TEST REPORT

of

FCC Part 15 Subpart C AND CANADA RSS-Gen

☒ New Application; ☐ Class I PC; ☐ Class II PC

Product :	**Sensor AID DUO TPMS TOOL**
Brand:	**Cub**
Model:	**FCC: Please see page 6**
	IC:VS-60U029
Model Difference:	**FCC: Please see page 6**
	IC: N/A
FCC ID:	**ZPNVS60U029**
IC:	**9959A-VS60U029**
FCC Rule Part:	**§15.209**
ISED Rule Part:	**RSS-Gen issue 5: 2018; RSS-210 issue 9**
Applicant:	**CUB ELECPARTS INC.**
Address:	**No.6, Lane 546, Sec.6, Changlu Road, Fuhsin Township, Changhua County, Taiwan 506**

Test Performed by:

International Standards Laboratory Corp.
<LT Lab.>
*Site Registration No.
BSMI: SL2-IN-E-0013; MRA TW0997; TAF: 0997; IC: IC4067B-4;
*Address:
No. 120, Lane 180, Hsin Ho Rd.
Lung-Tan Dist., Tao Yuan City 325, Taiwan
*Tel : 886-3-407-1718; Fax: 886-3-407-1738

Report No.: **ISL-18LR335FC**

Issue Date : **2019/01/17**

Test results given in this report apply only to the specific sample(s) tested and are traceable to national or international standard through calibration of the equipment and evaluating measurement uncertainty herein.
This report MUST not be used to claim product endorsement by TAF, NVLAP or any agency of the Government.
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VERIFICATION OF COMPLIANCE

Applicant:	CUB ELECPARTS INC.
Product Description:	Sensor AID DUO TPMS TOOL
Brand Name:	Cub
FCC ID:	ZPNVS60U029
IC:	9959A-VS60U029
Model No.:	FCC: Please see page 6
	IC:VS-60U029
Model Difference:	FCC: Please see page 6
	IC: N/A
Date of test:	2018/10/25 ~ 2019/01/16
Date of EUT Received:	2018/10/25

We hereby certify that:

All the tests in this report have been performed and recorded in accordance with the standards described above and performed by an independent electromagnetic compatibility consultant, International Standards Laboratory Corp.

The test results contained in this report accurately represent the measurements of the characteristics and the energy generated by sample equipment under test at the time of the test. The sample equipment tested as described in this report is in compliance with the limits of above standards.

Test By:	Barry Lee	***Date:***	2019/01/17
	Barry Lee / Senior Engineer		
Prepared By:	Gigi yeh	***Date:***	2019/01/17
	Gigi Yeh / Senior Engineer		
Approved By:	Jerry Liu	***Date:***	2019/01/17
	Jerry Liu / Technical Manager		

Version

Version No.	Date	Description
00	2019/01/17	Initial creation of document

Uncertainty of Measurement

Description Of Test	Uncertainty
Conducted Emission (AC power line)	2.586 dB
Field Strength of Spurious Radiation	≤ 30MHz: 2.96dB 30-1GHz: 4.22 dB 1-40 GHz: 4.08 dB
Conducted Power	2.412 GHz: 1.30 dB 5.805 GHz: 1.55 dB
Power Density	2.412 GHz:1.30 dB 5.805 GHz: 1.67 dB
Frequency	0.0032%
Time	0.01%
DC Voltage	1%

Table of Contents

1. General Information

1.1 Product Description

General:

Product Name	Sensor AID DUO TPMS TOOL	
Brand Name	Cub	
FCC: Model Name	VS-60U029; VS-60U029XX; VS-60U029XX-XX; VS-60U029XX-XX-X; VS-60U024; VS-60U024XX; VS-60U024XX-XX; VS-60U024XX-XX-X; VS-60U029XXXXXXX; VS-60U024XXXXXXX; CT4; Sensor AID TOOL Gen4; Sensor AID DUO TPMS TOOL; SENSOR AID TOOL GEN4; SENSOR AID DUO TPMS TOOL	
IC: Model Name	VS-60U029	
FCC Model Difference	1. For the marketing purpose 2. Where X may be any alpha character “a”-“z”, ”A”-“Z”, or numeric character “0”-“9”,or -, (,) , or blank or combination of alpha and numeric characters	
IC Model Difference	N/A	
Power Supply	5 Vdc from AC/DC adapter or 3.7V from battery	
	Adapter:	Model: SK22G3-0500250U
	Battery:	Model : HTT-104

IC RSS-Gen:

PMN (Product Marketing Name)	VS-60U029
HVIN (Hardware Version Identification Number)	VS-60U029
Product SW version	1.0
Product HW version	1.0
Radio SW version	RS1.0
Radio HW version	1.0

Rule: 15.209 (TX) / RSS-Gen

Frequency Range:	125kHz
Modulation type:	AM
Antenna Designation:	Loop Antenna

1.2 Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for FCC ID: **ZPNVS60U029** filing to comply with Section 15.209 of the FCC Part 15, Subpart C Rules and **IC: 9959A-VS60U029** filing to comply with Industry Canada RSS-Gen issue 5; RSS-210 issue 9.

1.3 Test Methodology

All testing were performed according to the procedures in ANSI C63.10: 2013.

1.4 Test Facility

The measurement facilities used to collect the 3m Radiated Emission and AC power line conducted data are located on the address of **International Standards Laboratory Corp.**<LT Lab.> No. 120, Lane 180, Hsin Ho Rd., Lung-Tan Dist., Tao Yuan City 325, Taiwan which are constructed and calibrated to meet the FCC requirements in documents ANSI C63.10: 2013. FCC Registration Number is: 487532; Designation Number is: TW0997, Canada Registration Number: 4067B-4.

1.5 Special Accessories

Not available for this EUT intended for grant.

1.6 Equipment Modifications

Not available for this EUT intended for grant.

2. System Test Configuration

2.1 EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

2.2 EUT Exercise

The EUT (Transmitter) was tested with a test program to fix the Tx frequency that was for the purpose of the measurements. For more information please see test data and APPENDIX 1 for set-up photographs.

2.3 Test Procedure

2.3.1 Conducted Emissions (Not apply in the report)

The EUT is a placed on as turn table which is 0.8 m above ground plane. According to the requirements in Section 7, 13 of ANSI C63.4-2014 and RSS-Gen issue 5. Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-Peak and Average detector mode.

2.3.2 Radiated Emissions

The EUT is a placed on as turn table which is 0.8/1.5 m above ground plane. The turn table shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max. emission, the relative positions of this hand-held transmitter (EUT) was rotated through three orthogonal axes and measurement procedures for electric field radiated emissions above 1 GHz the EUT measurement is to be made “while keeping the antenna in the ‘cone of radiation’ from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response.” Is still within the 3dB illumination BW of the measurement antenna. According to the requirements in Section 8 and 13 and Sub-clause 8.3.1.2 of ANSI C63.10: 2013.

2.4 Limitation

(1) Emission Bandwidth

FCC 15.215(c) requirement:

Intentional radiators operating under the alternative provisions to the general emission limits must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated.

RSS-Gen 6.7 requirement:

The occupied bandwidth or the "99% emission bandwidth" is defined as the frequency range between two points, one above and the other below the carrier frequency, within which 99% of the total transmitted power of the fundamental transmitted emission is contained. The occupied bandwidth shall be reported for all equipment in addition to the specified bandwidth required in the applicable RSSs.

(2) Conducted Emission

According to FCC 15.207(a) / RSS-Gen 8.8 requirement:

Conducted Emission Limits is as following.

Frequency range	Limits dB (uV)	
MHz	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50
Note 1.The lower limit shall apply at the transition frequencies 2.The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.		

(3) Radiated Emission

FCC 15.209 requirement:

(a) Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

(b) In the emission table above, the tighter limit applies at the band edges.

(c) The level of any unwanted emissions from an intentional radiator operating under these general provisions shall not exceed the level of the fundamental emission. For intentional radiators which operate under the provisions of other Sections within this Part and which are required to reduce their unwanted emissions to the limits specified in this table, the limits in this table are based on the frequency of the unwanted emission and not the fundamental frequency. However, the level of any unwanted emissions shall not exceed the level of the fundamental frequency.

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 and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.

Frequency (MHz)	Field strength μV/m	Distance (m)	Field strength at 3m dBμV/m
0.009-0.490	2400/F(kHz)	300	
0.490-1.705	24000/F(kHz)	30	
1.705-30	30	30	69.54
30-88	100	3	40
88-216	150	3	43.5
216-960	200	3	46
Above 960	500	3	54

RSS-Gen requirement:

Except where otherwise indicated in the applicable RSS, radiated emissions shall comply with the field strength limits shown in following tables. Additionally, the level of any transmitter unwanted emission shall not exceed the level of the transmitter's fundamental emission.

General field strength limits at frequencies above 30 MHz

Frequency (MHz)	Field strength (μV/m at 3 m)
30 – 88	100
88 – 216	150
216 – 960	200
Above 960	500

General field strength limits at frequencies below 30 MHz

Frequency	Magnetic field strength (H-Field) (μA/m)	Measurement distance (m)
9 - 490 kHz [1]	6.37/F (F in kHz)	300
490 - 1705 kHz	63.7/F (F in kHz)	30
1.705 - 30 MHz	0.08	30

Note 1: The emission limits for the ranges 9-90 kHz and 110-490 kHz are based on measurements employing a linear average detector.

Limit Table:

Number of Harmonic	Frequency (kHz)	Distance m	Limit at 300m (dBuV/m)	Limit at 30m (dBuV/m)	Distance Factor dB	Limit at 3m (dBuV/m)
1	125	300	25.67	--	80	105.67
2	250	300	19.65	--	80	99.65
3	375	300	16.12	--	80	96.12
4	500	30	--	33.62	40	73.62
5	625	30	--	31.69	40	71.69
6	750	30	--	30.10	40	70.10
7	875	30	--	28.76	40	68.76
8	1000	30	--	27.60	40	67.60
9	1125	30	--	26.58	40	66.58
10	1250	30	--	25.67	40	65.67

Limit Calculation and transfer to 3m test distance:
If the frequency between 9 – 490kHz,
Limit = 20log(2400/f(kHz) + 40log(300/3)

If the frequency between 490 kHz – 1.705MHz
Limit = 20log(24000/f(kHz) + 40log(30/3)

2.5 Configuration of Tested System

Fig. 2-1 Configuration of Tested System

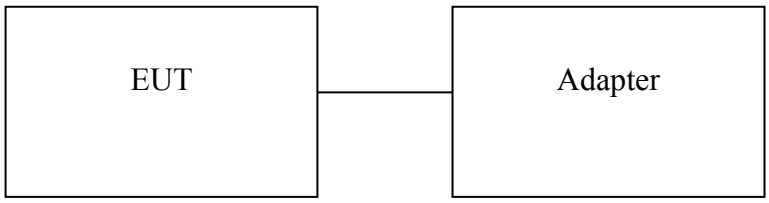


Table 2-1 Equipment Used in Tested System

Item	Equipment	Mfr/Brand	Model/ Type No.	Series No.	Data Cable	Power Cord
1	Adapter	Apple	A1385	N/A	Non-shield	Non-shield

3. Summary of Test Results

FCC Rules	Description Of Test	Result
§15.207	Conducted Emission	Compliant
§15.209	Radiated Emission	Compliant

4. Description of test modes

The EUT has been tested under continuous operating condition with a Test Kit. The Frequency 125kHz was chosen for testing.

The field strength of radiation emission was measured as EUT stand-up position (H mode) and lie down position (E1,E2 mode) three axis modes. Worse case E1 mode.

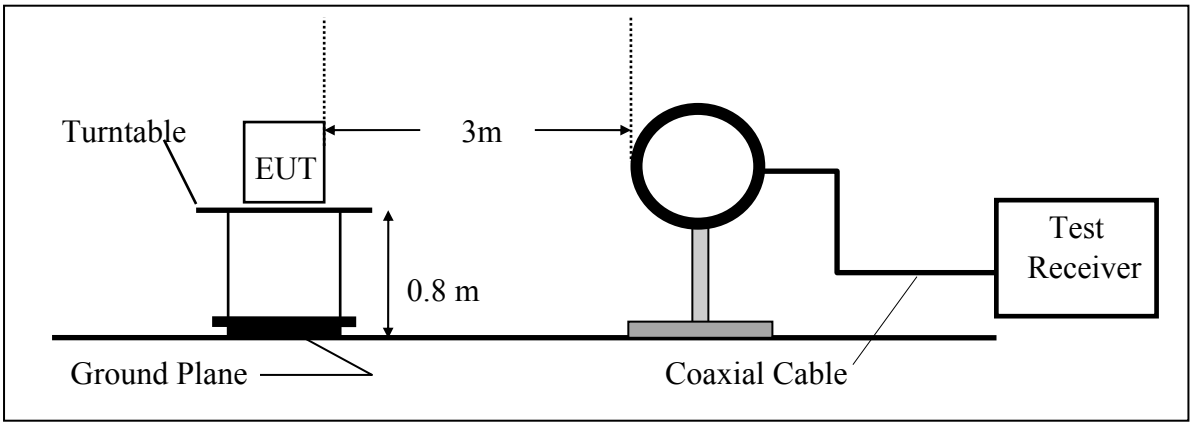
5. Emission Bandwidth Test

5.1 Measurement Procedure:

The spectrum analyzer span was set to 2 to 5 times the estimated bandwidth of the emission. The RBW was set from 1% to 5% of the estimated emission bandwidth. The trace was set to max hold with a peak detector active. The marker-delta function of the analyzer, set at 20 dB below the highest peak, was utilized to determine the 20 dB bandwidth of the emission.

The 99% occupied bandwidth was measured with the spectrum analyzer span set to fully display the emission, including the emissions skirts. The RBW was set from 1% and 5% of the estimated 99%bandwidth. The occupied 99% bandwidth was measured by using the occupied bandwidth function of the spectrum analyzer set to 99% with a peak detector.

5.2 Test Setup



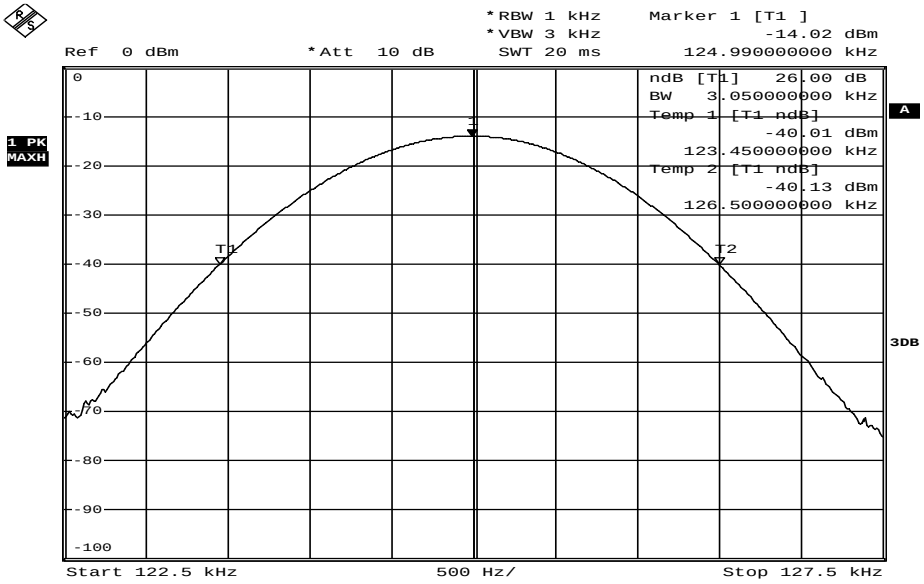
5.3 Measurement Equipment Used:

Chamber 14(966)					
Equipment Type	**Manufacturer**	**Model Number**	**Serial Number**	**Last Cal.**	**Cal Due.**
Spectrum Analyzer 21(26.5GHz)	Agilent	N9010A	MY52100117	06/30/2018	06/29/2019
Loop Antenna9K-30M	EM	EM 6879	271	06/06/2018	06/05/2020
Preamplifier9-1000M	HP	8447F	NA	12/08/2018	12/07/2019
Cable UP to 1G	HUBER SUHNER	RG 214/U	NA	11/12/2018	11/11/2019

5.4 Measurement Result:

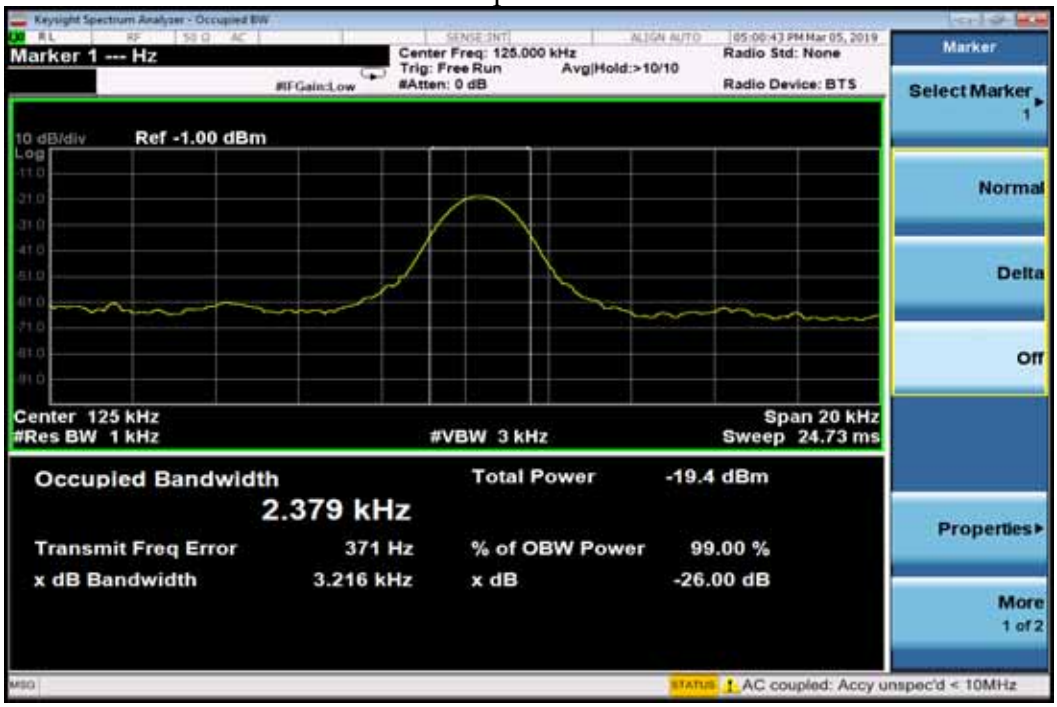
Frequency (kHz)	26dB Bandwidth (kHz)	99% Occupied Bandwidth (kHz)
125	3.05	2.379

26dB Bandwidth



Date: 29.NOV.2018 16:46:04

99% Occupied Bandwidth

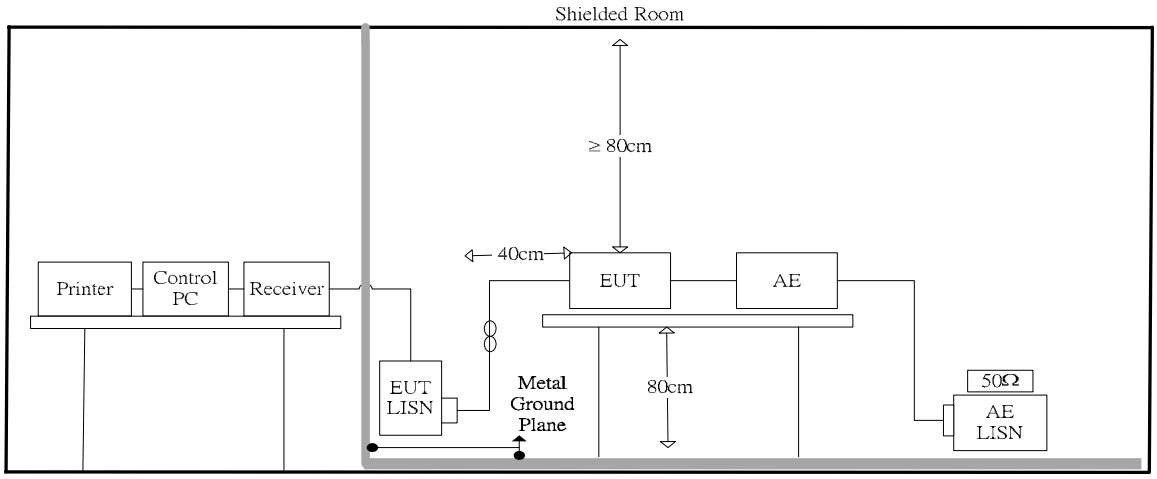


6. Conduced Emission Test

6.1 Measurement Procedure:

1. The EUT was placed on a table which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. Repeat above procedures until all frequency measured were complete.

6.2 Test Setup



6.3 Measurement Equipment Used:

Conducted Emission Test Site					
Equipment Type	**Manufacturer**	**Model Number**	**Serial Number**	**Last Cal.**	**Cal Due.**
Conduction 04-3 Cable	WOKEN	CFD 300-NL	Conduction 04 -3	09/11/2018	09/10/2019
EMI Receiver 16	Rohde & Schwarz	ESCI	101221	10/23/2018	10/22/2019
LISN 18	ROHDE & SCHWARZ	ENV216	101424	02/04/2018	02/03/2019
LISN 19	ROHDE & SCHWARZ	ENV216	101425	03/06/2018	03/05/2019

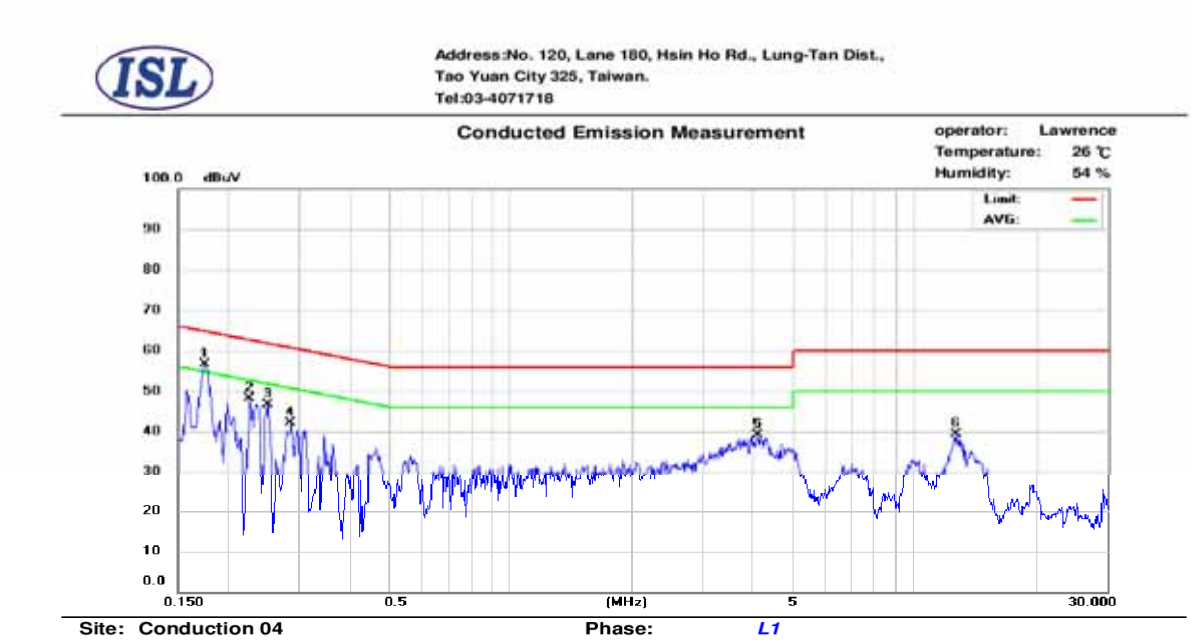
6.4 Measurement Result:

The initial step in collecting conducted data is a spectrum analyzer peak scan of the measurement range. Significant peaks are then marked as shown on the following data page, and these signals are then quasi-peaked.

Note: Refer to next page for measurement data and plots.

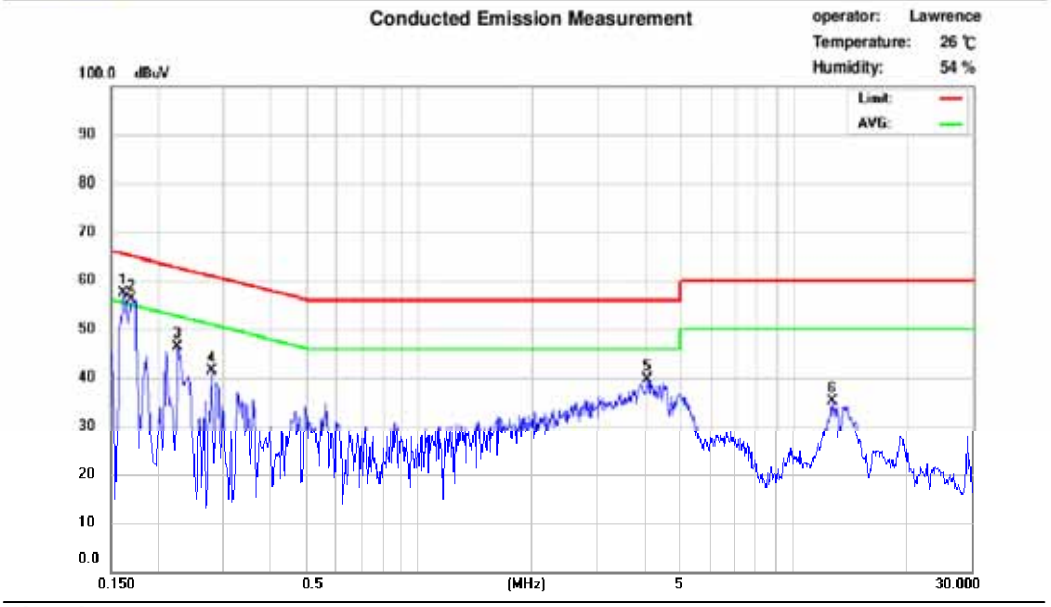
AC POWER LINE CONDUCTED EMISSION TEST DATA

Operation Mode:	Full mode	Test Date:	2018/12/26
Test By:	Barry		



No.	Frequency (MHz)	QP_R (dBuV)	AVG_R (dBuV)	Correct Factor (dB)	QP Emission (dBuV)	QP Limit (dBuV)	QP Margin (dB)	AVG Emission (dBuV)	AVG Limit (dBuV)	AVG Margin (dB)
1	0.174	45.44	32.87	9.69	55.13	64.77	-9.64	42.56	54.77	-12.21
2	0.226	35.37	21.08	9.69	45.06	62.60	-17.54	30.77	52.60	-21.83
3	0.250	29.46	6.66	9.69	39.15	61.76	-22.61	16.35	51.76	-35.41
4	0.286	30.14	13.82	9.70	39.84	60.64	-20.80	23.52	50.64	-27.12
5	4.086	24.06	16.50	9.81	33.87	56.00	-22.13	26.31	46.00	-19.69
6	12.630	23.22	16.96	9.98	33.20	60.00	-26.80	26.94	50.00	-23.06

Address:No. 120, Lane 180, Hsin Ho Rd., Lung-Tan Dist.,
Tao Yuan City 325, Taiwan.
Tel:03-4071718



Site: Conduction 04 Phase: *N*

No.	Frequency (MHz)	QP_R (dBuV)	AVG_R (dBuV)	Correct Factor (dB)	QP Emission (dBuV)	QP Limit (dBuV)	QP Margin (dB)	AVG Emission (dBuV)	AVG Limit (dBuV)	AVG Margin (dB)
1	0.162	46.03	32.47	9.68	55.71	65.36	-9.65	42.15	55.36	-13.21
2	0.170	44.57	30.64	9.68	54.25	64.96	-10.71	40.32	54.96	-14.64
3	0.226	31.60	14.79	9.68	41.28	62.60	-21.32	24.47	52.60	-28.13
4	0.278	27.07	12.35	9.69	36.76	60.88	-24.12	22.04	50.88	-28.84
5	4.050	23.89	16.88	9.80	33.69	56.00	-22.31	26.68	46.00	-19.32
6	12.602	15.91	8.48	10.01	25.92	60.00	-34.08	18.49	50.00	-31.51

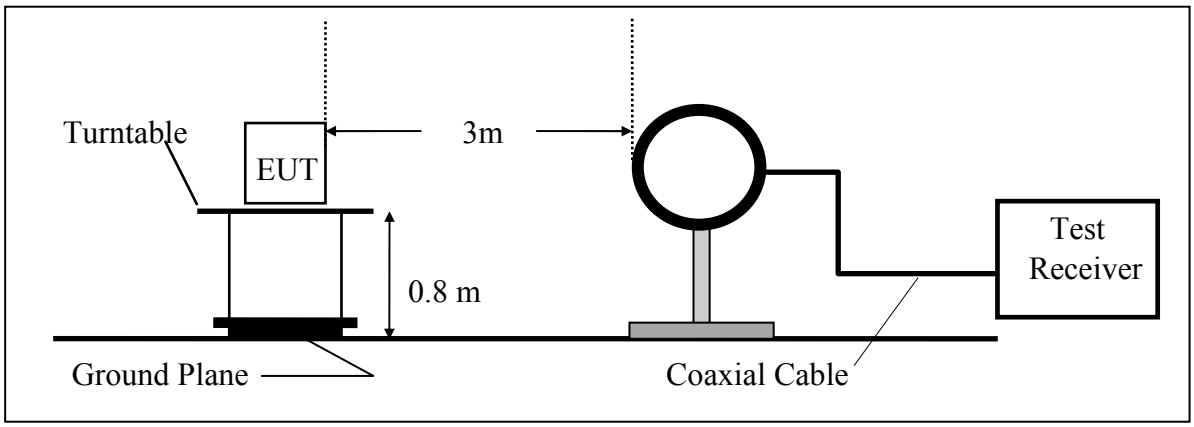
7. Radiated Emission Test

7.1 Measurement Procedure

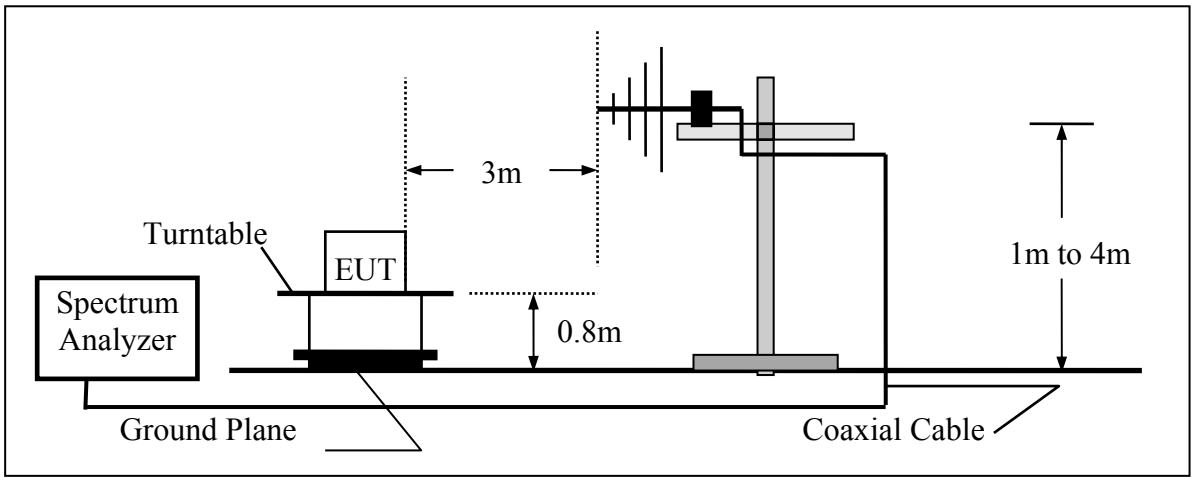
1. The EUT was placed on a turn table which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
4. Repeat above procedures until all frequency measured were complete.

7.2 Test SET-UP (Block Diagram of Configuration)

(A) Radiated Emission Test Set-Up, Frequency Below 30MHz



(B) Radiated Emission Test Set-Up, Frequency Below 1000MHz



7.3 Measurement Equipment Used:

Chamber 14(966)					
Equipment Type	**Manufacturer**	**Model Number**	**Serial Number**	**Last Cal.**	**Cal Due.**
Spectrum Analyzer 21(26.5GHz)	Agilent	N9010A	MY52100117	06/30/2018	06/29/2019
Loop Antenna9K-30M	EM	EM 6879	271	06/06/2018	06/05/2020
Bilog Antenna30-1G	SCHWARZBECK	VULB9168	736	07/21/2018	07/20/2019
Horn antenna1-18G	ETS	3117	00066665	11/29/2018	11/28/2019
Horn antenna18-26G(04)	Com-power	AH-826	081001	11/21/2017	11/20/2019
Horn antenna26-40G(05)	Com-power	AH-640	100A	02/22/2017	02/21/2019
Preamplifier9-1000M	HP	8447F	NA	12/08/2018	12/07/2019
Preamplifier1-18G	MITEQ	AFS44-00101800-25-10P-44	1329256	07/26/2018	07/25/2019
Cable UP to 1G	HUBER SUHNER	RG 214/U	NA	11/12/2018	11/11/2019

7.4 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor (if any) from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CL - AG

Average Value = Peak Value + 20 Log (Ton/Tp) ……. Pulse Modulation

Where	FS = Field Strength	CL = Cable Attenuation Factor (Cable Loss)
	RA = Reading Amplitude	AG = Amplifier Gain
	AF = Antenna Factor	

6.5 Measurement Result

Fundamental Measurement Result

Operation Mode	: TX CH	Test Date	: 2019/01/07
Fundamental Frequency	: 125kHz	Test By	: Barry
Temp	: 25 ℃	Hum.	: 60%

Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Margin dB	Remark	Pol V/H
0.125	71.23	30.31	101.54	125.67	-24.13	Peak	VERTICAL
0.125	66.89	30.31	97.20	105.67	-8.47	Avg	VERTICAL
0.125	70.23	30.31	100.54	125.67	-25.13	Peak	HORIZONTAL
0.125	65.88	30.31	96.19	105.67	-9.48	Avg	HORIZONTAL

Remark:

1 Measurement distance is 3 m.

2 The IF bandwidth of SPA was 10kHz, VBW=30kHz.

Radiated Spurious Emission Measurement Result (9 kHz~30 MHz)

Operation Mode: Transmitting Mode
Test Date: 2019/01/07
Fundamental Frequency: 125kHz
Test By: Barry
Temperature : 25 ℃
Humidity : 65 %

No	Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Margin dB	Remark	Pol V/H
1	1.72	46.37	12.40	58.77	69.54	-10.77	Peak	VERTICAL
2	3.46	43.81	10.30	54.11	69.54	-15.43	Peak	VERTICAL
3	5.20	35.89	10.33	46.22	69.54	-23.32	Peak	VERTICAL
4	6.91	30.97	10.74	41.71	69.54	-27.83	Peak	VERTICAL
5	13.27	23.92	10.88	34.80	69.54	-34.74	Peak	VERTICAL
6	21.18	22.38	10.67	33.05	69.54	-36.49	Peak	VERTICAL
1	1.72	47.39	12.40	59.79	69.54	-9.75	Peak	HORIZONTAL
2	3.46	44.06	10.30	54.36	69.54	-15.18	Peak	HORIZONTAL
3	5.20	36.10	10.33	46.43	69.54	-23.11	Peak	HORIZONTAL
4	6.94	29.99	10.75	40.74	69.54	-28.80	Peak	HORIZONTAL
5	12.07	23.22	11.00	34.22	69.54	-35.32	Peak	HORIZONTAL
6	18.18	20.75	10.41	31.16	69.54	-38.38	Peak	HORIZONTAL

Remark:

1 Measurement distance is 3 m.

2 The IF bandwidth of SPA was 10kHz, VBW=30kHz.

Radiated Spurious Emission Measurement Result (30 MHz – 1 GHz)

Operation Mode: Transmitting Mode
Test Date: 2019/01/07
Fundamental Frequency: 125kHz
Test By: Barry
Temperature : 25 ℃
Humidity : 65 %

No	Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Margin dB	Remark	Pol V/H
1	61.04	44.54	-6.95	37.59	40.00	-2.41	Peak	VERTICAL
2	123.12	41.20	-8.24	32.96	43.50	-10.54	Peak	VERTICAL
3	176.47	39.69	-7.07	32.62	43.50	-10.88	Peak	VERTICAL
4	335.55	36.89	-4.25	32.64	46.00	-13.36	Peak	VERTICAL
5	515.00	43.13	-1.40	41.73	46.00	-4.27	Peak	VERTICAL
6	746.83	41.65	3.02	44.67	46.00	-1.33	Peak	VERTICAL
1	122.15	49.76	-8.34	41.42	43.50	-2.08	Peak	HORIZONTAL
2	180.35	45.81	-7.57	38.24	43.50	-5.26	Peak	HORIZONTAL
3	498.51	46.11	-1.66	44.45	46.00	-1.55	Peak	HORIZONTAL
4	514.03	43.91	-1.42	42.49	46.00	-3.51	Peak	HORIZONTAL
5	734.22	42.19	2.70	44.89	46.00	-1.11	Peak	HORIZONTAL
6	959.26	34.74	6.42	41.16	46.00	-4.84	Peak	HORIZONTAL

Remark:

1 Measuring frequencies from the lowest internal frequency to the 1GHz.
2 Radiated emissions measured in frequency range from 30 MHz to 1000MHz were made with an instrument using Peak / QP detector mode.
3 The IF bandwidth of SPA between 30MHz to 1GHz was 100kHz, VBW=300kHz.