



Test Report No.: W7L-Q23041101RF01



# FCC TEST REPORT (Part 15, Subpart C)

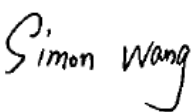

Applicant:	ELECOM CO.,LTD.
Address:	Fushimimachi 4-1-1, Chuo-ku,

Manufacturer or Supplier:	DONG GUAN SILITEN ELECTRONICS CO., LTD.
Address:	Sijia Yewu Industrial Park, Shijie Town, Dongguan City, Guangdong Province, China
Product:	Wireless Keyboard
Brand Name:	ELECOM
Model Name:	FDM106
Serial Model Name:	TK-FDM110T,TK-FDM105T ,TK-FDM105M ,TK-FDM106M,TK-FDM109T, TK-FDM109M ,TK-FDM106T, TK-FDM110M
FCC ID:	YWO-FDM106
Date of tests:	Apr. 12, 2023 ~ Apr. 24, 2023

The tests have been carried out according to the requirements of the following standard:

- 47 CFR FCC Part 15, Subpart C, Section 15.249
- 47 CFR FCC Part 15, Subpart C, Section 15.203
- ANSI C63.10-2013

**CONCLUSION:** The submitted sample was found to COMPLY with the test requirement

Prepared by Simon Wang Engineer / Mobile Department	Approved by Luke Lu Manager / Mobile Department
 Date: Apr. 24, 2023	 Date: Apr. 24, 2023

This report is governed by, and incorporates by reference, the Conditions of Testing as posted at the date of issuance of this report at <http://www.bureauveritas.com/home/about-us/our-business/cps/about-us/terms-conditions/> and is intended for your exclusive use. Any copying or replication of this report to or for any other person or entity, or use of our name or trademark, is permitted only with our prior written permission. This report sets forth our findings solely with respect to the test samples identified herein. The results set forth in this report are not indicative or representative of the quality or characteristics of the lot from which a test sample was taken or any similar or identical product unless specifically and expressly noted. Our report includes all of the tests requested by you and the results thereof based upon the information that you provided to us. Measurement uncertainty is only provided upon request for accredited tests. Statements of conformity are based on simple acceptance criteria without taking measurement uncertainty into account, unless otherwise requested in writing. You have 60 days from date of issuance of this report to notify us of any material error or omission caused by our negligence or if you require measurement uncertainty; provided, however, that such notice shall be in writing and shall specifically address the issue you wish to raise. A failure to raise such issue within the prescribed time shall constitute your unqualified acceptance of the completeness of this report, the tests conducted and the correctness of the report contents.

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## RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
W7L-Q23041101RF01	Original release	Apr. 24, 2023



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## 1 SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

APPLIED STANDARD: FCC Part 15, Subpart C		
STANDARD	TEST TYPE AND LIMIT	RESULT
15.207	AC Power Conducted Emission	N/A
15.249 (a)	Field Strength of the Fundamental Signal	Compliance
15.249 (d)	Restricted Band Around Fundamental Frequency	Compliance
47 CFR Part 15, Subpart C 15.209 & 15.249 (a),(d)	Radiated Emissions Below 1GHz	Compliance
47 CFR Part 15, Subpart C 15.205 & 15.249(d) & 15.209	Restricted Band Around Fundamental Frequency	Compliance
47 CFR Part 15, Subpart C 15.209 & 15.249 (a),(d)	Radiated Emissions Above 1GHz	Compliance
15.203	Antenna Requirement	Compliance
15.215	Channel Bandwidth Measurement(20 dB bandwidth)	Compliance

### NOTE:

Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

### Test Lab Information Reference:

BV 7Layers Communications Technology (Shenzhen) Co., Ltd

#### Lab Address:

No.B102, Dazu Chuangxin Mansion, North of Beihuan Avenue, North Area, Hi-Tech Industrial Park, Nanshan District, Shenzhen, Guangdong, China

**Accredited Test Lab Cert 3939.01**



## 1.1 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	UNCERTAINTY
AC Power Conducted emissions	$\pm 2.70\text{dB}$
Radiated emissions (9kHz ~ 30MHz)	$\pm 2.68\text{dB}$
Radiated emissions (30MHz~1GMHz)	$\pm 4.98\text{dB}$
Radiated emissions (1GMHz ~6GMHz)	$\pm 4.70\text{dB}$
Radiated emissions (6GMHz ~18GMHz)	$\pm 4.60\text{dB}$
Radiated emissions (18GMHz ~40GMHz)	$\pm 4.12\text{dB}$
Occupied Channel Bandwidth	$\pm 43.58\text{KHz}$

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of  $k=2$ .



## 2 GENERAL INFORMATION

### 2.1 GENERAL DESCRIPTION OF EUT

<b>PRODUCT</b>	Wireless Keyboard
<b>BRAND NAME</b>	ELECOM
<b>MODEL NAME</b>	FDM106
<b>SERIAL MODEL NAME</b>	TK-FDM110T,TK-FDM105T ,TK-FDM105M ,TK-FDM106M,TK-FDM109T, TK-FDM109M ,TK-FDM106T, TK-FDM110M
<b>NOMINAL VOLTAGE</b>	DC 1.5V from Battery
<b>MODULATION TECHNOLOGY</b>	DTS
<b>MODULATION TYPE</b>	GFSK
<b>OPERATING FREQUENCY</b>	2403MHz-2480 MHz
<b>NUMBER OF CHANNEL</b>	16
<b>FIELD STRENGTH</b>	94.83dBuV/m(3m)
<b>ANTENNA TYPE</b>	PCB Antenna with -2.2dBi gain
<b>HW VERSION</b>	VER:1.0
<b>SW VERSION</b>	DK-3202RZ-V1.0.1
<b>I/O PORTS</b>	Refer to user's manual
<b>CABLE SUPPLIED</b>	N/A

#### NOTE:

1. For a more detailed features description, please refer to the manufacturer's specifications or the user's manual.
2. For the test results, the EUT had been tested with all conditions. But only the worst case was shown in test report.
3. Model difference: The TK-FDM110T and TK-FDM105T, TK-FDM105M, TK-FDM106M, TK-FDM109T, TK-FDM109M, TK-FDM106T, TK-FDM110M use the same PCBA, the conductive film is different and the appearance is different. This report only reflects the model with the highest power (TK-FDM110T).

#### List of Accessory:

ACCESSORIES	BRAND	MANUFACTURER	MODEL	SPECIFICATION
Dongle	N/A	N/A	N/A	N/A



## 2.2 DESCRIPTION OF TEST MODES

16 channels are provided to this EUT:

CHANNEL	FRQUENCY. (MHZ)	CHANNEL	FREQUENCY. (MHZ)
1	2403	9	2414
2	2426	10	2436
3	2441	11	2459
4	2463	12	2473
5	2407	13	2419
6	2422	14	2439
7	2445	15	2453
8	2466	16	2480

### 2.2.1 CONFIGURATION OF SYSTEM UNDER TEST

Please see section 4 photograph of the test configuration for reference.

### 2.2.2 TEST MODE APPLICABILITY AND TESTED CHANNEL DETAIL

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates, XYZ axis and antenna ports. Following channel(s) was (were) selected for the final test as listed below:

EUT CONFIGURE MODE	APPLICABLE TO				DESCRIPTION
	RE<1G	RE≥1G	PLC	APCM	
-	√	√	NA	√	-

Where **RE<1G**: Radiated Emission below 1GHz  
**PLC**: Power Line Conducted Emission

**RE≥1G**: Radiated Emission above 1GHz  
**APCM**: Antenna Port Conducted Measurement

**NOTE:** The EUT had been pre-tested on the positioned of each 3 axis. The worst case was found when positioned on **X-plane**.  
“-”means no effect.

### RADIATED EMISSION TEST (BELOW 1 GHz):

- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, XYZ axis, antenna ports (if EUT with antenna diversity architecture) and packet type.
- Following channel(s) was (were) selected for the final test as listed below.



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EUT CONFIGURE MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	PACKET TYPE
-	1	1	DTS	GFSK	2.4G SRD

**RADIATED EMISSION TEST (ABOVE 1 GHz):**

- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, XYZ axis, antenna ports (if EUT with antenna diversity architecture) and packet type.
- Following channel(s) was (were) selected for the final test as listed below.

EUT CONFIGURE MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	PACKET TYPE
-	1-16	1,3,16	DTS	GFSK	2.4G SRD

**TEST CONDITION:**

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	TEST VOLTAGE (SYSTEM)	TESTED BY
RE<1G	23deg. C, 70%RH	DC 1.5V By Battery	Jace Hu
RE≥1G	23deg. C, 70%RH	DC 1.5V By Battery	Jace Hu
APCM	25deg. C, 60%RH	DC 1.5V By Battery	James Fu





### 2.3 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:

**47 CFR FCC Part 15, Subpart C, Section 15.249**

**47 CFR FCC Part 15, Subpart C, Section 15.203**

**ANSI C63.10-2013**

- NOTE:**
1. All test items have been performed and recorded as per the above standards.
  2. The EUT is also considered as a kind of computer peripheral, because the connection to computer is necessary for typical use. It has been verified to comply with the requirements of FCC Part 15, Subpart B, Class B (Certification). The test report has been issued separately.

### 2.4 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.

NO.	PRODUCT	BRAND	MODEL NO.	SERIAL NO.	FCC ID
1	N/A	N/A	N/A	N/A	N/A

NO.	SIGNAL CABLE DESCRIPTION OF THE ABOVE SUPPORT UNITS
1	N/A



### 3 TEST TYPES AND RESULTS

#### 3.1 RADIATED EMISSION MEASUREMENT

##### 3.1.1 LIMITS OF RADIATED EMISSION 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 MHz	50	500
2400 ~ 2483.5 MHz	50	500
5725 ~ 5875 MHz	50	500
24 ~ 24.25 GHz	250	2500

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(kHz)	300
0.490 ~ 1.705	24000/F(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 (uV/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. For fundamental frequency in "902-928MHz", the field strength of fundamental is based on Quasi-Peak.



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### 3.1.2 TEST INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
3m Semi-anechoic Chamber	ETS-LINDGREN	9m*6m*6m	Euroshieldpn-CT0001143-1216	May. 19,20	May. 18,23
Bilog Antenna	ETS-LINDGREN	3143B	00161965	Mar. 05,23	Mar. 04,24
Horn Antenna	ETS-LINDGREN	3117	00168692	Mar. 05,23	Mar. 04,24
Horn Antenna (18GHz-40GHz)	N/A	QWH-SL-18-40-K-SG/QMS-00361	15433	Sep.04, 22	Sep.03, 23
Test Software	E3	V 9.160323	N/A	N/A	N/A
Test Software	JS1120-3	3.2.06	N/A	N/A	N/A
10dB Attenuator	JFW/USA	50HF-010-SMA	N/A	May. 12,22	May. 11,23
MXE EMI Receiver	KEYSIGHT	N9038A-544	MY54450026	Feb. 20,23	Feb. 19,24
Signal Pre-Amplifier	EMSI	EMC 9135	980249	May.12,22	May.11,23
Signal Pre-Amplifier	EMSI	EMC 012645B	980257	May.12,22	May.11,23
Signal Pre-Amplifier	EMSI	EMC 184045B	980259	Feb. 17,23	Feb. 16,24
DC Source	Kikusui/JP	PMX18-5A	0000001	Aug. 12,22	Aug. 11,23
Power Meter	Anritsu	ML2495A	1506002	Feb. 14,23	Feb. 13,24
Power Sensor	Anritsu	MA2411B	1339352	Feb. 14,23	Feb. 13,24
Loop Antenna	Schwarzbeck	FMZB 1519B	00173	Sep.03,22	Sep.02,23

- NOTE:**
1. The calibration interval of the above test instruments is 12 months or 36 months and the calibrations are traceable to CEPREI/CHINA, GRGT/CHINA and NIM/CHINA.
  2. The test was performed in 3m Chamber.
  3. The FCC Site Registration No. is 525120; The Designation No. is CN1171.



### 3.1.3 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 antenna is a broadband antenna, and its 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.
- 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 Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- f. During the test, each emission was maximized by: having the EUT continuously working, investigated all operating modes, rotated about all 3 axis (X, Y & Z) and considered typical configuration to obtain worst position, manipulating interconnecting cables, For battery operated equipment, the equipment tests shall be perform using fresh batteries. The turntable was rotated to maximize the emission level.

#### NOTE:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and video bandwidth is 3MHz for Peak detection at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 10Hz for Average detection (AV) at frequency above 1GHz.
4. If the dwell time per channel of the hopping signal is less than 100 ms, then the reading obtained with the 10 Hz VBW may be further adjusted by a "duty cycle correction factor", derived from  $20\log(\text{dwell time}/100 \text{ ms})$ , in an effort to demonstrate compliance with the 15.209 limit.
5. All modes of operation were investigated and the worst-case emissions are reported.

### 3.1.4 DEVIATION FROM TEST STANDARD

No deviation.

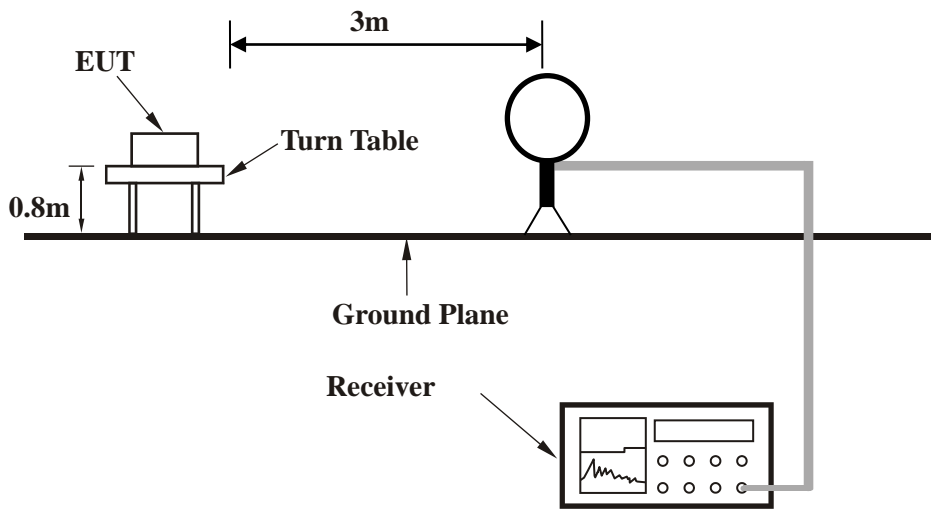
### 3.1.5 TEST SETUP



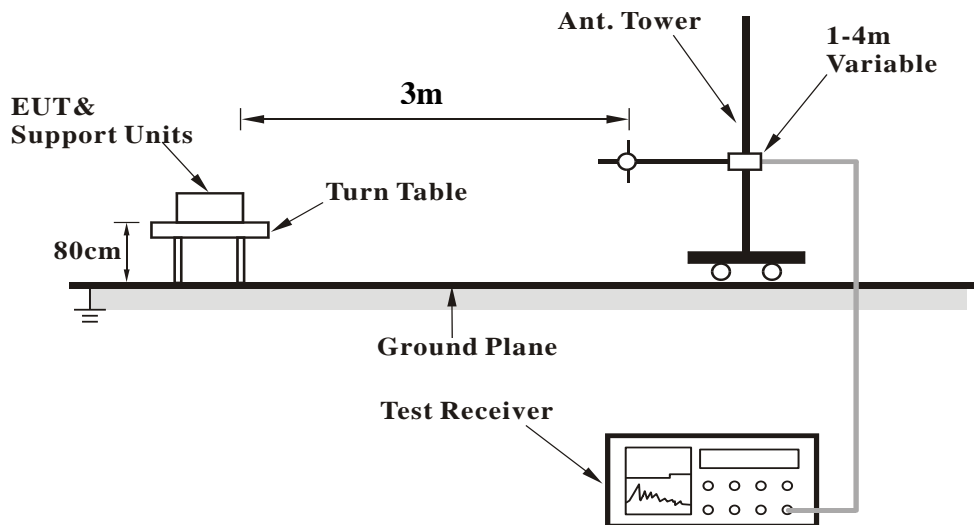
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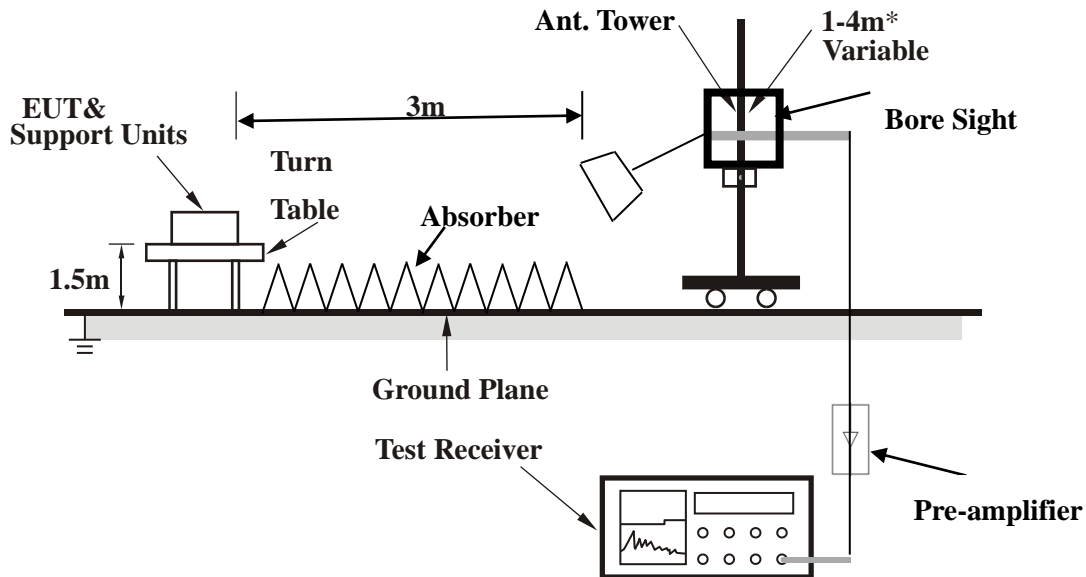
<Frequency Range 9KHz~30MHz >



< Frequency Range 30MHz~1GHz >



<Frequency Range above 1GHz>



**Note:** Above 1G is a directional antenna

Depends on the EUT height and the antenna 3dB beamwidth both, refer to section 7.3 of CISPR 16-2-3.

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

### 3.1.6 EUT OPERATING CONDITIONS

- Set the EUT under full load condition and placed them on a testing table.
- Set the transmitter part of EUT under transmission condition continuously at specific channel frequency.
- The necessary accessories enable the EUT in full functions.



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### 3.1.7 TEST RESULTS

**NOTE** : The 9K~30MHz amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required in the report.

**BELOW 1GHz WORST-CASE DATA:**

**30 MHz – 1GHz data:**

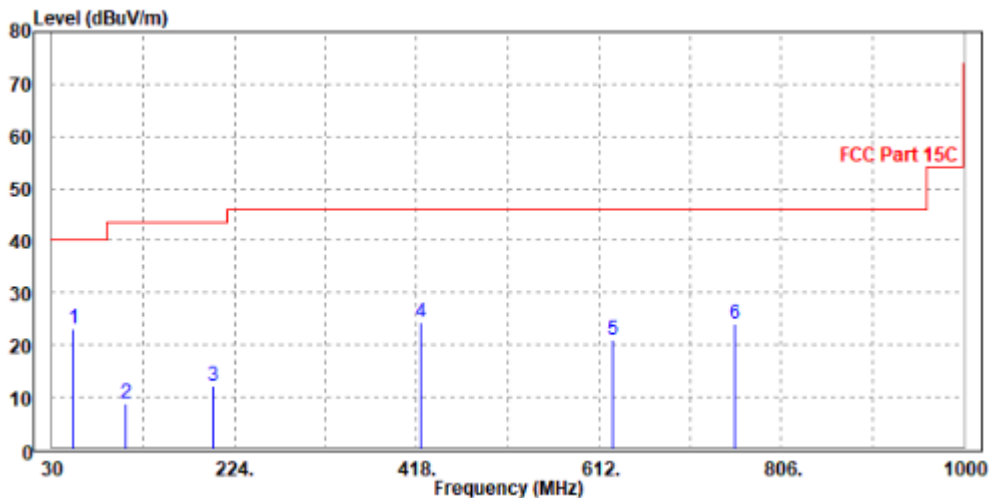
**2.4G SRD**

<b>CHANNEL</b>	Channel 1	<b>DETECTOR FUNCTION</b>	Quasi-Peak (QP)
<b>FREQUENCY RANGE</b>	30MHz ~ 1GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB /m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
52.31	23.05	49.66	40	-16.95	9.97	0.41	36.99	161	161	QP
108.57	8.74	34.94	43.5	-34.76	10.03	0.55	36.78	109	338	QP
201.69	12.17	36.35	43.5	-31.33	11.37	0.74	36.29	198	55	QP
422.85	24.31	43.04	46	-21.69	16.63	1.11	36.47	154	19	QP
625.58	20.87	36.23	46	-25.13	20.19	1.39	36.94	159	104	QP
756.53	23.9	37.51	46	-22.1	22.05	1.54	37.2	124	159	QP

**REMARKS:**

1. Emission Level(dBuV/m) = Read Level(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





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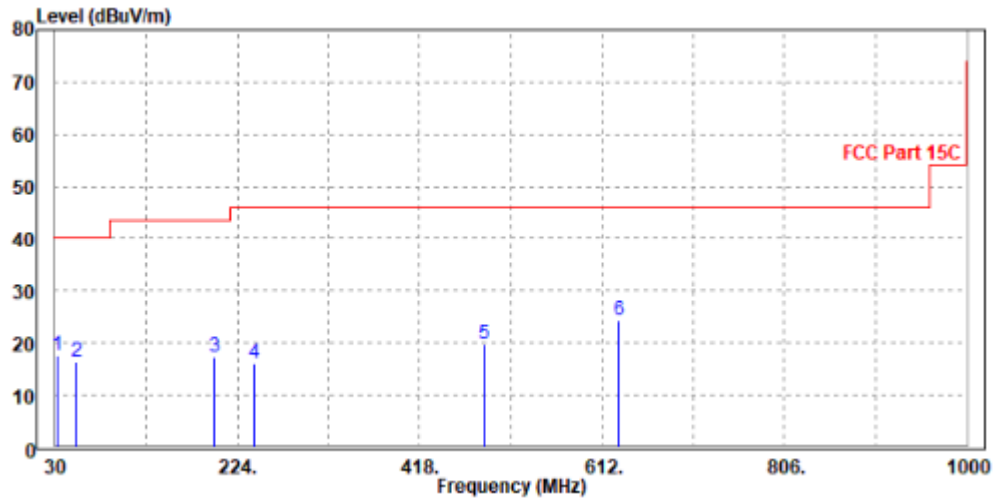
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CHANNEL	Channel 1	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	30MHz ~ 1GHz		

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB /m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
31.94	17.63	35.41	40	-22.37	19.33	0.32	37.43	124	92	QP
52.31	16.55	43.68	40	-23.45	9.45	0.41	36.99	186	14	QP
198.78	17.48	41.57	43.5	-26.02	11.48	0.73	36.3	162	127	QP
242.43	16.2	39.23	46	-29.8	12.43	0.82	36.28	200	229	QP
486.87	19.92	37.88	46	-26.08	17.43	1.2	36.59	118	29	QP
630.43	24.38	40.04	46	-21.62	19.9	1.4	36.96	147	275	QP

REMARKS:

1. Emission Level(dBuV/m) = Read Level(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







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ABOVE 1GHz WORST-CASE DATA:

CHANNEL	TX Channel 1	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz		Average (AV)

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M

FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB /m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
2390	51.93	56.67	74	-22.07	35.05	6.18	45.97	200	335	Peak
2390	45	49.74	54	-9	35.05	6.18	45.97	200	335	Average
2403	93.92	98.61	114	-20.08	35.09	6.19	45.97	200	335	Peak
*2403	54.34	-	94	-39.66	35.09	6.19	45.97	200	335	Average
2483.5	53.36	57.63	74	-20.64	35.35	6.31	45.93	200	335	Peak
2483.5	45.74	50.01	54	-8.26	35.35	6.31	45.93	200	335	Average

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M

FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB /m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
2390	51.16	58.09	74	-22.84	32.86	6.18	45.97	100	80	Peak
2390	42.67	49.6	54	-11.33	32.86	6.18	45.97	100	80	Average
2403	82.37	89.26	114	-31.63	32.89	6.19	45.97	100	80	Peak
*2403	42.79	-	94	-51.21	32.89	6.19	45.97	100	80	Average
2483.5	52.93	59.49	74	-21.07	33.06	6.31	45.93	100	80	Peak
2483.5	43.1	49.66	54	-10.9	33.06	6.31	45.93	100	80	Average

REMARKS:

1. Emission Level = Read Level+ Antenna Factor + Cable Loss- Preamp Factor  
Margin value = Emission level – Limit value.
2. 2403MHz: Fundamental frequency.
3. "\*" :Average Level=Peak Level+ Duty cycle Factor(-39.58db)



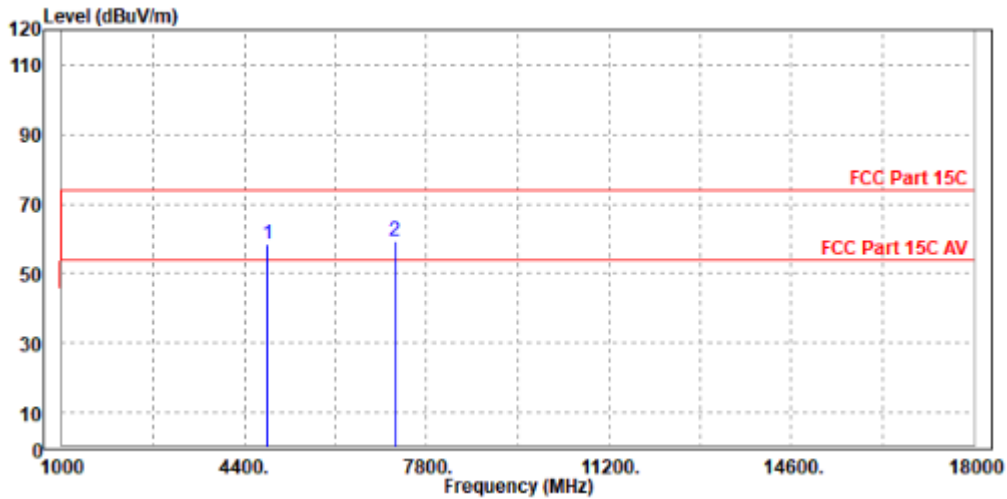
**BUREAU  
VERITAS**

Test Report No.: W7L-Q23041101RF01

harmonic:

<b>CHANNEL</b>	TX Channel 1	<b>DETECTOR FUNCTION</b>	Peak (PK)
<b>FREQUENCY RANGE</b>	1GHz ~ 25GHz		Average (AV)

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB /m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
4816	58.51	57.28	74	-15.49	36.75	9.96	45.48	100	360	Peak
*4816	18.93	-	54	-35.07	36.75	9.96	45.48	100	360	Average
7209	59.41	55.19	74	-14.59	38.34	10.8	44.92	100	360	Peak
*7209	19.83	-	54	-34.17	38.34	10.8	44.92	100	360	Average

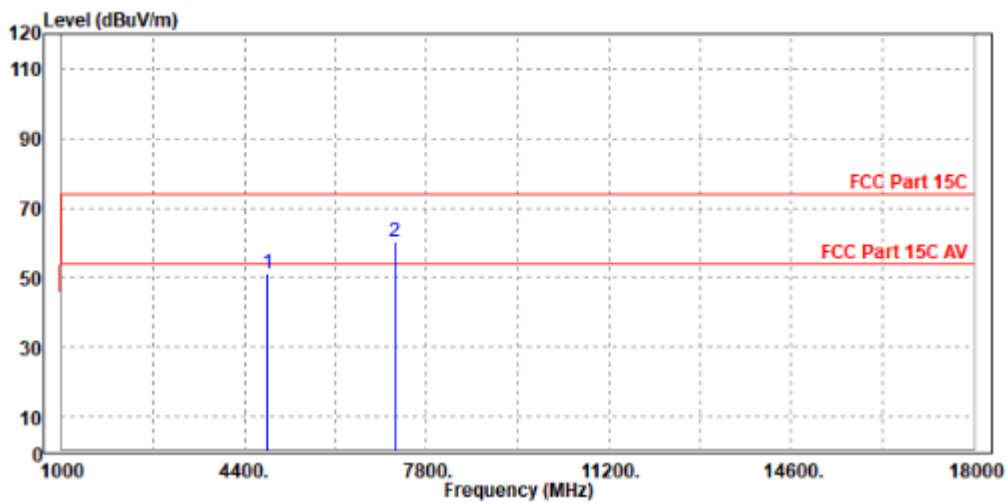




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VERITAS

Test Report No.: W7L-Q23041101RF01

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB /m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
4816	51.2	51.56	74	-22.8	35.16	9.96	45.48	200	360	Peak
*4816	11.62	-	54	-42.38	35.16	9.96	45.48	200	360	Average
7209	60.11	57	74	-13.89	37.23	10.8	44.92	200	360	Peak
*7209	20.53	-	54	-33.47	37.23	10.8	44.92	200	360	Average



**REMARKS:**

1. Emission Level = Read Level+ Antenna Factor + Cable Loss- Preamp Factor  
Margin value = Emission level – Limit value.
2. 2403MHz: Fundamental frequency.
3. For frequency above 18GHz, the emission was tested 20db below the limit so the data not recorded in the sheet.
4. "\*" :Average Level=Peak Level+ Duty cycle Factor(-39.58db)



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VERITAS

Test Report No.: W7L-Q23041101RF01

<b>CHANNEL</b>	TX Channel 3	<b>DETECTOR FUNCTION</b>	Peak (PK)
<b>FREQUENCY RANGE</b>	1GHz ~ 25GHz		Average (AV)

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB /m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
2390	52.14	56.88	74	-21.86	35.05	6.18	45.97	200	335	Peak
2390	44	48.74	54	-10	35.05	6.18	45.97	200	335	Average
2441	92.97	97.46	114	-21.03	35.21	6.25	45.95	200	335	Peak
*2441	53.39	-	94	-40.61	35.21	6.25	45.95	200	335	Average
2483.5	53.15	57.42	74	-20.85	35.35	6.31	45.93	200	335	Peak
2483.5	45.61	49.88	54	-8.39	35.35	6.31	45.93	200	335	Average

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB /m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
2390	49.31	56.24	74	-24.69	32.86	6.18	45.97	200	110	Peak
2390	42.83	49.76	54	-11.17	32.86	6.18	45.97	200	110	Average
2441	81.08	87.81	114	-32.92	32.97	6.25	45.95	200	110	Peak
*2441	41.5	-	94	-52.5	32.97	6.25	45.95	200	110	Average
2483.5	51.44	58	74	-22.56	33.06	6.31	45.93	200	110	Peak
2483.5	42.94	49.5	54	-11.06	33.06	6.31	45.93	200	110	Average

**REMARKS:**

1. Emission Level = Read Level+ Antenna Factor + Cable Loss- Preamp Factor  
Margin value = Emission level – Limit value.
2. 2441MHz: Fundamental frequency.
3. “\*” :Average Level=Peak Level+ Duty cycle Factor(-39.58db)



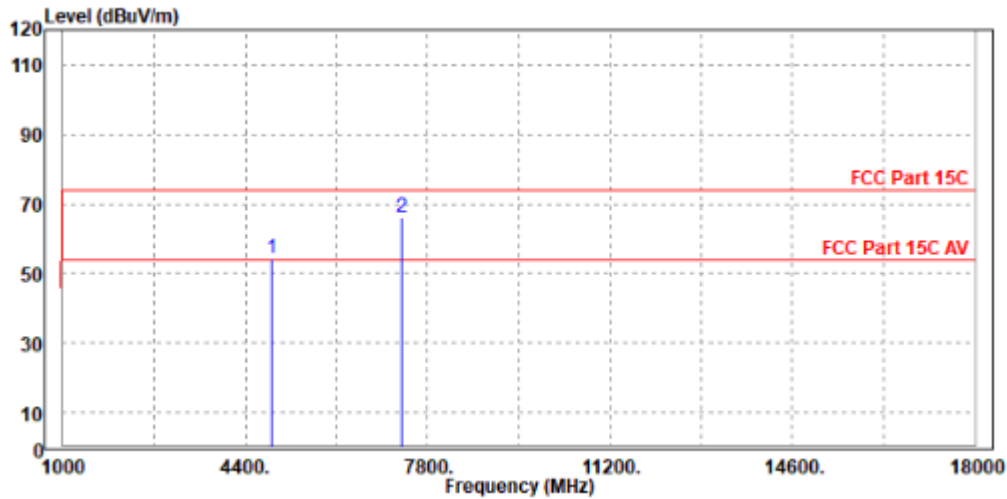
**BUREAU  
VERITAS**

Test Report No.: W7L-Q23041101RF01

harmonic:

<b>CHANNEL</b>	TX Channel 3	<b>DETECTOR FUNCTION</b>	Peak (PK)
<b>FREQUENCY RANGE</b>	1GHz ~ 25GHz		Average (AV)

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB /m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
4882	54.16	52.88	74	-19.84	36.81	9.96	45.49	200	360	Peak
*4882	14.58	-	54	-39.42	36.81	9.96	45.49	200	360	Average
7324	66.13	61.75	74	-7.87	38.36	10.83	44.81	200	360	Peak
*7324	26.55	-	54	-27.45	38.36	10.83	44.81	200	360	Average

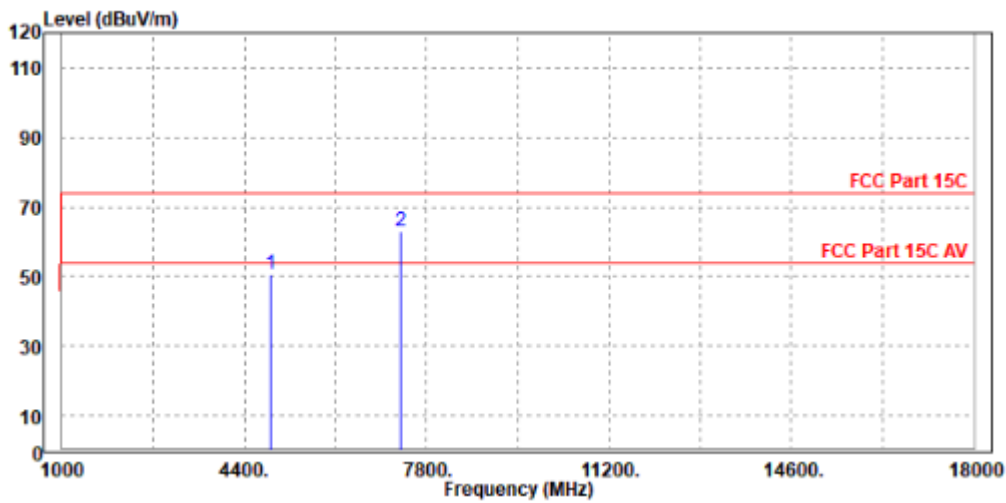




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VERITAS**

Test Report No.: W7L-Q23041101RF01

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB /m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
4876	50.59	50.94	74	-23.41	35.18	9.96	45.49	100	360	Peak
*4876	11.01	-	54	-42.99	35.18	9.96	45.49	100	360	Average
7323	63.14	59.83	74	-10.86	37.29	10.83	44.81	100	360	Peak
*7323	23.56	-	54	-30.44	37.29	10.83	44.81	100	360	Average



**REMARKS:**

1. Emission Level = Read Level+ Antenna Factor + Cable Loss- Preamp Factor  
Margin value = Emission level – Limit value.
2. 2441MHz: Fundamental frequency.
3. For frequency above 18GHz, the emission was tested 20db below the limit so the data not recorded in the sheet.
4. "\*" :Average Level=Peak Level+ Duty cycle Factor(-39.58db)



BUREAU VERITAS

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<b>CHANNEL</b>	TX Channel 16	<b>DETECTOR FUNCTION</b>	Peak (PK)
<b>FREQUENCY RANGE</b>	1GHz ~ 25GHz		Average (AV)

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB /m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
2390	52.09	56.83	74	-21.91	35.05	6.18	45.97	200	340	Peak
2390	44.77	49.51	54	-9.23	35.05	6.18	45.97	200	340	Average
2480	94.83	99.12	114	-19.17	35.34	6.3	45.93	200	340	Peak
*2480	55.2	-	94	-38.8	35.34	6.3	45.93	200	340	Average
2483.5	54.78	59.05	74	-19.22	35.35	6.31	45.93	200	340	Peak
2483.5	48.48	52.75	54	-5.52	35.35	6.31	45.93	200	340	Average

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB /m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
2390	50.75	57.68	74	-23.25	32.86	6.18	45.97	200	110	Peak
2390	42.28	49.21	54	-11.72	32.86	6.18	45.97	200	110	Average
2480	83.15	89.72	114	-30.85	33.06	6.3	45.93	200	110	Peak
*2480	43.52	-	94	-50.48	33.06	6.3	45.93	200	110	Average
2483.5	51.25	57.81	74	-22.75	33.06	6.31	45.93	200	110	Peak
2483.5	42.84	49.4	54	-11.16	33.06	6.31	45.93	200	110	Average

**REMARKS:**

1. Emission Level = Read Level+ Antenna Factor + Cable Loss- Preamp Factor  
Margin value = Emission level – Limit value.
2. 2480MHz: Fundamental frequency.
3. "\*" :Average Level=Peak Level+ Duty cycle Factor(-39.63db)



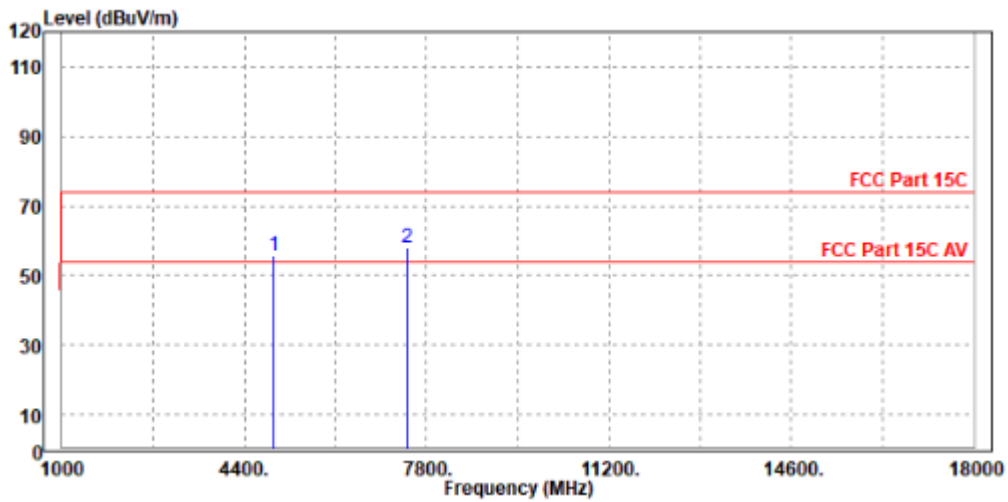
**BUREAU  
VERITAS**

Test Report No.: W7L-Q23041101RF01

harmonic:

<b>CHANNEL</b>	TX Channel 16	<b>DETECTOR FUNCTION</b>	Peak (PK)
<b>FREQUENCY RANGE</b>	1GHz ~ 25GHz		Average (AV)

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB /m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
4961	55.5	54.16	74	-18.5	36.87	9.97	45.5	100	360	Peak
*4961	15.87	-	54	-38.13	36.87	9.97	45.5	100	360	Average
7440	57.99	53.43	74	-16.01	38.39	10.86	44.69	100	360	Peak
*7440	18.36	-	54	-35.64	38.39	10.86	44.69	100	360	Average



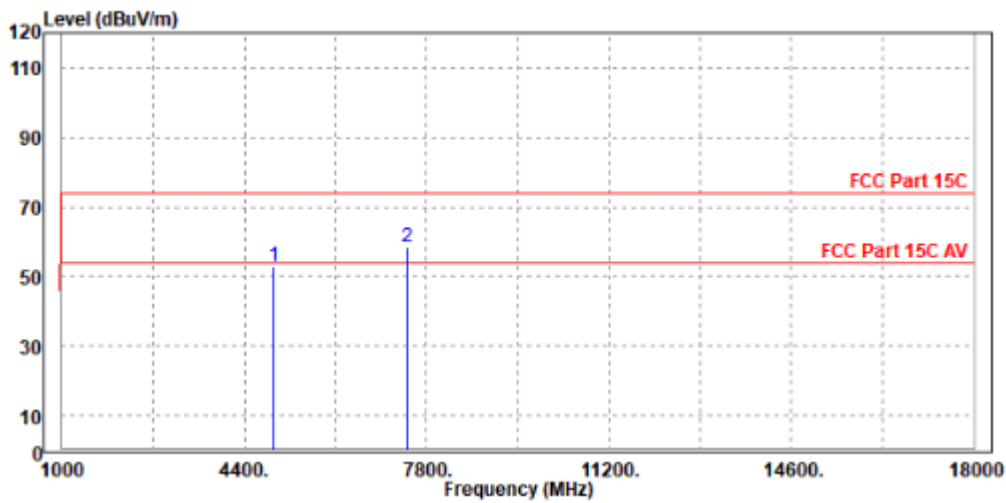




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ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB /m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
4960	53.03	53.37	74	-20.97	35.19	9.97	45.5	200	360	Peak
*4960	13.4	-	54	-40.6	35.19	9.97	45.5	200	360	Average
7443	58.63	55.09	74	-15.37	37.37	10.86	44.69	200	360	Peak
*7443	19	-	54	-35	37.37	10.86	44.69	200	360	Average



**REMARKS:**

1. Emission Level = Read Level+ Antenna Factor + Cable Loss- Preamp Factor  
Margin value = Emission level – Limit value.
2. 2480MHz: Fundamental frequency.
3. For frequency above 18GHz, the emission was tested 20db below the limit so the data not recorded in the sheet.
4. "\*" :Average Level=Peak Level+ Duty cycle Factor(-39.63db)

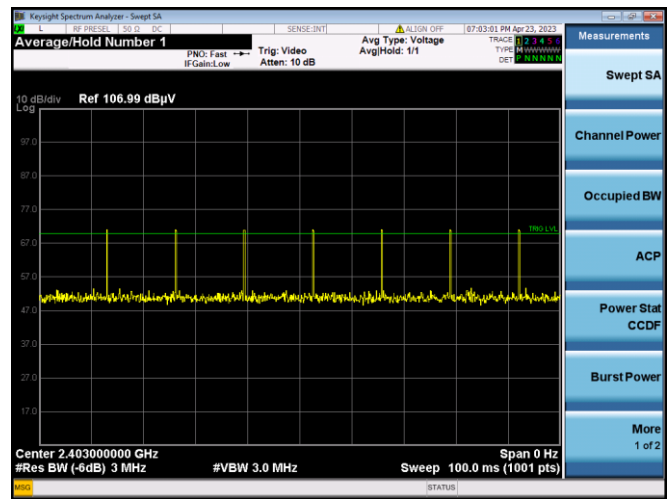
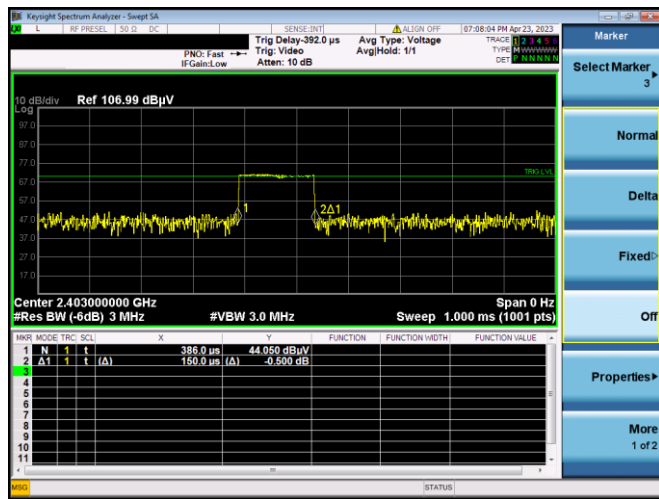
For Harmonic and fundamental data above, the average level was corrected by the duty cycle factor based on the peak level, according to the chapter 7.5 of C63.10-2013.

$$\text{Average Level} = \text{Peak Level} + \text{Duty cycle Factor}$$

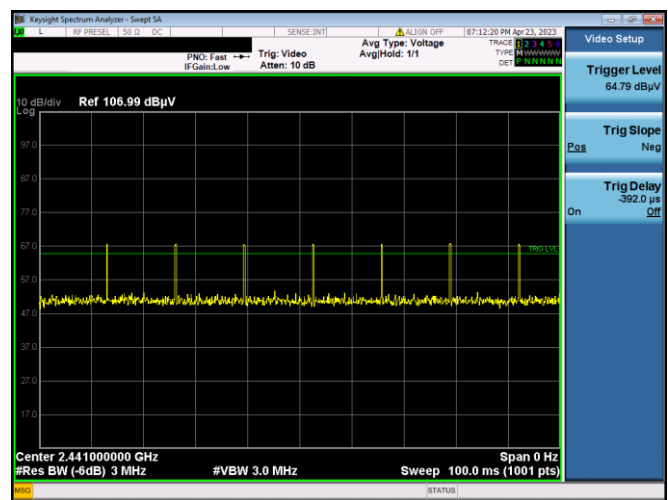
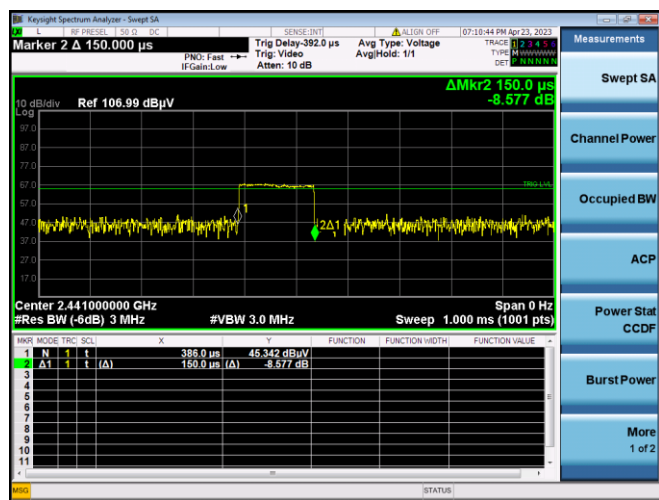
$$\text{Duty cycle Factor} = 20 * \log\left(\frac{\text{Ton} * \text{Number of pulses}}{100\text{ms}}\right)$$

Frequency MHz	Ton(ms)	Number of pulses In 100ms	Duty cycle	Duty cycle Factor
2403	0.150	7	0.011	-39.58
2441	0.150	7	0.011	-39.58
2480	0.149	7	0.010	-39.63

CH1\_2403



CH3\_2441

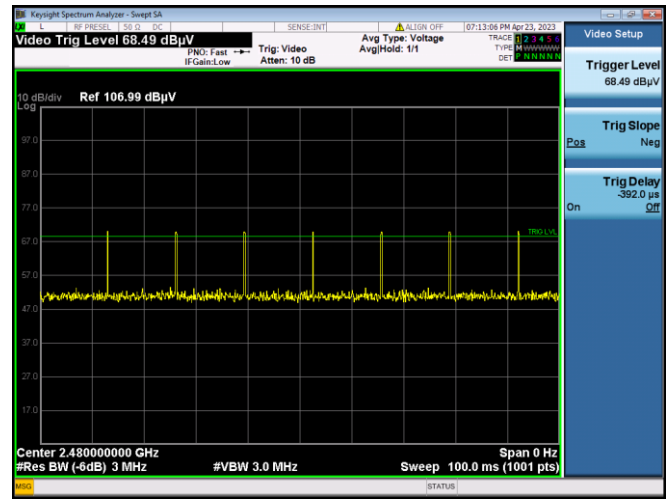
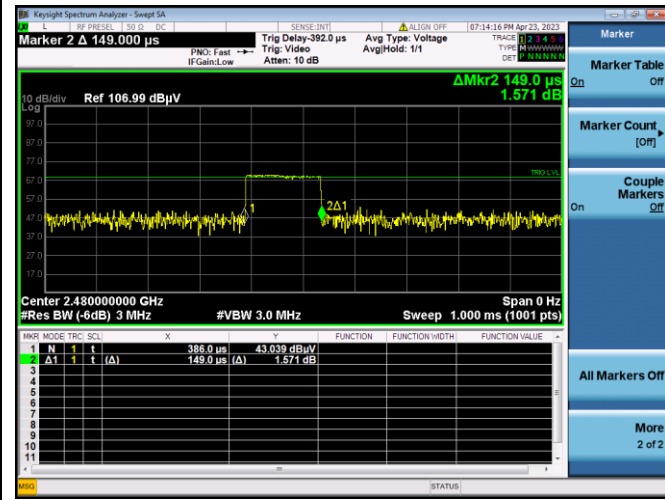




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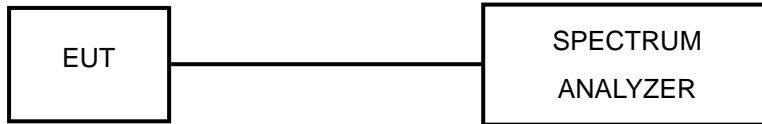
Test Report No.: W7L-Q23041101RF01

CH16\_2480



## 3.2 CHANNEL BANDWIDTH (20DB BANDWIDTH)

### 3.2.1 TEST SETUP



### 3.2.2 TEST INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
EXA Signal Analyzer	KEYSIGHT	N9010A-544	MY54510355	May.14,22	May.13,23

### 3.2.3 TEST PROCEDURE

- a. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
- b. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range.
- c. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 20 dB relative to the maximum level measured in the fundamental emission.
- d. Repeat above procedures until all frequencies measured were complete.

### 3.2.4 DEVIATION FROM TEST STANDARD

No deviation.

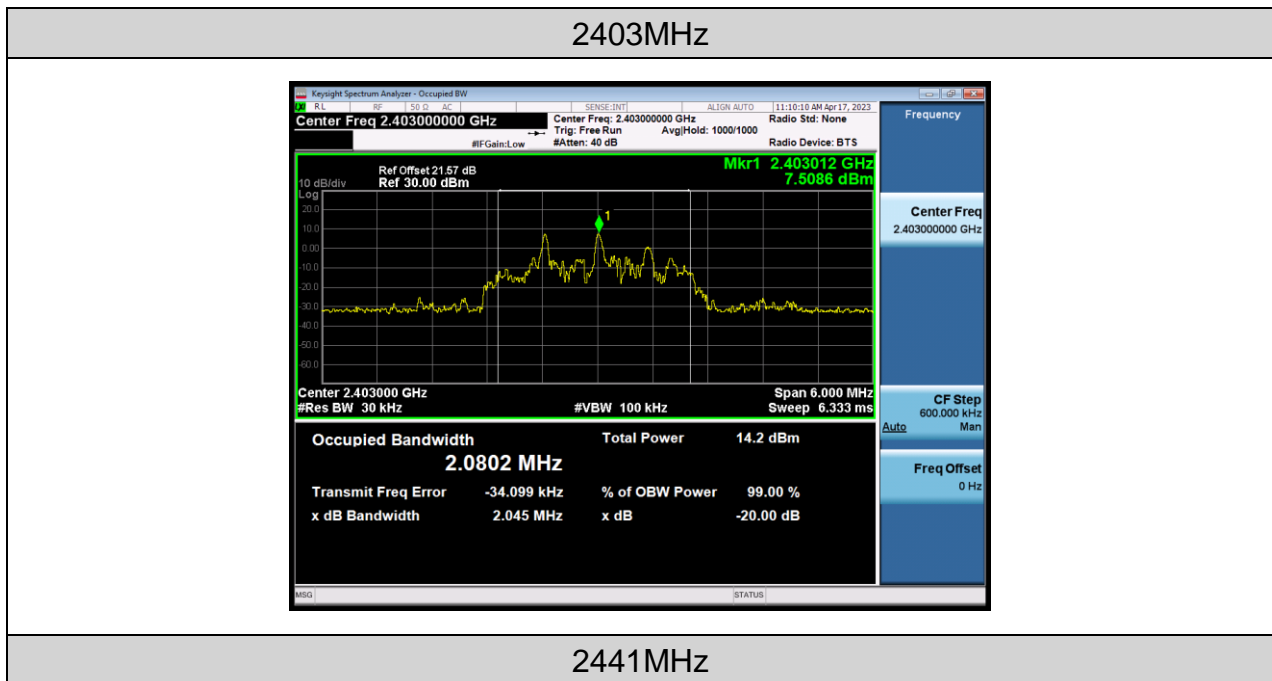


### 3.2.5 EUT OPERATING CONDITION

The EUT provided by client can transmission continuously at test frequency individually.

### 3.2.6 TEST RESULTS

Frequency (MHz)	OBW (MHz)	20dB bandwidth (MHz)	Result
2403	2.0802	2.045	Pass
2441	2.0963	2.083	Pass
2480	2.1274	2.066	Pass





BUREAU VERITAS

Test Report No.: W7L-Q23041101RF01



2480MHz



### 3.3 FCC §15.203 - ANTENNA REQUIREMENT

#### Applicable Standard

According to § 15.203, 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 shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the user of a standard antenna jack or electrical connector is prohibited. The structure and application of the EUT were analyzed to determine compliance with section §15.203 of the rules. §15.203 state that the subject device must meet the following criteria:

- a. Antenna must be permanently attached to the unit.
- b. Antenna must use a unique type of connector to attach to the EUT.

Unit must be professionally installed, and installer shall be responsible for verifying that the correct antenna is employed with the unit.

#### Antenna Connector Construction

The EUT has an metal plate Antenna arrangement, which was permanently attached and the antenna gain is 2.0dBi, fulfill the requirement of this section. Please refer to the EUT photos.

**Result:** Compliance.



Test Report No.: W7L-Q23041101RF01

## 4 PHOTOGRAPHS OF THE TEST CONFIGURATION

Please refer to the attached file (Test Setup Photo).





Test Report No.: W7L-Q23041101RF01

## 5 MODIFICATIONS RECORDERS FOR ENGINEERING CHANGES TO THE EUT BY THE LAB

No any modifications are made to the EUT by the lab during the test.

--- END ---