FCC SDoC Test Report

Issued date: Feb. 15, 2019

Project No.: 18Q030707

Product : Network Video Recorder

Model : ND9424P, ND9322P

Applicant : VIVOTEK INC.

Address : 6F, No.192, Lien-Cheng Rd., Chung-Ho, New Taipei City, 235, Taiwan, R.O.C.

Report No: WD-EF-R-180378-A0

According to

47 CFR FCC Part 15, Subpart B, Class A ANSI C63.4:2014

ICES-003:2016 Issue 6, Class A

Authorized Signatory : Robert Wang / Robert Wang

Wendell Industrial Co., Ltd

Wendell Electrical Testing Lab.

Add: 6F/6F-1, No.188, Baoqiao Rd., Xindian Dist., New Taipei City 23145, Taiwan R.O.C.

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History of this test report

Report No.	Issue date	Description
WD-EF-R-180378-A0	Feb. 15, 2019	Initial Issue

Declaration

This report is for your exclusive use. Any copying or replication of this report to or for any other person or entity, or use of our name or trademark, is permitted only with our prior written permission. This report sets forth our findings solely with respect to the test samples identified herein. The results set forth in this report are not indicative or representative of the quality or characteristics of the lot from which a test sample was taken or any similar or identical product unless specifically and expressly noted. Our report includes all of the tests requested by you and the results thereof based upon the information that you provided to us.

History of supplementary report

Report No.	Issue date	Description
WD-EF-R-180378-A0	Feb. 15, 2019	Original report

Declaration

This report is for your exclusive use. Any copying or replication of this report to or for any other person or entity, or use of our name or trademark, is permitted only with our prior written permission. This report sets forth our findings solely with respect to the test samples identified herein. The results set forth in this report are not indicative or representative of the quality or characteristics of the lot from which a test sample was taken or any similar or identical product unless specifically and expressly noted. Our report includes all of the tests requested by you and the results thereof based upon the information that you provided to us.

1 Certification

Product:	Network Video Recorder
Brand Name:	VIVOTEK
Model:	ND9424P, ND9322P
Applicant:	VIVOTEK INC.
Tested:	Jul. 20 ~ Oct. 25, 2018
Standard:	47 CFR FCC Part 15, Subpart B, Class A
	ICES-003:2016 Issue 6, Class A
	ANSI C63.4:2014

The above equipment (Model: ND9424P, ND9322P) has been tested by **Wendell Electrical Testing Lab.**, and found compliance with the requirement of the above standards. The test record, data evaluation and Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

1.1 Summary of Test Result

The EUT has been tested according to the following specifications:

Emission				
Standard	**Test Item**	**Limit**	**Result**	**Remark**
47 CFR FCC Part 15, Subpart B	Conducted disturbance at mains terminals	Class A	Pass	Meets the requirements
ICES-003	Radiated disturbance	Class A	Pass	Meets the requirements

Note: Test record contained in the referenced test report relate only to the EUT sample and test item.

2 Test Configuration of Equipment Under Test

2.1 Test Facility

Conducted disturbance at mains terminals Test

W01: 5F-1, No.188, Baoqiao Rd., Xindian Dist., New Taipei City 23145, Taiwan (R.O.C.)

Radiated emission Test (OATS)

W07: No.15, Neighborhood 3, Ruishukeng, Linkou Dist., New Taipei City 24451, Taiwan (R.O.C.)

Radiated emission (9*6*6 Chamber), Conducted disturbance at mains terminals and Conducted disturbance at telecommunication ports Tests

W06: No.67-9, Shimen Rd., Tucheng Dist., New Taipei City 23654, Taiwan (R.O.C.)

ACCREDITATIONS

The laboratories are accredited and approved by the TAF according to ISO/IEC 17025.

2.2 Measurement Uncertainty

The measurement instrumentation uncertainly consideration contained in CISPR 16-4-2.

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

2.2.1 Conducted Emission test

Test Site	Measurement Freq. Range	dB (U_{cispr})	Note
W01	150 kHz ~ 30 MHz	3.19	N/A
W06	150 kHz ~ 30 MHz	2.81	N/A

2.2.2 Radiated Emission test

Test Site	Measurement Freq. Range	Ant	dB (U_{cispr})	Note
W06	30 MHz ~ 200 MHz	V	4.38	N/A
	30 MHz ~ 200 MHz	H	4.05	N/A
	200 MHz ~ 1000 MHz	V	4.05	N/A
	200 MHz ~ 1000 MHz	H	3.91	N/A
	1 GHz ~ 6 GHz	V	5.13	N/A
	1 GHz ~ 6 GHz	H	5.03	N/A

Test Site	Measurement Freq. Range	Ant	dB (U_{cispr})	Note
W07	30 MHz ~ 200 MHz	V	4.75	N/A
	30 MHz ~ 200 MHz	H	3.63	N/A
	200 MHz ~ 1000 MHz	V	4.29	N/A
	200 MHz ~ 1000 MHz	H	3.82	N/A

3 Generation Information

3.1 Description of EUT

Product	Network Video Recorder
Brand	VIVOTEK
Model	ND9424P, ND9322P
Applicant	VIVOTEK INC.
Received date	May 18, 2018
EUT Power Rating	100-240Vac (from AC mains)
Model Differences	Refer to Note for more details
Operating System	N/A
Data Cable Supplied	N/A
Accessory Device	N/A
I/O Port	Please refer to note.

Note:

1. The following models are provided to this EUT.

Brand Name	Model	Difference
VIVOTEK	ND9322P	8port PoE, 1G memory, 200W PSU Input: 100~240 Vac, 50~60 Hz, 3.5A Max @ 110V
	ND9424P	16port PoE, 2G memory, 280W PSU Input: 100~240 Vac, 50~60 Hz, 6A Max @ 110V

2. The EUT's highest operating frequency is 1.6GHz. Therefore the radiated emission is tested up to 8GHz.

3.2 Description of Test Modes

Test results are presented in the report as below.

Test Result	Test Condition
Conducted emission test	
A	AC Mode – ND9424P
B	AC Mode – ND9322P – DPS-200PB-185A
C	AC Mode – ND9322P – DPS-200PB-185F
Radiated emission 30MHz ~ 1GHz test	
A	AC Mode – ND9424P
B	AC Mode – ND9322P – DPS-200PB-185A
C	AC Mode – ND9322P – DPS-200PB-185F
Radiated emission above 1GHz test	
A	AC Mode – ND9424P
B	AC Mode – ND9322P – DPS-200PB-185A
C	AC Mode – ND9322P – DPS-200PB-185F

3.3 EUT Operating Condition

Mode A

a. Placed the EUT on the test table.
b. Prepare server PC to act as a communication partner and placed it outside of testing area.
c. The EUT was connected to the server PC with LAN cable.
d. The communication partner sent data to EUT by command "ping" via LAN.
e. The EUT sent video signal to monitor and displayed on screen.
f. The IPCAM sent video signal to EUT via LAN.
g. The Microphone sent voice signal to EUT.
h. The EUT sent voice signal to earphone.
i. The EUT read and write data with Internal HDD and External HDD.

Mode B & C

a. Placed the EUT on the test table.
b. Prepare server PC to act as a communication partner and placed it outside of testing area.
c. The EUT was connected to the server PC with LAN cable.
d. The communication partner sent data to EUT by command "ping" via LAN.
e. Network Camera act as a communication partner and placed it outside of testing area.
f. The EUT was connected to Network Camera via LAN.
g. The communication partner sent data to EUT by command "ping" via LAN.
h. The EUT sent video signal to monitor and displayed on screen.
i. The EUT sent video signal to server PC via LAN cable.
j. The Network Camera sent video signal to EUT via LAN cable.
k. The server PC show IPCAM’s image on browser.
l. The Microphone sent voice signal to EUT.
m. The EUT sent voice signal to earphone.
n. The EUT write data with Internal HDD and External HDD.

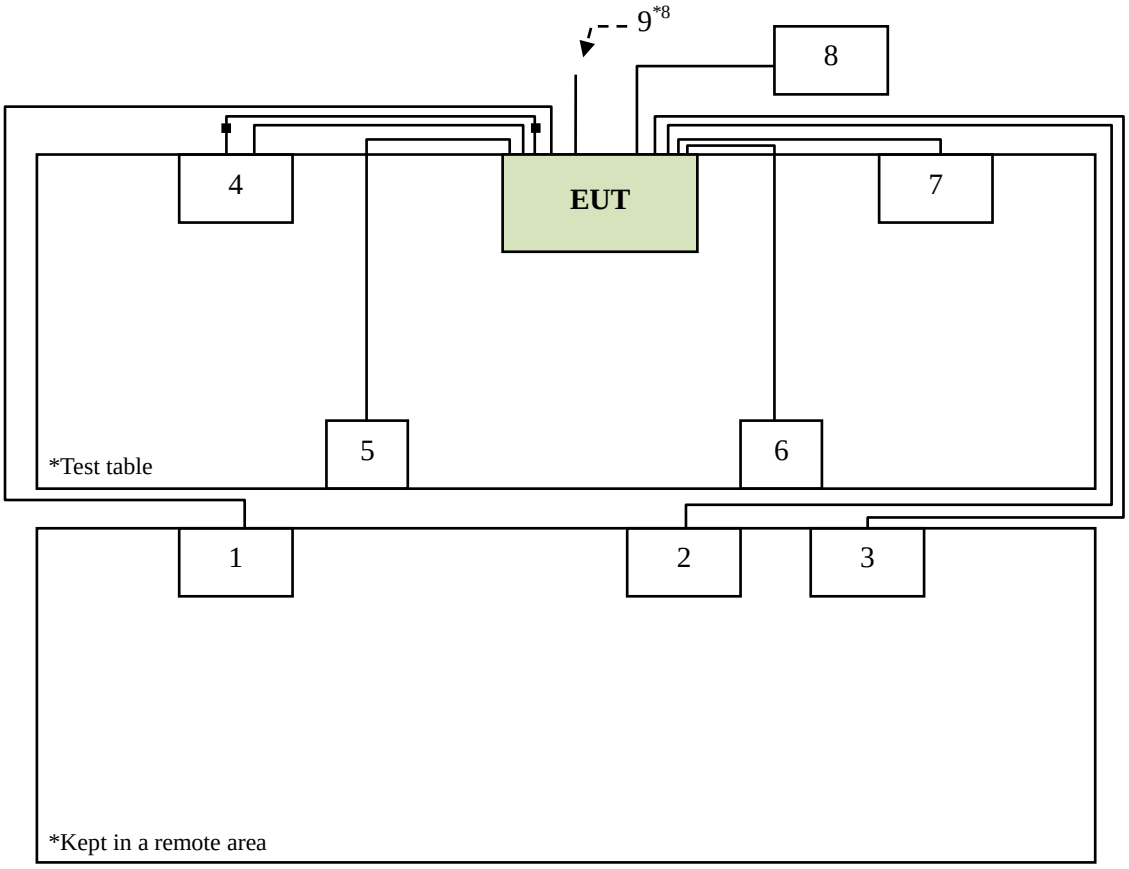
3.4 Description of Support Unit

The EUT has been conducted testing with other necessary accessories or support units.

Item	Equipment	Brand	Model No.	Serial No.	FCC ID	Data Cable	Power Cord	Remark
1	Desktop PC	DELL	D19M	N/A	PPD-QCN FA335	20m non-shielded RJ45 cable	1.8m non-shielded cable	-
2	Network CAMERA	VIVOTEK	FE9382-EHV	N/A	N/A	20m non-shielded RJ45 cable	N/A	Supplied by client
3	Network CAMERA	VIVOTEK	FE8180	N/A	N/A	20m non-shielded RJ45 cable	N/A	Supplied by client
4	Monitor	DELL	U2410F	CN-0J257M-72872-054-0NTL	FCC DoC Approved	1.5m shielded VGA cable with two cores 1.5m shielded HDMI cable	1.8m non-shielded cable	-
5	Mouse	DELL	MS111-L	N/A	FCC DoC Approved	1.5m non-shielded cable	N/A	-
6	Earphone & Microphone	E-books	E-EPA057	N/A	N/A	1.4m non-shielded cable	N/A	-
7	External Hard Drive	Transcend	TS1TSJ25C3N	D62397-0399	FCC DoC Approved	0.6m shielded cable	N/A	-
8	PD	Korenix	N/A	N/A	N/A	N/A	N/A	-
9	Multi conductor cable	N/A	N/A	N/A	N/A	30cm non-shielded cable*8	N/A	

Note: 1. The core(s) is(are) originally attached to the cable(s).
2. Item 1-3 acted as communication partners to transfer data.

3.5 Configuration of System Under Test



4 Emission Test

4.1 Conducted Emission Measurement (Frequency Range 150 KHz-30MHz)

4.1.1 Limit of Conducted Emission Measurement

Frequency (MHz)	Class A (dBuV)		Class B (dBuV)	
	Quasi-peak	Average	Quasi-peak	Average
0.15 to 0.5	79	66	66 to 56	56 to 46
0.50 to 5.0	73	60	56	46
5.0 to 30.0	73	60	60	50

Note: 1. The lower limit shall apply at the transition frequencies.
2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50 MHz.
3. Detector function in the form: PK = Peak, QP = Quasi Peak, AV = Average
4. The test result calculated as following:
Measurement Value = Reading Level + Correct Factor
Correction Factor = Insertion loss of LISN + Cable loss + Transient Limiter (If use)
Margin Level = Measurement Value –Limit Value

4.1.2 Test Instrument

Test Site: W01-CE					
Item	**Equipment**	**Manufacturer**	**Model**	**Meter No.**	**Calibration Date**
1	TWO-LINE V-NETWORK	R&S	ENV216	CT-1-025-1	Apr. 10, 2018
2	Pulse limiter	R&S®	ESH3-Z2	CT-2-015	Jan. 15, 2018
3	EMI Test Receiver	R&S	ESCI	CT-1-024	Apr. 11, 2018
4	V-LISN	Schwarzbeck	NSLK8127	CT-1-104-1	Aug. 08, 2018
5	Test Cable	Marvelous Microwave Inc	200200.400LL.500A	CT-10-048-1	Aug. 07, 2018
6	50ohm Termination	N/A	N/A	CT-1-065-1	Apr. 19, 2018
7	Measurement Software	EZ-EMC	Ver: FA-03A	CT-3-012	No calibration request

Note: 1. The calibration interval of the above test instruments is 12 months.

Test Site: W06-CE					
Item	**Equipment**	**Manufacturer**	**Model**	**Meter No.**	**Calibration Date**
1	TWO-LINE V-NETWORK	R&S	ENV216	CT-1-025-2	Apr. 10, 2018
2	Transient Limiter	Electro Metrics	EM-7600	CT-1-026	Aug. 07, 2018
3	EMI Test Receiver	R&S	ESR3	CT-1-103	Apr. 19, 2018
4	V-LISN	Schwarzbeck	NSLK8127RC	CT-1-104-1RC	Aug. 08, 2018
5	Test Cable	EMCI	EMCCFD300-BM-BM-5000	CT-1-107-2	Aug. 07, 2018
6	50ohm Termination	HUBER+SUHNER	N/A	CT-1-109-1	Aug. 08, 2018
7	Measurement Software	EZ-EMC	Ver: FA-03A	CT-3-012	No calibration request

Note: 1. The calibration interval of the above test instruments is 12 months.

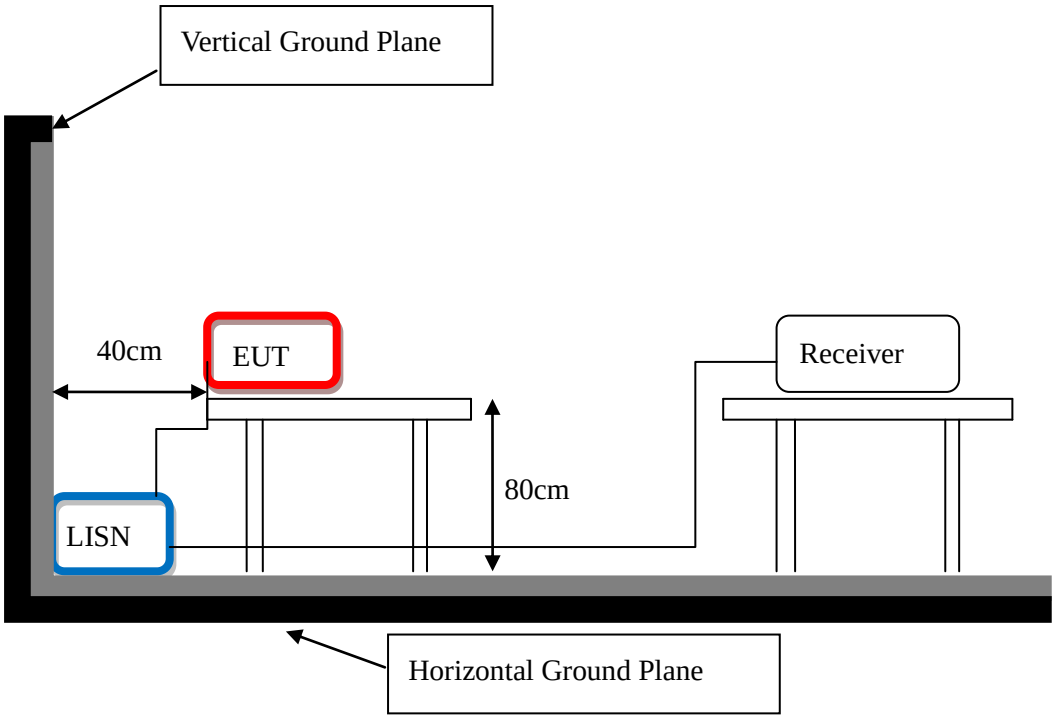
4.1.3 Test Procedure

a. The EUT was placed 0.8 meter height wooden table from the horizontal ground plane with EUT being connected to power source through a line impedance stabilization network (LISN). The LISN at least be 80 cm from nearest chassis of EUT.
b. The line impedance stabilization network (LISN) provides 50 ohm/50uH of coupling impedance for the measuring instrument. All other support equipments powered from additional LISN(s).
c. Interrelating cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle. All I/O cables were positioned to simulate typical usage.
d. All I/O cables that are not connected to a peripheral shall be bundle in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
e. The EMI test receiver connected to LISN powering the EUT. The actual test configuration, please refer to EUT test photos.
f. The receiver scanned from 150kHz to 30MHz for emissions in each of test modes. A scan was taken on both power lines, Line and Neutral, recording at least six highest emissions.
g. The EUT and cable configuration of the above highest emission levels were recorded. The test data of the worst case was recorded.

4.1.4 Deviation from Test Standard

No deviation

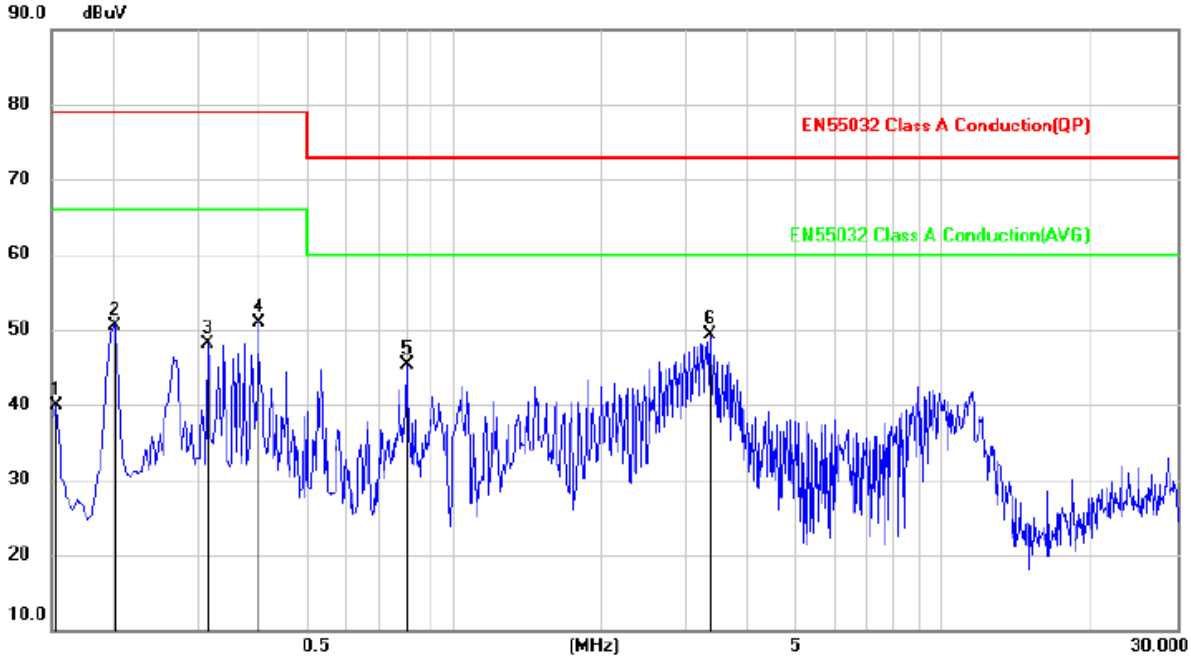
4.1.5 Test Setup



Note: Please refer to 4.1.7 for the actual test configuration.

4.1.6 Test Result

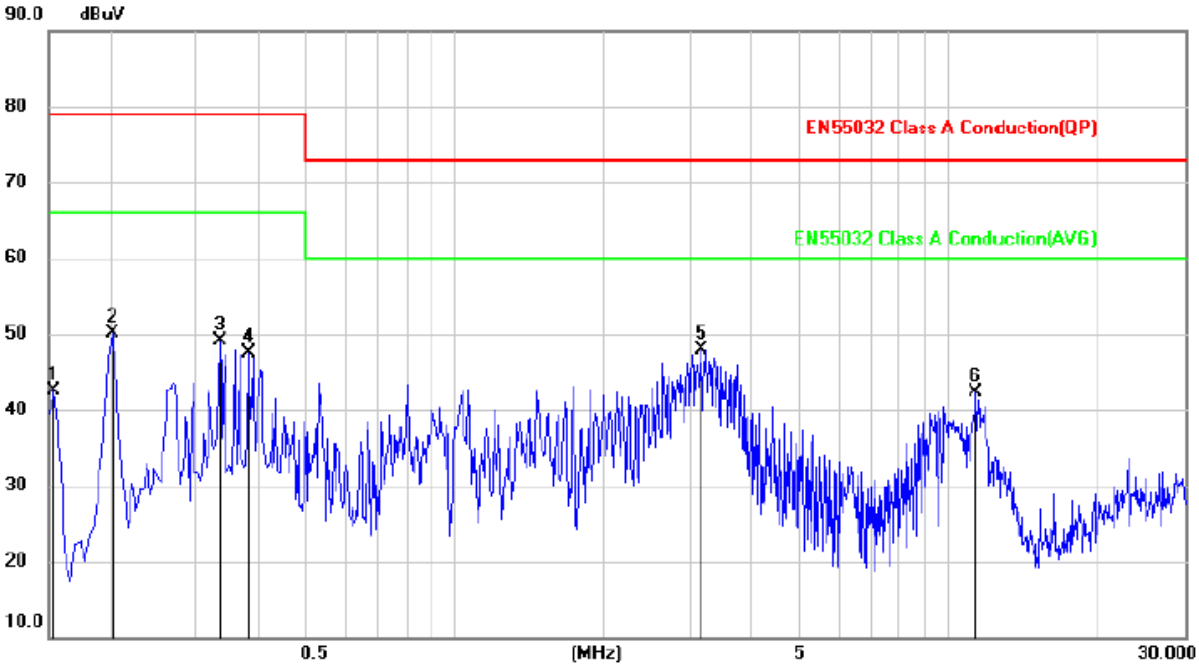
Test Voltage	120Vac, 60Hz	**Frequency Range**	0.15-30 MHz
Environmental Conditions	24℃, 52% RH	**6dB Bandwidth**	9 kHz
Test Date	2018/07/23	**Phase**	L
Tested by	Eddy Kao	**Test Site**	W01
Test Mode	A		



No.	Frequency (MHz)	Reading Level (dBuV)	Correct Factor (dB)	Measurement (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	0.1539	30.24	9.58	39.82	79.00	-39.18	peak
2	0.2020	41.02	9.58	50.60	79.00	-28.40	peak
3	0.3140	38.55	9.57	48.12	79.00	-30.88	peak
4	0.3980	41.27	9.57	50.84	79.00	-28.16	peak
5	0.8020	35.72	9.58	45.30	73.00	-27.70	peak
6	3.3540	39.68	9.60	49.28	73.00	-23.72	peak

Remark: 1. QP = Quasi Peak, AVG = Average
2. Correction Factor = Insertion loss of LISN + Cable loss + Transient Limiter (If use)
3. Measurement Value = Reading Level + Correct Factor
4. Margin Level = Measurement Value –Limit Value

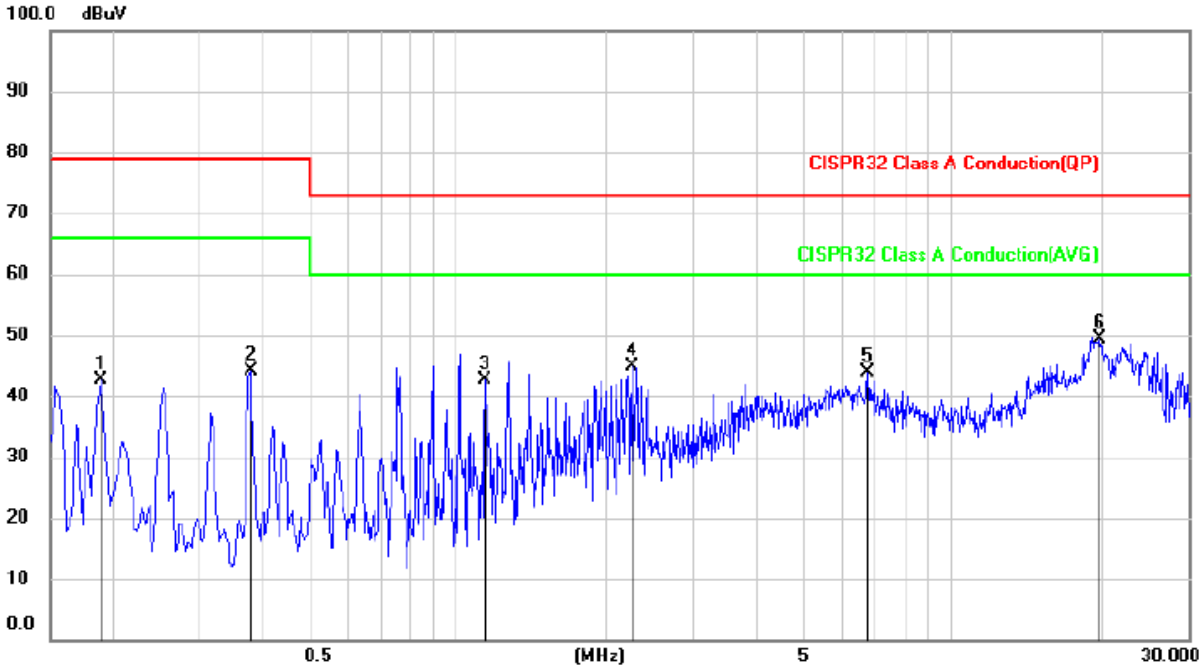
Test Voltage	120Vac, 60Hz	**Frequency Range**	0.15-30 MHz
Environmental Conditions	24℃, 52% RH	**6dB Bandwidth**	9 kHz
Test Date	2018/07/23	**Phase**	N
Tested by	Eddy Kao	**Test Site**	W01
Test Mode	A		



No.	Frequency (MHz)	Reading Level (dBuV)	Correct Factor (dB)	Measurement (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	0.1539	32.87	9.67	42.54	79.00	-36.46	peak
2	0.2020	40.42	9.66	50.08	79.00	-28.92	peak
3	0.3339	39.47	9.66	49.13	79.00	-29.87	peak
4	0.3820	37.77	9.66	47.43	79.00	-31.57	peak
5	3.1619	38.27	9.68	47.95	73.00	-25.05	peak
6	11.4340	32.64	9.75	42.39	73.00	-30.61	peak

Remark: 1. QP = Quasi Peak, AVG = Average
2. Correction Factor = Insertion loss of LISN + Cable loss + Transient Limiter (If use)
3. Measurement Value = Reading Level + Correct Factor
4. Margin Level = Measurement Value –Limit Value

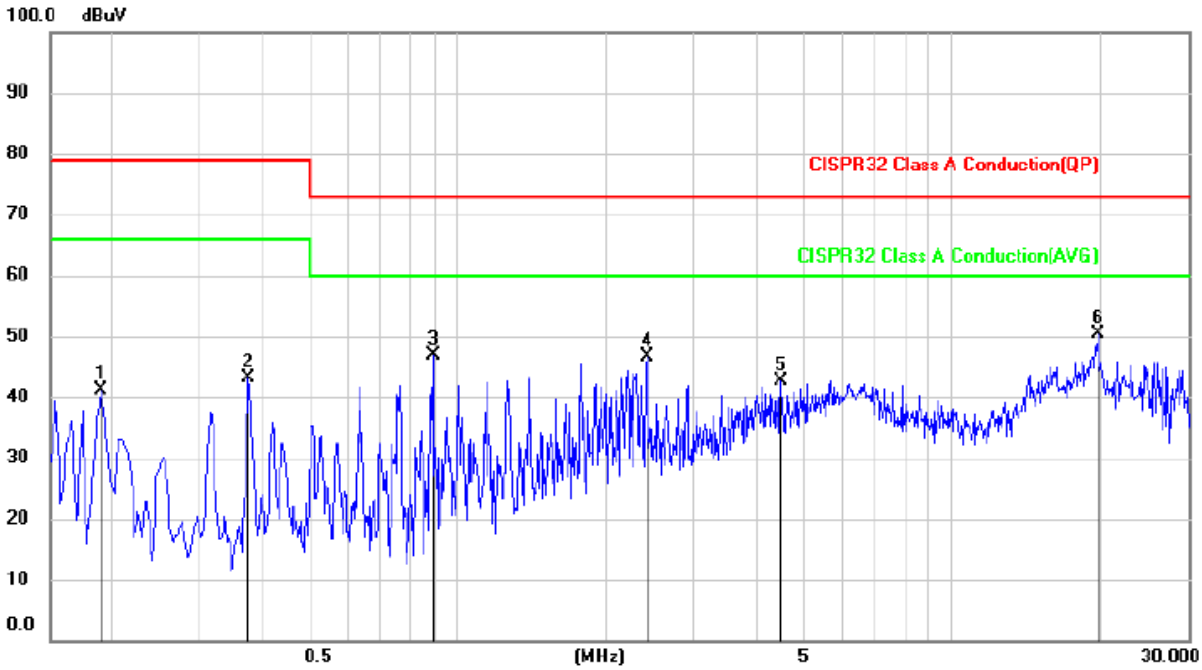
Test Voltage	120Vac, 60Hz	Frequency Range	0.15-30 MHz
Environmental Conditions	24℃, 67% RH	6dB Bandwidth	9 kHz
Test Date	2018/10/25	Phase	L
Tested by	Duncan Cheng	Test Site	W06
Test Mode	B		



No.	Frequency (MHz)	Reading Level (dBuV)	Correct Factor (dB)	Measurement (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	0.1900	32.88	9.83	42.71	79.00	-36.29	peak
2	0.3820	34.38	9.84	44.22	79.00	-34.78	peak
3	1.1380	32.77	9.85	42.62	73.00	-30.38	peak
4	2.2540	35.06	9.88	44.94	73.00	-28.06	peak
5	6.7620	33.81	10.02	43.83	73.00	-29.17	peak
6	19.8620	39.22	10.26	49.48	73.00	-23.52	peak

Remark: 1. QP = Quasi Peak, AVG = Average
2. Correction Factor = Insertion loss of LISN + Cable loss + Transient Limiter (If use)
3. Measurement Value = Reading Level + Correct Factor
4. Margin Level = Measurement Value –Limit Value

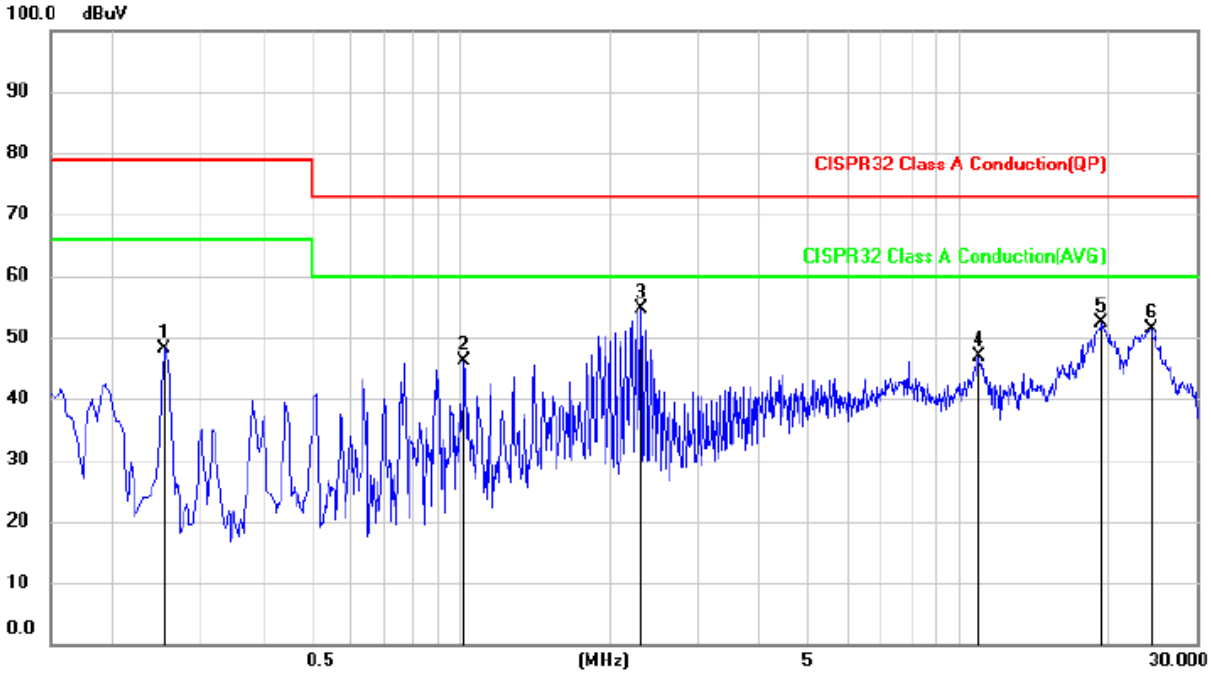
Test Voltage	120Vac, 60Hz	Frequency Range	0.15-30 MHz
Environmental Conditions	24℃, 67% RH	6dB Bandwidth	9 kHz
Test Date	2018/10/25	Phase	N
Tested by	Duncan Cheng	Test Site	W06
Test Mode	B		



No.	Frequency (MHz)	Reading Level (dBuV)	Correct Factor (dB)	Measurement (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	0.1900	31.42	9.82	41.24	79.00	-37.76	peak
2	0.3780	33.26	9.84	43.10	79.00	-35.90	peak
3	0.8900	36.97	9.84	46.81	73.00	-26.19	peak
4	2.4100	36.70	9.89	46.59	73.00	-26.41	peak
5	4.5020	32.79	9.96	42.75	73.00	-30.25	peak
6	19.7099	40.09	10.23	50.32	73.00	-22.68	peak

Remark: 1. QP = Quasi Peak, AVG = Average
2. Correction Factor = Insertion loss of LISN + Cable loss + Transient Limiter (If use)
3. Measurement Value = Reading Level + Correct Factor
4. Margin Level = Measurement Value –Limit Value

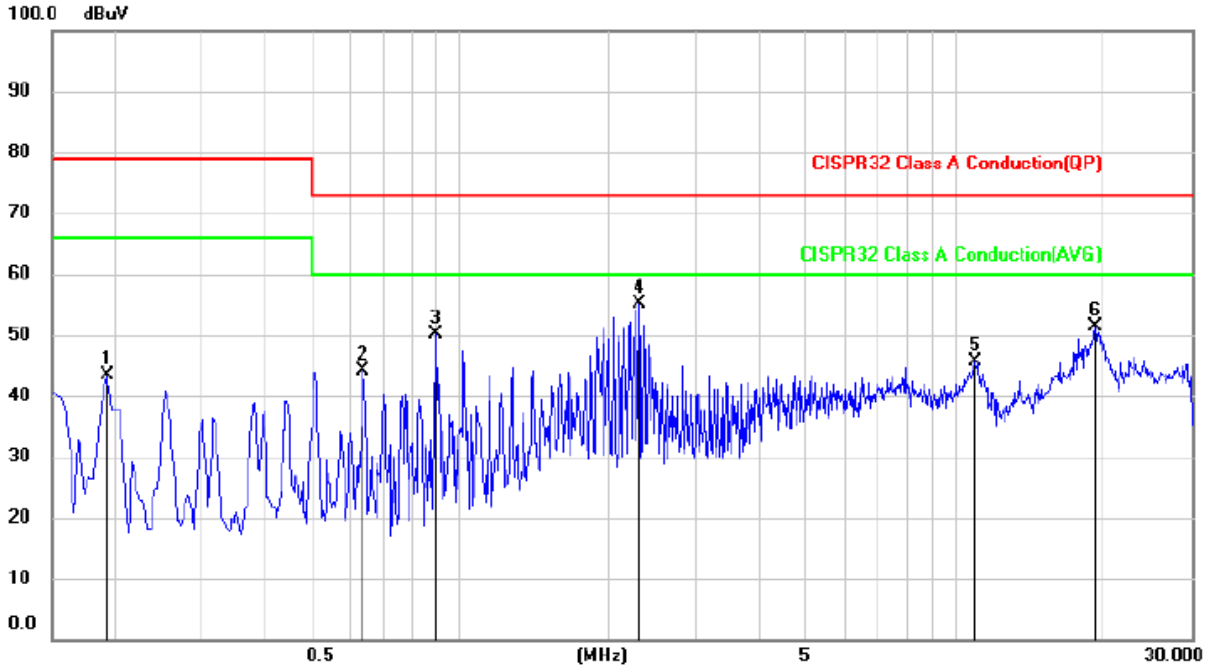
Test Voltage	120Vac, 60Hz	Frequency Range	0.15-30 MHz
Environmental Conditions	24℃, 67% RH	6dB Bandwidth	9 kHz
Test Date	2018/10/25	Phase	L
Tested by	Duncan Cheng	Test Site	W06
Test Mode	C		



No.	Frequency (MHz)	Reading Level (dBuV)	Correct Factor (dB)	Measurement (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	0.2540	38.36	9.83	48.19	79.00	-30.81	peak
2	1.0180	36.37	9.85	46.22	73.00	-26.78	peak
3	2.3020	44.77	9.88	54.65	73.00	-18.35	peak
4	10.9940	36.80	10.09	46.89	73.00	-26.11	peak
5	19.2420	42.16	10.25	52.41	73.00	-20.59	peak
6	24.3700	41.06	10.37	51.43	73.00	-21.57	peak

Remark: 1. QP = Quasi Peak, AVG = Average
2. Correction Factor = Insertion loss of LISN + Cable loss + Transient Limiter (If use)
3. Measurement Value = Reading Level + Correct Factor
4. Margin Level = Measurement Value –Limit Value

Test Voltage	120Vac, 60Hz	**Frequency Range**	0.15-30 MHz
Environmental Conditions	24℃, 67% RH	**6dB Bandwidth**	9 kHz
Test Date	2018/10/25	**Phase**	N
Tested by	Duncan Cheng	**Test Site**	W06
Test Mode	C		

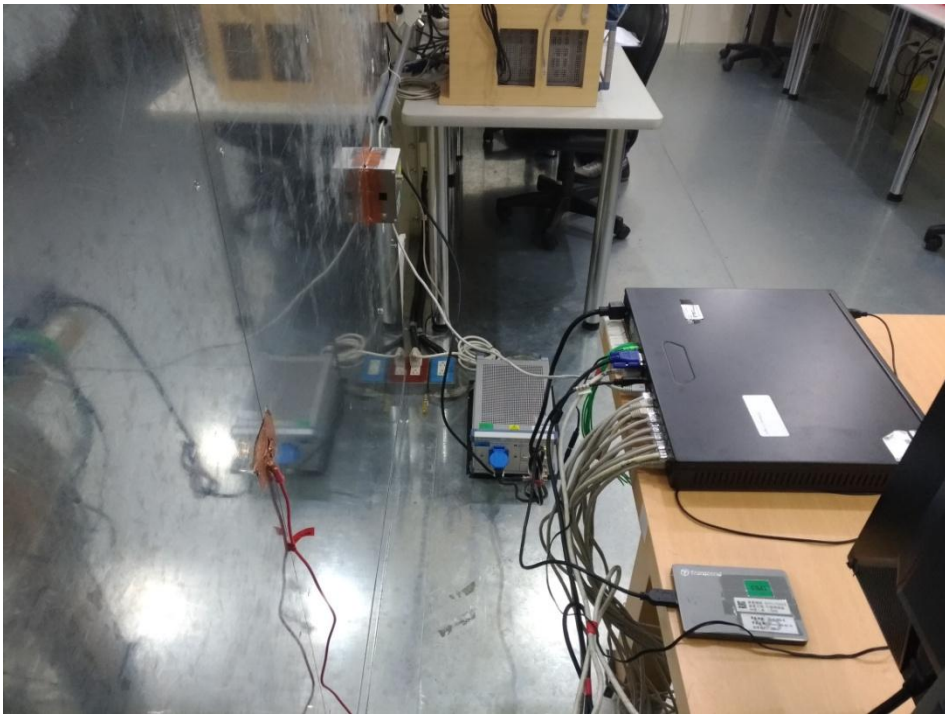


No.	Frequency (MHz)	Reading Level (dBuV)	Correct Factor (dB)	Measurement (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	0.1940	33.50	9.82	43.32	79.00	-35.68	peak
2	0.6380	34.36	9.84	44.20	73.00	-28.80	peak
3	0.8980	40.23	9.84	50.07	73.00	-22.93	peak
4	2.3020	45.19	9.87	55.06	73.00	-17.94	peak
5	10.9980	35.45	10.07	45.52	73.00	-27.48	peak
6	19.1860	41.12	10.22	51.34	73.00	-21.66	peak

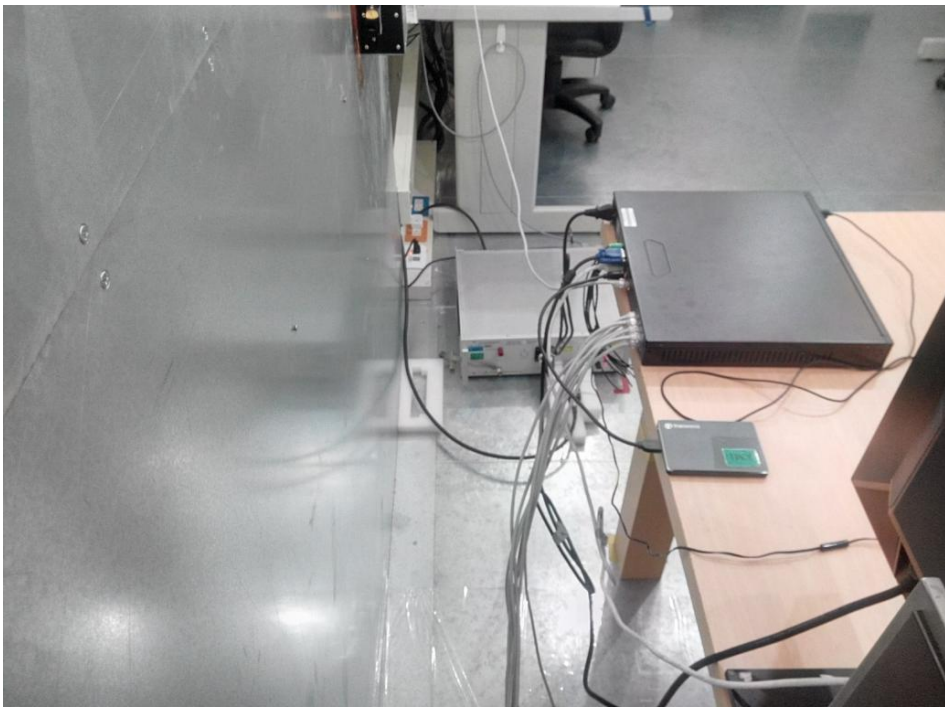
Remark: 1. QP = Quasi Peak, AVG = Average
2. Correction Factor = Insertion loss of LISN + Cable loss + Transient Limiter (If use)
3. Measurement Value = Reading Level + Correct Factor
4. Margin Level = Measurement Value –Limit Value

4.1.7 Photographs of Test Configuration

Mode A



Mode B & C



4.2 Radiated Emission Measurement

4.2.1 Limits of Radiated Emission Measurement

Radiated Frequency range 30 MHz to 1000 MHz

Radiated Emissions Limits at 10 meters				
Frequencies (MHz)	**FCC 15B/ ICES-003**		**CISPR 22**	
	Class A (dBµV/m)	**Class B (dBµV/m)**	**Class A (dBµV/m)**	**Class B (dBµV/m)**
30-88	39	29.5	40	30
88-216	43.5	33.1		
216-230	46.4	35.6		
230-960			47	37
960-1000	49.5	43.5		

Radiated Emissions Limits at 3 meters				
Frequencies (MHz)	**FCC 15B/ ICES-003**		**CISPR 22**	
	Class A (dBµV/m)	**Class B (dBµV/m)**	**Class A (dBµV/m)**	**Class B (dBµV/m)**
30-88	49.5	40	50.5	40.5
88-216	54	43.5		
216-230	56.9	46		
230-960			57.5	47.5
960-1000	60	54		

Note: 1. The lower limit shall apply at the transition frequency.
2. Detector function in the form: PK = Peak, QP = Quasi Peak, AV = Average
3. The test result calculated as following:
Measurement Value = Reading Level + Correct Factor
Correction Factor = Antenna factor + Cable loss (Antenna to preamplifier) - preamplifier Gain + Cable loss (preamplifier to receiver)
Margin Level = Measurement Value - Limit Value

Radiated Frequency range above 1 GHz

Radiated Emissions Limits at 10 meters						
Frequencies (MHz)	FCC 15B/ ICES-003				CISPR 22	
	Class A (dBμV/m)		Class B (dBμV/m)		Class A (dBμV/m)	Class B (dBμV/m)
	Peak	Average	Peak	Average		
1000-3000	69.5	49.5	63.5	43.5	Not defined	Not defined
Above 3000						

Radiated Emissions Limits at 3meters								
Frequencies (MHz)	FCC 15B/ ICES-003				CISPR 22			
	Class A (dBμV/m)		Class B (dBμV/m)		Class A (dBμV/m)		Class B (dBμV/m)	
	Peak	Average	Peak	Average	Peak	Average	Peak	Average
1000-3000	80	60	74	54	76	56	70	50
Above 3000					80	60	74	54

Note: 1. The lower limit shall apply at the transition frequency.
2. Detector function in the form: PK = Peak, QP = Quasi Peak, AV = Average
3. The test result calculated as following:
Measurement Value = Reading Level + Correct Factor
Correction Factor = Antenna factor + Cable loss (Antenna to preamplifier) - preamplifier Gain + Cable loss (preamplifier to receiver)
Margin Level = Measurement Value - Limit Value

Frequency Range (For unintentional radiators)

Highest frequency generated or used in the device or on which the device operates or tunes (MHz)	Upper frequency of measurement range (MHz)
Below 1.705	30
1.705-108	1000
108-500	2000
500-1000	5000
Above 1000	5th harmonic of the highest frequency or 40GHz, whichever is lower

4.2.2 Test Instrument

Test Site: W06-966					
Item	**Equipment**	**Manufacturer**	**Model**	**Meter No.**	**Calibration Date**
1	Horn Antenna	Schwarzbeck	BBHA 9120D	CT-9-031	Oct. 09, 2018
2	Horn Antenna	Schwarzbeck	BBHA 9170	CT-9-032	Oct. 11, 2018
3	Bilog Antenna	Schwarzbeck	VULB 9168	CT-9-027-2	Oct. 19, 2018
4	EXA Signal Analyzer	Keysight	N9010A	CT-1-093	Apr. 18, 2018
5	EMI Test Receiver	Keysight	N9038A	CT-9-007	Apr. 18, 2018
6	Preamplifier	EMEC	EMC330	CT-9-024	Oct. 16, 2018
7	Preamplifier	EMCI	EMC051845SE	CT-9-012	Oct. 11, 2018
8	Preamplifier	EMCI	EMC184045SE	CT-9-013	Oct. 10, 2018
9	Test Cable	EMEC	EM-CB400	CT-9-001-1	Oct. 18, 2018
10	Test Cable	EMEC	EM-CB400	CT-9-001-2	Oct. 18, 2018
11	Test Cable	EMEC	EM-CB400	CT-9-001-3	Oct. 18, 2018
12	Test Cable	HUBER+SUHNER	SF102	CT-9-002-1	Oct. 10, 2018
13	Test Cable	EMEC	EMC102-KM-KM-600	CT-9-020	Oct. 10, 2018
14	Test Cable	EMEC	EMC102-KM-KM-3000	CT-9-021-1	Oct. 10, 2018
15	Measurement Software	EZ-EMC	Ver : FA-03A2 RE	CT-3-012	No calibration request

Note: 1. The calibration interval of the above test instruments is 12 months.

Test Site: W07-OATS					
Item	**Equipment**	**Manufacturer**	**Model**	**Meter No.**	**Calibration Date**
1	Bilog Antenna	Schwarzbeck	VULB 9168	WDLK-002	Apr. 19, 2018
2	OATS cable	EMCI	EMCCFD400-NM-NM-12000	CT-1-111	Aug. 08, 2018
3	OATS cable	EMCI	EMCCFD400-NM-NM-24000	CT-1-112	Aug. 08, 2018
4	Preamplifier	EMV-Technik	PA303	WDLK-004	Jan. 15, 2018
5	EMI Test Receiver	Keysight	N9038A	CT-1-068(3)	Aug. 08, 2018
6	Measurement Software	EZ-EMC	Ver : FA-03A2 RE	CT-3-012	No calibration request

Note: 1. The calibration interval of the above test instruments is 12 months.

4.2.3 Test Procedure

a. The EUT was placed on the top of a turntable 0.8 meters above the ground at a 3 m or 10 m open area test site. The table was rotated 360 degrees to determine the position of the high radiation emissions.

b. The height of the test antenna shall vary between 1 m to 4 m. Both vertical and horizontal polarizations of the antenna were set to make the measurement.

c. The EUT was set up as per the test configuration to simulate typical usage per the user's manual. All I/O cables were positioned to simulate typical usage. The actual test configuration, please refer to EUT test photos.

d. The initial step in collecting radiated emission data is a Spectrum Mode scanning the measurement frequency range.

Blow 1GHz:

Reading in which marked as QP or Peak means measurements by using Spectrum Mode with detector RBW=120kHz.

If the Spectrum Mode measured peak value compliance with and lower than Quasi Peak Limit, the EUT shall be deemed to meet QP Limits.

Above 1GHz:

Reading in which marked as Peak & AVG means measurements by using Spectrum Mode with setting in RBW=1MHz.

If the Spectrum Mode measured value compliance with the Peak Limits and lower than AVG Limits, the EUT shall be deemed to meet both Peak and AVG Limits.

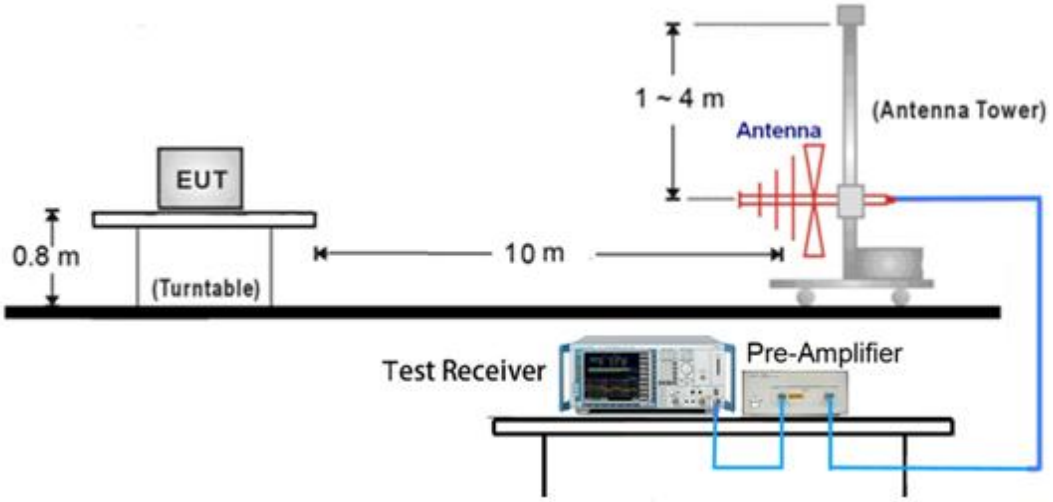
e. Emission frequency and amplitude were recorded, recording at least six highest emissions. The EUT and cable configuration of the above highest emission levels were recorded. The test data of the worst case was recorded.

4.2.4 Deviation from Test Standard

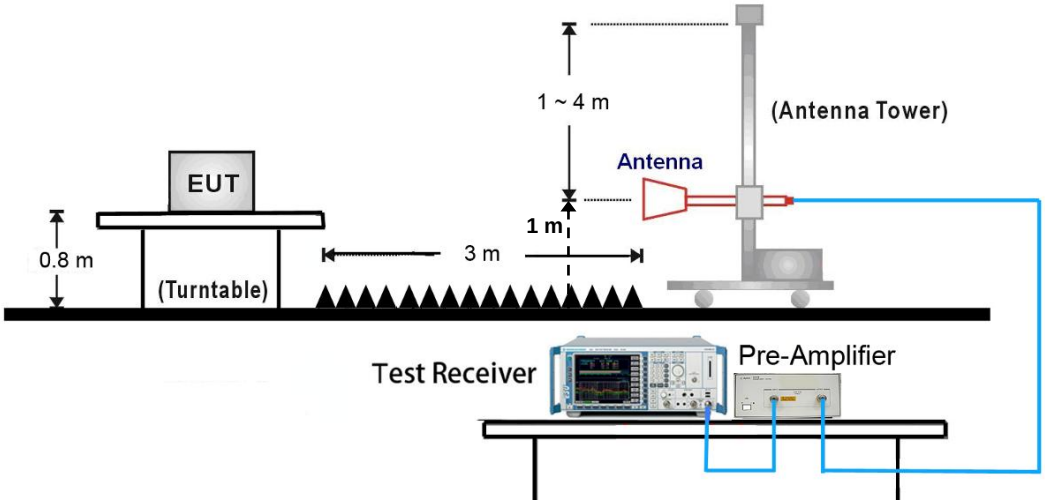
No deviation

4.2.5 Test Setup

< Radiated Emissions Frequency: 30 MHz to 1000 MHz >



< Radiated Emissions Frequency: above 1GHz >

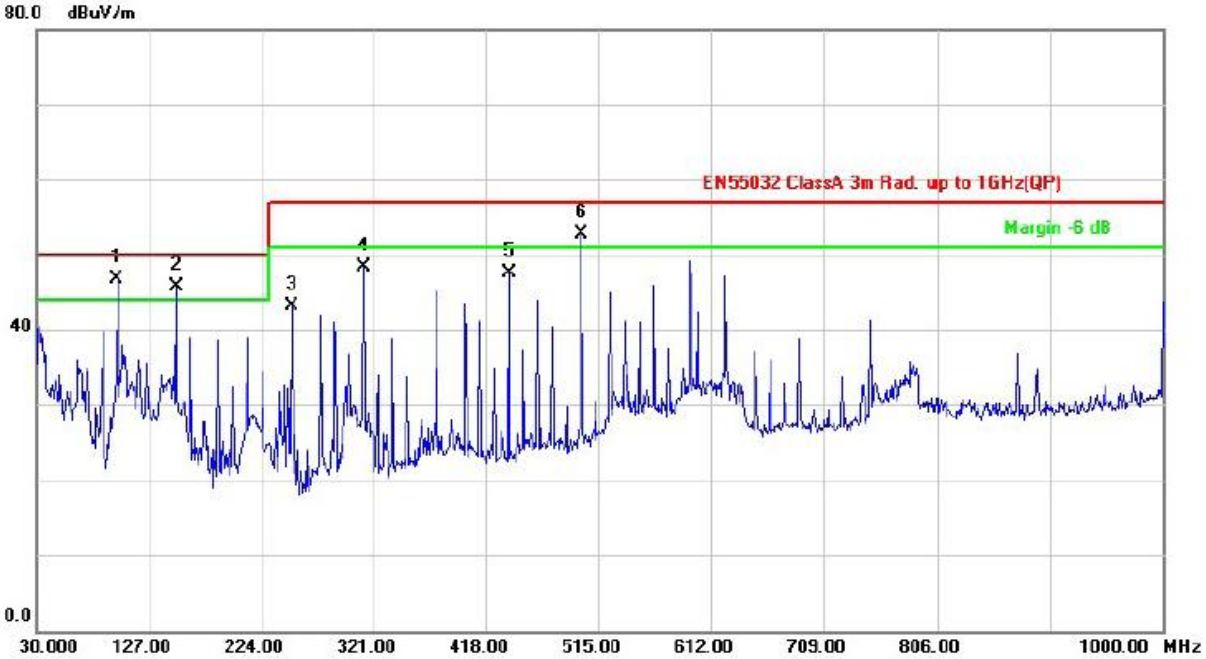


Note:

(1) Please refer to the 4.2.7 for the actual test configuration.
(2) The formula of measured value as: Test Result = Reading + Correction Factor
(3) Detector function in the form: PK = Peak, QP = Quasi Peak, AV = Average
(4) The test result calculated as following:
Measurement Value = Reading Level + Correct Factor
Correct Factor = Antenna Factor + Cable Loss - Amplifier Gain (if use)
Margin Level = Measurement Value - Limit Value

4.2.6 Test Result

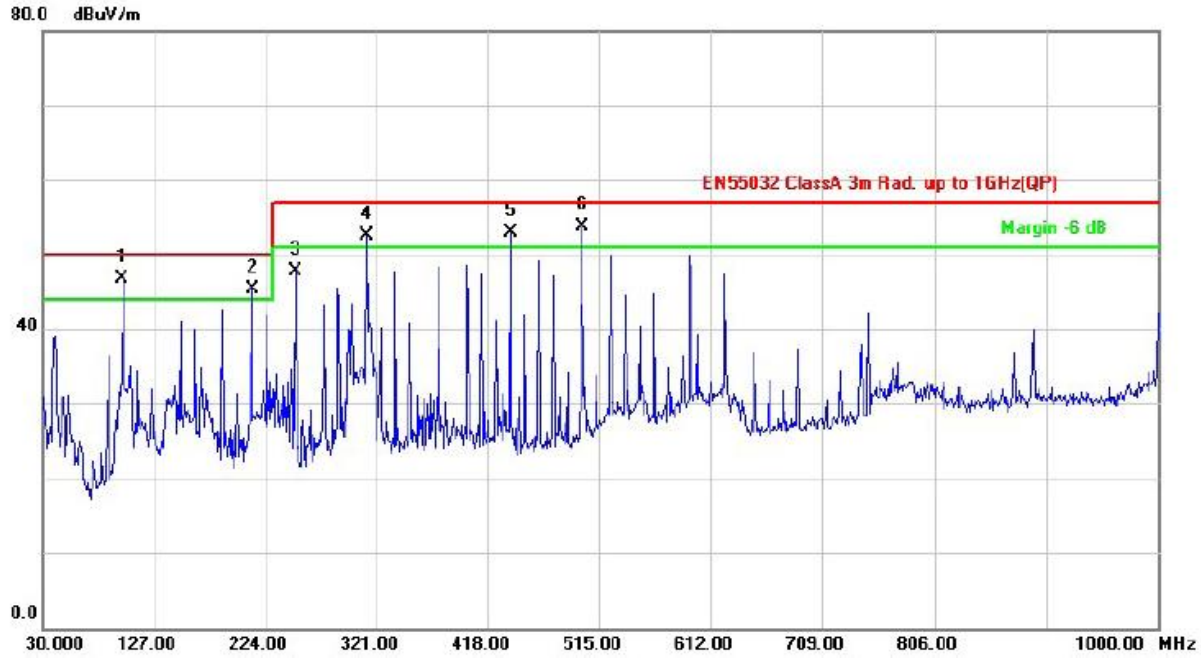
Test Voltage	120Vac, 60Hz	Frequency Range	30 – 1000 MHz
Environmental Conditions	27℃, 67% RH	6dB Bandwidth	120 kHz
Test Date	2018/07/20	Test Distance	3m
Tested by	Karwin Kao	Polarization	Vertical
Test Site	W06	Test Mode	A



No.	Frequency (MHz)	Reading Level (dBuV)	Correct Factor (dB/m)	Measurement (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Height (cm)	Table Degree (degree)
1	99.8399	61.84	-15.05	46.79	50.00	-3.21	peak	200	126
2	150.2800	55.48	-9.86	45.62	50.00	-4.38	peak	100	234
3	250.1899	54.29	-11.13	43.16	57.00	-13.84	peak	100	14
4	312.2699	57.42	-9.14	48.28	57.00	-8.72	peak	200	327
5	437.3999	53.46	-5.93	47.53	57.00	-9.47	peak	200	155
6	500.4499	57.44	-4.78	52.66	57.00	-4.34	peak	200	50

Remark: 1. QP = Quasi Peak
2. Correction Factor = Antenna factor + Cable loss (Antenna to preamplifier) - preamplifier Gain + Cable loss (preamplifier to receiver)
3. Measurement Value = Reading Level + Correct Factor
4. Margin Level = Measurement Value - Limit Value

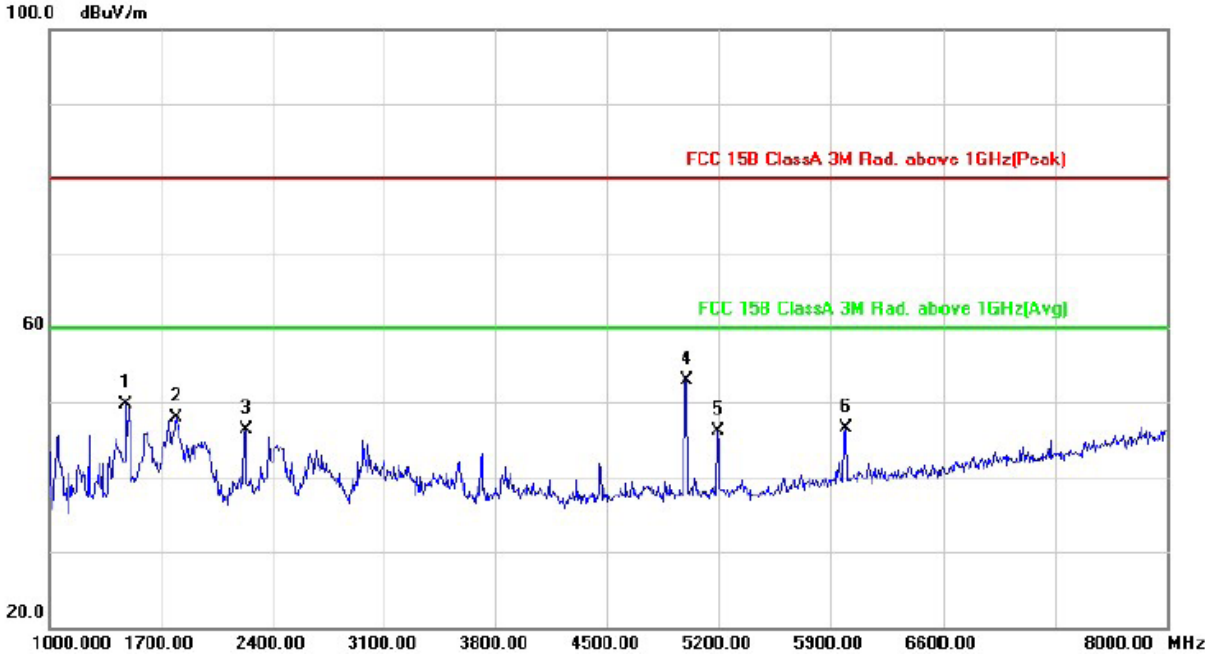
Test Voltage	120Vac, 60Hz	Frequency Range	30 – 1000 MHz
Environmental Conditions	27℃, 67% RH	6dB Bandwidth	120 kHz
Test Date	2018/07/20	Test Distance	3m
Tested by	Karwin Kao	Polarization	Horizontal
Test Site	W06	Test Mode	A



No.	Frequency (MHz)	Reading Level (dBuV)	Correct Factor (dB/m)	Measurement (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Height (cm)	Table Degree (degree)
1	99.8399	61.79	-15.05	46.74	50.00	-3.26	peak	200	206
2	212.3600	57.85	-12.58	45.27	50.00	-4.73	peak	100	259
3	250.1900	58.74	-11.13	47.61	57.00	-9.39	peak	100	126
4	312.2700	61.64	-9.14	52.50	57.00	-4.50	peak	100	117
5	437.4000	58.90	-5.93	52.97	57.00	-4.03	peak	100	327
6	499.4800	58.52	-4.80	53.72	57.00	-3.28	peak	200	206

Remark: 1. QP = Quasi Peak
2. Correction Factor = Antenna factor + Cable loss (Antenna to preamplifier) - preamplifier Gain + Cable loss (preamplifier to receiver)
3. Measurement Value = Reading Level + Correct Factor
4. Margin Level = Measurement Value - Limit Value

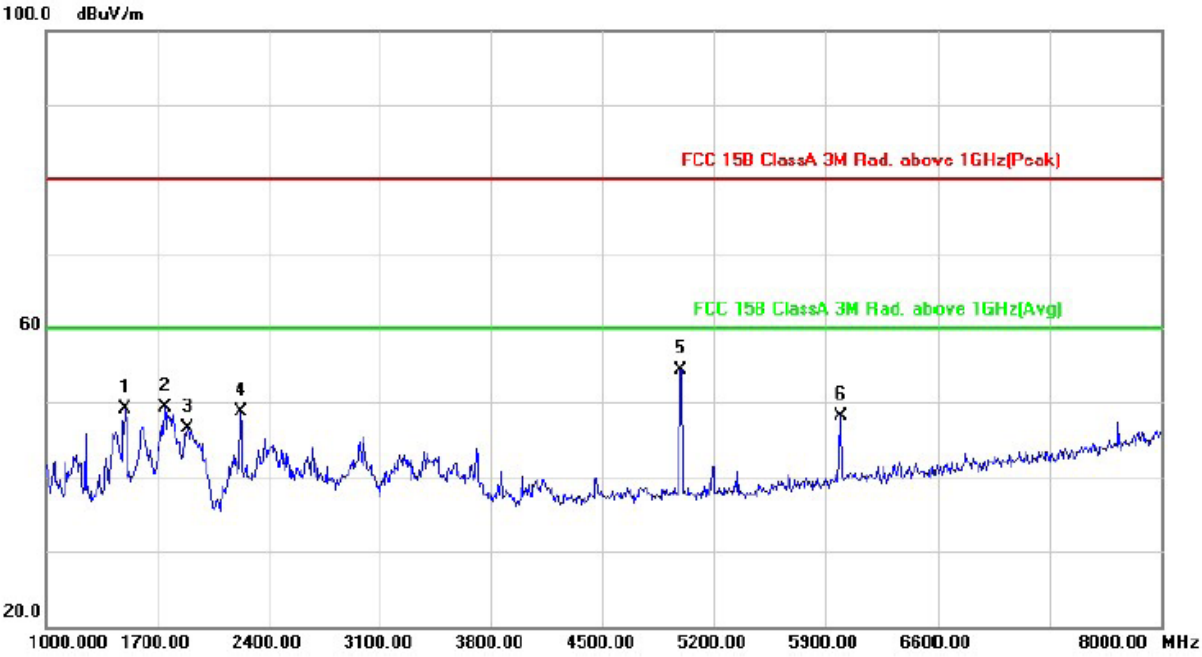
Test Voltage	120Vac, 60Hz	Frequency Range	1 – 8GHz
Environmental Conditions	27℃, 67% RH	6dB Bandwidth	1MHz
Test Date	2018/07/20	Test Distance	3m
Tested by	Karwin Kao	Polarization	Vertical
Test Site	W06	Test Mode	A



No.	Frequency (MHz)	Reading Level (dBuV)	Correct Factor (dB/m)	Measurement (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Height (cm)	Table Degree (degree)
1	1483.000	70.65	-20.94	49.71	80.00	-30.29	peak	200	136
2	1798.000	68.16	-20.22	47.94	80.00	-32.06	peak	200	318
3	2232.000	64.94	-18.73	46.21	80.00	-33.79	peak	101	360
4	4997.000	64.41	-11.41	53.00	80.00	-27.00	peak	200	185
5	5193.000	57.20	-11.15	46.05	80.00	-33.95	peak	100	157
6	5998.000	55.63	-9.07	46.56	80.00	-33.44	peak	200	204

Remark: 1. peak = Peak, AVG = Average
2. Correction Factor = Antenna factor + Cable loss (Antenna to preamplifier) - preamplifier Gain + Cable loss (preamplifier to receiver)
3. Measurement Value = Reading Level + Correct Factor
4. Margin Level = Measurement Value - Limit Value

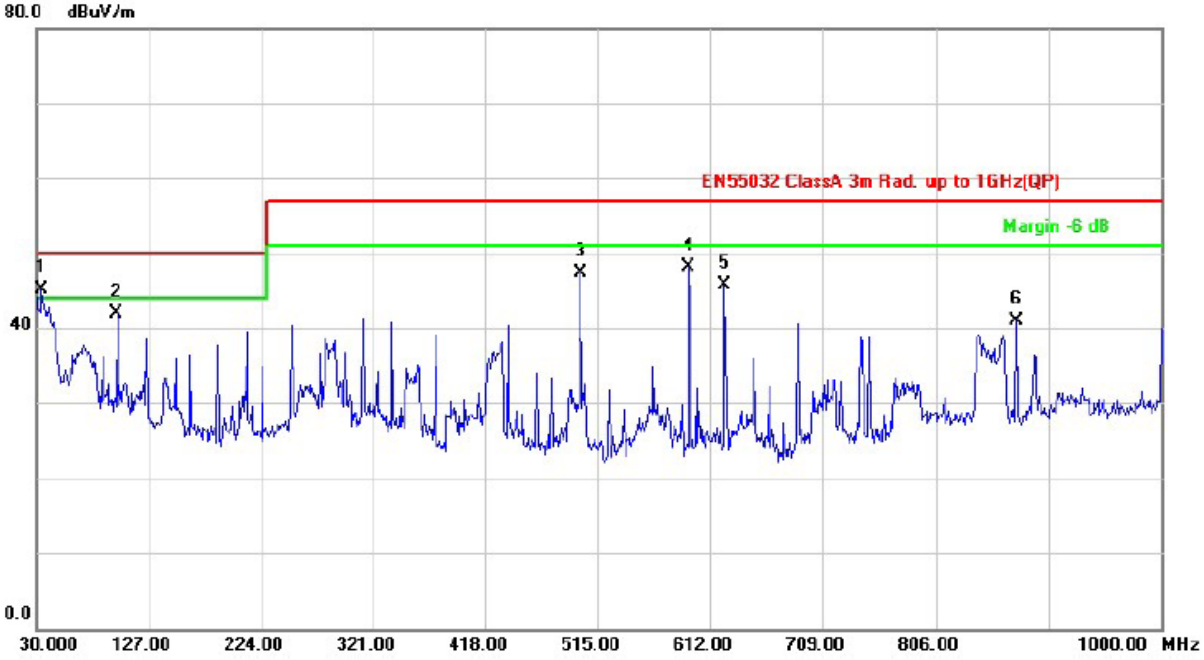
Test Voltage	120Vac, 60Hz	Frequency Range	1 – 8GHz
Environmental Conditions	27℃, 67% RH	6dB Bandwidth	1MHz
Test Date	2018/07/20	Test Distance	3m
Tested by	Karwin Kao	Polarization	Horizontal
Test Site	W06	Test Mode	A



No.	Frequency (MHz)	Reading Level (dBuV)	Correct Factor (dB/m)	Measurement (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Height (cm)	Table Degree (degree)
1	1497.000	70.03	-20.90	49.13	80.00	-30.87	peak	200	118
2	1749.000	69.55	-20.33	49.22	80.00	-30.78	peak	100	127
3	1889.000	66.42	-20.01	46.41	80.00	-33.59	peak	200	233
4	2225.000	67.37	-18.75	48.62	80.00	-31.38	peak	200	214
5	4990.000	65.74	-11.42	54.32	80.00	-25.68	peak	100	146
6	5998.000	57.12	-9.07	48.05	80.00	-31.95	peak	100	213

Remark: 1. peak = Peak, AVG = Average
2. Correction Factor = Antenna factor + Cable loss (Antenna to preamplifier) - preamplifier Gain + Cable loss (preamplifier to receiver)
3. Measurement Value = Reading Level + Correct Factor
4. Margin Level = Measurement Value - Limit Value

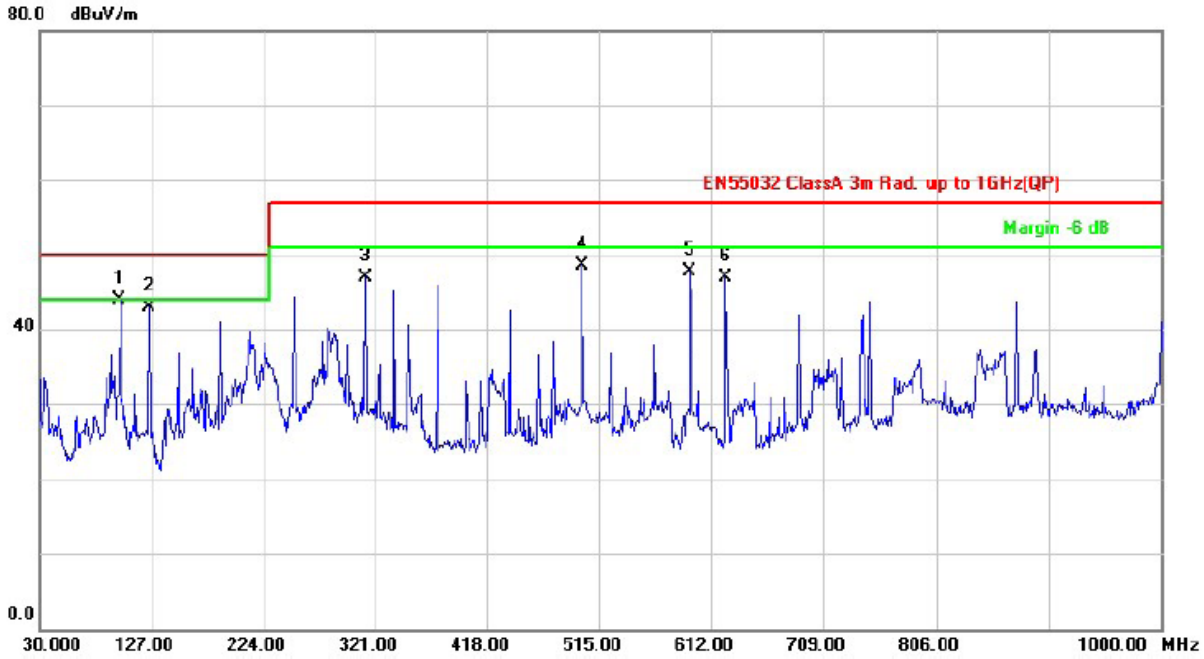
Test Voltage	120Vac, 60Hz	Frequency Range	30 – 1000 MHz
Environmental Conditions	24℃, 67% RH	6dB Bandwidth	120 kHz
Test Date	2018/10/24	Test Distance	3m
Tested by	Karwin Kao	Polarization	Vertical
Test Site	W06	Test Mode	B



No.	Frequency (MHz)	Reading Level (dBuV)	Correct Factor (dB/m)	Measurement (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Height (cm)	Table Degree (degree)
1	34.8500	55.81	-10.62	45.19	50.00	-4.81	peak	100	278
2	99.8399	56.98	-15.06	41.92	50.00	-8.08	peak	200	99
3	500.4499	52.12	-4.78	47.34	57.00	-9.66	peak	100	174
4	593.5700	50.92	-2.77	48.15	57.00	-8.85	peak	100	108
5	624.6100	47.90	-2.18	45.72	57.00	-11.28	peak	145	360
6	874.8700	39.75	1.15	40.90	57.00	-16.10	peak	100	5

Remark: 1. QP = Quasi Peak
2. Correction Factor = Antenna factor + Cable loss (Antenna to preamplifier) - preamplifier Gain + Cable loss (preamplifier to receiver)
3. Measurement Value = Reading Level + Correct Factor
4. Margin Level = Measurement Value - Limit Value

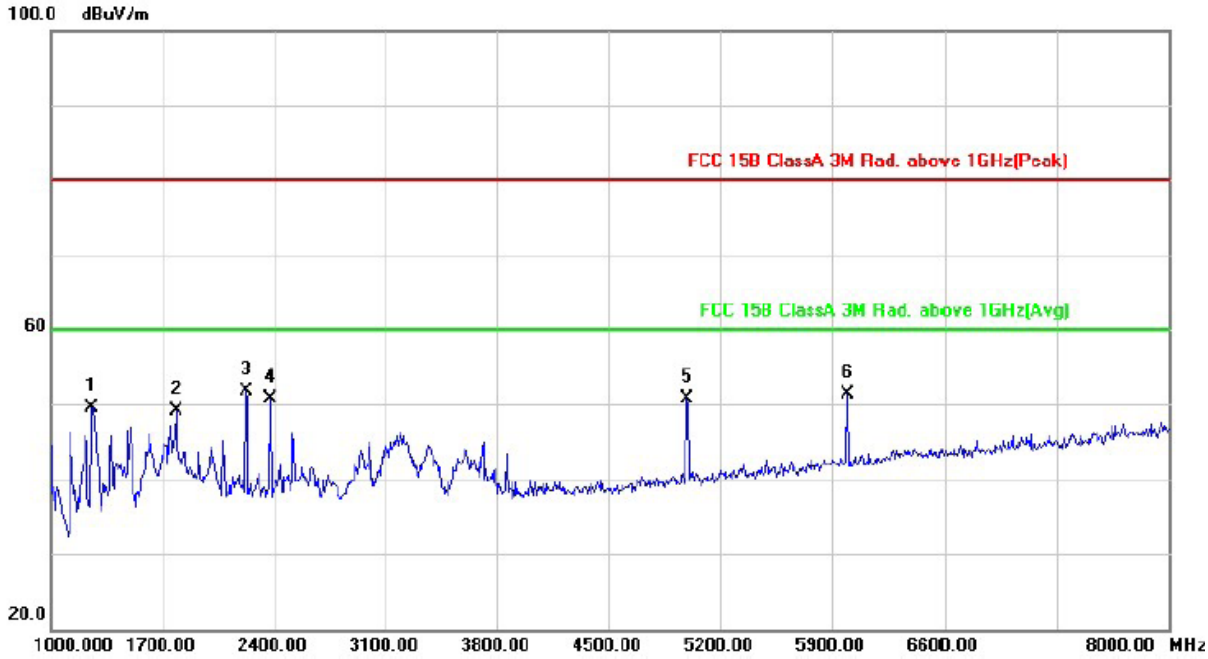
Test Voltage	120Vac, 60Hz	Frequency Range	30 – 1000 MHz
Environmental Conditions	24℃, 67% RH	6dB Bandwidth	120 kHz
Test Date	2018/10/24	Test Distance	3m
Tested by	Karwin Kao	Polarization	Horizontal
Test Site	W06	Test Mode	B



No.	Frequency (MHz)	Reading Level (dBuV)	Correct Factor (dB/m)	Measurement (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Height (cm)	Table Degree (degree)
1	99.8399	59.00	-15.06	43.94	50.00	-6.06	peak	200	4
2	125.0600	55.09	-12.23	42.86	50.00	-7.14	peak	145	360
3	312.2700	56.03	-9.14	46.89	57.00	-10.11	peak	100	121
4	500.4500	53.32	-4.78	48.54	57.00	-8.46	peak	200	99
5	593.5700	50.51	-2.77	47.74	57.00	-9.26	peak	200	204
6	624.6100	49.07	-2.18	46.89	57.00	-10.11	peak	100	327

Remark: 1. QP = Quasi Peak
2. Correction Factor = Antenna factor + Cable loss (Antenna to preamplifier) - preamplifier Gain + Cable loss (preamplifier to receiver)
3. Measurement Value = Reading Level + Correct Factor
4. Margin Level = Measurement Value - Limit Value

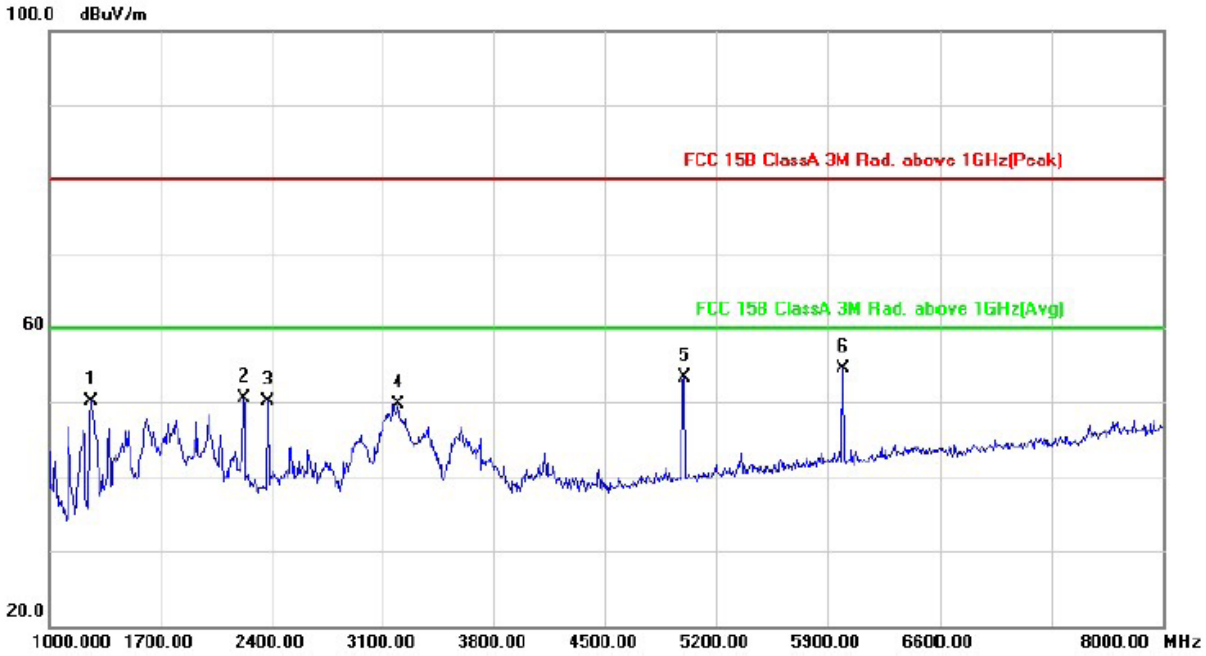
Test Voltage	120Vac, 60Hz	Frequency Range	1 – 8GHz
Environmental Conditions	24℃, 67% RH	6dB Bandwidth	1MHz
Test Date	2018/10/24	Test Distance	3m
Tested by	Karwin Kao	Polarization	Vertical
Test Site	W06	Test Mode	B



No.	Frequency (MHz)	Reading Level (dBuV)	Correct Factor (dB/m)	Measurement (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Height (cm)	Table Degree (degree)
1	1259.000	70.71	-21.16	49.55	80.00	-30.45	peak	200	203
2	1784.000	68.43	-19.38	49.05	80.00	-30.95	peak	100	5
3	2225.000	69.70	-17.95	51.75	80.00	-28.25	peak	100	223
4	2372.000	68.03	-17.34	50.69	80.00	-29.31	peak	200	175
5	4990.000	60.97	-10.25	50.72	80.00	-29.28	peak	200	194
6	5998.000	59.28	-7.99	51.29	80.00	-28.71	peak	200	223

Remark: 1. peak = Peak, AVG = Average
2. Correction Factor = Antenna factor + Cable loss (Antenna to preamplifier) - preamplifier Gain + Cable loss (preamplifier to receiver)
3. Measurement Value = Reading Level + Correct Factor
4. Margin Level = Measurement Value - Limit Value

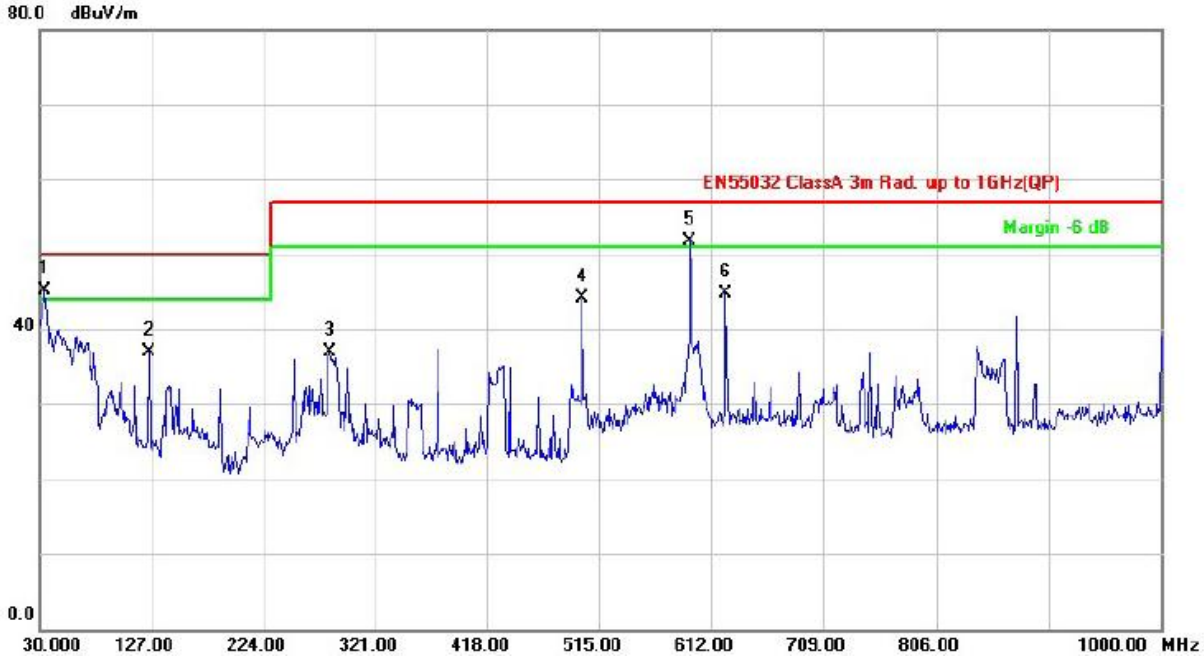
Test Voltage	120Vac, 60Hz	Frequency Range	1 – 8GHz
Environmental Conditions	24℃, 67% RH	6dB Bandwidth	1MHz
Test Date	2018/10/24	Test Distance	3m
Tested by	Karwin Kao	Polarization	Horizontal
Test Site	W06	Test Mode	B



No.	Frequency (MHz)	Reading Level (dBuV)	Correct Factor (dB/m)	Measurement (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Height (cm)	Table Degree (degree)
1	1266.000	71.27	-21.13	50.14	80.00	-29.86	peak	100	232
2	2225.000	68.49	-17.95	50.54	80.00	-29.46	peak	100	242
3	2379.000	67.36	-17.32	50.04	80.00	-29.96	peak	100	213
4	3198.000	64.61	-14.84	49.77	80.00	-30.23	peak	100	127
5	4997.000	63.44	-10.23	53.21	80.00	-26.79	peak	100	203
6	5998.000	62.51	-7.99	54.52	80.00	-25.48	peak	100	213

Remark: 1. peak = Peak, AVG = Average
2. Correction Factor = Antenna factor + Cable loss (Antenna to preamplifier) - preamplifier Gain + Cable loss (preamplifier to receiver)
3. Measurement Value = Reading Level + Correct Factor
4. Margin Level = Measurement Value - Limit Value

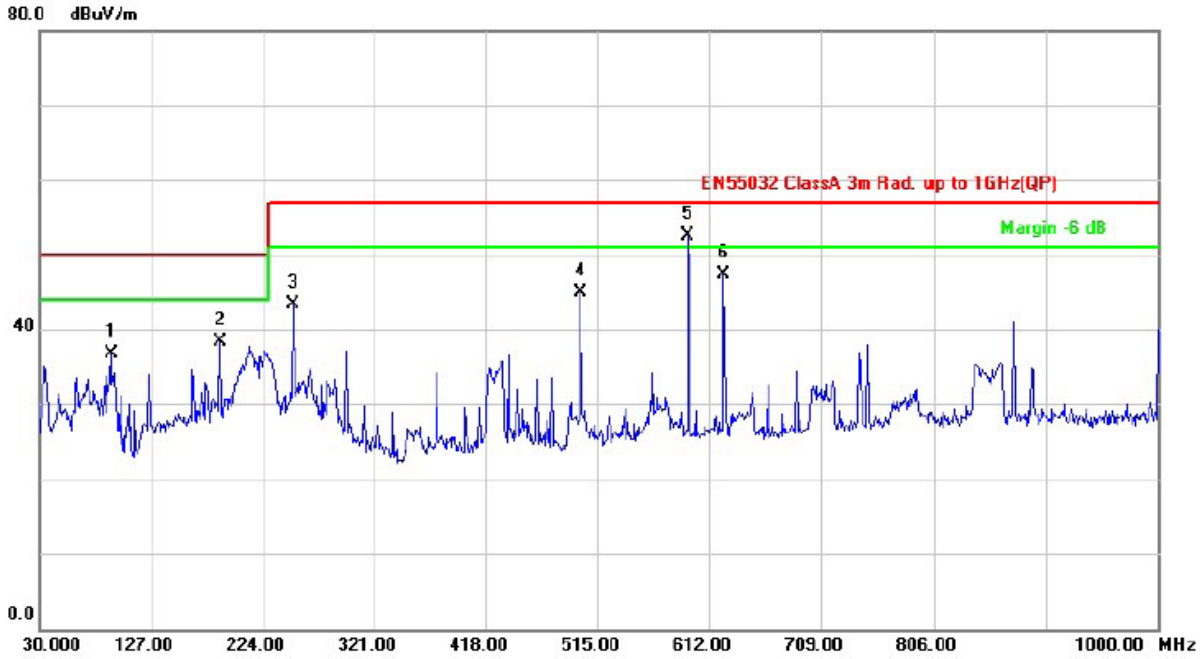
Test Voltage	120Vac, 60Hz	Frequency Range	30 – 1000 MHz
Environmental Conditions	24℃, 67% RH	6dB Bandwidth	120 kHz
Test Date	2018/10/24	Test Distance	3m
Tested by	Karwin Kao	Polarization	Vertical
Test Site	W06	Test Mode	C



No.	Frequency (MHz)	Reading Level (dBuV)	Correct Factor (dB/m)	Measurement (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Height (cm)	Table Degree (degree)
1	34.8500	55.65	-10.62	45.03	50.00	-4.97	peak	100	240
2	125.0600	49.15	-12.24	36.91	50.00	-13.09	peak	100	61
3	281.2300	46.76	-9.80	36.96	57.00	-20.04	peak	171	360
4	500.4499	48.86	-4.78	44.08	57.00	-12.92	peak	200	196
5	593.5700	54.47	-2.77	51.70	57.00	-5.30	peak	100	183
6	624.6100	46.95	-2.18	44.77	57.00	-12.23	peak	100	23

Remark: 1. QP = Quasi Peak
2. Correction Factor = Antenna factor + Cable loss (Antenna to preamplifier) - preamplifier Gain + Cable loss (preamplifier to receiver)
3. Measurement Value = Reading Level + Correct Factor
4. Margin Level = Measurement Value - Limit Value

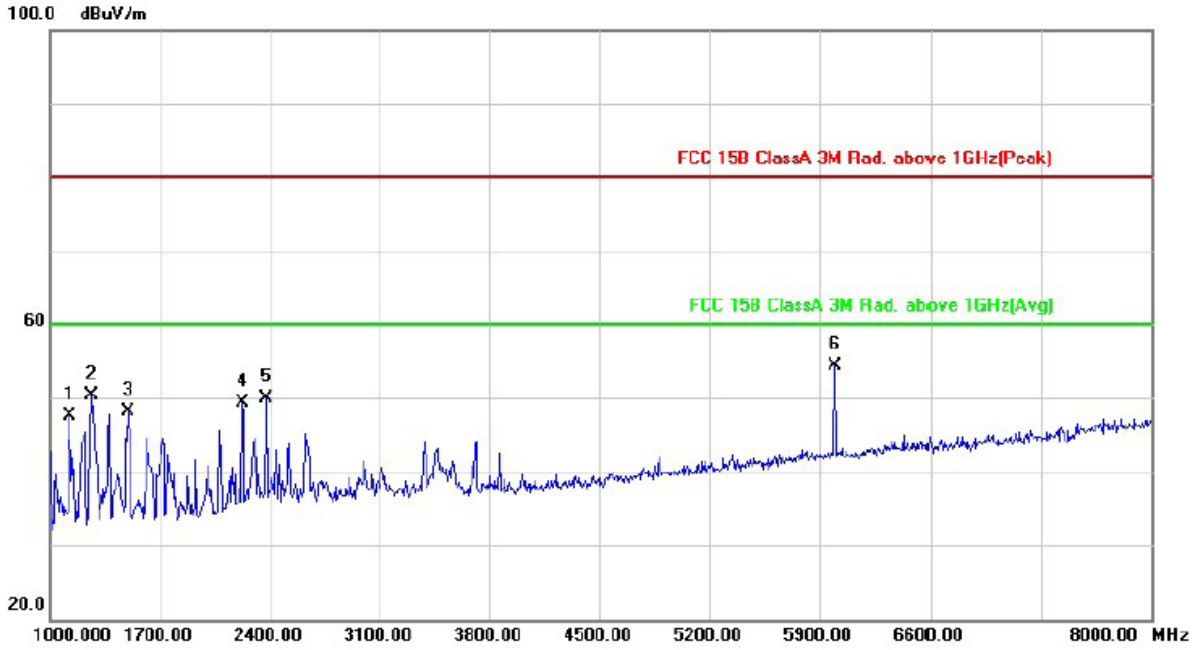
Test Voltage	120Vac, 60Hz	**Frequency Range**	30 – 1000 MHz
Environmental Conditions	24℃, 67% RH	**6dB Bandwidth**	120 kHz
Test Date	2018/10/24	**Test Distance**	3m
Tested by	Karwin Kao	**Polarization**	Horizontal
Test Site	W06	**Test Mode**	C



No.	Frequency (MHz)	Reading Level (dBuV)	Correct Factor (dB/m)	Measurement (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Height (cm)	Table Degree (degree)
1	92.0800	53.02	-16.26	36.76	50.00	-13.24	peak	200	52
2	187.1400	50.49	-12.25	38.24	50.00	-11.76	peak	200	268
3	250.1900	54.31	-11.03	43.28	57.00	-13.72	peak	100	186
4	500.4500	49.77	-4.78	44.99	57.00	-12.01	peak	100	328
5	593.5700	55.19	-2.77	52.42	57.00	-4.58	peak	200	155
6	624.6100	49.51	-2.18	47.33	57.00	-9.67	peak	200	316

Remark: 1. QP = Quasi Peak
2. Correction Factor = Antenna factor + Cable loss (Antenna to preamplifier) - preamplifier Gain + Cable loss (preamplifier to receiver)
3. Measurement Value = Reading Level + Correct Factor
4. Margin Level = Measurement Value - Limit Value

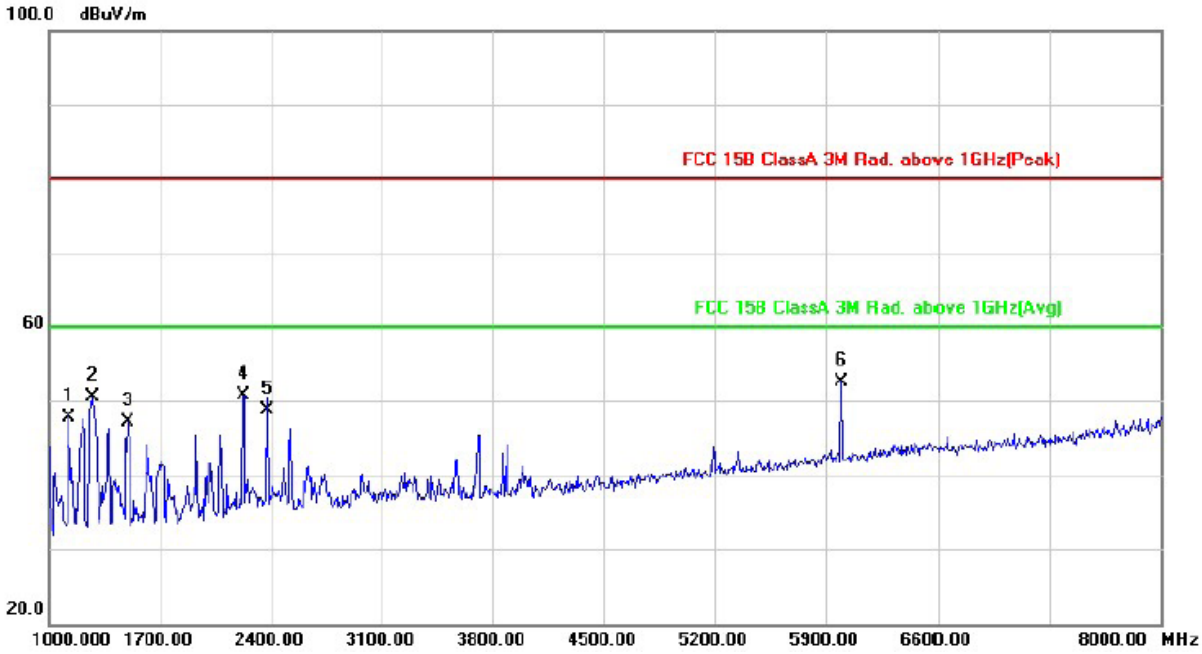
Test Voltage	120Vac, 60Hz	Frequency Range	1 – 8GHz
Environmental Conditions	24℃, 67% RH	6dB Bandwidth	1MHz
Test Date	2018/10/24	Test Distance	3m
Tested by	Karwin Kao	Polarization	Vertical
Test Site	W06	Test Mode	C



No.	Frequency (MHz)	Reading Level (dBuV)	Correct Factor (dB/m)	Measurement (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Height (cm)	Table Degree (degree)
1	1126.000	69.24	-21.79	47.45	80.00	-32.55	peak	200	167
2	1266.000	71.48	-21.13	50.35	80.00	-29.65	peak	200	186
3	1497.000	68.19	-20.06	48.13	80.00	-31.87	peak	200	309
4	2225.000	67.18	-17.95	49.23	80.00	-30.77	peak	200	139
5	2379.000	67.24	-17.32	49.92	80.00	-30.08	peak	200	186
6	5998.000	62.30	-7.99	54.31	80.00	-25.69	peak	200	157

Remark: 1. peak = Peak, AVG = Average
2. Correction Factor = Antenna factor + Cable loss (Antenna to preamplifier) - preamplifier Gain + Cable loss (preamplifier to receiver)
3. Measurement Value = Reading Level + Correct Factor
4. Margin Level = Measurement Value - Limit Value

Test Voltage	120Vac, 60Hz	Frequency Range	1 – 8GHz
Environmental Conditions	24℃, 67% RH	6dB Bandwidth	1MHz
Test Date	2018/10/24	Test Distance	3m
Tested by	Karwin Kao	Polarization	Horizontal
Test Site	W06	Test Mode	C



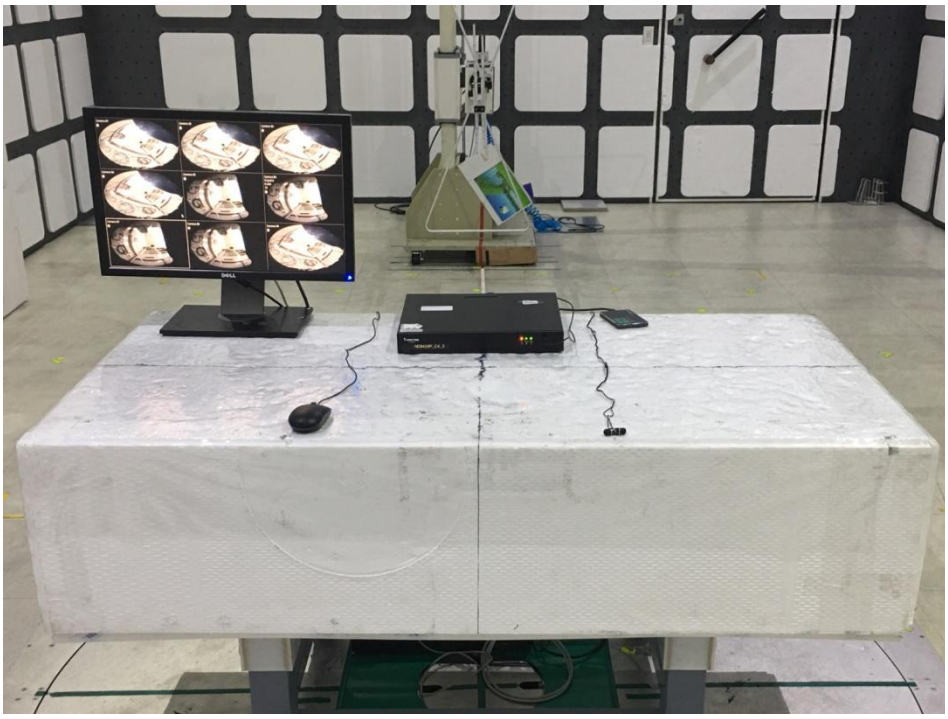
No.	Frequency (MHz)	Reading Level (dBuV)	Correct Factor (dB/m)	Measurement (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Height (cm)	Table Degree (degree)
1	1126.000	69.43	-21.79	47.64	80.00	-32.36	peak	100	138
2	1273.000	71.61	-21.09	50.52	80.00	-29.48	peak	100	119
3	1497.000	67.21	-20.06	47.15	80.00	-32.85	peak	100	233
4	2225.000	68.72	-17.95	50.77	80.00	-29.23	peak	100	242
5	2379.000	66.12	-17.32	48.80	80.00	-31.20	peak	100	242
6	5998.000	60.59	-7.99	52.60	80.00	-27.40	peak	100	233

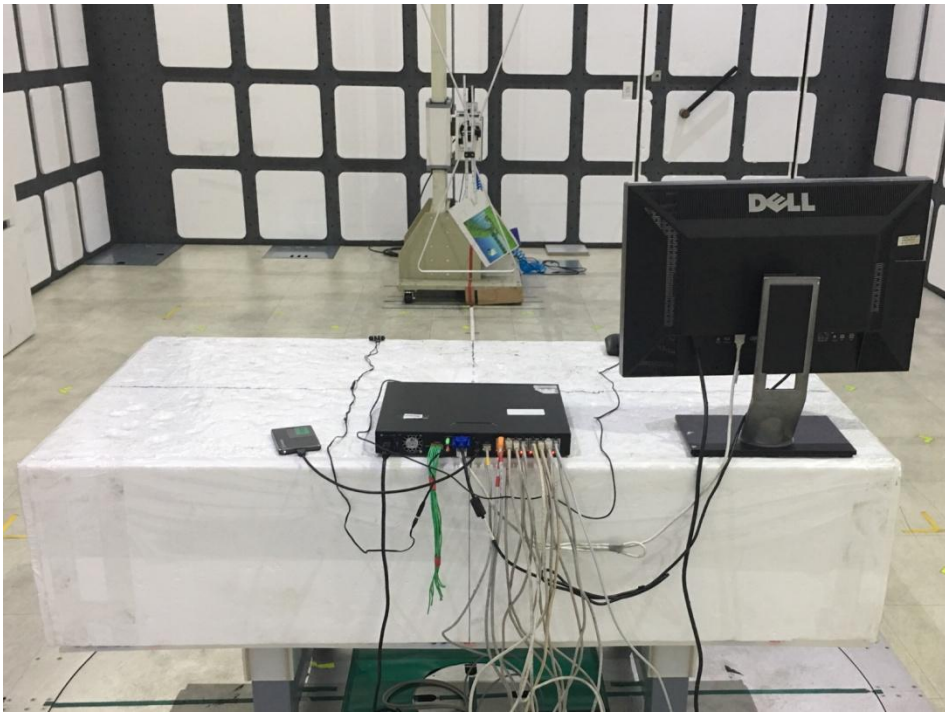
Remark: 1. peak = Peak, AVG = Average
2. Correction Factor = Antenna factor + Cable loss (Antenna to preamplifier) - preamplifier Gain + Cable loss (preamplifier to receiver)
3. Measurement Value = Reading Level + Correct Factor
4. Margin Level = Measurement Value - Limit Value

4.2.7 Photographs of Test Configuration

Radiated Emission Test (30MHz~1GHz)

Mode A

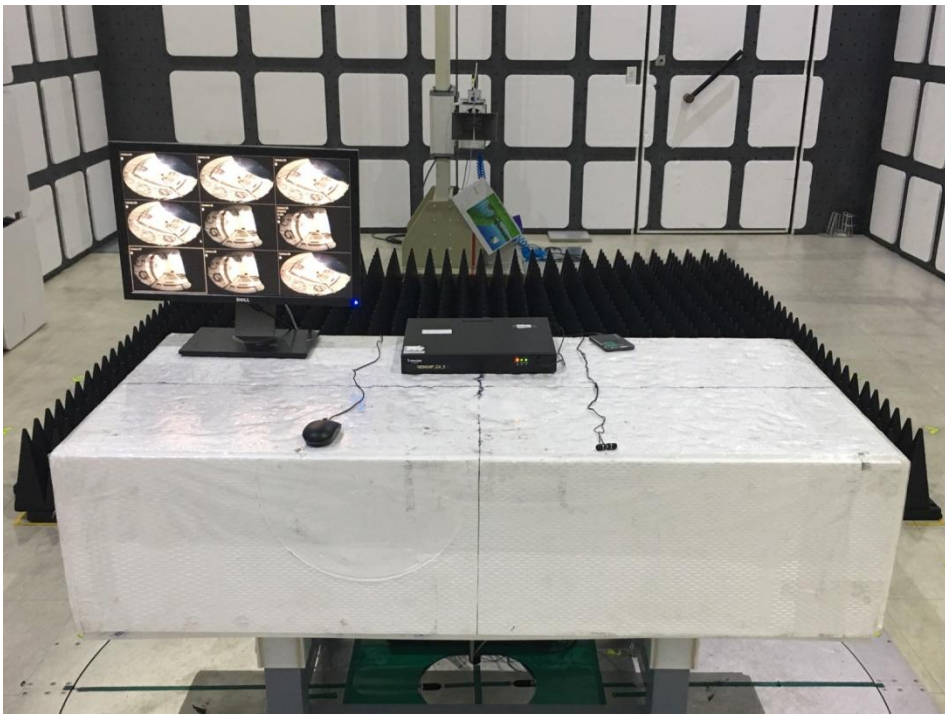


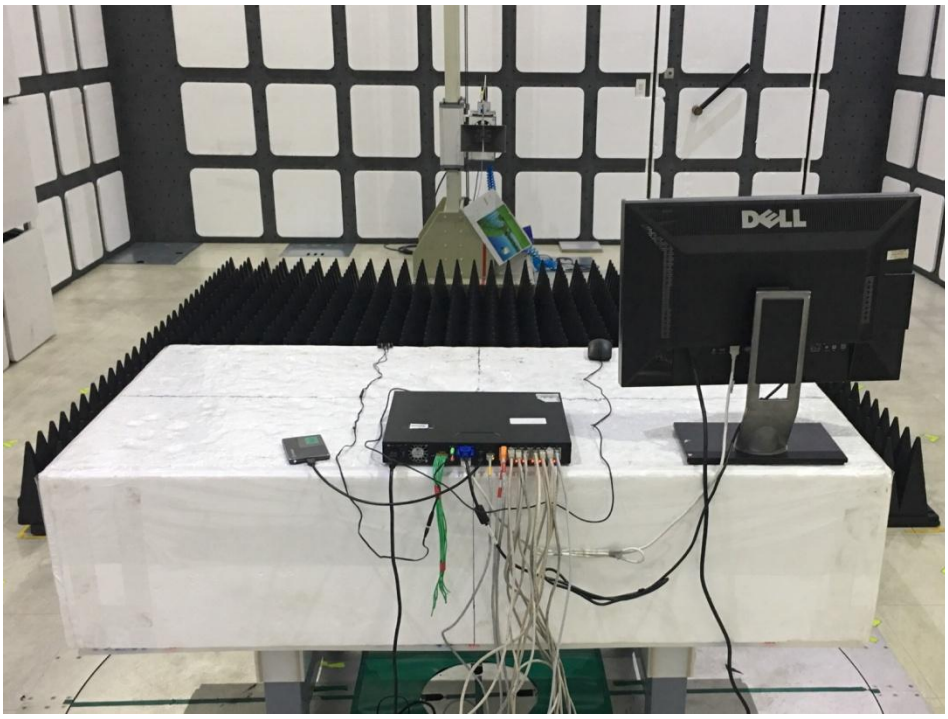


Mode B & C

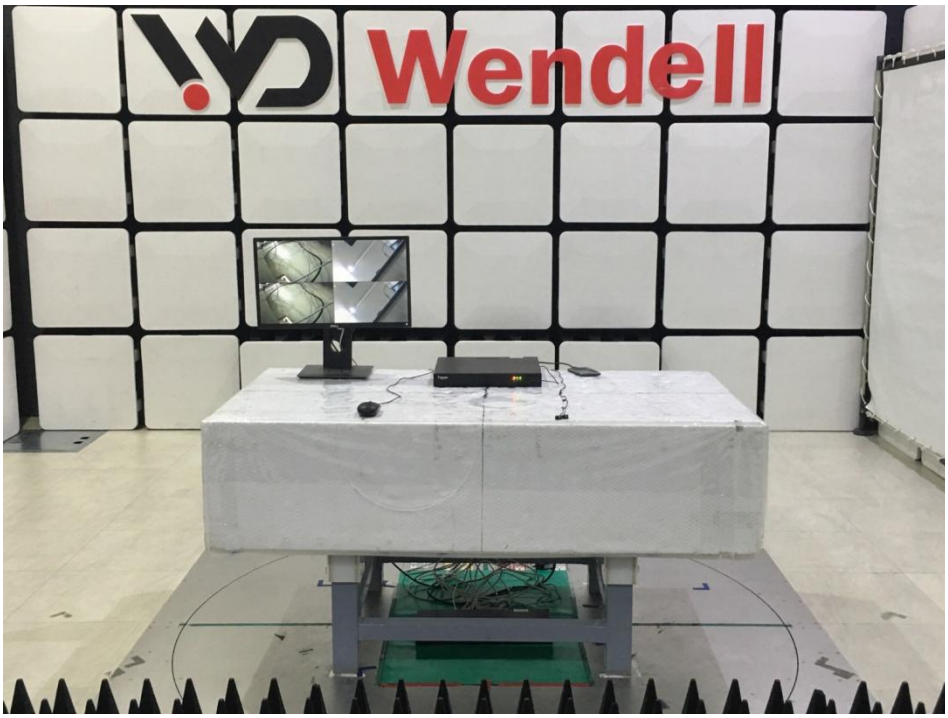
Radiated Emission Test (Above 1GHz)

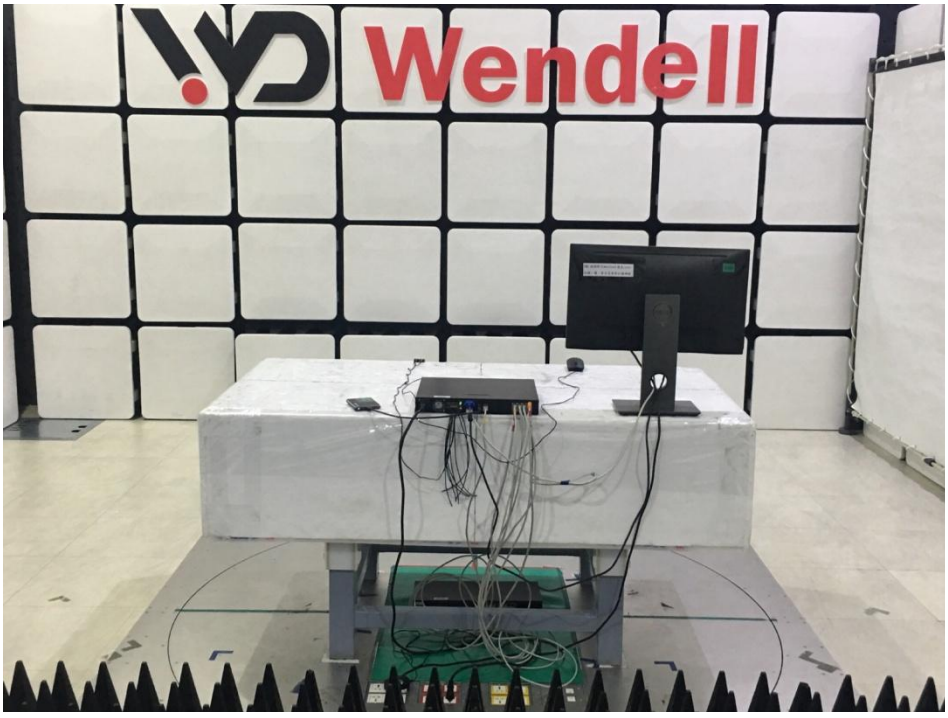
Mode A





Mode B & C





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