

FCC TEST REPORT

Product Name: Micro Video Drone
Trade Mark: N/A
Model No.: BKST003
Report Number: 170400775SHA-001
Test Standards: FCC 47 CFR Part 15 Subpart C
FCC ID: VLEST003R
Test Result: PASS
Date of Issue: April 6, 2017

Prepared for:

Asian Express Holdings Limited
Room 1702 Sino Centre 582 - 592 Nathan Road Mongkok Kowloon
Hong Kong

Prepared by:

Intertek Testing Service Shanghai
Building 86, No. 1198 Qinzhou Road(North), Shanghai 200233, P.R.
China
TEL: +86 (0)21 61278200
FAX: +86 (0)21 54262353

Prepared by:



Wade Zhang
Project Engineer

Reviewed by:



Daniel Zhao
Reviewer

Version

Version No.	Date	Description
V1.0	April 6, 2017	Original

CONTENTS

1. GENERAL INFORMATION	4
1.1 CLIENT INFORMATION	4
1.2 EUT INFORMATION	4
1.2.1 GENERAL DESCRIPTION OF EUT	4
1.2.2 DESCRIPTION OF ACCESSORIES	4
1.3 PRODUCT SPECIFICATION SUBJECTIVE TO THIS STANDARD	4
1.4 OTHER INFORMATION	5
1.5 DESCRIPTION OF SUPPORT UNITS	5
1.6 TEST LOCATION	5
1.7 TEST FACILITY	6
1.8 DEVIATION FROM STANDARDS	6
1.9 ABNORMALITIES FROM STANDARD CONDITIONS	6
1.10 OTHER INFORMATION REQUESTED BY THE CUSTOMER	6
1.11 MEASUREMENT UNCERTAINTY	6
2. TEST SUMMARY	7
3. EQUIPMENT LIST	8
4. TEST CONFIGURATION	9
4.1 ENVIRONMENTAL CONDITIONS FOR TESTING	9
4.1.1 NORMAL OR EXTREME TEST CONDITIONS	9
4.1.2 RECORD OF NORMAL ENVIRONMENT	9
4.2 TEST CHANNELS	9
4.3 EUT TEST STATUS	9
4.4 TEST SETUP	9
4.4.1 FOR RADIATED EMISSIONS TEST SETUP	9
4.4.2 FOR CONDUCTED EMISSIONS TEST SETUP	10
4.4.3 FOR CONDUCTED EMISSIONS TEST SETUP	10
4.5 SYSTEM TEST CONFIGURATION	11
4.6 DUTY CYCLE	12
5. RADIO TECHNICAL REQUIREMENTS SPECIFICATION	13
5.1 REFERENCE DOCUMENTS FOR TESTING	13
5.2 ANTENNA REQUIREMENT	13
5.3 RADIATED EMISSION	13
5.4 RESTRICTED BANDS AROUND FUNDAMENTAL FREQUENCY	24
5.5 20dB OCCUPIED BANDWIDTH	27
5.6 CONDUCTED EMISSION	30
APPENDIX 1 PHOTOGRAPHS OF TEST SETUP	33
APPENDIX 2 PHOTOGRAPHS OF EUT CONSTRUCTIONAL DETAILS	33

1. GENERAL INFORMATION

1.1 CLIENT INFORMATION

Applicant:	Asian Express Holdings Limited
Address of Applicant:	Room 1702 Sino Centre 582 - 592 Nathan Road Mongkok Kowloon Hong Kong
Manufacturer:	Asian Express Holdings Limited
Address of Manufacturer:	Room 1702 Sino Centre 582 - 592 Nathan Road Mongkok Kowloon Hong Kong

1.2 EUT INFORMATION

1.2.1 General Description of EUT

Product Name:	Micro Video Drone
Model No.:	BKST003
Add. Model No.:	BKST004
Trade Mark:	N/A
DUT Stage:	Production Unit
EUT Supports Function:	General 2.4GHz Technique
Power Supply:	3.7V \approx 140mAh Lithium-ion Polymer Rechargeable Battery (Power the by USB port/AC adapter).
Software Version:	N/A
Hardware Version:	N/A
Sample Received Date:	March 30, 2017
Sample Tested Date:	March 30, 2017 to April 6, 2017
Note: The test data is gathered from a production sample, provided by the manufacturer. The appearance of others models listed in the report is different from main-test model BKST003, but the circuit and the electronic construction do not change, declared by the manufacturer.	

1.2.2 Description of Accessories

Battery	
Trade Mark:	N/A
Model No.:	N/A
Battery Type:	Lithium-ion Polymer Rechargeable Battery
Rated Voltage:	3.7 Vdc
Limited Charge Voltage:	4.4 Vdc
Rated Capacity:	140 mAh
Manufacturer:	N/A

Cable	
Trade Mark:	N/A
Model No.:	N/A
Description:	USB Micro-B Plug Cable
Cable Type:	Unshielded without ferrite
Length:	0.6 Meter

1.3 PRODUCT SPECIFICATION SUBJECTIVE TO THIS STANDARD

Frequency Range:	2405 MHz to 2476 MHz
Modulation Technique:	Frequency Hopping Spread Spectrum(FHSS)
Type of Modulation:	GFSK
Number of Channels:	25

Channel Separation:	≥ 2 MHz
Antenna Type:	Integral Antenna
Antenna Gain:	1.9 dBi
Maximum Field Strength:	79.03 dBμV/m
Normal Test Voltage:	3.7 Vdc

1.4 OTHER INFORMATION

Operation Frequency Each of Channel							
Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
1	2405 MHz	8	2433 MHz	15	2452 MHz	22	2470 MHz
2	2413 MHz	9	2437 MHz	16	2455 MHz	23	2472 MHz
3	2422 MHz	10	2440 MHz	17	2457 MHz	24	2474 MHz
4	2424 MHz	11	2442 MHz	18	2460 MHz	25	2476 MHz
5	2426 MHz	12	2445 MHz	19	2462 MHz	---	---
6	2428 MHz	13	2447 MHz	20	2465 MHz	---	---
7	2430 MHz	14	2450 MHz	21	2467 MHz	---	---

1.5 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested with associated equipment below.

1) Support Equipment

Description	Manufacturer	Model No.	Serial Number	Supplied by
Notebook	Lenovo	B40-80	MP12NEQ6	UnionTrust

2) Support Cable

Cable No.	Description	Connector	Length	Supplied by
--	--	--	--	--

1.6 TEST LOCATION

Sub-contact laboratory for testing

Shenzhen UnionTrust Quality and Technology Co., Ltd.

Address: 16/F, Block A, Building 6, Baoneng Science and Technology Park, Qingxiang Road No.1, Longhua New District, Shenzhen, China 518109

Telephone: +86 (0) 755 2823 0888

Fax: +86 (0) 755 2823 0886

Compliance Certification Services (Shenzhen) Inc.

Address: No.10-1 Mingkeda Logistics Park, No.18 Huanguan South RD. Guan lan Town, Baoan Distr, Shenzhen, Guangdong, China.

Telephone: +86 (0) 755 28055000

Fax: +86 (0) 755 29055221

1.7 TEST FACILITY

Shenzhen UnionTrust Quality and Technology Co., Ltd.

The test facility is recognized, certified, or accredited by the following organizations:

CNAS-Lab Code: L9069

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 is traceable under the ISO/IEC/EN 17025 to international or national standards. Equipment has been calibrated by accredited calibration laboratories.

IC-Registration No.: 21600-1

The 3m Semi-anechoic chamber of Shenzhen UnionTrust Quality and Technology Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 21600-1.

Compliance Certification Services (Shenzhen) Inc.

FCC Registration Number is 441872.

1.8 DEVIATION FROM STANDARDS

None.

1.9 ABNORMALITIES FROM STANDARD CONDITIONS

None.

1.10 OTHER INFORMATION REQUESTED BY THE CUSTOMER

None.

1.11 MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the Product 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.

No.	Item	Measurement Uncertainty
1	Conducted emission 9KHz-150KHz	±3.2878 dB
2	Conducted emission 150KHz-30MHz	±3.2878 dB
3	Radiated emission 30MHz-200Hz	±3.8928 dB
4	Radiated emission 200MHz-1GHz	±3.8753 dB
5	Radiated emission 1GHz-8GHz	±5.3112 dB
6	Radiated emission Above 8GHz	±5.3493 dB

2. TEST SUMMARY

FCC 47 CFR Part 15 Subpart C Test Cases			
Test Item	Test Requirement	Test Method	Result
Antenna Requirement	FCC 47 CFR Part 15 Subpart C Section 15.203	ANSI C63.10-2013	PASS
Conducted Emission	FCC 47 CFR Part 15 Subpart C Section 15.207	ANSI C63.10-2013	PASS ^{Note2}
Radiated Emission	FCC 47 CFR Part 15 Subpart C Section 15.249 (a)/15.209	ANSI C63.10-2013	PASS ^{Note2}
Restricted bands around fundamental frequency (Radiated Emission)	FCC 47 CFR Part 15 Subpart C Section 15.249(a)/15.205	ANSI C63.10-2013	PASS ^{Note2}
20dB Occupied Bandwidth	FCC 47 CFR Part 15 Subpart C Section 15.215 (c)	ANSI C63.10-2013	PASS ^{Note3}
Note: 1) N/A: In this whole report not application. 2) Subcontract to Compliance Certification Services (Shenzhen) Inc. 3) Subcontract to Shenzhen UnionTrust Quality and Technology Co., Ltd.			

3. EQUIPMENT LIST

Radiated Emission Test Equipment List 966(1)						
Used	Equipment	Manufacturer	Model No.	Serial Number	Cal. date (mm dd, yyyy)	Cal. Due date (mm dd, yyyy)
<input checked="" type="checkbox"/>	Amplifier	HP	8447D	2944A08999	Feb. 12, 2017	Feb. 11, 2018
<input checked="" type="checkbox"/>	Antenna	SCHAFFNER	CBL6143	5082	Feb. 12, 2017	Feb. 11, 2018
<input checked="" type="checkbox"/>	Turn Table	N/A	N/A	N/A	N.C.R	N.C.R
<input checked="" type="checkbox"/>	EMI TEST RECEIVER	ROHDE&SCHW ARZ	ESPI	101026	Feb. 12, 2017	Feb. 11, 2018
<input checked="" type="checkbox"/>	Temp. / Humidity Meter	Anymetre	JR913	N/A	Feb. 15, 2017	Feb. 14, 2018
<input checked="" type="checkbox"/>	Test S/W	FARAD	EZ-EMC/ CCS-03A1			

Radiated Emission Test Equipment List 966(2)						
Used	Equipment	Manufacturer	Model No.	Serial Number	Cal. date (mm dd, yyyy)	Cal. Due date (mm dd, yyyy)
<input checked="" type="checkbox"/>	PSA Series Spectrum Analyzer	Agilent	E4446A	US44300399	Feb. 17, 2017	Feb. 16, 2018
<input checked="" type="checkbox"/>	High Noise Amplifier	Agilent	8449B	3008A01838	Feb. 11, 2017	Feb. 10, 2018
<input checked="" type="checkbox"/>	Horn Antenna	SCHWARZBECK	BBHA9120	D286	Feb. 12, 2017	Feb. 11, 2018
<input checked="" type="checkbox"/>	Board-Band Horn Antenna	Schwarzbeck	BBHA 9170	9170-497	Feb. 11, 2017	Feb. 10, 2018
<input checked="" type="checkbox"/>	Turn Table	N/A	N/A	N/A	N.C.R	N.C.R
<input checked="" type="checkbox"/>	Controller	Sunol Sciences	SC104V	022310-1	N.C.R	N.C.R
<input checked="" type="checkbox"/>	Controller	CT	N/A	N/A	N.C.R	N.C.R
<input checked="" type="checkbox"/>	Antenna Tower	SUNOL	TLT2	N/A	N.C.R	N.C.R
<input checked="" type="checkbox"/>	Temp. / Humidity Meter	Anymetre	JR913	N/A	Feb. 15, 2017	Feb. 14, 2018
<input checked="" type="checkbox"/>	Test S/W	FARAD	LZ-RF / CCS-SZ-3A2			

Conducted Emission Test Equipment List						
Used	Equipment	Manufacturer	Model No.	Serial Number	Cal. date (mm dd, yyyy)	Cal. Due date (mm dd, yyyy)
<input checked="" type="checkbox"/>	EMI TEST RECEIVER	ROHDE&SCHW ARZ	ESCI	100783	Feb. 11, 2017	Feb. 10, 2018
<input checked="" type="checkbox"/>	LISN(EUT)	ROHDE&SCHW ARZ	ENV216	101543-WX	Feb. 11, 2017	Feb. 10, 2018
<input checked="" type="checkbox"/>	LISN	EMCO	3825/2	8901-1459	Feb. 12, 2017	Feb. 11, 2018
<input checked="" type="checkbox"/>	Temp. / Humidity Meter	VICTOR	HTC-1	N/A	Feb. 15, 2017	Feb. 14, 2018
<input checked="" type="checkbox"/>	Test S/W	FARAD	EZ-EMC/ CCS-3A1-CE			

RF Conducted Test Equipment List						
Used	Equipment	Manufacturer	Model No.	Serial Number	Cal. date (mm dd, yyyy)	Cal. Due date (mm dd, yyyy)
<input checked="" type="checkbox"/>	EXA Spectrum Analyzer	KEYSIGHT	N9010A	MY51440197	Dec. 22, 2016	Dec. 22, 2017

4. TEST CONFIGURATION

4.1 ENVIRONMENTAL CONDITIONS FOR TESTING

4.1.1 Normal or Extreme Test Conditions

Environment Parameter	Selected Values During Tests		
Test Condition	Ambient		
	Temperature (°C)	Voltage (V)	Relative Humidity (%)
NT/NV	+15 to +35	3.7	20 to 75
Remark: 1) NV: Normal Voltage; NT: Normal Temperature			

4.1.2 Record of Normal Environment

Test Item	Temperature (°C)	Relative Humidity (%)	Pressure (Kpa)	Tested by
Conducted Emission	27	46	100.2	Evan ai
Radiated Emission	27	46	100.2	Evan ai
Restricted bands around fundamental frequency (Radiated Emission)	27	46	100.2	Evan ai
20dB Occupied Bandwidth	24.1	65	99.8	Tiny You

4.2 TEST CHANNELS

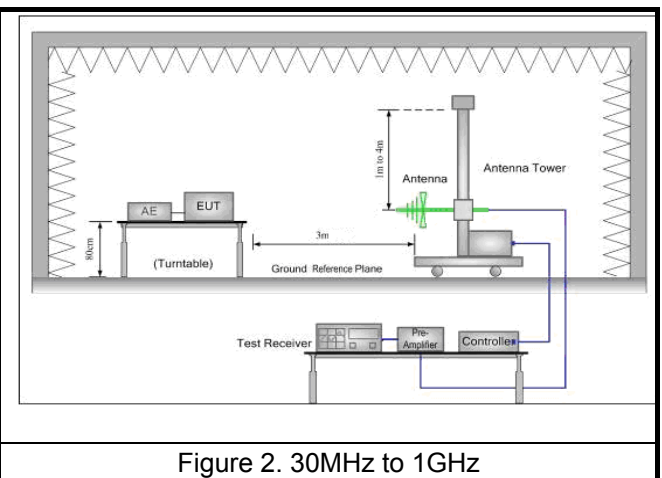
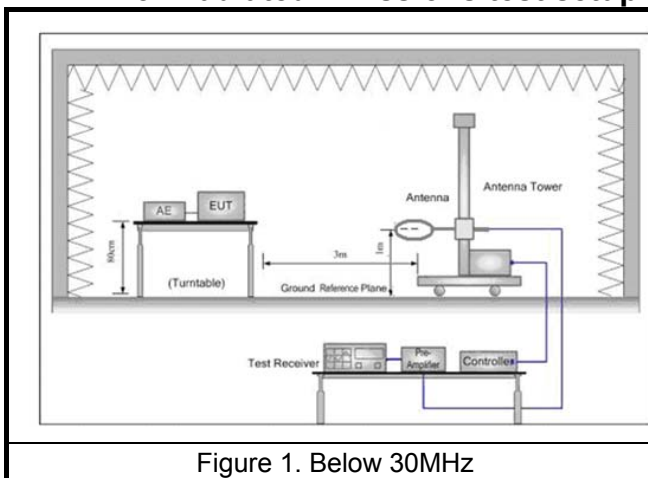
Type of Modulation	Tx/Rx Frequency	Test RF Channel Lists		
GFSK	2405 MHz to 2476 MHz	Lowest(L)	Middle(M)	Highest(H)
		Channel 1	Channel 13	Channel 25
		2405 MHz	2447 MHz	2476 MHz

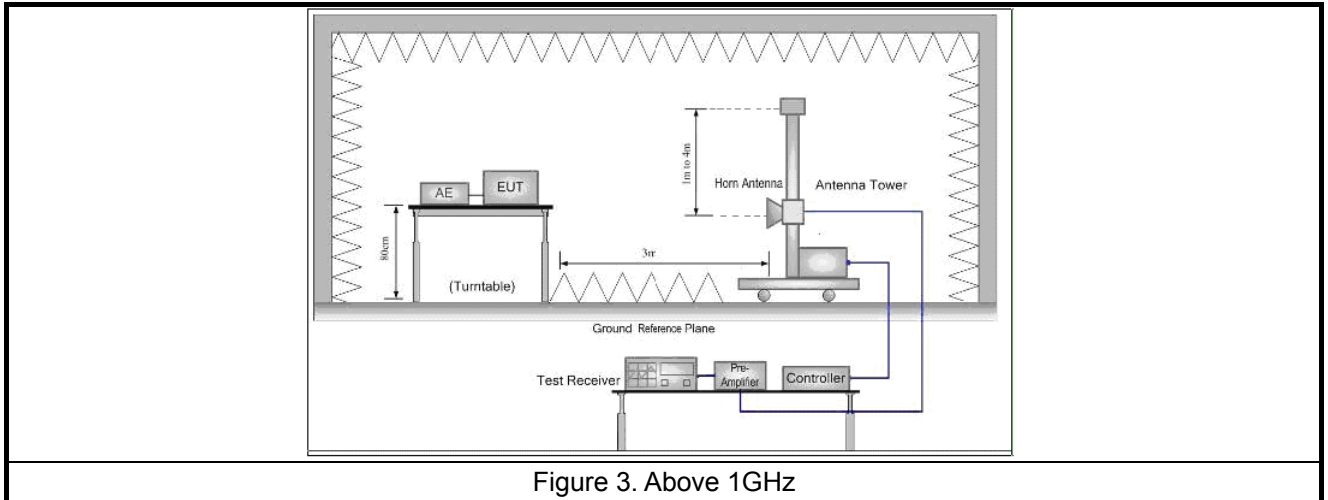
4.3 EUT TEST STATUS

Modulation Mode	Tx Function	Description
GFSK	1Tx	Keep the EUT in continuously transmitting or receiving with modulation test single.

4.4 TEST SETUP

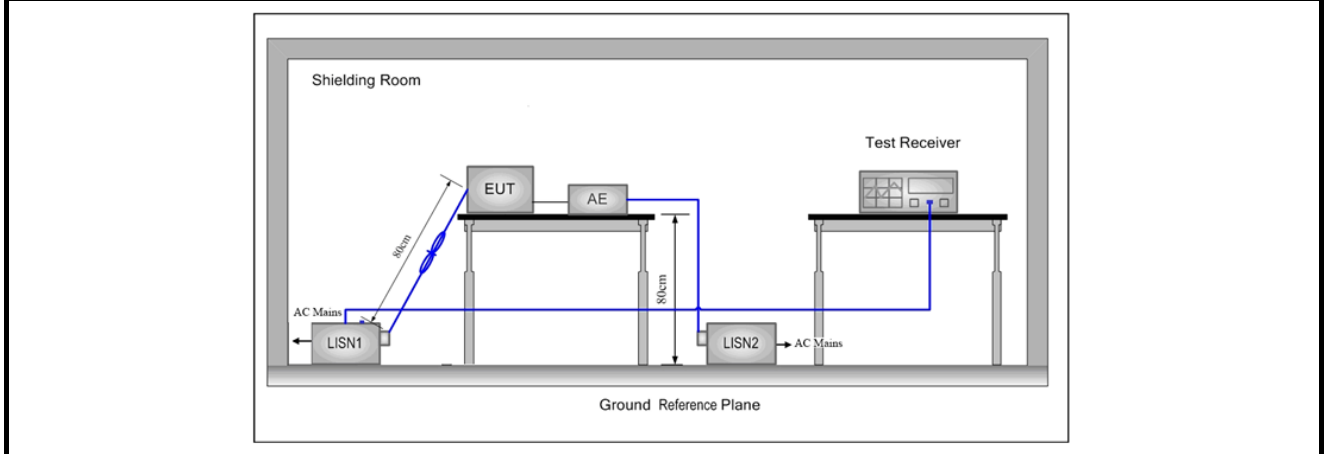
4.4.1 For Radiated Emissions test setup



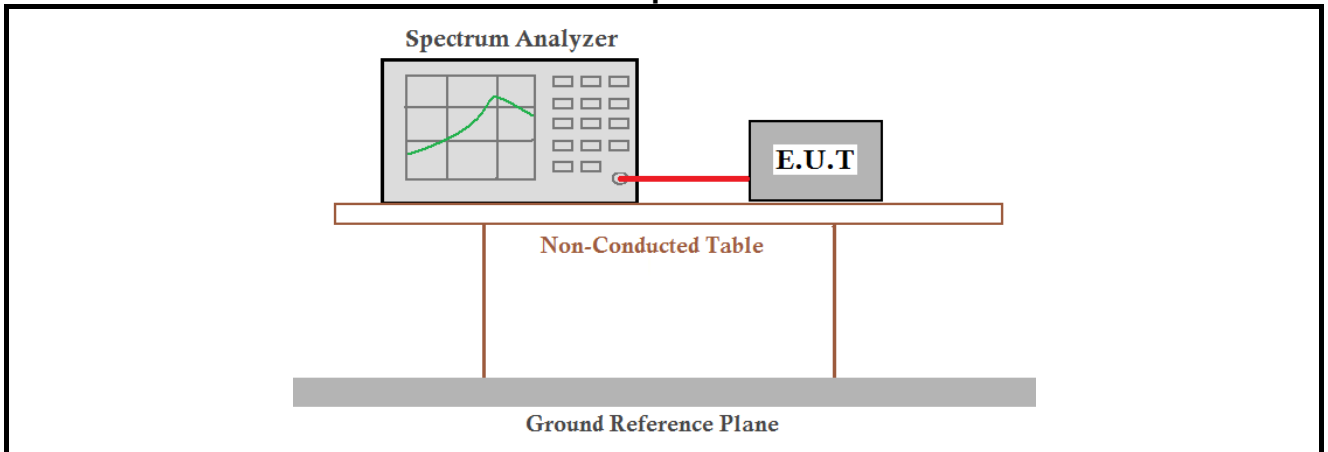


4.4.2 For Conducted Emissions test setup

Figure 3. Conducted Emissions setup



4.4.3 For Conducted Emissions test setup



4.5 SYSTEM TEST CONFIGURATION

For emissions testing, the equipment under test (EUT) setup to transmit continuously to simplify the measurement methodology. Care was taken to ensure proper power supply voltages during testing. During testing, radiated emission were performed with the EUT set to transmit at the channel with highest output power as worst-case scenario. It was powered by a 3.7Vdc rechargeable Li-on battery. Only the worst case data were recorded in this test report.

The signal is maximized through rotation and placement in the three orthogonal axes. The antenna height and polarization are varied during the search for maximum signal level. The antenna height is varied from 1 to 4 meters. Radiated emissions are taken at three meters unless the signal level is too low for measurement at that distance. If necessary, a pre-amplifier is used and/or the test is conducted at a closer distance. Therefore, all final radiated testing was performed with the EUT in (see table below) orientation.

Frequency	Mode	Antenna Port	Worst-case axis positioning
Above 1GHz	1TX	Chain 0	Y axis

All readings are extrapolated back to the equivalent three meter reading using inverse scaling with distance. Analyzer resolution is 100 kHz or greater for frequencies below 1000 MHz. The resolution is 1 MHz or greater for frequencies above 1000 MHz. The spurious emissions more than 20 dB below the permissible value are not reported.

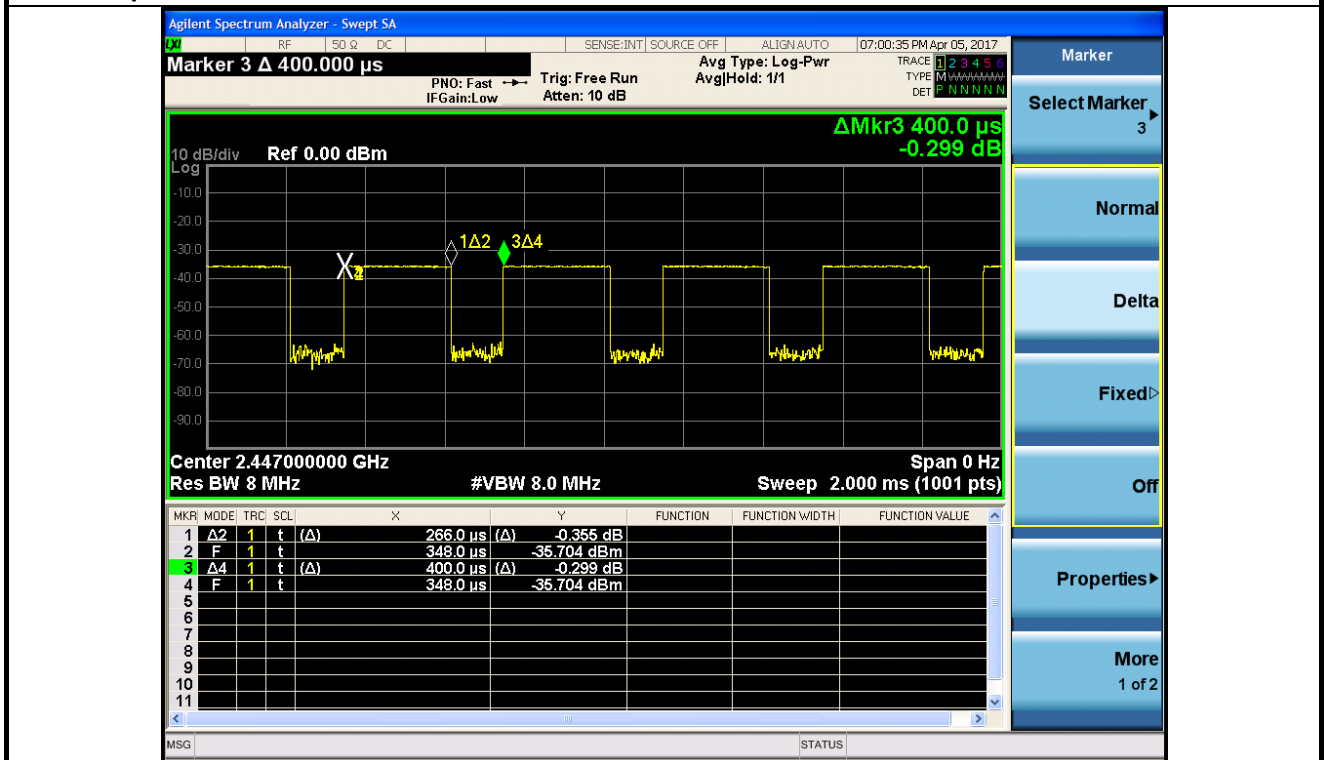
Radiated emission measurement were performed from the lowest radio frequency signal generated in the device which is greater than 9 kHz to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.

4.6 DUTY CYCLE

Type of Modulation	On Time (msec)	Period (msec)	Duty Cycle (linear)	Duty Cycle (%)	1/ T Minimum VBW (kHz)	Average Factor (dB)
GFSK	0.266	0.400	0.67	66.50	3.76	-3.48

Remark:

- 1) Duty cycle= On Time/ Period;
- 2) Duty Cycle factor = $10 * \log(1/ \text{Duty cycle})$;
- 3) Average factor = $20 \log_{10} \text{Duty Cycle}$.

The test plot as follows


5. RADIO TECHNICAL REQUIREMENTS SPECIFICATION

5.1 REFERENCE DOCUMENTS FOR TESTING

No.	Identity	Document Title
1	FCC 47 CFR Part 15	Radio Frequency Devices
2	ANSI C63.10-2013	American National Standard for Testing Unlicensed Wireless Devices

5.2 ANTENNA REQUIREMENT

Standard Requirement
15.203 Requirement: An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.
EUT Antenna: Antenna in the interior of the equipment and no consideration of replacement. The gain of the antenna is 1.9 dBi.

5.3 RADIATED EMISSION

Test Requirement: FCC 47 CFR Part 15.209 and 15.249

Test Method: ANSI C63.10-2014

Receiver Setup:

Frequency	Detector	RBW	VBW	Remark
0.009 MHz-0.090 MHz	Peak	10 kHz	30 KHz	Peak
0.009 MHz-0.090 MHz	Average	10 kHz	30 KHz	Average
0.090 MHz-0.110 MHz	Quasi-peak	10 kHz	30 KHz	Quasi-peak
0.110 MHz-0.490 MHz	Peak	10 kHz	30 KHz	Peak
0.110 MHz-0.490 MHz	Average	10 kHz	30 KHz	Average
0.490 MHz -30 MHz	Quasi-peak	10 kHz	30 kHz	Quasi-peak
30 MHz-1 GHz	Quasi-peak	100 kHz	300 KHz	Quasi-peak
Above 1 GHz	Peak	1 MHz	3 MHz	Peak
	Peak	1 MHz	10 Hz	Average

Limits:

Spurious Emissions

Frequency	Field strength (microvolt/meter)	Limit (dBμV/m)	Remark	Measurement distance (m)
0.009 MHz-0.490 MHz	2400/F(kHz)	--	--	300
0.490 MHz-1.705 MHz	24000/F(kHz)	--	--	30
1.705 MHz-30 MHz	30	--	--	30
30 MHz-88 MHz	100	40.0	Quasi-peak	3
88 MHz-216 MHz	150	43.5	Quasi-peak	3
216 MHz-960 MHz	200	46.0	Quasi-peak	3
Above 1 GHz	500	54.0	Average	3

Field strength of the fundamental signal

Frequency	Limit (dBμV/m @3m)	Remark
2400 MHz-2483.5 MHz	94.0	Average
	114.0	Peak

Note: 15.35(b), Unless otherwise specified, the limit on peak radio frequency emissions is 20dB above the maximum permitted average emission limit applicable to the equipment under test. This peak limit applies to the total peak emission level radiated by the device.

Remark:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
3. For frequencies above 1000 MHz, 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 20 dB under any condition of modulation.

Test Setup: Refer to section 4.4.1 for details.

Test Procedures:

1. From 30 MHz to 1GHz test procedure as below:

- 1) The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- 2) The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- 3) The antenna height 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.
- 4) 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 (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rota table table was turned from 0 degrees to 360 degrees to find the maximum reading.
- 5) The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- 6) If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

2. Above 1GHz test procedure as below:

- 1) Different between above is the test site, change from Semi- Anechoic Chamber to fully Anechoic Chamber and change form table 0.8 meter to 1.5 meter(Above 18GHz the distance is 1 meter and table is 1.5 meter).
- 2) Test the EUT in the lowest channel ,middle channel, the Highest channel
- 3) The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the Y axis positioning which it is worse case.
- 4) Repeat above procedures until all frequencies measured was complete.

Equipment Used: Refer to section 3 for details.

Test Result: Pass

The measurement data as follows:

Field Strength of the Fundamental Signal					
Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Antenna Polaxis	Pass/Fail
Lowest Channel					
73.00	94.00	-21.00	Average	Horizontal	Pass
76.48	114.00	-37.52	Peak	Horizontal	Pass
71.87	94.00	-22.13	Average	Vertical	Pass
75.35	114.00	-38.65	Peak	Vertical	Pass
Middle Channel					
72.19	94.00	-21.81	Average	Horizontal	Pass
75.67	114.00	-38.33	Peak	Horizontal	Pass
73.66	94.00	-20.34	Average	Vertical	Pass
77.14	114.00	-36.86	Peak	Vertical	Pass
Highest Channel					
71.78	94.00	-22.22	Average	Horizontal	Pass
75.26	114.00	-38.74	Peak	Horizontal	Pass
75.55	94.00	-18.45	Average	Vertical	Pass
79.03	114.00	-34.97	Peak	Vertical	Pass

Remark: Average Result = Peak Result + Average Factor.

Radiated Emission Test Data (9 KHz ~ 30 MHz):

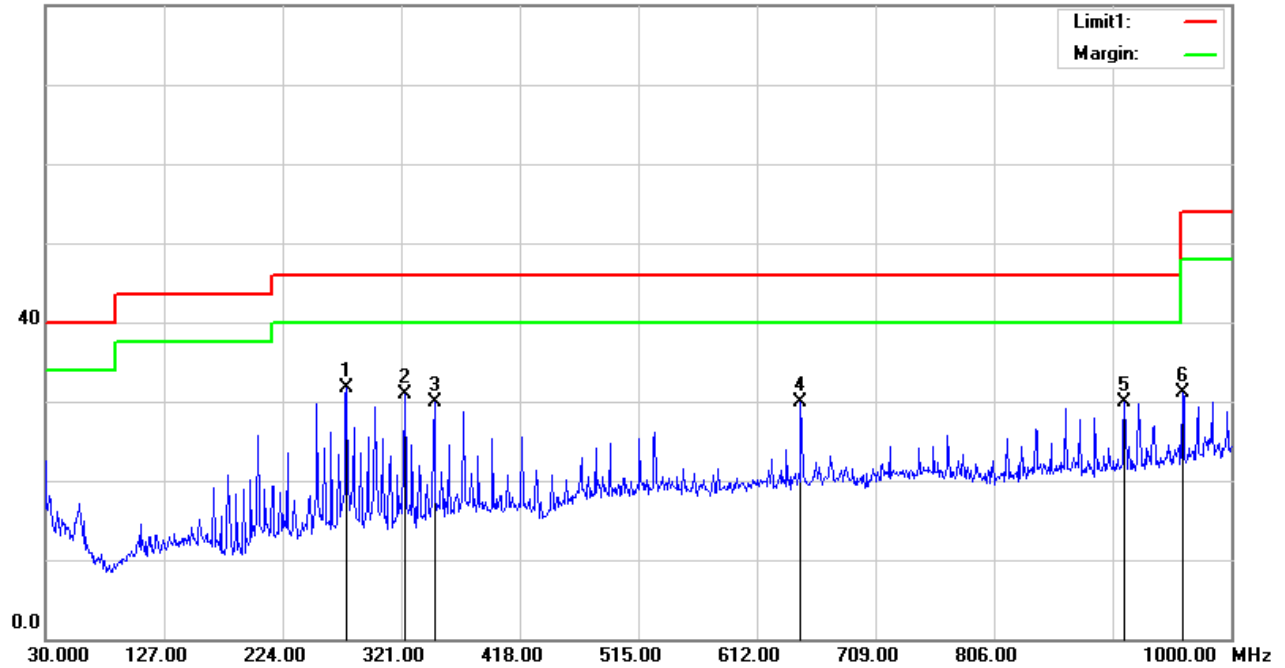
The amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required to be report.

Radiated Emission Test Data (Above 10 GHz):

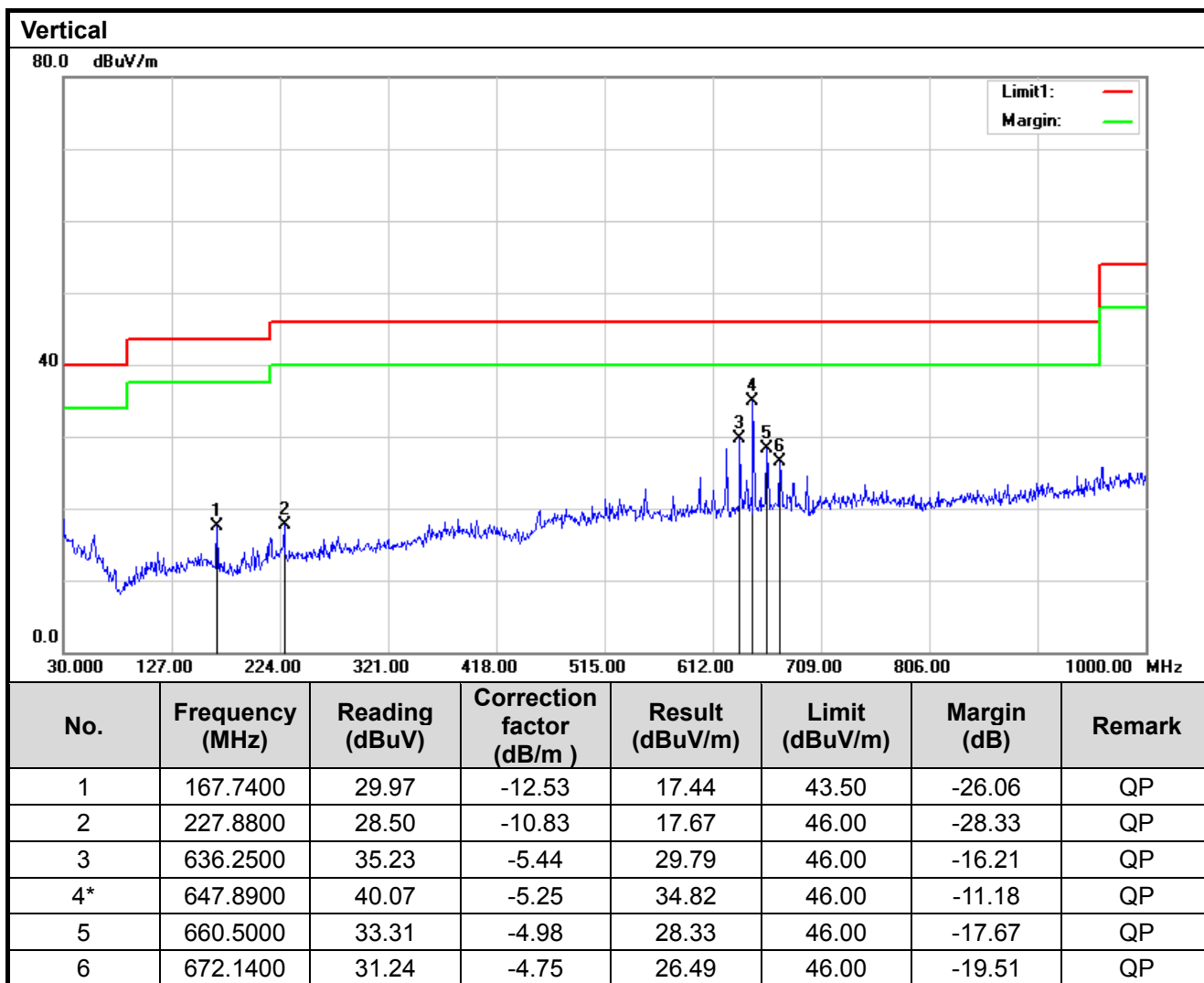
The amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required to be report.

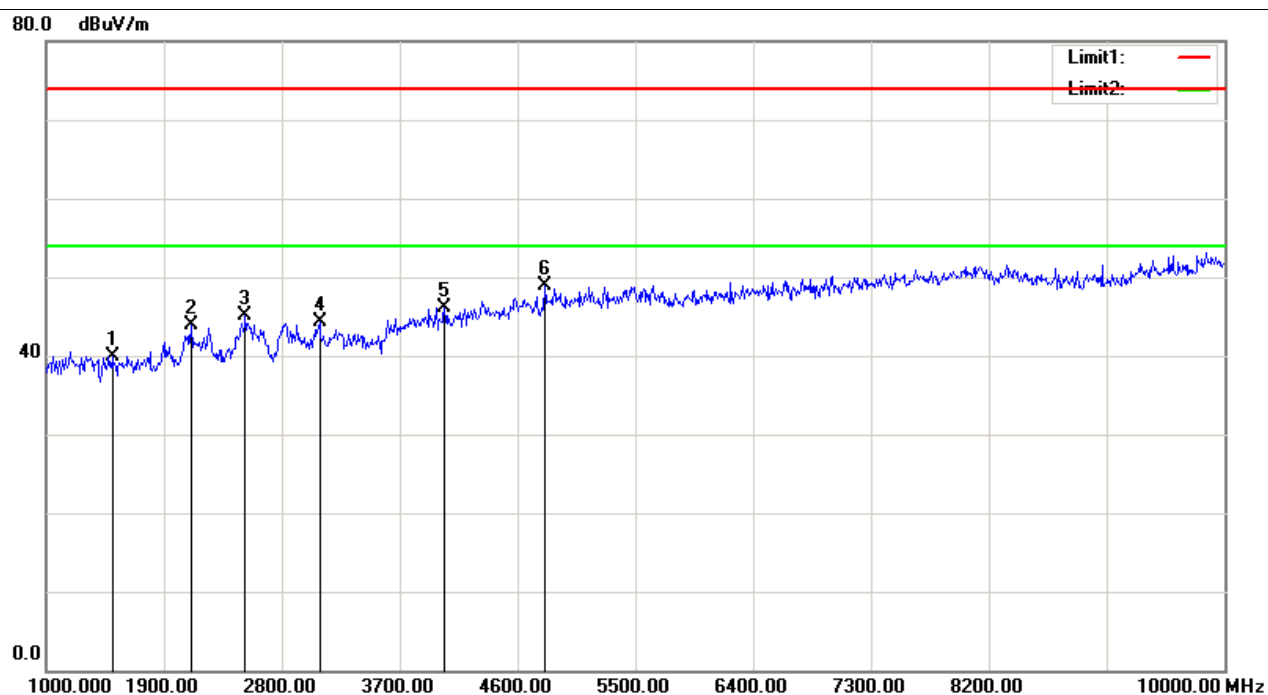
Radiated Emission Worst Test Data (30 MHz ~ 1 GHz): Highest channel
Horizontal

80.0 dBuV/m

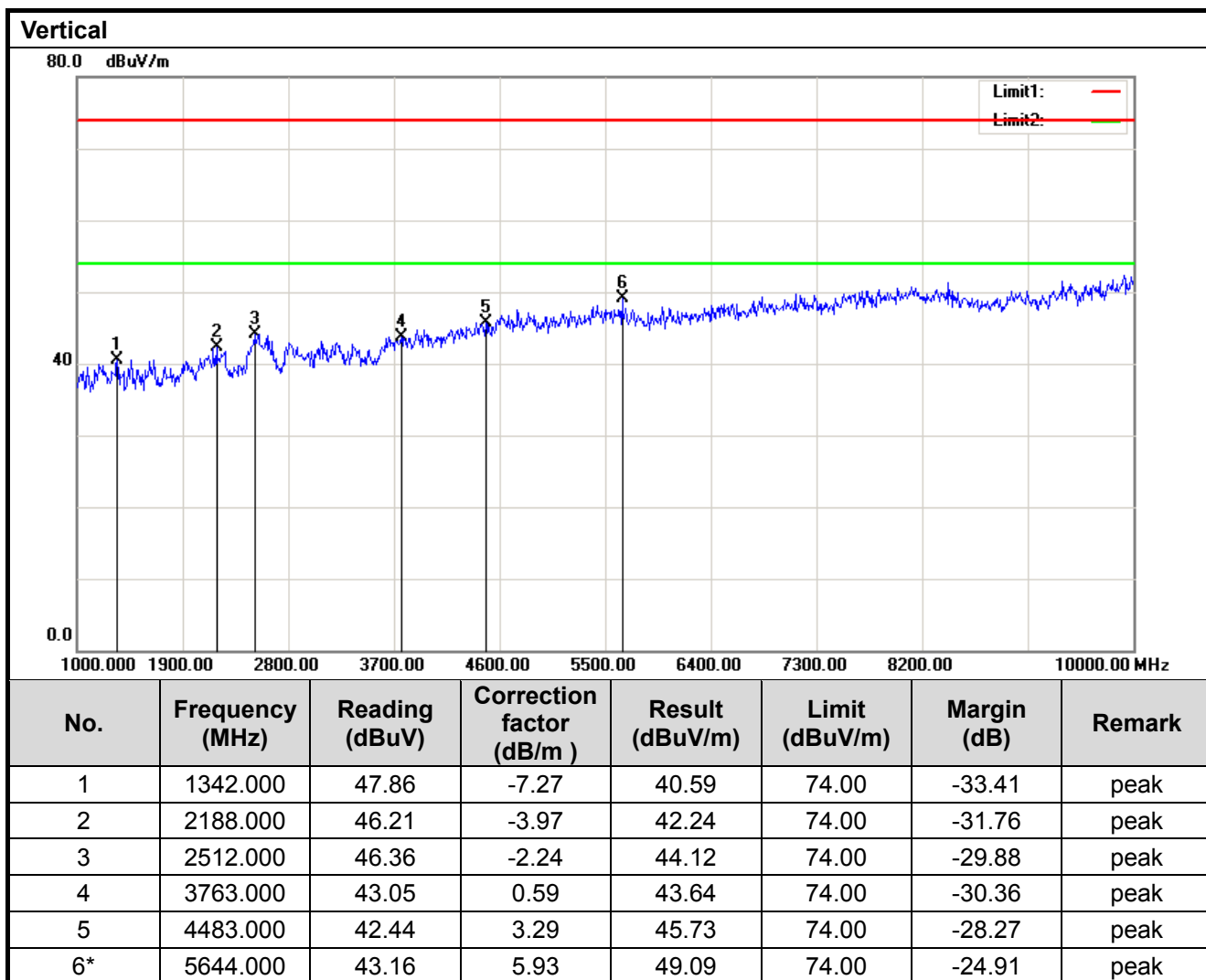


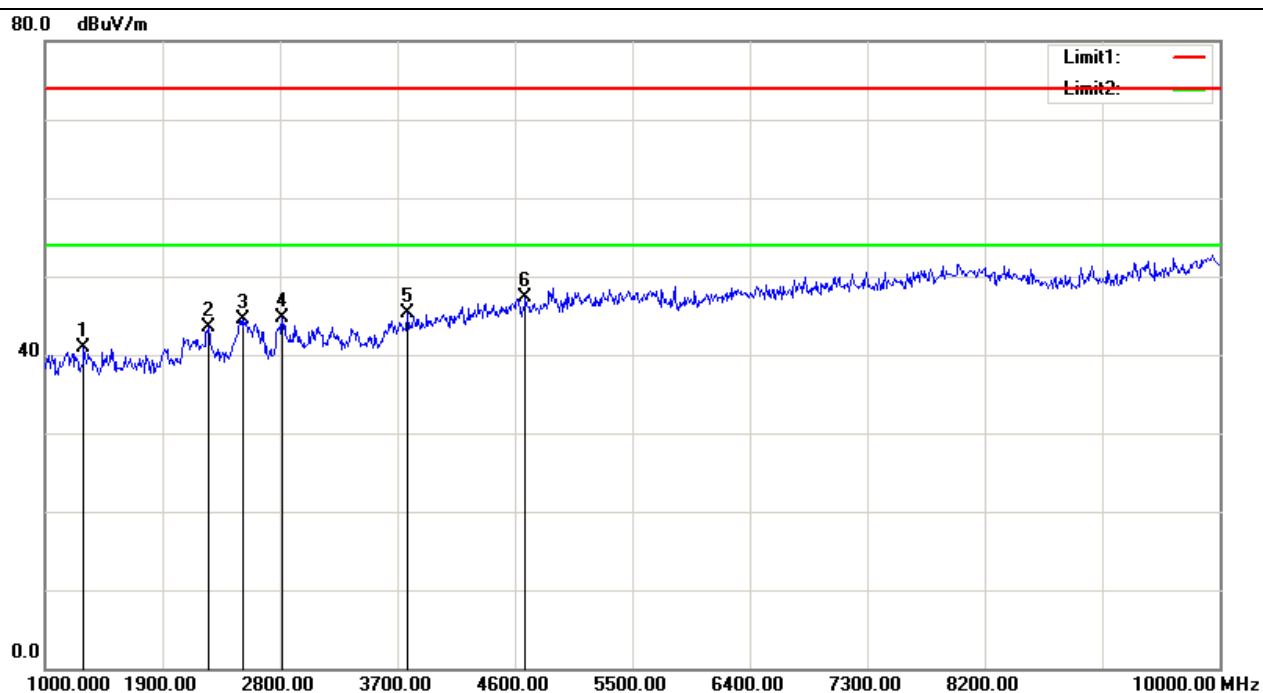
No.	Frequency (MHz)	Reading (dBuV)	Correction factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1*	276.3800	41.59	-9.87	31.72	46.00	-14.28	QP
2	323.9100	40.67	-9.82	30.85	46.00	-15.15	QP
3	348.1600	39.37	-9.42	29.95	46.00	-16.05	QP
4	647.8900	35.23	-5.25	29.98	46.00	-16.02	QP
5	912.7000	31.98	-2.06	29.92	46.00	-16.08	QP
6	960.2300	31.97	-0.83	31.14	54.00	-22.86	QP



Radiated Emission Test Data (1 GHz ~ 10 GHz):
Lowest Channel:
Horizontal


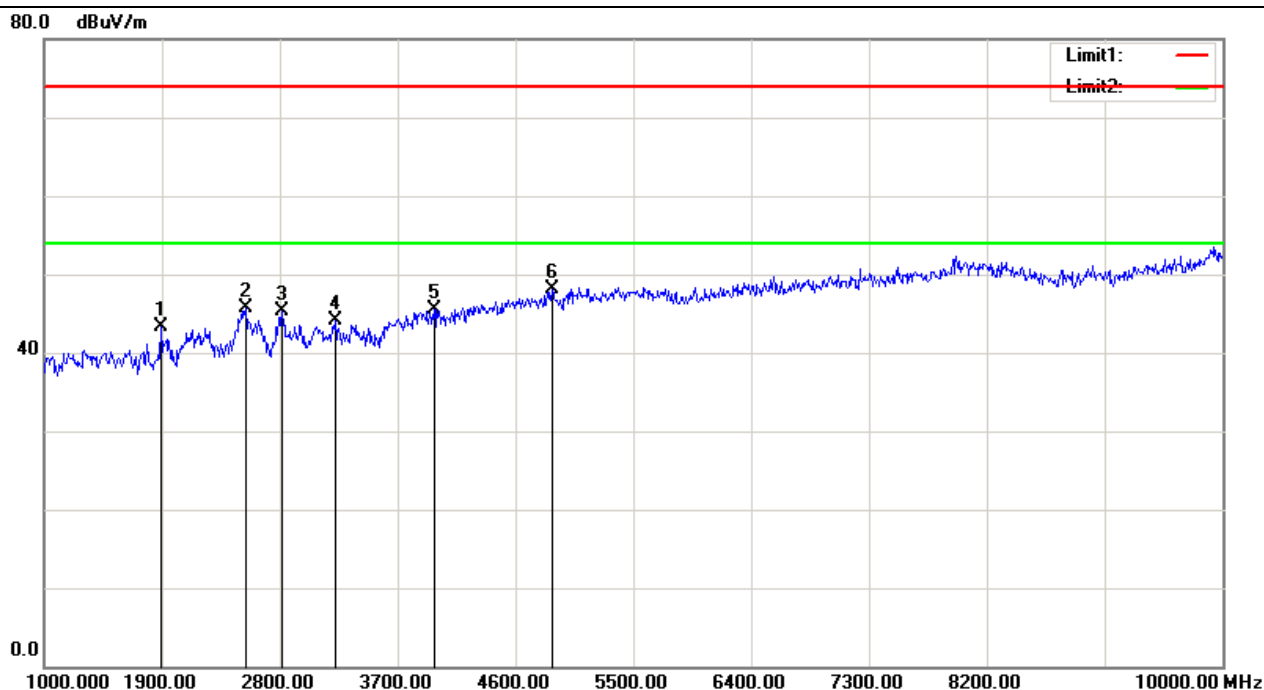
No.	Frequency (MHz)	Reading (dBuV)	Correction factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1504.000	46.79	-6.87	39.92	74.00	-34.08	peak
2	2107.000	48.24	-4.41	43.83	74.00	-30.17	peak
3	2521.000	47.24	-2.22	45.02	74.00	-28.98	peak
4	3088.000	45.49	-1.21	44.28	74.00	-29.72	peak
5	4042.000	44.39	1.74	46.13	74.00	-27.87	peak
6*	4807.000	44.52	4.35	48.87	74.00	-25.13	peak



Middle Channel:
Horizontal


No.	Frequency (MHz)	Reading (dBuV)	Correction factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1297.000	48.38	-7.44	40.94	74.00	-33.06	peak
2	2251.000	47.18	-3.62	43.56	74.00	-30.44	peak
3	2521.000	46.77	-2.22	44.55	74.00	-29.45	peak
4	2818.000	46.31	-1.69	44.62	74.00	-29.38	peak
5	3781.000	44.58	0.67	45.25	74.00	-28.75	peak
6*	4681.000	43.30	3.94	47.24	74.00	-26.76	peak

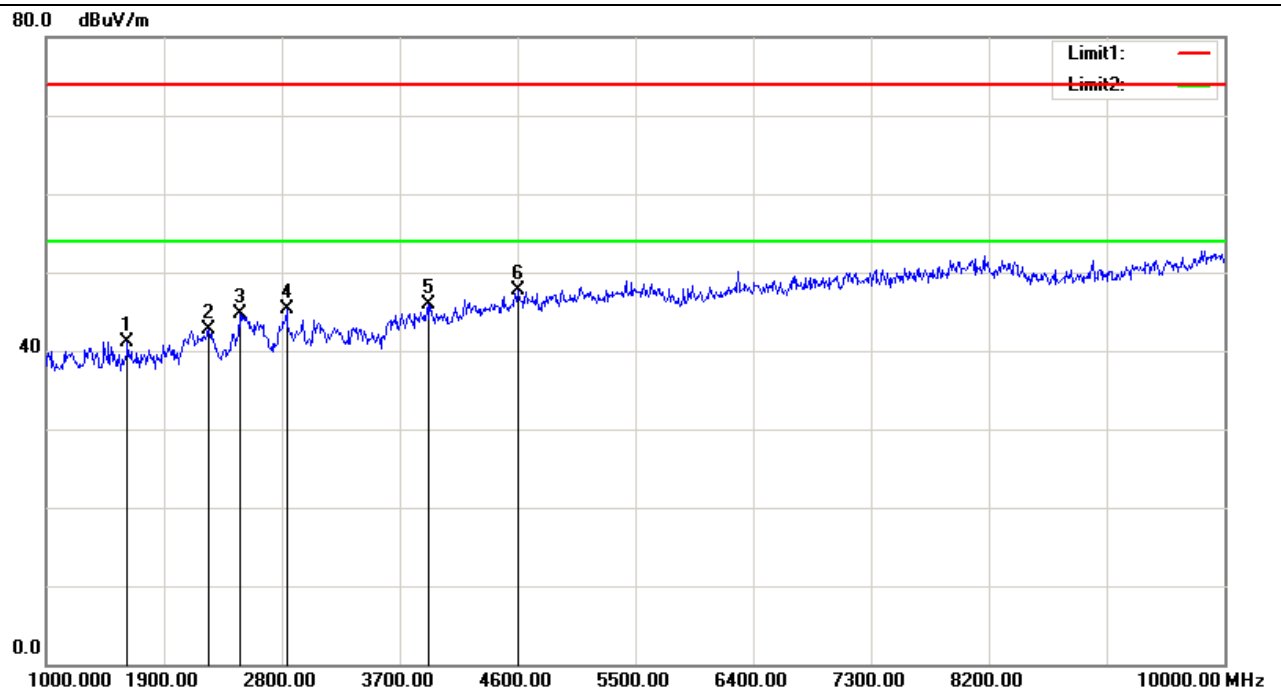
Vertical



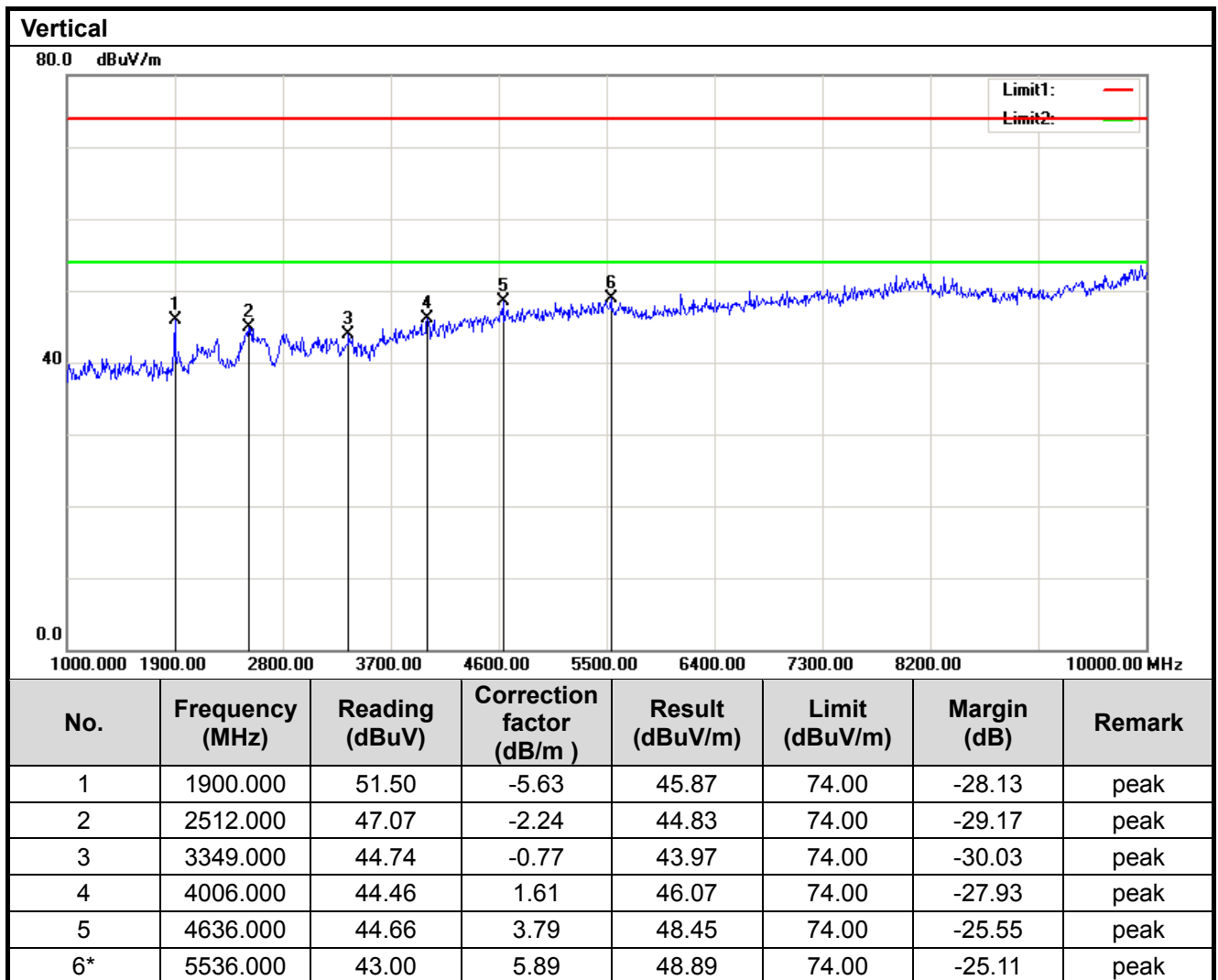
No.	Frequency (MHz)	Reading (dBuV)	Correction factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1891.000	48.96	-5.69	43.27	74.00	-30.73	peak
2	2539.000	47.94	-2.19	45.75	74.00	-28.25	peak
3	2818.000	46.98	-1.69	45.29	74.00	-28.71	peak
4	3223.000	45.08	-0.99	44.09	74.00	-29.91	peak
5	3979.000	43.98	1.50	45.48	74.00	-28.52	peak
6*	4879.000	43.53	4.59	48.12	74.00	-25.88	peak

Highest Channel:

Horizontal



No.	Frequency (MHz)	Reading (dBuV)	Correction factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1621.000	47.72	-6.65	41.07	74.00	-32.93	peak
2	2242.000	46.43	-3.67	42.76	74.00	-31.24	peak
3	2476.000	47.17	-2.39	44.78	74.00	-29.22	peak
4	2836.000	47.00	-1.66	45.34	74.00	-28.66	peak
5	3916.000	44.62	1.24	45.86	74.00	-28.14	peak
6*	4600.000	44.09	3.68	47.77	74.00	-26.23	peak



Remark:

- As shown in this section, for frequencies above 1GHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. So, only the peak measurements were shown in the report.

5.4 RESTRICTED BANDS AROUND FUNDAMENTAL FREQUENCY

Test Requirement: FCC 47 CFR Part 15.209 and 15.205

Test Method: ANSI C63.10-2014

Limits:

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 in Section 15.209, whichever is the lesser attenuation.

Frequency	Limit (dB μ V/m @3m)	Remark
30 MHz-88 MHz	40.0	Quasi-peak Value
88 MHz-216 MHz	43.5	Quasi-peak Value
216 MHz-960 MHz	46.0	Quasi-peak Value
960 MHz-1 GHz	54.0	Quasi-peak Value
Above 1 GHz	54.0	Average Value
	74.0	Peak Value

Test Setup: Refer to section 4.4.1 for details.

Test Procedures:

Radiated band edge measurements at 2390 MHz and 2483.5 MHz were made with the unit transmitting in the low end of the channel range and the high end closest to the restricted bands respectively. The emissions were made on the 966 Semi-Chamber. Use (resolution bandwidth (RBW) = 1 MHz, video bandwidth (VBW) = 3 MHz for peak levels and RBW = 1 MHz and VBW = 10 Hz or 1/T for average levels).

1. Use radiated spurious emission test procedure described in clause 5.3. The transmitter output (antenna port) was connected to the test receiver.
2. Set the PK and AV limit line.
3. Record the fundamental emission and emissions out of the band-edge.
4. Determine band-edge compliance as required.

Equipment Used: Refer to section 3 for details.

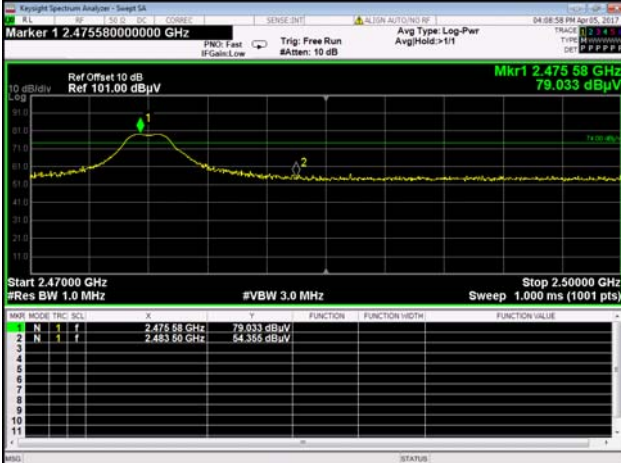
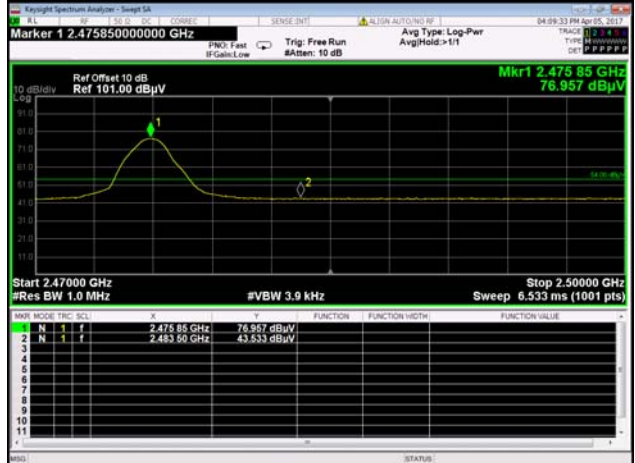
Test Result: Pass

The measurement data as follows:

Test Channel:			Ant. Polar. : Horizontal		
Lowest Channel			Detector: AV		
Detector: Peak			Detector: AV		
Frequency (MHz)	Peak level (dBuV/m)	Peak Limit (dBuV/m)	AV level (dBuV/m)	AV Limit (dBuV/m)	Conclusion
2390	53.446	74	42.820	54	Pass

Test Channel:		Lowest Channel		Ant. Polar. :		Vertical	
Detector: Peak				Detector: AV			
Frequency (MHz)	Peak level (dBuV/m)	Peak Limit (dBuV/m)		AV level (dBuV/m)	AV Limit (dBuV/m)	Conclusion	
2390	53.084	74		42.765	54	Pass	

Test Channel:		Highest Channel		Ant. Polar. : Horizontal	
Detector: Peak			Detector: AV		
Frequency (MHz)	Peak level (dBuV/m)	Peak Limit (dBuV/m)	AV level (dBuV/m)	AV Limit (dBuV/m)	Conclusion
2483.5	53.247	74	43.231	54	Pass

Test Channel:		Highest Channel		Ant. Polar. :		Vertical	
Detector: Peak				Detector: AV			
							
Frequency (MHz)	Peak level (dBuV/m)	Peak Limit (dBuV/m)		AV level (dBuV/m)	AV Limit (dBuV/m)	Conclusion	
2483.5	54.355	74		43.533	54	Pass	

5.520DB OCCUPIED BANDWIDTH

Test Requirement: FCC 47 CFR Part 15.215
Test Method: ANSI C63.10-2014
Test Setup: Refer to section 4.4.3 for details.
Limits: N/A
Equipment Used: Refer to section 3 for details.
Test Result: Pass
The measurement procedure shall be as follows:

Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
 Use the following spectrum analyzer settings:

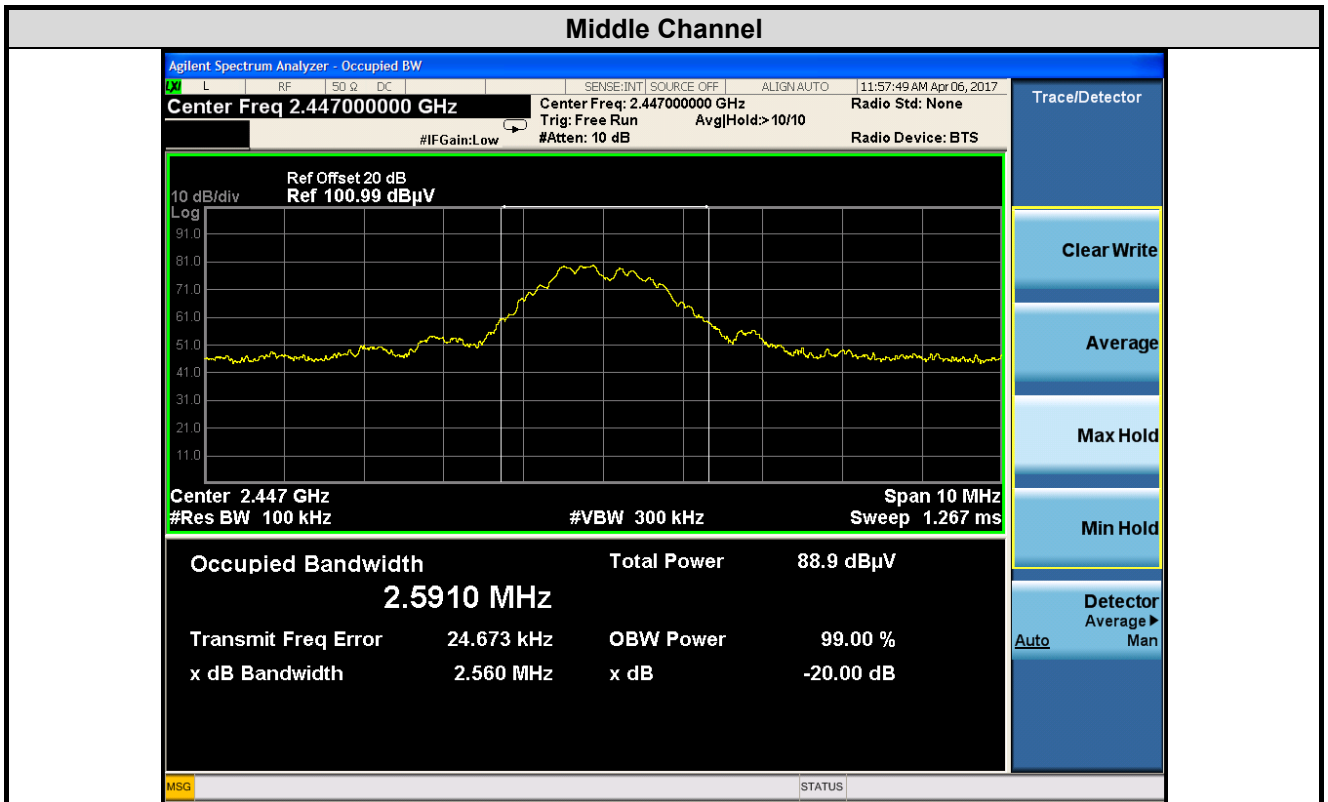
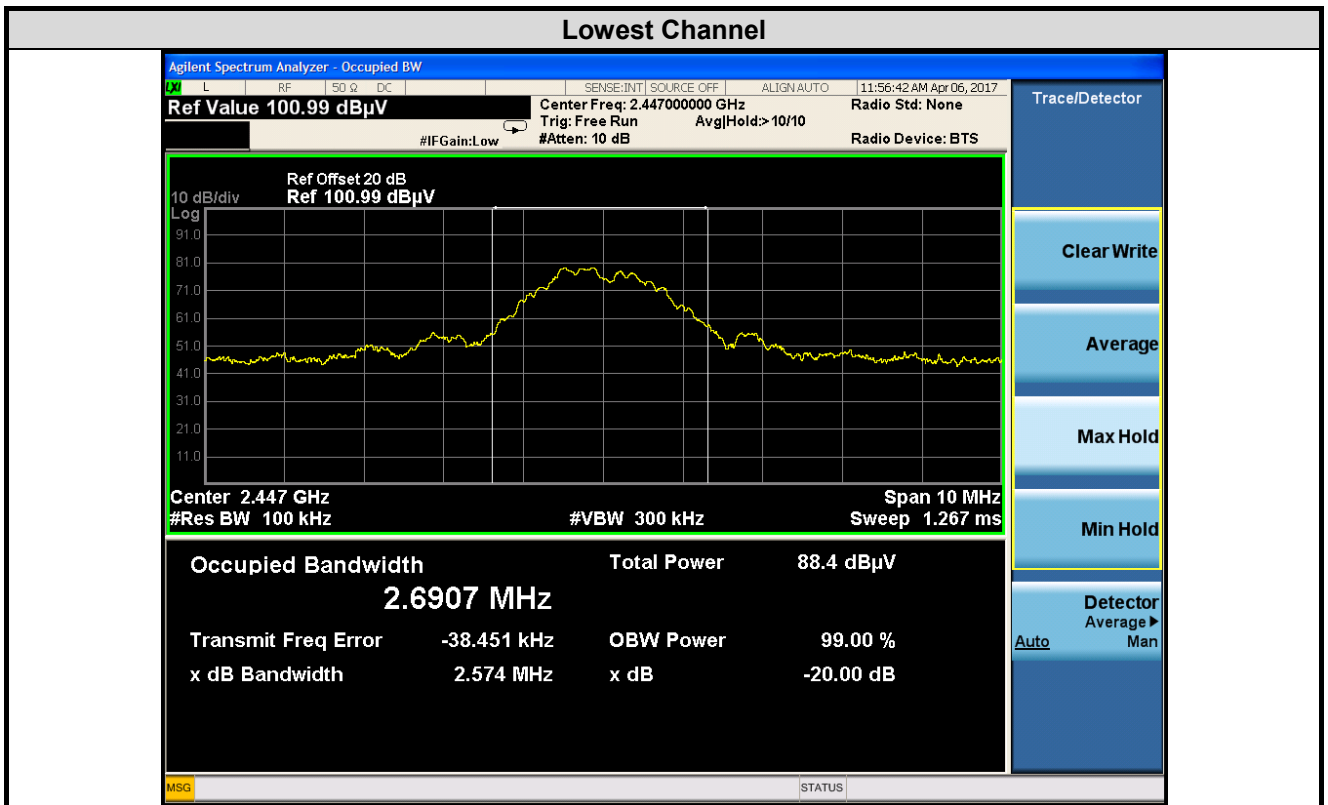
- a) Span = approximately 2 to 3 times the 20 dB bandwidth, centered on a hopping channel
- b) RBW \geq 1% of the 20 dB bandwidth
- c) VBW \geq RBW
- d) Sweep = auto;
- e) Detector function = peak
- f) Trace = max hold
- g) All the trace to stabilize, use the marker-to-peak function to set the marker to the peak of the emission, use the marker-delta function to measure and record the 20dB down bandwidth of the emission.

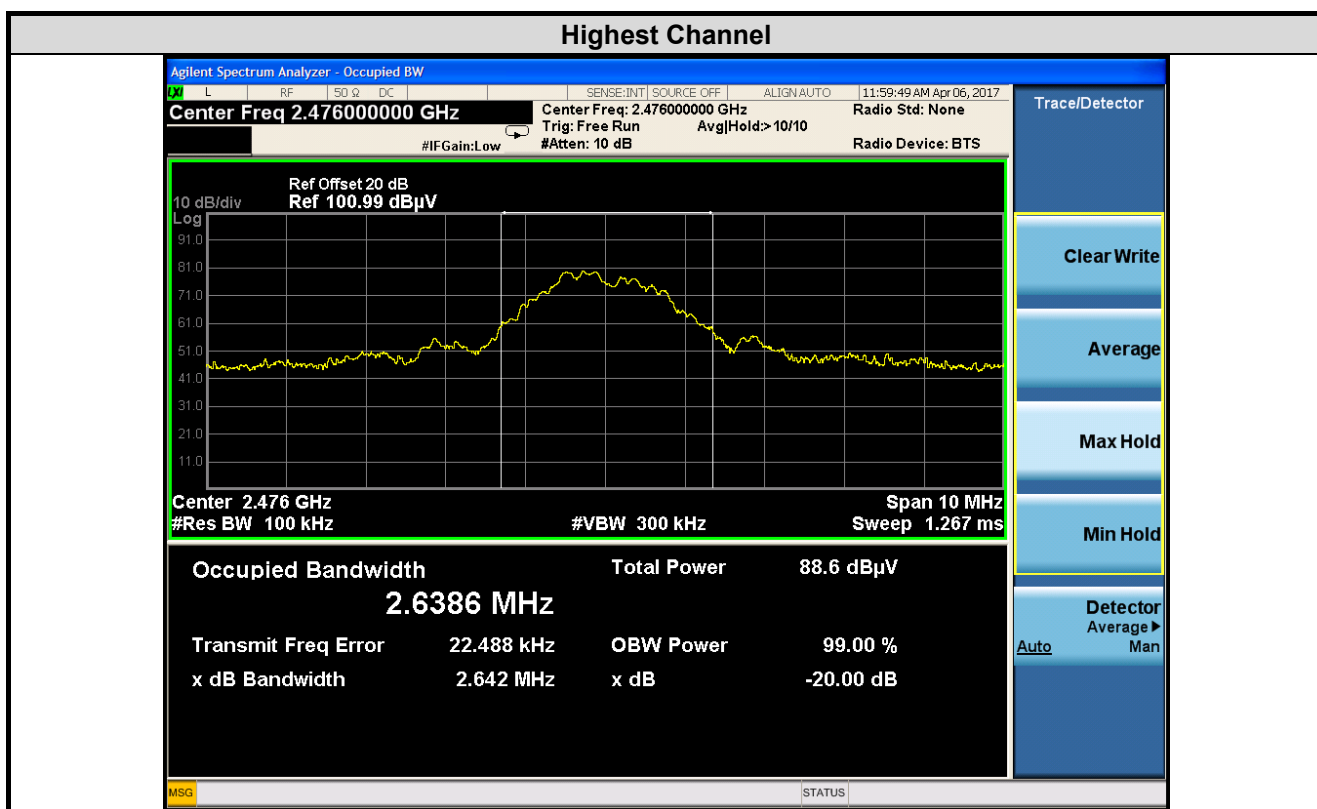
Note: The cable loss and attenuator loss were offset into measure device as an amplitude offset.

Test Result: Pass
The measurement data as follows:

Test Channel	20 dB Bandwidth (MHz)
Lowest	2.574
Middle	2.560
Highest	2.642

The test plot as follows:





5.6 CONDUCTED EMISSION

Test Requirement: FCC 47 CFR Part 15.207

Test Method: ANSI C63.4-2014

Limits:

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

Remark:

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.

Test Setup: Refer to section 4.4.2 for details.

Test Procedures:

- 1) The Product was placed on a nonconductive table 0.8 m above the horizontal ground reference plane, and 0.4 m from the vertical ground reference plane, and connected to the main through Line Impedance Stability Network (L.I.S.N).
- 2) The RBW of the receiver was set at 9 kHz in 150 kHz ~ 30MHz with Peak and AVG detector in Max Hold mode. Run the receiver's pre-scan to record the maximum disturbance generated from Product in all power lines in the full band.
- 3) For each frequency whose maximum record was higher or close to limit, measure its QP and AVG values and record.

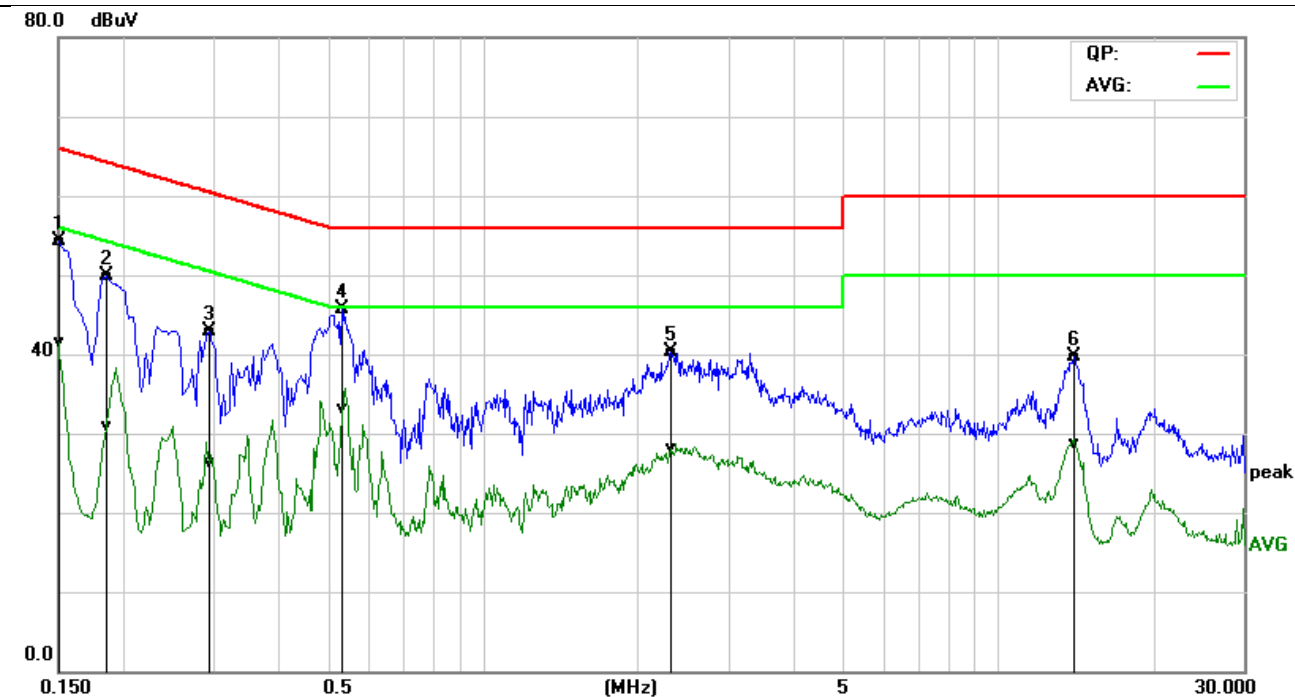
Equipment Used: Refer to section 3 for details.

Test Result: Pass

The measurement data as follows:

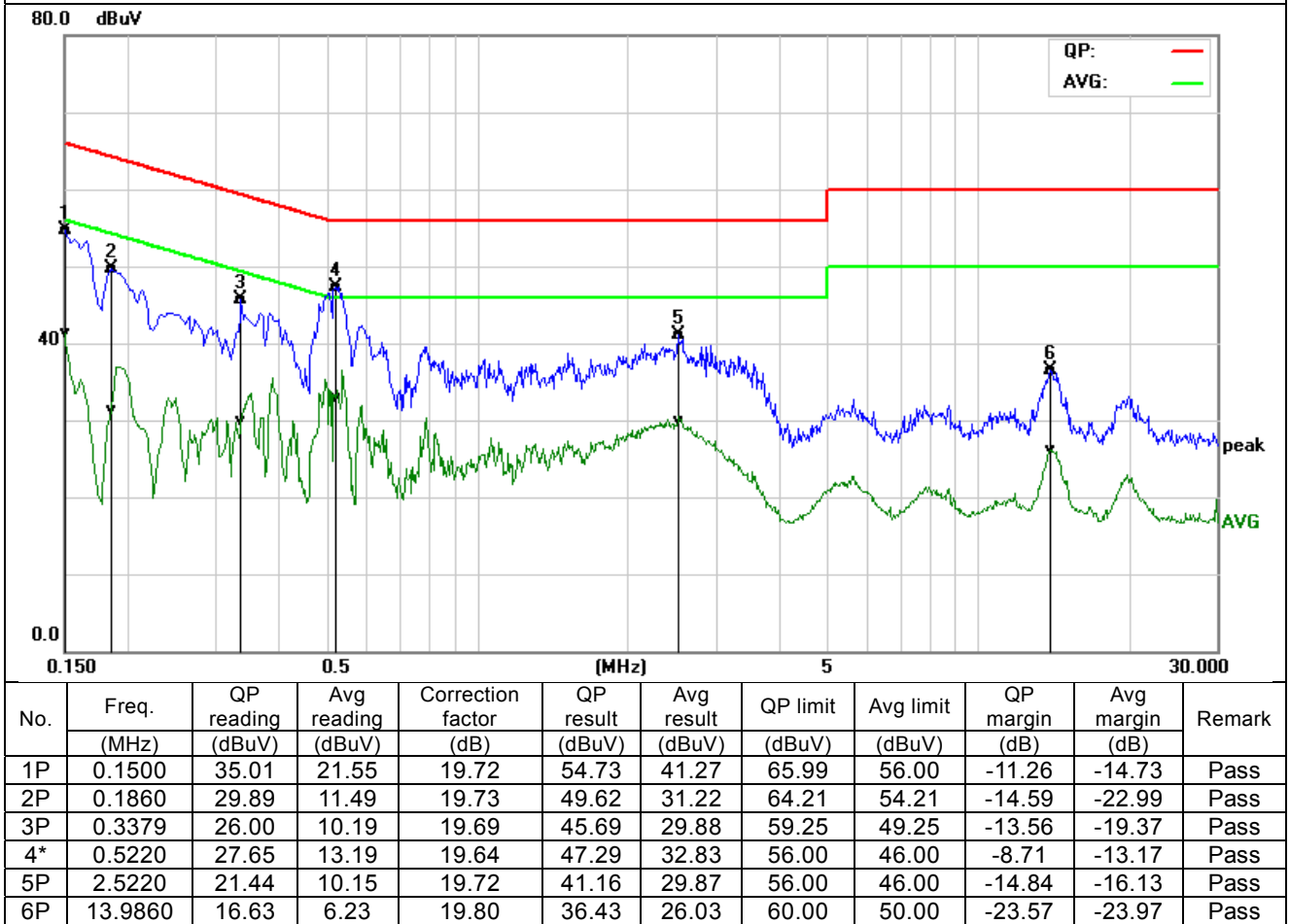
Quasi Peak:

Live Line



No	Freq. (MHz)	QP reading (dBuV)	Avg reading (dBuV)	Correction factor (dB)	QP result (dBuV)	Avg result (dBuV)	QP limit (dBuV)	Avg limit (dBuV)	QP margin (dB)	Avg margin (dB)	Remark
1P	0.1500	34.74	22.03	19.52	54.26	41.55	65.99	56.00	-11.73	-14.45	Pass
2P	0.1860	30.31	11.26	19.60	49.91	30.86	64.21	54.21	-14.30	-23.35	Pass
3P	0.2940	23.29	6.60	19.64	42.93	26.24	60.41	50.41	-17.48	-24.17	Pass
4*	0.5340	25.95	13.41	19.66	45.61	33.07	56.00	46.00	-10.39	-12.93	Pass
5P	2.3260	20.57	8.40	19.71	40.28	28.11	56.00	46.00	-15.72	-17.89	Pass
6P	14.1180	19.68	8.80	19.95	39.63	28.75	60.00	50.00	-20.37	-21.25	Pass

Neutral Line



Remark:

1. An initial pre-scan was performed on the Phase and neutral lines with peak detector. Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission were detected.

APPENDIX 1 PHOTOGRAPHS OF TEST SETUP

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

APPENDIX 2 PHOTOGRAPHS OF EUT CONSTRUCTIONAL DETAILS

Refer to Appendix 2 for EUT external and internal photographs.

*** End of Report ***

The test report is effective only with both signature and specialized stamp. The result(s) shown in this report refer only to the sample(s) tested. Without written approval of Intertek, this report can't be reproduced except in full.
