

FCC Test Report

Report No.: RF151202D02

FCC ID: NRIHS150900

Test Model: LMS-509

Series Model: LMS-509(X)(Y)(Z)
(where (X) may be A-Z, 0-9 or blank ; (Y) may be A-Z, 0-9 or blank ; (Z) may be A-Z, 0-9 or blank.)

Received Date: Dec. 2, 2015

Test Date: Apr. 6, 2016

Issued Date: Jun. 15, 2017

Applicant: IR-TEC International Ltd.

Address: 6 Rong An Road, Luzhu Taoyuan 33852, TAIWAN

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.)



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Table of Contents

Release Control Record	3
1 Certificate of Conformity	4
2 Summary of Test Results	5
2.1 Measurement Uncertainty	5
2.2 Modification Record	5
3 General Information	6
3.1 General Description of EUT	6
3.2 Description of Test Modes	6
3.2.1 Test Mode Applicability and Tested Channel Detail	7
3.3 Description of Support Units	8
3.3.1 Configuration of System under Test	8
3.4 General Description of Applied Standards	8
4 Test Types and Results	9
4.1 Radiated Emission and Bandedge Measurement	9
4.1.1 Limits of Radiated Emission and Bandedge Measurement	9
4.1.2 Test Instruments	10
4.1.3 Test Procedures	11
4.1.4 Deviation from Test Standard	11
4.1.5 Test Set Up	12
4.1.6 EUT Operating Conditions	12
4.1.7 Test Results	13
4.2 Conducted Emission Measurement	15
4.2.1 Limits of Conducted Emission Measurement	15
4.2.2 Test Instruments	15
4.2.3 Test Procedures	16
4.2.4 Deviation from Test Standard	16
4.2.5 Test Setup	16
4.2.6 EUT Operating Conditions	16
4.2.7 Test Results	17
5 Pictures of Test Arrangements	19
Appendix – Information on the Testing Laboratories	20

Release Control Record

Issue No.	Description	Date Issued
RF151202D02	Original release.	Jun. 15, 2017

1 Certificate of Conformity

Product: Occupancy Sensor

Brand: IR-TEC

Test Model: LMS-509

Series Model: LMS-509(X)(Y)(Z)
(where (X) may be A-Z, 0-9 or blank ; (Y) may be A-Z, 0-9 or blank ; (Z) may be A-Z, 0-9 or blank.)

Sample Status: Engineering sample

Applicant: IR-TEC International Ltd.

Test Date: Apr. 6, 2016

Standards: 47 CFR FCC Part 15, Subpart C (Section 15.245)
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 EMC characteristics under the conditions specified in this report.

Prepared by :

Annie Chang

, Date:

Jun. 15, 2017

Annie Chang / Senior Specialist

Approved by :

Rex Lai

, Date:

Jun. 15, 2017

Rex Lai / Assistant Manager

2 Summary of Test Results

47 CFR FCC Part 15, Subpart C (SECTION 15.245)			
FCC Clause	Test Item	Result	Remarks
15.207	AC Power Conducted Emission	PASS	Meet the requirement of limit. Minimum passing margin is -20.57dB at 0.16587MHz.
15.209 15.245 (b)	Radiated Emission Test Band Edge Measurement Limit: 50dB less than the peak value of fundamental frequency or meet radiated emission limit in section 15.209	PASS	Meet the requirement of limit. Minimum passing margin is -2.7dB at 34.52MHz.

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) ($\pm$)
Conducted Emissions at mains ports	150kHz ~ 30MHz	2.77 dB
Radiated Emissions up to 1 GHz	30MHz ~ 1000MHz	5.54 dB
Radiated Emissions above 1 GHz	1-6GHz	4.77 dB
	6-18GHz	5.48 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	Occupancy Sensor
Brand	IR-TEC
Test Model	LMS-509
Series Model	LMS-509(X)(Y)(Z) (where (X) may be A-Z, 0-9 or blank ; (Y) may be A-Z,0-9 or blank ; (Z) may be A-Z, 0-9 or blank.)
Model Difference	Marketing Differentiation
Status of EUT	Engineering sample
Power Supply Rating	AC 120~277V, 50/60Hz
Operating Frequency	5810MHz
Number of Channel	1
Antenna Type	Flat antenna with 2dBi gain
Antenna Connector	N/A
Accessory Device	N/A
Data Cable Supplied	N/A

Note:

1. The above EUT information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications or user's manual.

3.2 Description of Test Modes

1 channel is provided to this EUT:

Channel	Frequency
1	5810MHz

3.2.1 Test Mode Applicability and Tested Channel Detail

EUT CONFIGURE MODE	APPLICABLE TO			DESCRIPTION
	RE $\geq$ 1G	RE<1G	PLC	
-	√	√	√	-

Where **RE $\geq$ 1G**: Radiated Emission above 1GHz & Bandedge Measurement
RE<1G: Radiated Emission below 1GHz
PLC: Power Line Conducted Emission

NOTE: The EUT had been pre-tested on the positioned of each 3 axis. The worst case was found when positioned on **X-plane**.

Radiated Emission Test (Above 1GHz):

- ☒ 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
-	1	1

Radiated Emission Test (Below 1GHz):

- ☒ 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
-	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
-	1	1

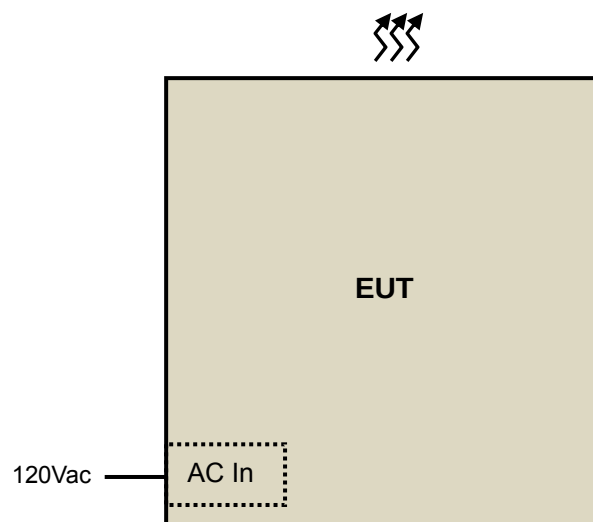
Test Condition:

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER	TESTED BY
RE $\geq$ 1G	20deg. C, 66%RH	120Vac, 60Hz	Aaron You
RE<1G	20deg. C, 66%RH	120Vac, 60Hz	Aaron You
PLC	25deg. C, 75%RH	120Vac, 60Hz	Dalen Dai

3.3 Description of Support Units

The EUT has been tested as an independent unit together without other necessary accessories or support units.

3.3.1 Configuration of System under Test



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 (15.245)

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

The field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following

Fundamental Frequency (MHz)	Field Strength of Fundamental (millivolts/meter)	Field Strength of Harmonics (microvolts/meter)
902 ~ 928	500	16
2435 ~ 2465	500	1.6
5785 ~ 5815	500	1.6
10500 ~ 10550	2500	25.0
24075 ~ 24175	2500	25.0

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits as below table, whichever is the lesser attenuation

Frequencies (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 ~ 0.490	$2400/F(\text{kHz})$	300
0.490 ~ 1.705	$24000/F(\text{kHz})$	30
1.705 ~ 30.0	30	30
30 ~ 88	100	3
88 ~ 216	150	3
216 ~ 960	200	3
Above 960	500	3

NOTE:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = $20 \log$ Emission level ($\mu\text{V/m}$).
3. 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.	CALIBRATED DATE	CALIBRATED UNTIL
HP Preamplifier	8447D	2432A03504	Feb. 26, 2016	Feb. 25, 2017
HP Preamplifier	8449B	3008A01201	Feb. 26, 2016	Feb. 25, 2017
MITEQ Preamplifier	AMF-6F-260400-33-8P	892164	Mar. 01, 2016	Feb. 28, 2017
Agilent TEST RECEIVER	N9038A	MY51210129	Feb. 02, 2016	Feb. 01, 2017
Schwarzbeck Antenna	VULB 9168	139	Jan. 04, 2016	Jan. 03, 2017
Schwarzbeck Antenna	VHBA 9123	480	May 29, 2015	May 28, 2017
Schwarzbeck Horn Antenna	BBHA-9170	212	Jan. 08, 2016	Jan. 07, 2017
Schwarzbeck Horn Antenna	BBHA 9120-D1	D130	Jan. 21, 2016	Jan. 20, 2017
ADT. Turn Table	TT100	0306	NA	NA
ADT. Tower	AT100	0306	NA	NA
Software	Radiated_V7.6.15.9.4	NA	NA	NA
SUHNER RF cable With 4dB PAD	SF104	CABLE-CH6	Aug. 15, 2015	Aug. 14, 2016
SUHNER RF cable With 3dB PAD	SF102	Cable-CH8-3.6m	Aug. 15, 2015	Aug. 14, 2016
KEYSIGHT MIMO Powermeasurement Test set	U2021XA	U2021XA-001	May 04, 2015	May 03, 2016
KEYSIGHT Spectrum Analyzer	N9030A	MY54490260	Jul. 14, 2015	Jul. 13, 2016
EMCO Horn Antenna	3115	00028257	Jan. 19, 2016	Jan. 18, 2017
Highpass filter Wainwright Instruments	WHK 3.1/18G-10SS	SN 8	NA	NA
ROHDE & SCHWARZ Spectrum Analyzer	FSV40	101042	Sep. 23, 2015	Sep. 22, 2016

- NOTE:** 1. The calibration interval of the above test instruments is 12/24 months. And the calibrations are traceable to NML/ROC and NIST/USA.
2. The horn antenna and HP preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
3. The test was performed in Chamber No. 6.
4. The Industry Canada Reference No. IC 7450E-6.
5. The FCC Site Registration No. is 447212.

4.1.3 Test Procedures

- 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:

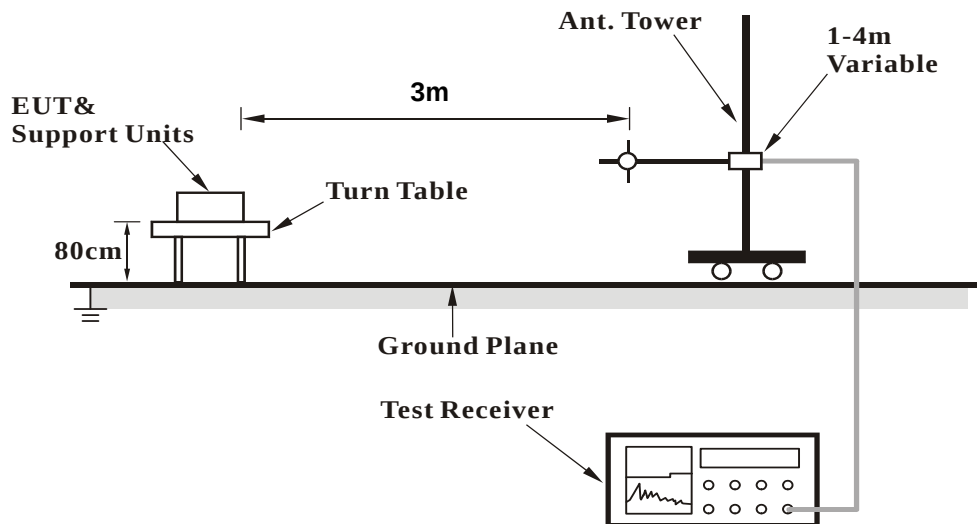
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 3MHz for RMS Average (Duty cycle < 98%) for Average detection (AV) at frequency above 1GHz, then the measurement results was added to a correction factor ($10 \log(1/\text{duty cycle})$).
4. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 10Hz (Duty cycle $\geq 98\%$) for Average detection (AV) at frequency above 1GHz.
5. All modes of operation were investigated and the worst-case emissions are reported.

4.1.4 Deviation from Test Standard

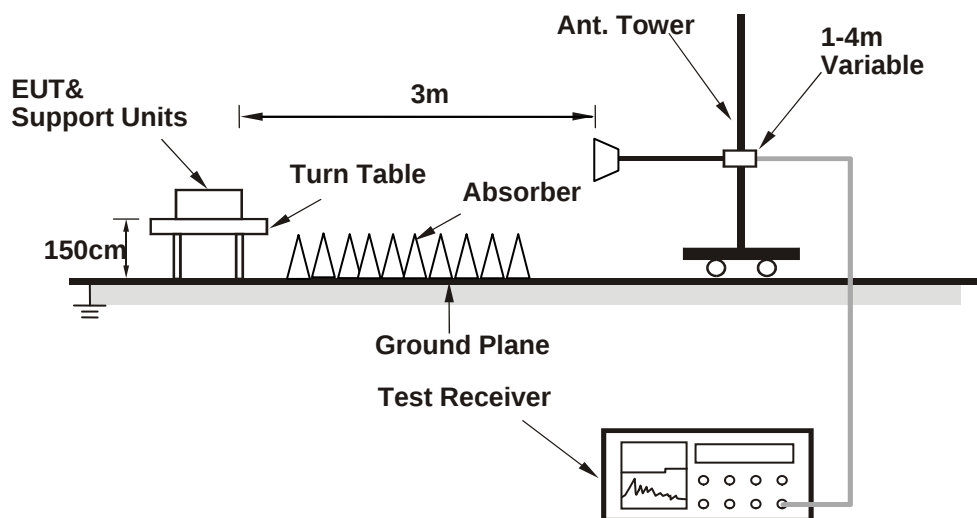
No deviation.

4.1.5 Test Set Up

<Frequency Range below 1GHz>



<Frequency Range above 1GHz>



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

4.1.6 EUT Operating Conditions

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

4.1.7 Test Results

ABOVE 1GHz DATA

CHANNEL	TX Channel 1	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 40GHz		Average (AV)

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
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	5725.00	62.0 PK	74.0	-12.0	1.58 H	20	54.59	7.37
2	5725.00	46.7 AV	54.0	-7.3	1.58 H	20	39.29	7.37
3	*5810.00	91.1 PK	134.0	-42.9	2.57 H	354	83.62	7.48
4	*5810.00	49.4 AV	114.0	-64.6	2.57 H	354	41.88	7.48
5	5875.00	62.4 PK	74.0	-11.6	2.57 H	354	54.79	7.64
6	5875.00	47.9 AV	54.0	-6.1	2.57 H	354	40.25	7.64
7	11620.00	60.9 PK	74.0	-13.1	1.69 H	234	43.63	17.27
8	11620.00	47.4 AV	54.0	-6.6	1.69 H	234	30.15	17.27
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
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	5725.00	62.3 PK	74.0	-11.7	2.64 V	346	54.92	7.37
2	5725.00	47.9 AV	54.0	-6.1	2.64 V	346	40.49	7.37
3	*5810.00	88.3 PK	134.0	-45.7	3.99 V	75	80.79	7.48
4	*5810.00	49.3 AV	114.0	-64.7	3.99 V	75	41.77	7.48
5	5875.00	62.1 PK	74.0	-11.9	3.99 V	75	54.48	7.64
6	5875.00	48.1 AV	54.0	-5.9	3.99 V	75	40.48	7.64
7	11620.00	60.2 PK	74.0	-13.8	2.84 V	194	42.88	17.27
8	11620.00	47.2 AV	54.0	-6.8	2.84 V	194	29.95	17.27

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.

BELOW 1GHz WORST-CASE DATA

CHANNEL	TX Channel 1	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	30MHz ~ 1GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
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	32.33	32.4 QP	40.0	-7.6	1.64 H	14	43.78	-11.34
2	63.13	30.0 QP	40.0	-10.0	2.84 H	116	40.43	-10.39
3	107.50	26.8 QP	43.5	-16.7	1.74 H	178	39.79	-12.99
4	146.50	28.7 QP	43.5	-14.8	2.15 H	95	38.31	-9.64
5	263.53	31.1 QP	46.0	-14.9	1.89 H	120	39.98	-8.91
6	368.19	31.6 QP	46.0	-14.4	1.57 H	191	38.01	-6.38
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
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	34.52	37.3 QP	40.0	-2.7	1.18 V	135	48.28	-10.94
2	62.74	30.8 QP	40.0	-9.2	2.16 V	38	41.23	-10.39
3	132.48	28.1 QP	43.5	-15.4	1.34 V	216	38.63	-10.56
4	153.09	28.5 QP	43.5	-15.0	1.28 V	52	37.93	-9.42
5	214.35	32.4 QP	43.5	-11.1	1.42 V	270	44.07	-11.70
6	313.19	32.4 QP	46.0	-13.7	1.00 V	146	39.89	-7.54

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
ROHDE & SCHWARZ TEST RECEIVER	ESCS 30	100276	Apr. 01, 2015	Mar. 31, 2016
ROHDE & SCHWARZ Artificial Mains Network (for EUT)	ENV216	101197	Apr. 27, 2015	Apr. 26, 2016
LISN With Adapter (for EUT)	AD10	C10Ada-002	Apr. 27, 2015	Apr. 26, 2016
ROHDE & SCHWARZ Artificial Mains Network (for peripherals)	ESH3-Z5	100218	Nov. 25, 2015	Nov. 24, 2016
SCHWARZBECK Artificial Mains Network (For EUT)	NNLK8129	8129229	May 06, 2015	May 05, 2016
Software	Cond_V7.3.7	NA	NA	NA
RF cable (JYEBAO) With 10dB PAD	5D-FB	Cable-C10.01	Feb. 15, 2016	Feb. 14, 2017
SUHNER Terminator (For ROHDE & SCHWARZ LISN)	65BNC-5001	E1-011484	May 19, 2015	May 18, 2016
ROHDE & SCHWARZ Artificial Mains Network (For TV EUT)	ESH3-Z5	100220	Nov. 13, 2015	Nov. 12, 2016
LISN With Adapter (for TV EUT)	100220	N/A	Nov. 13, 2015	Nov. 12, 2016

Notes: 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 Shielded Room No. 10.

3. The VCCI Site Registration No. C-1852.

4.2.3 Test Procedures

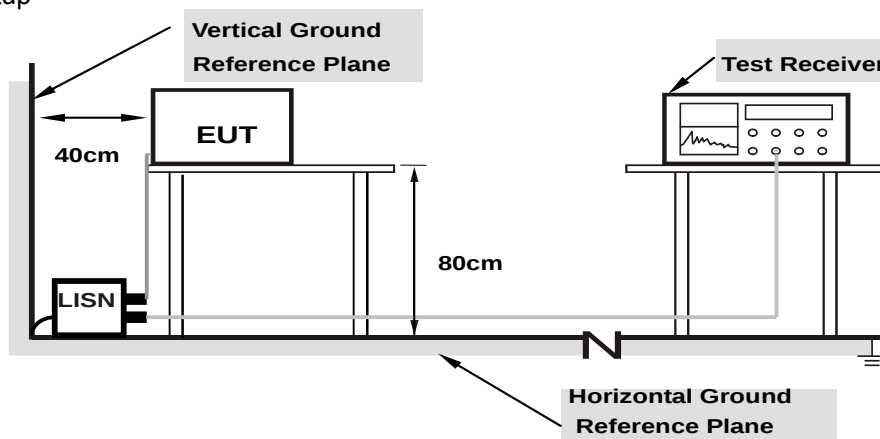
- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance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

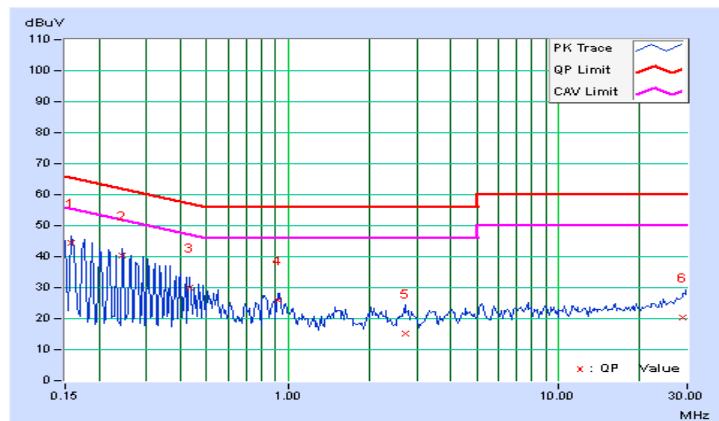
4.2.7 Test Results

Phase	Line (L)	Detector Function	Quasi-Peak (QP) / Average (AV)
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No	Freq. [MHz]	Corr.	Reading Value		Emission Level		Limit		Margin	
		Factor	[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
		(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15781	9.66	34.93	22.68	44.59	32.34	65.58	55.58	-20.99	-23.24
2	0.24375	9.65	30.57	17.68	40.22	27.33	61.97	51.97	-21.75	-24.64
3	0.43125	9.64	20.46	7.93	30.10	17.57	57.23	47.23	-27.13	-29.66
4	0.91953	9.68	16.43	7.14	26.11	16.82	56.00	46.00	-29.89	-29.18
5	2.71875	9.76	5.33	1.87	15.09	11.63	56.00	46.00	-40.91	-34.37
6	28.95313	10.06	10.28	5.81	20.34	15.87	60.00	50.00	-39.66	-34.13

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

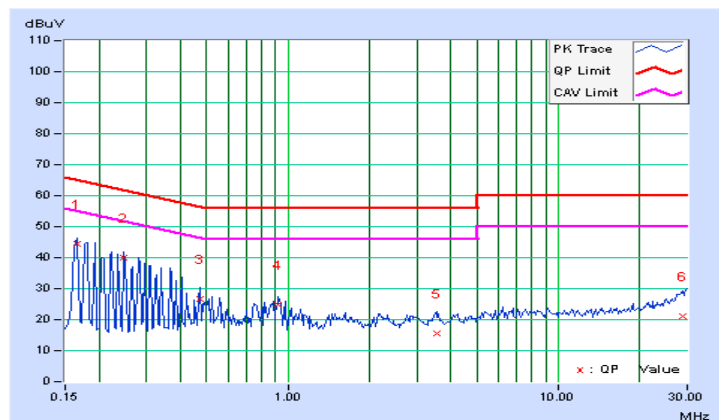


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)
-------	-------------	-------------------	-----------------------------------

No	Freq. [MHz]	Corr.	Reading Value		Emission Level		Limit		Margin	
		Factor	[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
		(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.16587	9.69	34.90	22.45	44.59	32.14	65.16	55.16	-20.57	-23.02
2	0.24766	9.69	30.30	16.98	39.99	26.67	61.84	51.84	-21.85	-25.17
3	0.47031	9.68	16.99	5.43	26.67	15.11	56.51	46.51	-29.83	-31.39
4	0.92344	9.71	15.00	6.23	24.71	15.94	56.00	46.00	-31.29	-30.06
5	3.55469	9.84	5.89	2.57	15.73	12.41	56.00	46.00	-40.27	-33.59
6	28.79688	10.08	11.19	6.03	21.27	16.11	60.00	50.00	-38.73	-33.89

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).

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 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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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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