

FCC Co-location Test Report

Equipment : Wireless Gateway Pro
Brand Name : PHILIPS
Model No. : LCN1850/05
FCC ID : 2AGBW-LCN1850
Standard : 47 CFR FCC Part 15
Applicant / Manufacturer : Philips Lighting(China) Investment Co., Ltd.
Building 9, Lane 888, Tianlin Road,
Minhang District, Shanghai 200233 China

The product sample received on Aug. 10, 2016 and completely tested on Oct. 5, 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:

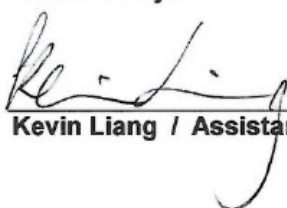

Kevin Liang / Assistant Manager

Table of Contents

1	CO-LOCATION	4
1.1	Conducted emission.....	4
1.1.1	Limit.....	4
1.1.1.1	Fundamental Emission Output Power Limit.....	4
1.1.1.2	Power Spectral Density Limit	4
1.1.1.3	Un-restricted Band Emissions Limit.....	5
1.1.2	Test procedure	5
1.1.3	Maximum Conducted Output Power	6
1.1.4	Power Spectral Density.....	7
1.1.5	Transmitters operating simultaneously	8
1.2	Transmitter Radiated Unwanted Emissions	9
1.2.1	Transmitter Radiated Unwanted Emissions Limit.....	9
1.2.2	Measuring Instruments	9
1.2.3	Test Procedures	10
1.2.4	Test Setup	11
1.2.5	Results of Radiated Emissions (Below 1GHz).....	12
1.2.6	Results for Radiated Emissions (Above 1GHz)	14
2	TEST EQUIPMENT AND CALIBRATION DATA.....	16
	Instrument for Radiated Test	16
	Instrument for Conducted Test	16

Revision History

[illegible]

1 CO-LOCATION

1.1 Conducted emission

1.1.1 Limit

1.1.1.1 Fundamental Emission Output Power Limit

Maximum Peak Conducted Output Power or Maximum Conducted Output Power Limit		
2400-2483.5 MHz Band:		
	If $G_{TX} \leq 6$ dBi, then $P_{Out} \leq 30$ dBm (1 W)	
	Point-to-multipoint systems (P2M): If $G_{TX} > 6$ dBi, then $P_{Out} = 30 - (G_{TX} - 6)$ dBm	
	Point-to-point systems (P2P): If $G_{TX} > 6$ dBi, then $P_{Out} = 30 - (G_{TX} - 6)/3$ dBm	
	Smart antenna system (SAS):	
		- Single beam: If $G_{TX} > 6$ dBi, then $P_{Out} = 30 - (G_{TX} - 6)/3$ dBm - Overlap beam: If $G_{TX} > 6$ dBi, then $P_{Out} = 30 - (G_{TX} - 6)/3$ dBm - Aggregate power on all beams: If $G_{TX} > 6$ dBi, then $P_{Out} = 30 - (G_{TX} - 6)/3 + 8$ dB dBm
e.i.r.p. Power Limit:		
2400-2483.5 MHz Band		
	Point-to-multipoint systems (P2M): $P_{eirp} \leq 36$ dBm (4 W)	
	Point-to-point systems (P2P): $P_{eirp} \leq \text{MAX}(36, [P_{Out} + G_{TX}])$ dBm	
	Smart antenna system (SAS)	
		- Single beam: $P_{eirp} \leq \text{MAX}(36, P_{Out} + G_{TX})$ dBm - Overlap beam: $P_{eirp} \leq \text{MAX}(36, P_{Out} + G_{TX})$ dBm - Aggregate power on all beams: $P_{eirp} \leq \text{MAX}(36, [P_{Out} + G_{TX} + 8])$ dBm
P_{Out} = maximum peak conducted output power or maximum conducted output power in dBm, G_{TX} = the maximum transmitting antenna directional gain in dBi. P_{eirp} = e.i.r.p. Power in dBm.		

1.1.1.2 Power Spectral Density Limit

Power Spectral Density Limit
Power Spectral Density (PSD) ≤ 8 dBm/3kHz

1.1.1.3 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.

1.1.2 Test procedure

Refer to ANSI C63.10 clause 14.3

1.1.3 Maximum Conducted Output Power

Maximum Peak Conducted Output Power					
Summary					
Modulation	Mode	Sum(dBm)	Sum(W)	EIRP(dBm)	EIRP(W)
Zigbee	2.4G;Zigbee;5;1;1	15.53	0.03573	17.23	0.05284
WiFi 2.4G	2.4G;11b;20;1;1	12.41	0.01742	14.81	0.03027
	2.4G;11g;20;1;1	21.38	0.1374	23.78	0.23878
	2.4G;HT20;20;1,(M0-7);1	22.03	0.15959	24.43	0.27733
	2.4G;HT40;40;1,(M0-7);1	19.08	0.08091	21.48	0.1406

Worst Maximum Peak Conducted Output Power					
	Zigbee	WiFi 2.4G	Total	Limit	Pass/Fail
Sum(W)	0.03573	0.15959	0.19532	1	Pass

Maximum Average Conducted Output Power					
Summary					
Modulation	Mode	Sum(dBm)	Sum(W)	EIRP(dBm)	EIRP(W)
Zigbee	2.4G;Zigbee;5;1;1	15.48	0.03532	17.18	0.05224
WiFi 2.4G	2.4G;11b;20;1;1	10.11	0.01026	12.51	0.01782
	2.4G;11g;20;1;1	15.02	0.03177	17.42	0.05521
	2.4G;HT20;20;1,(M0-7);1	15.9	0.0389	18.3	0.06761
	2.4G;HT40;40;1,(M0-7);1	12.89	0.01945	15.29	0.03381

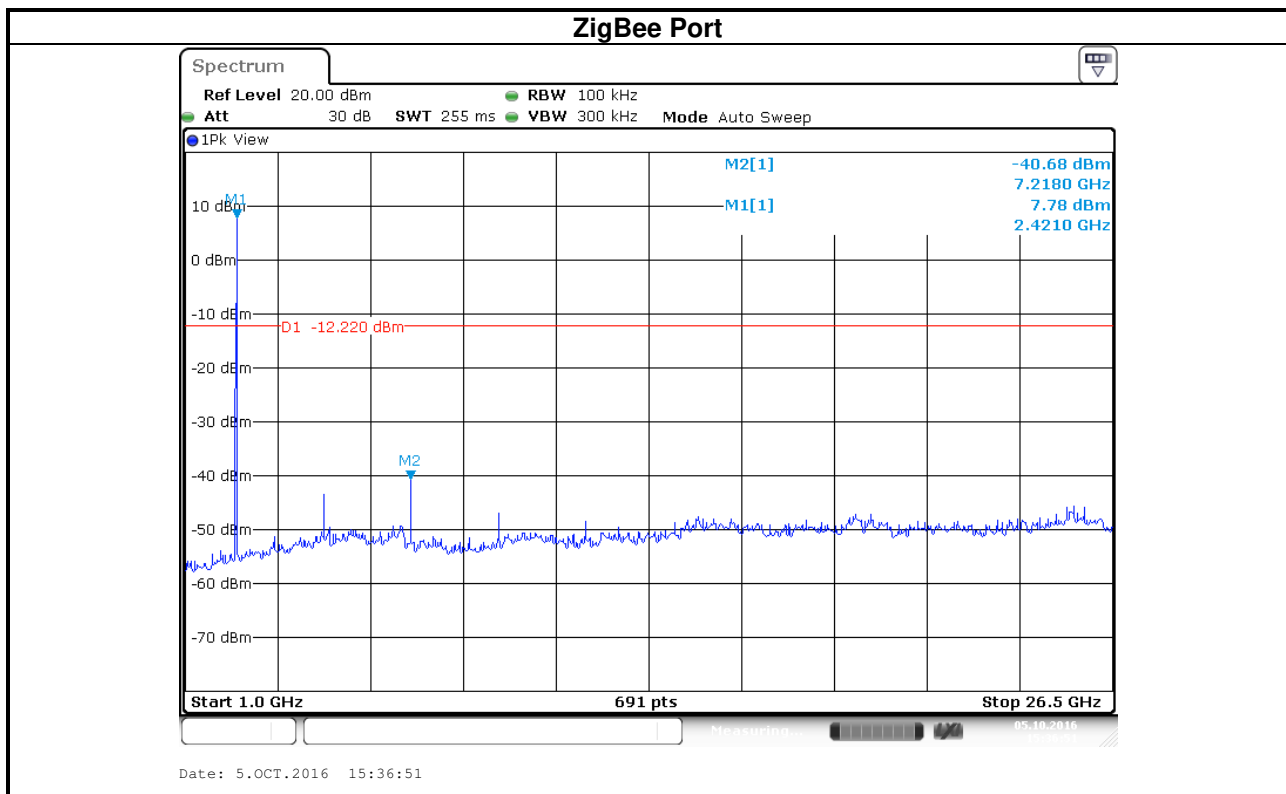
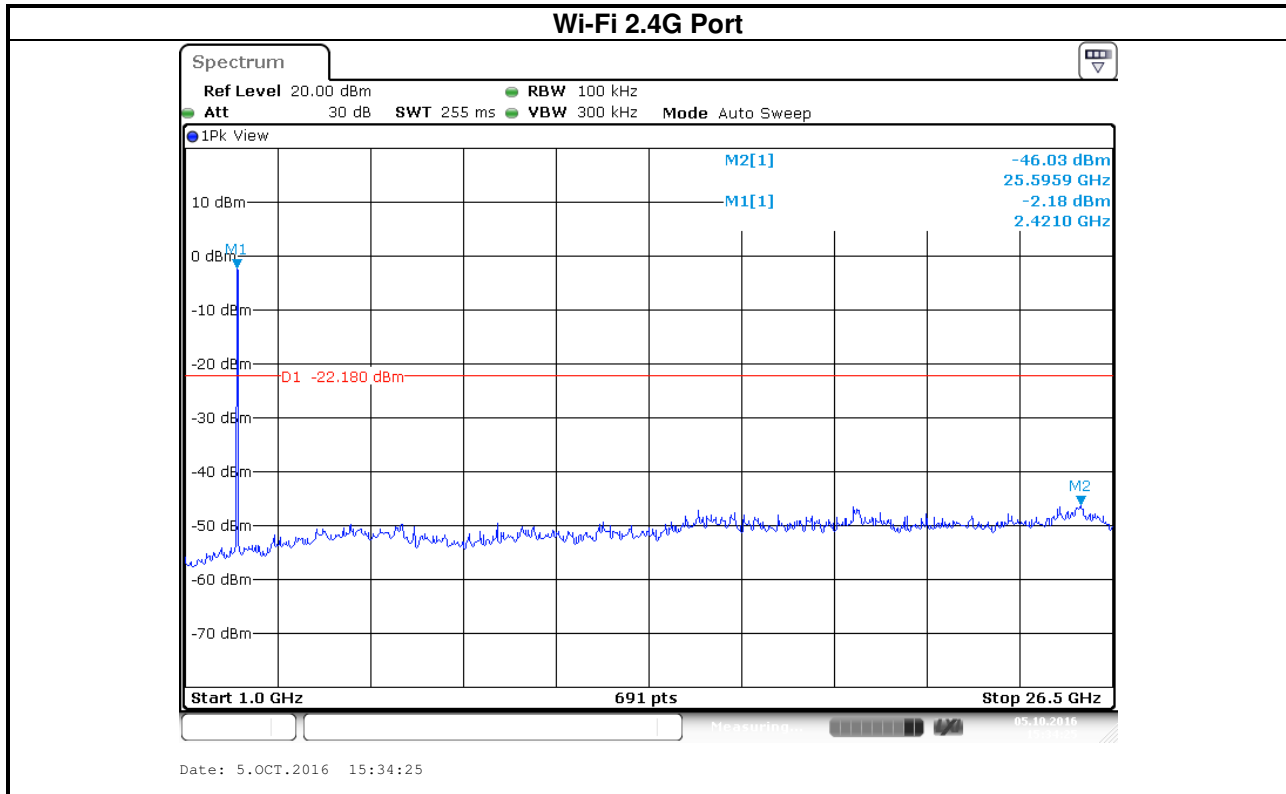
Worst Maximum Peak Conducted Output Power					
	Zigbee	WiFi 2.4G	Total	Limit	Pass/Fail
Sum(W)	0.03532	0.0389	0.07422	1	Pass

1.1.4 Power Spectral Density

Maximum Power Spectral Density			
Summary			
Modulation	Mode	PD (dBm/3k)	EIRP.PD (dBm/3k)
Zigbee	2.4G;Zigbee;5;1;1	-1.14	0.56
WiFi 2.4G	2.4G;11b;20;1;1	-13.44	-11.04
	2.4G;11g;20;1;1	-10.46	-8.06
	2.4G;HT20;20;1,(M0-7);1	-9.53	-7.13
	2.4G;HT40;40;1,(M0-7);1	-14	-11.6

Worst Maximum Power Spectral Density					
	Zigbee	WiFi 2.4G	Total	Limit	Pass/Fail
(dBm/3k)	-1.14	-9.53	-0.55	8	Pass

1.1.5 Transmitters operating simultaneously



1.2 Transmitter Radiated Unwanted Emissions

1.2.1 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 30 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.

1.2.2 Measuring Instruments

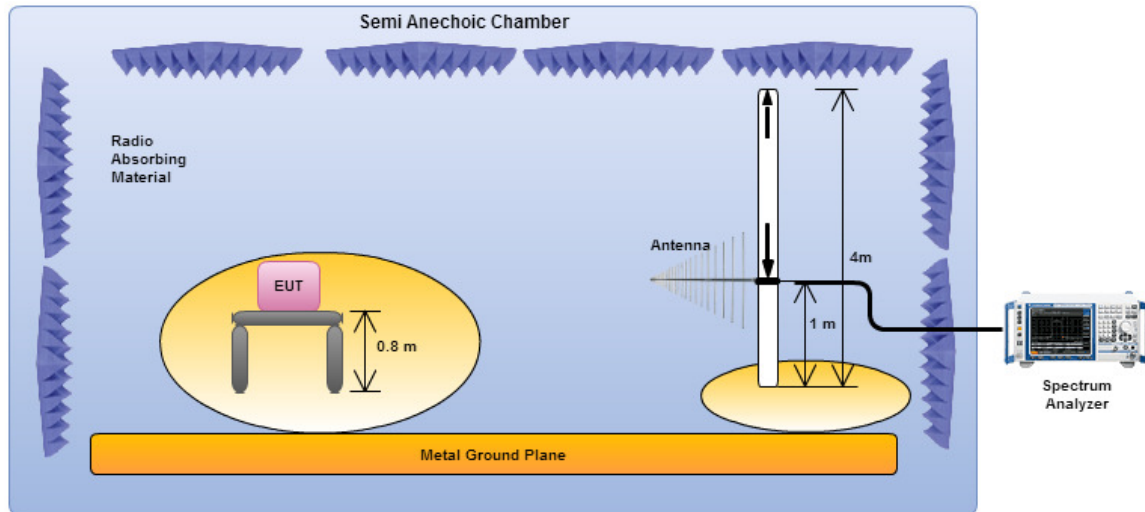
Refer a test equipment and calibration data table in this test report.

1.2.3 Test Procedures

Test Method	
☒	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).
☒	The average emission levels shall be measured in [duty cycle $\geq$ 98 or duty factor].
☒	For the transmitter unwanted emissions shall be measured using following options below:
☒	Refer as FCC KDB 558074, clause 11 for unwanted emissions into non-restricted bands.
☒	Refer as FCC KDB 558074, clause 12 for unwanted emissions into restricted bands.
☐	Refer as FCC KDB 558074, clause 12.2.5.1 and 9.2.1 Option 1 (spectral trace averaging)
☐	Refer as FCC KDB 558074, clause 12.2.5.2 and 9.2.1 Option 2 (slow sweep speed).
☒	Refer as ANSI C63.10, clause 4.1.4.2.3 (Reduced VBW). VBW $\geq$ 1/T, where T is pulse time.
☐	Refer as ANSI C63.10, clause 4.1.4.2.4 average value of pulsed emissions.
☒	Refer as FCC KDB 558074, clause 12.2.4 and 9.1.1 measurement procedure peak limit.
☐	Refer as FCC KDB 558074, clause 12.2.3 measurement procedure Quasi-Peak limit.
☒	For radiated measurement, refer as FCC KDB 558074, clause 12.1.
☒	Refer as ANSI C63.10, clause 6.4 for radiated emissions below 30 MHz and test distance is 3m.
☒	Refer as ANSI C63.10, clause 6.5 for radiated emissions 30 MHz to 1 GHz and test distance is 3m.
☒	Refer as ANSI C63.10, clause 6.6 for radiated emissions above 1 GHz and test distance is 3m.
☐	For conducted and cabinet radiation measurement, refer as FCC KDB 558074, clause 12.2.2.
☐	For conducted unwanted emissions into non-restricted bands (relative emission limits). Devices with multiple transmit chains: Refer as FCC KDB 662911, when testing out-of-band and spurious emissions against relative emission limits, tests may be performed on each output individually without summing or adding 10 log(N) if the measurements are made relative to the in-band emissions on the individual outputs.
☐	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

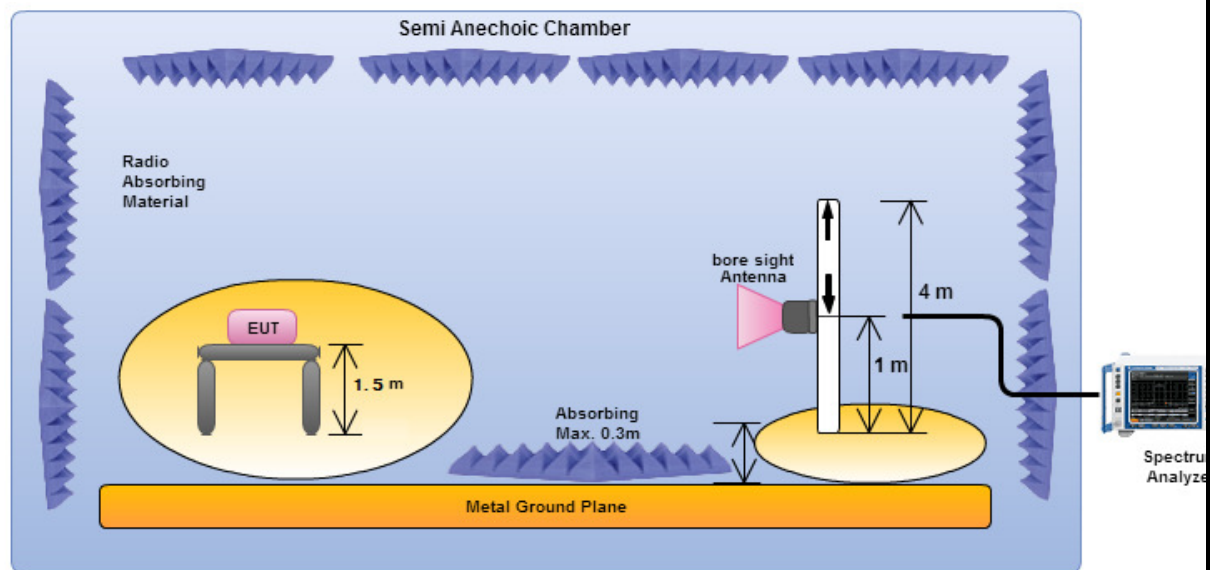
1.2.4 Test Setup

Transmitter Radiated Unwanted Emissions (below 1GHz)

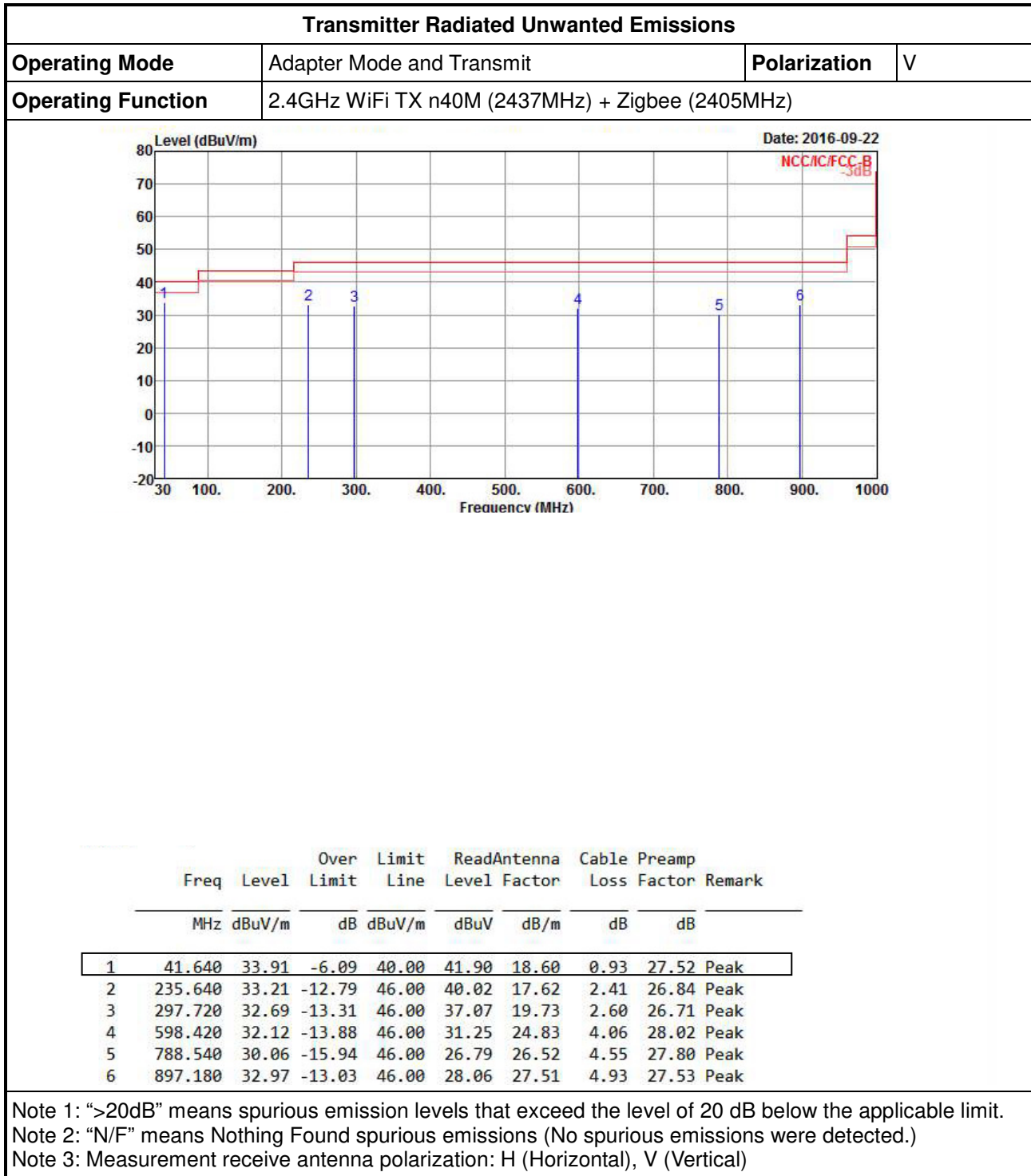


Electric field tests shall be performed in the frequency range of 30 MHz to 1000 MHz using a calibrated bi-log antenna.

Transmitter Radiated Unwanted Emissions (Above 1GHz)

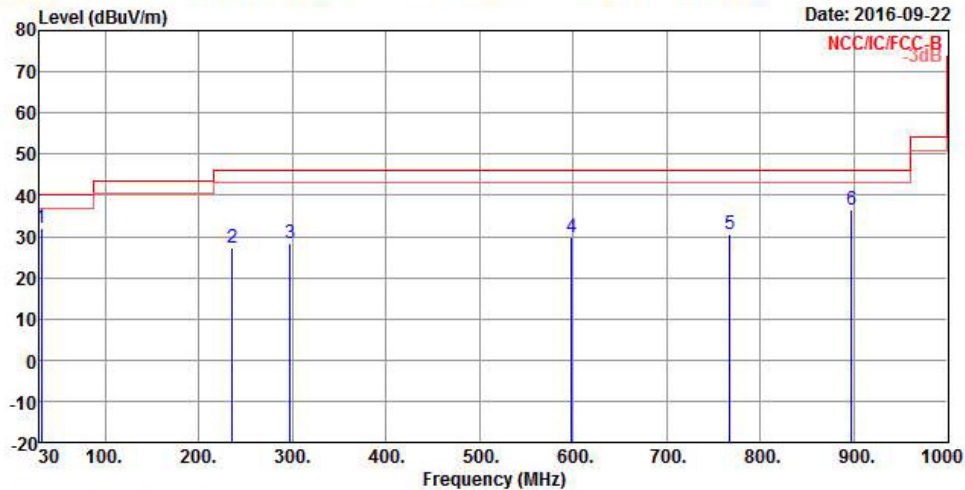


Electric field tests shall be performed in the frequency range of 1 GHz to 10th harmonic of highest fundamental frequency or 40 GHz using a calibrated horn antenna.

1.2.5 Results of Radiated Emissions (Blow 1GHz)


Transmitter Radiated Unwanted Emissions

Operating Mode	Adapter Mode and Transmit	Polarization	H
Operating Function	2.4GHz WiFi TX n40M (2437MHz) + Zigbee (2405MHz)		



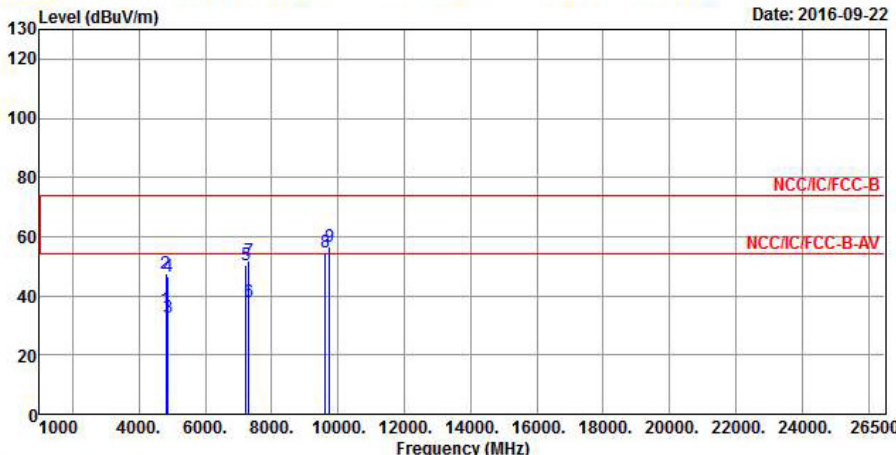
	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Antenna Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1	31.940	31.91	-8.09	40.00	34.25	24.41	0.80	27.55	Peak
2	235.640	27.33	-18.67	46.00	34.14	17.62	2.41	26.84	Peak
3	297.720	28.26	-17.74	46.00	32.64	19.73	2.60	26.71	Peak
4	598.420	29.82	-16.18	46.00	28.95	24.83	4.06	28.02	Peak
5	767.200	30.68	-15.32	46.00	27.58	26.39	4.54	27.83	Peak
6	897.180	36.54	-9.46	46.00	31.63	27.51	4.93	27.53	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)

1.2.6 Results for Radiated Emissions (Above 1GHz)

Transmitter Radiated Unwanted Emissions									
Operating Function	2.4GHz WiFi TX n40M (2437MHz) + Zigbee (2405MHz)								
Polarization	V								
 Date: 2016-09-22									
	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1	4810.000	35.39	-18.61	54.00	29.93	31.13	4.44	30.11	Average
2	4810.000	47.52	-26.48	74.00	42.06	31.13	4.44	30.11	Peak
3	4874.000	32.63	-21.37	54.00	27.04	31.22	4.47	30.10	Average
4	4874.000	46.73	-27.27	74.00	41.14	31.22	4.47	30.10	Peak
5	7215.000	50.30	-23.70	74.00	40.16	35.62	5.48	30.96	Peak
6	7311.000	37.98	-16.02	54.00	27.60	35.85	5.56	31.03	Average
7	7311.000	51.61	-22.39	74.00	41.23	35.85	5.56	31.03	Peak
8	9620.000	54.61	-19.39	74.00	40.28	38.72	6.71	31.10	Peak
9	9748.000	56.39	-17.61	74.00	41.96	38.75	6.80	31.12	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)

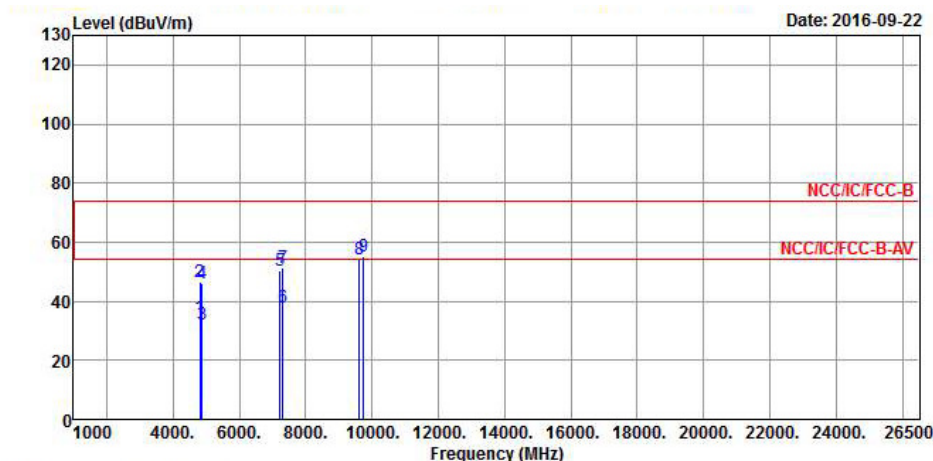
Note 4: For restricted bands, the peak measurement is fully sufficient, as the max field strength as measured with the Peak-Detector meets the AV-Limit so that the AV level does not need to be reported in addition.

Note 5: For un-restricted bands, unwanted emissions shall be attenuated by at least 20 dB relative to the maximum measured in-band level.

Transmitter Radiated Unwanted Emissions

Operating Function 2.4GHz WiFi TX n40M (2437MHz) + Zigbee (2405MHz)

Polarization H



	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Cable Loss	Preamplifier	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB
1	4810.000	34.51	-19.49	54.00	29.05	31.13	4.44	30.11 Average
2	4810.000	46.67	-27.33	74.00	41.21	31.13	4.44	30.11 Peak
3	4874.000	32.13	-21.87	54.00	26.54	31.22	4.47	30.10 Average
4	4874.000	45.83	-28.17	74.00	40.24	31.22	4.47	30.10 Peak
5	7215.000	50.29	-23.71	74.00	40.15	35.62	5.48	30.96 Peak
6	7311.000	37.70	-16.30	54.00	27.32	35.85	5.56	31.03 Average
7	7311.000	51.26	-22.74	74.00	40.88	35.85	5.56	31.03 Peak
8	9620.000	54.18	-19.82	74.00	39.85	38.72	6.71	31.10 Peak
9	9748.000	55.20	-18.80	74.00	40.77	38.75	6.80	31.12 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.

2 Test Equipment and Calibration Data

Instrument for Radiated Test

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Calibration Due Date
3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH03-HY	30MHz ~ 1GHz 3m	28/11/2015	27/11/2016
3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH03-HY	1GHz ~ 18GHz 3m	16/12/2015	15/12/2016
Amplifier	HP	8447D	2944A08033	10kHz ~ 1.3GHz	10/05/2016	09/05/2017
Amplifier	Keysight	83017A	MY53270197	1GHz ~ 26.5GHz	29/08/2016	28/08/2017
Spectrum	R&S	FSV40	101513	9kHz ~ 40GHz	16/02/ 2016	15/02/2017
Bilog Antenna	SCHAFFNER	CBL 6112B	2723	30MHz ~ 1GHz	05/10/2015	04/10/2016
Horn Antenna	SCHWARZBECK	BBHA9120D	1531	1GHz ~ 18GHz	22/04/2016	21/04/2017
Horn Antenna	SCHWARZBECK	BBHA9170	BBHA9170154	18GHz ~ 40GHz	29/01/2016	28/01/2017
Amplifier	MITEQ	JS44-18004000 -33-8P	1840917	18GHz ~ 40GHz	02/06/2015	01/06/2017

Instrument for Conducted Test

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Last Cal.	Calibration Due Date
Spectrum Analyzer	R&S	FSV 40	101500	9KHz~40GHz	May 12, 2016	May 11, 2017
Power Sensor	Anritsu	MA2411B	917017	300MHz ~ 40GHz	Feb. 04, 2016	Fed. 03, 2017
Power Meter	Anritsu	ML2495A	949003	300MHz ~ 40GHz	Feb. 04, 2016	Fed. 03, 2017
Signal Generator	R&S	SMR40	100116	10MHz ~ 40GHz	Jul. 21, 2016	Jul. 20, 2017