## 1 CO-LOCATION

## 1.1 Transmitter Radiated Unwanted Emissions

#### 1.1.1 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.

#### 1.1.2 Measuring Instruments

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

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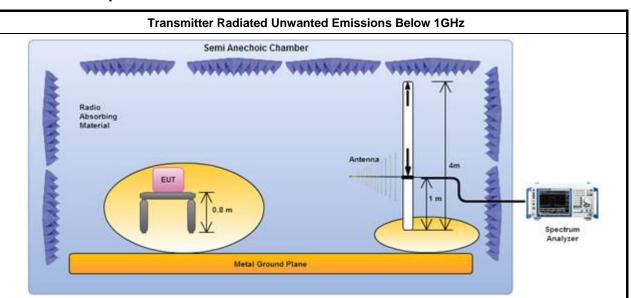
# 1.1.3 Test Procedures

		Test Method
$\boxtimes$	perfe equi extra dista	isurements may be performed at a distance other than the limit distance provided they are not ormed in the near field and the emissions to be measured can be detected by the measurement ipment. When performing measurements at a distance other than that specified, the results shall be appolated to the specified distance using an extrapolation factor of 20 dB/decade (inverse of linear ance for field-strength measurements, inverse of linear distance-squared for power-density issurements).
$\boxtimes$	The	average emission levels shall be measured in [duty cycle ≥ 98 or duty factor].
$\boxtimes$	For	the transmitter unwanted emissions shall be measured using following options below:
	$\boxtimes$	Refer as FCC KDB 558074, clause 10.1 for unwanted emissions into non-restricted bands.
	$\boxtimes$	Refer as FCC KDB 558074, clause 10.2 for unwanted emissions into restricted bands.
		Refer as FCC KDB 558074, clause 10.2.3.3 and 8.2.1 Option 1 (spectral trace averaging)
		Refer as FCC KDB 558074, clause 10.2.3.3 and 8.2.1 Option 2 (slow sweep speed).
		Refer as ANSI C63.10, clause 4.2.3.2.3 (Reduced VBW). VBW ≥ 1/T, where T is pulse time.
		Refer as ANSI C63.10, clause 4.2.3.2.4 average value of pulsed emissions.
		Refer as FCC KDB 558074, clause 10.2.3.2 and 8.1.1 measurement procedure peak limit.
		Refer as FCC KDB 558074, clause 10.2.3.1 measurement procedure Quasi-Peak limit.
$\boxtimes$	For	radiated measurement, refer as FCC KDB 558074, clause 10.2.1.
		Refer as ANSI C63.10, clause 6.4 for radiated emissions from below 30 MHz. Test distance is 3m.
		Refer as ANSI C63.10, clause 6.5 for radiated emissions from 30 MHz to 1000 MHz. Test distance is 3m.
	$\boxtimes$	Refer as ANSI C63.10, clause 6.6 for radiated emissions from above 1 GHz. Test distance is 3m.
	For	conducted and cabinet radiation measurement, refer as FCC KDB 558074, clause 10.2.2.
		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

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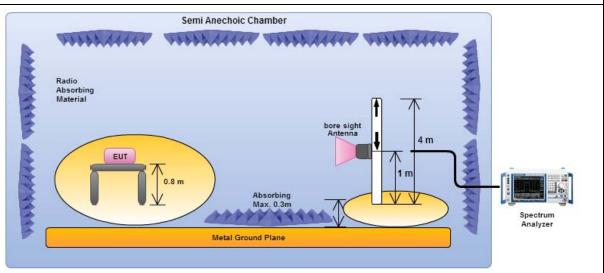
1.1.4 Test Setup



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Magnetic field tests shall be performed in the frequency range of 9 kHz to 30 MHz using a calibrated loop antenna. 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.

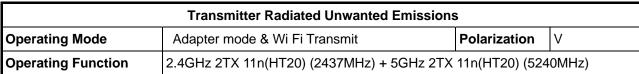
#### 1.1.5 Transmitter Radiated Unwanted Emissions (Below 30MHz)

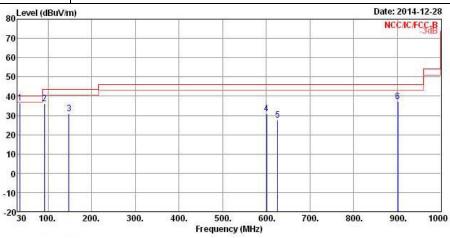
All amplitude of spurious emissions that are attenuated by more than 20 dB below the permissible value has no need to be reported.

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### 1.1.6 Results of Radiated Emissions (30MHz~1GHz)





	Freq	Level	Over Limit	Limit Line		Antenna Factor		Preamp Factor	Remark	A/Pos	T/Pos
11	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	11	cm	deg
1	35.820	36.49	-3.51	40.00	47.25	15.52	0.96	27.24	Peak		
2	92.080	35.98	-7.52	43.50	52.13	9.55	1.54	27.24	Peak	7.7.7.	7.7.7
3	148.340	30.88	-12.62	43.50	45.35	10.68	2.01	27.16	Peak		-,-,-
4	600.360	30.78	-15.22	46.00	35.93	18.46	4.15	27.76	Peak		222
5	625.580	27.44	-18.56	46.00	32.29	18.67	4.25	27.77	Peak		
6	901.060	37.29	-8.71	46.00	38.86	20.53	5.19	27.29	Peak	7.7.7	7.7.7.

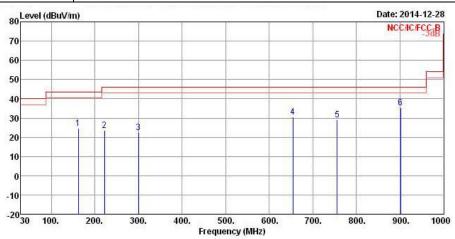
Note 1: ">20dB" means spurious emission levels that exceed the level of 20 dB below the applicable limit.

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

Note 3: Measurement receive antenna polarization: H (Horizontal), V (Vertical)

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Transmitter Radiated Unwanted Emissions									
Operating Mode	Operating Mode Adapter mode & Wi Fi Transmit Polarization								
Operating Function	2.4GHz 2TX 11n(HT20) (2437MHz) + 5GHz 2TX 11r	n(HT20) (5240M	Hz)						



		110	0ver	Limit	Read	Antenna	Cable	Preamp		A/Pos	T/Pos
	Freq	Level	Limit	Line	Level	Factor	Loss	Factor	Remark		
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	÷ <del>-</del>	cm	deg
1	161.920	24.76	-18.74	43.50	39.83	9.98	2.10	27.15	Peak		
2	222.060	23.69	-22.31	46.00	38.51	9.76	2.45	27.03	Peak		
3	299.660	22.43	-23.57	46.00	32.99	13.23	2.90	26.69	Peak		
4	654.680	30.41	-15.59	46.00	35.01	18.81	4.37	27.78	Peak		444
5	755.560	29.02	-16.98	46.00	32.48	19.55	4.69	27.70	Peak		
6	901.060	35.52	-10.48	46.00	37.09	20.53	5.19	27.29	Peak	222	

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

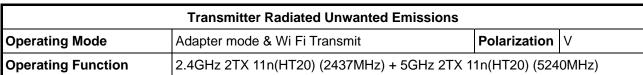
Note 2: "N/F" means Nothing Found spurious emissions (No spurious emissions were detected.)

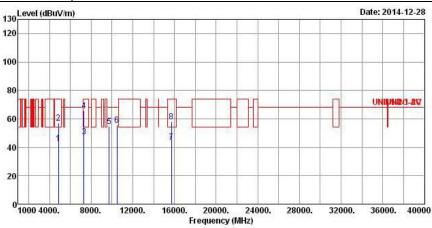
Note 3: Measurement receive antenna polarization: H (Horizontal), V (Vertical)

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# 1.1.7 Results for Radiated Emissions (1GHz~10<sup>th</sup> Harmonic)



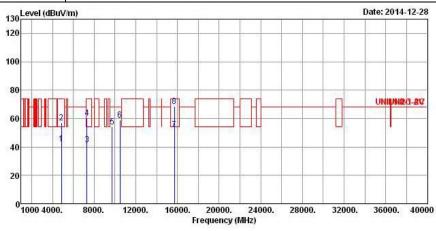


			0ver	Limit	Read	Antenna	Cable	Preamp		A/Pos	T/Pos
	Freq	Level	Limit	Line	Level	Factor	Loss	Factor	Remark		
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	11		deg
1	4874.000	42.48	-11.52	54.00	37.11	33.31	4.51	32.45	Average		
2	4874.000	57.23	-16.77	74.00	51.86	33.31	4.51	32.45	Peak	H.H.H.	
3	7311.000	47.54	-6.46	54.00	38.35	36.11	5.75	32.67	Average		
4	7311.000	65.95	-8.05	74.00	56.76	36.11	5.75	32.67	Peak		
5	9748.000	54.57	-13.63	68.20	42.39	38.61	6.71	33.14	Peak		
6	10480.000	55.67	-12.53	68.20	42.37	39.00	7.00	32.70	Peak		
7	15720.000	43.49	-10.51	54.00	29.59	37.34	8.86	32.30	Average	222	2(2)2
8	15720.000	57.89	-16.11	74.00	43.99	37.34	8.86	32.30	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.

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Transmitter Radiated Unwanted Emissions									
Operating Mode	Operating Mode Adapter mode & Wi Fi Transmit Polarization   H								
Operating Function	2.4GHz 2TX 11n(HT20) (2437MHz) + 5GHz 2TX 11r	n(HT20) (5240)	MHz)						



		200000000	0ver	A-1000000000000000000000000000000000000		Antenna		Preamp		A/Pos	T/Pos
	Freq	Level	Limit	Line	Level	Factor	Loss	Factor	Remark		
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	11	cm	deg
1	4874.000	42.16	-11.84	54.00	36.79	33.31	4.51	32.45	Average	5,5,5)	
2	4874.000	57.25	-16.75	74.00	51.88	33.31	4.51	32.45	Peak		
3	7311.000	41.91	-12.09	54.00	32.72	36.11	5.75	32.67	Average	222	222
4	7311.000	60.50	-13.50	74.00	51.31	36.11	5.75	32.67	Peak		
5	9748.000	54.15	-14.05	68.20	41.97	38.61	6.71	33.14	Peak		
6	10480.000	58.97	-9.23	68.20	45.67	39.00	7.00	32.70	Peak		
7	15720.000	52.06	-1.94	54.00	38.16	37.34	8.86	32.30	Average	222	222
8	15720.000	68.70	-5.30	74.00	54.80	37.34	8.86	32.30	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.

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# 2 TEST EQUIPMENT AND CALIBRATION DATA

### **Radiated Emission**

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH03-HY	30MHz ~ 1GHz 3m	Nov. 29, 2014	Radiation
Amplifier	HP	8447D	2944A08033	10kHz ~ 1.3GHz	May 05, 2014	Radiation
Amplifier	Agilent	8449B	3008A02120	1GHz ~ 26.5GHz	Sep. 01, 2014	Radiation
Spectrum	R&S	FSP40	100004	9kHz ~ 40GHz	Mar. 27, 2014	Radiation
Bilog Antenna	SCHAFFNER	CBL 6112D	22237	30MHz ~ 1GHz	Sep. 20, 2014	Radiation
Horn Antenna	ETS·LINDGREN	3115	6741	1GHz ~ 18GHz	Jul. 11, 2014	Radiation
Horn Antenna	SCHWARZBECK	BBHA9170	BBHA9170154	18GHz ~ 40GHz	Jan. 10, 2014	Radiation
RF Cable-R03m	Jye Bao	RG142	CB021	9kHz ~ 1GHz	Nov. 15, 2014	Radiation
RF Cable-high	SUHNER	SUCOFLEX 106	03CH03-HY	1GHz ~ 40GHz	Dec. 12, 2014	Radiation
Turn Table	EM Electronics	EM Electronics	060615	0 ~ 360 degree	N/A	Radiation
Antenna Mast	MF	MF-7802	MF780208179	1 ~ 4 m	N/A	Radiation

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

Instrument	Manufacturer	Model No.	Serial No. Characteristics		Calibration Date	Remark
Amplifier	EM	EM18G40G	060604	18GHz ~ 40GHz	Oct. 17.2013	Radiation
Loop Antenna	Rohde & Schwarz	HFH2-Z2	100315	9kHz ~ 30MHz	Jul. 28, 2014	Radiation

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

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