



FCC Test Report

Equipment : N450 DB Wireless N Router
Brand Name : belkin
Model No. : F9K1105v5
FCC ID : K7SF9K1105V3
Standard : 47 CFR FCC Part 15.247
Operating Band : 2400 MHz – 2483.5 MHz
FCC Classification : DTS
Function : ☒ Point-to-multipoint; ☐ Point-to-point
Applicant : Belkin International, Inc.
12045 East Waterfront Drive, Playa Vista, CA 90094

The product sample received on Feb. 24, 2016 and completely tested on Apr. 11, 2016. 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.


Sam Chen
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(d)	Emissions in Restricted Frequency Bands	Restricted Bands: FCC 15.209	Complied

Revision History

[illegible]

1 General Description

1.1 Information

1.1.1 RF General Information

Band	Mode	BWch (MHz)	Nss-Min	Nant
2.4G	11b	20	1	1
2.4G	11g	20	1	1
2.4G	HT20	20	1,(M0-7)	1
2.4G	HT40	40	1,(M0-7)	1

Note:

- ♦ 2.4G is the 2.4GHz Band (2.4-2.4835GHz).
- ♦ 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.

1.1.2 Antenna Information

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)	
					2.4GHz	5GHz
1	Arcadyan	N/A	PCB Antenna	N/A	3.43	-
2	Arcadyan	N/A	PCB Antenna	N/A	3.31	-
3	Arcadyan	N/A	PCB Antenna	N/A	-	3.06
4	Arcadyan	N/A	PCB Antenna	N/A	-	2.81

Note: The EUT has four antennas.

For 2.4GHz:

For IEEE 802.11b/g/n mode (1TX/1RX):

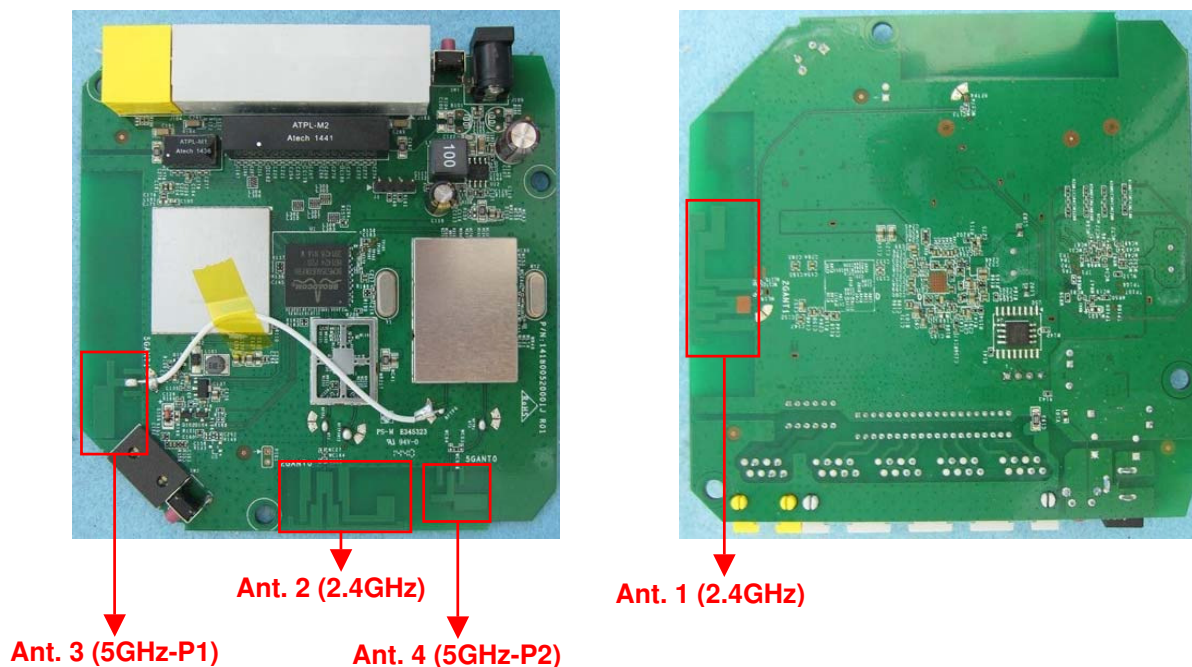
The EUT supports the antenna with TX/RX diversity function.

Both Ant. 1 and Ant. 2 can be used as transmitting/receiving antenna, but only one antenna can transmit/receive at the same time.

For 5GHz:

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

Ant. 3 and Ant. 4 could both transmit/receive simultaneously.



1.1.3 EUT Operational Condition

EUT Power Type	From power adapter		
Beamforming Function	<input type="checkbox"/> With beamforming	<input checked="" type="checkbox"/> Without beamforming	

1.1.4 Table for Class II Change

This product is an extension of original one reported under Sporton project number: FR240601

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

Modifications	Performance Checking
1. Changing brand name to "belkin" from "Belkin".	It does not need to test.
2. Changing model number to "F9K1105v5" from "F9K1105v3".	
3. Updating adapter (Model No.: MT12-Y120100-A1) to Level VI energy efficiency.	1. AC Power-line Conducted Emissions. 2. Emissions in Restricted Frequency Bands Below 1GHz.
4. Changing flash to "16M flash (Brand Name: MXIC, Model No.: MX25L12835FM2I-10G)" from "8M flash (Brand Name: MXIC, Model No.: MX25L6406EM2I-12G)".	

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 v03r05

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	Akina Chiu	22°C / 58%	04/09/2016
AC Conduction	CO01-CB	Edison Lin	24°C / 59%	04/11/2016

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	Normal Link

The Worst Case Mode for Following Conformance Tests	
Tests Item	Emissions in Restricted Frequency Bands
Test Condition	Radiated measurement If EUT consist of multiple antenna assembly (multiple antenna are used in EUT regardless of spatial multiplexing MIMO configuration), the radiated test should be performed with highest antenna gain of each antenna type.
Operating Mode < 1GHz	Normal Link

The Worst Case Mode for Following Conformance Tests	
Tests Item	Simultaneous Transmission Analysis
Operating Mode	
1	WLAN 2.4GHz+WLAN 5GHz
Refer to Sporton Test Report No.: FA4N1172-25AA for Co-location RF Exposure Evaluation.	

2.2 EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

2.3 Accessories

Accessories			
Power	Brand	Model No.	Rating
Adapter	LEI	MT12-Y120100-A1	INPUT: 100-120Vac, 60Hz, 0.3A OUTPUT: 12Vdc, 1A

2.4 Support Equipment

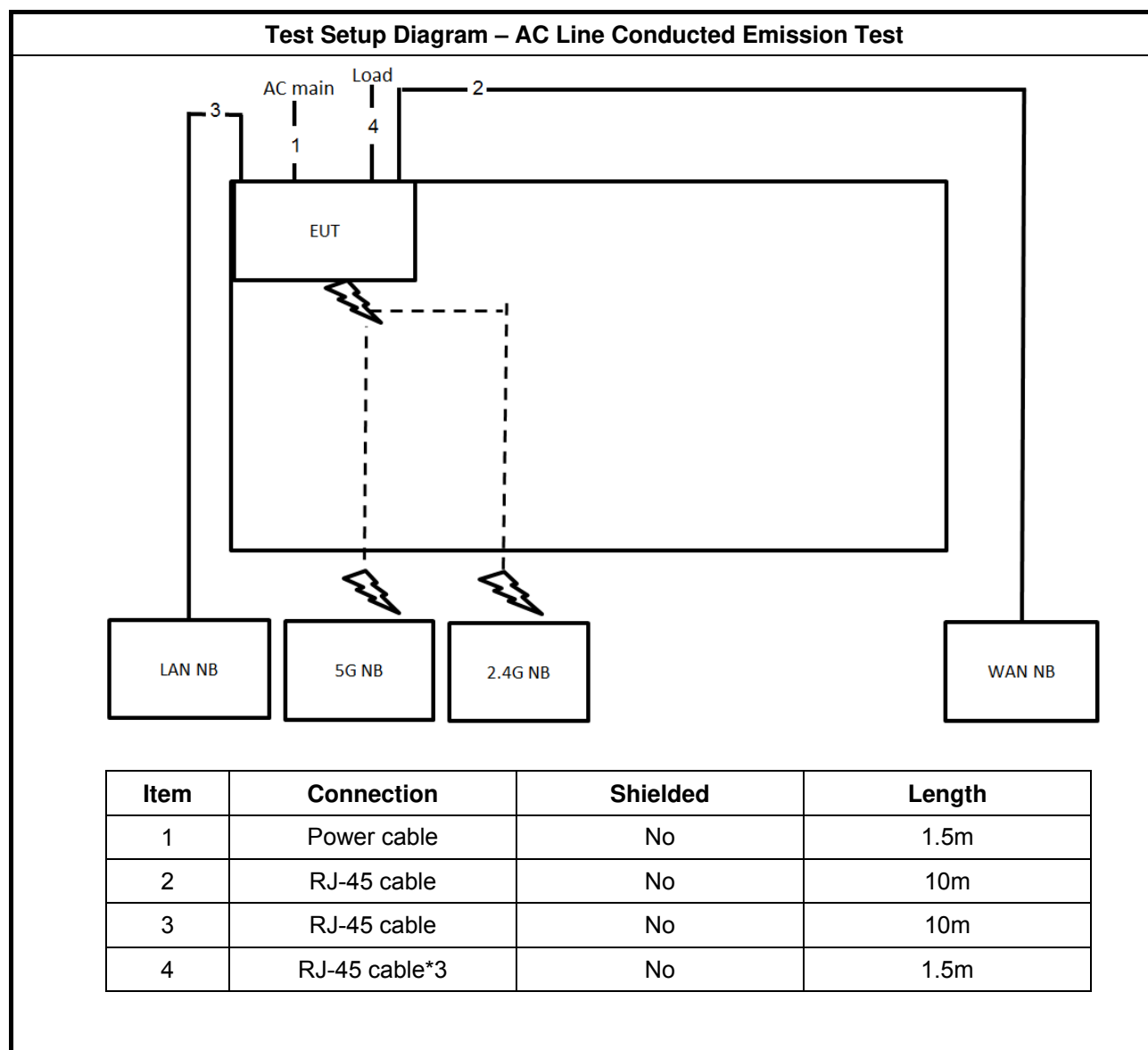
For Test Site No: CO01-CB

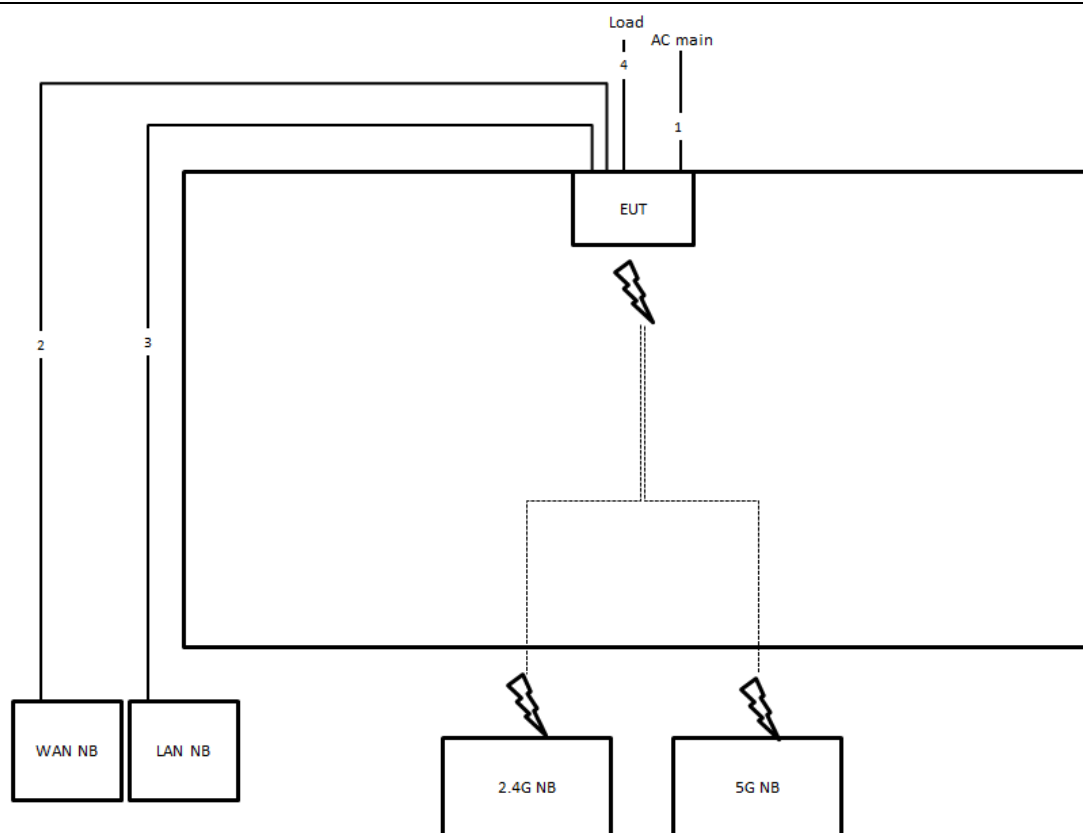
Support Equipment				
No.	Equipment	Brand Name	Model Name	FCC ID
1	NB*4	DELL	E6430	DoC

For Test Site No: 03CH01-CB

Support Equipment				
No.	Equipment	Brand Name	Model Name	FCC ID
1	NB*4	DELL	E4300	DoC

2.5 Test Setup Diagram



Test Setup Diagram - Radiated Test


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

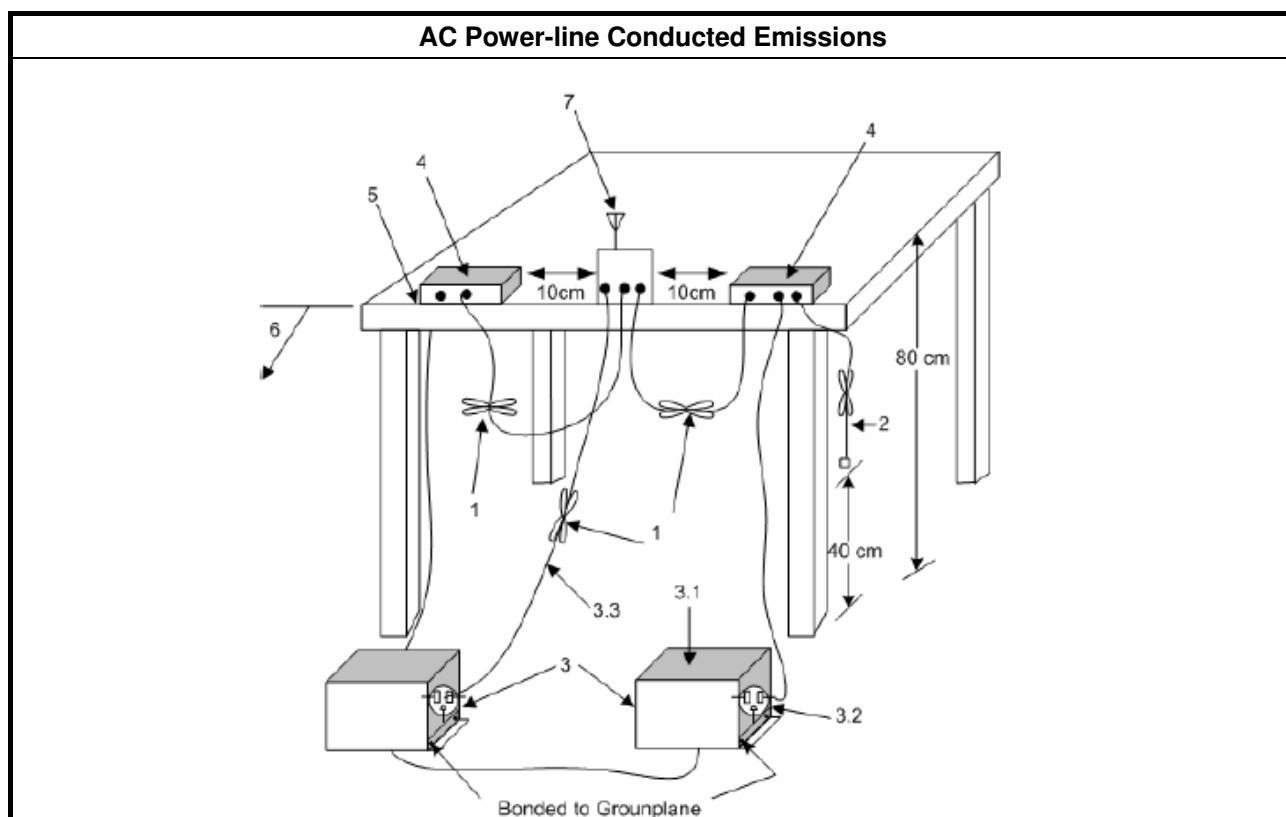
3.1.2 Measuring Instruments

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

3.1.3 Test Procedures

Test Method
<input checked="" type="checkbox"/> 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 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.

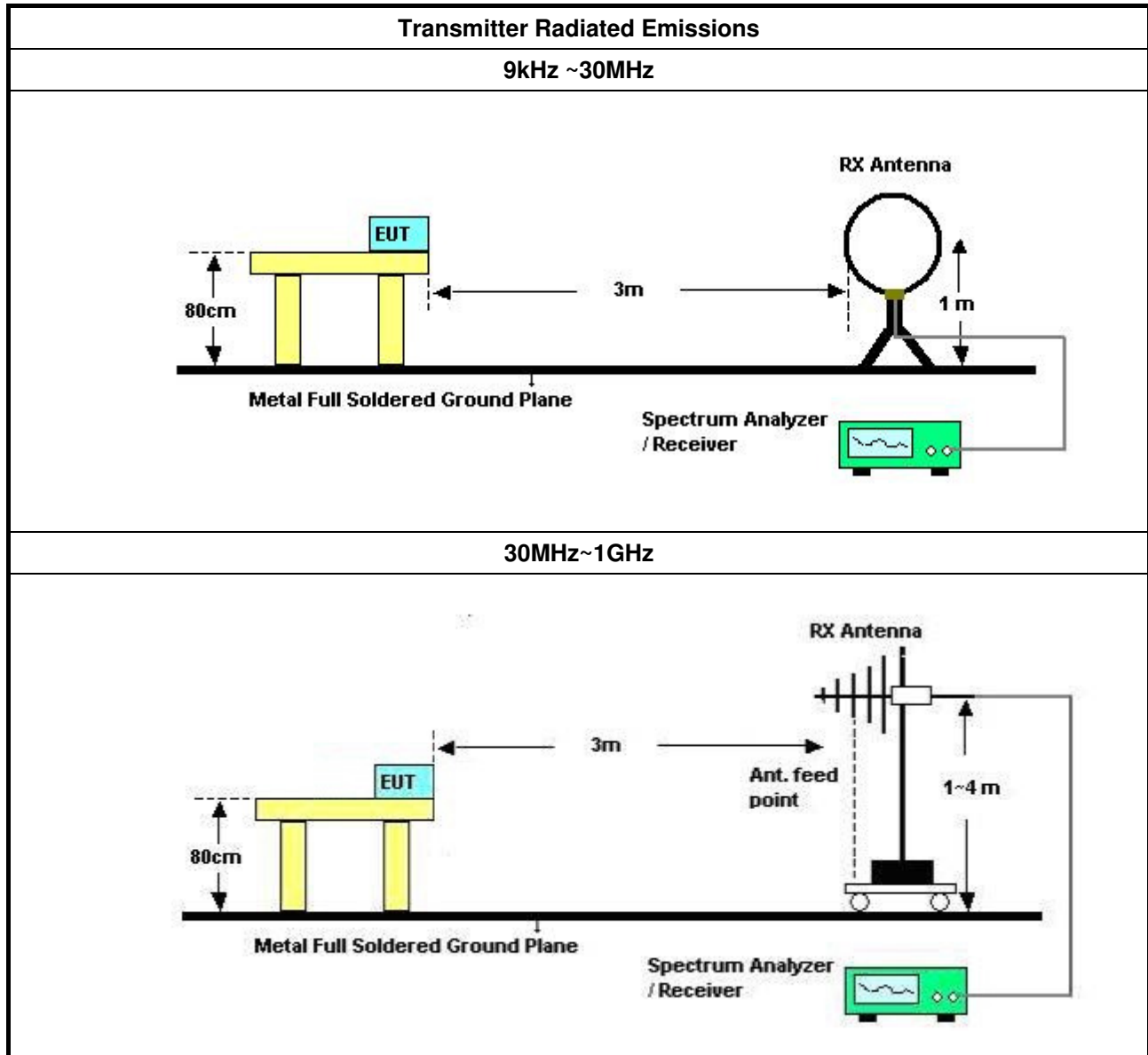
3.2.2 Measuring Instruments

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 D01 v03r05, clause 12 for unwanted emissions into restricted bands. 	<input type="checkbox"/> Refer as FCC KDB 558074 D01 v03r05, clause 12.2.5.1 Option 1 (trace averaging for duty cycle $\geq 98\%$)
	<input type="checkbox"/> Refer as FCC KDB 558074 D01 v03r05, clause 12.2.5.2 Option 2 (trace averaging + duty factor).
	<input checked="" type="checkbox"/> Refer as FCC KDB 558074 D01 v03r05, 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 D01 v03r05, 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 D01 v03r05 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 D01 v03r05, 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 D01 v03r05, 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 D01 v03r05, 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.

3.2.6 Test Result of Transmitter Radiated Unwanted Emissions (30MHz-1GHz)

Refer as Appendix B

4 Test Equipment and Calibration Data

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
EMI Receiver	Agilent	N9038A	My52260123	9kHz ~ 8.45GHz	Jan. 27, 0216	Conduction (CO01-CB)
LISN	F.C.C.	FCC-LISN-50-16-2	04083	150kHz ~ 100MHz	Dec. 08, 2015	Conduction (CO01-CB)
LISN	Schwarzbeck	NSLK 8127	8127647	9kHz ~ 30MHz	Dec. 23, 2015	Conduction (CO01-CB)
COND Cable	Woken	Cable	01	150kHz ~ 30MHz	May 25, 2015	Conduction (CO01-CB)
Software	Audix	E3	6.120210n	-	N.C.R.	Conduction (CO01-CB)
BILOG ANTENNA	Schaffner	CBL6112D	37880	20MHz ~ 2GHz	Sep. 03, 2015	Radiation (03CH01-CB)
Pre-Amplifier	Agilent	8447D	2944A10991	0.1MHz ~ 1.3GHz	Mar. 15, 2016	Radiation (03CH01-CB)
Spectrum Analyzer	R&S	FSP40	100056	9kHz ~ 40GHz	Oct. 27, 2015	Radiation (03CH01-CB)
EMI Receiver	Agilent	N9038A	MY52260123	9kHz ~ 8.4GHz	Jan. 27, 2016	Radiation (03CH01-CB)
RF Cable-low	Woken	Low Cable-1	N/A	30 MHz ~ 1 GHz	Nov. 02, 2015	Radiation (03CH01-CB)
Loop Antenna	Teseq	HLA 6120	24155	9kHz - 30 MHz	Mar. 16, 2016*	Radiation (03CH01-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.

