



FCC RADIO TEST REPORT

FCC ID:2ABH3FOC48TA-BL

Product : Digital wireless observation system

Trade Name : FURRION

Model Name : FOS48TA-BL

Serial Model : FOD43TA-BL,FOC48TA-BL

Report No. : NTEK-2015NT0114234F-01

Prepared for

Furrion Ltd.

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Prepared by

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TEST RESULT CERTIFICATION

Applicant's name : Furrion Ltd.

Address : Suite 3-5, 16/F Pacific Plaza, 410 Des Voeux Road West,
Sai Wan, Hong Kong.

Manufacture's Name..... : Dongguan Protronic Electronics Ltd.

Address : Protronic Industrial Park, Xiangxi Village, Shipai Town,
DongGuan, GuangDong, China

Product description

Product name : Digital wireless observation system

Model and/or type reference : FOS48TA-BL

Serial Model : FOD43TA-BL,FOC48TA-BL

Standards : FCC Part15.247: 01 Oct. 2014

Test procedure ANSI C63.10-2013

This device described above has been tested by NTEK, and the test results show that the equipment under test (EUT) is in compliance with the FCC requirements. And it is applicable only to the tested sample identified in the report.

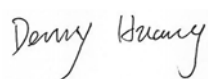
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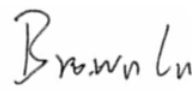
Date of Test :

Date (s) of performance of tests : 25 Jun. 2015 ~03 Jul. 2015

Date of Issue..... : 03 Jul. 2015

Test Result..... : **Pass**

Testing Engineer : 
Denny Huang

Technical Manager : 
(Brown Lu)

Authorized Signatory : 
(Bill Yao)

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1. SUMMARY OF TEST RESULTS

Test procedures according to the technical standards:

FCC Part15 (15.247) , Subpart C			
Standard Section	Test Item	Judgment	Remark
15.247(c)	Radiated Spurious Emission	PASS	
15.205	Band Edge Emission	PASS	

Note : This C2PC testing , the changed is: Only change the layout of board and RF module to earth, Circuit and RF module are the same. details please see SCS-F159 FCC Class II Permissive Change Request Letter.

1.1 TEST FACILITY

NTEK Testing Technology Co., Ltd

Add. : 1/F, Building E, Fenda Science Park, Sanwei Community, Xixiang Street, Bao'an District, Shenzhen P.R. China.

FCC Registration No.:238937; IC Registration No.:9270A-1

CNAS Registration No.:L5516

1.2 MEASUREMENT UNCERTAINTY

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 %.

No.	Item	Uncertainty
1	Conducted Emission Test	$\pm 1.38\text{dB}$
2	RF power,conducted	$\pm 0.16\text{dB}$
3	Spurious emissions,conducted	$\pm 0.21\text{dB}$
4	All emissions,radiated(<1G)	$\pm 4.68\text{dB}$
5	All emissions,radiated(>1G)	$\pm 4.89\text{dB}$
6	Temperature	$\pm 0.5^{\circ}\text{C}$
7	Humidity	$\pm 2\%$

2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

Equipment	Digital wireless observation system	
Trade Name	FURRION	
Model Name	FOS48TA-BL	
Serial Model	FOD43TA-BL,FOC48TA-BL	
Model Difference	All the model are the same circuit and RF module, except the model name and colour.	
Product Description	The EUT is a Digital wireless observation system	
	Operation Frequency:	2403~2478 MHz
	Modulation Type:	QPSK
	Number Of Channel	26 CH
	Antenna Designation:	Please see Note 3.
Channel List	Please refer to the Note 2.	
Adapter	N/A	
Battery	N/A	
Connecting I/O Port(s)	Please refer to the User's Manual	

Note:

1. For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.
- 2.

Channel List					
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
01	2403	11	2433	21	2463
02	2406	12	2436	22	2466
03	2409	13	2439	23	2469
04	2412	14	2442	24	2472
05	2415	15	2445	25	2475
06	2418	16	2448	26	2478
07	2421	17	2451		
08	2424	18	2454		
09	2427	19	2457		
10	2430	20	2460		

3.

Table for Filed Antenna

Ant .	Brand	Model Name	Antenna Type	Connector	Gain (dBi)	NOTE
1	N/A	N/A	External Antenna	N/A	3.0	BT Antenna

2.2 DESCRIPTION OF TEST MODES

To investigate the maximum EMI emission characteristics generates 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	CH01
Mode 2	CH14
Mode 3	CH26
Mode 4	normal link

For Conducted Emission	
Final Test Mode	Description
Mode 4	normal link

For Radiated Emission	
Final Test Mode	Description
Mode 1	CH01
Mode 2	CH14
Mode 3	CH26

Note:

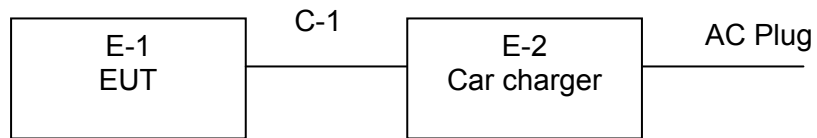
- (1) The measurements are performed at the highest, middle, lowest available channels.
- (2) The EUT use new battery.
- (3)The data rate was set in 3Mbps for radiated emission due to the highest RF output power.

2.3 TABLE OF PARAMETERS OF TEXT SOFTWARE SETTING

During testing channel & power controlling software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the firmware of the final end product power parameters of FHSS

Test software Version	Test program: Broadcom		
Frequency	2403 MHz	2442 MHz	2478 MHz
Parameters(1/2/3Mbps)	DEF	DEF	DEF

2.4 BLOCK DIGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED



2.5 DESCRIPTION OF SUPPORT UNITS(CONDUCTED MODE)

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.	Series No.	Note
E-1	Digital wireless observation system	FURRION	FOS48TA-BL	N/A	EUT
E-2	Car charger	N/A	N/A	N/A	

Item	Shielded Type	Ferrite Core	Length	Note
C-1	NO	NO	120cm	

Note:

- (1) The support equipment was authorized by Declaration of Confirmation.
- (2) For detachable type I/O cable should be specified the length in cm in 『Length』 column.
- (3) “YES” is means “shielded” “with core”; “NO” is means “unshielded” “without core”.

2.6 EQUIPMENTS LIST FOR ALL TEST ITEMS

Radiation Test equipment

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until	Calibration period
1	Spectrum Analyzer	Agilent	E4407B	MY45108040	2014.07.06	2015.07.05	1 year
2	Test Receiver	R&S	ESPI	101318	2015.06.07	2016.06.06	1 year
3	Bilog Antenna	TESEQ	CBL6111D	31216	2014.07.06	2015.07.05	1 year
4	50Ω Coaxial Switch	Anritsu	MP59B	6200264416	2015.06.07	2016.06.06	1 year
5	Spectrum Analyzer	ADVANTEST	R3132	150900201	2015.06.07	2016.06.06	1 year
6	Horn Antenna	EM	EM-AH-10180	2011071402	2014.07.06	2015.07.05	1 year
7	Horn Ant	Schwarzbeck	BBHA 9170	9170-181	2014.07.06	2015.07.05	1 year
8	Amplifier	EM	EM-30180	060538	2014.12.22	2015.12.21	1 year
9	Loop Antenna	ARA	PLA-1030/B	1029	2015.06.08	2016.06.07	1 year
10	Power Meter	R&S	NRVS	100696	2014.07.06	2015.07.05	1 year
11	Power Sensor	R&S	URV5-Z4	0395.1619.05	2014.07.06	2015.07.05	1 year
12	Test Cable	N/A	R-01	N/A	2014.07.06	2015.07.05	1 year
13	Test Cable	N/A	R-02	N/A	2014.07.06	2015.07.05	1 year

Conduction Test equipment

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until	Calibration period
1	Test Receiver	R&S	ESCI	101160	2015.06.06	2016.06.05	1 year
2	LISN	R&S	ENV216	101313	2014.08.24	2015.08.23	1 year
3	LISN	EMCO	3816/2	00042990	2014.08.24	2015.08.23	1 year
4	50Ω Coaxial Switch	Anritsu	MP59B	6200264417	2015.06.07	2016.06.06	1 year
5	Passive Voltage Probe	R&S	ESH2-Z3	100196	2015.06.07	2016.06.06	1 year
6	Absorbing clamp	R&S	MOS-21	100423	2015.06.08	2016.06.07	1 year
7	Test Cable	N/A	C01	N/A	2015.06.08	2016.06.07	1 year
8	Test Cable	N/A	C02	N/A	2015.06.08	2016.06.07	1 year
9	Test Cable	N/A	C03	N/A	2015.06.08	2016.06.07	1 year

1	Attenuation	MCE	24-10-34	BN9258	2015.06.08	2016.06.07	1 year
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3. EMC EMISSION TEST

3.1 RADIATED EMISSION MEASUREMENT

3.1.1 RADIATED EMISSION LIMITS (Frequency Range 9kHz-1000MHz)

20dBc in any 100 kHz bandwidth outside the operating frequency band. In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

Frequencies (MHz)	Field Strength (micorvolts/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

LIMITS OF RADIATED EMISSION MEASUREMENT (Above 1000MHz)

FREQUENCY (MHz)	Class B (dBuV/m) (at 3M)	
	PEAK	AVERAGE
Above 1000	74	54

Notes:

- (1) The limit for radiated test was performed according to FCC PART 15C.
- (2) The tighter limit applies at the band edges.
- (3) Emission level (dBuV/m)=20log Emission level (uV/m).

FREQUENCY RANGE OF RADIATED MEASUREMENT (For unintentional radiators)

Highest frequency generated or Upper frequency of measurement used in the device or on which the device operates or tunes (MHz)	Range (MHz)
Below 1.705	30
1.705 – 108	1000
108 – 500	2000
500 – 1000	5000
Above 1000	5 th harmonic of the highest frequency or 40 GHz, whichever is lower

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10th carrier harmonic
RB / VB (emission in restricted band)	1 MHz / 1 MHz for Peak, 1 MHz / 10Hz for Average

Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RB 200Hz for QP
Start ~ Stop Frequency	150kHz~30MHz / RB 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RB 120kHz for QP

3.1.2 TEST PROCEDURE

- The measuring distance of at 3 m shall be used for measurements at frequency up to 1GHz. For frequencies above 1GHz, any suitable measuring distance may be used.
- The EUT was placed on the top of a rotating table 0.8 m for below 1GHz and 1.5m for above 1GHz the ground at a 3 meter open area test site. The table was rotated 360 degrees to determine the position of the highest radiation.
- The height of the equipment or of the substitution antenna shall be 0.8 m for below 1GHz and 1.5m for above 1GHz; 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.
- The initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.
- If the Peak Mode measured value compliance with and lower than Quasi Peak Mode Limit, the EUT shall be deemed to meet QP Limits and then no additional QP Mode measurement performed.
- For the actual test configuration, please refer to the related Item –EUT Test Photos.

Note:

Both horizontal and vertical antenna polarities were tested and performed pretest to three orthogonal axis. The worst case emissions were reported

During the radiated emission test, the Spectrum Analyzer was set with the following configurations:

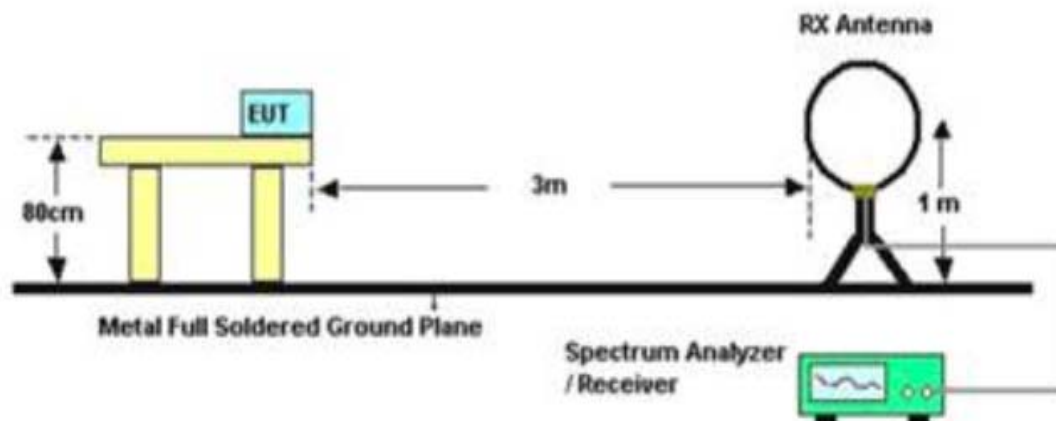
Frequency Band (MHz)	Function	Resolution bandwidth	Video Bandwidth
30 to 1000	QP	120 kHz	300 kHz
Above 1000	Peak	1 MHz	1 MHz
	Peak	1 MHz	10 Hz

3.1.3 DEVIATION FROM TEST STANDARD

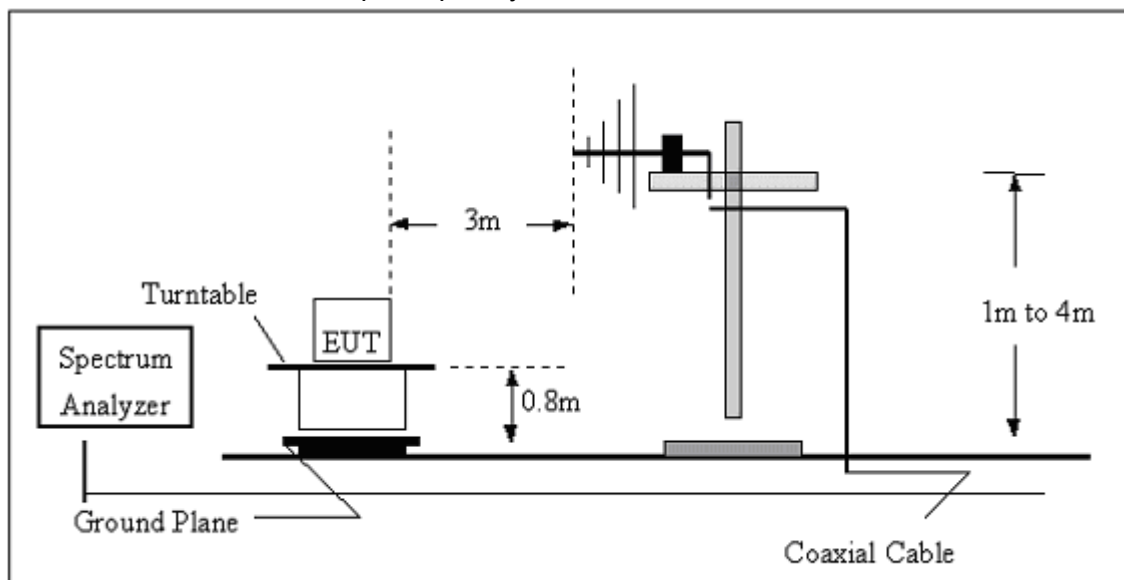
No deviation

3.1.4 TEST SETUP

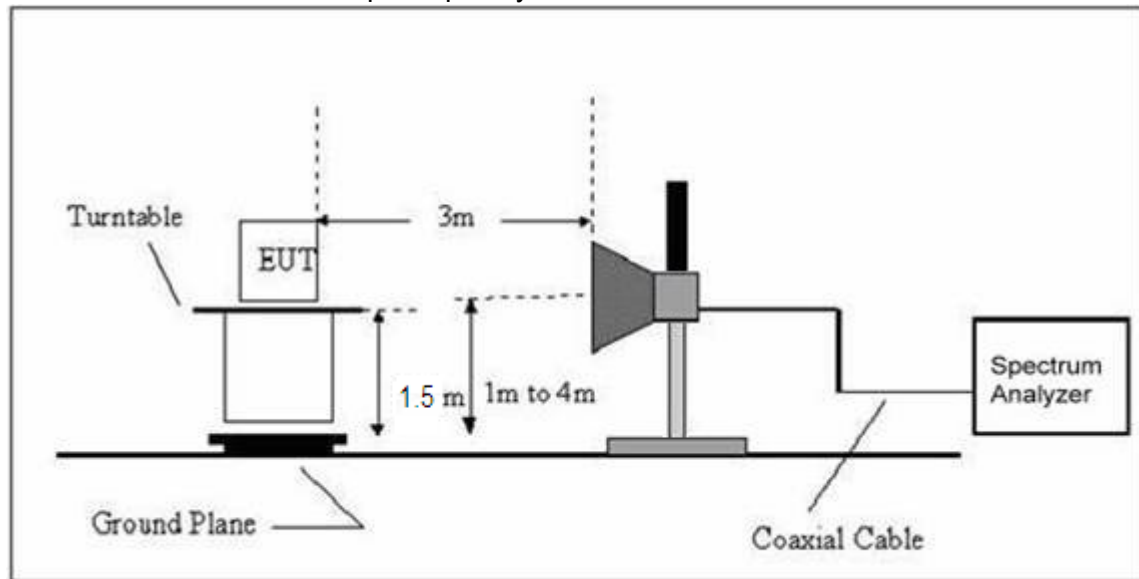
(A) Radiated Emission Test-Up Frequency Below 30MHz



(B) Radiated Emission Test-Up Frequency 30MHz~1GHz



(C) Radiated Emission Test-Up Frequency Above 1GHz

**3.1.5 EUT OPERATING CONDITIONS**

The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

3.1.6 TEST RESULTS (BELOW 30 MHZ)

EUT :	Digital wireless observation system	Model Name :	FOS48TA-BL
Temperature :	20 °C	Relative Humidity :	48%
Pressure :	1010 hPa	Test Voltage :	DC 12V
Test Mode :	TX	Polarization :	---

Freq.	Reading	Limit	Margin	State
(MHz)	(dBuV/m)	(dBuV/m)	(dB)	P/F
--	--	--	--	P
--	--	--	--	P

NOTE:

The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

Distance extrapolation factor = $20 \log (\text{specific distance/test distance})$ (dB);

Limit line = specific limits(dBuv) + distance extrapolation factor.

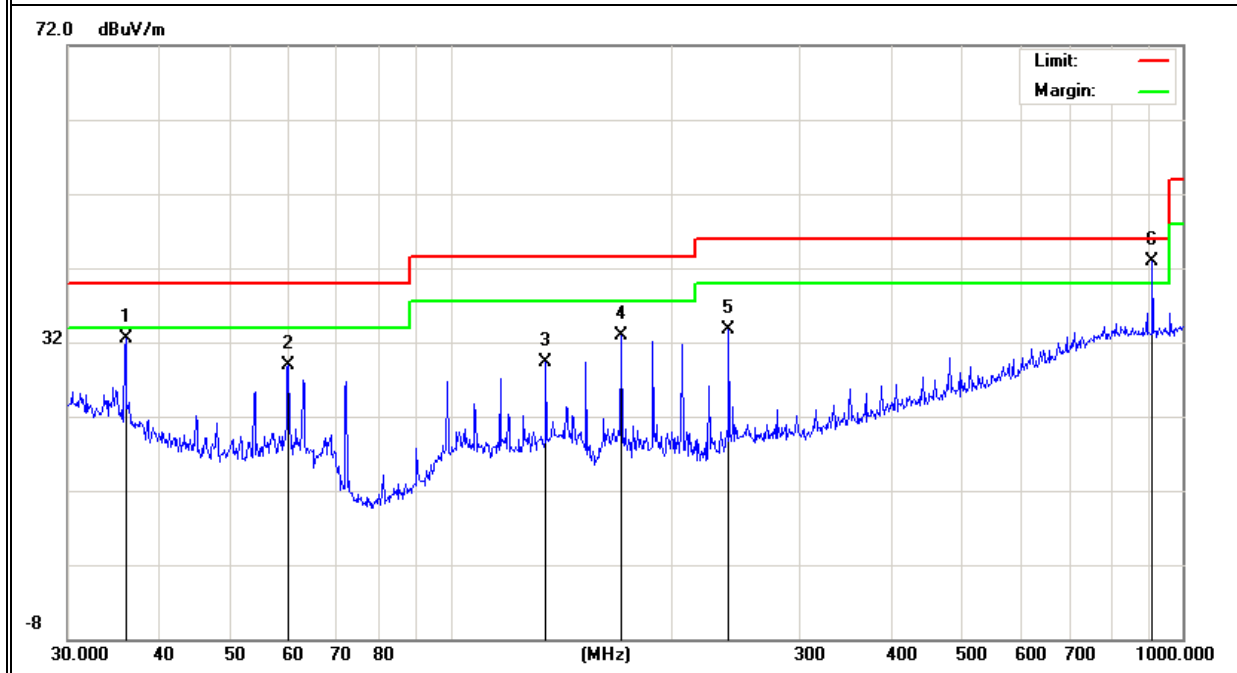
3.1.7 TEST RESULTS (BETWEEN 30M – 1000 MHZ)

EUT :	Digital wireless observation system	Model Name :	FOS48TA-BL
Temperature :	20 °C	Relative Humidity :	48%
Pressure :	1010hPa	Test Mode :	TX
Test Voltage :	DC 12V		

Polar (H/V)	Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Remark
	(MHz)	(dBuV)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	
V	36.0007	16.36	16.06	32.42	40.00	-7.58	QP
V	60.0690	21.17	7.81	28.98	40.00	-11.02	QP
V	135.0319	17.73	11.65	29.38	43.50	-14.12	QP
V	171.3925	22.24	10.57	32.81	43.50	-10.69	QP
V	239.9874	20.19	13.49	33.68	46.00	-12.32	QP
V	909.6666	15.78	27.07	42.85	46.00	-3.15	QP

Remark:

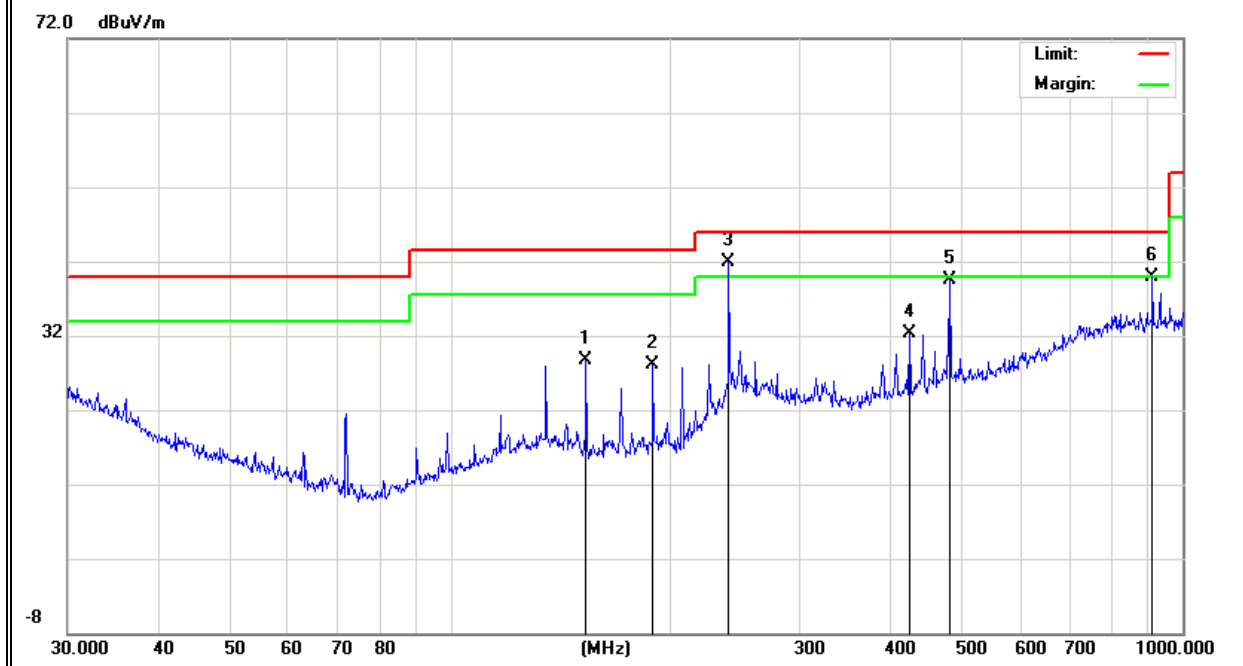
Absolute Level= ReadingLevel+ Factor, Margin= Absolute Level - Limit



Polar (H/V)	Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Remark
	(MHz)	(dBuV)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	
H	153.2004	18.28	10.44	28.72	43.50	-14.78	QP
H	189.0742	17.31	10.70	28.01	43.50	-15.49	QP
H	239.9874	28.43	13.49	41.92	46.00	-4.08	QP
H	423.5403	13.59	18.78	32.37	46.00	-13.63	QP
H	480.5276	19.50	19.91	39.41	46.00	-6.59	QP
H	909.6667	12.88	27.07	39.95	46.00	-6.05	QP

Remark:

Absolute Level= ReadingLevel+ Factor, Margin= Absolute Level - Limit



3.1.8 TEST RESULTS (ABOVE 1000 MHZ)

EUT :	Digital wireless observation system	Model Name :	FOS48TA-BL
Temperature :	20 °C	Relative Humidity :	48%
Pressure :	1010hPa	Test Mode :	TX
Test Mode :	DC 12V		

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Remark	Comment
Low Channel (2403 MHz)-Above 1G							
4806.147	59.42	-3.69	55.73	74.00	-18.27	Pk	Vertical
4806.147	41.62	-3.69	37.93	54.00	-16.07	AV	Vertical
7209.208	52.57	-0.91	51.66	74.00	-22.34	Pk	Vertical
7209.208	37.57	-0.91	36.66	54.00	-17.34	AV	Vertical
4806.185	59.76	-3.69	56.07	74.00	-17.93	Pk	Horizontal
4806.185	41.54	-3.69	37.85	54.00	-16.15	AV	Horizontal
7209.362	54.22	-0.91	53.31	-0.91	54.22	Pk	Horizontal
7209.362	37.55	-0.91	36.64	-0.91	37.55	AV	Horizontal
Mid Channel (2441 MHz)-Above 1G							
4884.156	59.25	-3.74	55.51	74.00	-18.49	Pk	Vertical
4884.156	39.72	-3.74	35.98	54.00	-18.02	AV	Vertical
7326.063	55.72	-0.88	54.84	74.00	-19.16	Pk	Vertical
7326.063	40.65	-0.88	39.77	54.00	-14.23	AV	Vertical
4884.306	58.25	-3.74	54.51	74.00	-19.49	Pk	Horizontal
4884.306	39.44	-3.74	35.70	54.00	-18.30	AV	Horizontal
7326.254	55.62	-0.88	54.74	74.00	-19.26	Pk	Horizontal
7326.254	39.86	-0.88	38.98	54.00	-15.02	AV	Horizontal
High Channel (2480 MHz)- Above 1G							
4956.142	58.62	-3.32	55.30	74.00	-18.70	Pk	Vertical
4956.142	41.86	-3.32	38.54	54.00	-15.46	AV	Vertical
7434.265	53.16	-0.46	52.70	74.00	-21.30	Pk	Vertical
7434.265	37.35	-0.46	36.89	54.00	-17.11	AV	Vertical
4956.231	57.45	-3.32	54.13	74.00	-19.87	Pk	Horizontal
4956.231	39.62	-3.32	36.30	54.00	-17.70	AV	Horizontal
7434.147	53.03	-0.46	52.57	74.00	-21.43	Pk	Horizontal
7434.147	36.82	-0.46	36.36	54.00	-17.64	AV	Horizontal

4. 100 KHZ BANDWIDTH OF FREQUENCY BAND EDGE

APPLICABLE STANDARD

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

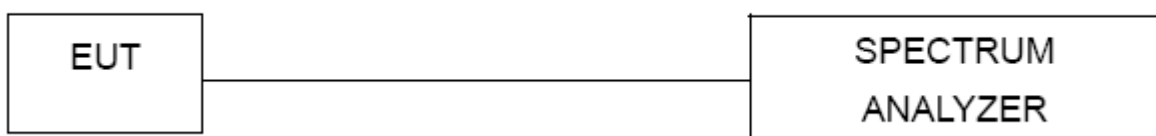
TEST PROCEDURE

- Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
- Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
- Set RBW to 100 kHz and VBW of spectrum analyzer to 300 kHz with a convenient frequency span including 100 kHz bandwidth from band edge.
- Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
- Repeat above procedures until all measured frequencies were complete.

4.1 DEVIATION FROM STANDARD

No deviation.

4.2 TEST SETUP



4.3 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

4.4 TEST RESULTS

EUT :	Digital wireless observation system	Model Name :	FOS48TA-BL
Temperature :	25 °C	Relative Humidity :	60%
Pressure :	1012 hPa	Test Voltage :	DC 12V
Test Mode :	CH01/ CH26		

Radiated band edge:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type	Comment
Non-hopping							
2390	56.97	-13.06	43.91	74.00	-30.09	peak	Vertical
2390	58.15	-13.06	45.09	74.00	-28.91	peak	Horizontal
2483.5	56.85	-12.78	44.07	74.00	-29.93	peak	Vertical
2483.5	59.23	-12.78	46.45	74.00	-27.55	peak	Horizontal
hopping							
2390	57.52	-13.06	44.46	74.00	-29.54	peak	Vertical
2390	59.17	-13.06	46.11	74.00	-27.89	peak	Horizontal
2483.5	56.39	-12.78	43.61	74.00	-30.39	peak	Vertical
2483.5	59.42	-12.78	46.64	74.00	-27.36	peak	Horizontal

Note: Refer to chapter 3.2 test method, When PK value is lower than the Average value limit, average didn't record.

5. EUT TEST PHOTO

Radiated Measurement Photos

