



FCC RADIO TEST REPORT

FCC ID : HEDML60LW
Equipment : Metrolinq 60G dual band dual radio wireless bridge
Brand Name : Ignitenet
Model Name : ML-60-LW-DO,ML-5-LW,ML-60-LW
Applicant : Accton Technology Corp
No. 1, Creation Rd. III, Science-based Industrial
Park Hsin Chu 30077, Taiwan
Manufacturer (1) : Joy Technology (Shen Zhen) Co. Ltd
HengKeng Ind., Shangpai, Shangwu, Aiqun Rd.,
Shiyan Town, Shenzhen 518108 China
Manufacturer (2) : Accton Technology Corp
No. 1, Creation Rd. III, Science-based Industrial
Park Hsin Chu 30077, Taiwan
Standard : 47 CFR FCC Part 15.247

The product was received on Jan. 09, 2018, and testing was started from Apr. 19, 2018 and completed on May 05, 2018. We, SPORTON INTERTIONAL 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 INTERTIONAL INC. EMC & Wireless Communications Laboratory, the test report shall not be reproduced except in full.


Approved by: Sam Chen

SPORTON INTERTIONAL 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

[illegible]



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	-

Reviewed by: Sam Chen

Report Producer: Viola Huang



1 General Description

1.1 Information

1.1.1 RF General Information

Frequency Range (MHz)	IEEE Std. 802.11	Ch. Frequency (MHz)	Channel Number
2400-2483.5	b, g, n (HT20)	2412-2462	1-11 [11]
2400-2483.5	n (HT40)	2422-2452	3-9 [7]

Band	Mode	BWch (MHz)	Nant
2.4-2.4835GHz	802.11b	20	2TX
2.4-2.4835GHz	802.11g	20	2TX
2.4-2.4835GHz	802.11n HT20	20	2TX
2.4-2.4835GHz	802.11n HT40	40	2TX

Note 1:

- ♦ 11b mode uses a combination of DSSS-DBPSK, DQPSK, CCK modulation.
- ♦ 11g, HT20 and HT40 use a combination of OFDM-BPSK, QPSK, 16QAM, 64QAM 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.

Note 2: This device contains transmitter 60GHz module FCC ID: HEDML60PRS4601

**1.1.2 Antenna Information****For WLAN 2.4GHz and WLAN 5GHz:****For Model Name: ML-5-LW, ML-60-LW**

Ant.	Port	Brand	Model Name	Antenna Type	Connector	Gain (dBi)	Remark
1	1	Accton	120G00000186X	Dipole Antenna	MMCX	7	2.4GHz
	2						
2	1	Accton	120G00000181X	Sector Antenna	MMCX	15	5GHz
	2						

For Model Name: ML-60-LW-DO

Ant.	Port	Brand	Model Name	Antenna Type	Connector	Gain (dBi)	Remark
1	1	Accton	120G00000192X	Dipole Antenna	MMCX	5.23	2.4GHz
	2					6.15	2.4GHz
	1					8.11	5GHz
2	2	Accton	120G00000191X	Dipole Antenna	MMCX	6.39	5GHz

Note:

1. For WLAN 2.4GHz:
Port 1 and Port 2 could transmit/receive simultaneously.
2. For WLAN 5GHz:
Port 1 and Port 2 could transmit/receive simultaneously.

For 60GHz:

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)
1	Accton	120300000225X	Chip Ant.	N/A	17.2

**1.1.3 EUT Operational Condition**

EUT Power Type	From PoE or DC 48V			
Beamforming Function	<input type="checkbox"/>	With beamforming	<input checked="" type="checkbox"/>	Without beamforming
Function	<input checked="" type="checkbox"/>	Outdoor P2M	<input type="checkbox"/>	Indoor P2M
	<input type="checkbox"/>	Fixed P2P	<input type="checkbox"/>	Client
Test Software Version	QRCT			

1.1.4 Table for Multiple Listing

Model Name	EUT No.	WLAN 2.4GHz Function	WLAN 5GHz Function	60GHz Function
ML-60-LW	EUT 1	V	V	V
		Match antenna "Dipole Antenna, Model Name: 120G00000186X"	Match Antenna "Sector Antenna, Model Name: 120G00000181X"	Match Antenna "Chip Antenna, Model Name: 120300000225X"
ML-5-LW	EUT 2	V	V	X
		Match Antenna "Dipole Antenna, Model Name: 120G00000186X"	Match Antenna "Sector Antenna, Model Name: 120G00000181X"	-
ML-60-LW-DO	EUT 3	V	V	V
		Match Antenna "Dipole Antenna, Model Name: 120G00000192X"	Match Antenna "Dipole Antenna, Model Name: 120G00000191X" and 120G00000192X"	Match Antenna "Chip Antenna, Model Name: 120300000225X"

From the above models, model: ML-60-LW and ML-60-LW-DO were selected as representative model for the test and its data was recorded in this report.



1.1.5 Table for Class II Change

This product is an extension of original one reported under Sporton project number: FR7D2234-01AA

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

Modifications	Performance Checking
<p>For the original model name "ML-60-LW".</p> <ol style="list-style-type: none">1. Changing the Equipment Name to "Metrolinq 60G dual band dual radio wireless bridge" from "MetroLinq 60 LW".2. Updating the digital board version to R01 from R0B.3. Changing a new USB cable.4. Updating EUT Power Type to DC 48V from DC 24V. <p>Based on the above modification.</p> <ol style="list-style-type: none">5. Adding a new model name "ML-5-LW" which without the 60GHz module.6. Adding a new model name "ML-60-LW-DO" which with a new set dipole antenna. The new set antenna has lower gain, same type antennas in 2.4GHz function and lower gain, different type antennas in 5GHz function.	<p>For item 1 and item 5 Do not have to retest assessed. For item 2~4 and item 6 1.AC Power-line Conducted Emissions 2.Emissions in Restricted Frequency Bands</p>



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				
<input type="checkbox"/>	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
<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	03CH01-CB	Stim Sung & Gino Huang & Justin Lin & Ekko Hsieh	22°C / 54%	Apr. 21, 2018~May 04, 2018
AC Conduction	CO01-CB	Wei Li	24°C / 52%	Apr. 19, 2018~ May 05, 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%

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
1	EUT 3 + WLAN 2.4GHz - AC mode
2	EUT 3 + WLAN 5GHz - AC mode
Mode 2 has been evaluated to be the worst case among Mode 1~2, thus measurement for Mode 3 will follow this same test mode.	
3	EUT 3 + WLAN 5GHz - DC mode (48V)
4	EUT 1 + WLAN 2.4GHz - AC mode
5	EUT 1 + WLAN 5GHz - AC mode
Mode 5 has been evaluated to be the worst case among Mode 4~5, thus measurement for Mode 6 will follow this same test mode.	
6	EUT 1 + WLAN 5GHz - DC mode (48V)
Mode 5 generated the worst test result, so it was recorded in this report.	

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
1	EUT 3 + WLAN 2.4GHz - AC mode
2	EUT 3 + WLAN 5GHz - AC mode
Mode 2 has been evaluated to be the worst case among Mode 1~2, thus measurement for Mode 3 will follow this same test mode.	
3	EUT 3 + WLAN 5GHz - DC mode (48V)
4	EUT 1 + WLAN 2.4GHz - AC mode
5	EUT 1 + WLAN 5GHz - AC mode
Mode 5 has been evaluated to be the worst case among Mode 4~5, thus measurement for Mode 6 will follow this same test mode.	
6	EUT 1 + WLAN 5GHz - DC mode (48V)
Mode 2 generated the worst test result, so it was recorded in this report.	



The Worst Case Mode for Following Conformance Tests	
Tests Item	Simultaneous Transmission Analysis - Co-location RF Exposure Evaluation
Operating Mode	
1	WLAN 2.4GHz+WLAN 5GHz+60GHz
Refer to Sporton Test Report No.: FA7D2234-03 for Co-location RF Exposure Evaluation.	

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

2. The PoE is for measurement only, would not be marketed, and its information as below:

Equipment	Brand Name	Model Name	FCC ID
PoE	CARRIER	GME241DA-240100G	N/A

2.2 EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

2.3 Accessories

N/A

2.4 Support Equipment

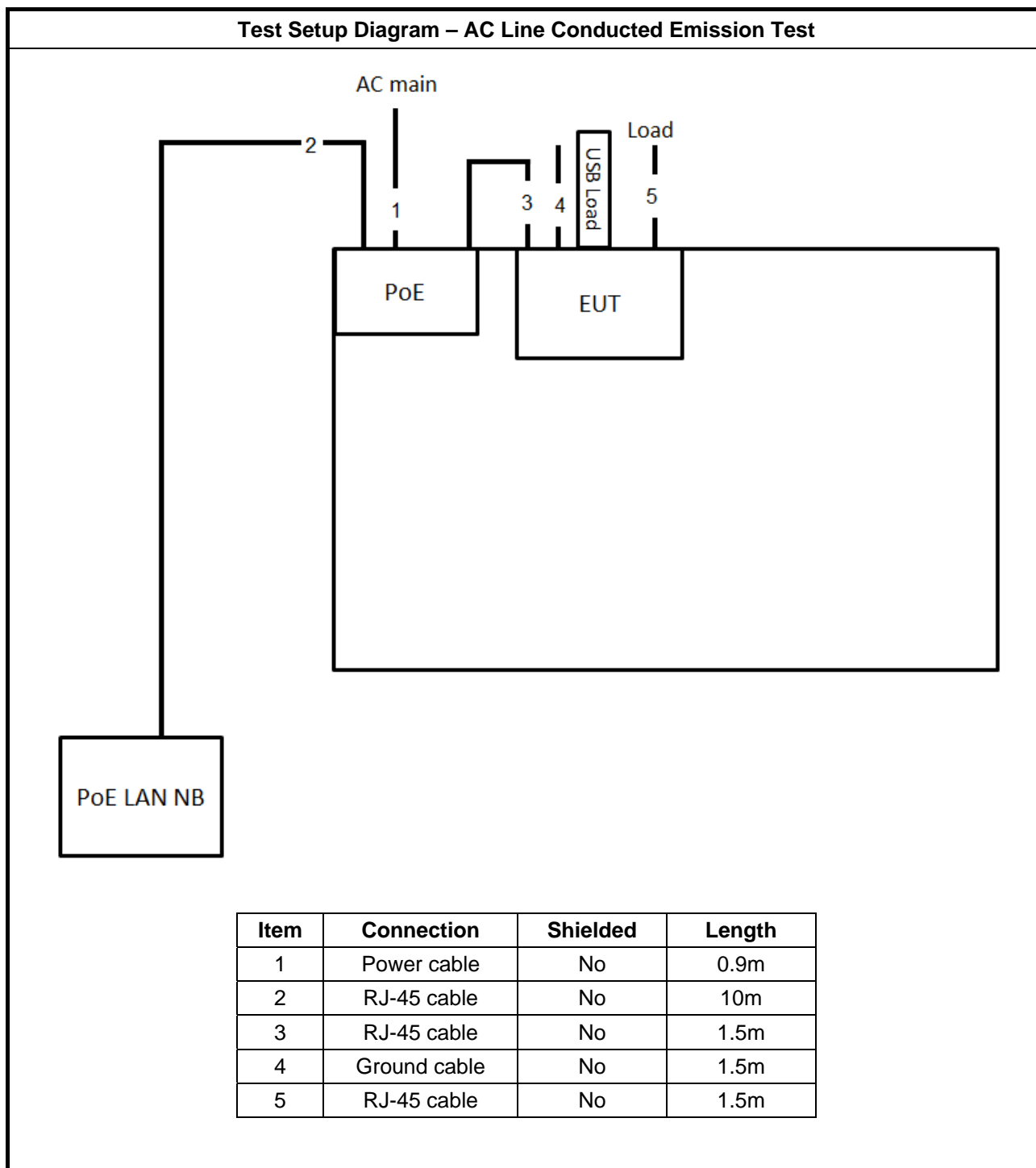
For Test Site No: CO01-CB

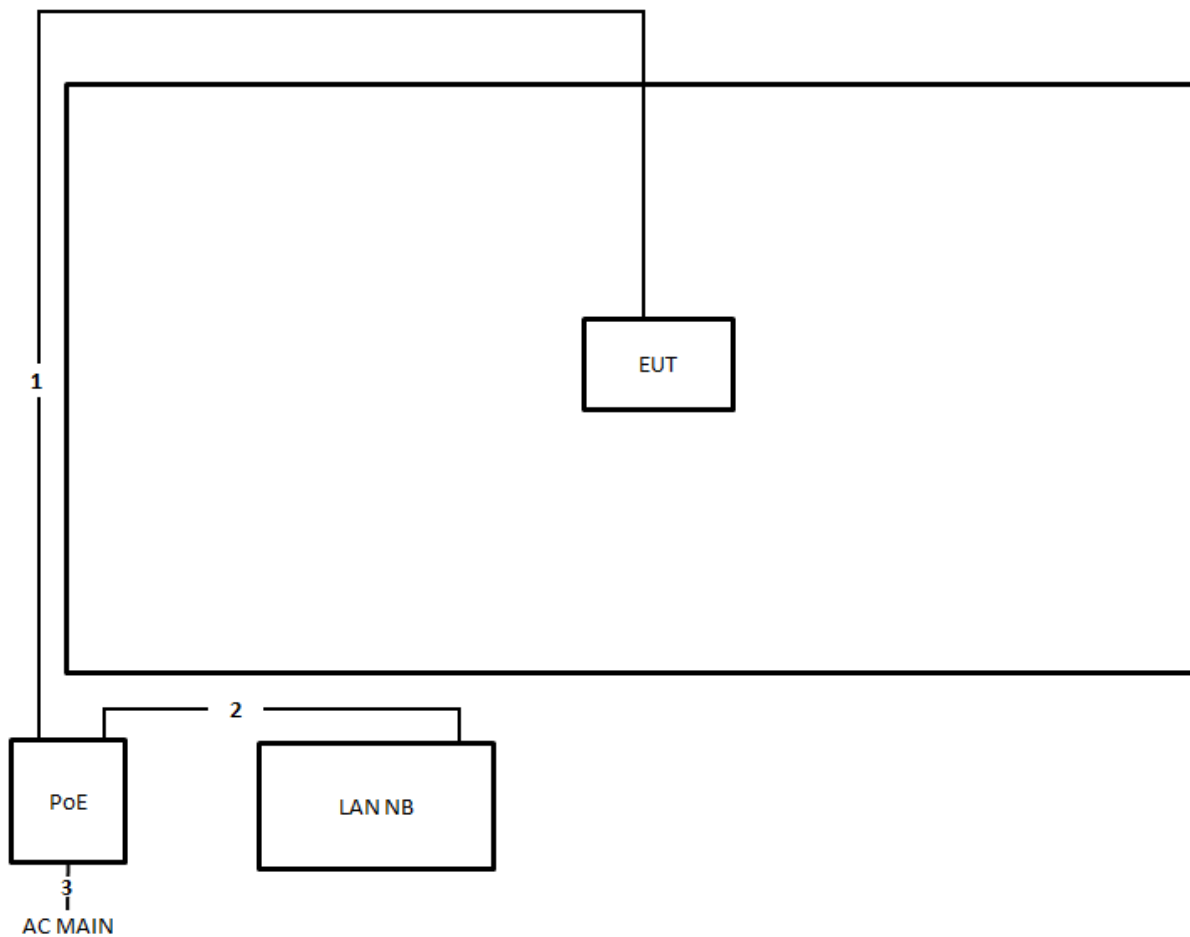
Support Equipment				
No.	Equipment	Brand Name	Model Name	FCC ID
1	Notebook	DELL	E6430	DoC
2	Flash disk	Kingston	DTSE9H	N/A
3	PoE	CARRIER	GME241DA-240100G	N/A

For Test Site No: 03CH01-CB

Support Equipment				
No.	Equipment	Brand Name	Model Name	FCC ID
1	Notebook	DELL	E4300	DoC
2	PoE	CARRIER	GME241DA-240100G	N/A

2.5 Test Setup Diagram



Test Setup Diagram - Radiated Test


Item	Connection	Shielded	Length
1	RJ-45 cable	No	10 m
2	RJ-45 cable	No	1.5 m
3	Power cable	No	0.9 m

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.

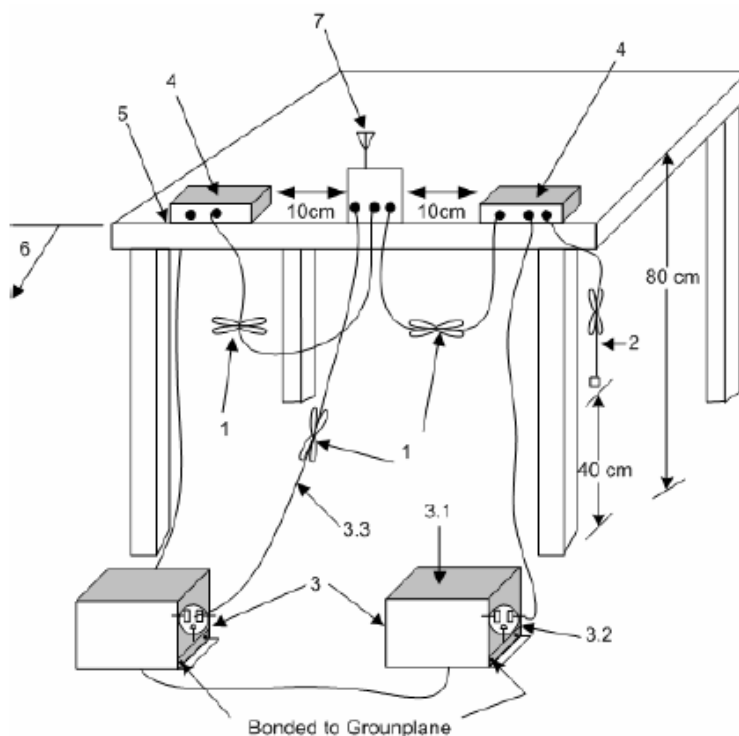
3.1.2 Measuring Instruments

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

3.1.3 Test Procedures

Test Method
<input checked="" type="checkbox"/> Refer as ANSI C63.10-2013, clause 6.2 for AC power-line conducted emissions.

AC Power-line Conducted Emissions



7—Antenna can be integral or detachable. If detachable, then the antenna shall be attached for this test.

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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.

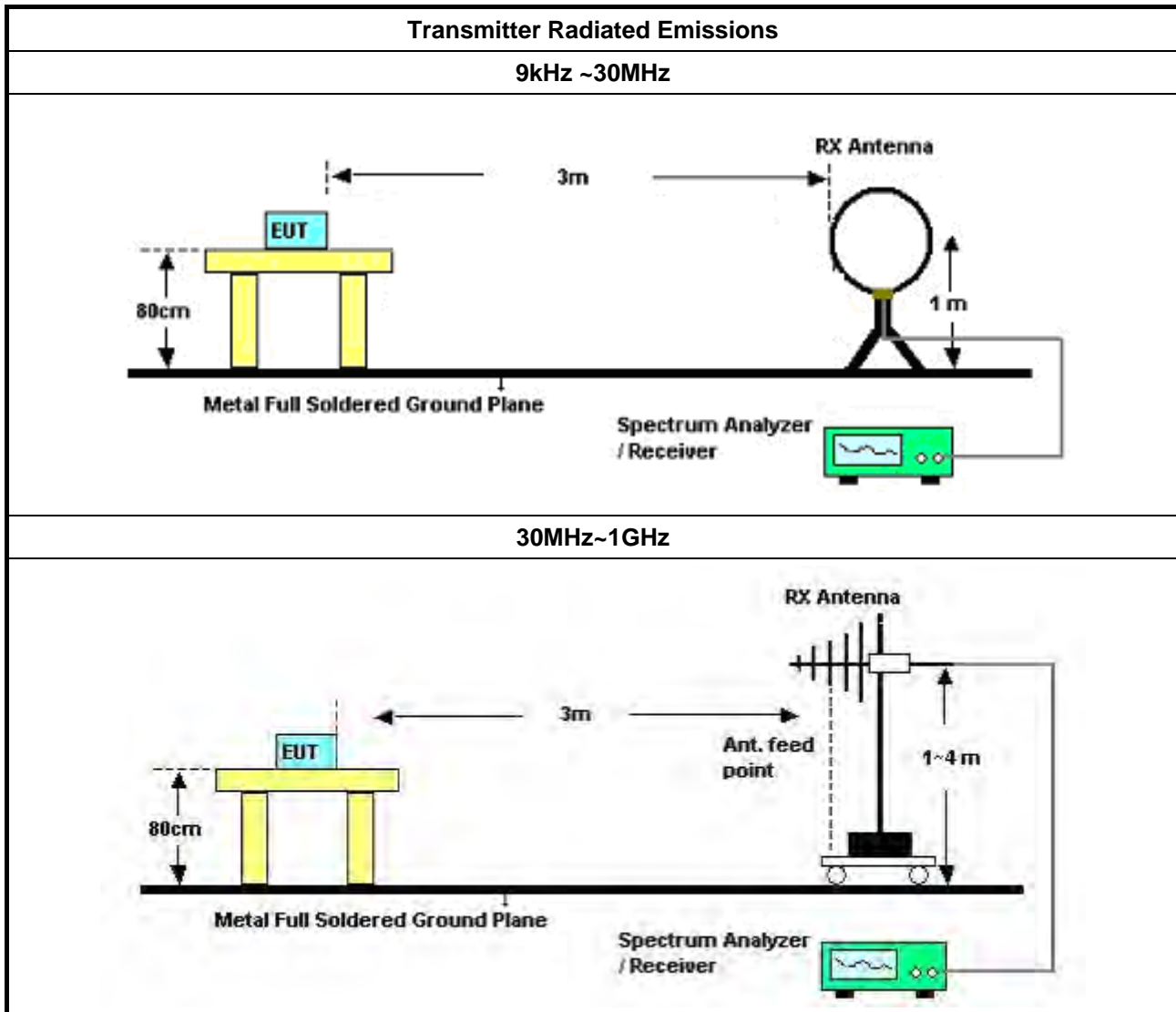
3.2.2 Measuring Instruments

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

3.2.3 Test Procedures

Test Method	
<ul style="list-style-type: none"> The average emission levels shall be measured in [duty cycle ≥ 98 or duty factor]. 	
<ul style="list-style-type: none"> 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. 	
<ul style="list-style-type: none"> For the transmitter unwanted emissions shall be measured using following options below: 	
	<ul style="list-style-type: none"> Refer as FCC KDB 558074, clause 12 for unwanted emissions into restricted bands.
	<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"> For the transmitter band-edge emissions shall be measured using following options below: 	
	<ul style="list-style-type: none"> 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.
	<ul style="list-style-type: none"> Refer as FCC KDB 558074, clause 13.2 (ANSI C63.10, clause 6.9.3) for marker-delta method for band-edge measurements.
	<ul style="list-style-type: none"> 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).
<ul style="list-style-type: none"> For conducted and cabinet radiation measurement, refer as FCC KDB 558074, clause 12.2.2. 	
	<ul style="list-style-type: none"> 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
	<ul style="list-style-type: none"> 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 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.

3.2.6 Test Result of Transmitter Radiated Unwanted Emissions

Refer as Appendix B

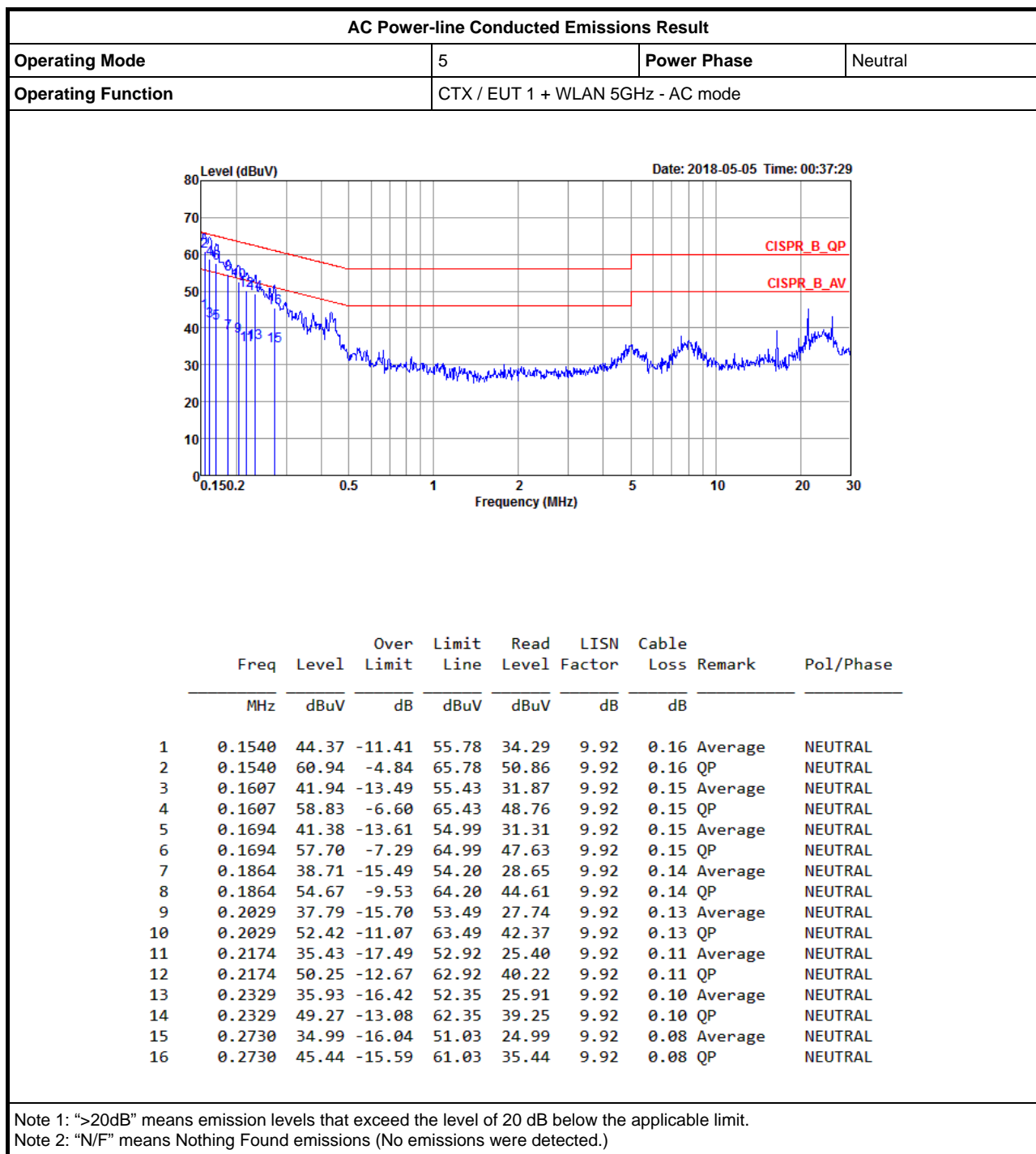


4 Test Equipment and Calibration Data

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Calibration Due Date	Remark
EMI Receiver	Agilent	N9038A	My52260123	9kHz ~ 8.45GHz	Jan. 31, 2018	Jan. 30, 2019	Conduction (CO01-CB)
LISN	F.C.C.	FCC-LISN-50-16-2	04083	150kHz ~ 100MHz	Dec. 20, 2017	Dec. 19, 2018	Conduction (CO01-CB)
LISN	Schwarzbeck	NSLK 8127	8127647	9kHz ~ 30MHz	Dec. 29, 2017	Dec. 28, 2018	Conduction (CO01-CB)
COND Cable	Woken	Cable	01	150kHz ~ 30MHz	May 23, 2017	May 22, 2018	Conduction (CO01-CB)
Software	Audix	E3	6.120210n	-	N.C.R.	N.C.R.	Conduction (CO01-CB)
BILOG ANTENNA with 6dB Attenuator	TESEQ & EMCI	CBL6112D & N-6-06	37880 & AT-N0609	20MHz ~ 2GHz	Aug. 30, 2017	Aug. 29, 2018	Radiation (03CH01-CB)
Loop Antenna	Teseq	HLA 6120	24155	9kHz - 30 MHz	Mar. 16, 2018	Mar. 15, 2019	Radiation (03CH01-CB)
Log Antenna	Schwarzbeck	VUSLP 9111	247	200MHz ~ 1GHz	May 26, 2017	May 25, 2018	Radiation (03CH01-CB)
Pre-Amplifier	Agilent	8447D	2944A10259	9kHz ~ 1.3GHz	Jan. 15, 2018	Jan. 14, 2019	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	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. 11, 2017	Oct. 10, 2018	Radiation (03CH01-CB)

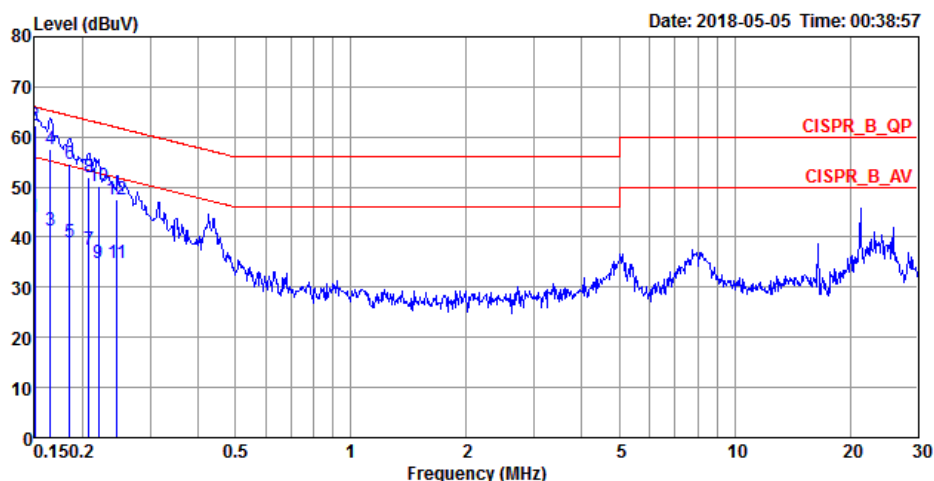
Note: Calibration Interval of instruments listed above is one year.

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



AC Power-line Conducted Emissions Result

Operating Mode	5	Power Phase	Line
Operating Function	CTX / EUT 1 + WLAN 5GHz - AC mode		



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark	Pol/Phase
	MHz	dBuV	dB	dBuV	dBuV	dB	dB		
1	0.1500	44.11	-11.89	56.00	34.04	9.91	0.16	Average	LINE
2	0.1500	62.22	-3.78	66.00	52.15	9.91	0.16	QP	LINE
3	0.1650	41.40	-13.81	55.21	31.34	9.91	0.15	Average	LINE
4	0.1650	57.43	-7.78	65.21	47.37	9.91	0.15	QP	LINE
5	0.1854	38.98	-15.26	54.24	28.93	9.91	0.14	Average	LINE
6	0.1854	54.49	-9.75	64.24	44.44	9.91	0.14	QP	LINE
7	0.2072	37.55	-15.77	53.32	27.52	9.91	0.12	Average	LINE
8	0.2072	51.82	-11.50	63.32	41.79	9.91	0.12	QP	LINE
9	0.2197	34.98	-17.85	52.83	24.96	9.91	0.11	Average	LINE
10	0.2197	50.32	-12.51	62.83	40.30	9.91	0.11	QP	LINE
11	0.2455	34.92	-16.99	51.91	24.92	9.91	0.09	Average	LINE
12	0.2455	47.54	-14.37	61.91	37.54	9.91	0.09	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.)

