FCC Test Report

Report No.:	RF180828C01-2
FCC ID:	DMOM3IETWR
Test Model:	M3IETW R
Received Date:	Aug. 24, 2018
Test Date:	Aug. 31, 2018
Issued Date:	Sep. 10, 2018
Applicant:	Sennheiser electronic GmbH & Co. KG
Address:	Am Labor 1 D-30900 Wedemark, Germany
Issued By:	Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch
Lab Address:	No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan (R.O.C.)
Test Location:	No. 19, Hwa Ya 2nd Rd., Wen Hwa Vil., Kwei Shan Dist., Taoyuan City 33383, TAIWAN (R.O.C.)
FCC Registration / Designation Number:	788550 / TW0003

Testing Laboratory
2021

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Release Control Record

Issue No.	Description	Date Issued
RF180828C01-2	Original release	Sep. 10, 2018

1 Certificate of Conformity

Product:	MOMENTUM True Wireless (M3IETW)
Brand:	SENNHEISER
Test Model:	M3IETW R
Sample Status:	Engineering sample
Applicant:	Sennheiser electronic GmbH & Co. KG
Test Date:	Aug. 31, 2018
Standards:	47 CFR FCC Part 15, Subpart C (Section 15.209) ANSI C63.10: 2013

The above equipment has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's RF characteristics under the conditions specified in this report.

Prepared by : Celine Chou , **Date:** Sep. 10, 2018

Celine Chou / Senior Specialist

Approved by : Bruce Chen , **Date:** Sep. 10, 2018

Bruce Chen / Project Engineer

2 Summary of Test Results

47 CFR FCC Part 15, Subpart C (Section 15.209)			
FCC Clause	Test Item	Result	Remarks
15.207	AC Power Conducted Emission	Pass	Meet the requirement of limit. Minimum passing margin is -9.02dB at 0.46058MHz.
15.209	Radiated Emission Test	Pass	Meet the requirement of limit. Minimum passing margin is -18.3dB at 951.59MHz.

2.1 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

Measurement	Frequency	Expanded Uncertainty (k=2) (±)
Radiated Emissions up to 1 GHz	30MHz ~ 200MHz	3.59 dB
	200MHz ~ 1000MHz	3.60 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	MOMENTUM True Wireless (M3IETW)
Brand	SENNHEISER
Test Model	M3IETW R
Sample Status	Engineering sample
Power Supply Rating	5Vdc (from USB interface) 3.7Vdc (from battery)
Modulation Type	D8PSK
Operating Frequency	10.60MHz
Field Strength	41.59dBuV/m
Antenna Type	T-Coil antenna
Accessory Device	NA
Cable Supplied	0.2m shielded USB cable without core

Note:

1. The EUT system (M3IETW) contains the following devices:

Item	Brand	Model
Left Earbud	SENNHEISER	M3IETW L
Right Earbud	SENNHEISER	M3IETW R
Charging Case	SENNHEISER	M3IETW C

* M3IETW R with BT & BT LE TX/RX function + NFMI TX function

* M3IETW L with NFMI RX function only

* Charging case is solely used for charging M3IETW R and M3IETW L only

2. The EUT uses following charging case and battery.

Charging Case	
Brand	SENNHEISER
Model	M3IETW C
Input Rating	5Vdc, 650mA
Output Rating	5Vdc, 220mA

Battery for Charging Case	
Brand	SENNHEISER
Model	AHB702535PCT-01
Power Rating	3.7Vdc, 600mAh

Battery for Left Earbud	
Brand	VARTA
Model	CP1254 A3
Power Rating	3.7Vdc, 60mAh

Battery for Right Earbud	
Brand	VARTA
Model	CP1454 A3
Power Rating	3.7Vdc, 85mAh

3.2 Description of Test Modes

1 channel is provided to this EUT

Channel	Freq. (MHz)
1	10.60

3.2.1 Test Mode Applicability and Tested Channel Detail

EUT CONFIGURE MODE	APPLICABLE TO		DESCRIPTION
	RE	PLC	
A	√	-	EUT (Right Earbud, Model: M3IETW R + Left Earbud)
B	-	√	EUT (Right Earbud, Model: M3IETW R + Left Earbud + Charging case) + Adapter
C	-	√	EUT (Right Earbud, Model: M3IETW R + Left Earbud + Charging case) + Notebook

Where **RE<1G:** Radiated Emission **PLC:** Power Line Conducted Emission

Note:
1. The EUT had been pre-tested on the positioned of each 3 axis. The worst case was found when positioned on **Z-plane**.
2. No need to concern of Conducted Emission due to the EUT is powered by battery.

Radiated Emission Test:

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
☒ Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Available Channel	Tested Channel
A	1	1

Power Line Conducted Emission Test:

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
☒ Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Available Channel	Tested Channel
B, C	1	1

Test Condition:

Applicable To	Environmental Conditions	Input Power	Tested by
RE	25 deg. C, 69% RH	3.7Vdc	Noah Chang
PLC	22 deg. C, 66% RH	120Vac, 60Hz	Adair Peng

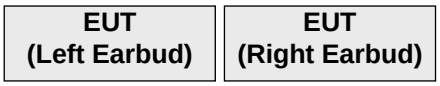
3.3 Description of Support Units

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

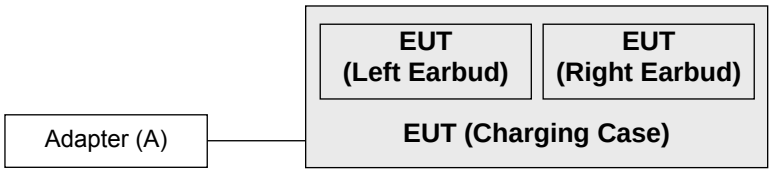
ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	Adapter	HTC	TC-P900-US	NA	NA	Not supplied
B.	Notebook	DELL	E5410	1HC2XM1	FCC DoC Approved	-

3.3.1 Configuration of System under Test

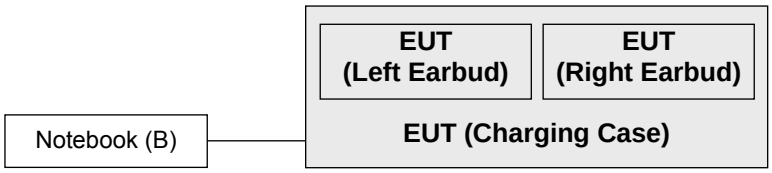
Test Mode A



Test Mode B



Test Mode C



3.4 General Description of Applied Standards

The EUT is a RF Product. According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

FCC Part 15, Subpart C (15.209)

ANSI C63.10-2013

All test items have been performed and recorded as per the above standards.

4 Test Types and Results

4.1 Radiated Emission and Bandedge Measurement

4.1.1 Limits of Radiated Emission and Bandedge Measurement

Radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a). Other emissions shall be at least 20dB below the highest level of the desired power.

Frequencies (MHz)	Field strength (microvolts/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

As shown in 15.35(b), for frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any Emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.

4.1.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Test Receiver KEYSIGHT	N9038A	MY55420137	Apr. 11, 2018	Apr. 10, 2019
Spectrum Analyzer ROHDE & SCHWARZ	FSP40	100269	May 29, 2018	May 28, 2019
BILOG Antenna SCHWARZBECK	VULB9168	9168-148	Dec. 11, 2017	Dec. 10, 2018
HORN Antenna SCHWARZBECK	BBHA 9120 D	9120D-1169	Dec. 12, 2017	Dec. 11, 2018
HORN Antenna SCHWARZBECK	BBHA 9170	BBHA9170241	Dec. 01, 2017	Nov. 30, 2018
Loop Antenna TESEQ	HLA 6121	45745	Jun. 14, 2018	Jun. 13, 2019
Preamplifier Agilent (Below 1GHz)	8447D	2944A10638	Aug. 08, 2018	Aug. 07, 2019
Preamplifier Agilent (Above 1GHz)	8449B	3008A01638	Feb. 22, 2018	Feb. 21, 2019
RF signal cable HUBER+SUHNER&EMCI	SUCOFLEX 104 & EMC104-SM-SM8000	CABLE-CH9-02 (248780+171006)	Jan. 15, 2018	Jan. 14, 2019
RF signal cable HUBER+SUHNER	SUCOFLEX 104	CABLE-CH9-(250795/4)	Aug. 08, 2018	Aug. 07, 2019
RF signal cable Woken	8D-FB	Cable-CH9-01	Jul. 31, 2018	Jul. 30, 2019
Software BV ADT	ADT_Radiated_ V7.6.15.9.5	NA	NA	NA
Antenna Tower EMCO	2070/2080	512.835.4684	NA	NA
Turn Table EMCO	2087-2.03	NA	NA	NA
Antenna Tower &Turn BV ADT	AT100	AT93021705	NA	NA
Turn Table BV ADT	TT100	TT93021705	NA	NA
Turn Table Controller BV ADT	SC100	SC93021705	NA	NA
Boresight Antenna Fixture	FBA-01	FBA-SIP01	NA	NA

Note: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in HwaYa Chamber 9.
3. The FCC Designation Number is TW0003. The number will be varied with the Lab location and scope as attached.
4. The IC Site Registration No. is IC 7450F-9.

4.1.3 Test Procedures

For Radiated emission below 30MHz

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.

b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

c. Parallel, perpendicular, and ground-parallel orientations of the antenna are set to make the measurement.

d. For each suspected emission, the EUT was arranged to its worst case and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

e. The test-receiver system was set to Quasi-Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

Note:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9kHz at frequency below 30MHz.
2. The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9–90 kHz, 110–490 kHz . Radiated emission limits in these two bands are based on measurements employing an average detector.

For Radiated emission above 30MHz

a. The EUT was placed on the top of a rotating table 0.8 meters (for below 1GHz) / 1.5 meters (for above 1GHz) above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.

b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

c. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

e. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.

f. The test-receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

Note:

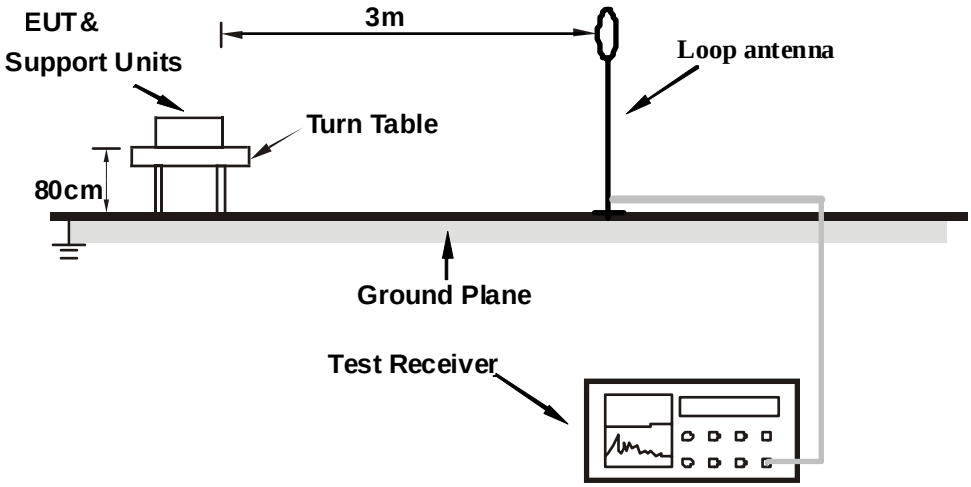
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. All modes of operation were investigated and the worst-case emissions are reported.

4.1.4 Deviation from Test Standard

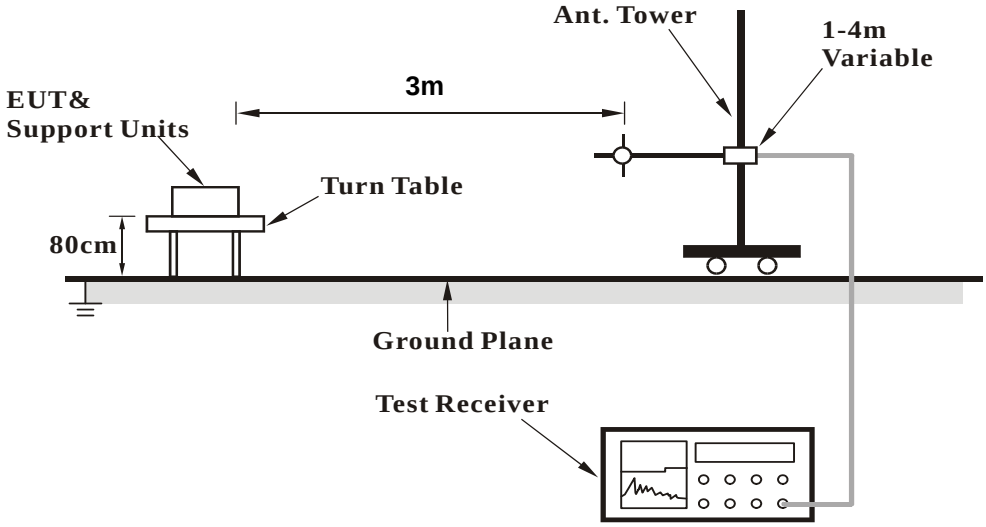
No deviation.

4.1.5 Test Set Up

For Radiated emission below 30MHz



For Radiated emission 30MHz to 1GHz



For the actual test configuration, please refer to the attached file (Test Setup Photo).

4.1.6 EUT Operating Conditions

a. Set the EUT under transmission condition continuously at specific channel frequency.

4.1.7 Test Results

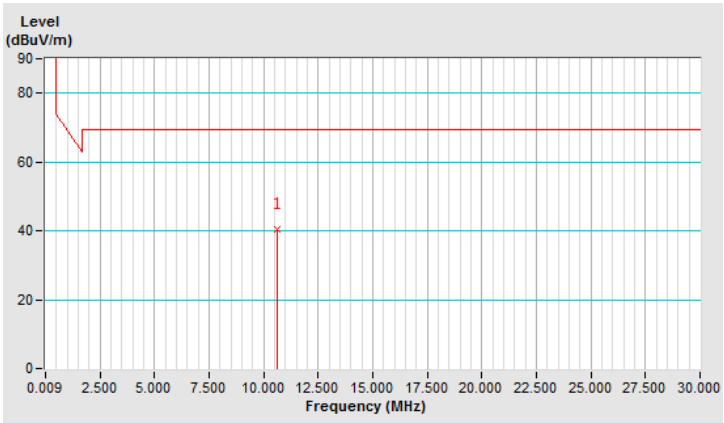
Below 30MHz Data:

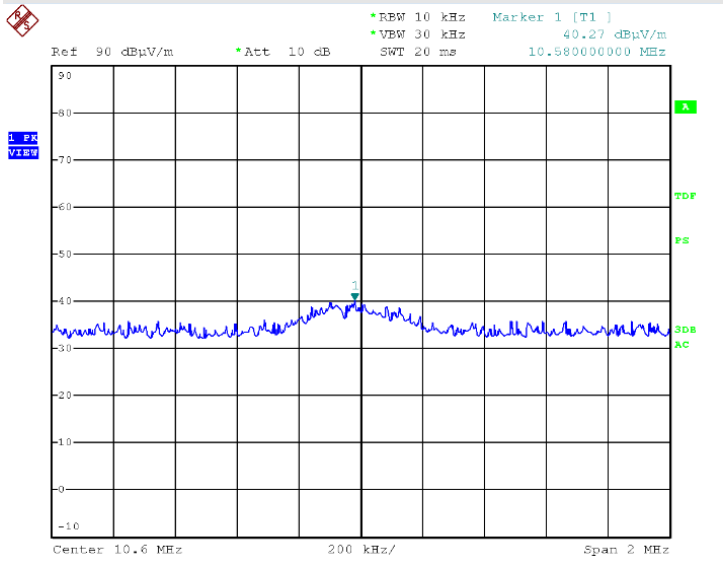
Channel	TX Channel 1	Detector Function	Quasi-Peak
Frequency Range	9 kHz ~ 30 MHz		

ANTENNA POLARITY & TEST DISTANCE: LOOP ANTENNA OPEN AT 3m								
No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*10.60	40.27	69.54	-29.27	1.00	293	18.48	21.79

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.
6. Loop antenna was used for all radiated emission below 30MHz.
7. Limit @3m=Limit@300m+40log(300 / 3)=Limit@300m+80
8. Limit @3m=Limit@30m+40log(30 / 3)=Limit@30m+40



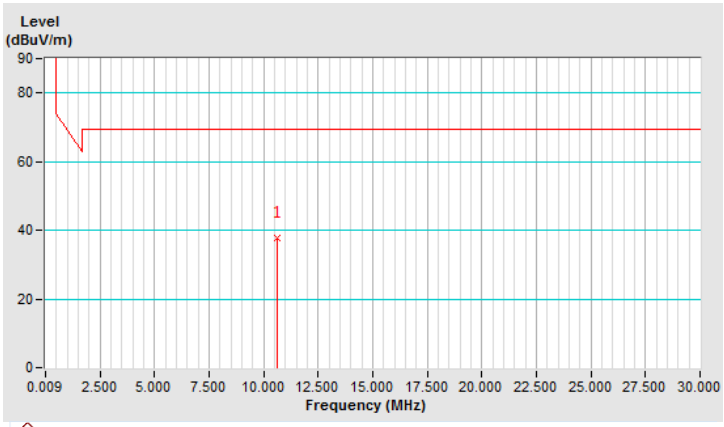


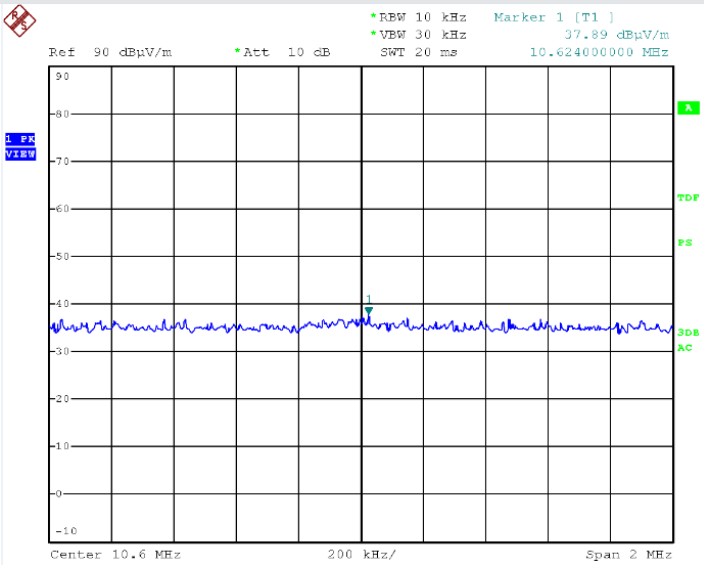
Channel	TX Channel 1	Detector Function	Quasi-Peak
Frequency Range	9 kHz ~ 30 MHz		

ANTENNA POLARITY & TEST DISTANCE: LOOP ANTENNA CLOSE AT 3m								
No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*10.60	37.89	69.54	-31.65	1.00	152	16.10	21.79

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.
6. Loop antenna was used for all radiated emission below 30MHz.
7. Limit @3m=Limit@300m+40log(300 / 3)=Limit@300m+80
8. Limit @3m=Limit@30m+40log(30 / 3)=Limit@30m+40



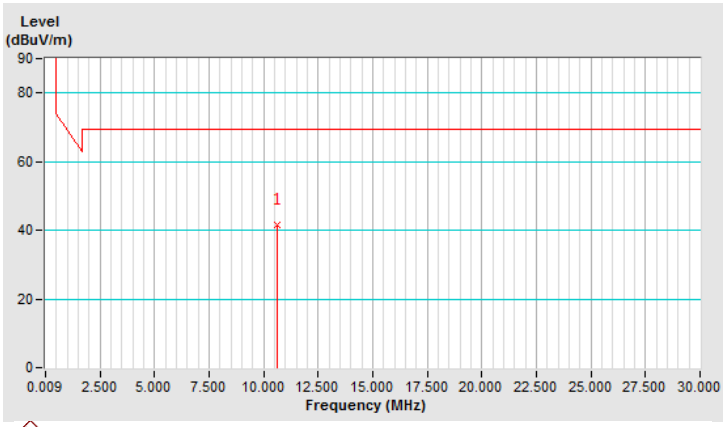


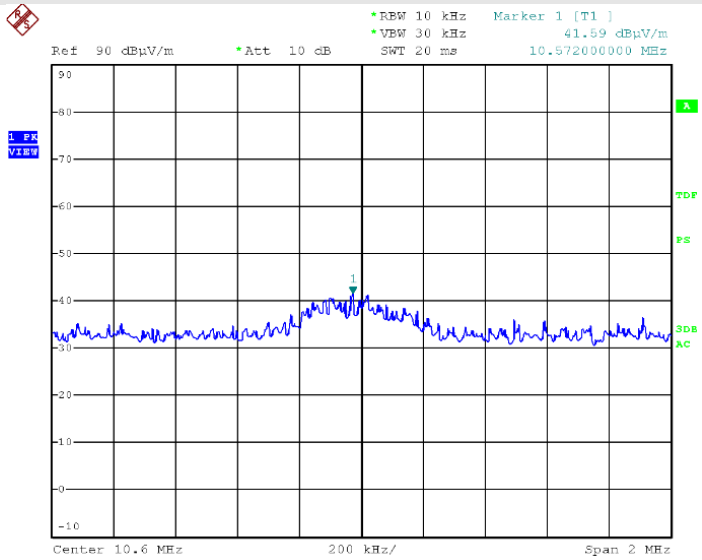
Channel	TX Channel 1	Detector Function	Quasi-Peak
Frequency Range	9 kHz ~ 30 MHz		

ANTENNA POLARITY & TEST DISTANCE: LOOP ANTENNA GROUND-PARALLEL AT 3M								
No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*10.60	41.59	69.54	-27.95	1.00	200	19.80	21.79

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.
6. Loop antenna was used for all radiated emission below 30MHz.
7. Limit @3m=Limit@300m+40log(300 / 3)=Limit@300m+80
8. Limit @3m=Limit@30m+40log(30 / 3)=Limit@30m+40



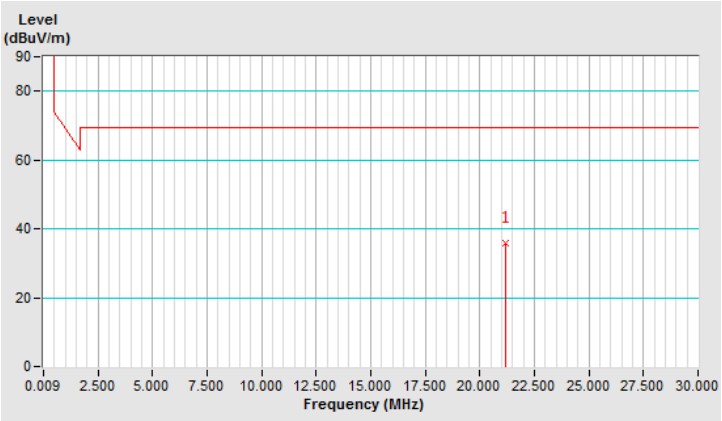


Channel	TX Channel 1	Detector Function	Quasi-Peak
Frequency Range	9 kHz ~ 30 MHz		

ANTENNA POLARITY & TEST DISTANCE: LOOP ANTENNA OPEN AT 3m								
No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	21.20	35.87	69.54	-33.67	1.00	189	13.98	21.89

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.
6. Loop antenna was used for all radiated emission below 30MHz.
7. Limit @3m=Limit@300m+40log(300 / 3)=Limit@300m+80
8. Limit @3m=Limit@30m+40log(30 / 3)=Limit@30m+40

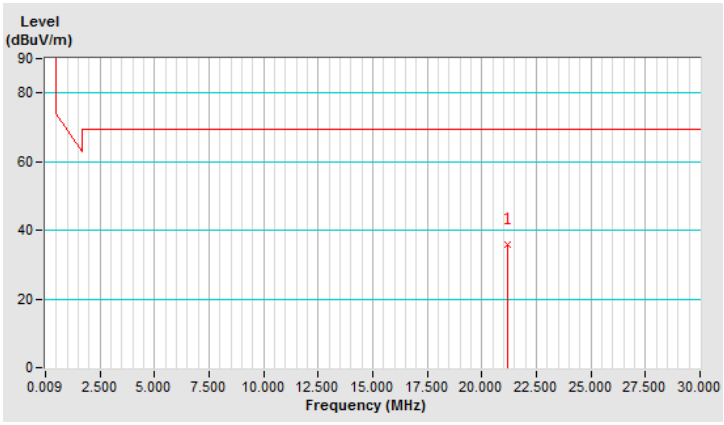


Channel	TX Channel 1	Detector Function	Quasi-Peak
Frequency Range	9 kHz ~ 30 MHz		

ANTENNA POLARITY & TEST DISTANCE: LOOP ANTENNA CLOSE AT 3m								
No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	21.20	35.81	69.54	-33.73	1.00	351	13.92	21.89

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.
6. Loop antenna was used for all radiated emission below 30MHz.
7. Limit @3m=Limit@300m+40log(300 / 3)=Limit@300m+80
8. Limit @3m=Limit@30m+40log(30 / 3)=Limit@30m+40

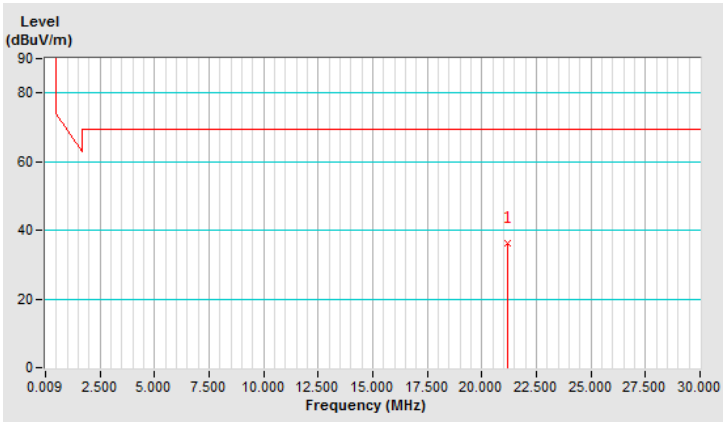


Channel	TX Channel 1	Detector Function	Quasi-Peak
Frequency Range	9 kHz ~ 30 MHz		

ANTENNA POLARITY & TEST DISTANCE: LOOP ANTENNA GROUND-PARALLEL AT 3M								
No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	21.20	36.21	69.54	-33.33	1.00	25	14.32	21.89

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.
6. Loop antenna was used for all radiated emission below 30MHz.
7. Limit @3m=Limit@300m+40log(300 / 3)=Limit@300m+80
8. Limit @3m=Limit@30m+40log(30 / 3)=Limit@30m+40



Channel	TX Channel 1	Detector Function	Quasi-Peak
Frequency Range	9 kHz ~ 30 MHz		

ANTENNA POLARITY & TEST DISTANCE: LOOP ANTENNA OPEN AT 3m								
No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	1.03	38.50	67.36	-28.86	1.00	62	18.46	20.04
2	2.35	37.12	69.54	-32.42	1.00	62	17.43	19.69
3	6.67	36.81	69.54	-32.73	1.00	185	15.85	20.96
4	10.33	36.18	69.54	-33.36	1.00	139	14.39	21.79
5	20.28	35.44	69.54	-34.10	1.00	102	13.58	21.86
6	27.84	35.81	69.54	-33.73	1.00	37	13.69	22.12

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
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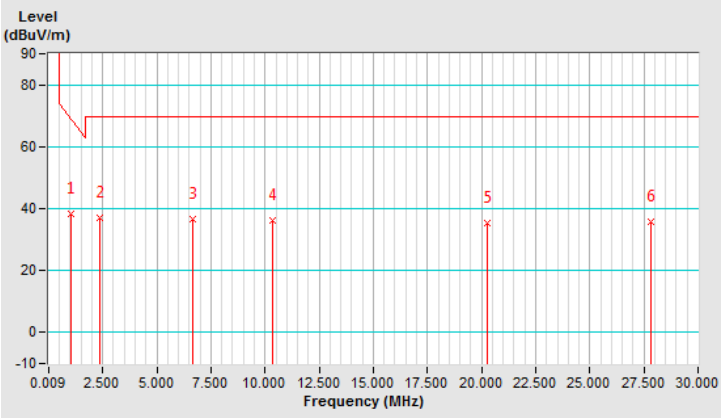
7. Limit @3m=Limit@300m+40log(300 / 3)=Limit@300m+80
8. Limit @3m=Limit@30m+40log(30 / 3)=Limit@30m+40

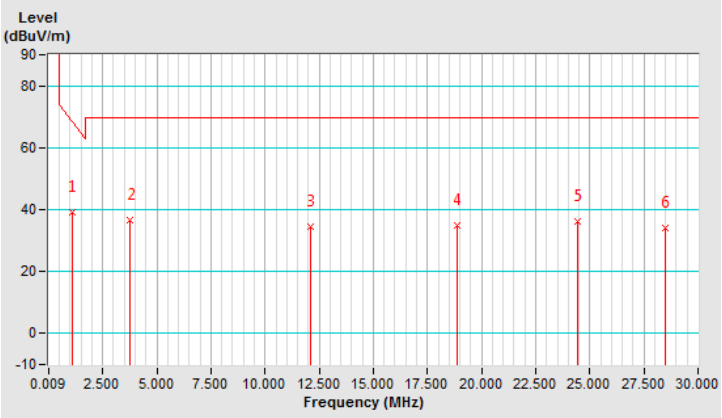


Channel	TX Channel 1	Detector Function	Quasi-Peak
Frequency Range	9 kHz ~ 30 MHz		

ANTENNA POLARITY & TEST DISTANCE: LOOP ANTENNA CLOSE AT 3m								
No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	1.09	39.18	66.87	-27.69	1.00	302	19.15	20.03
2	3.79	36.44	69.54	-33.10	1.00	289	16.52	19.92
3	12.13	34.45	69.54	-35.09	1.00	63	12.65	21.80
4	18.90	34.83	69.54	-34.71	1.00	90	12.99	21.84
5	24.42	36.12	69.54	-33.42	1.00	91	14.12	22.00
6	28.50	34.08	69.54	-35.46	1.00	165	11.93	22.15

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.
6. Loop antenna was used for all radiated emission below 30MHz.
7. Limit @3m=Limit@300m+40log(300 / 3)=Limit@300m+80
8. Limit @3m=Limit@30m+40log(30 / 3)=Limit@30m+40

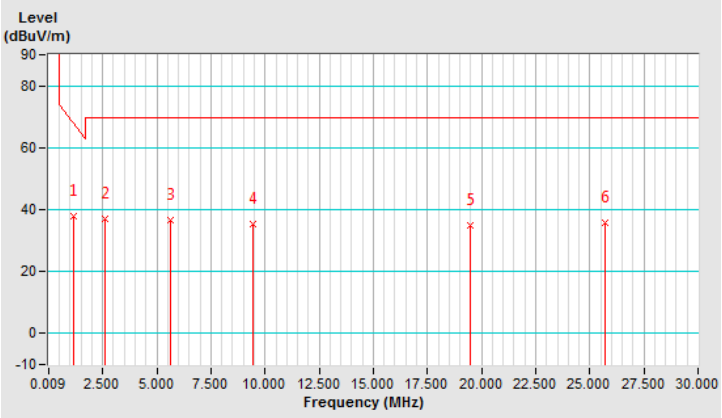


Channel	TX Channel 1	Detector Function	Quasi-Peak
Frequency Range	9 kHz ~ 30 MHz		

ANTENNA POLARITY & TEST DISTANCE: LOOP ANTENNA GROUND-PARALLEL AT 3M								
No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	1.15	37.94	66.40	-28.46	1.00	258	17.93	20.01
2	2.59	37.09	69.54	-32.45	1.00	213	17.47	19.62
3	5.65	36.79	69.54	-32.75	1.00	234	16.09	20.70
4	9.43	35.25	69.54	-34.29	1.00	236	13.60	21.65
5	19.50	34.79	69.54	-34.75	1.00	19	12.94	21.85
6	25.68	35.95	69.54	-33.59	1.00	247	13.90	22.05

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.
6. Loop antenna was used for all radiated emission below 30MHz.
7. Limit @3m=Limit@300m+40log(300 / 3)=Limit@300m+80
8. Limit @3m=Limit@30m+40log(30 / 3)=Limit@30m+40



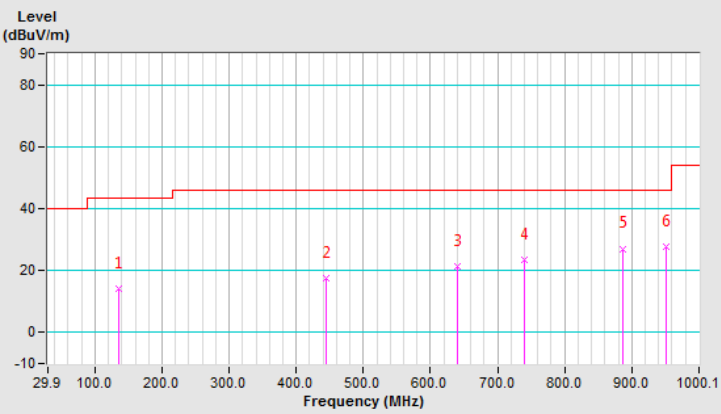
Below 1GHz Data:

Channel	TX Channel 1	Detector Function	Quasi-Peak
Frequency Range	30 MHz ~ 1GHz		

Antenna Polarity & Test Distance: Horizontal At 3m								
No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	134.68	14.0 QP	43.5	-29.5	1.50 H	66	23.7	-9.7
2	445.15	17.7 QP	46.0	-28.3	1.00 H	304	23.3	-5.6
3	641.13	21.5 QP	46.0	-24.5	1.00 H	58	23.0	-1.5
4	740.09	23.6 QP	46.0	-22.4	1.00 H	48	22.7	0.9
5	887.56	27.1 QP	46.0	-18.9	2.00 H	10	23.8	3.3
6	**951.59**	**27.7 QP**	**46.0**	**-18.3**	**1.00 H**	**103**	**23.2**	**4.5**

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value

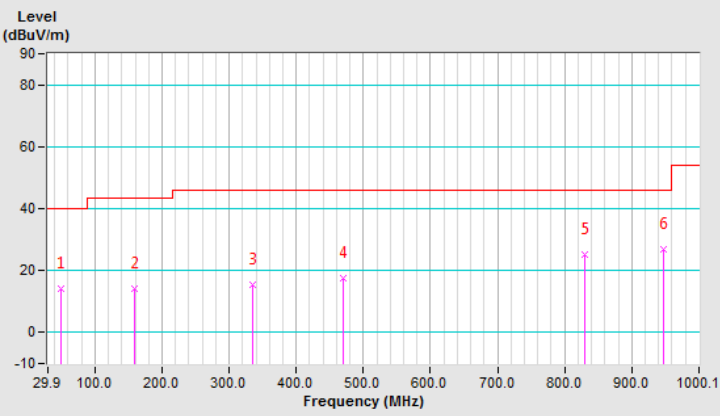


Channel	TX Channel 1	Detector Function	Quasi-Peak
Frequency Range	30 MHz ~ 1GHz		

Antenna Polarity & Test Distance: Vertical At 3m								
No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	49.30	14.2 QP	40.0	-25.8	1.50 V	304	22.8	-8.6
2	159.91	14.0 QP	43.5	-29.5	1.00 V	272	22.6	-8.6
3	334.54	15.6 QP	46.0	-30.4	1.00 V	208	22.9	-7.3
4	470.37	17.7 QP	46.0	-28.3	1.00 V	97	22.9	-5.2
5	829.34	25.0 QP	46.0	-21.0	1.50 V	35	22.5	2.5
6	947.71	26.9 QP	46.0	-19.1	1.00 V	106	22.4	4.5

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value



4.2 Conducted Emission Measurement

4.2.1 Limits of Conducted Emission Measurement

Frequency (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15 - 0.5	66 - 56	56 - 46
0.50 - 5.0	56	46
5.0 - 30.0	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 0.50MHz.

4.2.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Test Receiver ROHDE & SCHWARZ	ESCI	100613	Nov. 23, 2017	Nov. 22, 2018
RF signal cable Woken	5D-FB	Cable-cond1-01	Sep. 05, 2018	Sep. 04, 2019
LISN ROHDE & SCHWARZ (EUT)	ENV216	101826	Feb. 26, 2018	Feb. 25, 2019
LISN ROHDE & SCHWARZ (Peripheral)	ESH3-Z5	100311	Aug. 19, 2018	Aug. 18, 2019
Software ADT	BV ADT_Cond_ V7.3.7.4	NA	NA	NA

Note: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in HwaYa Shielded Room 1.
3. The VCCI Site Registration No. is C-2040.

4.2.3 Test Procedures

a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument.

b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.

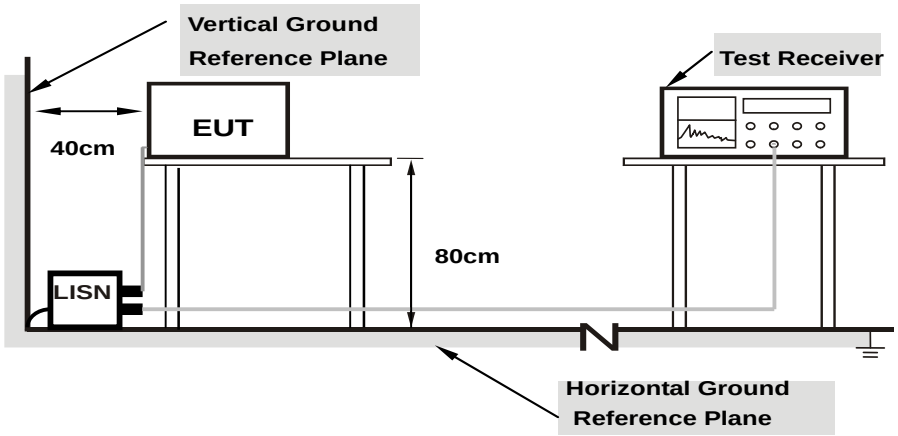
c. The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

Note: The resolution bandwidth and video bandwidth of test receiver is 9kHz for quasi-peak detection (QP) and average detection (AV) at frequency 0.15MHz-30MHz.

4.2.4 Deviation from Test Standard

No deviation.

4.2.5 Test Setup



Note: 1.Support units were connected to second LISN.

For the actual test configuration, please refer to the attached file (Test Setup Photo).

4.2.6 EUT Operating Conditions

Same as 4.1.6.

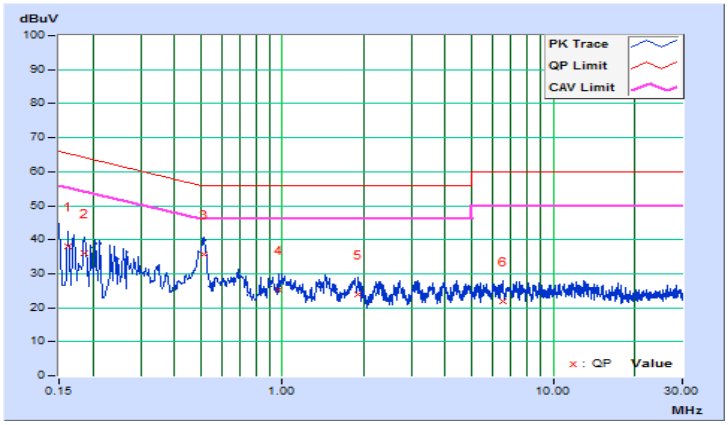
4.2.7 Test Results

Phase	Line (L)	Detector Function	Quasi-Peak (QP) / Average (AV)
Test Mode	B		

No	Freq.	Corr. Factor	Reading Value		Emission Level		Limit		Margin	
			[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.16173	19.68	18.37	3.38	38.05	23.06	65.37	55.37	-27.32	-32.31
2	0.18519	19.67	16.33	2.27	36.00	21.94	64.25	54.25	-28.25	-32.31
3	0.51719	19.69	16.13	10.72	35.82	30.41	56.00	46.00	-20.18	-15.59
4	0.97501	19.64	5.55	2.54	25.19	22.18	56.00	46.00	-30.81	-23.82
5	1.91341	19.69	4.36	2.11	24.05	21.80	56.00	46.00	-31.95	-24.20
6	6.55067	19.79	2.13	1.23	21.92	21.02	60.00	50.00	-38.08	-28.98

Remarks:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level - Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value.

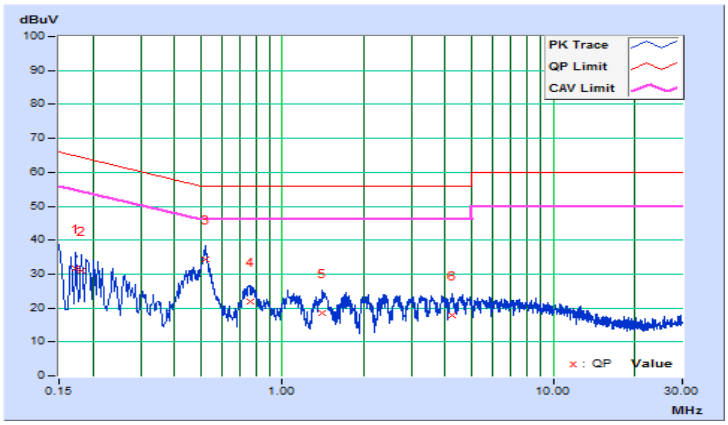


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)
Test Mode	B		

No	Freq.	Corr. Factor	Reading Value		Emission Level		Limit		Margin	
			[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.17346	10.11	21.65	8.23	31.76	18.34	64.79	54.79	-33.03	-36.45
2	0.18128	10.10	20.95	7.64	31.05	17.74	64.43	54.43	-33.38	-36.69
3	0.52130	10.09	24.15	18.56	34.24	28.65	56.00	46.00	-21.76	-17.35
4	0.75996	10.12	11.65	6.74	21.77	16.86	56.00	46.00	-34.23	-29.14
5	1.40902	10.16	8.42	3.95	18.58	14.11	56.00	46.00	-37.42	-31.89
6	4.25159	10.32	7.54	2.38	17.86	12.70	56.00	46.00	-38.14	-33.30

Remarks:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level - Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value.

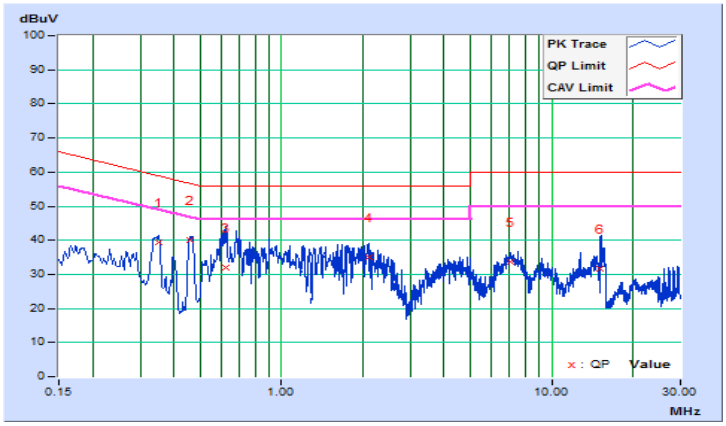


Phase	Line (L)	Detector Function	Quasi-Peak (QP) / Average (AV)
Test Mode	C		

No	Freq.	Corr. Factor	Reading Value		Emission Level		Limit		Margin	
			[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.34941	10.17	29.19	23.76	39.36	33.93	58.98	48.98	-19.62	-15.05
2	**0.46058**	**10.18**	**29.98**	**27.48**	**40.16**	**37.66**	**56.68**	**46.68**	**-16.52**	**-9.02**
3	0.62311	10.19	21.80	17.38	31.99	27.57	56.00	46.00	-24.01	-18.43
4	2.10109	10.24	24.82	11.83	35.06	22.07	56.00	46.00	-20.94	-23.93
5	7.02769	10.52	23.10	14.78	33.62	25.30	60.00	50.00	-26.38	-24.70
6	15.18786	11.01	20.68	12.32	31.69	23.33	60.00	50.00	-28.31	-26.67

Remarks:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level - Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value.

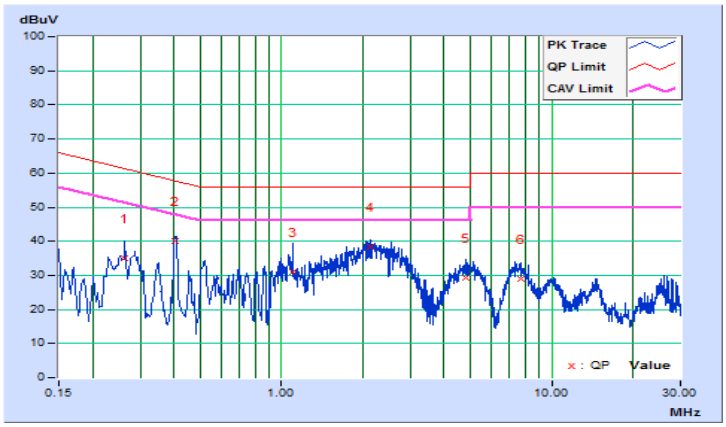


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)
Test Mode	C		

No	Freq.	Corr. Factor	Reading Value		Emission Level		Limit		Margin	
			[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.26339	10.13	24.93	15.05	35.06	25.18	61.32	51.32	-26.26	-26.14
2	0.40479	10.14	30.04	28.46	40.18	38.60	57.75	47.75	-17.57	-9.15
3	1.10404	10.22	20.91	13.22	31.13	23.44	56.00	46.00	-24.87	-22.56
4	2.14801	10.27	28.03	17.11	38.30	27.38	56.00	46.00	-17.70	-18.62
5	4.79508	10.40	19.00	10.57	29.40	20.97	56.00	46.00	-26.60	-25.03
6	7.73931	10.52	18.58	10.14	29.10	20.66	60.00	50.00	-30.90	-29.34

Remarks:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level - Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value.



5 Pictures of Test Arrangements

Please refer to the attached file (Test Setup Photo).

6 Construction Photos of EUT

Please refer to the attached file (180828C01 (EUT photo)).

Appendix – Information on the Testing Laboratories

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are FCC recognized accredited test firms and accredited and approved according to ISO/IEC 17025.

If you have any comments, please feel free to contact us at the following:

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Hwa Ya EMC/RF/Safety Lab
Tel: 886-3-3183232
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Email: service.adt@tw.bureauveritas.com
Web Site: www.bureauveritas-adt.com

The address and road map of all our labs can be found in our web site also.

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