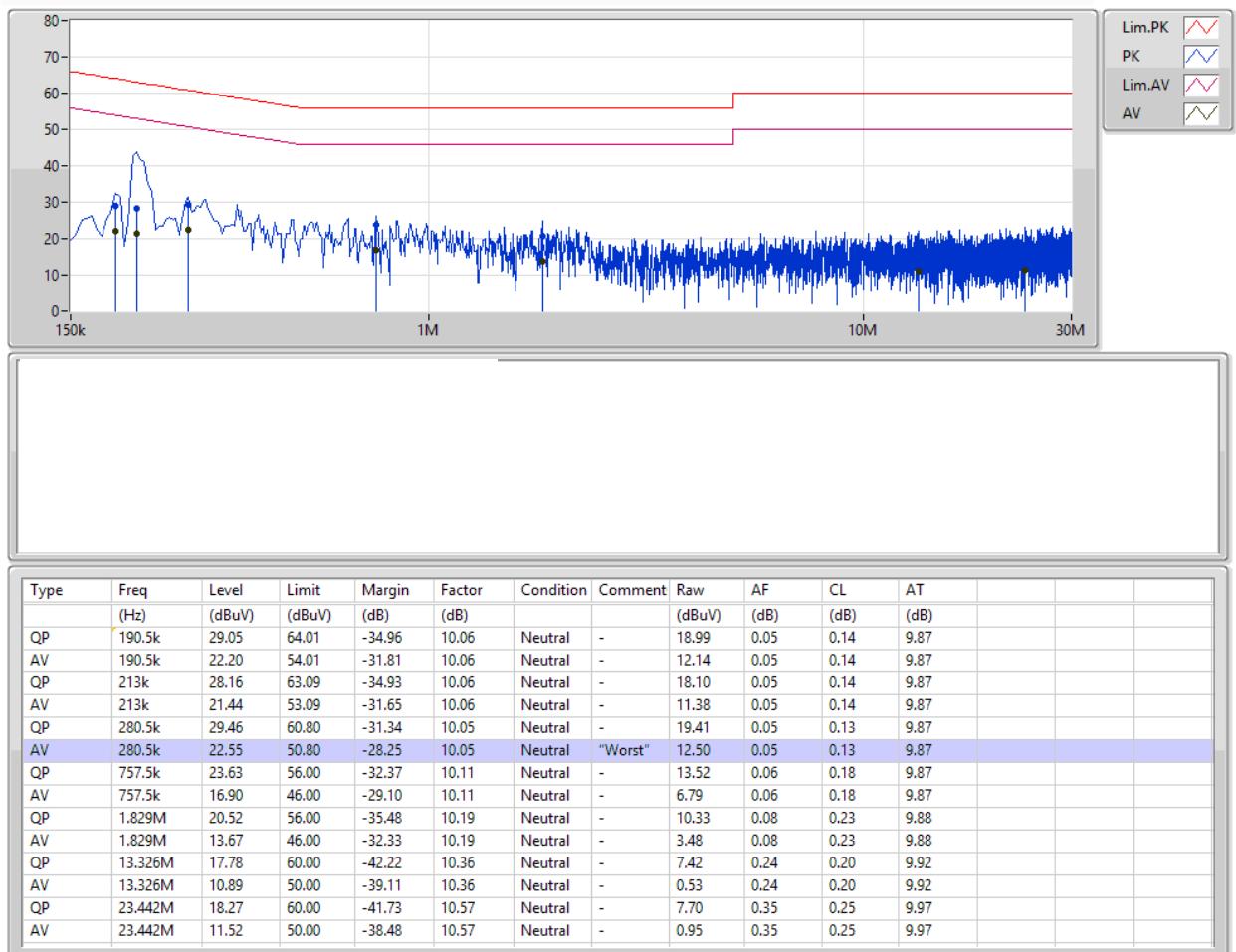
Mode 1

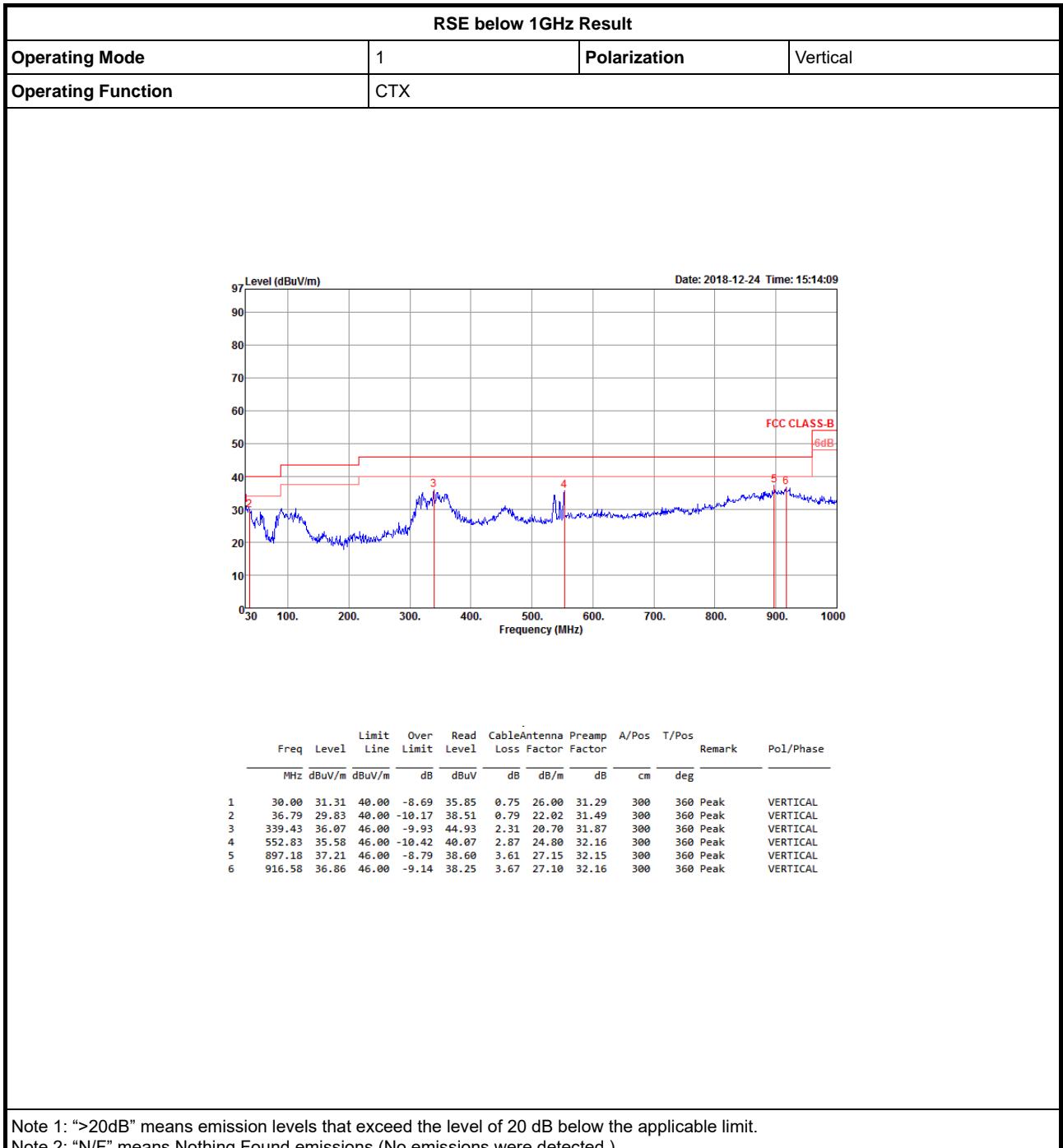
21/12/2018



Mode 1

21/12/2018





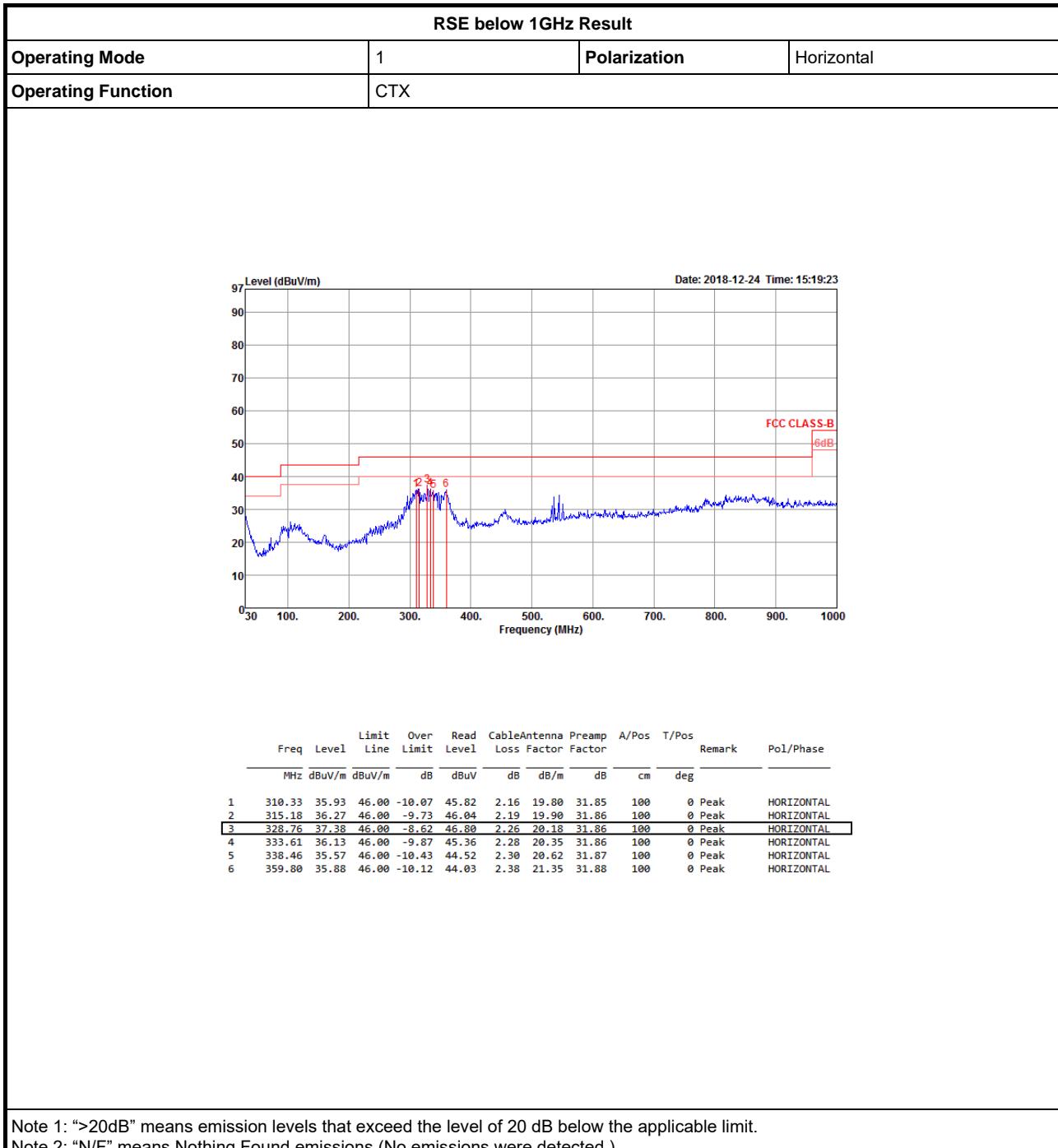
Note 1: ">20dB" means emission levels that exceed the level of 20 dB below the applicable limit.

Note 2: "N/F" means Nothing Found emissions (No emissions were detected.)



RSE below 1GHz Result

Appendix B



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.)