

FCC TEST REPORT

for

Zhe Jiang Eastsun Autocar Things Co., Ltd.

Flash Controller

Model Number:ES-YK5005

FCC ID: 2ACT9ES-YK5005

Prepared for : Zhe Jiang Eastsun Autocar Things Co., Ltd.
Address : No. 97 North Chezhan Road, Jiashan County,
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Report No. : 14KWE071357F

Date of Test : Jul. 21~25, 2014

Date of Report : Jul. 25, 2014

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Keyway Testing Technology Co., Ltd.

Applicant:	Zhe Jiang Eastsun Autocar Things Co., Ltd.		
Address:	No. 97 North Chezhan Road, Jiashan County, Zhejiang, China		
Manufacturer:	Zhe Jiang Eastsun Autocar Things Co., Ltd.		
Address:	No. 97 North Chezhan Road, Jiashan County, Zhejiang, China		
E.U.T:	Flash Controller		
Model Number:	ES-YK5005		
Trade Name:	EASTSUN	Serial No.:	-----
Date of Receipt:	Jul. 20, 2014	Date of Test:	Jul. 22~25, 2014
Test Specification:	FCC Part 15, Subpart C: Oct. 1, 2013 ANSI C63.4:2009		
Test Result:	The equipment under test was found to be compliance with the requirements of the standards applied.		
Issue Date: Jul. 25, 2014			
Tested by:	Reviewed by:	Approved by:	
 <hr/> Andy Gao / Engineer	 <hr/> Jade Yang/ Supervisor	 <hr/> Chris Du / Manager	
Other Aspects:	None.		
<i>Abbreviations: OK/P=passed fail/F=failed n.a/N=not applicable E.U.T=equipment under tested</i>			
<i>This test report is based on a single evaluation of one sample of above mentioned products. It is not permitted to be duplicated in extracts without written approval of Keyway Testing Technology Co., Ltd.</i>			

1. GENERAL PRODUCT INFORMATION

1.1. Product Function

Refer to Technical Construction Form and User Manual.

1.2. Description of Device (EUT)

Description : Flash Controller
 M/N : ES-YK5005
 Power Supply : DC 12V
 Operation Frequency : 433.92MHz
 Modulation Technology : ASK
 Antenna Type : Integral
 Antenna Gain : 0dBi

1.3. Independent Operation Modes

The basic operation modes are:

1.3.1. Keep the EUT in transmitting mode.

2. TEST SITES

2.1. Test Facilities

Lab Qualifications : Certificated by FCC, USA
 Registration No.: 795647
 Date of registration: November 7, 2011

Certificated by Industry Canada
 Registration No.: 9868A
 Date of registration: December 8, 2011

2.2. List of Test and Measurement Instruments

2.2.1. For radiated emission test

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
EMI Test Receiver	Rohde&Schwarz	ESCI	101156	Apr. 27,2014	Apr. 27,2015
Bilog Antenna	ETS-LINDGREEN	3142D	135452	Apr. 27,2014	Apr. 27,2015
Spectrum Analyzer	Agilent	E4411B	MY4511304	Apr. 27,2014	Apr. 27,2015
3m Semi-anechoic Chamber	ETS-LINDGREEN	966	KW01	Apr. 27,2014	Apr. 27,2015
Signal Amplifier	SONOMA	310	187016	Apr. 27,2014	Apr. 27,2015
RF Cable	IMRO	IMRO-400	966 Cable 1#	Apr. 27,2014	Apr. 27,2015
MULTI-DEVICE Controller	ETS-LINDGREEN	2090	126913	N/A	N/A
Antenna Holder	ETS-LINDGREN	2070B	00109601	N/A	N/A

3. TEST SET-UP AND OPERATION MODES

3.1. Principle of Configuration Selection

Emission: The equipment under test (EUT) was configured to measure its highest possible radiation level. The test modes were adapted accordingly in reference to the Operating Instructions.

3.2. Block Diagram of Test Set-up

System Diagram of Connections between EUT and Simulators



(EUT: Flash Controller)

Note: By preliminary testing and verifying three axis (X, Y and Z) position of EUT transmitted status, it was found that “X axis” position was the worst, then the final test was executed the worst condition and test data were recorded in this report. Test data as below.

Frequency (MHz)	Axis	Field Strength (dBuV/m)	Antenna Polarization
433.92	X	88.40	Vertical
433.92	Y	82.78	Vertical
433.92	Z	83.27	Vertical

3.3. Test Operation Mode and Test Software

Refer to Test Setup in clause 4.

3.4. Special Accessories and Auxiliary Equipment

None.

3.5. Countermeasures to Achieve EMC Compliance

None.

3.6. Test Environment:

Ambient conditions in the test laboratory:

Items	Actual
Temperature (°C)	21~23
Humidity (%RH)	50~65

4. EMISSION TEST RESULTS

4.1. Radiated Emission Test

4.1.1. Limit 15.209 limits

FREQUENCY MHz	DISTANCE Meters	FIELD STRENGTHS LIMIT	
		$\mu\text{V/m}$	$\text{dB}(\mu\text{V})/\text{m}$
30 ~ 88	3	100	40.0
88 ~ 216	3	150	43.5
216 ~ 960	3	200	46.0
960 ~ 1000	3	500	54.0
Above 1000	3	74.0 $\text{dB}(\mu\text{V})/\text{m}$ (Peak) 54.0 $\text{dB}(\mu\text{V})/\text{m}$ (Average)	

4.1.2. Fundamental and harmonics emission limits

Frequency (MHz)	Field Strength of Fundamental		Field Strength of Harmonics	
	($\mu\text{V/m@3m}$)	($\text{dB } \mu\text{V/m@3m}$)	($\mu\text{V/m@3m}$)	($\text{dB } \mu\text{V/m@3m}$)
433.92	10996	80.8	1099.6	60.8

4.1.3. Restricted bands of operation

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
¹ 0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2690 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	(²)

All the emissions appearing within 15.205 restricted frequency bands shall not exceed the limits shown in 15.209, all the other emissions shall be at least 20dB below the fundamental emissions, or comply with 15.209 limits.

4.1.4. Test setup

The EUT was placed on a turn table which was 0.8 m above the ground. The turn table can rotate 360 degrees to determine the position of the maximum emission level. The EUT was set 3 m away from the receiving antenna which was mounted on an antenna tower. The measuring antenna moved up and down to find out the maximum emission level. It moved from 1 m to 4 m for both horizontal and vertical polarizations.

The EUT was tested in the Chamber Site. It was pre-scanned with a Peak detector from the spectrum, and all the final readings from the test receiver were measured with the Quasi-Peak detector.

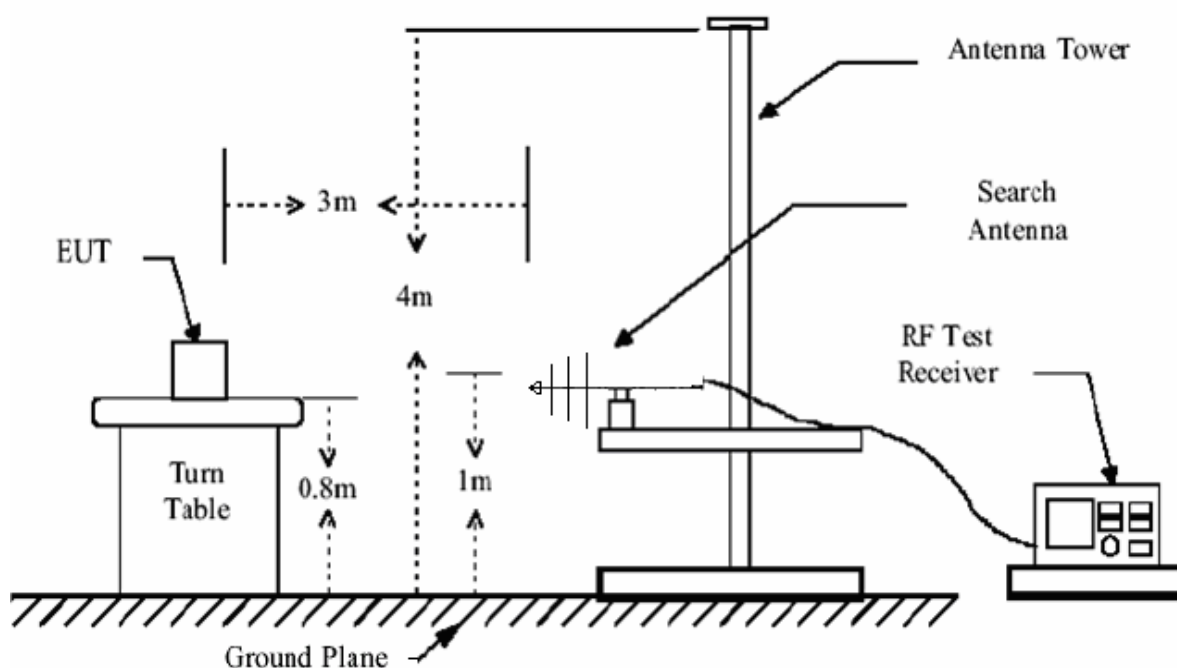
The bandwidth of the EMI test receiver is set at 120kHz for frequency range from 30MHz to 1000 MHz. The frequency range from 30MHz to 10th harmonic (25GHz) are checked

The bandwidth of the Spectrum's VBW is set at 3MHz and RBW is set at 1MHz for peak emissions measurement above 1GHz and 1MHz RBW, 10Hz VBW for average emissions measure above 1GHz.

The test data of the worst case condition(s) was reported on the following pages.

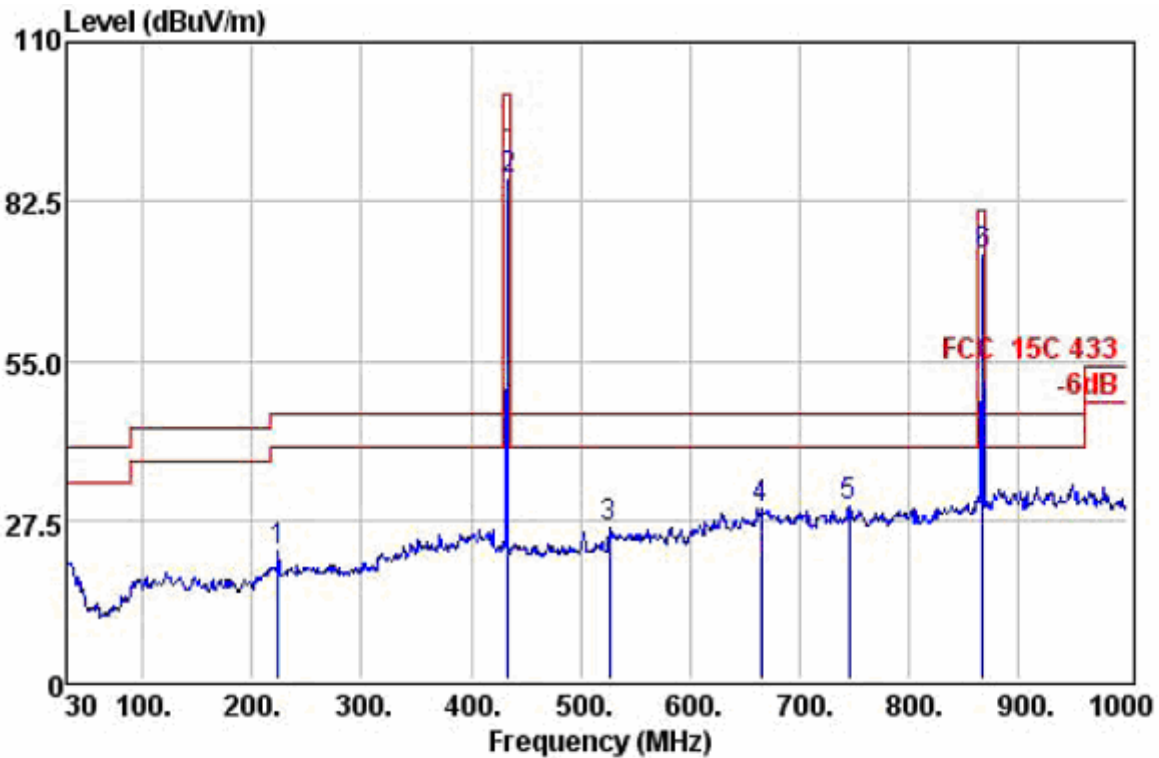
Notes:

1. Emission Level = Antenna Factor + Cable Loss + Meter Reading-Preamp Factor.
2. Measurement Uncertainty: ± 3.2 dB at a level of confidence of 95%.
3. For emissions above 1GHz, if peak level comply with average limit, then the average level is deemed to comply with average limit.
- 4: The emission of below 30MHz is background, the data no show it.



Test Data below 1GHz

Horizontal



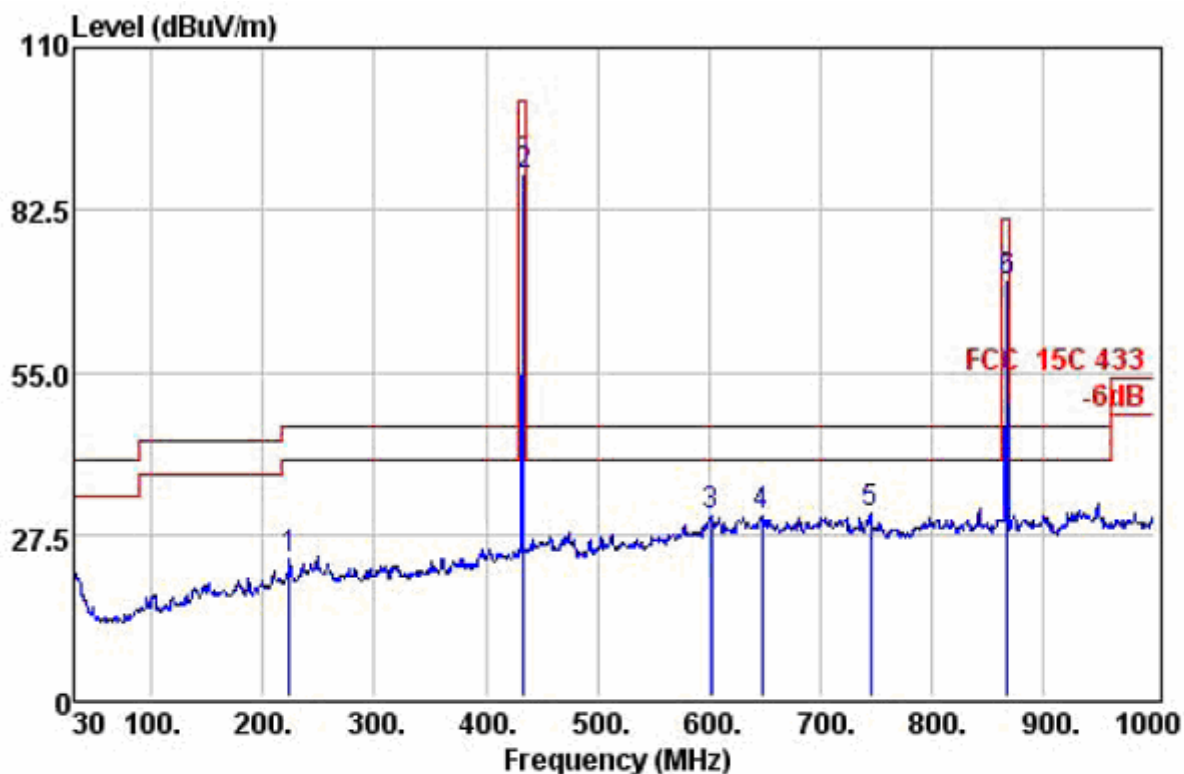
	Preamp	Read	Cable	Antenna		Limit	Over	
	Freq	Factor	Level	Loss	Factor	Level	Line	Limit
	MHz		dB			dBuV/m	dBuV/m	dB
1	224.00	30.95	39.22	1.53	12.15	21.95	46.00	-24.05 QP
2	433.92	30.62	97.11	2.55	17.28	86.32	100.80	-14.48 Peak
3	526.64	30.72	34.68	2.94	19.22	26.12	46.00	-19.88 QP
4	665.35	30.80	34.84	3.69	21.77	29.50	46.00	-16.50 QP
5	745.86	30.67	33.71	4.04	22.77	29.85	46.00	-16.15 QP
6	867.84	30.27	67.27	4.67	23.39	65.06	80.80	-15.74 Peak

For average:

Frequency MHz	Peak Level dBuV/m	Duty cycle factor	Average Level dBuV/m	Limit	Margin dB
433.92	86.32	-9.67	76.65	80.80	-4.15
867.84	65.06	-9.67	55.39	60.80	-5.41

Notes: 1. Average emission Level = Peak Level + Duty cycle factor
 2. Duty cycle level please see clause 5.

Vertical



		Preamp	Read	CableAntenna		Limit	Over	
	Freq	Factor	Level	Loss	Factor	Level	Line	Limit
	MHz		dBuV	dB	dB/m	dBuV/m	dBuV/m	dB
1	224.00	30.95	40.63	1.53	12.15	23.36	46.00	-22.64 QP
2	433.92	30.62	99.19	2.55	17.28	88.40	100.80	-12.40 Peak
3	602.30	30.61	37.28	3.29	20.66	30.62	46.00	-15.38 QP
4	647.89	30.80	36.65	3.58	21.39	30.82	46.00	-15.18 QP
5	745.86	30.67	34.75	4.04	22.77	30.89	46.00	-15.11 QP
6	867.84	30.27	69.38	4.67	23.39	67.17	80.80	-13.63 Peak

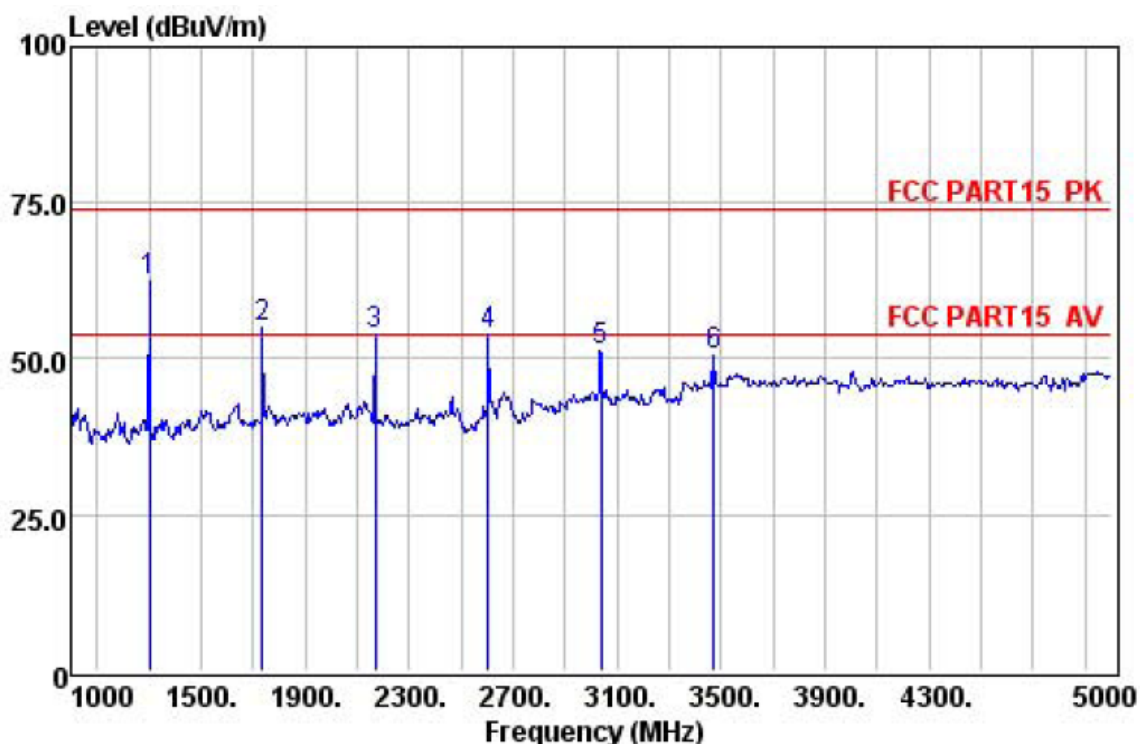
For average:

Frequency MHz	Peak Level dBuV/m	Duty cycle factor	Average Level dBuV/m	Limit	Margin dB
433.92	88.40	-9.67	78.73	80.80	-2.07
867.84	67.17	-9.67	57.50	60.80	-3.30

Notes: 1. Average emission Level = Peak Level + Duty cycle factor
 2. Duty cycle level please see clause 5.

Test Data for 1GHz~5GHz

Horizontal



	Preamp Freq	Factor	Read Level	CableAntenna Loss	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dB	dBuV	dB	dB/m	dBuV/m	dBuV/m	dB	
1	1301.76	26.06	58.54	5.15	24.84	62.47	74.00	-11.53	Peak
2	1735.68	26.15	48.75	5.85	26.75	55.20	74.00	-18.80	Peak
3	2169.60	26.25	44.63	6.80	28.54	53.72	74.00	-20.28	Peak
4	2603.52	26.38	43.29	8.02	29.04	53.97	74.00	-20.03	Peak
5	3037.44	26.52	37.97	9.93	30.03	51.41	74.00	-22.59	Peak
6	3471.36	26.73	37.01	9.98	30.47	50.73	74.00	-23.27	Peak

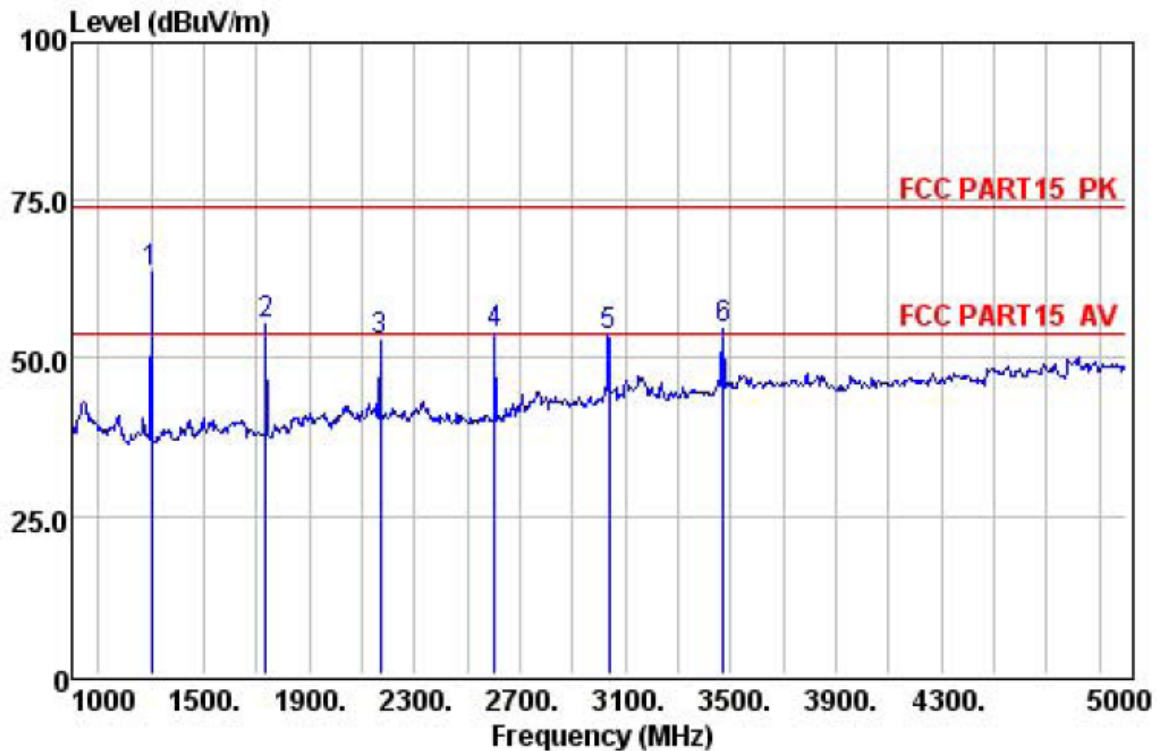
For peak and average

Frequency MHz	Peak Level dBuV/m	Duty cycle factor	Average Level dBuV/m	Limit		Margin dB	
				PK	AV	PK	AV
1301.76	62.47	-9.67	52.80	80.80	60.80	-18.33	-8.00
1735.68	55.20	-9.67	45.53	80.80	60.80	-25.60	-15.27
2169.60	53.72	-9.67	44.05	80.80	60.80	-27.08	-16.75
2603.52	53.97	-9.67	44.30	80.80	60.80	-26.83	-16.50
3037.44	51.41	-9.67	41.74	80.80	60.80	-29.39	-19.06
3471.36	50.73	-9.67	41.06	80.80	60.80	-30.07	-19.74

Notes: 1. Average emission Level = Peak Level + Duty cycle factor

2. Duty cycle level please see clause 5.

Vertical



	Preamp Freq	Factor	Read Level	CableAntenna Loss	Antenna Factor	Level	Limit Line	Over Limit	Remark
	MHz	dB	dBuV	dB	dB/m	dBuV/m	dBuV/m	dB	
1	1301.76	26.06	59.47	5.15	24.84	63.40	74.00	-10.60	Peak
2	1735.68	26.15	49.09	5.85	26.75	55.54	74.00	-18.46	Peak
3	2169.60	26.25	43.85	6.80	28.54	52.94	74.00	-21.06	Peak
4	2603.52	26.38	43.07	8.02	29.04	53.75	74.00	-20.25	Peak
5	3037.44	26.52	40.17	9.93	30.03	53.61	74.00	-20.39	Peak
6	3471.36	26.73	40.92	9.98	30.47	54.64	74.00	-19.36	Peak

For peak and average

Frequency MHz	Peak Level dBuV/m	Duty cycle factor	Average Level dBuV/m	Limit		Margin		dB
				PK	AV	PK	AV	
1301.76	63.40	-9.67	53.73	80.80	60.80	-17.40	-7.07	
1735.68	55.54	-9.67	45.87	80.80	60.80	-25.26	-14.93	
2169.60	52.94	-9.67	43.27	80.80	60.80	-27.86	-17.53	
2603.52	53.75	-9.67	44.08	80.80	60.80	-27.05	-16.72	
3037.44	53.61	-9.67	43.94	80.80	60.80	-27.19	-16.86	
3471.36	54.64	-9.67	44.97	80.80	60.80	-26.16	-15.83	

Notes: 1. Average emission Level = Peak Level + Duty cycle factor

2. Duty cycle level please see clause 5.

5. CALCULATION OF AVERAGE FACTOR

The output field strengths of specification in accordance with the FCC rules specify measurements with an average detector. During the test, a spectrum analyzer incorporating a peak detector was used. Therefore, a reduction factor can be applied to the resultant peak signal level and compared to the limit for measurement instrumentation incorporating an average detector.

The duty cycle is measured in 100 ms or the repetition cycle period, whichever is a shorter time frame. The duty cycle is measured by placing the spectrum analyzer to set zero span at 100kHz resolution bandwidth.

Averaging factor in dB = $20\log(\text{duty cycle})$

The duration of one cycle = 46.5ms

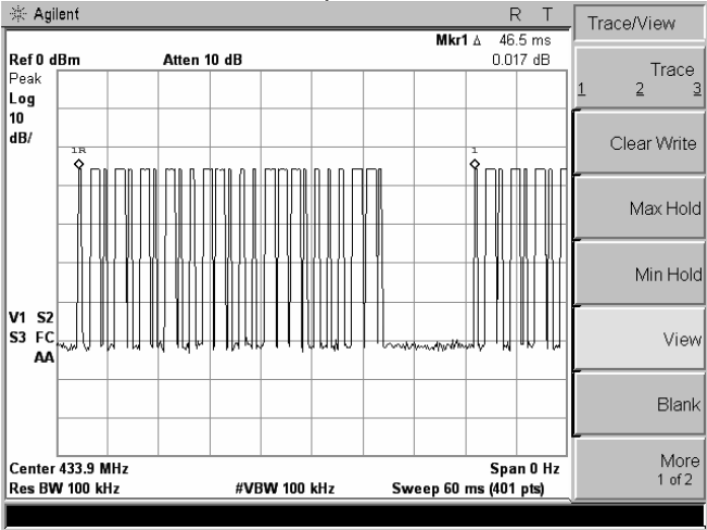
The duty cycle is simply the on-time divided the duration of one cycle

Duty Cycle = $(0.975\text{ms} \times 11 + 0.325\text{ms} \times 14) / 46.5 = 15.275\text{ms} / 46.5\text{ms} = 0.3285$

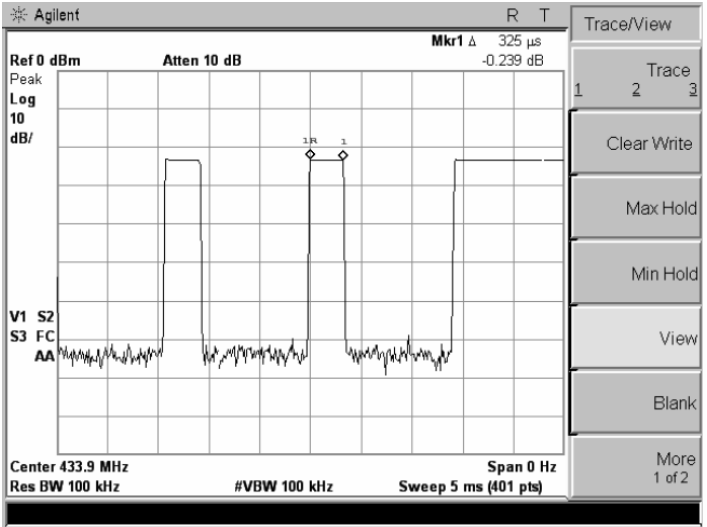
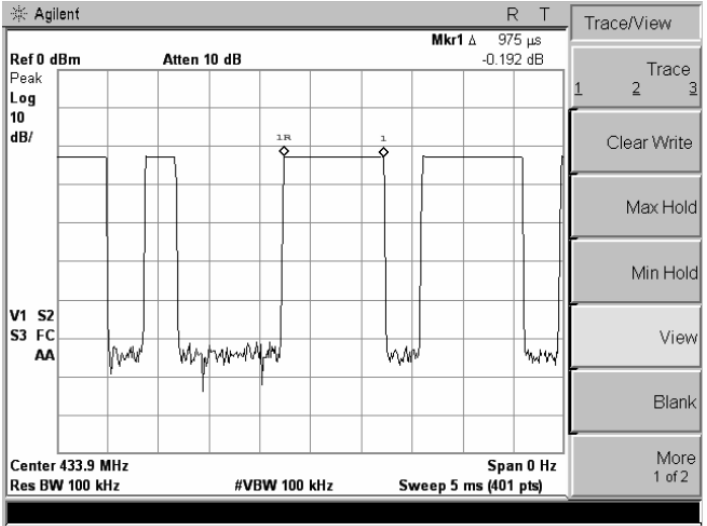
Therefore, the averaging factor is found by $20\log 3285 = -9.67\text{dB}$

Test plot as follows:

T period



T on time slot



6. 20DB OCCUPY BANDWIDTH

6.1. Limits

According to FCC 15.231(c) requirement:

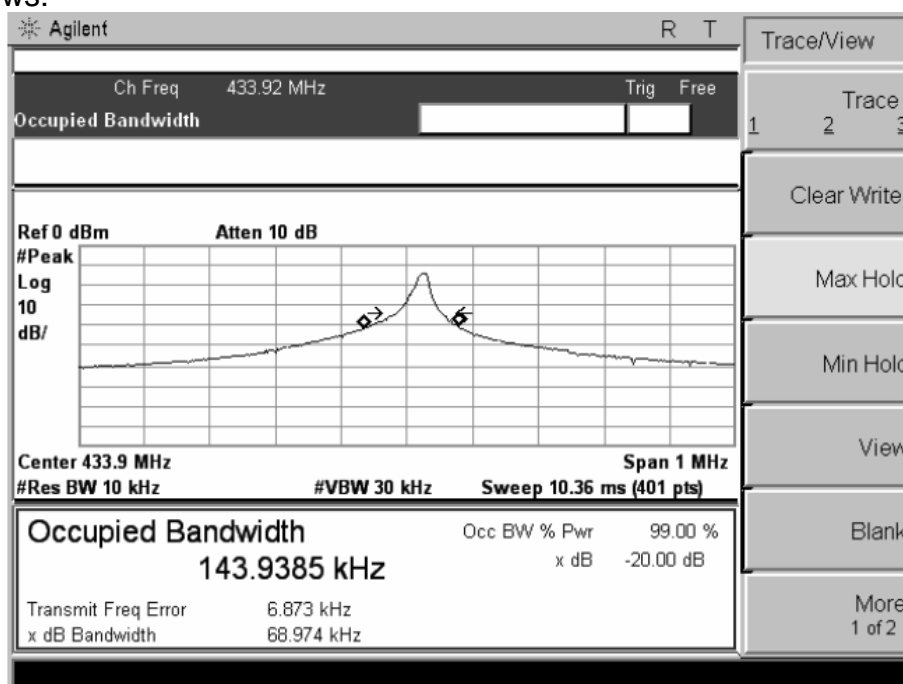
The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating between 70 MHz to 900 MHz. Those devices operating above 900 MHz, the emission spurious shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.

$$B.W (20dBc) \text{ Limit} = 0.25\% * f(\text{MHz}) = 0.25\% * 433.92\text{MHz} = 1.0848\text{MHz}$$

Test data:

Channel Frequency (MHz)	20dB Bandwidth (kHz)	Limit (MHz)	Result
433.92	68.97	1.0848	Pass

Test plot as follows:



7. DWELL TIME

7.1. Limits

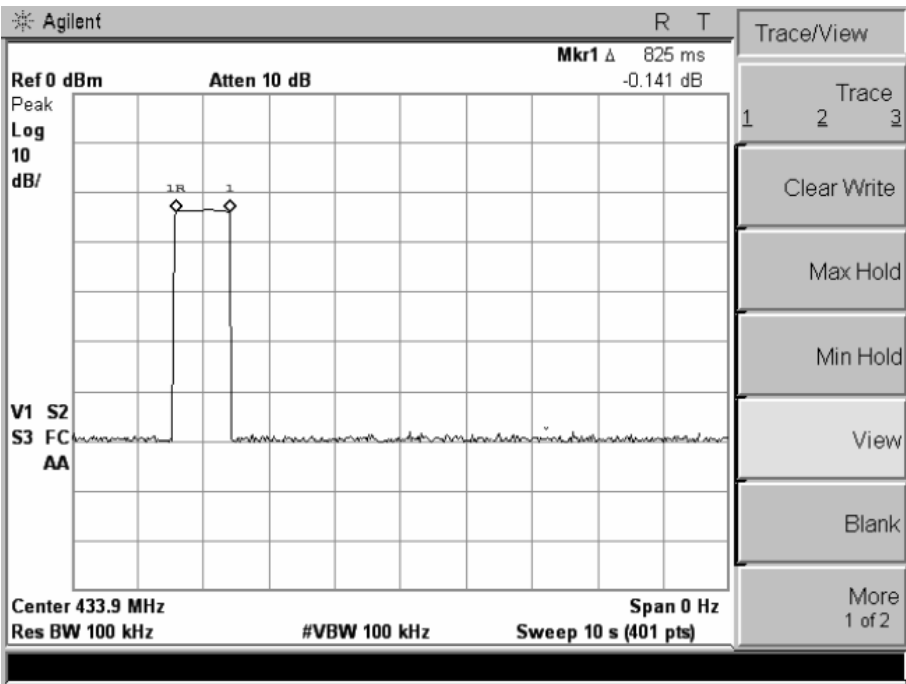
According to FCC 15.231(a) requirement:

A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

Test Data:

Dwell time (second)	Limit (second)	Result
0.825s	<5s	Pass

Test plot as follows:



8. PHOTOGRAPHS OF TEST SET-UP

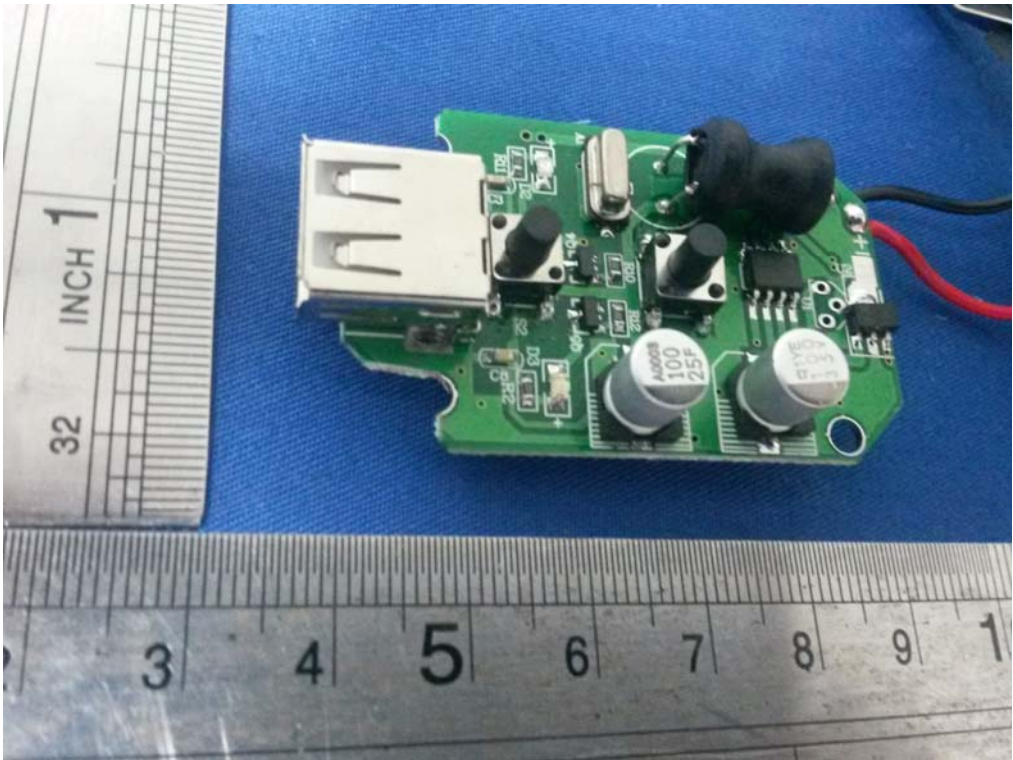
Please see annex.

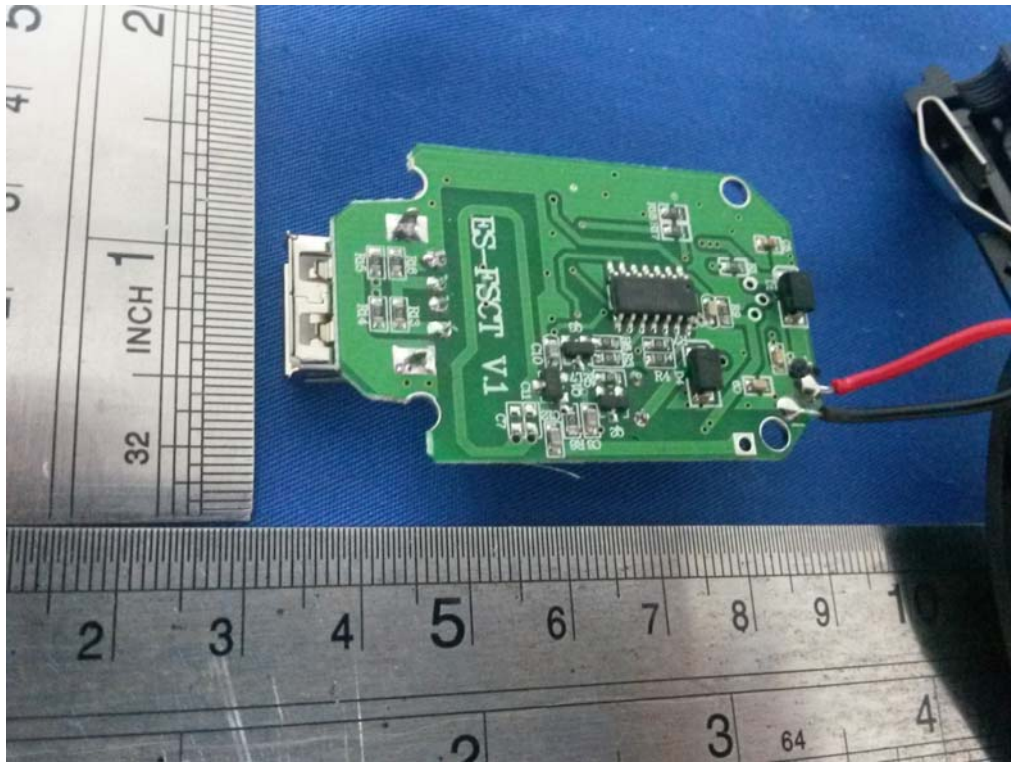
9. PHOTOGRAPHS OF THE EUT











END.