

# FCC Test Report

**Project No.** : 1709C099A  
**Equipment** : Smart Lite Giga Switch  
**Test Model** : VigorSwitch G1080  
**Series Model** : N/A  
**Applicant** : DrayTek Corp.  
**Address** : No. 26, Fu Shing Rd., HuKou County, Hsin-Chu  
Industrial Park, Hsin-Chu, Taiwan R.O.C

**Date of Receipt** : Sep. 19, 2017  
**Date of Test** : Sep. 19, 2017 ~ Nov. 06, 2017  
**Issued Date** : April 27, 2018  
**Tested by** : BTL Inc.

**Testing Engineer** : Sam Wang  
(Sam Wang)  
**Technical Manager** : Bill Zhang  
(Bill Zhang)  
**Authorized Signatory** : Kevin Li  
(Kevin Li)

## **B T L I N C .**

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### **Limitation**

For the use of the authority's logo is limited unless the Test Standard(s)/Scope(s)/Item(s) mentioned in this test report is (are) included in the conformity assessment authorities acceptance respective.

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### REPORT ISSUED HISTORY

Issued No.	Description	Issued Date
BTL-FCCE-1-1709C099	Original Issue.	Nov. 07, 2017
BTL-EMC-1-1709C099A	Compared with the previous report (BTL-FCCE-1-1709C099), product, brand, model name and applicant, manufacturer, factory information are changed which does not affect the test results, the rest are kept the same.	April 27, 2018

## 1. VERIFICATION

Equipment : Smart Lite Giga Switch  
Brand Name : DrayTek Corp.  
Test Model : VigorSwitch G1080  
Series Model : N/A  
Applicant : DrayTek Corp.  
Manufacturer : DrayTek Corp.  
Address : No. 26, Fu Shing Rd., HuKou County, Hsin-Chu Industrial Park,  
Hsin-Chu, Taiwan R.O.C  
Factory : Intelligent TechnologyINC.  
Address : Yuanhe 3 Street, Tongsha Industrial Zone, Dongcheng Area, Dongguan,  
Guangdong, China  
Date of Test : Sep. 19, 2017 ~ Nov. 06, 2017  
Test Sample : Engineering Sample  
Standard(s) : FCC Part 15, Subpart B  
ANSI C63.4-2014

The above equipment has been tested and found compliance with the requirement of the relative standards by BTL Inc.

The test data, data evaluation, and equipment configuration contained in our test report (Ref No. BTL-FCCE-1-1709C099A) were obtained utilizing the test procedures, test instruments, test sites that has been accredited by the Authority of NVLAP according to the ISO-17025 quality assessment standard and technical standard(s).

## 2. SUMMARY OF TEST RESULTS

Test procedures according to the technical standard(s):

EMC Emission				
Standard(s)	Test Item	Limit	Judgment	Remark
FCC Part15, Subpart B ANSI C63.4-2014	Conducted Emission	Class B	PASS	
	Radiated emission Below 1 GHz	Class B	PASS	
	Radiated emission Above 1 GHz	Class B	N/A	NOTE(1) NOTE(2)

**NOTE:**

- (1) " N/A" denotes test is not applicable to this device.
- (2) The EUT's max operating frequency is 25MHz which does not exceed 108 MHz, so the test will not be performed.

## 2.1 TEST FACILITY

The test facilities used to collect the test data in this report at the location of No.3, Jinshagang 1st Road, Shixia, Dalang Town, Dongguan, Guangdong, China.

BTL's test firm number for FCC: 854385

BTL's designation number for FCC: CN5020

## 2.2 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. The BTL measurement uncertainty is less than the CISPR 16-4-2  $U_{CISPR}$  requirement.

The reported uncertainty of measurement  $y \pm U$ , where expanded uncertainty  $U$  is based on a standard uncertainty multiplied by a coverage factor of  $k=2$ , providing a level of confidence of approximately **95%**.

### A. Conducted Measurement :

Test Site	Method	Measurement Frequency Range	U, (dB)
DG-C02	CISPR	150 kHz ~ 30MHz	2.32

### B. Radiated Measurement :

Test Site	Method	Measurement Frequency Range	Ant. H / V	U, (dB)
DG-CB03 (3m)	CISPR	150 kHz ~ 30MHz		2.32
		9KHz ~ 30MHz	V	3.79
		9KHz ~ 30MHz	H	3.57
		30MHz ~ 200MHz	V	3.82
		30MHz ~ 200MHz	H	3.78
		200MHz ~ 1,000MHz	V	4.10
		200MHz ~ 1,000MHz	H	4.06

Note: Unless specifically mentioned, the uncertainty of measurement has not been taken into account to declare the compliance or non-compliance to the specification.

### 3. GENERAL INFORMATION

#### 3.1 GENERAL DESCRIPTION OF EUT

Equipment	Smart Lite Giga Switch
Brand Name	DrayTek Corp.
Test Model	VigorSwitch G1080
Series Model	N/A
Model Difference	N/A
Power Source	DC voltage supplied from AC/DC adapter. Brand/ Model: DVE / DSA-6PFG-05 FUS 050100
Power Rating	I/P: AC 100-240V 50/60Hz 0.2A    O/P: DC 5V 1A
I/O Ports	LAN port, Power port

Note:

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

#### 3.2 DESCRIPTION OF TEST MODES

To investigate the maximum EMI emission characteristics generated from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

Pretest Mode	Description
Mode 1	FULL SYSTEM

For Conducted Test	
Final Test Mode	Description
Mode 1	FULL SYSTEM

For Radiated Test	
Final Test Mode	Description
Mode 1	FULL SYSTEM

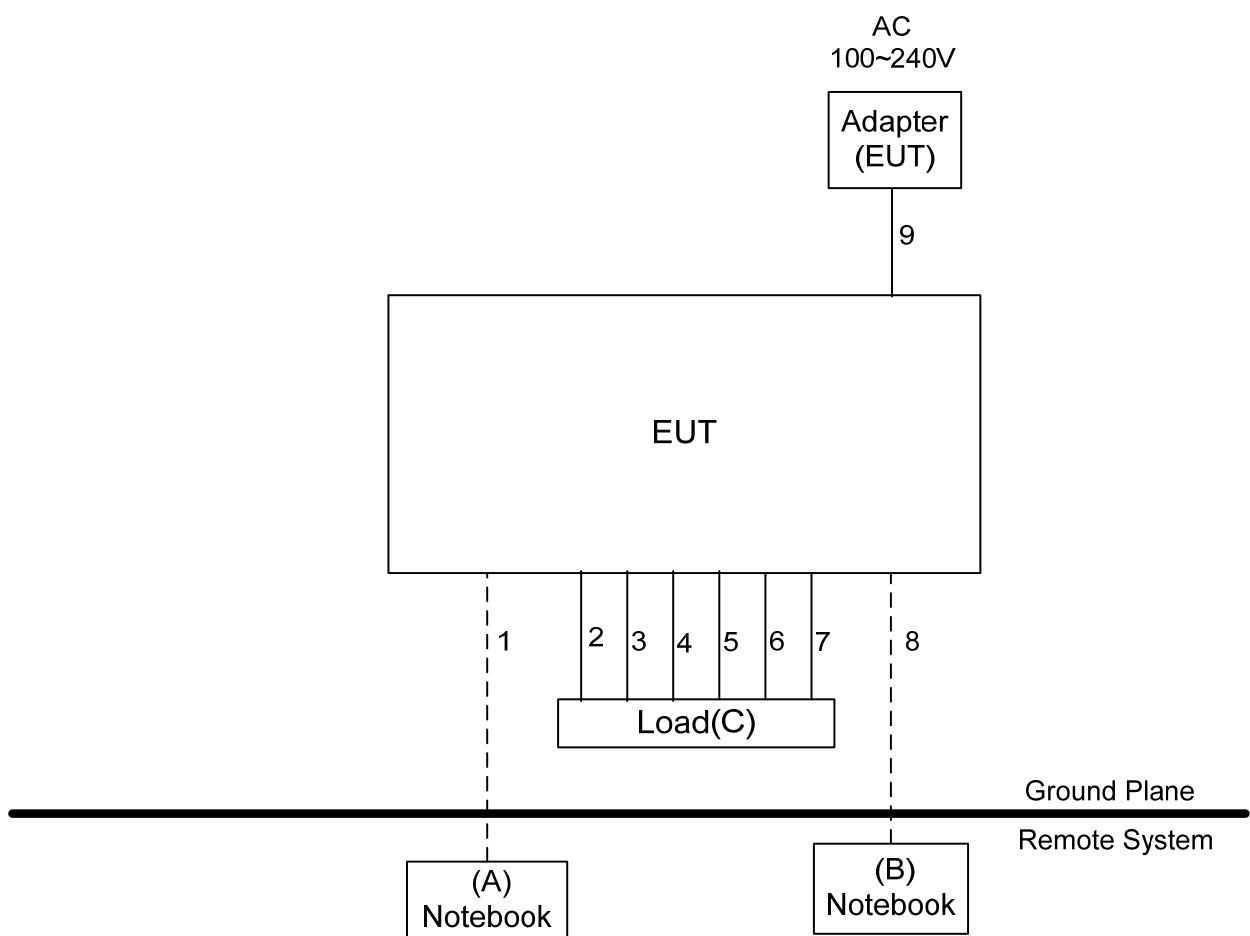


### 3.3 EUT OPERATING CONDITIONS

The EUT exercise program used during radiated and/or conducted emission measurement was designed to exercise the various system components in a manner similar to a typical use. The standard test signals and output signal as following:

1. EUT Connected to Load via RJ45 cable.
2. EUT Connected to Notebook via RJ45 cable.

### 3.4 BLOCK DIAGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED



### 3.5 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.

Item	Equipment	Mfr/Brand	Model/Type No.	FCC ID	Series No.
A	Notebook	Lenovo	E46L	DOC	EB22953770
B	Notebook	Lenovo	E445	DOC	MP-05Y56S
C	LOAD	N/A	N/A	N/A	N/A

Item	Shielded Type	Ferrite Core	Length	Note
1	NO	NO	10m	RJ45 Cable
2-7	NO	NO	1.5m	RJ45 Cable
8	NO	NO	10m	RJ45 Cable
9	NO	NO	1.5m	DC Cable

## 4. EMC EMISSION TEST

### 4.1 CONDUCTED EMISSION MEASUREMENT

#### 4.1.1 POWER LINE CONDUCTED EMISSION (FREQUENCY RANGE 150KHZ-30MHZ)

FREQUENCY (MHz)	Class A (dBuV)		Class B (dBuV)	
	Quasi-peak	Average	Quasi-peak	Average
0.15 -0.5	79.00	66.00	66 - 56 *	56 - 46 *
0.50 -5.0	73.00	60.00	56.00	46.00
5.0 -30.0	73.00	60.00	60.00	50.00

Note:

- (1) The tighter limit applies at the band edges.
- (2) The limit of " \* " marked band means the limitation decreases linearly with the logarithm of the frequency in the range.
- (3) The test result calculated as following:  
 Measurement Value = Reading Level + Correct Factor  
 Correct Factor = Insertion Loss + Cable Loss + Attenuator Factor(if use)  
 Margin Level = Measurement Value - Limit Value

#### 4.1.2 MEASUREMENT INSTRUMENTS LIST

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Measurement Software	Farad	EZ-EMC Ver.NB-03A 1-01	N/A	N/A
2	Cable	N/A	RG223	12m	Oct. 19, 2018
3	LISN	EMCO	3816/2	00052765	Mar. 26, 2018
4	50Ω Terminator	SHX	TF2-3G-A	08122901	Mar. 26, 2018
5	TWO-LINE V-NETWORK	R&S	ENV216	101447	Mar. 26, 2018
6	EMI Test Receiver	R&S	ESCI	100382	Mar. 26, 2018

Remark: "N/A" denotes no model name, serial no. or calibration specified.

All calibration period of equipment list is one year.

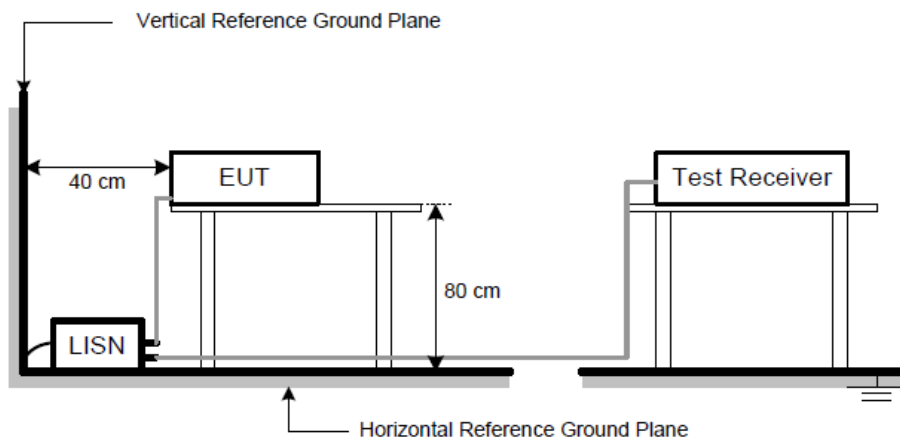
### 4.1.3 TEST PROCEDURE

- a. The EUT was placed 0.8 meters from the horizontal ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipments powered from additional LISN(s). The LISN provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.
- b. Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.
- c. I/O cables that are not connected to a peripheral shall be bundled 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.
- d. LISN at least 80 cm from nearest part of EUT chassis.
- e. For the actual test configuration, please refer to the related Item –EUT Test Photos.
- f. First the whole spectrum of emission caused by equipment under test(EUT) is recorded with Detector set to peak. Peak value recorded in table if the margin from QP Limit is larger than 2dB, otherwise, QP value is recorded, Measuring frequency range from 150KHz to 30MHz.

### 4.1.4 DEVIATION FROM TEST STANDARD

No deviation

### 4.1.5 TEST SETUP

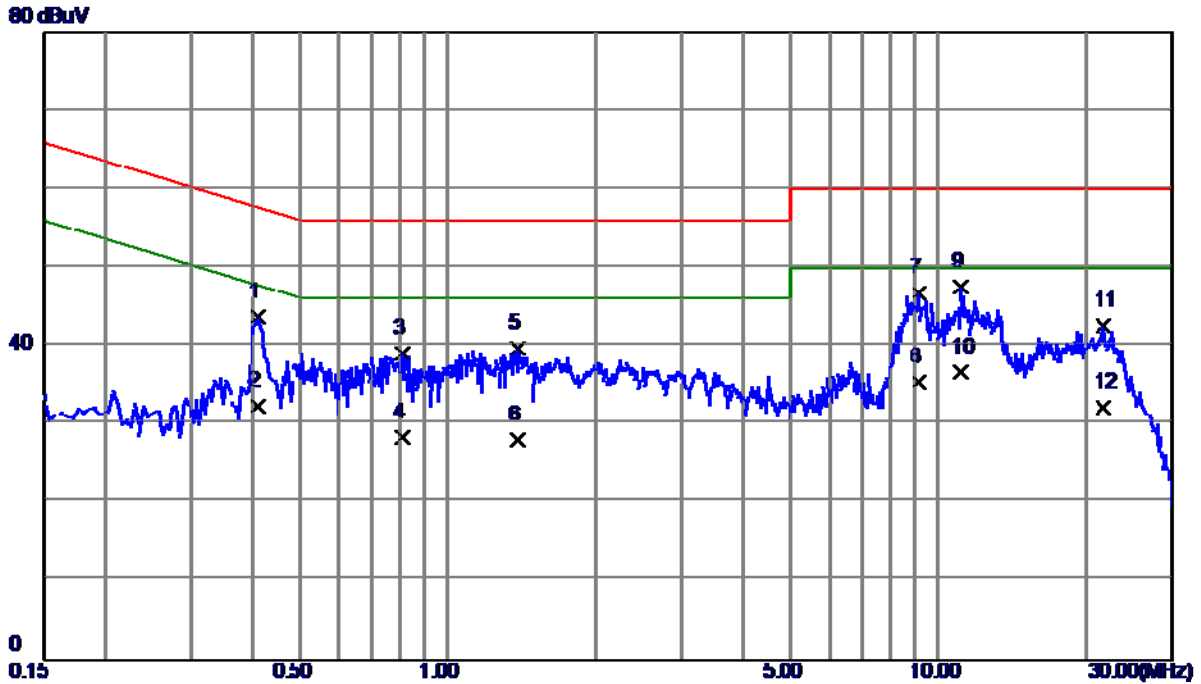


### 4.1.6 TEST RESULTS

Remark

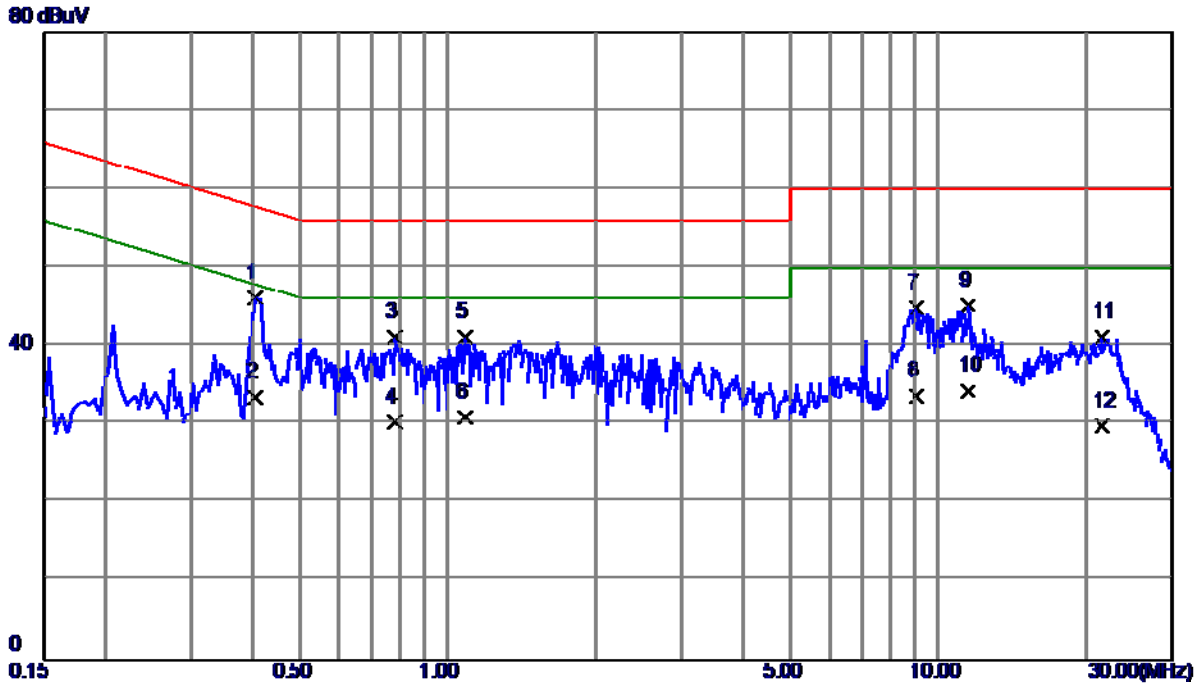
- (1) Reading in which marked as QP means measurements by using are Quasi-Peak Mode with Detector BW=9KHz; SPA setting in RBW=10KHz, VBW =10KHz, Swp. Time = 0.3 sec./MHz. Reading in which marked as AV means measurements by using are Average Mode with instrument setting in RBW=10KHz, VBW=10KHz, Swp. Time =0.3 sec./MHz.
- (2) All readings are QP Mode value unless otherwise stated AVG in column of 『Note』. If the QP Mode Measured value compliance with the QP Limits and lower than AVG Limits, the EUT shall be deemed to meet both QP & AVG Limits and then only QP Mode was measured, but AVG Mode didn't perform. In this case, a “ \* ” marked in AVG Mode column of Interference Voltage Measured.

EUT	Smart Lite Giga Switch	Model Name	VigorSwitch G1080
Temperature	25°C	Relative Humidity	53%
Test Voltage	AC 120V/60Hz	Phase	Line
Test Mode	FULL SYSTEM		
Test Engineer	Sam Wang		



No.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure ment dBuV	Limit dBuV	Margin dB	Detector
1	0.4110	33.92	9.75	43.67	57.63	-13.96	QP
2	0.4110	22.50	9.75	32.25	47.63	-15.38	AVG
3	0.8070	29.31	9.76	39.07	56.00	-16.93	QP
4	0.8070	18.60	9.76	28.36	46.00	-17.64	AVG
5	1.3875	29.83	9.80	39.63	56.00	-16.37	QP
6	1.3875	18.21	9.80	28.01	46.00	-17.99	AVG
7	9.1185	36.73	10.01	46.74	60.00	-13.26	QP
8	9.1185	25.31	10.01	35.32	50.00	-14.68	AVG
9 *	11.0940	37.42	10.09	47.51	60.00	-12.49	QP
10	11.0940	26.60	10.09	36.69	50.00	-13.31	AVG
11	21.6645	32.26	10.29	42.55	60.00	-17.45	QP
12	21.6645	21.90	10.29	32.19	50.00	-17.81	AVG

EUT	Smart Lite Giga Switch	Model Name	VigorSwitch G1080
Temperature	25°C	Relative Humidity	53%
Test Voltage	AC 120V/60Hz	Phase	Neutral
Test Mode	FULL SYSTEM		
Test Engineer	Sam Wang		



No.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure ment dBuV	Limit dBuV	Margin dB	Detector
1 *	0.4065	36.49	9.65	46.14	57.72	-11.58	QP
2	0.4065	23.79	9.65	33.44	47.72	-14.28	AVG
3	0.7799	31.43	9.66	41.09	56.00	-14.91	QP
4	0.7799	20.60	9.66	30.26	46.00	-15.74	AVG
5	1.0815	31.47	9.68	41.15	56.00	-14.85	QP
6	1.0815	21.20	9.68	30.88	46.00	-15.12	AVG
7	9.0285	34.88	9.95	44.83	60.00	-15.17	QP
8	9.0285	23.70	9.95	33.65	50.00	-16.35	AVG
9	11.5125	35.10	10.08	45.18	60.00	-14.82	QP
10	11.5125	24.11	10.08	34.19	50.00	-15.81	AVG
11	21.6060	30.70	10.41	41.11	60.00	-18.89	QP
12	21.6060	19.30	10.41	29.71	50.00	-20.29	AVG

## 4.2 RADIATED EMISSION MEASUREMENT

### 4.2.1 LIMITS OF RADIATED EMISSION MEASUREMENT

Below 1 GHz

Measurement Method and Applied Limits:

ANSI C63.4:

Frequency (MHz)	Class A (at 10m)		Class B (at 3m)	
	(uV/m) Field strength	(dBuV/m) Field strength	(uV/m) Field strength	(dBuV/m) Field strength
30 - 88	90	39	100	40
88 - 216	150	43.5	150	43.5
216 - 960	210	46.4	200	46
Above 960	300	49.5	500	54

NOTE:

- (1) The limit for radiated test was performed according to as following:  
FCC Part 15, Subpart B
- (2) The tighter limit applies at the band edges.
- (3) Emission level (dBuV/m) = 20log Emission level (uV/m).  
3m Emission level = 10m Emission level + 20log(10m/3m).
- (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

### 4.2.2 MEASUREMENT INSTRUMENTS LIST

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Antenna	Schwarbeck	VULB9160	9160-3232	Mar. 26, 2018
2	Amplifier	HP	8447D	2944A09673	Oct. 19, 2018
3	Receiver	Agilent	N9038A	MY52130039	Aug. 20, 2018
4	Cable	emci	LMR-400(30 MHz-1GHz)(8m+5m)	N/A	Jun. 26, 2018
5	Controller	CT	SC100	N/A	N/A
6	Controller	MF	MF-7802	MF780208416	N/A
7	Measurement Software	Farad	EZ-EMC Ver.NB-03A1-01	N/A	N/A

Remark: "N/A" denotes no model name, serial no. or calibration specified.

All calibration period of equipment list is one year.

### 4.2.3 TEST PROCEDURE

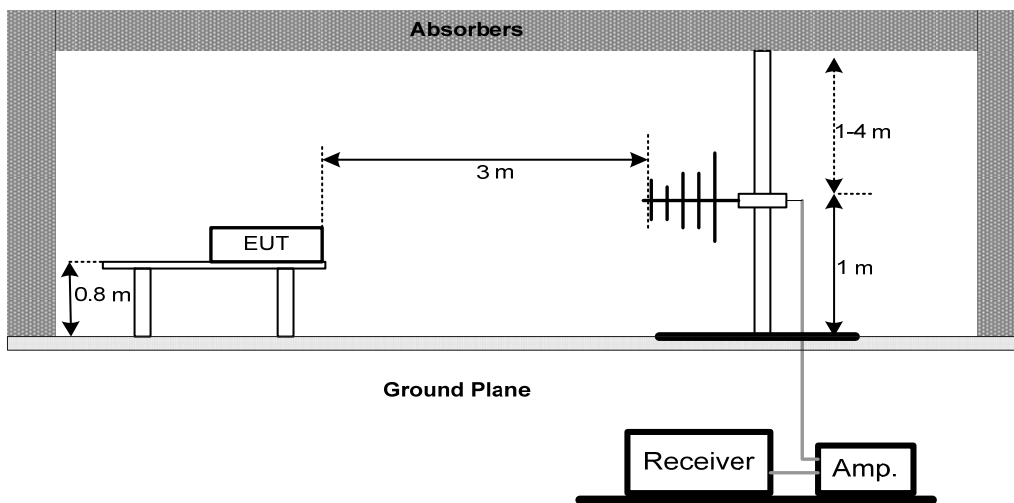
- a. The measuring distance of 3 m shall be used for measurements. The EUT was placed on the top of a rotating table 0.8 meter above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.(below 1GHz)
- b. The height of the equipment or of the substitution antenna shall be 0.8 m, the height of the test antenna shall vary between 1 m to 4 m. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- c. The initial step in collecting radiated emission data is a receiver peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.
- d. All readings are Peak unless otherwise stated QP in column of Note. Peak denotes that the Peak reading compliance with the QP Limits and then QP Mode measurement didn't perform. (below 1GHz)
- e. For the actual test configuration, please refer to the related Item - Block Diagram of system tested (please refer to 3.3).

### 4.2.4 DEVIATION FROM TEST STANDARD

No deviation

### 4.2.5 TEST SETUP

(A) Radiated Emission Test Set-Up Frequency Below 1 GHz



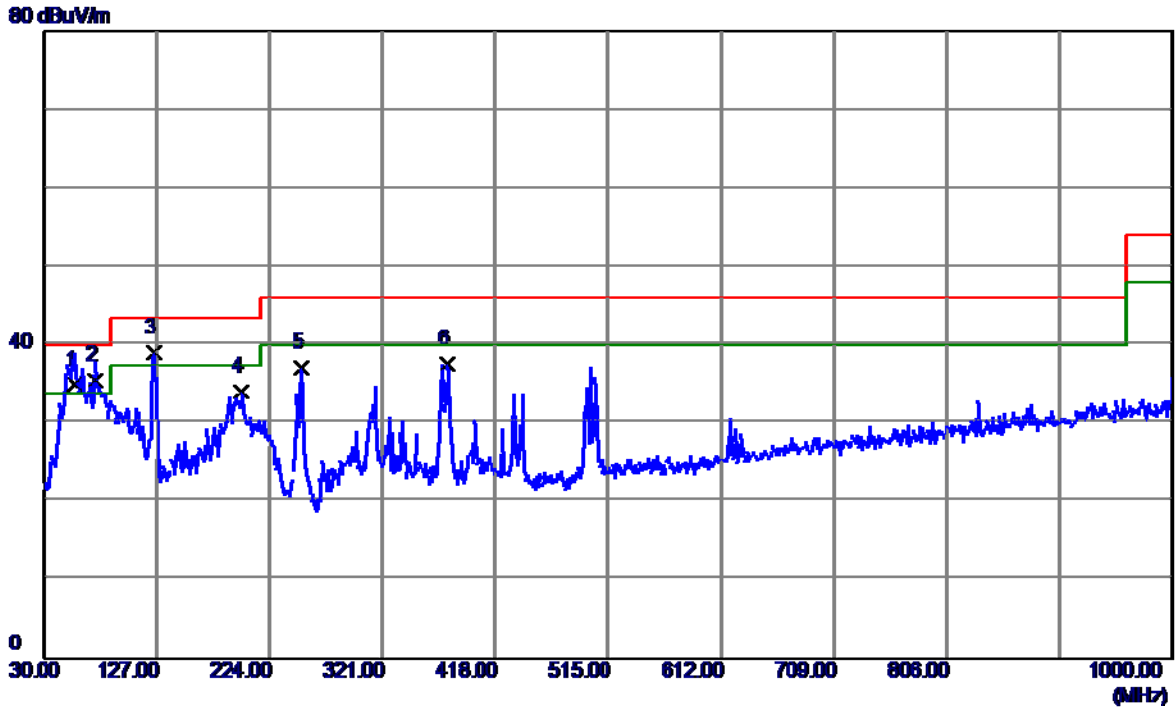
### 4.2.6 TEST RESULTS-BELOW 1GHZ

Remark :

- (1) All readings are Peak unless otherwise stated QP in column of 『Note』 . Peak denotes that the Peak reading compliance with the QP Limits and then QP Mode measurement didn't perform ◦
- (2) Measuring frequency range from 30MHz to 1000MHz ◦
- (3) If the peak scan value lower limit more than 20dB, then this signal data does not show in table ◦

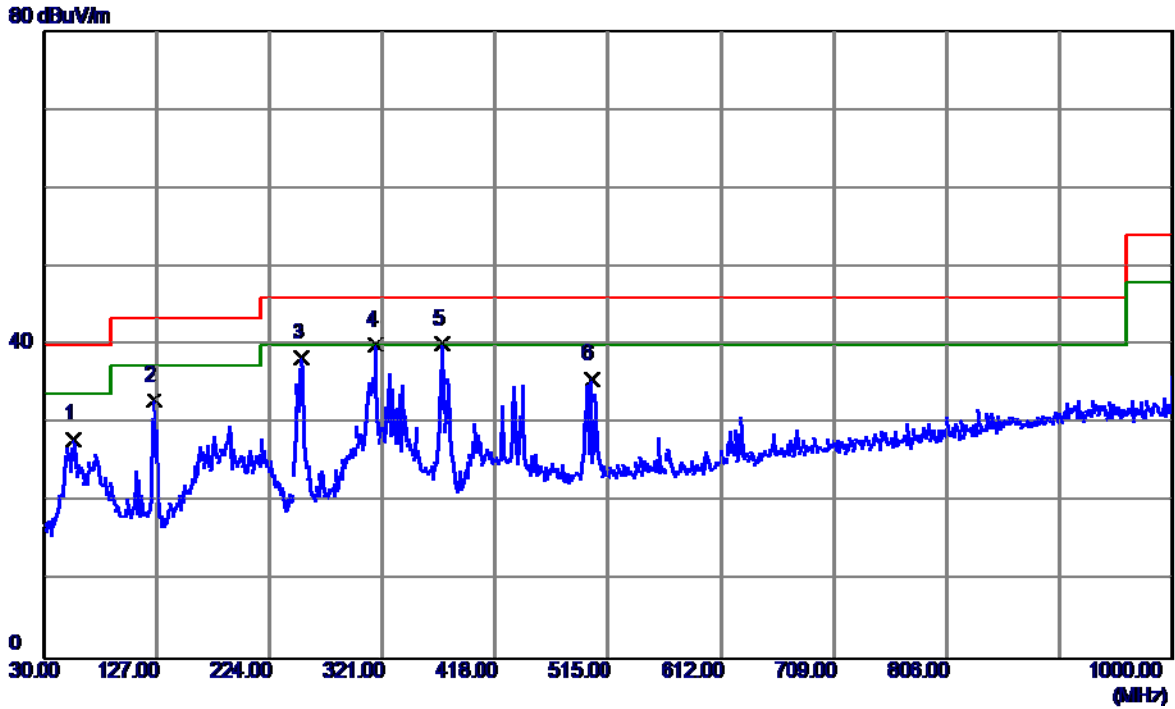


EUT	Smart Lite Giga Switch	Model Name	VigorSwitch G1080
Temperature	25°C	Relative Humidity	45%
Test Voltage	AC 120V/60Hz	Polarization	Vertical
Test Mode	FULL SYSTEM		
Test Engineer	Sam Wang		



No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector
1	57.1600	48.73	-13.77	34.96	40.00	-5.04	QP
2 *	74.6200	52.33	-16.75	35.58	40.00	-4.42	QP
3	125.0600	53.68	-14.70	38.98	43.50	-4.52	QP
4	200.7200	47.41	-13.36	34.05	43.50	-9.45	QP
5	252.1300	51.75	-14.58	37.17	46.00	-8.83	QP
6	377.2600	48.63	-10.99	37.64	46.00	-8.36	QP

EUT	Smart Lite Giga Switch	Model Name	VigorSwitch G1080
Temperature	25°C	Relative Humidity	45%
Test Voltage	AC 120V/60Hz	Polarization	Horizontal
Test Mode	FULL SYSTEM		
Test Engineer	Sam Wang		



No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector
1	56.1900	41.66	-13.68	27.98	40.00	-12.02	QP
2	125.0600	47.73	-14.70	33.03	43.50	-10.47	QP
3	252.1300	53.01	-14.58	38.43	46.00	-7.57	QP
4	315.1800	51.96	-11.99	39.97	46.00	-6.03	QP
5 *	372.4100	51.18	-11.05	40.13	46.00	-5.87	QP
6	500.4500	43.62	-7.92	35.70	46.00	-10.30	QP

## 5. EUT TEST PHOTO

### Conducted Emission



Radiated emission below 1 GHz

