

FCC Test Report

Equipment : Low Powered Camera Gateway
Brand Name : EDIMAX
Model No. : IC-3011 RX Gateway, IC-6230DC (Gateway),
IC-6220DC (Gateway), IC-3210W (Gateway)
FCC ID : NDD9530111504
Standard : 47 CFR FCC Part 15.247
Operating Band : 2400 MHz – 2483.5 MHz
FCC Classification : DSS
Applicant : EDIMAX TECHNOLOGY CO., LTD.
Manufacturer : No.3,Wu-Chuan 3rd Road,Wu-Ku Industrial Park,
New Taipei City, Taiwan

The product sample received on Aug. 20, 2015 and completely tested on May 27, 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.

Reviewed by:

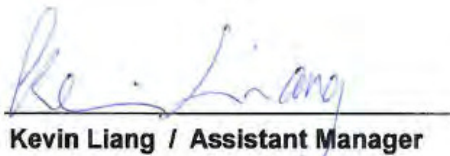

Kevin Liang / Assistant Manager





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APPENDIX A. TEST PHOTOS

APPENDIX B. PHOTOGRAPHS OF EUT



Summary of Test Result

Conformance Test Specifications					
Report Clause	Ref. Std. Clause	Description	Measured	Limit	Result
1.1.2	15.203	Antenna Requirement	Antenna connector mechanism complied	FCC 15.203	Complied
3.1	15.207	AC Power-line Conducted Emissions	[dBuV]: 0.1630020MHz 48.72 (Margin 16.59dB) - QP 31.59 (Margin 23.72dB) - AV	FCC 15.207	Complied
3.2	15.247(a)	20dB Bandwidth	4.2980 MHz	N/A	Complied
3.2	15.247(a)	Carrier Frequency Separation (ChS)	2.996 MHz	ChS \geq BW _{20dB} x2/3.	Complied
3.3	15.247(a)	Number of Hopping Frequencies (N)	Max: 21 Min: 15	N \geq 15	Complied
3.4	15.247(a)	Time of Occupancy (Dwell Time)	0.320sec	0.4 s within 0.4 x N	Complied
3.5	15.247(b)	RF Output Power (Maximum Peak Conducted Output Power)	Power [dBm]:15.21	Power [dBm]:21	Complied
3.6	15.247(d)	Transmitter Bandedge Emissions	Restricted Bands [dBuV/m at 3m]: 2388.54MHz 64.43 (Margin 9.57dB) - PK 52.23 (Margin 1.77dB) - AV	Non-Restricted Bands: > 20 dBc Restricted Bands: FCC 15.209	Complied
3.7	15.247(d)	Transmitter Unwanted Emissions	Restricted Bands [dBuV/m at 3m]: 773.020MHz 41.69 (Margin 4.31dB) - QP	Non-Restricted Bands: > 20 dBc Restricted Bands: FCC 15.209	Complied



1 General Description

1.1 Information

1.1.1 RF General Information

RF General Information				
Frequency Range (MHz)	Modulation	Ch. Frequency (MHz)	Channel Number	RF Output Power (dBm)
2400-2483.5	GFSK	2405-2465	1-21 [21]	15.21

Note 1: RF output power specifies that Maximum Peak Conducted Output Power.

1.1.2 Antenna Information

Antenna Category	
<input type="checkbox"/>	Integral antenna (antenna permanently attached)
<input type="checkbox"/>	Temporary RF connector provided
<input type="checkbox"/>	No temporary RF connector provided Transmit chains bypass antenna and soldered temporary RF connector provided for connected measurement. In case of conducted measurements the transmitter shall be connected to the measuring equipment via a suitable attenuator and correct for all losses in the RF path.
<input checked="" type="checkbox"/>	External antenna (dedicated antennas)
<input checked="" type="checkbox"/>	Single power level with corresponding antenna(s).
<input type="checkbox"/>	Multiple power level and corresponding antenna(s).

Antenna General Information				
No.	Ant. Cat.	Ant. Type	Ant. Connector	Gain (dBi)
1	External	Dipole	Reverse SMA	1.91



1.1.3 Type of EUT

Identify EUT	
EUT Serial Number	N/A
Presentation of Equipment	<input checked="" type="checkbox"/> Production ; <input type="checkbox"/> Pre-Production ; <input type="checkbox"/> Prototype
Type of EUT	
<input checked="" type="checkbox"/>	Stand-alone
<input type="checkbox"/>	Combined (EUT where the radio part is fully integrated within another device) Combined Equipment - Brand Name / Model No.:
<input type="checkbox"/>	Plug-in radio (EUT intended for a variety of host systems) Host System - Brand Name / Model No.:
<input type="checkbox"/>	Other:

1.1.4 Test Signal Duty Cycle

Operated Mode for Worst Duty Cycle	
<input type="checkbox"/>	Operated normally mode for worst duty cycle
<input checked="" type="checkbox"/>	Operated test mode for worst duty cycle
Test Signal Duty Cycle (x)	Power Duty Factor [dB] – (10 log 1/x)
<input checked="" type="checkbox"/> 89.12%	0.50

1.1.5 EUT Operational Condition

Supply Voltage	<input checked="" type="checkbox"/> AC mains	<input type="checkbox"/> DC	
Type of DC Source	<input type="checkbox"/> From Host System	<input checked="" type="checkbox"/> External AC adapter	<input type="checkbox"/> Battery

1.2 Accessories and Support Equipment

Specification of Accessory				
AC Adapter 1	Brand Name	DVE	Model Name	DSA-6PFG-12FUS 120050
	Power Rating	I/P: 100-240Vac, 2000mA ; O/P: 12Vdc, 0.5A		
	Power Cord	1.5 meter, non-shielded cable, w/o ferrite core		
AC Adapter 2	Brand Name	DVE	Model Name	DSA-12PFT-12 FUS 120100
	Power Rating	I/P: 100-240Vac, 0.5A ; O/P: 12Vdc, 1A		
	Power Cord	1.5 meter, non-shielded cable, w/o ferrite core		
RJ45 Cable	Category	5E	In/Out door	In door
	Power Cord	0.95 meter, non-shielded cable		

Support Equipment - Radiated Emission				
No.	Equipment	Brand Name	Model Name	FCC ID
1	-	-	-	-

1.3 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 Public Notice DA 00-705

1.4 Testing Location Information

Testing Location				
<input checked="" type="checkbox"/>	HWA YA	ADD :	No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan District, Tao Yuan City, Taiwan, R.O.C.	
		TEL :	886-3-327-3456	FAX : 886-3-327-0973
Test Site Registration Number: 553509				
Test Condition	Test Site No.	Test Engineer	Test Environment	
AC Conduction	CO04-HY	Ryan	23°C / 56%	
RF Conducted	TH01-HY	Jeremy	24°C / 60%	
Radiated Emission	03CH03-HY	Daniel	23.6°C / 54%	

1.5 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))

Measurement Uncertainty		
Test Item		Uncertainty
AC power-line conducted emissions		±2.3 dB
Emission bandwidth, 6dB bandwidth		±0.6 %
RF output power, conducted		±0.1 dB
Power density, conducted		±0.6 dB
Unwanted emissions, conducted	9 – 150 kHz	±0.4 dB
	0.15 – 30 MHz	±0.4 dB
	30 – 1000 MHz	±0.6 dB
	1 – 18 GHz	±0.5 dB
	18 – 40 GHz	±0.5 dB
	40 – 200 GHz	N/A
All emissions, radiated	9 – 150 kHz	±2.5 dB
	0.15 – 30 MHz	±2.3 dB
	30 – 1000 MHz	±2.6 dB
	1 – 18 GHz	±3.6 dB
	18 – 40 GHz	±3.8 dB
	40 – 200 GHz	N/A
Temperature		±0.8 °C
Humidity		±5 %
DC and low frequency voltages		±0.9%
Time		±1.4 %
Duty Cycle		±0.6 %

2 Test Configuration of EUT

2.1 The Worst Case Modulation Configuration

Worst Modulation Used for Conformance Testing			
Modulation Mode	Transmit Chains (N _{TX})	Data Rate	RF Output Power (dBm)
GFSK	1	1 Mbps	15.21

Note 1: RF output power specifies that Maximum Peak Conducted Output Power.

2.2 Test Channel Frequencies Configuration

Test Channel Frequencies Configuration	
Modulation Mode	Test Channel Frequencies (MHz)
GFSK	2405, 2435, 2465




2.3 The Worst Case Power Setting Parameter

The Worst Case Power Setting Parameter			
Test Software	N/A		
Modulation Mode	2405 MHz	2435 MHz	2465 MHz
GFSK	Default	Default	Default

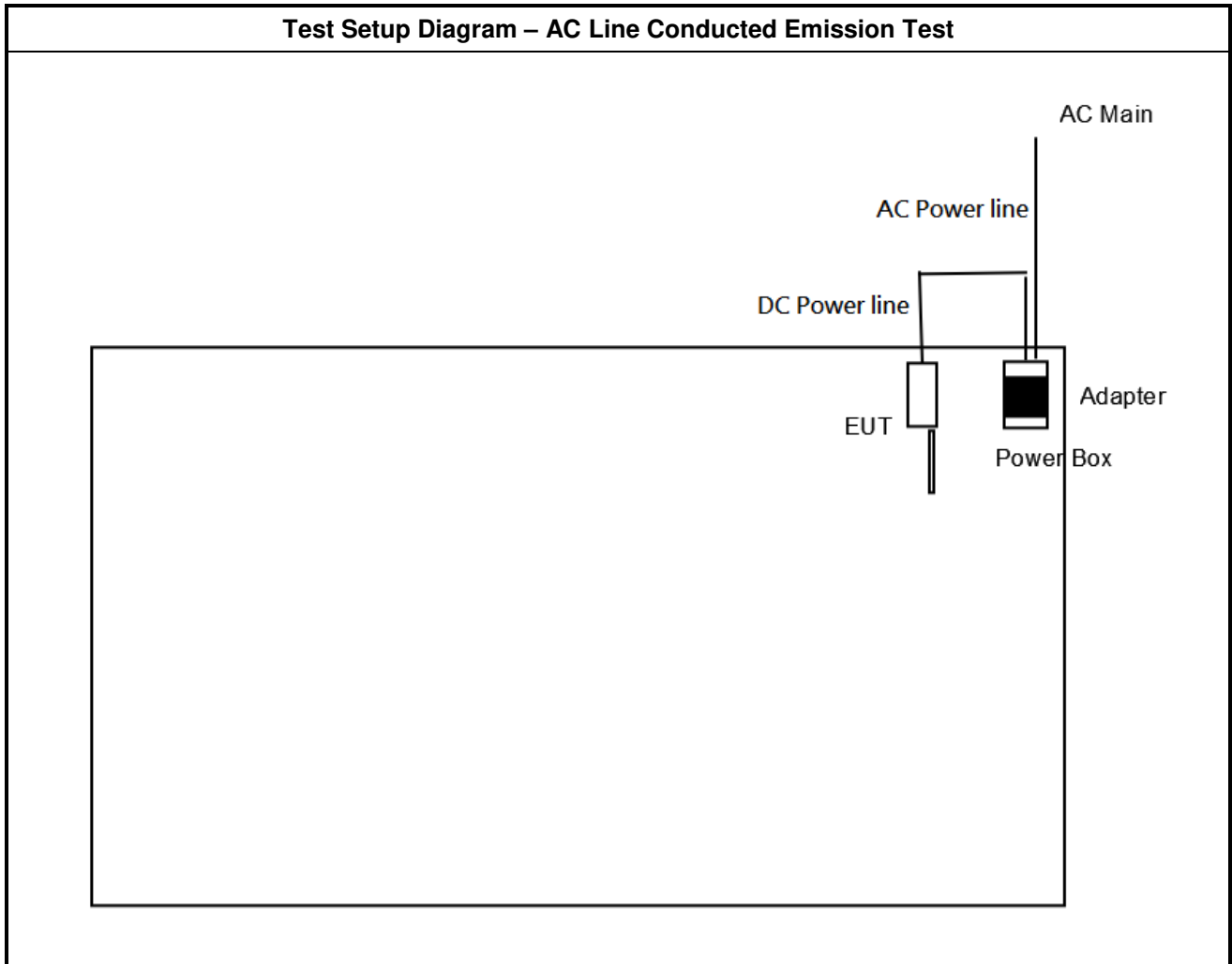
2.4 The Worst Case Measurement Configuration

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 Test Voltage: 120Vac / 60Hz
Operating Mode	Operating Mode Description
1	Adapter 1 Mode and Transmit
2	Adapter 2 Mode and Transmit
Operating mode 2 was the worst case and it was recorded in this test report.	

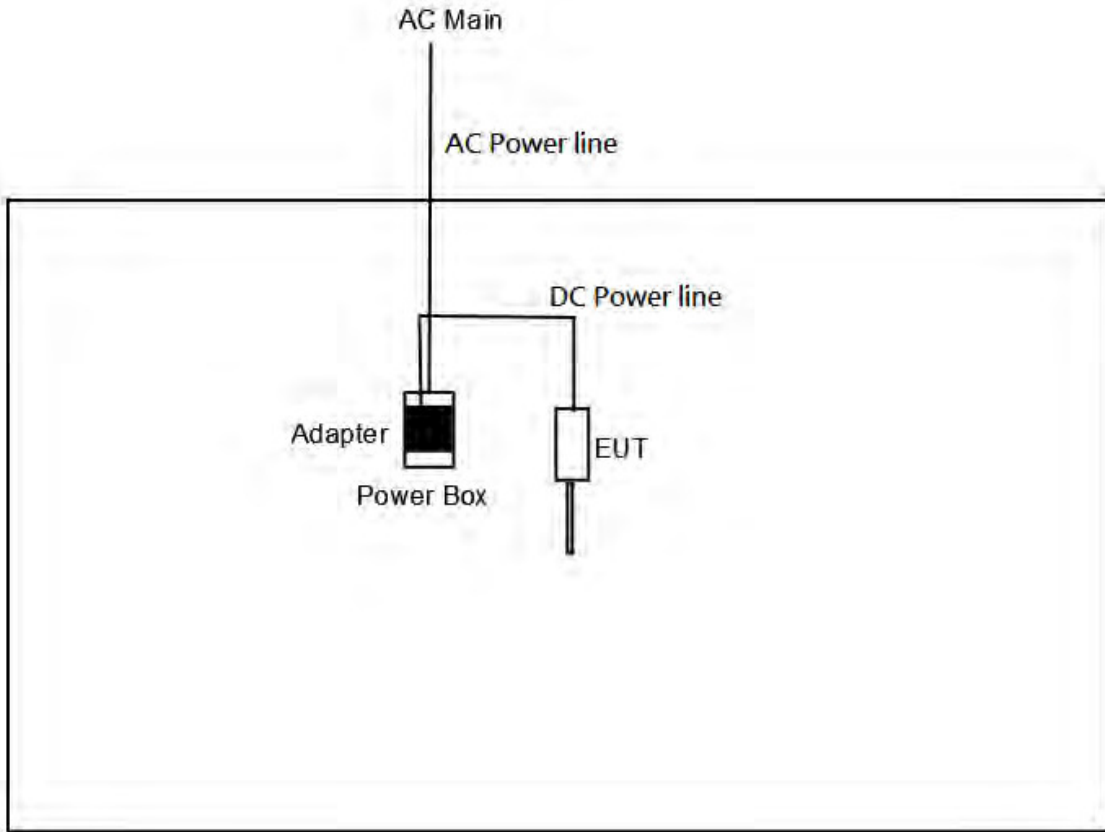
The Worst Case Mode for Following Conformance Tests	
Tests Item	RF Output Power, 20dB Bandwidth, Carrier Frequency Separation (ChS) Number of Hopping Frequencies (N), Time of Occupancy (Dwell Time)
Test Condition	Conducted measurement at transmit chains
Modulation Mode	GFSK

The Worst Case Mode for Following Conformance Tests			
Tests Item	Transmitter Radiated Bandedge Emissions Transmitter Radiated Unwanted Emissions		
Test Condition	Radiated measurement		
User Position	<input type="checkbox"/> EUT will be placed in fixed position.		
	<input checked="" type="checkbox"/> EUT will be placed in mobile position and operating multiple positions. EUT shall be performed three orthogonal planes.		
	<input type="checkbox"/> EUT will be a hand-held or body-worn battery-powered devices and operating multiple positions.		
Operating Mode	Operating Mode Description		
1	Adapter 1 Mode		
2	Adapter 2 Mode		
Operating mode 1 was the worst case and it was recorded in this test report.			
Modulation Mode	GFSK		
Orthogonal Planes of EUT	X Plane	Y Plane	Z Plane
			
Worst Planes of EUT	V		

2.5 Test Setup Diagram



Test Setup Diagram - Radiated Test



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.

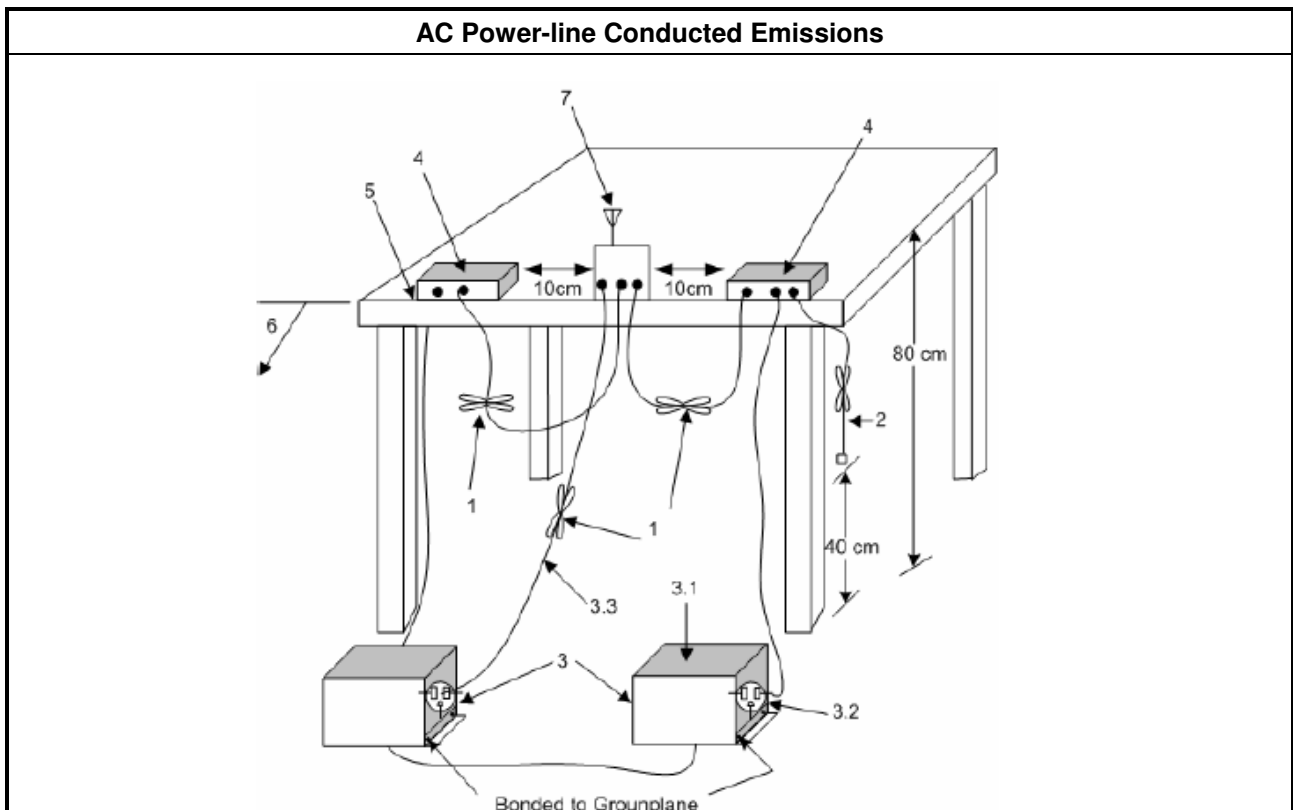
3.1.2 Measuring Instruments

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

3.1.3 Test Procedures

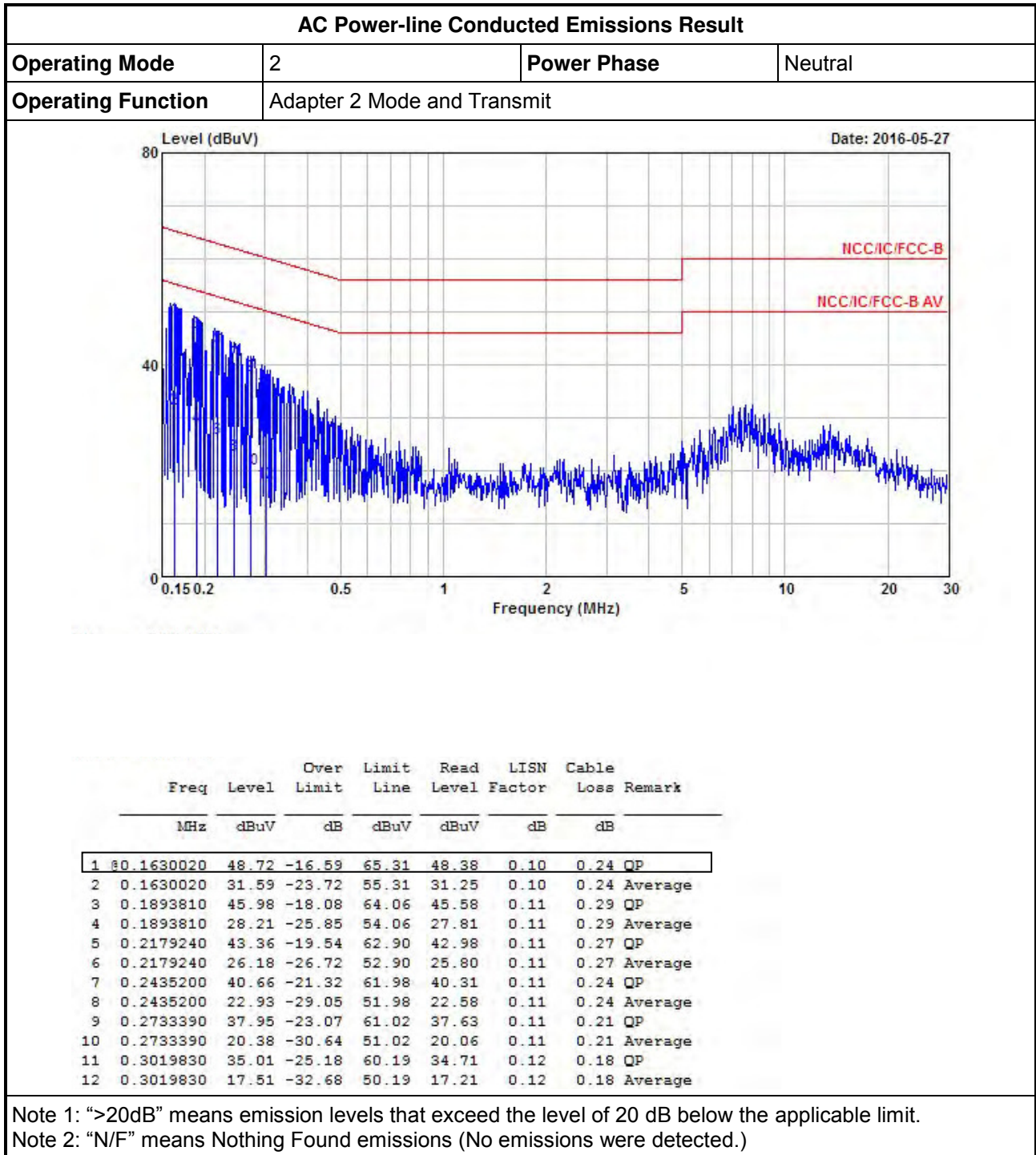
Test Method
<input checked="" type="checkbox"/> Refer as ANSI C63.10-2013, clause 6.2 for AC power-line conducted emissions.

3.1.4 Test Setup



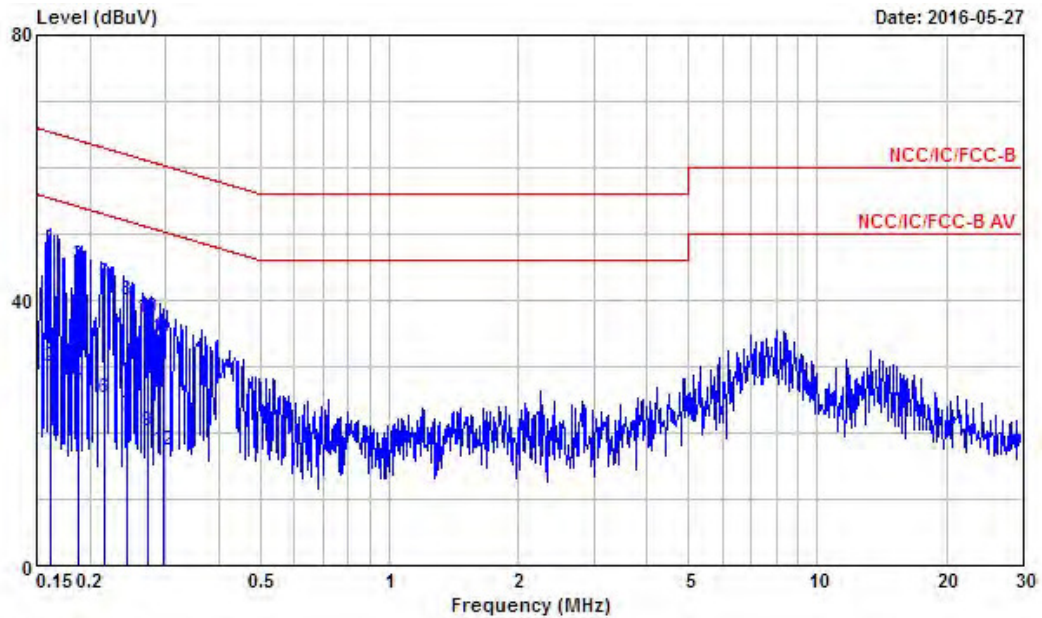


3.1.5 Test Result of AC Power-line Conducted Emissions





AC Power-line Conducted Emissions Result			
Operating Mode	2	Power Phase	Line
Operating Function	Adapter 2 Mode and Transmit		



Freq	Level	Over	Limit	Read	LISN	Cable	Remark
MHz	dBuV	Limit	Line	Level	Factor	Loss	
		dB	dBuV	dBuV	dB	dB	
1	0.1610020	47.88	-17.53	65.41	47.53	0.11	0.24 QP
2	0.1610020	29.87	-25.54	55.41	29.52	0.11	0.24 Average
3	0.1883870	45.23	-18.88	64.11	44.84	0.11	0.28 QP
4	0.1883870	27.29	-26.82	54.11	26.90	0.11	0.28 Average
5	0.2162030	42.61	-20.35	62.96	42.22	0.11	0.28 QP
6	0.2162030	25.32	-27.64	52.96	24.93	0.11	0.28 Average
7	0.2429320	22.75	-29.25	52.00	22.40	0.11	0.24 Average
8	0.2429320	39.91	-22.09	62.00	39.56	0.11	0.24 QP
9	0.2729320	20.38	-30.65	51.03	20.06	0.11	0.21 Average
10	0.2729320	37.29	-23.74	61.03	36.97	0.11	0.21 QP
11	0.2958750	34.53	-25.83	60.36	34.22	0.12	0.19 QP
12	0.2958750	17.33	-33.03	50.36	17.02	0.12	0.19 Average

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.)

3.2 20dB Bandwidth and Carrier Frequency Separation

3.2.1 20dB Bandwidth and Carrier Frequency Separation Limit

20dB Bandwidth and Carrier Frequency Separation Limit for Frequency Hopping Systems	
<input checked="" type="checkbox"/>	2400-2483.5 MHz Band:
<input type="checkbox"/>	N ≥ 75 and ChS ≥ MAX (20 dB bandwidth, 25 kHz).
<input checked="" type="checkbox"/>	N ≥ 15 and ChS ≥ MAX (20 dB bandwidth x 2/3, 25 kHz).
N: Number of Hopping Frequencies; ChS: Hopping Channel Separation	

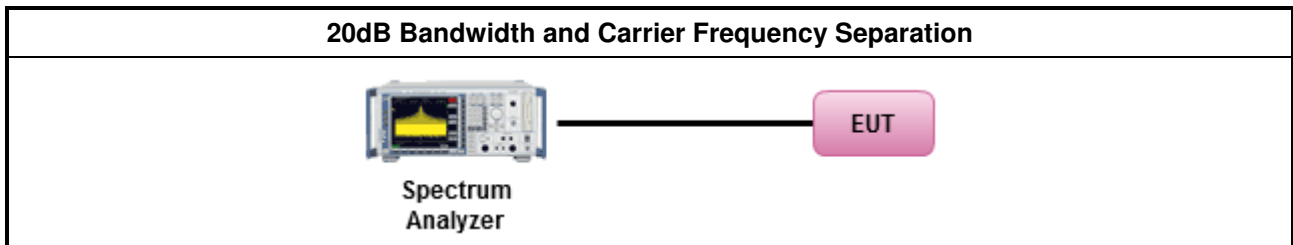
3.2.2 Measuring Instruments

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

3.2.3 Test Procedures

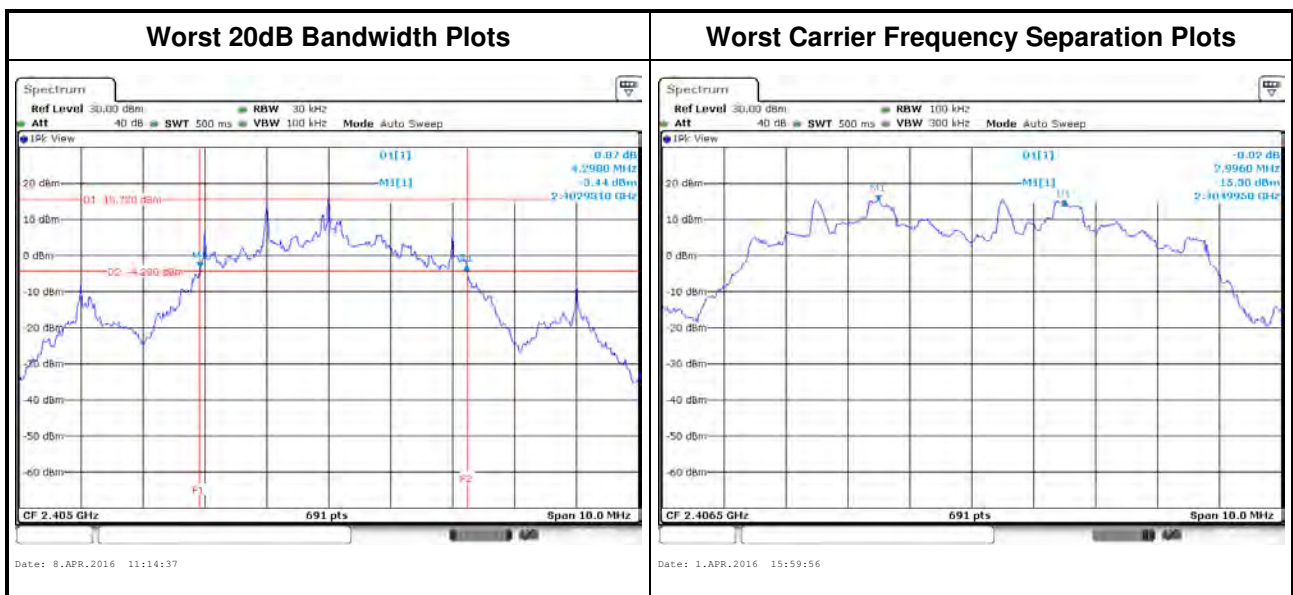
Test Method	
<input checked="" type="checkbox"/>	Refer as FCC Public Notice DA 00-705, 20 dB bandwidth measurement.
<input checked="" type="checkbox"/>	Refer as FCC Public Notice DA 00-705, carrier frequency separation measurement.
<input checked="" type="checkbox"/>	For conducted measurement.
<input checked="" type="checkbox"/>	The EUT supports single transmit chain and measurements performed on this transmit chain.
<input type="checkbox"/>	The EUT supports diversity transmitting and the results on transmit chain port 1 is the worst case.

3.2.4 Test Setup



3.2.5 Test Result of 20dB Bandwidth and Carrier Frequency Separation

20dB Bandwidth and Carrier Frequency Separation Result					
Modulation Mode	Freq. (MHz)	20dB Bandwidth (MHz)	99% Bandwidth (MHz)	Channel Separation (MHz)	Channel Separation Limits (MHz)
GFSK	2405	4.2980	4.5875	2.9960	2.865
GFSK	2435	4.2980	4.6020	2.9960	2.865
GFSK	2465	4.2840	4.5730	2.9960	2.856
Result		Complied			



3.3 Number of Hopping Frequencies

3.3.1 Number of Hopping Frequencies Limit

Number of Hopping Frequencies Limit for Frequency Hopping Systems	
<input checked="" type="checkbox"/>	2400-2483.5 MHz Band:
<input type="checkbox"/>	$N \geq 75$ and ChS \geq MAX (20 dB bandwidth, 25 kHz).
<input checked="" type="checkbox"/>	$N \geq 15$ and ChS \geq MAX (20 dB bandwidth x 2/3, 25 kHz).
N: Number of Hopping Frequencies; ChS: Hopping Channel Separation	

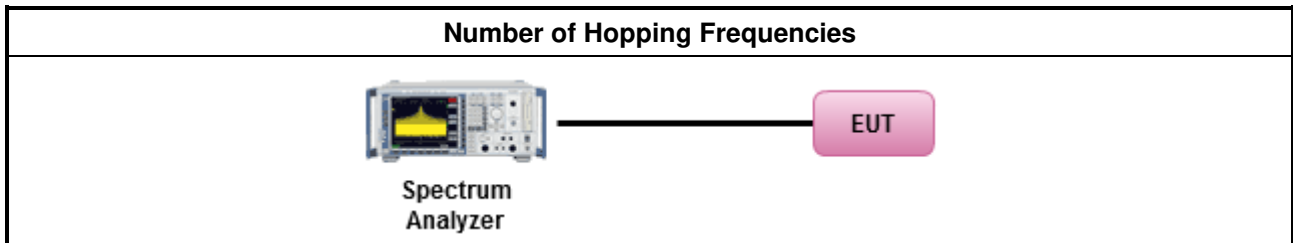
3.3.2 Measuring Instruments

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

3.3.3 Test Procedures

Test Method	
<input checked="" type="checkbox"/>	Refer as FCC Public Notice DA 00-705, number of hopping frequencies measurement.
<input checked="" type="checkbox"/>	For conducted measurement.
<input checked="" type="checkbox"/>	The EUT supports single transmit chain and measurements performed on this transmit chain.
<input type="checkbox"/>	The EUT supports diversity transmitting and the results on transmit chain port 1 is the worst case.

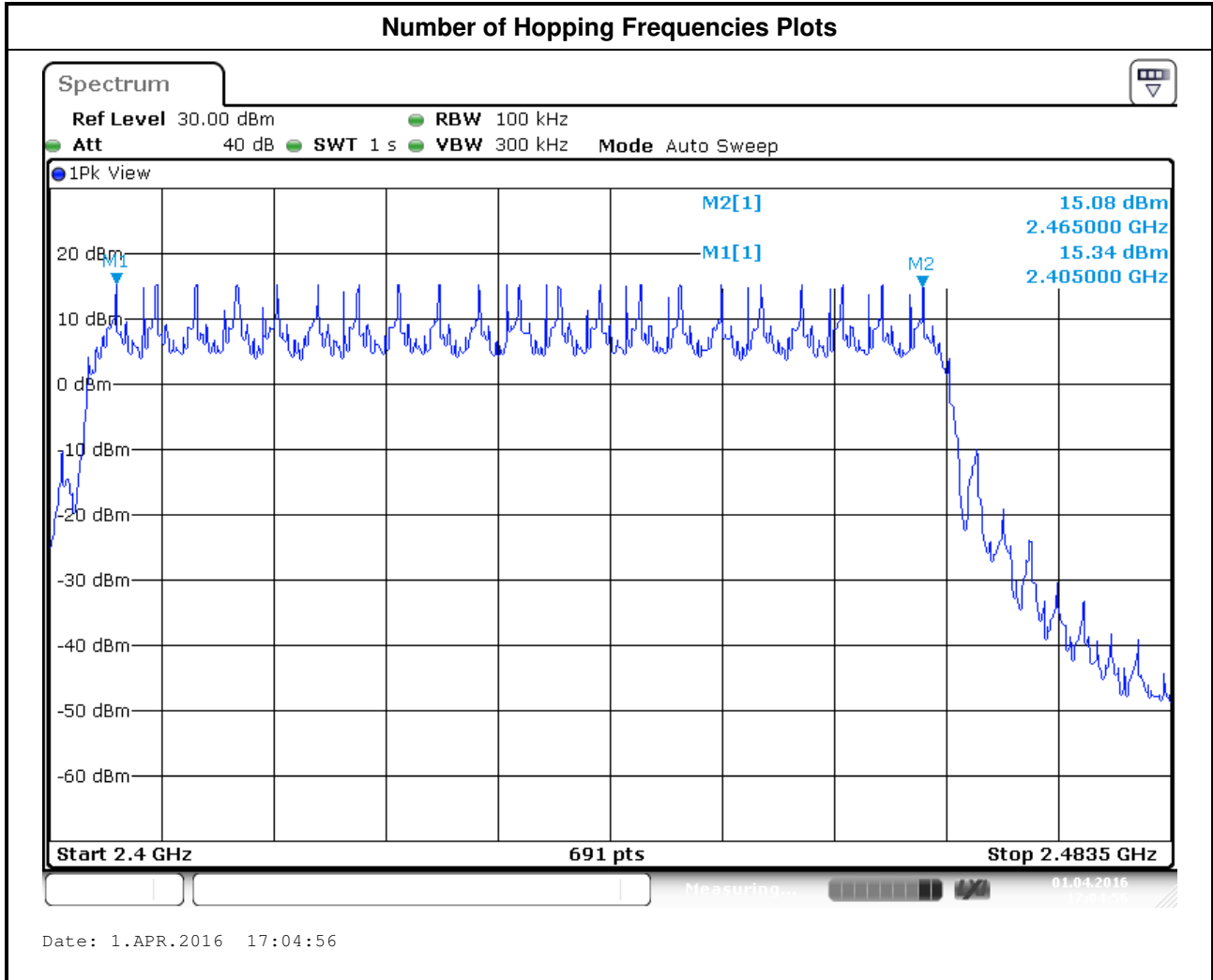
3.3.4 Test Setup





3.3.5 Test Result of Number of Hopping Frequencies

Number of Hopping Frequencies Result			
Modulation Mode	Freq. (MHz)	Hopping Channel Number (N)	Hopping Channel Number Limits
GFSK	2402-2480	21	15
Result	Complied		



3.4 Time of Occupancy (Dwell Time)

3.4.1 Time of Occupancy (Dwell Time) Limit

Time of Occupancy (Dwell Time) Limit for Frequency Hopping Systems	
<input checked="" type="checkbox"/>	2400-2483.5 MHz Band: Dwell time ≤ 0.4 second within $0.4 \times N$
N: Number of Hopping Frequencies	

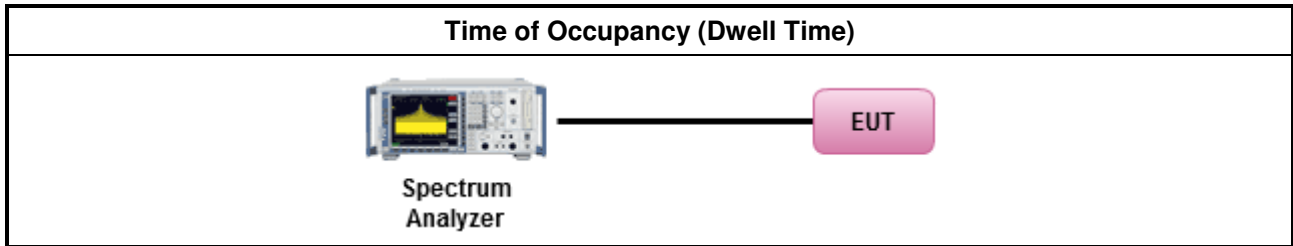
3.4.2 Measuring Instruments

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

3.4.3 Test Procedures

Test Method	
<input checked="" type="checkbox"/>	Refer as FCC Public Notice DA 00-705, dwell time measurement.
<input checked="" type="checkbox"/>	For conducted measurement.
<input checked="" type="checkbox"/>	The EUT supports single transmit chain and measurements performed on this transmit chain.
<input type="checkbox"/>	The EUT supports diversity transmitting and the results on transmit chain port 1 is the worst case.

3.4.4 Test Setup

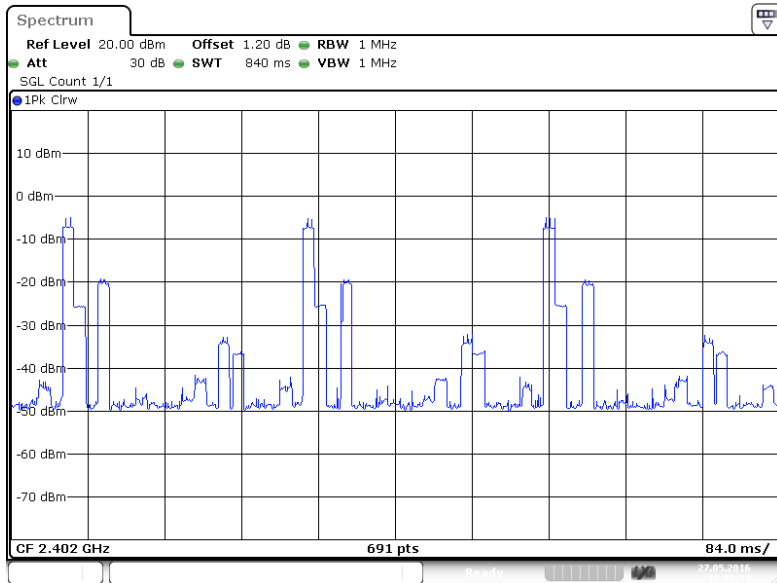


3.4.5 Test Result of Time of Occupancy (Dwell Time)

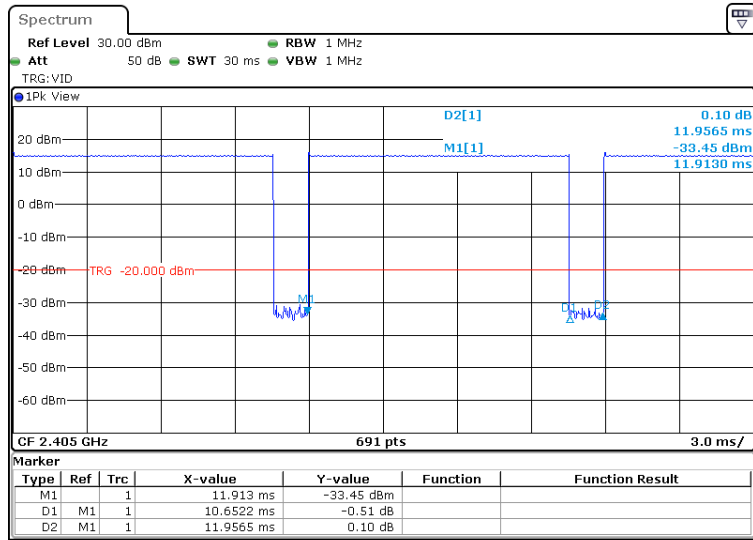
Time of Occupancy (Dwell Time) Result						
Modulation Mode	Freq. (MHz)	Pulse Time per Hop (ms)	Number of Pulse	Measure Time (s)	Dwell Time in $[0.4 \times N \text{ sec}]$ (s)	Dwell Time Limits (s)
GFSK	2405	10.65	3.0	0.84	0.320	0.4
Result		Complied				
The total sweep time is 0.4×21 Channels = 8.4 seconds. The number of hops is in the 8.4sec. sweep time, we determined to reduce the sweep time to 0.84 sec., count the number of hops and multiply by 10. The total number of hops will be multiplied by the measured time of one pulse.						



Worst Number of Pulse



Worst Pulse Time per Hop Plots



Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	11.913 ms	-33.45 dBm		
D1	M1	1	10.6522 ms	-0.51 dB		
D2	M1	1	11.9565 ms	0.10 dB		

Date: 1.APR.2016 14:56:33

3.5 RF Output Power

3.5.1 RF Output Power Limit

RF Output Power Limit for Frequency Hopping Systems	
Maximum Peak Conducted Output Power Limit	
<input checked="" type="checkbox"/> 2400-2483.5 MHz Band:	
<input type="checkbox"/>	For Hopping Channel: $N \geq 75$
<input type="checkbox"/>	If $G_{TX} \leq 6$ dBi, then $P_{Out} \leq 30$ dBm (1 W)
<input type="checkbox"/>	If $G_{TX} > 6$ dBi, then $P_{Out} = 30 - (G_{TX} - 6)$ dBm
<input checked="" type="checkbox"/>	For Hopping Channel: $N \geq 15$
<input checked="" type="checkbox"/>	If $G_{TX} \leq 6$ dBi, then $P_{Out} \leq 21$ dBm (0.125 W)
<input type="checkbox"/>	If $G_{TX} > 6$ dBi, then $P_{Out} = 21 - (G_{TX} - 6)$ dBm
e.i.r.p. Power Limit:	
<input checked="" type="checkbox"/> 2400-2483.5 MHz Band:	
<input type="checkbox"/>	For Hopping Channel: $N \geq 75 - P_{eirp} \leq 36$ dBm (4 W)
<input checked="" type="checkbox"/>	For Hopping Channel: $N \geq 15 - P_{eirp} \leq 27$ dBm (0.5 W)
G_{TX} = the maximum transmitting antenna directional gain in dBi. P_{eirp} = e.i.r.p. Power in dBm. N: Number of Hopping Frequencies ChS: Hopping Channel Separation	

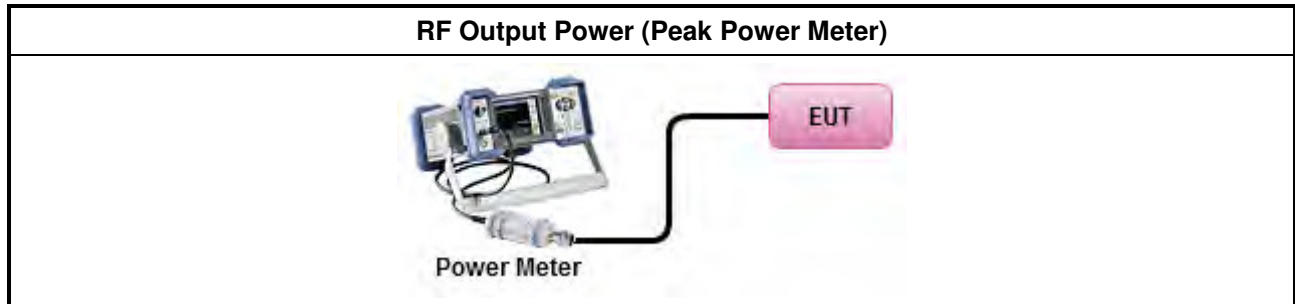
3.5.2 Measuring Instruments

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

3.5.3 Test Procedures

Test Method	
<input checked="" type="checkbox"/>	Maximum Peak Conducted Output Power
<input type="checkbox"/>	Refer as FCC DA 00-0705, spectrum analyzer for peak power.
<input checked="" type="checkbox"/>	Refer as FCC DA 00-0705, peak power meter for peak power.
<input type="checkbox"/>	Refer as ANSI C63.10, clause 11.9.1.3) for peak power meter.
<input type="checkbox"/>	Refer as ANSI C63.10, clause 11.9.1.1) for spectrum analyzer - (RBW \geq EBW).
<input checked="" type="checkbox"/>	For conducted measurement.
<input checked="" type="checkbox"/>	The EUT supports single transmit chain and measurements performed on this transmit chain.
<input type="checkbox"/>	The EUT supports diversity transmitting and the results on transmit chain port 1 is the worst case.

3.5.4 Test Setup



3.5.5 Test Result of Maximum Peak Conducted Output Power

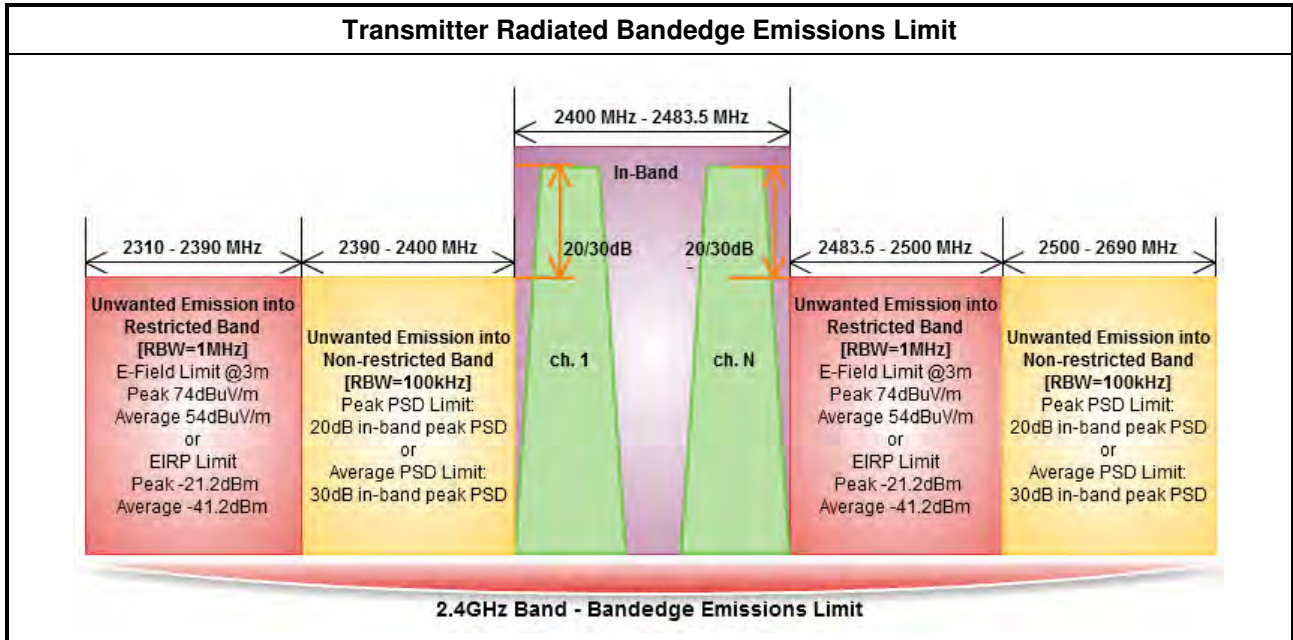
Maximum Peak Conducted Output Power Result						
Condition		RF Output Power (dBm)				
Modulation Mode	Freq. (MHz)	RF Output Power	Power Limit	Antenna Gain (dBi)	EIRP Power	EIRP Limit
GFSK	2405	15.21	21	1.91	17.12	27
GFSK	2435	15.07	21	1.91	16.98	27
GFSK	2465	14.89	21	1.91	16.80	27
Result		Complied				

3.5.6 Test Result of Maximum Average Conducted Output Power

Maximum Average Conducted Output Power Result						
Condition		RF Output Power (dBm)				
Modulation Mode	Freq. (MHz)	Average Power	Duty Factor (dB)	RF Output Power	Antenna Gain (dBi)	EIRP Power
GFSK	2405	14.68	0.50	15.18	1.91	17.09
GFSK	2435	14.51	0.50	15.01	1.91	16.92
GFSK	2465	14.35	0.50	14.85	1.91	16.76
Result		Complied				

3.6 Transmitter Radiated Bandedge Emissions

3.6.1 Transmitter Radiated Bandedge Emissions Limit



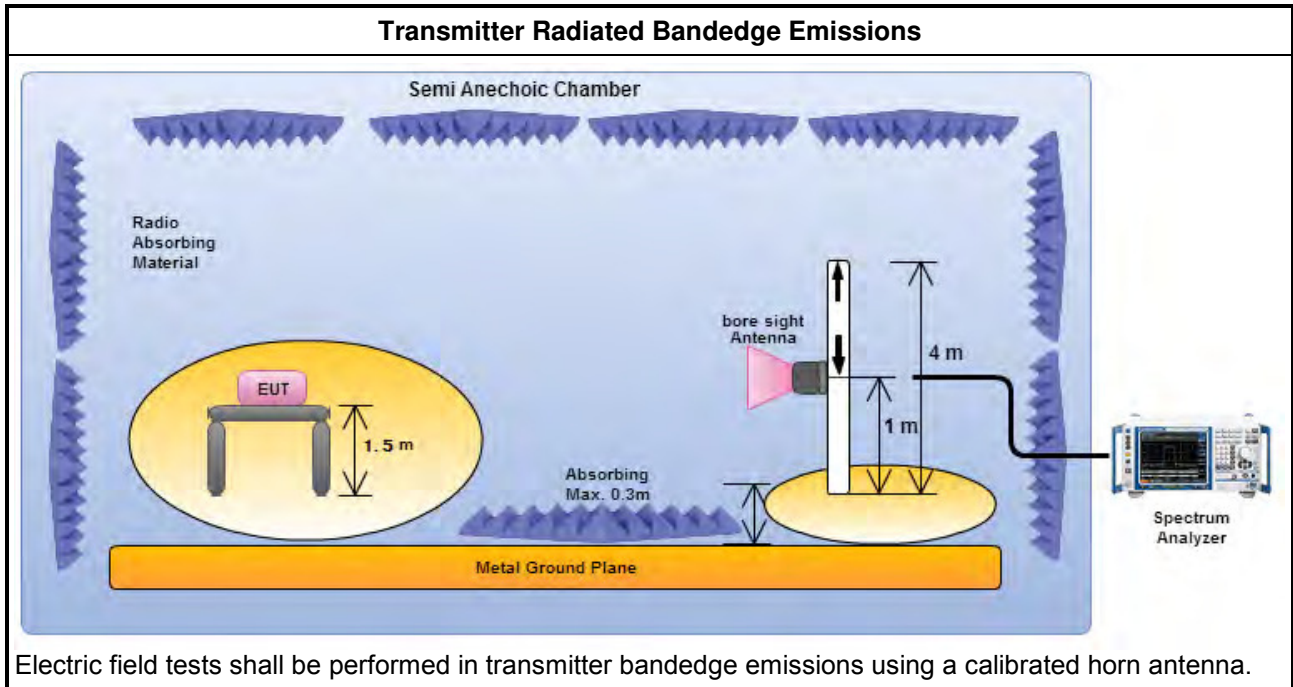
3.6.2 Measuring Instruments

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

3.6.3 Test Procedures

Test Method – General Information	
<input checked="" type="checkbox"/>	The average emission levels shall be measured in [duty cycle ≥ 98 or duty factor].
<input checked="" type="checkbox"/>	Refer as ANSI C63.10, clause 6.10 bandedge testing shall be performed at the lowest frequency channel and highest frequency channel within the allowed operating band.
<input checked="" type="checkbox"/>	For the transmitter unwanted emissions shall be measured using following options below:
<input checked="" type="checkbox"/>	For unwanted emissions into non-restricted bands. 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.
<input checked="" type="checkbox"/>	For unwanted emissions into restricted bands.
<input checked="" type="checkbox"/>	Refer as ANSI C63.10, clause 4.1.4.2.3 (Reduced VBW). VBW ≥ 1/T, where T is pulse time.
<input type="checkbox"/>	Refer as ANSI C63.10, clause 4.1.4.2.4 average value of pulsed emissions.
<input checked="" type="checkbox"/>	Refer as ANSI C63.10, clause 4.1.4.2.2 measurement procedure peak limit.
<input checked="" type="checkbox"/>	For the transmitter bandedge emissions shall be measured using following options below:
<input checked="" type="checkbox"/>	Refer as ANSI C63.10, clause 6.10 for band-edge testing.
<input type="checkbox"/>	Refer as ANSI C63.10, clause 6.10.6.2 for marker-delta method for band-edge measurements.
<input checked="" type="checkbox"/>	Refer as ANSI C63.10, clause 7.8.6 for band-edge testing into non-restricted bands.
<input checked="" type="checkbox"/>	Refer as ANSI C63.10, clause 6.6 for radiated emissions and test distance is 3m.

3.6.4 Test Setup



3.6.5 Test Result of Transmitter Radiated Bandedge Emissions

2400-2483.5MHz Transmitter Radiated Bandedge Emissions (Non-restricted Band)							
Modulation	Test Freq. (MHz)	In-band PSD [i] (dBuV/100kHz)	Freq. (MHz)	Out-band PSD [o] (dBuV/100kHz)	[i] – [o] (dB)	Limit (dB)	Pol.
GFSK	2405	112.18	2399.040	79.82	32.36	20	H
GFSK	2465	113.56	2519.990	52.83	56.48	20	H

Note 1: Measurement worst emissions of receive antenna polarization

2400-2483.5MHz Transmitter Radiated Bandedge Emissions (Restricted Band)									
Modulation Mode	Freq. (MHz)	Measure Distance (m)	Freq. (MHz) PK	Level (dBuV/m) PK	Limit (dBuV/m) PK	Freq. (MHz) AV	Level (dBuV/m) AV	Limit (dBuV/m) AV	Pol.
GFSK	2405	3	2388.960	64.43	74	2388.540	52.23	54	H
GFSK	2465	3	2486.816	62.49	74	2484.488	49.90	54	H

Note 1: Measurement worst emissions of receive antenna polarization.
 Note 2: Average emission setting: RBW=1MHz; VBW ≥ 1/T, where T is "Pulse On Time", e.g., LE VBW≥1/625us, VBW=3kHz.

3.7 Transmitter Radiated Unwanted Emissions

3.7.1 Transmitter Radiated Unwanted Emissions 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.

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.

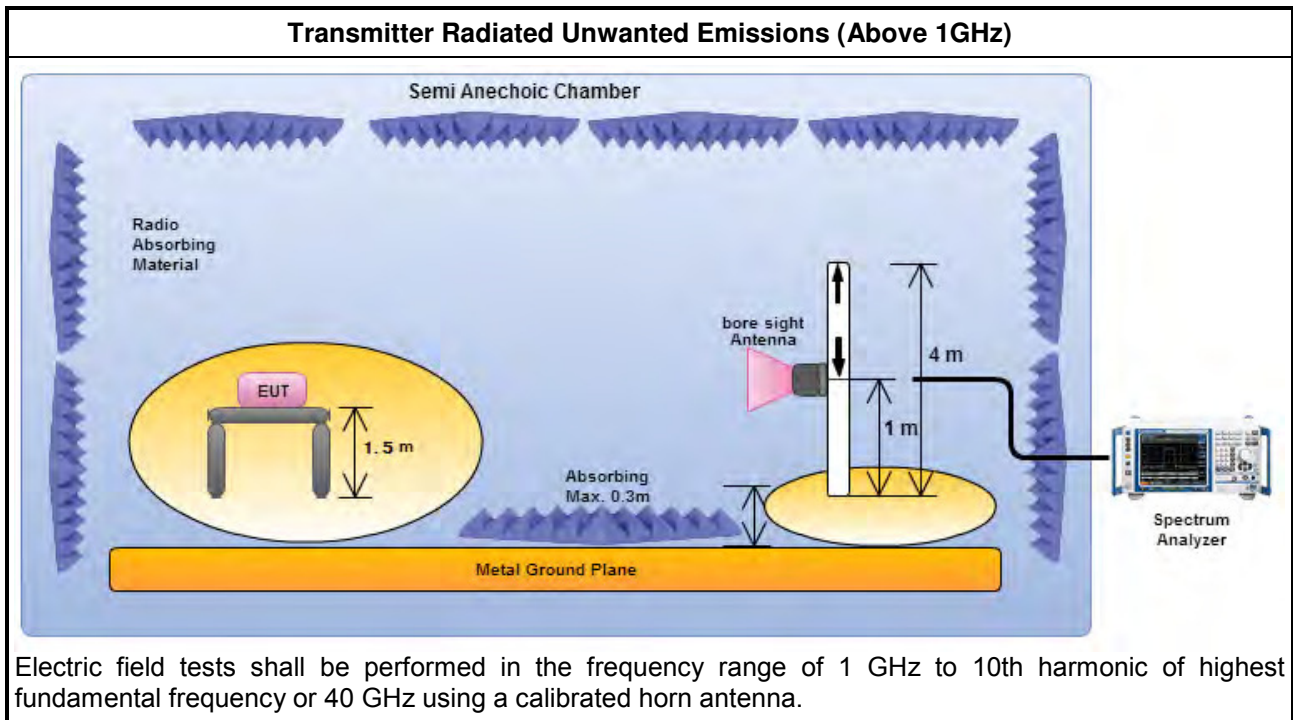
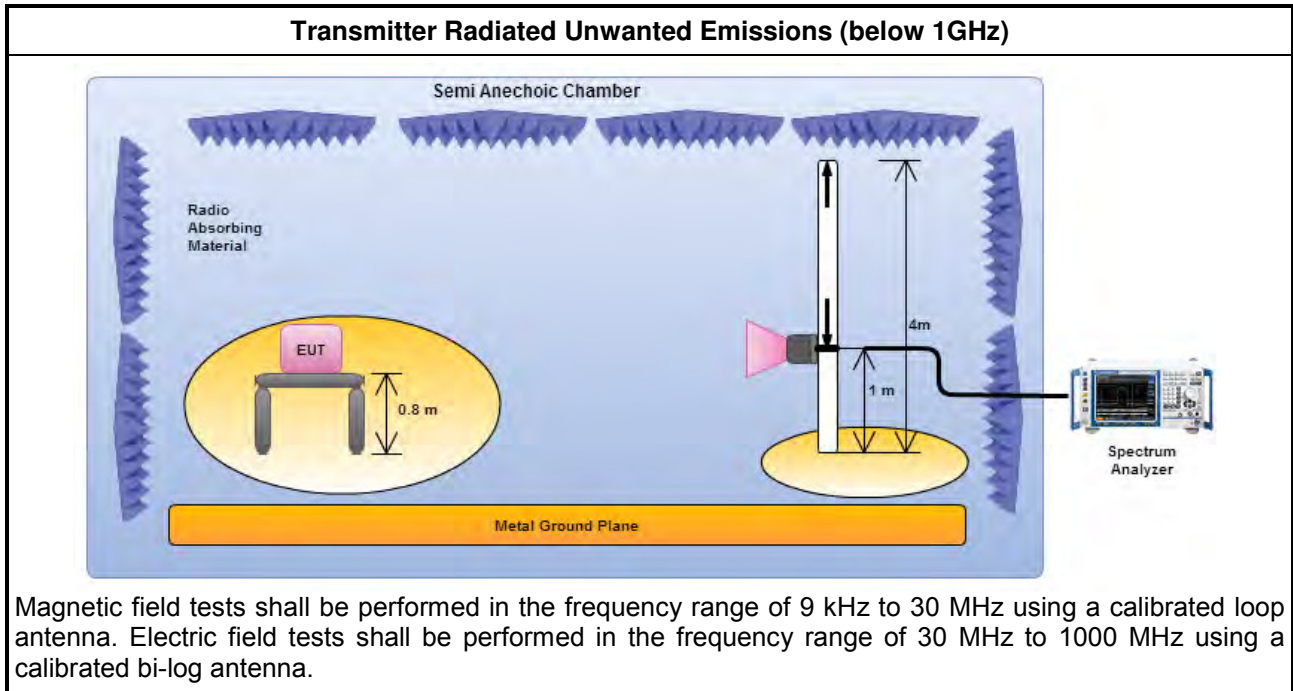
3.7.2 Measuring Instruments

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

3.7.3 Test Procedures

Test Method – General Information	
<input checked="" type="checkbox"/>	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).
<input checked="" type="checkbox"/>	The average emission levels shall be measured in [duty cycle \geq 98 or duty factor].
<input checked="" type="checkbox"/>	For the transmitter unwanted emissions shall be measured using following options below:
<input checked="" type="checkbox"/>	Refer as FCC DA 00-0705, for spurious radiated emissions. The dwell time per channel of the hopping signal is less than 100 ms, then the reading obtained with the 10 Hz VBW may be further adjusted by a “duty cycle correction factor”, derived from $20\log(\text{dwell time}/100 \text{ ms})$
<input type="checkbox"/>	For unwanted emissions into non-restricted bands. 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.
<input checked="" type="checkbox"/>	For unwanted emissions into restricted bands.
<input checked="" type="checkbox"/>	Refer as ANSI C63.10, clause 4.1.4.2.3 (Reduced VBW). $VBW \geq 1/T$, where T is pulse time.
<input type="checkbox"/>	Refer as ANSI C63.10, clause 4.1.4.2.4 average value of pulsed emissions.
<input checked="" type="checkbox"/>	Refer as ANSI C63.10, clause 4.1.4.2.2 measurement procedure peak limit.
<input checked="" type="checkbox"/>	For radiated measurement.
<input checked="" type="checkbox"/>	Refer as ANSI C63.10, clause 6.4 for radiated emissions below 30 MHz and test distance is 3m.
<input checked="" type="checkbox"/>	Refer as ANSI C63.10, clause 6.5 for radiated emissions 30 MHz to 1 GHz and test distance is 3m.
<input checked="" type="checkbox"/>	Refer as ANSI C63.10, clause 6.6 for radiated emissions above 1 GHz and test distance is 3m.
<input checked="" type="checkbox"/>	The any unwanted emissions level shall not exceed the fundamental emission level.
<input checked="" type="checkbox"/>	All amplitude of spurious emissions that are attenuated by more than 20 dB below the permissible value has no need to be reported.

3.7.4 Test Setup



3.7.5 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.



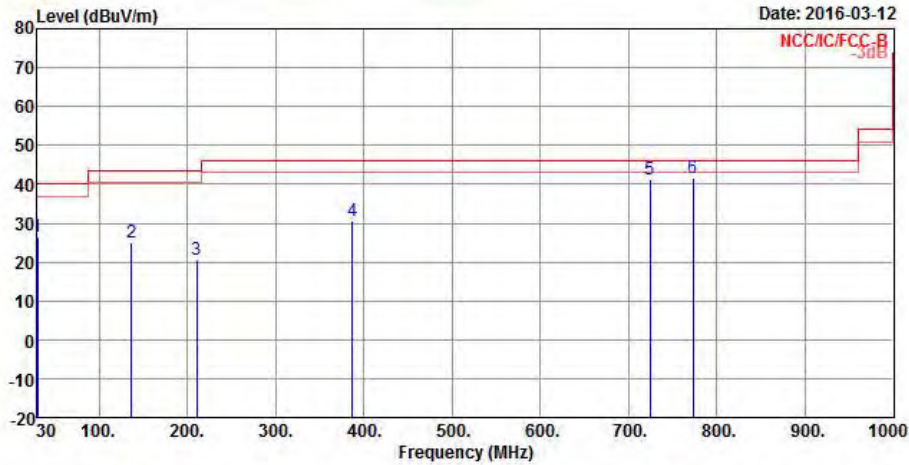
3.7.6 Transmitter Radiated Unwanted Emissions (Below 1GHz)

Transmitter Radiated Unwanted Emissions (Below 1GHz)																																																																																	
Operating Mode	1			Polarization	V																																																																												
Operating Function	Adapter 1 Mode																																																																																
<div style="display: flex; justify-content: space-between;"> <div> <p style="font-size: small;">Date: 2016-03-12 MCC/CIC/FCC-B -3dB</p> </div> </div>																																																																																	
<table border="1" style="width:100%; border-collapse: collapse; font-size: small;"> <thead> <tr> <th></th> <th>Freq</th> <th>Level</th> <th>Over Limit</th> <th>Limit Line</th> <th>ReadAntenna Level</th> <th>Cable Factor</th> <th>Preamp</th> <th>Remark</th> </tr> <tr> <th></th> <th>MHz</th> <th>dBuV/m</th> <th>dB</th> <th>dBuV/m</th> <th>dBuV</th> <th>dB/m</th> <th>dB</th> <th>dB</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>35.820</td> <td>31.74</td> <td>-8.26</td> <td>40.00</td> <td>36.43</td> <td>22.01</td> <td>0.85</td> <td>27.55 Peak</td> </tr> <tr> <td>2</td> <td>72.680</td> <td>24.85</td> <td>-15.15</td> <td>40.00</td> <td>38.30</td> <td>12.72</td> <td>1.27</td> <td>27.44 Peak</td> </tr> <tr> <td>3</td> <td>136.700</td> <td>25.23</td> <td>-18.27</td> <td>43.50</td> <td>32.53</td> <td>18.09</td> <td>1.81</td> <td>27.20 Peak</td> </tr> <tr> <td>4</td> <td>573.200</td> <td>35.49</td> <td>-10.51</td> <td>46.00</td> <td>34.85</td> <td>24.75</td> <td>3.84</td> <td>27.95 Peak</td> </tr> <tr> <td>5</td> <td>633.340</td> <td>34.52</td> <td>-11.48</td> <td>46.00</td> <td>33.12</td> <td>25.18</td> <td>4.19</td> <td>27.97 Peak</td> </tr> <tr> <td>6</td> <td>679.900</td> <td>35.09</td> <td>-10.91</td> <td>46.00</td> <td>33.26</td> <td>25.42</td> <td>4.34</td> <td>27.93 Peak</td> </tr> </tbody> </table>											Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Cable Factor	Preamp	Remark		MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	1	35.820	31.74	-8.26	40.00	36.43	22.01	0.85	27.55 Peak	2	72.680	24.85	-15.15	40.00	38.30	12.72	1.27	27.44 Peak	3	136.700	25.23	-18.27	43.50	32.53	18.09	1.81	27.20 Peak	4	573.200	35.49	-10.51	46.00	34.85	24.75	3.84	27.95 Peak	5	633.340	34.52	-11.48	46.00	33.12	25.18	4.19	27.97 Peak	6	679.900	35.09	-10.91	46.00	33.26	25.42	4.34	27.93 Peak
	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Cable Factor	Preamp	Remark																																																																									
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Transmitter Radiated Unwanted Emissions (Below 1GHz)

Operating Mode	1	Polarization	H
Operating Function	Adapter 1 Mode		



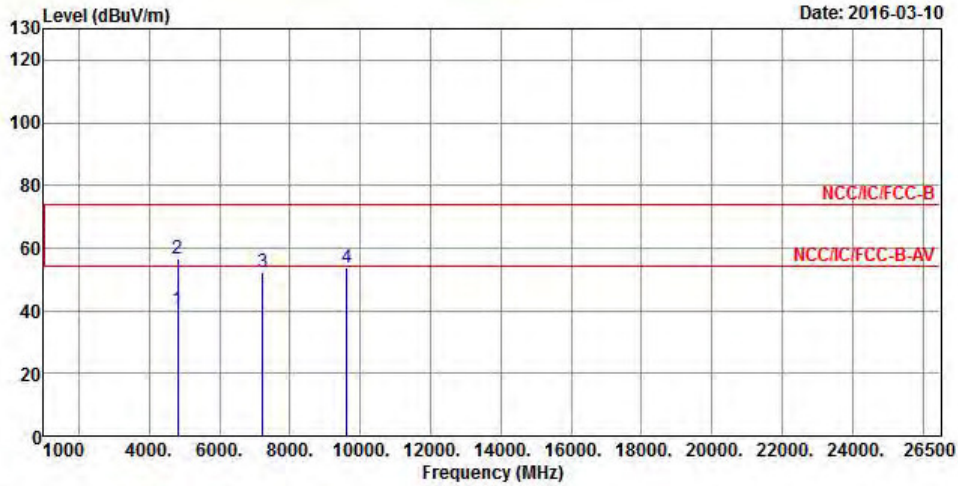
	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Antenna Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1	30.000	26.66	-13.34	40.00	27.83	25.62	0.78	27.57	Peak
2	136.700	24.91	-18.59	43.50	32.21	18.09	1.81	27.20	Peak
3	210.420	20.57	-22.93	43.50	28.85	16.33	2.32	26.93	Peak
4	386.960	30.72	-15.28	46.00	32.68	22.08	3.20	27.24	Peak
5	724.520	41.08	-4.92	46.00	38.65	25.86	4.46	27.89	Peak
6	773.020	41.69	-4.31	46.00	38.55	26.42	4.54	27.82	Peak

Note 1: ">20dB" means spurious emission levels that exceed the level of 20 dB below the applicable limit.
 Note 2: "N/F" means Nothing Found spurious emissions (No spurious emissions were detected.)
 Note 3: Measurement receive antenna polarization: H (Horizontal), V (Vertical)



3.7.7 Transmitter Radiated Unwanted Emissions (Above 1GHz)

Transmitter Radiated Unwanted Emissions (Above 1GHz)			
Modulation Mode	GFSK	Test Freq. (MHz)	2405
Operating Function	Transmit	Polarization	V

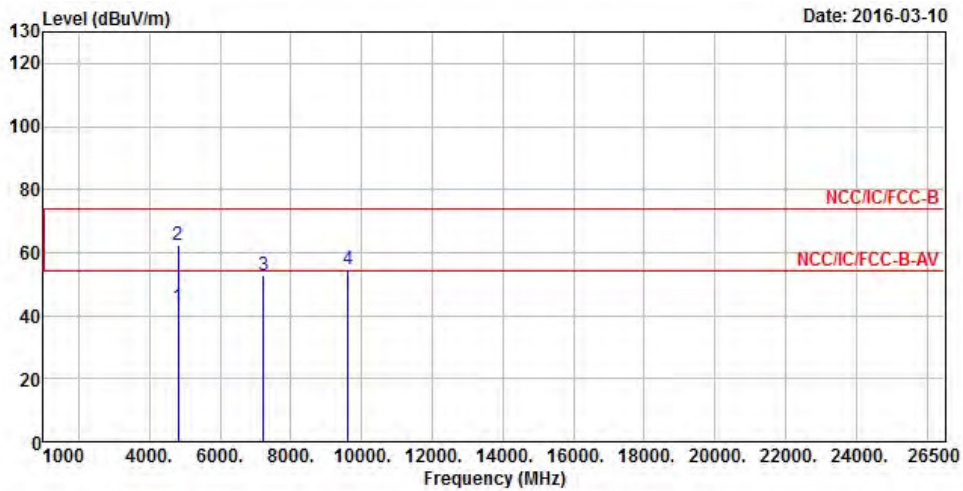


	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Cable Preamp	Loss	Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1	4810.000	40.31	-13.69	54.00	35.40	33.02	4.44	32.55	Average
2	4810.000	56.61	-17.39	74.00	51.70	33.02	4.44	32.55	Peak
3	7215.000	52.47	-21.53	74.00	43.99	35.78	5.48	32.78	Peak
4	9620.000	53.88	-20.12	74.00	42.25	38.14	6.71	33.22	Peak

Note 1: ">20dB" means spurious emission levels that exceed the level of 20 dB below the applicable limit.
 Note 2: "N/F" means Nothing Found spurious emissions (No spurious emissions were detected.)
 Note 3: Measurement receive antenna polarization: H (Horizontal), V (Vertical)
 Note 4: For restricted bands, the peak measurement is fully sufficient, as the max field strength as measured with the Peak-Detector meets the AV-Limit so that the AV level does not need to be reported in addition.
 Note 5: For un-restricted bands, unwanted emissions shall be attenuated by at least 20 dB relative to the maximum measured in-band level (112.80 dBuV/m).



Transmitter Radiated Unwanted Emissions (Above 1GHz)			
Modulation Mode	GFSK	Test Freq. (MHz)	2405
Operating Function	Transmit	Polarization	H



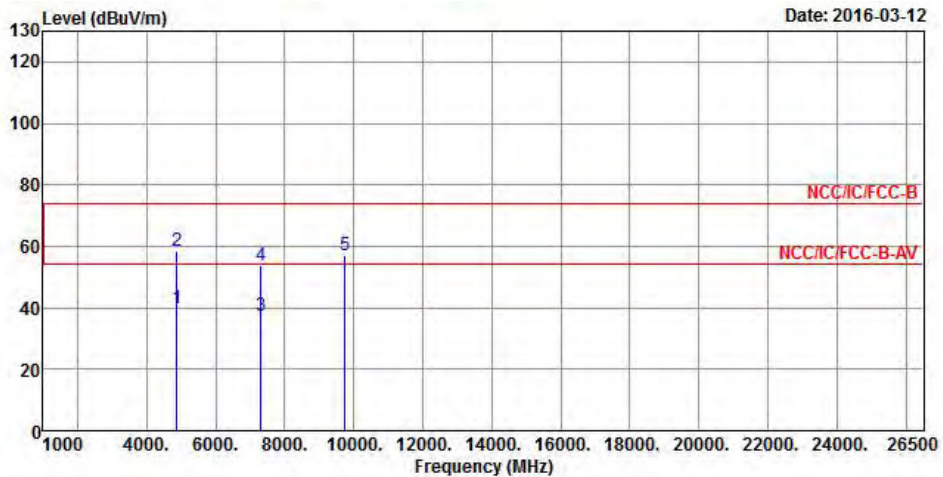
	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Cable Preamp	Loss Factor	Preamp	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1	4810.000	42.82	-11.18	54.00	37.91	33.02	4.44	32.55	Average
2	4810.000	62.20	-11.80	74.00	57.29	33.02	4.44	32.55	Peak
3	7215.000	52.59	-21.41	74.00	44.11	35.78	5.48	32.78	Peak
4	9620.000	54.74	-19.26	74.00	43.11	38.14	6.71	33.22	Peak

Note 1: ">20dB" means spurious emission levels that exceed the level of 20 dB below the applicable limit.
 Note 2: "N/F" means Nothing Found spurious emissions (No spurious emissions were detected.)
 Note 3: Measurement receive antenna polarization: H (Horizontal), V (Vertical)
 Note 4: For restricted bands, the peak measurement is fully sufficient, as the max field strength as measured with the Peak-Detector meets the AV-Limit so that the AV level does not need to be reported in addition.
 Note 5: For un-restricted bands, unwanted emissions shall be attenuated by at least 20 dB relative to the maximum measured in-band level (112.80 dBuV/m).



Transmitter Radiated Unwanted Emissions (Above 1GHz)

Modulation Mode	GFSK	Test Freq. (MHz)	2435
Operating Function	Transmit	Polarization	V

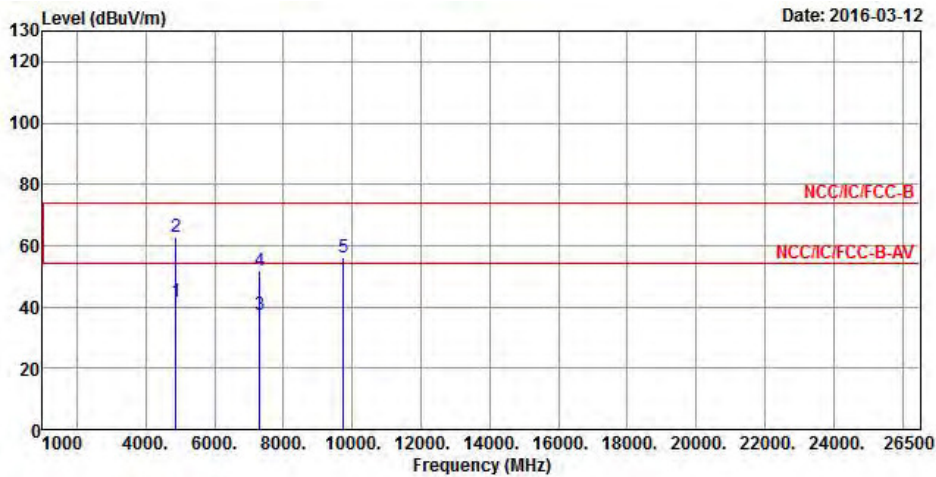


	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Cable Factor	Preamp Loss	Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1	4870.000	39.89	-14.11	54.00	34.79	33.16	4.47	32.53	Average
2	4870.000	58.63	-15.37	74.00	53.53	33.16	4.47	32.53	Peak
3	7305.000	37.19	-16.81	54.00	28.42	36.01	5.56	32.80	Average
4	7305.000	53.53	-20.47	74.00	44.76	36.01	5.56	32.80	Peak
5	9740.000	56.89	-17.11	74.00	44.93	38.38	6.80	33.22	Peak

- Note 1: ">20dB" means spurious emission levels that exceed the level of 20 dB below the applicable limit.
- Note 2: "N/F" means Nothing Found spurious emissions (No spurious emissions were detected.)
- Note 3: Measurement receive antenna polarization: H (Horizontal), V (Vertical)
- Note 4: For restricted bands, the peak measurement is fully sufficient, as the max field strength as measured with the Peak-Detector meets the AV-Limit so that the AV level does not need to be reported in addition.
- Note 5: For un-restricted bands, unwanted emissions shall be attenuated by at least 20 dB relative to the maximum measured in-band level (114.24 dBuV/m).



Transmitter Radiated Unwanted Emissions (Above 1GHz)			
Modulation Mode	GFSK	Test Freq. (MHz)	2435
Operating Function	Transmit	Polarization	H



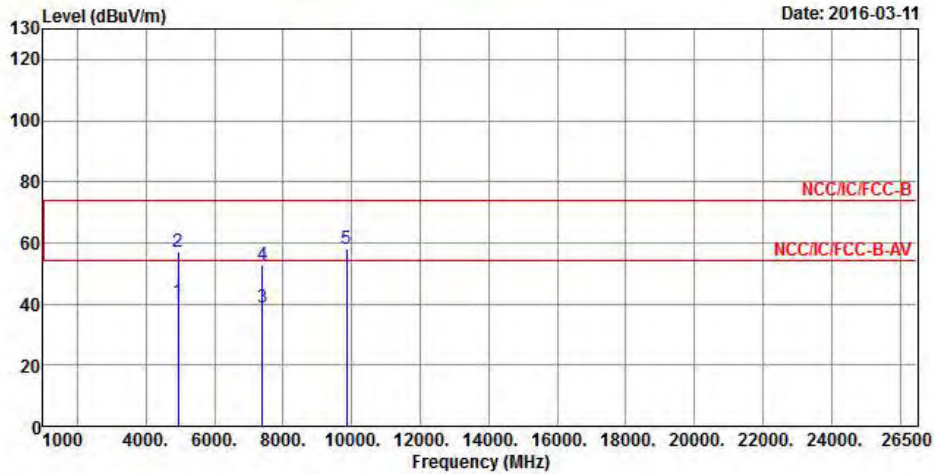
	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Cable Factor	Preamp Loss	Preamp Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1	4870.000	41.87	-12.13	54.00	36.77	33.16	4.47	32.53	Average
2	4870.000	62.91	-11.09	74.00	57.81	33.16	4.47	32.53	Peak
3	7305.000	37.20	-16.80	54.00	28.43	36.01	5.56	32.80	Average
4	7305.000	51.63	-22.37	74.00	42.86	36.01	5.56	32.80	Peak
5	9740.000	56.16	-17.84	74.00	44.20	38.38	6.80	33.22	Peak

Note 1: ">20dB" means spurious emission levels that exceed the level of 20 dB below the applicable limit.
 Note 2: "N/F" means Nothing Found spurious emissions (No spurious emissions were detected.)
 Note 3: Measurement receive antenna polarization: H (Horizontal), V (Vertical)
 Note 4: For restricted bands, the peak measurement is fully sufficient, as the max field strength as measured with the Peak-Detector meets the AV-Limit so that the AV level does not need to be reported in addition.
 Note 5: For un-restricted bands, unwanted emissions shall be attenuated by at least 20 dB relative to the maximum measured in-band level (114.24 dBuV/m).



Transmitter Radiated Unwanted Emissions (Above 1GHz)

Modulation Mode	GFSK	Test Freq. (MHz)	2465
Operating Function	Transmit	Polarization	V



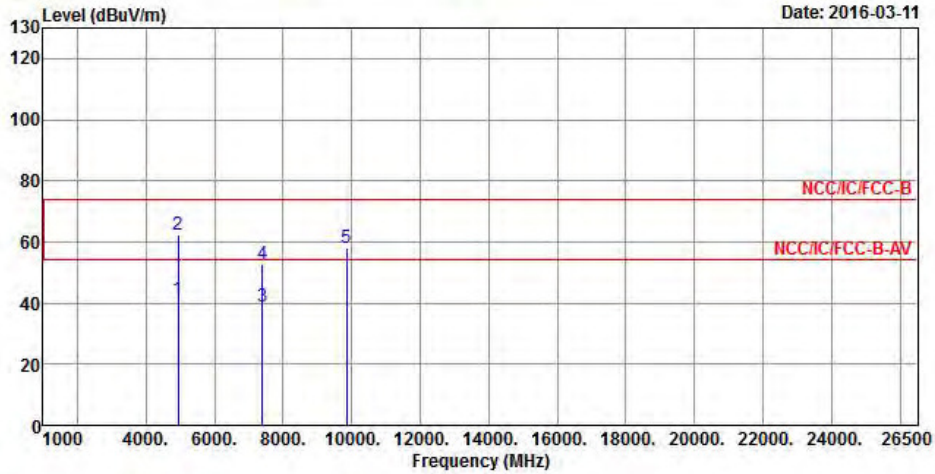
	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Cable Factor	Preamp Loss	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB
1	4930.000	40.88	-13.12	54.00	35.62	33.26	4.52	32.52 Average
2	4930.000	57.14	-16.86	74.00	51.88	33.26	4.52	32.52 Peak
3	7395.000	38.85	-15.15	54.00	29.83	36.23	5.62	32.83 Average
4	7395.000	53.00	-21.00	74.00	43.98	36.23	5.62	32.83 Peak
5	9860.000	57.99	-16.01	74.00	45.68	38.62	6.90	33.21 Peak

Note 1: ">20dB" means spurious emission levels that exceed the level of 20 dB below the applicable limit.
 Note 2: "N/F" means Nothing Found spurious emissions (No spurious emissions were detected.)
 Note 3: Measurement receive antenna polarization: H (Horizontal), V (Vertical)
 Note 4: For restricted bands, the peak measurement is fully sufficient, as the max field strength as measured with the Peak-Detector meets the AV-Limit so that the AV level does not need to be reported in addition.
 Note 5: For un-restricted bands, unwanted emissions shall be attenuated by at least 20 dB relative to the maximum measured in-band level (113.67 dBuV/m).



Transmitter Radiated Unwanted Emissions (Above 1GHz)

Modulation Mode	GFSK	Test Freq. (MHz)	2465
Operating Function	Transmit	Polarization	H



	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Cable Factor	Preamp Loss	Preamp Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1	4930.000	41.49	-12.51	54.00	36.23	33.26	4.52	32.52	Average
2	4930.000	62.21	-11.79	74.00	56.95	33.26	4.52	32.52	Peak
3	7395.000	39.06	-14.94	54.00	30.04	36.23	5.62	32.83	Average
4	7395.000	52.75	-21.25	74.00	43.73	36.23	5.62	32.83	Peak
5	9860.000	58.13	-15.87	74.00	45.82	38.62	6.90	33.21	Peak

Note 1: ">20dB" means spurious emission levels that exceed the level of 20 dB below the applicable limit.
 Note 2: "N/F" means Nothing Found spurious emissions (No spurious emissions were detected.)
 Note 3: Measurement receive antenna polarization: H (Horizontal), V (Vertical)
 Note 4: For restricted bands, the peak measurement is fully sufficient, as the max field strength as measured with the Peak-Detector meets the AV-Limit so that the AV level does not need to be reported in addition.
 Note 5: For un-restricted bands, unwanted emissions shall be attenuated by at least 20 dB relative to the maximum measured in-band level (113.67 dBuV/m).



4 Test Equipment and Calibration Data

< AC Conduction >

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Last Cal.	Calibration Due Date
EMC Receiver	KETSIGHT	N9038A	MY54130031	20Hz ~ 8.4GHz	Apr. 14, 2016	Apr. 13, 2017
LISN	SCHWARZBECK MESS-ELEKTRONIK	NSLK 8127	8127-477	9kHz ~ 30MHz	Jan. 26, 2016	Jan. 25, 2017
RF Cable-CON	HUBER+SUHNER	RG213/U	07611832020001	9kHz ~ 30MHz	Oct. 30, 2015	Oct. 29, 2016
EMI Filter	LINDGREN	LRE-2030	2651	< 450 Hz	NCR	NCR

< RF Conducted >

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Last Cal.	Calibration Due Date
Spectrum Analyzer	R&S	FSV 40	101500	9KHz~40GHz	May 06, 2015	May 05, 2016
Signal Generator	R&S	SMR40	100116	10MHz ~ 40GHz	Jul. 28, 2015	Jul. 27, 2016
Power Sensor	Anritsu	MA2411B	0917017	300MHz ~ 40GHz	Feb. 04 ,2016	Feb. 03 ,2017
Power Meter	Anritsu	ML2495A	0949003	300MHz ~ 40GHz	Feb. 04, 2016	Feb. 03, 2017

< Radiated Emission >

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Last Cal.	Calibration Due Date
3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH03-HY	30MHz ~ 1GHz 3m	Nov. 28, 2015	Nov. 27, 2016
3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH03-HY	1GHz ~ 18GHz 3m	Dec. 16, 2015	Dec. 15, 2016
Amplifier	HP	8447D	2944A08033	10kHz ~ 1.3GHz	May 11, 2015	May 10, 2016
Amplifier	HP	8447D	2944A08033	10kHz ~ 1.3GHz	May 10, 2016	May 09, 2017
Amplifier	Agilent	8449B	3008A02120	1GHz ~ 26.5GHz	Sep. 02, 2015	Sep. 01, 2016
Spectrum	R&S	FSV40	101513	9kHz ~ 40GHz	Feb. 16, 2016	Feb. 15, 2017
Bilog Antenna	SCHAFFNER	CBL 6112D	22237	30MHz ~ 1GHz	Sep. 18, 2015	Sep. 17, 2016
Horn Antenna	ETS · LINDGREN	3115	6741	1GHz ~ 18GHz	Jul. 15, 2015	Jul. 14, 2016
Horn Antenna	SCHWARZBECK	BBHA9170	BBHA9170154	18GHz ~ 40GHz	Jan. 29, 2016	Jan. 28, 2017

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Last Cal.	Calibration Due Date
Loop Antenna	R&S	HFH2-Z2	100330	9 kHz~30 MHz	Nov.16, 2015	Nov.15, 2017