

FCC Part 15B TEST REPORT

Product Name : PIQS Virtual Touch Projector

Model Name : TT

Prepared for:

**PIQS Technology(Shenzhen) Limited
West,6F Buiding 1,No.35 CuiJing Road,Pingshan New District,Shenzhen
City,Guangdong,China
TEL: /
FAX: /**

Prepared by:

**Unilab (Shanghai) Co., Ltd.
FCC 2.948 register number is 714465
No. 1350, Lianxi Rd. Pudong New District, Shanghai, China
TEL: +86-21-50275125
FAX: +86-21-50277862**

**Report Number : UL71220170302FCC -8
Date of Report : 04-19-2017
Date of Test : 03-03-2015~04-19-2017**

Notes :

The test results only relate to these samples which have been tested.
Partly using this report will not be admitted unless been allowed by Unilab.
Unilab is only responsible for the complete report with the reported stamp of Unilab.

Applicant: PIQS Technology(Shenzhen) Limited.
West,6F Buiding 1,No.35 CuiJing Road,Pingshan New District,Shenzhen City,Guangdong,China.

Manufacturer: PIQS Technology(Shenzhen) Limited.
West,6F Buiding 1,No.35 CuiJing Road,Pingshan New District,Shenzhen City,Guangdong,China.

Product Name: PIQS Virtual Touch Projector

Brand Name: PIQS

Model Name: TT

Model Description: See Part1.1 Note.

FCC ID: 2ALH2-PFAT100

EUT Voltage: Extreme Low: 16 Norminal: 19 Extreme High:23

Date of Receipt: 03-02-2017

Test Standard: FCC CFR Tile 47 Part 15 Subpart B

Test Result: Pass

Date of Test 03-03-2017-04-16-2017

Prepared by : Wayne Wu
(Technical Engineer: Wayne Wu)

Reviewed by : Forest Cao
(Senior Engineer: Forest Cao)

Approved by : Eva Wang
(Supervisor: Eva Wang)

TABLE OF CONTENTS

1.	TECHNIACL SUMMARY	4
1.1	SUMMARY OF STANDARDS AND TEST RESULTS	4
1.2	TEST UNCERTAINTY	4
1.3	TEST EQUIPMENT LIST	4
1.4	TEST MODE AND DESCRIPTION	4
1.5	TEST FACILITY	4
1.6	TEST SETUP CONFIGURATION	5
2.	CONDUCTED DISTURBANCE	6
2.1	TEST SETUP	6
2.2	LIMITS.....	6
2.3	TEST PROCEDURE	6
2.4	TEST RESULT	7
3.	RADIATED DISTURBANCE (RE)	9
3.1	TEST SETUP	9
3.2	LIMITS.....	9
3.3	TEST PROCEDURE	10
3.4	TEST RESULT	11
APPENDIX 1	PHOTOGRAPHS OF TEST SETUP.....	15
APPENDIX 2	PHOTOGRAPHS OF EUT	15

1. TECHNICAL SUMMARY

1.1 SUMMARY OF STANDARDS AND TEST RESULTS

The EUT have been tested according to the applicable standards as referenced below:

EMISSION		
Test Item	FCC	Result
Conducted disturbance	FCC 15.107	P*
Radiated disturbance	FCC 15.109	P

Note *: P means pass, F means failure, N/A means not applicable

1.2 TEST UNCERTAINTY

Where relevant, the following test uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

Test item	Value (dB)
Conducted disturbance	3.4
Radiated disturbance	4.2

1.3 TEST EQUIPMENT LIST

Equipment	Manufacturer	Model	Serial No.	Due Date	Cal interval
Receiver	Agilent	N9038A	MY51210142	11/05/2017	1 year
LISN	R&S	ENV216	100069	06/07/2017	1 year
ESG Vector Signal Generator	Agilent	E4438C	MY42081708	09/22/2017	3 years
Bilog Antenna	Schwarzbeck	VULB9160	9160-3316	09/08/2017	2 years
Broad-Band Horn Antenna	Schwarzbeck	BBHA9120D	9120D-943	09/08/2017	2 years
Microwave Preamplifier	EM Electronics	EM30180	3008A02425	02/25/2018	1 year
3m Chamber & Accessory Equipment	ETS-LINDGREN	FACT-3	CT-0000336	07/27/2018	3 years

The measuring equipment utilized to perform the tests documented in this report has been calibrated once a year or in accordance with the manufacturer's recommendations, and has been calibrated by accredited calibration laboratories.

1.4 TEST MODE AND DESCRIPTION

Test mode	Projecting at maximum brightness
-----------	----------------------------------

1.5 TEST FACILITY

All test facilities used to collect the test data are located at No. 1350, Lianxi Rd. Pudong New District, Shanghai, China. The site and apparatus are constructed in conformance with the requirements of ANSI C63.4: 2009, CISPR 16-1-1 and other equivalent standards. The laboratory is compliance with the requirements of the ISO/IEC/EN17025.

1.6 TEST SETUP CONFIGURATION

See test photographs attached in Appendix 1 for the actual connections between EUT and support equipment.

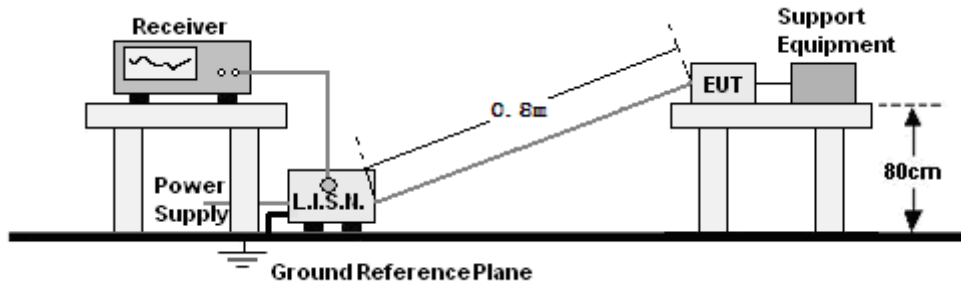
Notes:

1. All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.
2. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.
3. All the tests were carried out with the EUT in normal operation. Which was shown in this test report is the worst test mode.

2. CONDUCTED DISTURBANCE

2.1 TEST SETUP

For mains port:



2.2 LIMITS

Limits for Class B digital devices

Frequency range (MHz)	Limits dB(μV)	
	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 to 0.50 MHz.

2.3 TEST PROCEDURE

For mains port:

a. The EUT and support equipment were placed on a nonconductive table 0.8m above the horizontal ground reference plane, and 0.4 m from the vertical ground reference plane. The EUT connected to the main through Line Impedance Stability Network (L.I.S.N) to provide a 50 Ω/50uH coupling impedance for the measuring equipment. The support equipment is also connected to the main power through a LISN that provides a 50 Ω/50uH coupling impedance with 50 Ω terminations. Both sides of AC line (Line & Neutral) were checked to find out the maximum conducted emission.

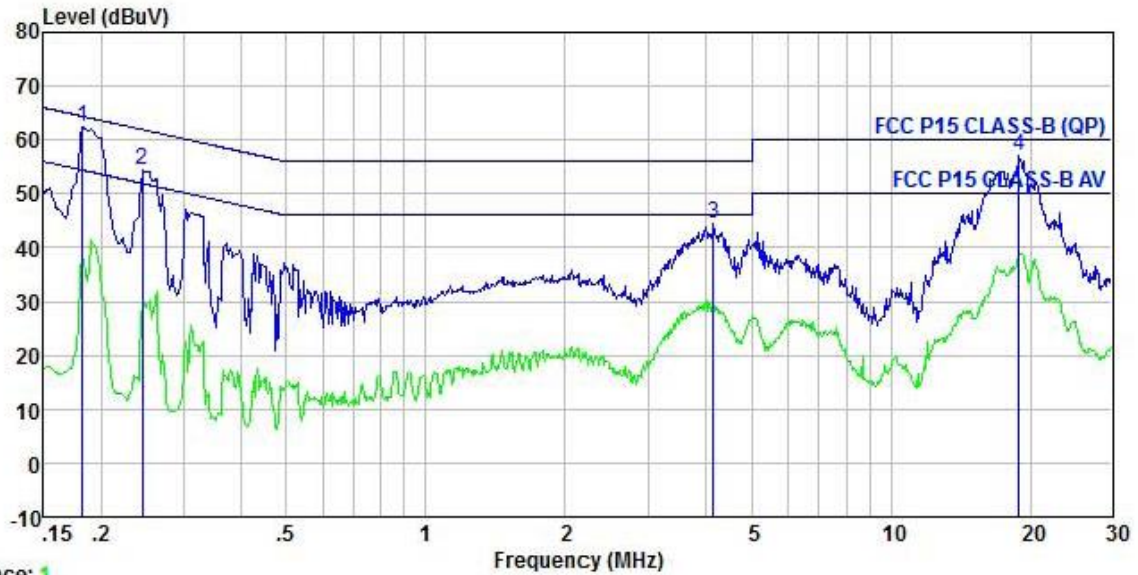
b. The RBW of the receiver was set at 9 kHz. The frequency range from 150 kHz to 30 MHz was checked. Run the receiver's pre-scan to record the maximum disturbance generated from EUT in all power lines in the full band.

c. For each frequency whose maximum record was higher or close to limit, measure its QP and AVG values and record.

2.4 TEST RESULT

For mains port:

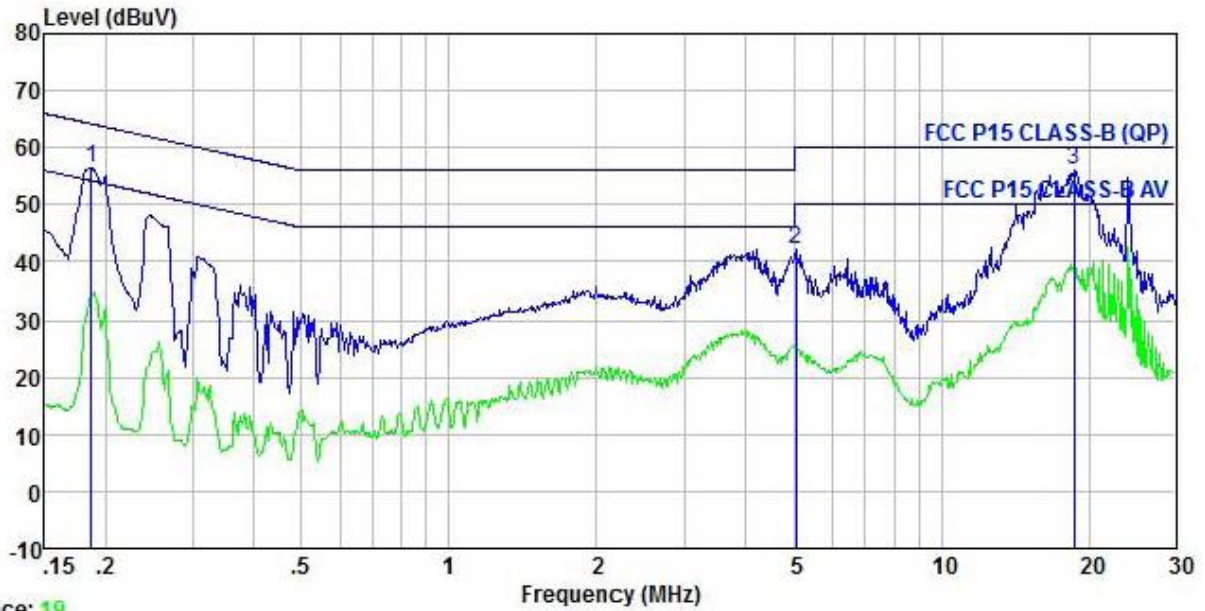
EUT : PIQS Virtual Touch Projector	M/N : TT
Power : AC 220V/50Hz	Temperature : 21°C
Mode : Projecting at maximum brightness	Humidity : 56%
LISN : Live	



Trace: 1
 Site : chamber
 Condition : FCC P15 CLASS-B (QP) ENV216(L) LINE
 EUT :
 Model Name : TT
 Temp/Humi : 21 °C /56 %
 Power Rating:
 Mode :
 Memo :

	Read	LISN	Cable	Preamp	Limit	Over	
Freq	Level	Factor	Loss	Factor	Level	Line	Limit Remark
MHz	dBuV	dB	dB	dB	dBuV	dBuV	dB
1	0.18	52.83	9.46	0.23	0.00	62.52	64.42 -1.90 Peak
2	0.24	44.79	9.52	0.20	0.00	54.51	61.95 -7.44 Peak
3	4.14	34.64	9.66	0.14	0.00	44.44	56.00 -11.56 Peak
4	18.92	47.28	9.73	0.11	0.00	57.12	60.00 -2.88 Peak

EUT : PIQS Virtual Touch Projector **M/N** : TT
Power : AC 220V/50Hz **Temperature** : 21°C
Mode : Projecting at maximum brightness **Humidity** : 56%
LISN : Neutral



Trace: 19
 Site : chamber
 Condition : FCC P15 CLASS-B (QP) ENV216(N) NEUTRAL
 EUT :
 Model Name : TT
 Temp/Humi : 21 °C / 56 %
 Power Rating :
 Mode :
 Memo :

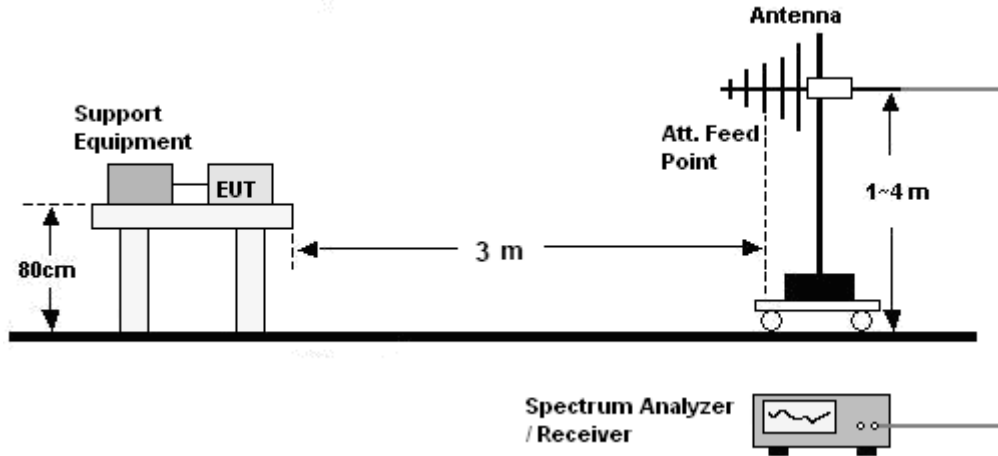
Read LISN Cable Preamp Limit Over
 Freq Level Factor Loss Factor Level Line Limit Remark

	MHz	dBUV	dB	dB	dB	dBUV	dBUV	dB
1	0.19	46.79	9.42	0.23	0.00	56.44	64.20	-7.76 Peak
2	5.06	32.46	9.53	0.15	0.00	42.14	60.00	-17.86 Peak
3	18.62	46.09	9.83	0.11	0.00	56.03	60.00	-3.97 Peak

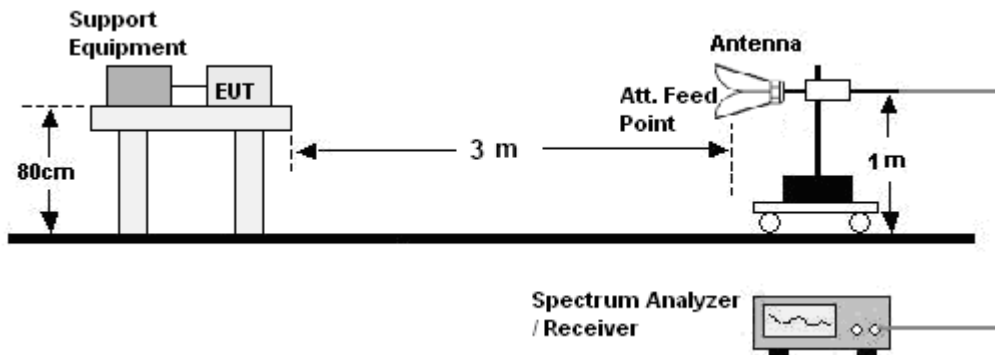
3. RADIATED DISTURBANCE (RE)

3.1 TEST SETUP

30MHz ~ 1GHz:



Above 1GHz:



3.2 LIMITS

Limits for Class B digital devices

Frequency (MHz)	limits at 3m dB(μV/m)
30-88	40.0
88-216	43.5
216-960	46.0
Above 960	54.0

- NOTE:**
1. The lower limit shall apply at the transition frequency.
 2. The limits shown above are based on measuring equipment employing a CISPR quasi-peak detector function for frequencies below or equal to 1000MHz.
 3. The limits shown above are based on measuring equipment employing an average detector function for frequencies above 1000MHz.

3.3 TEST PROCEDURE

30MHz ~ 1GHz:

- a. The EUT and support equipment were placed on the non-conductive turntable 0.8m above the horizontal metal ground plane at a chamber. The EUT was set 3 meters away from the receiving antenna, which was mounted on an antenna tower. Broadband antenna (Calibrated Bilog Antenna) was used as receiving antenna.
- b. The frequency range from 30MHz to 1GHz was checked. The RBW of the receiver was set at 120kHz. Set the receiver in Peak detector, Max Hold mode. Record the maximum field strength of all the pre-scan process in the full band when the antenna is varied between 1~4 m in both horizontal and vertical, and the turntable is rotated from 0 to 360 degrees.
- c. For each frequency whose maximum record was higher or close to limit, measure its QP value: vary the antenna's height and rotate the turntable from 0 to 360 degrees to find the height and degree where EUT radiated the maximum emission, then set the test frequency receiver to QP Detector and record the maximum value.

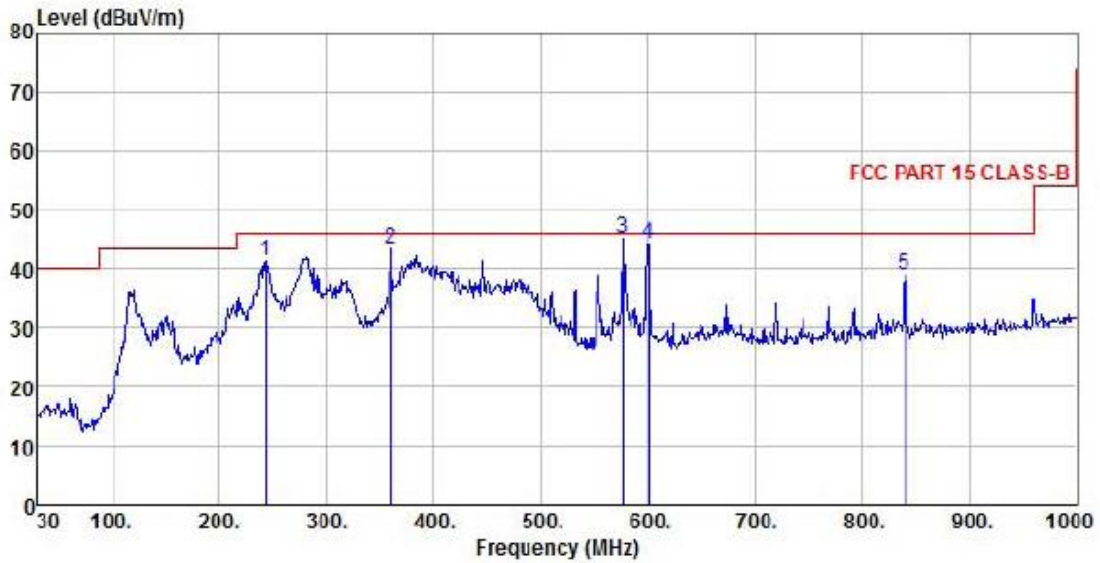
Above 1GHz:

- a. The EUT and support equipment were placed on the non-conductive turntable 0.8m above the ground at a chamber. The EUT was set 3 meters away from the receiving antenna, which was mounted on an antenna tower. Horn antenna was used as receiving antenna.
- b. The frequency range above 1GHz was checked. The RBW of the receiver was set at 1MHz. Set the receiver in Peak detector, Max Hold mode. Record the maximum field strength of all the pre-scan process in the full band when the antenna is 1m and varied in both horizontal and vertical, and the turntable is rotated from 0 to 360 degrees.
- c. For each frequency whose maximum record was higher or close to limit, measure its Average value: rotate the turntable from 0 to 360 degrees to find the degree where EUT radiated the maximum emission, then set the test frequency receiver to EMI Average Detector and record the maximum value.

3.4 TEST RESULT

30MHz ~ 1GHz:

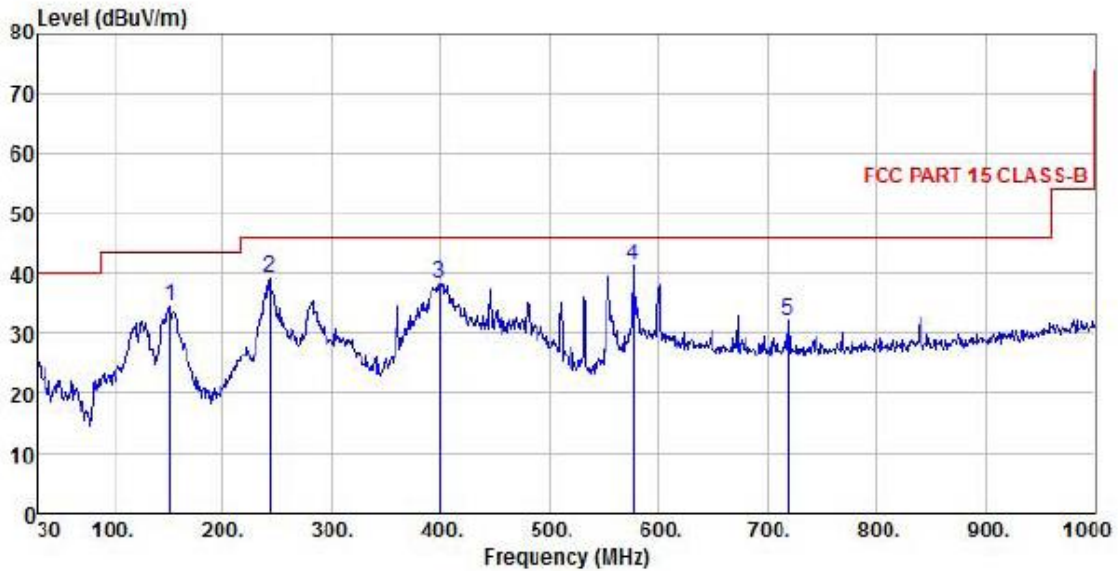
EUT : PIQS Virtual Touch Projector	M/N : TT
Power : AC 220V/50Hz	Temperature : 20°C
Mode : Projecting at maximum brightness	Humidity : 56%
Antenna Polarity: Horizontal	



Site : chamber
 Condition : FCC PART 15 CLASS-B 3m VULB9160 HORIZONTAL
 EUT :
 Model Name : TT
 Temp/Humi : 20 °C / 56 %
 Power Rating :
 Mode :
 Memo :

	Read	Antenna	Cable	Preamp	Limit	Over	
Freq	Level	Factor	Loss	Factor	Level	Line	Limit Remark
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB
1	243.40	27.47	11.79	2.13	0.00	41.39	46.00 -4.61 Peak
2	359.80	26.52	14.39	2.58	0.00	43.49	46.00 -2.51 Peak
3	576.11	23.31	18.53	3.26	0.00	45.10	46.00 -0.90 Peak
4	600.36	21.88	19.16	3.34	0.00	44.38	46.00 -1.62 Peak
5	839.95	12.90	22.01	3.94	0.00	38.85	46.00 -7.15 Peak

EUT	: PIQS Virtual Touch Projector	M/N	: TT
Power	: AC 220V/50Hz	Temperature	: 20°C
Mode	: Projecting at maximum brightness	Humidity	: 56%
Antenna Polarity:	Vertical		



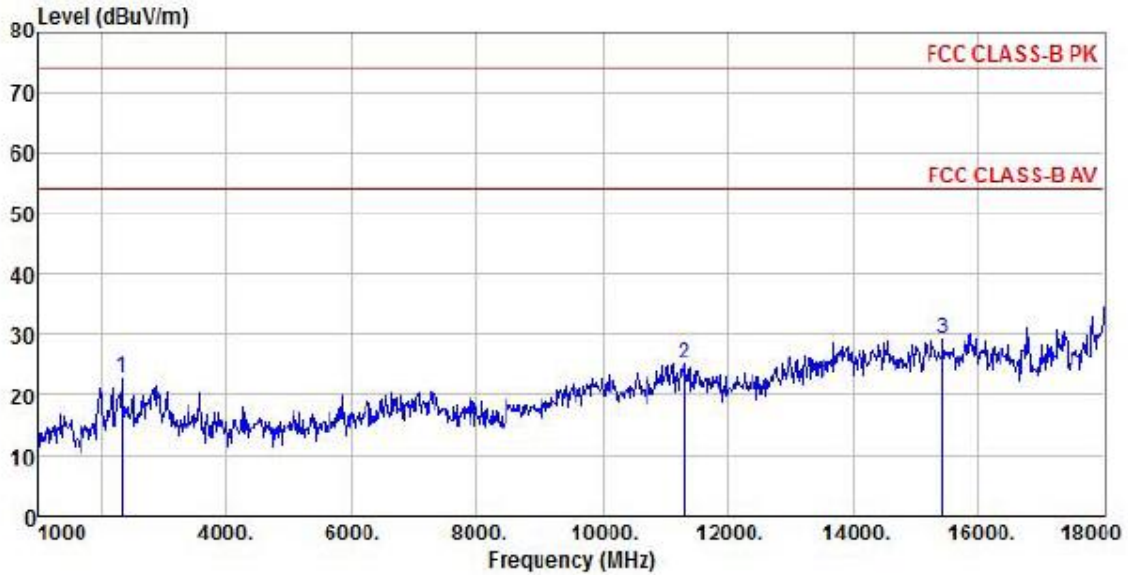
```

Site       : chamber
Condition  : FCC PART 15 CLASS-B 3m VULB9160 VERTICAL
EUT        :
Model Name : TT
Temp/Humi  : 20 °C / 56 %
Power Rating:
Mode       :
Memo       :
    
```

Freq	MHz	dBuV	dB/m	dB	ReadAntenna		Cable Preamp		Limit	Over	Remark
					Level	Factor	Loss Factor	Level			
1	151.25	19.03	13.90	1.66	0.00	34.59	43.50	-8.91	Peak		
2	243.40	25.20	11.79	2.13	0.00	39.12	46.00	-6.88	Peak		
3	390.57	20.48	15.32	2.65	0.00	38.45	46.00	-7.55	Peak		
4	pp 576.11	19.66	18.53	3.26	0.00	41.45	46.00	-4.55	Peak		
5	719.67	7.91	20.52	3.72	0.00	32.15	46.00	-13.85	Peak		

Above 1GHz:

EUT : PIQS Virtual Touch Projector	M/N : TT
Power : AC 220V/50Hz	Temperature : 20°C
Mode : Projecting at maximum brightness	Humidity : 56%
Antenna Polarity: Horizontal	



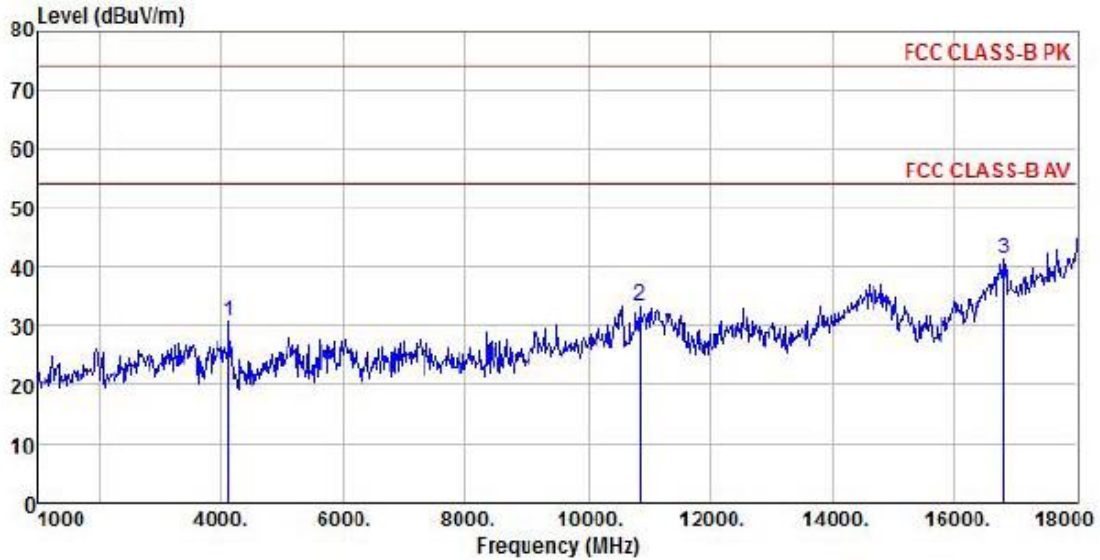
Site : chamber
 Condition : FCC CLASS-B PK 3m BBHA9120D(942) HORIZONTAL
 EUT :
 Model Name : TT
 Temp/Humi : 20 °C / 56 %
 Power Rating:
 Mode :
 Memo :

ReadAntenna	Cable	Preamp	Limit	Over
Freq	Level	Factor	Loss	Factor
Level	Line	Limit	Remark	

	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB
1	2343.00	26.35	27.80	7.22	38.54	22.83	74.00	-51.17 Peak
2	11319.00	7.54	40.02	16.11	38.51	25.16	74.00	-48.84 Peak
3	15433.00	12.27	38.73	17.78	39.70	29.08	74.00	-44.92 Peak

EUT : PIQS Virtual Touch Projector
Power : AC 220V/50Hz
Mode : Projecting at maximum brightness
Antenna Polarity: Vertical

M/N : TT
Temperature : 20°C
Humidity : 56%



Site : chamber
 Condition : FCC CLASS-B PK 3m BBHA9120D(942) VERTICAL
 EUT :
 Model Name : TT
 Temp/Humi : 20 °C / 56 %
 Power Rating :
 Mode :
 Memo :

	Read	Antenna	Cable	Preamp	Limit	Over		
	Freq	Level	Factor	Loss	Factor	Level	Line	Limit
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB
1	4128.00	28.35	30.09	9.53	37.40	30.57	74.00	-43.43 Peak
2	10860.00	15.61	40.14	15.73	38.01	33.47	74.00	-40.53 Peak
3 pp	16793.00	22.90	40.62	18.27	40.39	41.40	74.00	-32.60 Peak

APPENDIX 1 PHOTOGRAPHS OF TEST SETUP

Please refer to the file named “Part15B Setup Photos”.

APPENDIX 2 PHOTOGRAPHS OF EUT

Please refer to the two files named “Internal Photos” and “External Photos”.

----End of the report----