



FCC RADIO TEST REPORT

Applicant : Allied Telesis K.K.

Address : 2nd. TOC Bldg. 721-11 Nishi-Gotanda, Shinagawa-ku,
Tokyo Japan, 141-0031

Equipment : 802.11ac wave2 2x2 tri-radio 2.4G/5G/5G wireless AP

Model No. : AT-TQ5403

Trade Name : Allied Telesis

FCC ID : RSL-TQ5403

I HEREBY CERTIFY THAT :

The sample was received on Feb. 09, 2018 and the testing was carried out on Feb. 11, 2018 at CerpPASS Technology Corp. The test result refers exclusively to the test presented test model / sample. Without written approval of CerpPASS Technology Corp., the test report shall not be reproduced except in full.

Approved by:

Mark Liao / Assistant Manager

Tested by:

Spree Yei / Engineer

Laboratory Accreditation:

CerpPASS Technology Corporation Test Laboratory





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History of this test report

Report No.	Issue Date	Description
TEFU1801057	Feb. 13, 2018	Original



1. Summary of Test Procedure and Test Results

1.1 Applicable Standards

ANSI C63.4:2014

ANSI C63.10:2013

FCC Rule	Description of Test	Result
15.203	CO-LOCATION	Pass

This EUT has been also tested and compiled with the requirement of FCC Part 15, Subpart B, recorded in a separate test report.



2. Test Configuration of Equipment under Test

2.1 Feature of Equipment under Test

Equipment	802.11ac wave2 2x2 tri-radio 2.4G/5G/5G wireless AP
Model No.	AT-TQ5403
Brand Name	Allied Telesis
Product Description	Please refer to User's Manual.
Connecting I/O Port(s)	Please refer to User's Manual.
AC ADAPTER	Adapter Brand: APD Model No.: WA-24Q12R I/P: AC 100-240V~, 50-60Hz, 0.7A MAX. ; O/P: DC 12V, 2.0A
PoE	48Vdc/0.67A
Memo	A1
Frequency Range	802.11b/g/n: 2400~2483.5 MHz 802.11a/n/ac: 5150MHz-5250MHz, 5725MHz-5850MHz
Modulation Type	OFDM, DSSS
Data Rate	2.4GHz: 802.11b: 1, 2, 5.5, 11Mbps 802.11g: 6, 9, 12, 18, 24, 36, 48, 54Mbps 802.11n: MCS0 – MCS15, HT20/40, VHT20/40 5GHz: 802.11a: 6, 9, 12, 18, 24, 36, 48, 54Mbps 802.11n: MCS0 – MCS15, HT20/40 802.11ac: MCS0 – MCS9, VHT20/40/80
Antenna Type	PCB Antenna
Antenna Gain	2.4GHz: ANT A: 4.85 dBi ; ANT B: 4.4 dBi 5150MHz-5250MHz: ANT A: 4.18 dBi ; ANT B: 4.81 dBi 5725MHz-5850MHz: ANT A: 4.9 dBi ; ANT B: 4.18 dBi

Note:

1. For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.



2.2 Test Mode and Test Software

- During testing, the interface cables and equipment positions were varied according to ANSI C63.4.
- The complete test system included remote workstation and EUT for RF test. The remote workstation included Notebook.
- An executive program, "QDART_CONN.WIN.1.0 Installer-00039.1" under WIN 7 was executed to transmit and receive data via WLAN.
- The following test mode was performed for the test:

Conducted Emissions from the AC mains power ports	
Test Mode	Operating Description
1	802.11b CH06 + 802.11a CH40 + 802.11a CH149
Radiation Emissions (30MHz ~ 1GHz)	
Test Mode	Operating Description
1	802.11b CH06 + 802.11a CH40 + 802.11a CH149, Power from Adapter
2	802.11b CH06 + 802.11a CH40 + 802.11a CH149, Power from PoE
Radiation Emissions (1GHz ~ 40GHz)	
Test Mode	Operating Description
1	802.11b CH06 + 802.11a CH40 + 802.11a CH149, Power from Adapter

2.3 Description of Test System

Device	Manufacturer	Model No.	Description
Remote workstation			
Notebook	DELL	LatitudeE5450/5450	Power Cable, Unshielding, 1.8m



2.4 General Information of Test

Test Site	Cerpass Technology Corporation Test Laboratory Address: No.10, Ln. 2, Lianfu St., Luzhu Dist., Taoyuan City 33848, Taiwan (R.O.C.) Tel:+886-3-3226-888 Fax:+886-3-3226-881 Address: No.68-1, Shihbachongsi, Shihding Township, New Taipei City 223, Taiwan, R.O.C. Tel: +886-2-2663-8582	
	FCC	TW1079, TW1061, TW1439
	IC	4934E-1, 4934E-2
	VCCI	T-2205 for Telecommunication Test C-4663 for Conducted emission test R-3428, R-4218 for Radiated emission test G-10812, G-10813 for radiated disturbance above 1GHz
Frequency Range Investigated:	Conducted: from 150kHz to 30 MHz Radiation: from 30 MHz to 40,000MHz	
Test Distance:	The test distance of radiated emission from antenna to EUT is 3 M.	

2.5 Measurement Uncertainty

Measurement Item	Measurement Frequency	Polarization	Uncertainty
Conducted Emission	9 kHz ~ 30 MHz	Line / Neutral	±2.9076 dB
Radiated Emission	9 kHz ~ 25,000 MHz	Vertical / Horizontal	±0.948 dB
Spurious Emission (Conducted)	-	-	±4.011 dB
Maximum Peak and Average Output Power	-	-	±0.322 dB
Power Spectral Density	-	-	±0.322 dB
Bandwidth	-	-	74.224Hz



3. Test Equipment and Ancillaries Used for Tests

Instrument	Manufacturer	Model No.	Serial No.	Calibration Date	Valid Date
EMI Receiver	R&S	ESC13	100443	2017/03/07	2018/03/06
LISN	Schwarzbeck	NSLK 8127	8127-568	2017/02/15	2018/02/14
Pulse Limiter	R&S	ESH3-Z2	101934	2017/02/14	2018/02/13
Bilog Antenna	Schwarzbeck	VULB9168	369	2017/03/15	2018/03/14
Active Loop Antenna	EMCO	6507	40855	2017/05/15	2018/05/14
Horn Antenna	EMCO	3115	31589	2017/02/18	2018/02/17
Horn Antenna	EMCO	3116	31970	2017/03/29	2018/03/28
EXA Signal Analyzer	KEYSIGHT	N9010A	MY54200207	2017/03/17	2018/03/16
Preamplifier	EM	EM330	60660	2017/02/25	2018/02/24
Preamplifier	EMC INSTRUMENTS	EMC051845SE	980333	2017/09/20	2018/09/19
Preamplifier	Agilent	8449B	3008A01954	2017/02/09	2018/02/08
Preamplifier	EMC INSTRUMENTS	EMC184045	980065	2017/11/10	2018/11/09
MXG MW Analog Signal Generator	KEYSIGHT	N5183A	MY50142931	2017/03/17	2018/03/16
Spectrum Analyzer	R&S	FSP40	100219	2017/07/01	2018/06/30
BLUETOOTH TESTER	R&S	CBT	101133	2017/03/10	2018/03/09
Attenuator	KEYSIGHT	8491B	MY39250703	2017/03/07	2018/03/06
Rotary Attenuator	Agilent	8495B	MY42146680	2017/03/13	2018/03/12
Temp & Humi chamber	T-MACHINE	TMJ-9712	T-12-040111	2017/09/04	2018/09/03
Series Power Meter	Anritsu	ML2495A	1224005	2017/03/01	2018/02/28
Power Sensor	Anritsu	MA2411B	1207295	2017/03/01	2018/02/28
Cable	HUBER SUHNER	SUCOFLEX 102	28422/2	2017/02/25	2018/02/24
Cable	HUBER SUHNER	SUCOFLEX 102	28418/2	2017/02/25	2018/02/24
Software	Farad	Ez-EMC	ver.ct3a1	N/A	N/A
Software	AUDIX	E3	V8.2014-8-6	N/A	N/A
Software	Keysight	N7607B Signal Studio	v2.0.0.1	N/A	N/A
Software	Keysight	Inservice MonitorUtility	N/A	N/A	N/A



4. Test of AC Power Line Conducted Emission

4.1 Test Limit

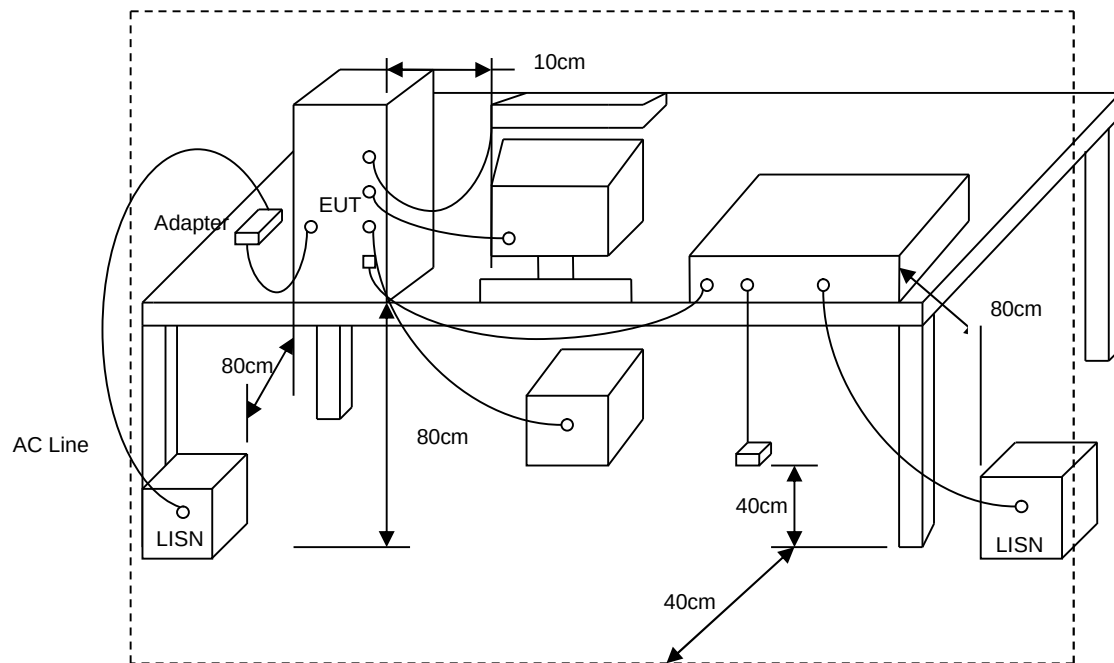
Conducted Emissions were measured from 150 kHz to 30 MHz with a bandwidth of 9 KHz, according to the methods defined in ANSI C63.4-2014. The EUT was placed on a nonmetallic stand in a shielded room 0.8 meters above the ground plane. The interface cables and equipment positioning were varied within limits of reasonable applications to determine the position produced maximum conducted emissions.

Frequency (MHz)	Quasi Peak (dB μ V)	Average (dB μ V)
0.15 – 0.5	66-56*	56-46*
0.5 – 5.0	56	46
5.0 – 30.0	60	50

*Decreases with the logarithm of the frequency.

4.2 Test Procedures

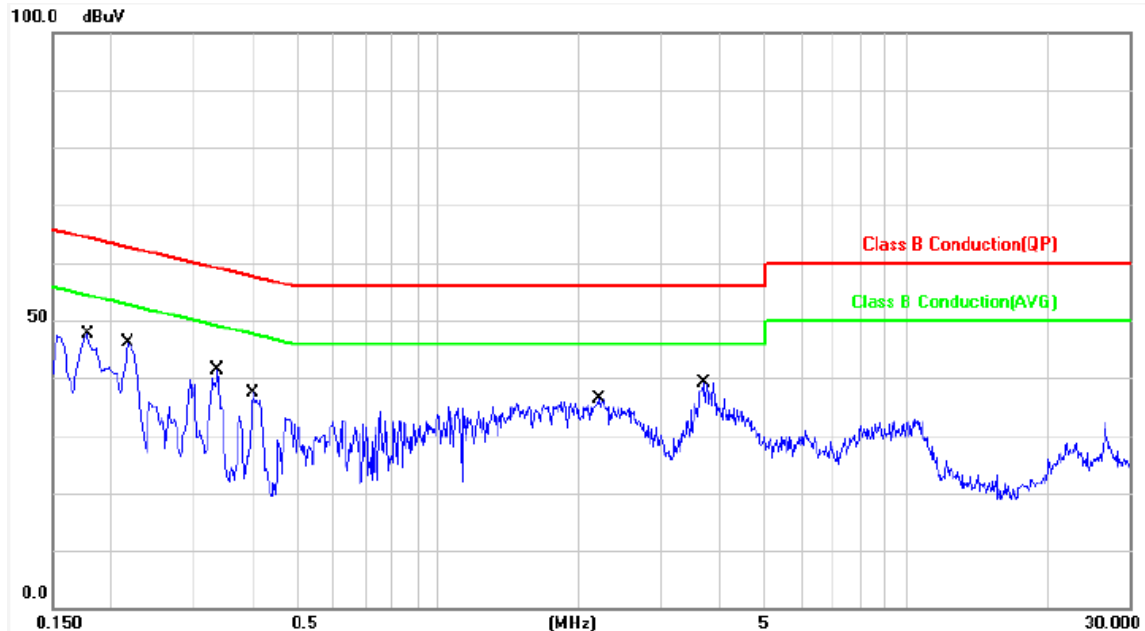
- The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
- Connect EUT to the power mains through a line impedance stabilization network (LISN).
- All the support units are connecting to the other LISN.
- The LISN provides 50 ohm coupling impedance for the measuring instrument.
- The FCC states that a 50 ohm, 50 micro-Henry LISN should be used.
- Both sides of AC line were checked for maximum conducted interference.
- The frequency range from 150 kHz to 30 MHz was searched.
- Set the test-receiver system to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.





4.4 Test Result and Data

Power	: AC 120V	Pol/Phase	: LINE
Test Mode	: Mode 1	Temperature	: 20 °C
Test Date	: Feb. 09, 2018	Humidity	: 40 %



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F
1	0.1780	9.91	33.80	43.71	64.57	-20.86	QP	P
2	0.1780	9.91	26.10	36.01	54.57	-18.56	AVG	P
3	0.2180	9.91	31.28	41.19	62.89	-21.70	QP	P
4	0.2180	9.91	24.97	34.88	52.89	-18.01	AVG	P
5	0.3379	9.92	29.12	39.04	59.25	-20.21	QP	P
6	0.3379	9.92	24.14	34.06	49.25	-15.19	AVG	P
7	0.4020	9.93	25.96	35.89	57.81	-21.92	QP	P
8	0.4020	9.93	18.15	28.08	47.81	-19.73	AVG	P
9	2.2020	10.02	22.72	32.74	56.00	-23.26	QP	P
10	2.2020	10.02	14.94	24.96	46.00	-21.04	AVG	P
11	3.6940	10.07	25.88	35.95	56.00	-20.05	QP	P
12	3.6940	10.07	15.89	25.96	46.00	-20.04	AVG	P

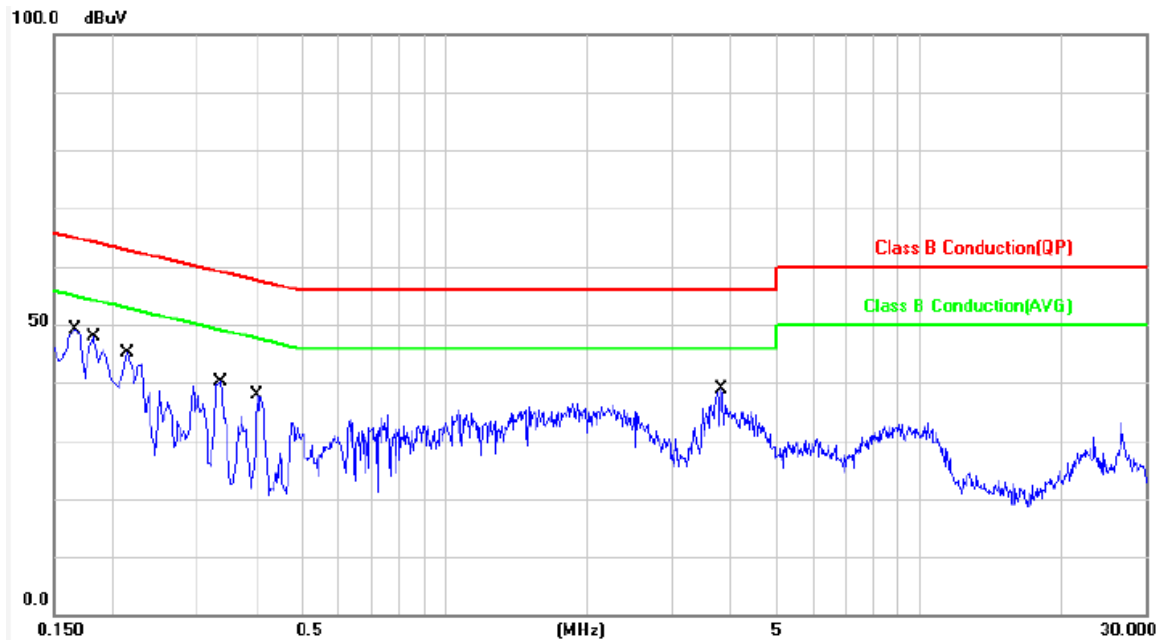
Note: Level = Reading + Factor

Margin = Level – Limit

Factor = (LISN, ISN, PLC or current probe) Factor + Cable Loss+ Attenuator



Power	: AC 120V	Pol/Phase	: NEUTRAL
Test Mode	: Mode 1	Temperature	: 20 °C
Test Date	: Feb. 09, 2018	Humidity	: 40 %



No.	Frequency (MHz)	Factor (dB)	Reading (dBUV)	Level (dBUV)	Limit (dBUV)	Margin (dB)	Detector	P/F
1	0.1660	9.91	32.67	42.58	65.15	-22.57	QP	P
2	0.1660	9.91	23.72	33.63	55.15	-21.52	AVG	P
3	0.1819	9.91	33.90	43.81	64.39	-20.58	QP	P
4	0.1819	9.91	26.88	36.79	54.39	-17.60	AVG	P
5	0.2140	9.91	31.83	41.74	63.04	-21.30	QP	P
6	0.2140	9.91	24.46	34.37	53.04	-18.67	AVG	P
7	0.3379	9.92	29.18	39.10	59.25	-20.15	QP	P
8	0.3379	9.92	24.16	34.08	49.25	-15.17	AVG	P
9	0.4020	9.93	26.06	35.99	57.81	-21.82	QP	P
10	0.4020	9.93	18.23	28.16	47.81	-19.65	AVG	P
11	3.8260	10.09	21.79	31.88	56.00	-24.12	QP	P
12	3.8260	10.09	15.15	25.24	46.00	-20.76	AVG	P

Note: Level = Reading + Factor

Margin = Level – Limit

Factor = (LISN, ISN, PLC or current probe) Factor + Cable Loss+ Attenuator



5. Test of Spurious Emission (Radiated)

5.1 Test Limit

In any 100kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. If the transmitter measurement is based on the maximum conducted output power, the attenuation required under this paragraph shall be 30dB instead of 20dB. In addition, radiated emissions which fall in section 15.205(a) the restricted bands must also comply with the radiated emission limit specified in section 15.209(a).

Frequency (MHz)	Field Strength (microvolt/meter)	Measurement Distance (meters)
0.009 ~ 0.490	2400/F(kHz)	300
0.490 ~ 1.705	24000/F(kHz)	30
1.705 ~ 30.0	30	30
30 ~ 88	100	3
88 ~ 216	150	3
216 ~ 960	200	3
Above 960	500	3

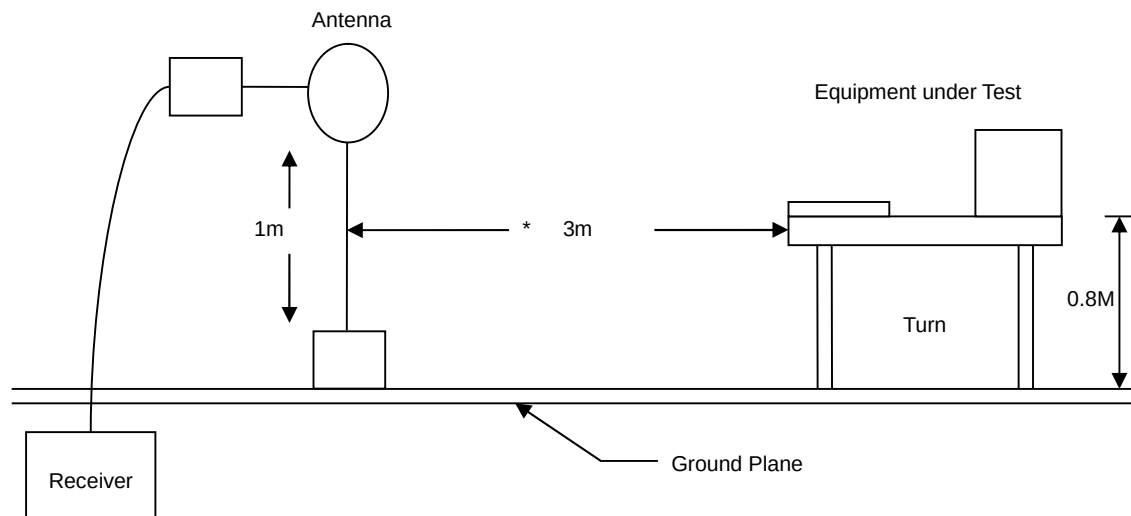
5.2 Test Procedures

- The EUT was placed on a rotatable table top 0.8 meter above ground.
- The EUT was set 3 meters from the interference receiving antenna which was mounted on the top of a variable height antenna tower.
- The table was rotated 360 degrees to determine the position of the highest radiation.
- The antenna is a broadband antenna and its height is varied between one meter and four meters above ground to find the maximum value of the field strength both horizontal polarization and vertical polarization of the antenna are set to make the measurement.
- For each suspected emission the EUT was arranged to its worst case and then tune the antenna tower (from 1 M to 4 M) and turn table (from 0 degree to 360 degrees) to find the maximum reading.
- Set the test-receiver system to Peak or CISPR quasi-peak Detect Function and specified bandwidth with Maximum Hold Mode.
- If the emission level of the EUT in peak mode was 3 dB lower than the limit specified, then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions which do not have 3 dB margin will be repeated one by one using the quasi-peak method and reported.
- For testing above 1GHz, the emission level of the EUT in peak mode was 20dB lower than average limit (that means the emission level in peak mode also complies with the limit in average mode), then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.
- "Cone of radiation" has been considered to be 3dB bandwidth of the measurement antenna.

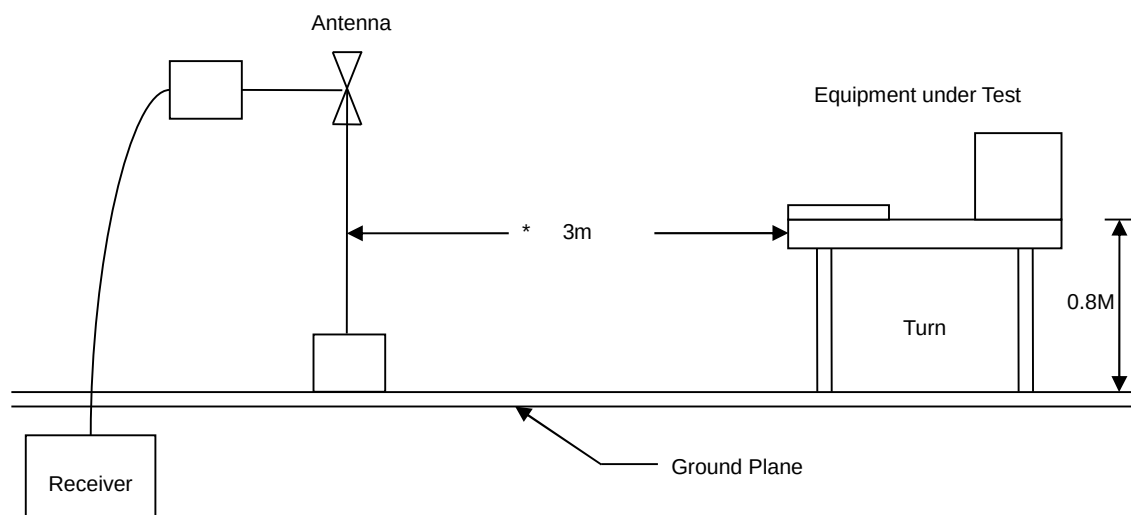


5.3 Typical Test Setup

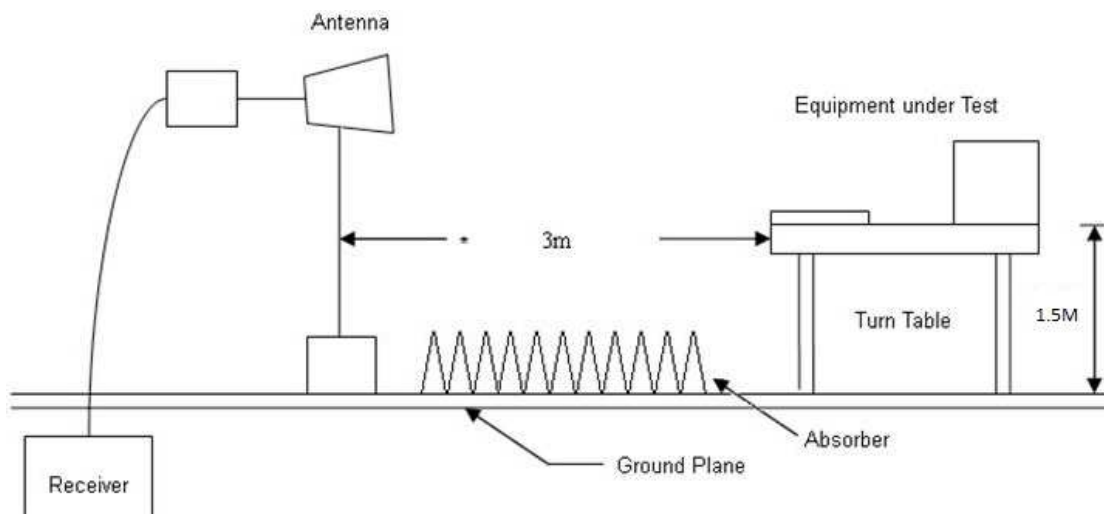
Below 30MHz test setup



30MHz- 1GHz Test Setup



Above 1GHz Test Setup



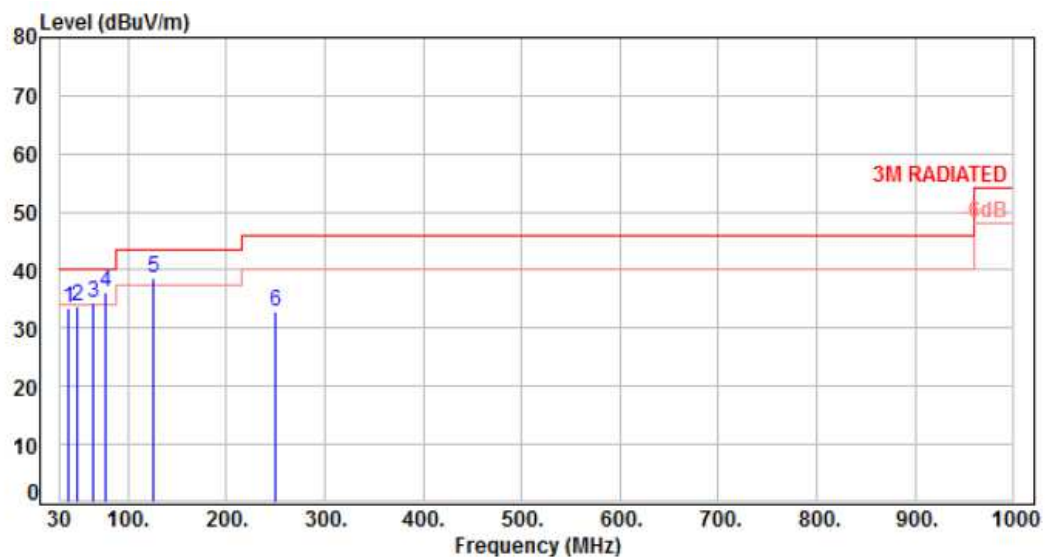


5.4 Test Result and Data (9kHz ~ 30MHz)

The 9kHz - 30MHz spurious emission is under limit 20dB more.

5.5 Test Result and Data (30MHz ~ 1GHz)

Power	: AC 120V	Pol/Phase	: VERTICAL
Test Mode	: Mode 1	Temperature	: 24 °C
Test Date	: Feb. 11, 2018	Humidity	: 59 %



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	39.70	-10.38	43.89	33.51	40.00	-6.49	QP	105	147	P
2	48.43	-9.76	43.63	33.87	40.00	-6.13	QP	107	200	P
3	63.95	-10.93	45.29	34.36	40.00	-5.64	QP	100	118	P
4	77.53	-13.68	49.90	36.22	40.00	-3.78	Peak	400	0	P
5	125.06	-11.93	50.59	38.66	43.50	-4.84	QP	107	85	P
6	250.19	-10.63	43.63	33.00	46.00	-13.00	Peak	400	0	P

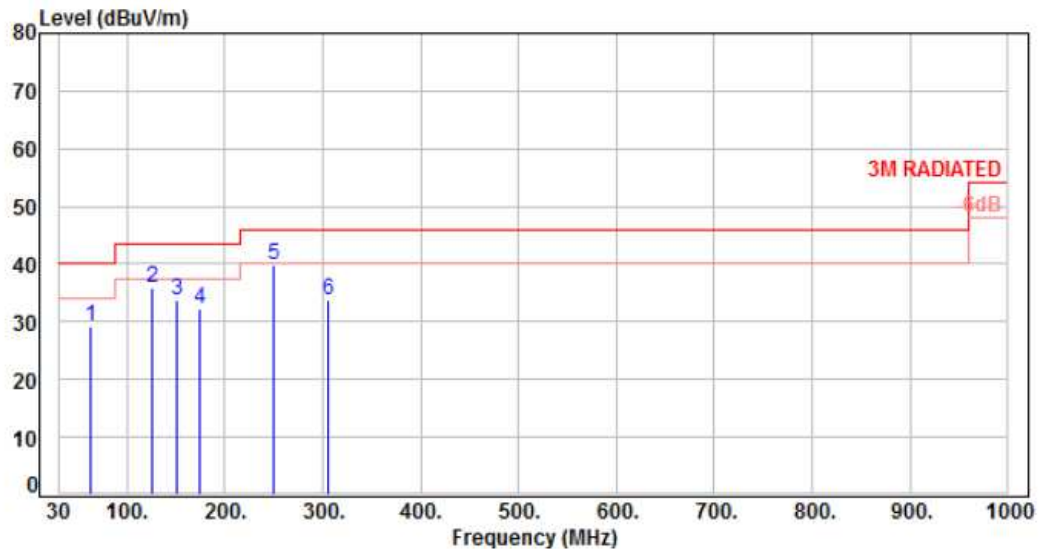
Note: Level=Reading+Factor

Margin=Level-Limit

Factor=Antenna Factor + cable loss - Amplifier Factor



Power	: AC 120V	Pol/Phase	: HORIZONTAL
Test Mode	: Mode 1	Temperature	: 24 °C
Test Date	: Feb. 11, 2018	Humidity	: 59 %



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	62.98	-10.77	40.06	29.29	40.00	-10.71	Peak	100	0	P
2	125.06	-11.93	47.95	36.02	43.50	-7.48	Peak	100	0	P
3	150.28	-10.07	43.73	33.66	43.50	-9.84	Peak	100	0	P
4	173.56	-10.46	42.72	32.26	43.50	-11.24	Peak	100	0	P
5	250.19	-10.63	50.34	39.71	46.00	-6.29	Peak	100	0	P
6	305.48	-8.65	42.49	33.84	46.00	-12.16	Peak	100	0	P

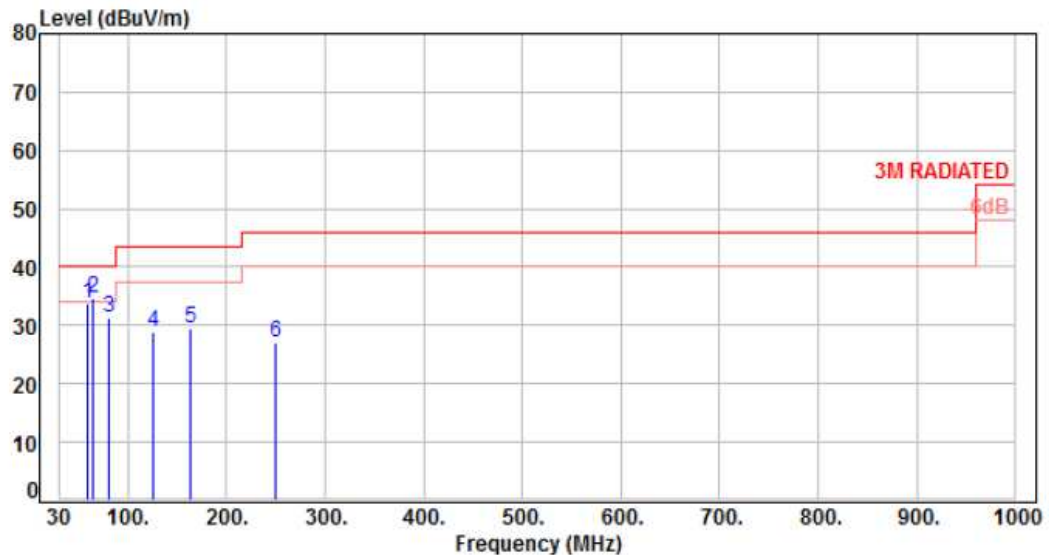
Note: Level=Reading+Factor

Margin=Level-Limit

Factor=Antenna Factor + cable loss - Amplifier Factor



Power	:	PoE	Pol/Phase	:	VERTICAL
Test Mode	:	Mode 2	Temperature	:	24 °C
Test Date	:	Feb. 11, 2018	Humidity	:	59 %



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	59.10	-10.21	44.02	33.81	40.00	-6.19	Peak	400	0	P
2	64.92	-11.11	45.87	34.76	40.00	-5.24	Peak	400	0	P
3	80.44	-14.31	45.54	31.23	40.00	-8.77	Peak	400	0	P
4	125.06	-11.93	40.78	28.85	43.50	-14.65	Peak	400	0	P
5	163.86	-9.93	39.40	29.47	43.50	-14.03	Peak	400	0	P
6	250.19	-10.63	37.64	27.01	46.00	-18.99	Peak	400	0	P

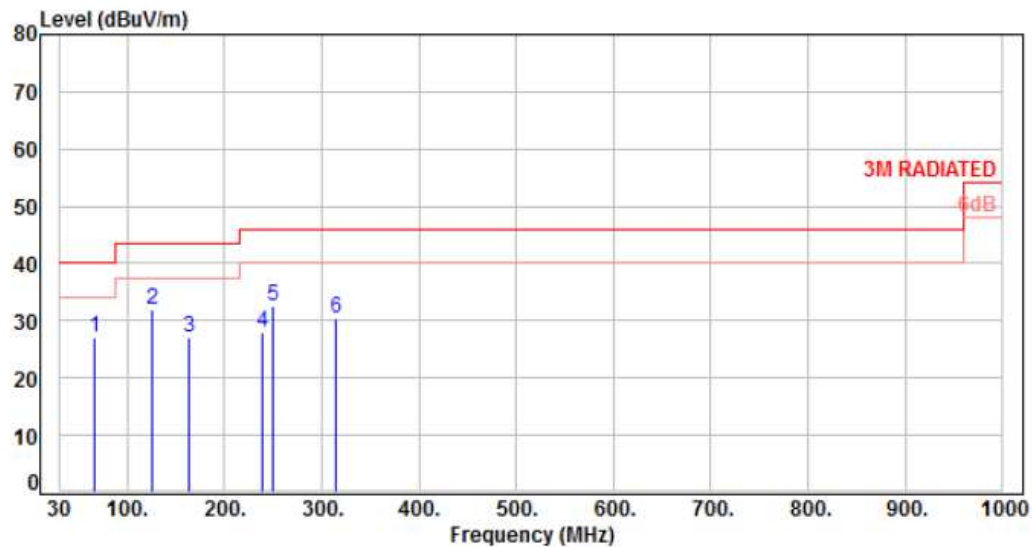
Note: Level=Reading+Factor

Margin=Level-Limit

Factor=Antenna Factor + cable loss - Amplifier Factor



Power	: PoE	Pol/Phase	: HORIZONTAL
Test Mode	: Mode 2	Temperature	: 24 °C
Test Date	: Feb. 11, 2018	Humidity	: 59 %



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	65.89	-11.28	38.23	26.95	40.00	-13.05	Peak	100	0	P
2	125.06	-11.93	43.84	31.91	43.50	-11.59	Peak	100	0	P
3	162.89	-9.91	36.84	26.93	43.50	-16.57	Peak	100	0	P
4	238.55	-10.92	38.76	27.84	46.00	-18.16	Peak	100	0	P
5	250.19	-10.63	43.06	32.43	46.00	-13.57	Peak	100	0	P
6	314.21	-8.43	38.72	30.29	46.00	-15.71	Peak	100	0	P

Note: Level=Reading+Factor

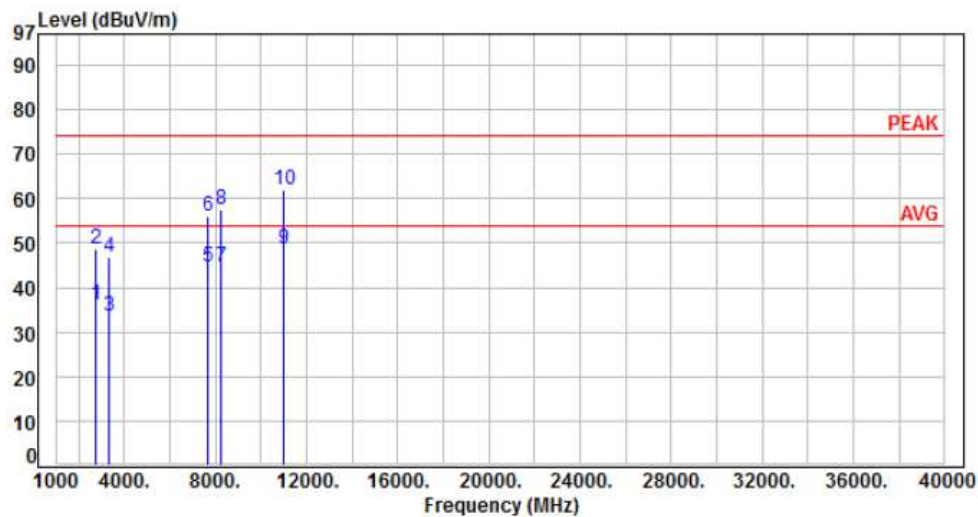
Margin=Level-Limit

Factor=Antenna Factor + cable loss - Amplifier Factor



5.6 Test Result and Data (1GHz ~ 40GHz)

Power	: AC 120V	Pol/Phase	: VERTICAL
Test Mode	: Mode 1	Temperature	: 24 °C
Test Date	: Feb. 09, 2018	Humidity	: 59 %



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	2763.00	-12.78	48.90	36.12	54.00	-17.88	Average	100	75	P
2	2763.00	-12.78	61.54	48.76	74.00	-25.24	Peak	100	75	P
3	3348.00	-10.54	44.27	33.73	54.00	-20.27	Average	147	254	P
4	3348.00	-10.54	57.35	46.81	74.00	-27.19	Peak	147	254	P
5	7637.00	-1.26	45.91	44.65	54.00	-9.35	Average	201	132	P
6	7637.00	-1.26	57.44	56.18	74.00	-17.82	Peak	201	132	P
7	8222.00	-0.47	45.26	44.79	54.00	-9.21	Average	133	158	P
8	8222.00	-0.47	58.13	57.66	74.00	-16.34	Peak	133	158	P
9	10985.00	3.41	45.33	48.74	54.00	-5.26	Average	111	47	P
10	10985.00	3.41	58.70	62.11	74.00	-11.89	Peak	111	47	P

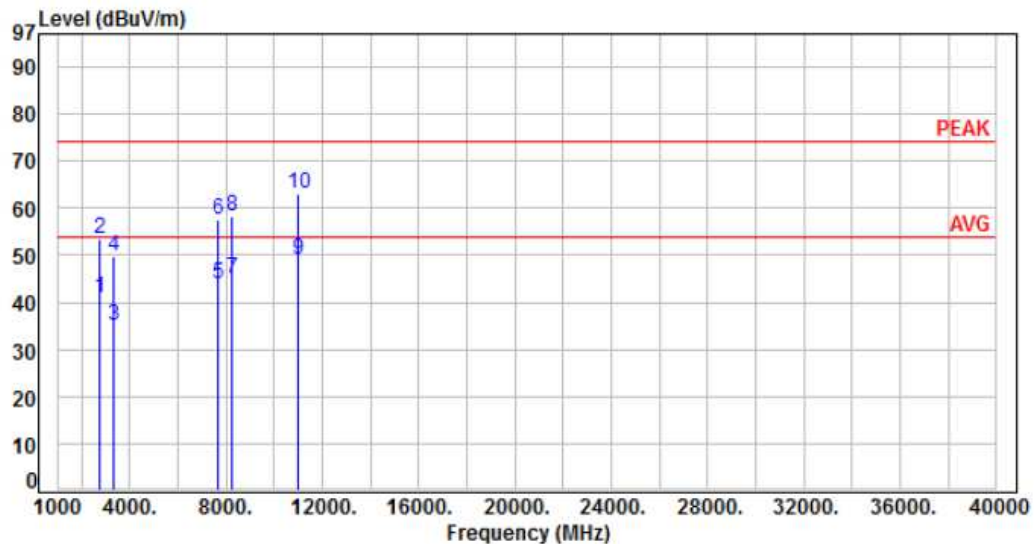
Note: Level=Reading+Factor

Margin=Level-Limit

Factor=Antenna Factor + cable loss - Amplifier Factor



Power	: AC 120V	Pol/Phase	: HORIZONTAL
Test Mode	: Mode 1	Temperature	: 24 °C
Test Date	: Feb. 09, 2018	Humidity	: 59 %



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	2763.00	-12.78	53.60	40.82	54.00	-13.18	Average	326	339	P
2	2763.00	-12.78	66.20	53.42	74.00	-20.58	Peak	326	339	P
3	3348.00	-10.54	45.49	34.95	54.00	-19.05	Average	224	0	P
4	3348.00	-10.54	60.19	49.65	74.00	-24.35	Peak	224	0	P
5	7637.00	-1.26	45.21	43.95	54.00	-10.05	Average	203	142	P
6	7637.00	-1.26	58.79	57.53	74.00	-16.47	Peak	203	142	P
7	8222.00	-0.47	45.36	44.89	54.00	-9.11	Average	185	223	P
8	8222.00	-0.47	58.66	58.19	74.00	-15.81	Peak	185	223	P
9	10985.00	3.41	45.80	49.21	54.00	-4.79	Average	133	287	P
10	10985.00	3.41	59.60	63.01	74.00	-10.99	Peak	133	287	P

Note: Level=Reading+Factor

Margin=Level-Limit

Factor=Antenna Factor + cable loss - Amplifier Factor



5.7 Restricted Bands of Operation

Only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.09000 – 0.11000	16.42000 – 16.42300	399.9 – 410.0	4.500 – 5.250
0.49500 – 0.505**	16.69475 – 16.69525	608.0 – 614.0	5.350 – 5.460
2.17350 – 2.19050	16.80425 – 16.80475	960.0 – 1240.0	7.250 – 7.750
4.12500 – 4.12800	25.50000 – 25.67000	1300.0 – 1427.0	8.025 – 8.500
4.17725 – 4.17775	37.50000 – 38.25000	1435.0 – 1626.5	9.000 – 9.200
4.20725 – 4.20775	73.00000 – 74.60000	1645.5 – 1646.5	9.300 – 9.500
6.21500 – 6.21800	74.80000 – 75.20000	1660.0 – 1710.0	10.600 – 12.700
6.26775 – 6.26825	108.00000 – 121.94000	1718.8 – 1722.2	13.250 – 13.400
6.31175 – 6.31225	123.00000 – 138.00000	2200.0 – 2300.0	14.470 – 14.500
8.29100 – 8.29400	149.90000 – 150.05000	2310.0 – 2390.0	15.350 – 16.200
8.36200 – 8.36600	156.52475 – 156.52525	2483.5 – 2500.0	17.700 – 21.400
8.37625 – 8.38675	156.70000 – 156.90000	2655.0 – 2900.0	22.010 – 23.120
8.41425 – 8.41475	162.01250 – 167.17000	3260.0 – 3267.0	23.600 – 24.000
12.29000 – 12.29300	167.72000 – 173.20000	3332.0 – 3339.0	31.200 – 31.800
12.51975 – 12.52025	240.00000 – 285.00000	3345.8 – 3358.0	36.430 – 36.500
12.57675 – 12.57725	322.00000 – 335.40000	3600.0 – 4400.0	Above 38.6
13.36000 – 13.41000			

** : Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz