FCC Co-location Test Report

Equipment	:	**GPON ONT**
Brand Name	:	ADTRAN
Model No.	:	**424RG**
Part No.	:	**1287781Fxy (x=0~9, a~z, A~Z, blank, "-" or "+"), (y=0~9, a~z, A~Z, blank, "-" or "+")**
Contained FCC ID	:	**HDC424RG50X** **HDC414RG24X**
Standard	:	**47 CFR FCC Part 15**
Applicant	:	**Adtran** 901 Explorer Blvd., Huntsville, AL 35806, US
Manufacturer	:	**XAVi Technologies Corporation** 22F., No.69, Sec. 2, Guangfu Rd., Sanchong Dist., New Taipei City 241, Taiwan (R.O.C.)

The product sample received on Jun. 05, 2016 and completely tested on Dec. 30, 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:

Phoenix Chen / Assistant Manager

Testing Laboratory
1190

Table of Contents

Revision History

Report No.	Version	Description	Issued Date
FR630720CO	Rev. 01	Initial issue of report	Jan. 10, 2017

1 CO-LOCATION

1.1 Information

Contained ID	1. HDC424RG50X for 5G Module 2. HDC414RG24X for 2.4G Module

1.2 Product Details

The difference between the report no. : N/A	
The Difference	N/A

Evaluated Test Items	N/A

1.3 Transmitter Radiated Unwanted Emissions

1.3.1 The Worst Case Measurement Configuration

The Worst Case Mode for Following Conformance Tests			
Tests Item	Transmitter Radiated Unwanted Emissions		
Test Condition	Radiated measurement		
User Position	☐ EUT will be placed in fixed position.		
	☒ EUT will be placed in mobile position and operating multiple positions.		
	☐ EUT will be a hand-held or body-worn battery-powered devices and operating multiple positions.		
Operating Mode	☒ 1. Adapter Mode		
	☒ 2. UPS Mode		
Orthogonal Planes of EUT	**X Plane**	**Y Plane**	**Z Plane**
			
Worst Planes of EUT		V	

1.3.2 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.

1.3.3 Measuring Instruments

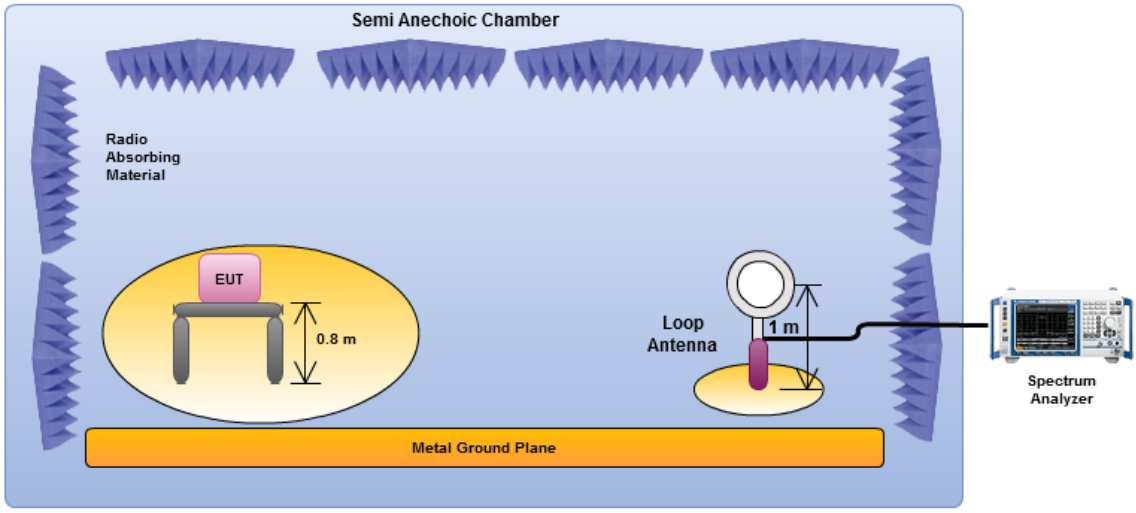
Refer a test equipment and calibration data table in this test report.

1.3.4 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 ≥ 98 or duty factor].		
☒	For the transmitter unwanted emissions shall be measured using following options below:		
	☒	Refer as KDB 558074, clause 11 for unwanted emissions into non-restricted bands.	
	☒	Refer as KDB 558074, clause 12 for unwanted emissions into restricted bands.	
		☐	Refer as KDB 558074, clause 12.2.5.1 and 9.2.1 Option 1 (spectral trace averaging)
		☐	Refer as 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 ≥ 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 KDB 558074, clause 12.2.4 and 9.1.1 measurement procedure peak limit.
		☒	Refer as KDB 558074, clause 12.2.3 measurement procedure Quasi-Peak limit.
☒	For radiated measurement, refer as 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 KDB 558074, clause 12.2.2.		
	☐	For conducted unwanted emissions into non-restricted bands (relative emission limits). Devices with multiple transmit chains: Refer as 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	

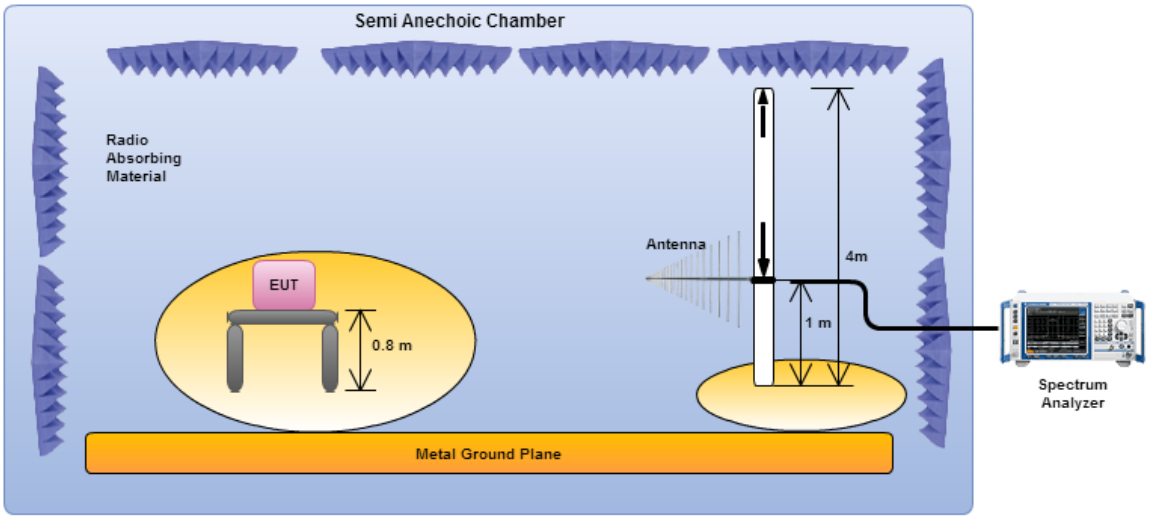
1.3.5 Test Setup

Transmitter Radiated Unwanted Emissions (below 30MHz)



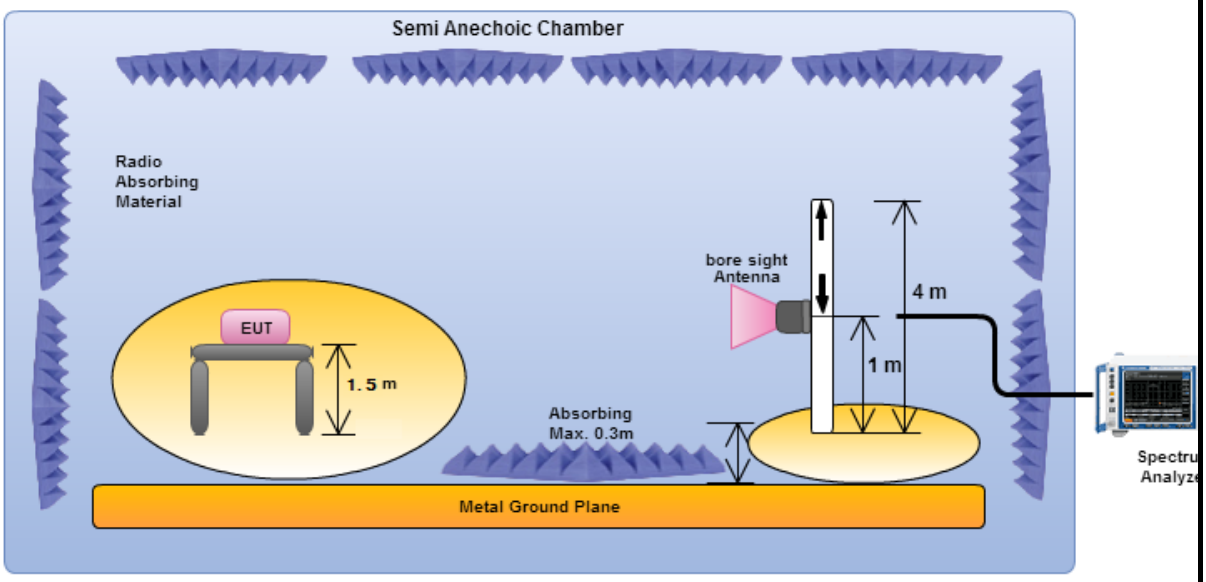
Magnetic field tests shall be performed in the frequency range of 9 kHz to 30 MHz using a calibrated loop antenna. The center of the loop shall be 1 m above the ground.

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.

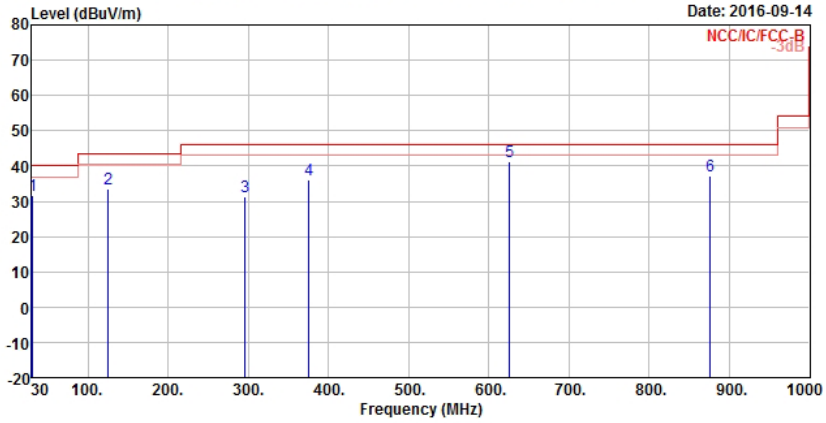
Transmitter Radiated Unwanted Emissions (above 1GHz)



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.

1.3.6 Results of Radiated Emissions (Below 1GHz)

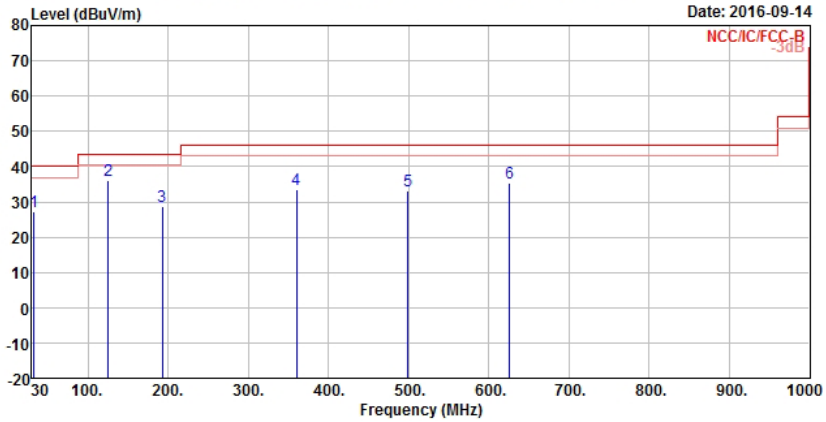
Transmitter Radiated Unwanted Emissions			
Operating Mode	Adapter Mode	**Polarization**	H
Operating Function	2.4G (2452MHz 11n20m) + 5G (5240MHz 11ac20m Band1)		



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1	30.970	31.59	-8.41	40.00	44.28	24.38	0.33	37.40	Peak
2	125.060	33.56	-9.94	43.50	52.63	17.00	0.64	36.71	Peak
3	295.780	31.20	-14.80	46.00	47.92	18.72	0.96	36.40	Peak
4	375.320	36.23	-9.77	46.00	50.84	20.91	1.08	36.60	Peak
5	625.580	41.33	-4.67	46.00	52.21	25.01	1.44	37.33	Peak
6	875.840	37.06	-8.94	46.00	44.65	28.30	1.76	37.65	Peak

Note 1: “>20dB” means spurious emission levels that exceed the level of 6 dB below the applicable limit.
Note 2: “N/F” means Nothing Found spurious emissions (No spurious emissions were detected.)
Note 3: Measurement worst emissions of receive antenna polarization: H (Horizontal).
Note 4: No level of unwanted emissions exceeds the level of the fundamental emission.
Note 5: Except fundamental emission, other emissions from digital circuitry used to control additional panel functions or display capabilities other than the touch panel radio transmission. While disable touch panel radio transmission, other emissions have the same levels. Therefore other emissions level could be exceed the fundamental emission level.
Note 6: Below 30MHz of spurious emissions that are attenuated by more than 20 dB below the permissible value has no need to be reported.

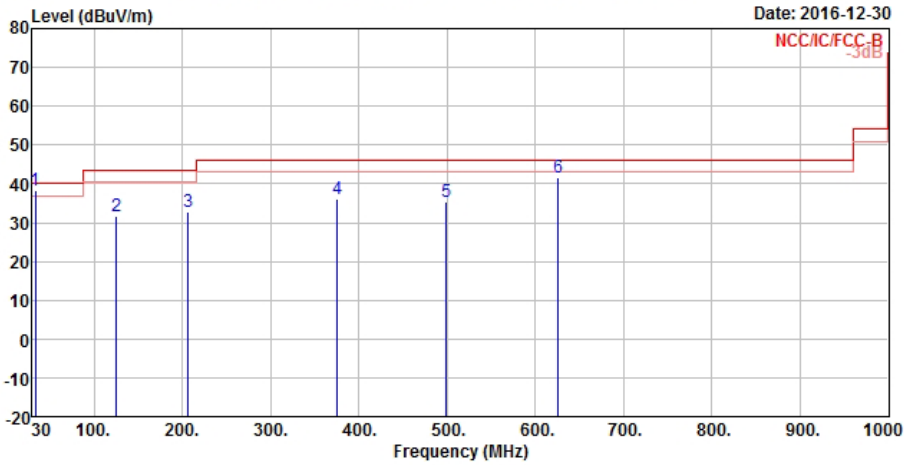
Transmitter Radiated Unwanted Emissions			
Operating Mode	Adapter Mode	**Polarization**	H
Operating Function	2.4G (2452MHz 11n20m) + 5G (5240MHz 11ac20m Band1)		



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1	32.910	27.38	-12.62	40.00	41.09	23.33	0.34	37.38	Peak
2	125.060	35.98	-7.52	43.50	55.05	17.00	0.64	36.71	Peak
3	192.960	28.56	-14.94	43.50	49.45	14.75	0.78	36.42	Peak
4	359.800	33.38	-12.62	46.00	48.34	20.54	1.06	36.56	Peak
5	499.480	33.28	-12.72	46.00	45.68	23.29	1.29	36.98	Peak
6	625.580	35.26	-10.74	46.00	46.14	25.01	1.44	37.33	Peak

Note 1: “>20dB” means spurious emission levels that exceed the level of 6 dB below the applicable limit.
Note 2: “N/F” means Nothing Found spurious emissions (No spurious emissions were detected.)
Note 3: Measurement worst emissions of receive antenna polarization: H (Horizontal).
Note 4: No level of unwanted emissions exceeds the level of the fundamental emission.
Note 5: Except fundamental emission, other emissions from digital circuitry used to control additional panel functions or display capabilities other than the touch panel radio transmission. While disable touch panel radio transmission, other emissions have the same levels. Therefore other emissions level could be exceed the fundamental emission level.
Note 6: Below 30MHz of spurious emissions that are attenuated by more than 20 dB below the permissible value has no need to be reported.

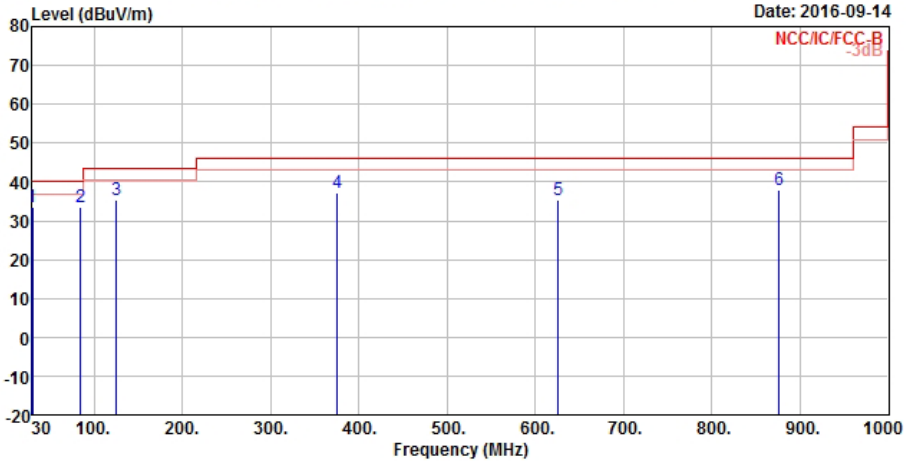
Transmitter Radiated Unwanted Emissions			
Operating Mode	UPS Mode	**Polarization**	V
Operating Function	2.4G (2452MHz 11n20m) + 5G (5240MHz 11ac20m Band1)		



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1	33.880	38.15	-1.85	40.00	52.38	22.80	0.34	37.37	QP
2	125.060	31.66	-11.84	43.50	50.73	17.00	0.64	36.71	Peak
3	206.540	32.65	-10.85	43.50	52.94	15.30	0.80	36.39	Peak
4	375.320	36.04	-9.96	46.00	50.65	20.91	1.08	36.60	Peak
5	499.480	35.52	-10.48	46.00	47.92	23.29	1.29	36.98	Peak
6	625.580	41.80	-4.20	46.00	52.68	25.01	1.44	37.33	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)

Transmitter Radiated Unwanted Emissions			
Operating Mode	UPS Mode	**Polarization**	H
Operating Function	2.4G (2452MHz 11n20m) + 5G (5240MHz 11ac20m Band1)		

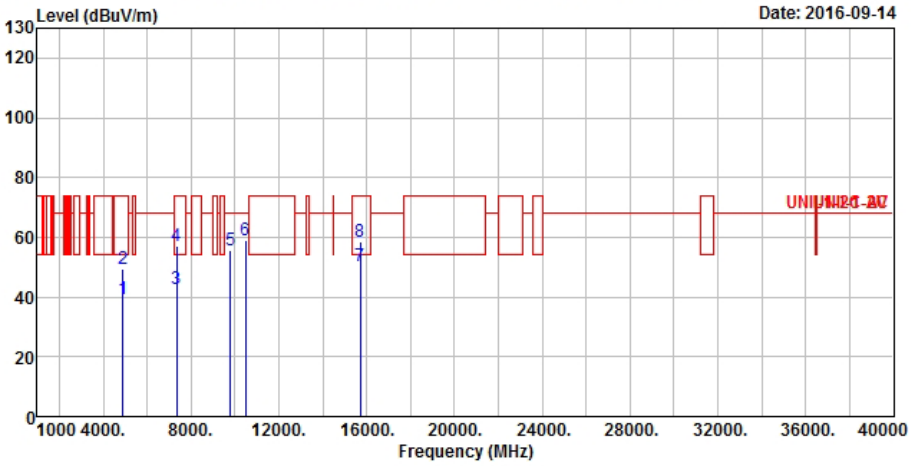


	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1	30.000	33.47	-6.53	40.00	45.67	24.90	0.32	37.42	Peak
2	84.320	33.61	-6.39	40.00	56.60	13.42	0.53	36.94	Peak
3	125.060	35.47	-8.03	43.50	54.54	17.00	0.64	36.71	Peak
4	375.320	37.27	-8.73	46.00	51.88	20.91	1.08	36.60	Peak
5	625.580	35.30	-10.70	46.00	46.18	25.01	1.44	37.33	Peak
6	875.840	37.90	-8.10	46.00	45.49	28.30	1.76	37.65	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)

1.3.7 Results for Radiated Emissions (Above 1GHz)

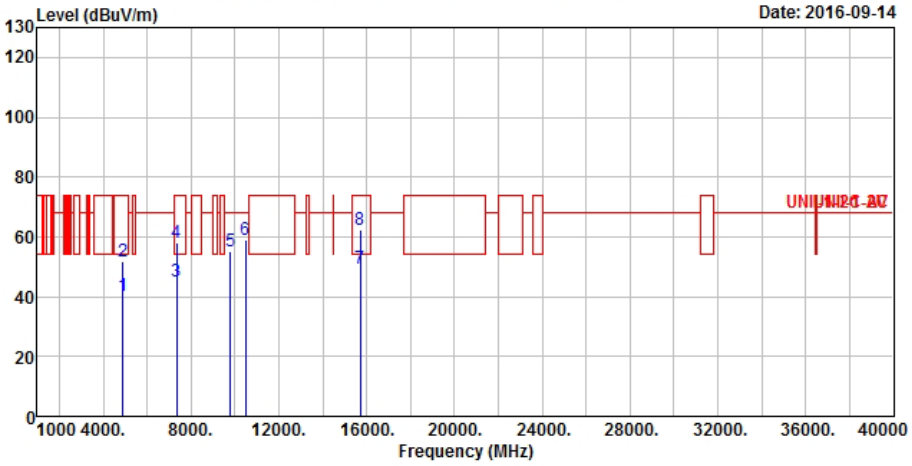
Transmitter Radiated Unwanted Emissions	
Operating Function	2.4G (2452MHz 11n20m) + 5G (5240MHz 11ac20m Band1)
Polarization	V



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1	4904.000	39.56	-14.44	54.00	37.29	31.27	6.15	35.15	Average
2	4904.000	49.56	-24.44	74.00	47.29	31.27	6.15	35.15	Peak
3	7356.000	42.81	-11.19	54.00	34.40	36.23	7.61	35.43	Average
4	7356.000	56.91	-17.09	74.00	48.50	36.23	7.61	35.43	Peak
5	9808.000	55.71	-12.59	68.30	43.90	38.78	8.99	35.96	Peak
6	10480.000	58.99	-9.31	68.30	45.34	39.67	9.48	35.50	Peak
7	15720.000	50.49	-3.51	54.00	36.80	38.02	11.40	35.73	Average
8	15720.000	58.58	-15.42	74.00	44.89	38.02	11.40	35.73	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	2.4G (2452MHz 11n20m) + 5G (5240MHz 11ac20m Band1)
Polarization	H



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1	4904.000	40.36	-13.64	54.00	38.09	31.27	6.15	35.15	Average
2	4904.000	51.85	-22.15	74.00	49.58	31.27	6.15	35.15	Peak
3	7356.000	45.01	-8.99	54.00	36.60	36.23	7.61	35.43	Average
4	7356.000	58.11	-15.89	74.00	49.70	36.23	7.61	35.43	Peak
5	9808.000	55.40	-12.90	68.30	43.59	38.78	8.99	35.96	Peak
6	10480.000	58.88	-9.42	68.30	45.23	39.67	9.48	35.50	Peak
7	15720.000	49.38	-4.62	54.00	35.69	38.02	11.40	35.73	Average
8	15720.000	62.28	-11.72	74.00	48.59	38.02	11.40	35.73	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	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Calibration Due Date
3m Semi Anechoic Chamber	TDK	SAC-3M	03CH09-HY	30 MHz ~ 1 GHz 3m	25/04/2016	24/04/2017
3m Semi Anechoic Chamber	TDK	SAC-3M	03CH09-HY	1 GHz ~ 18 GHz 3m	30/06/2016	29/06/2017
Amplifier	EMC	EMC9135	980232	9 kHz ~ 1 GHz	29/01/2016	28/01/2017
Amplifier	Agilent	8449B	3008A02096	1 GHz ~ 26.5 GHz	11/04/2016	10/04/2017
Spectrum	KEYSIGHT	N9010A	MY54200885	10 Hz ~ 44 GHz	04/07/2016	03/07/2017
Bilog Antenna & 5dB Attenuator	TESEQ & MTJ	CBL 6111D & MTJ6102	35418	30 MHz ~ 1 GHz	31/03/2016	30/03/2017
Horn Antenna	SCHWARZBECK	BBHA 9120D	BBHA 9120D 1534	1 GHz ~ 18 GHz	22/04/2016	21/04/2017
Horn Antenna	SCHWARZBECK	BBHA9170	BBHA9170614	18 GHz ~ 40 GHz	04/01/2016	03/01/2017
RF Cable-R03m	Jye Bao	RG142	CB021	9 kHz ~ 1 GHz	23/07/2016	22/07/2017
RF Cable-high	Jye Bao	RG142	03CH09-HY	1 GHz ~ 40 GHz	23/07/2016	22/07/2017
Amplifier	MITEQ	JS44-18004000-33-8P	1840917	18 GHz ~ 40 GHz	02/06/2016	01/06/2017
Loop Antenna	ROHDE&SCHWARZ	HFH2-Z2	100330	9 kHz ~ 30 MHz	10/11/2016	09/11/2017