ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT INTENTIONAL RADIATOR CERTIFICATION TO FCC PART 15 SUBPART C REQUIREMENT T

OF

915MHz Radio telemetry

MODEL No.: HT0X

Trademark: HolyBro

FCC ID: 2AEK9-HT0XG

REPORT NO: ES150513127E

ISSUE DATE: April 20, 2015

Prepared for

SHENZHEN HELIXIONGDI TECHNOLOGY CO,.LTD

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Prepared by

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VERIFICATION OF COMPLIANCE

Applicant:	SHENZHEN HELIXIONGDI TECHNOLOGY CO,.LTD Building B, Floor 5, Youzhenfu Industry District, Baoshi east Road No.262, ShiYan town Shenzhen City, Guangdong Province, China
Manufacturer:	SHENZHEN HELIXIONGDI TECHNOLOGY CO,.LTD Building B, Floor 5, Youzhenfu Industry District, Baoshi east Road No.262, ShiYan town Shenzhen City, Guangdong Province, China
Product Description:	915MHz Radio telemetry
Model Number:	HT0X
Serial Number:	N/A
File Number:	ES150513127E
Date of Test:	April 1, 2015 to April 20, 2015

We hereby certify that:

The above equipment was tested by SHENZHEN EMTEK CO., LTD. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.10 (2013) and the energy emitted by the sample EUT tested as described in this report is in compliance with conducted and radiated emission limits of FCC Rules Part 15.249:2014.

The test results of this report relate only to the tested sample identified in this report.

Date of Test : April 1, 2015 to April 20, 2015

Prepared by : Joe Xia

Joe Xia/Editor

Reviewer : Jack Li

Jack Li /Supervisor

Approve & Authorized Signer :

Lisa Wang/Manager

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1. GENERAL INFORMATION

1.1. Product Description

A major technical descriptions of EUT is described as following:

A). Operation Frequency: 916.215MHz~927.215MHz
B). Modulation: GFSK
B). Chanel spacing: 1MHz
C). Number of Channel: 12
E). Antenna Type: Dipole antenna
F). Antenna Gain: 2.0dBi(Dipole antenna)
G). Power Supply: DC 5V from USB port

1.2. Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for FCC ID: 2AEK9-HT0XG filing to comply with Section 15.249:2014 of the FCC Part 15, Subpart C Rules.

1.3. Test Methodology

Both conducted and radiated testing was performed according to the procedures in ANSI C63.10 (2013). Radiated testing was performed at an antenna to EUT distance 3 meters.

1.4. Special Accessories

Not available for this EUT intended for grant.

1.5. Equipment Modifications

Not available for this EUT intended for grant.

1.6. Measurement Uncertainty

Measurement Type	Range	Confidence Level (%)	Calculated Uncertainty
AC Conducted Spurious Emissions	0.15 MHz to 30 MHz	95%	±3.00dB
Fundamental Field strength	Not Applicable	95%	±2.94dB
Transmitter 20 dB Bandwidth	Not Applicable	95%	±0.92PPm
Radiated Spurious Emissions	30 MHz to 40 GHz	95%	±3.00dB

1.7. Test Facility

Site Description

EMC Lab. : Accredited by CNAS, 2013.10.29
The certificate is valid until 2016.10.28
The Laboratory has been assessed and proved to be in compliance with CNAS/CL01:2006(identical to ISO/IEC17025: 2005)
The Certificate Registration Number is L2291

Accredited by FCC, April 17, 2014
The Certificate Registration Number is 406365.

Name of Firm : SHENZHEN EMTEK CO., LTD
Site Location : Bldg 69, Majialong Industry Zone,
Nanshan District, Shenzhen, Guangdong, China

2. SYSTEM TEST CONFIGURATION

2.1. EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

2.2. EUT Exercise

The Transmitter was operated in the normal operating mode. The TX frequency was fixed which was for the purpose of the measurements.

2.3. Test Procedure

2.3.1 Conducted Emissions

The EUT is a placed on as turn table which is 0.8 m above ground plane. According to the requirements in Section 13.1.4.1 of ANSI C63.10-2013 Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-Peak and average detector mode.

2.3.2 Radiated Emissions

Below 30MHz：
The EUT is placed on a turntable 0.8 meters above the ground in the chamber, 3 meter away from the antenna (loop antenna). The Antenna should be positioned with its plane vertical at the specified distance from the EUT and rotated about its vertical axis for maximum response at each azimuth about the EUT. The center of the loop shall be 1 m above the ground. For certain applications, the loop antenna plane may also need to be positioned horizontally at the specified distance from the EUT.

Above 30MHz：
The EUT is placed on a turntable 0.8 meters above the ground in the chamber, 3 meter away from the antenna. The maximal emission value is acquired by adjusting the antenna height, polarisation and turntable azimuth. Normally, the height range of antenna is 1 m to 4 m, the azimuth range of turntable is 0° to 360°, and the receive antenna has two polarizations Vertical (V) and Horizontal (H).

Above 1GHz：
The EUT is placed on a turntable 1.5 meters above the ground in the chamber, 3 meter away from the antenna. The maximal emission value is acquired by adjusting the antenna height, polarisation and turntable azimuth. Normally, the height range of antenna is 1 m to 4 m, the azimuth range of turntable is 0° to 360°, and the receive antenna has two polarizations Vertical (V) and Horizontal (H).

2.4. Description of test modes

The EUT (915MHz Radio telemetry) has been tested under normal operating condition.
Pre-scanned tests, X, Y, Z in the three orthogonal panels, were conducted to determine the final configuration from all possible combinations. We use blue test to control the EUT, Let EUT hopping on and transmit with highest power. All modulations GFSK have been tested, and the worst result GFSK was recorded in the report. 12 Channels are provided by EUT. The 3 channels of lower, medium and higher were chosen for test.

Pretest Mode (GFSK)	**Description**
Mode 1	916.215MHz
Mode 2	921.215MHz
Mode 3	927.215MHz

For Conducted Test	
Final Test Mode	Description
Mode 1	ON

For Radiated Test	
Pretest Mode (GFSK)	**Description**
Mode 1	916.215MHz
Mode 2	921.215MHz
Mode 3	927.215MHz

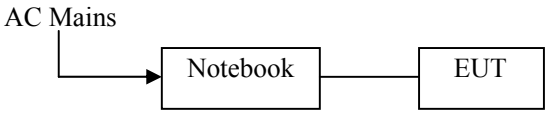
3. SUMMARY OF TEST RESULTS

FCC Part15, Subpart C (15.249:2014)		
Standard Section	**Test Item**	**Result**
FCC		
15.207	Conducted Emission	Pass
15.209	Radiated Emission	Pass
15.249	Radiated Spurious Emission	Pass
15.249	Band edge test	Pass
15.249	20dB Bandwidth	Pass

Note: (1)"N/A" denotes test is not applicable in this test report.

3.1. CONFIGURATION OF TESTED SYSTEM

Fig. 2-1 Configuration of Tested System



3.2. DESCRIPTION OF SUPPORT UNITS

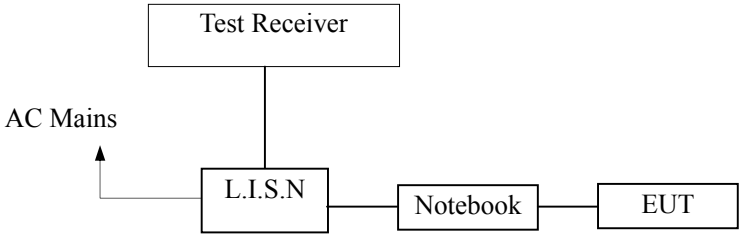
Equipment	Mfr/Brand	Model/Type No.	FCC ID / IC	Series No.	Note
915MHz Radio telemetry	HolyBro	HT0X	2AEK9-HT0XG	N/A	EUT

4. CONDUCTED EMISSIONS TEST

4.1. Measurement Procedure:

1. The EUT was placed on a table which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. Repeat above procedures until all frequency measured was complete.

4.2. Test SET-UP (Block Diagram of Configuration)



4.3. Measurement Equipment Used:

Conducted Emission Test Site # 1					
EQUIPMENT TYPE	**MFR**	**MODEL NUMBER**	**SERIAL NUMBER**	**LAST CAL.**	**CAL DUE.**
Test Receiver	Rohde & Schwarz	ESCS30	828985/018	05/17/2014	05/16/2015
L.I.S.N	Rohde & Schwarz	ESH2-Z5	834549/005	05/17/2014	05/16/2015
L.I.S.N	Rohde & Schwarz	ENV216	834549/005	05/17/2014	05/16/2015
50ΩCoaxial Switch	Anritsu	MP59B	M20531	05/17/2014	05/16/2015

4.4. Conducted Emission Limit

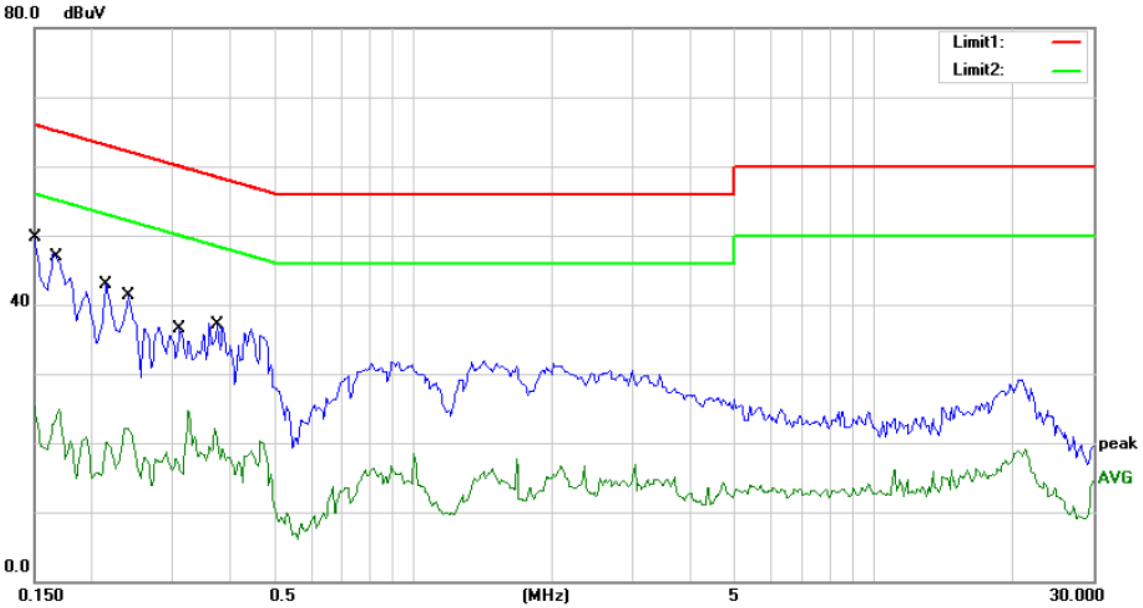
(7) Conducted Emission

Frequency(MHz)	Quasi-peak	Average
0.15-0.5	66-56	56-46
0.5-5.0	56	46
5.0-30.0	60	50

Note:

1. The lower limit shall apply at the transition frequencies
2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

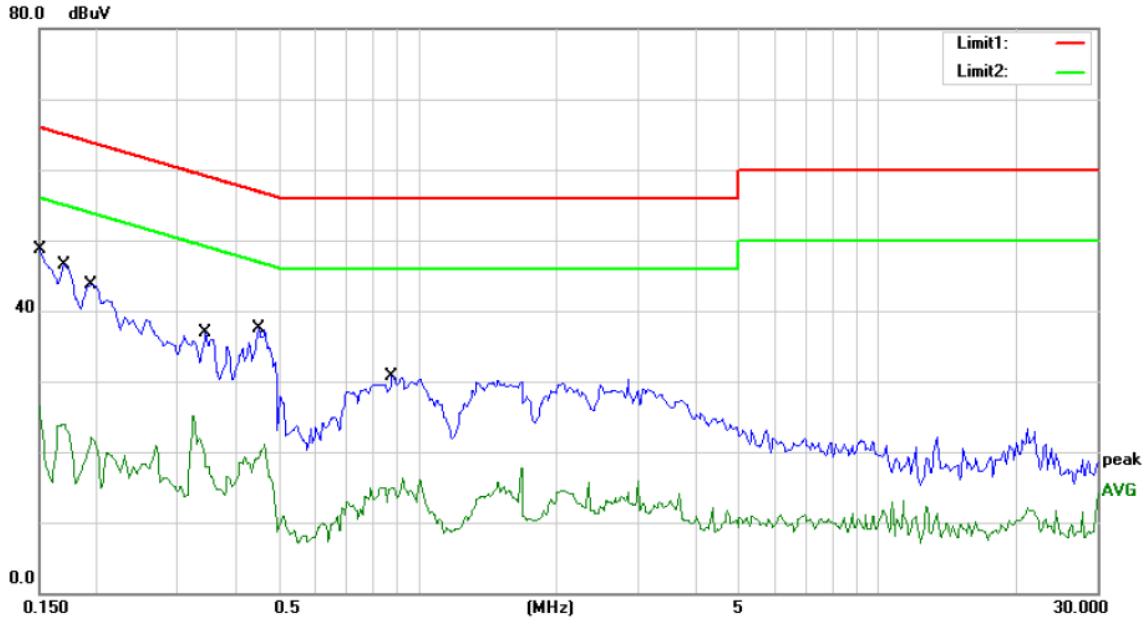
4.5. Measurement Result:



Site Conduction #1 Phase: *L1* Temperature: 26
Limit: (CE)FCC PART 15 class B_QP Power: AC 120V/60Hz Humidity: 60 %
EUT: 915MHz Radio telemetry
M/N: HT0X(Dipole Antenna)
Mode: ON
Note:

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1	*	0.1500	49.72	0.00	49.72	66.00	-16.28	QP	
2		0.1500	25.32	0.00	25.32	56.00	-30.68	AVG	
3		0.1685	46.44	0.00	46.44	65.03	-18.59	QP	
4		0.1685	24.88	0.00	24.88	55.03	-30.15	AVG	
5		0.2150	42.94	0.00	42.94	63.01	-20.07	QP	
6		0.2150	20.92	0.00	20.92	53.01	-32.09	AVG	
7		0.2400	41.22	0.00	41.22	62.10	-20.88	QP	
8		0.2400	22.19	0.00	22.19	52.10	-29.91	AVG	
9		0.3100	36.59	0.00	36.59	59.97	-23.38	QP	
10		0.3100	24.67	0.00	24.67	49.97	-25.30	AVG	
11		0.3750	37.04	0.00	37.04	58.39	-21.35	QP	
12		0.3750	22.04	0.00	22.04	48.39	-26.35	AVG	

*:Maximum data x:Over limit !:over margin Comment: Factor build in receiver. Operator: CSL



Site Conduction #1 Phase: N Temperature: 26
Limit: (CE)FCC PART 15 class B_QP Power: AC 120V/60Hz Humidity: 60 %
EUT: 915MHz Radio telemetry
M/N: HT0X(Dipole Antenna)
Mode: ON
Note:

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1	*	0.1500	48.67	0.00	48.67	66.00	-17.33	QP	
2		0.1500	26.59	0.00	26.59	56.00	-29.41	AVG	
3		0.1712	46.34	0.00	46.34	64.90	-18.56	QP	
4		0.1712	24.00	0.00	24.00	54.90	-30.90	AVG	
5		0.1950	43.80	0.00	43.80	63.82	-20.02	QP	
6		0.1950	22.09	0.00	22.09	53.82	-31.73	AVG	
7		0.3450	36.92	0.00	36.92	59.08	-22.16	QP	
8		0.3450	25.17	0.00	25.17	49.08	-23.91	AVG	
9		0.4500	37.53	0.00	37.53	56.88	-19.35	QP	
10		0.4500	21.12	0.00	21.12	46.88	-25.76	AVG	
11		0.8800	30.78	0.00	30.78	56.00	-25.22	QP	
12		0.8800	16.27	0.00	16.27	46.00	-29.73	AVG	

*:Maximum data x:Over limit !:over margin Comment: Factor build in receiver. Operator: CSL

5. RADIATED EMISSION TEST

5.1. Measurement Procedure

a. 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.(below 1GHz)
b. The EUT was placed on the top of a rotating table 1.5 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.(above 1GHz)
c. The height of the equipment or of the substitution antenna shall be 0.8 m; 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.
d. 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 AV detector mode re-measured.
e. 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.

When spectrum scanned from 30 MHz to 1GHz setting resolution bandwidth 120 kHz and video bandwidth 300kHz.

EMI Test Receiver	Setting
Attenuation	Auto
RB	120kHz
VB	300kHz
Detector	QP
Trace	Max hold

When spectrum scanned above 1GHz setting resolution bandwidth 1MHz, video bandwidth 3MHz.

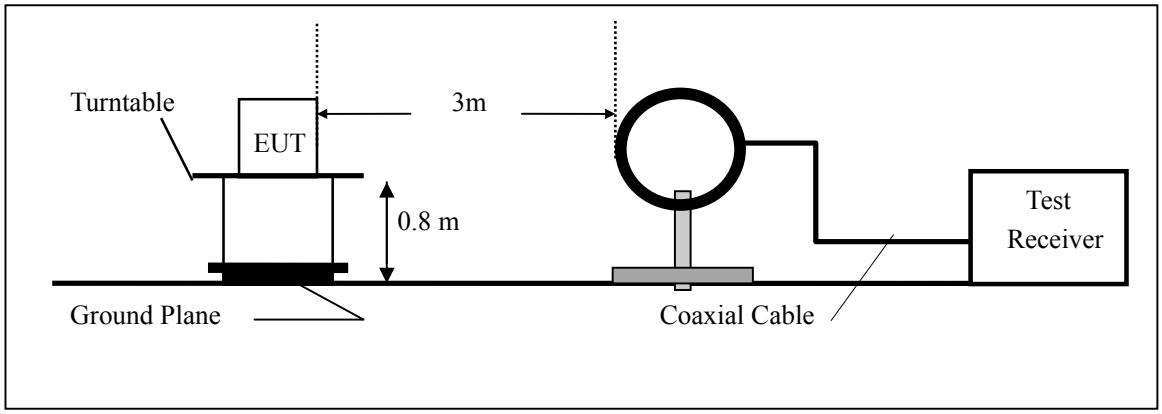
EMI Test Receiver	Setting
Attenuation	Auto
RB	1MHz
VB	3MHz
Detector	Peak
Trace	Max hold

When spectrum scanned above 1GHz setting resolution bandwidth 1MHz, video bandwidth 10Hz.

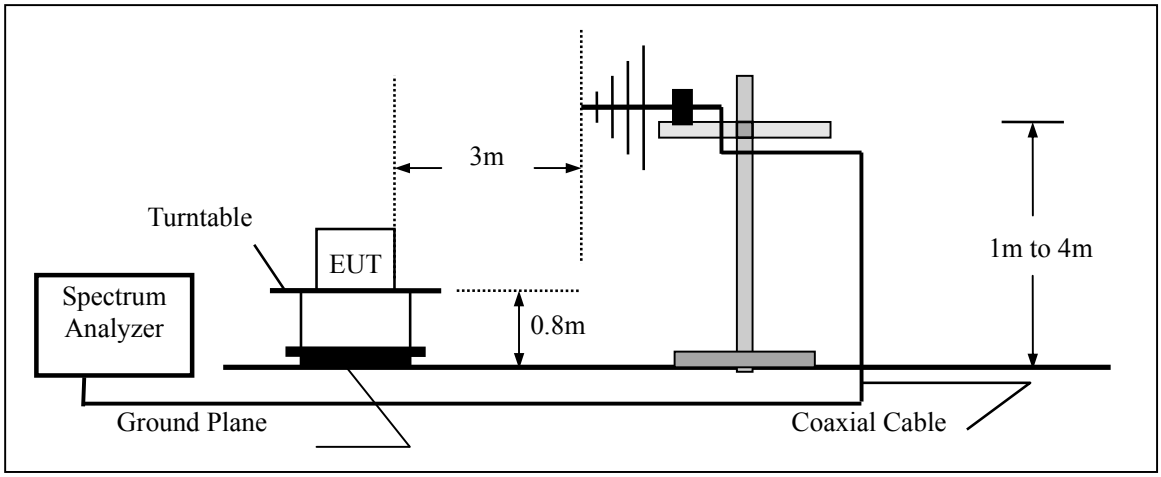
EMI Test Receiver	Setting
Attenuation	Auto
RB	1MHz
VB	10Hz
Detector	Peak
Trace	Max hold

5.2. Test SET-UP (Block Diagram of Configuration)

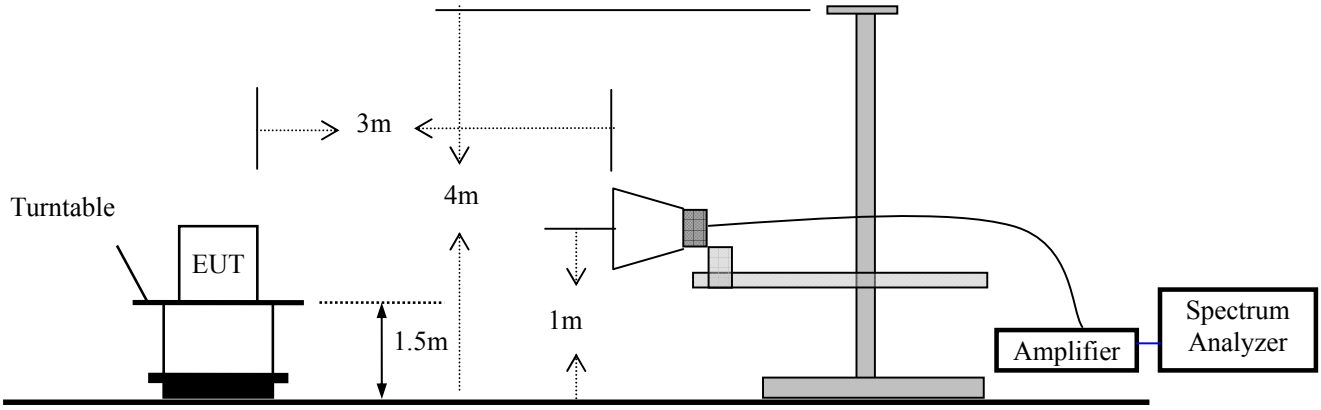
(A) Radiated Emission Test Set-Up, Frequency Below 30MHz



(B) Radiated Emission Test Set-Up, Frequency Below 1000MHz



(C) Radiated Emission Test Set-Up, Frequency above 1000MHz



5.3 Measurement Equipment Used:

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	Rohde & Schwarz	FSP7	839511/010	05/17/2014	05/16/2015
Spectrum Analyzer	HP	E4407B	839840481	05/17/2014	05/16/2015
EMI Test Receiver	Rohde & Schwarz	ESCS30	828985/018	05/17/2014	05/16/2015
Pre-Amplifier	HP	8447D	2944A07999	05/17/2014	05/16/2015
Bilog Antenna	Schwarzbeck	VULB9163	142	05/17/2014	05/16/2015
Loop Antenna	ARA	PLA-1030/B	1029	05/17/2014	05/16/2015
Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170399	05/17/2014	05/16/2015
Horn Antenna	Schwarzbeck	BBHA 9120	D143	05/17/2014	05/16/2015

5.4 Radiated Emission Limit

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
960~1000	500	3

Harmonic emissions limits comply with below 54 dBuV/m at 3m. Other 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 comply with the radiated emissions limits specified in section 1 5.209(a) limit in the table below has to be followed.

Note:

(1) The tighter limit applies at the band edges.

(2) Emission level (dBuV/m)=20log Emission level (uV/m).

Limits of radiated emission measurement (FCC 15.209)

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

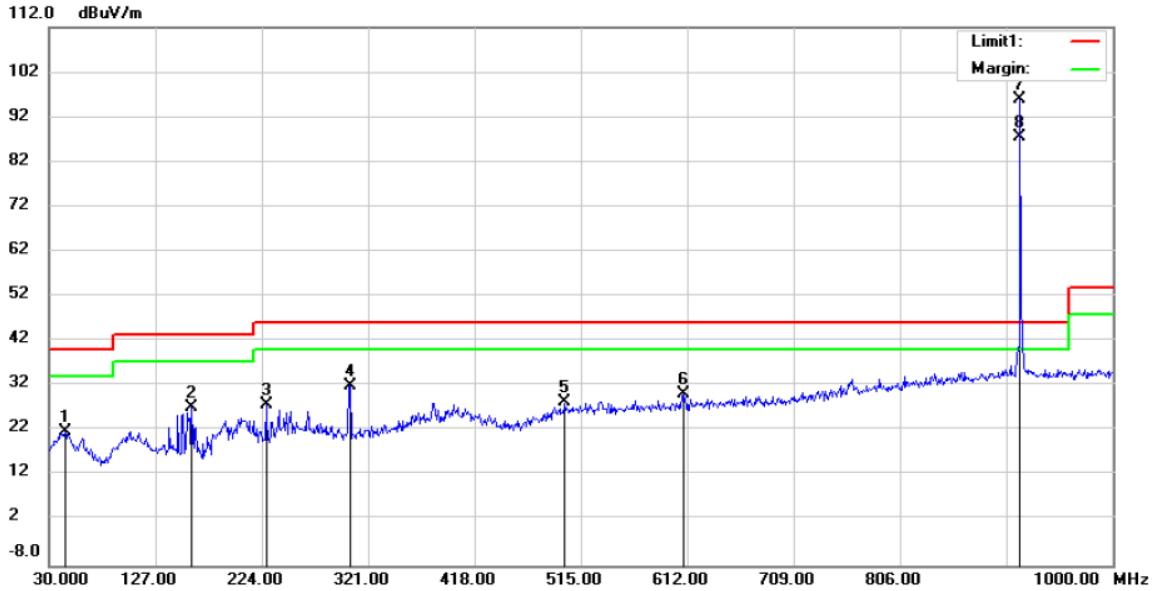
Notes:
(1) The limit for radiated test was performed according to FCC PART 15C.
(2) The tighter limit applies at the band edges.
(3) Emission level (dBuV/m) =20log Emission level (uV/m).

Limits of radiated emission measurement (FCC 15.249)

FCC Part15 (15.249) , Subpart C	
Limit	Frequency Range (MHz)
Field strength of fundamental 50000uV/m (94 dBV/m) @ 3 m	902-928
Field strength of harmonics 500uV/m (54 dBV/m) @ 3 m	Above 928 for Harmonic

5.5 Measurement Result

Transmitter Fundamental Field Strength and Radiated Emission



Site 3m Chamber #3 Polarization: *Horizontal* Temperature: 24 C

Limit: (RE)FCC PART 15 CLASS B Power: Humidity: 53 %

EUT: 915MHz Radio telemetry

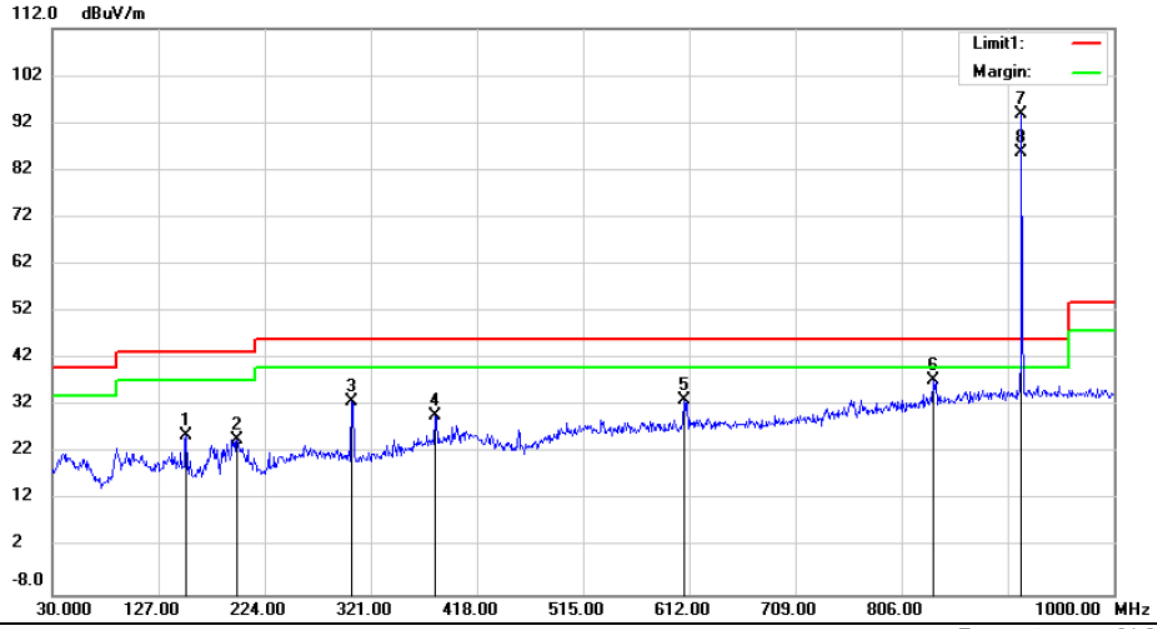
M/N: HT0X(Dipole Antenna)

Mode:915.125

Note:

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1		44.5500	35.13	-13.37	21.76	40.00	-18.24	QP			
2		159.9800	45.92	-18.72	27.20	43.50	-16.30	QP			
3		227.8800	43.11	-15.37	27.74	46.00	-18.26	QP			
4		304.5100	45.86	-13.76	32.10	46.00	-13.90	QP			
5		500.4500	36.10	-7.80	28.30	46.00	-17.70	QP			
6		608.1200	37.01	-6.91	30.10	46.00	-15.90	QP			
7	*	915.1250	96.49	-0.64	95.85	114.00	-18.15	peak			
8	X	915.1250	88.12	-0.64	87.48	94.00	-6.52	AVG			

*:Maximum data x:Over limit !:over margin Operator: XLX



Site 3m Chamber #3 Polarization: *Vertical* Temperature: 24 C

Limit: (RE)FCC PART 15 CLASS B Power: Humidity: 53 %

EUT: 915MHz Radio telemetry

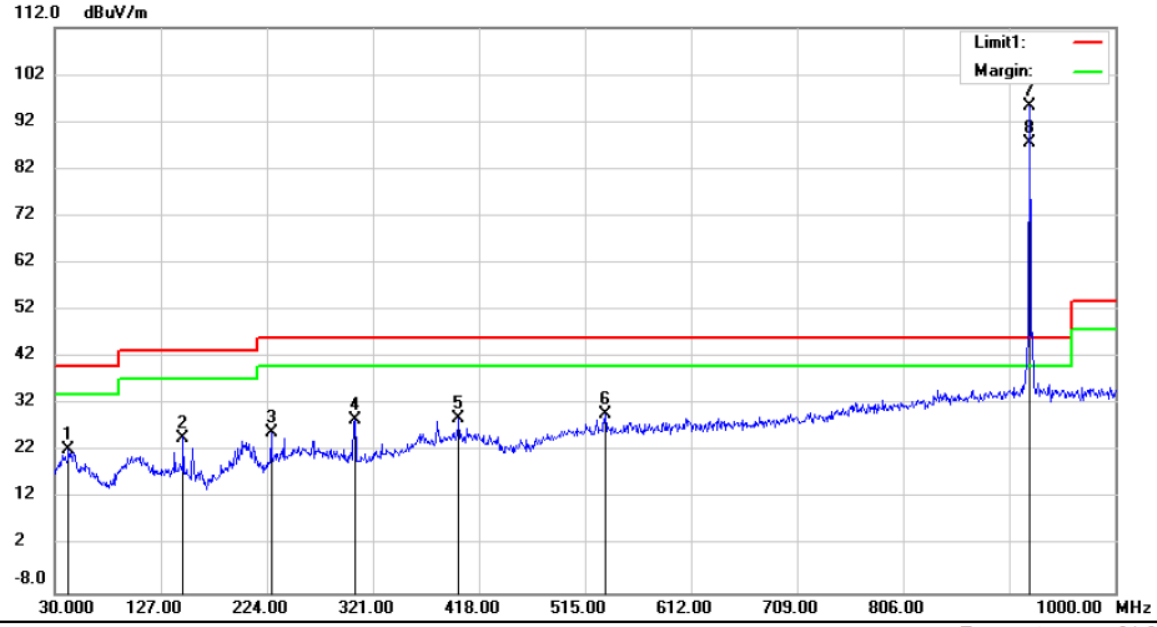
M/N: HT0X(Dipole Antenna)

Mode:915.125

Note:

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1		152.2200	44.11	-18.24	25.87	43.50	-17.63	QP			
2		198.7800	41.47	-16.51	24.96	43.50	-18.54	QP			
3		303.5400	46.77	-13.78	32.99	46.00	-13.01	QP			
4		379.2000	40.01	-10.03	29.98	46.00	-16.02	QP			
5		607.1500	40.12	-6.91	33.21	46.00	-12.79	QP			
6		835.1000	39.67	-2.09	37.58	46.00	-8.42	QP			
7	*	915.1250	94.42	-0.64	93.78	114.00	-20.22	peak			
8	X	915.1250	86.39	-0.64	85.75	94.00	-8.25	AVG			

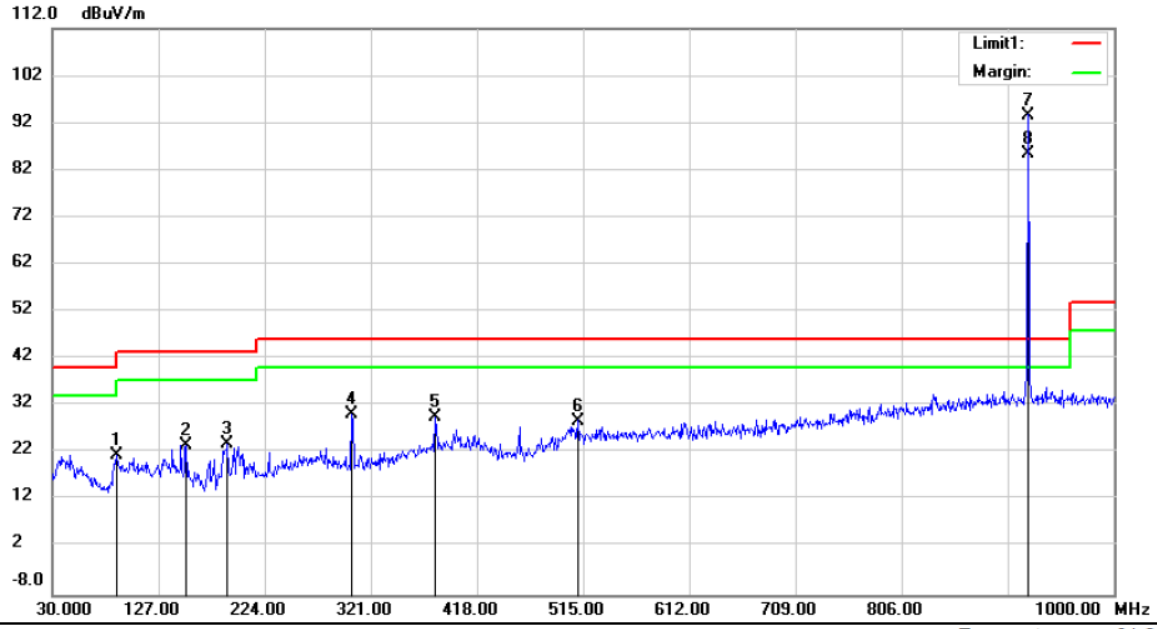
*:Maximum data x:Over limit !:over margin Operator: XLX



Site 3m Chamber #3 Polarization: *Horizontal* Temperature: 24 C
Limit: (RE)FCC PART 15 CLASS B Power: Humidity: 53 %
EUT: 915MHz Radio telemetry
M/N: HT0X(Dipole Antenna)
Mode:921.125
Note:

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1		42.6100	35.49	-13.02	22.47	40.00	-17.53	QP			
2		147.3700	43.02	-18.02	25.00	43.50	-18.50	QP			
3		227.8800	41.53	-15.37	26.16	46.00	-19.84	QP			
4		304.5100	42.64	-13.76	28.88	46.00	-17.12	QP			
5		399.5700	37.80	-8.89	28.91	46.00	-17.09	QP			
6		533.4300	37.38	-7.53	29.85	46.00	-16.15	QP			
7	*	921.1250	95.91	-0.66	95.25	114.00	-18.75	peak			
8	X	921.1250	88.29	-0.66	87.63	94.00	-6.37	AVG			

*:Maximum data x:Over limit !:over margin Operator: XLX



Site 3m Chamber #3 Polarization: *Vertical* Temperature: 24 C

Limit: (RE)FCC PART 15 CLASS B Power: Humidity: 53 %

EUT: 915MHz Radio telemetry

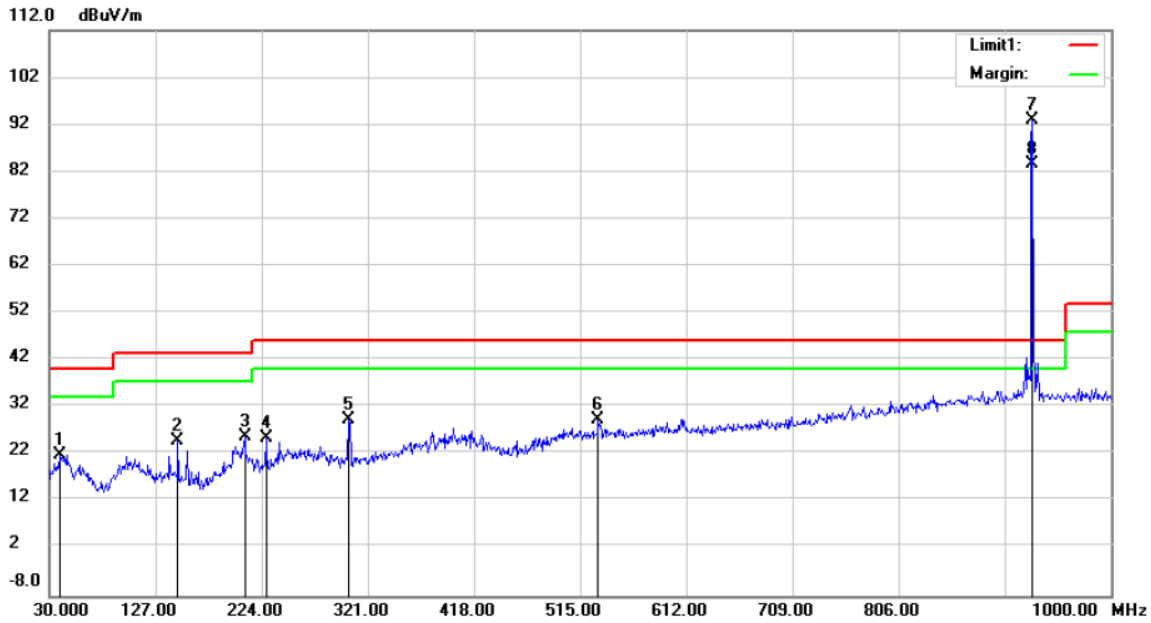
M/N: HT0X(Dipole Antenna)

Mode:921.125

Note:

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1		89.1700	38.79	-17.17	21.62	43.50	-21.88	QP			
2		152.2200	41.93	-18.24	23.69	43.50	-19.81	QP			
3		190.0500	41.21	-17.28	23.93	43.50	-19.57	QP			
4		303.5400	43.98	-13.78	30.20	46.00	-15.80	QP			
5		379.2000	39.67	-10.03	29.64	46.00	-16.36	QP			
6		510.1500	36.62	-7.72	28.90	46.00	-17.10	QP			
7	*	921.1250	94.36	-0.66	93.70	114.00	-20.30	peak			
8	X	921.1250	86.15	-0.66	85.49	94.00	-8.51	AVG			

*:Maximum data x:Over limit !:over margin Operator: XLX



Site 3m Chamber #3 Polarization: *Horizontal* Temperature: 24 C

Limit: (RE)FCC PART 15 CLASS B Power: Humidity: 53 %

EUT: 915MHz Radio telemetry

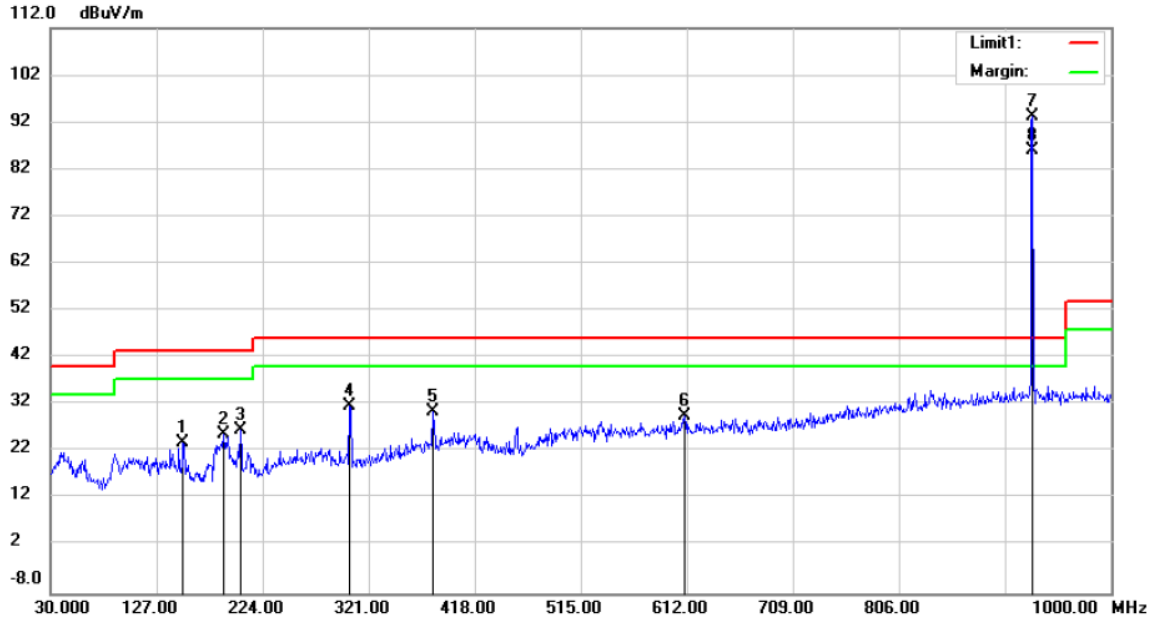
M/N: HT0X(Dipole Antenna)

Mode:927.125

Note:

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1		39.7000	34.81	-12.95	21.86	40.00	-18.14	QP			
2		147.3700	42.76	-18.02	24.74	43.50	-18.76	QP			
3		208.4800	42.22	-16.38	25.84	43.50	-17.66	QP			
4		227.8800	40.70	-15.37	25.33	46.00	-20.67	QP			
5		303.5400	43.11	-13.78	29.33	46.00	-16.67	QP			
6		531.4900	36.81	-7.55	29.26	46.00	-16.74	QP			
7	*	927.1250	93.60	-0.67	92.93	114.00	-21.07	peak			
8	X	927.1250	84.26	-0.67	83.59	94.00	-10.41	AVG			

*:Maximum data x:Over limit !:over margin Operator: XLX



Site 3m Chamber #3 Polarization: *Vertical* Temperature: 24 C

Limit: (RE)FCC PART 15 CLASS B Power: Humidity: 53 %

EUT: 915MHz Radio telemetry

M/N: HT0X(Dipole Antenna)

Mode:927.125

Note:

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1		151.2500	42.08	-18.18	23.90	43.50	-19.60	QP			
2		188.1100	43.35	-17.59	25.76	43.50	-17.74	QP			
3		203.6300	43.01	-16.40	26.61	43.50	-16.89	QP			
4		303.5400	45.54	-13.78	31.76	46.00	-14.24	QP			
5		379.2000	40.60	-10.03	30.57	46.00	-15.43	QP			
6		610.0600	36.48	-6.89	29.59	46.00	-16.41	QP			
7	*	927.1250	94.03	-0.67	93.36	114.00	-20.36	peak			
8	X	927.1250	86.81	-0.67	86.14	94.00	-7.86	AVG			

*:Maximum data x:Over limit !:over margin Operator: XLX

Operation Mode:	Mode 1	Test Date :	April 15, 2015
Frequency Range:	1-25GHz	Temperature :	28 ℃
Test Result:	PASS	Humidity :	65 %
Measured Distance:	3m	Test By:	Andy

Freq. (MHz)	Ant.Pol. H/V	Emission Level(dBuV/m) PK	Emission Level(dBuV/m) AV	Limit 3m(dBuV/m) PK	Limit 3m(dBuV/m) AV	Margin(dB) PK	Margin(dB) AV
1832.43	V	54.21	47.59	74.00	54.00	-19.79	-6.41
1832.43	H	55.43	47.68	74.00	54.00	-18.57	-6.32

Operation Mode:	Mode 2	Test Date :	April 15, 2015
Frequency Range:	1-25GHz	Temperature :	28 ℃
Test Result:	PASS	Humidity :	65 %
Measured Distance:	3m	Test By:	Andy

Freq. (MHz)	Ant.Pol. H/V	Emission Level(dBuV/m) PK	Emission Level(dBuV/m) AV	Limit 3m(dBuV/m) PK	Limit 3m(dBuV/m) AV	Margin(dB) PK	Margin(dB) AV
1842.43	V	54.55	48.60	74.00	54.00	-19.45	-5.40
1842.43	H	54.72	48.73	74.00	54.00	-19.28	-5.27

Operation Mode:	Mode 3	Test Date :	April 15, 2015
Frequency Range:	1-25GHz	Temperature :	28 ℃
Test Result:	PASS	Humidity :	65 %
Measured Distance:	3m	Test By:	Andy

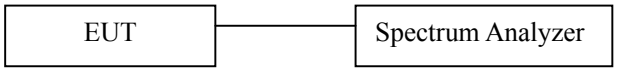
Freq. (MHz)	Ant.Pol. H/V	Emission Level(dBuV/m) PK	Emission Level(dBuV/m) AV	Limit 3m(dBuV/m) PK	Limit 3m(dBuV/m) AV	Margin(dB) PK	Margin(dB) AV
1854.43	V	54.89	48.15	74.00	54.00	-19.11	-5.85
1854.43	H	54.93	48.23	74.00	54.00	-19.07	-5.77

6. BANDWIDTH TEST

6.1. Measurement Procedure

The EUT was operating in hopping mode or could be controlled its channel. Printed out the test result from the spectrum by hard copy function.

6.2. Test SET-UP (Block Diagram of Configuration)



6.3. Measurement Equipment Used:

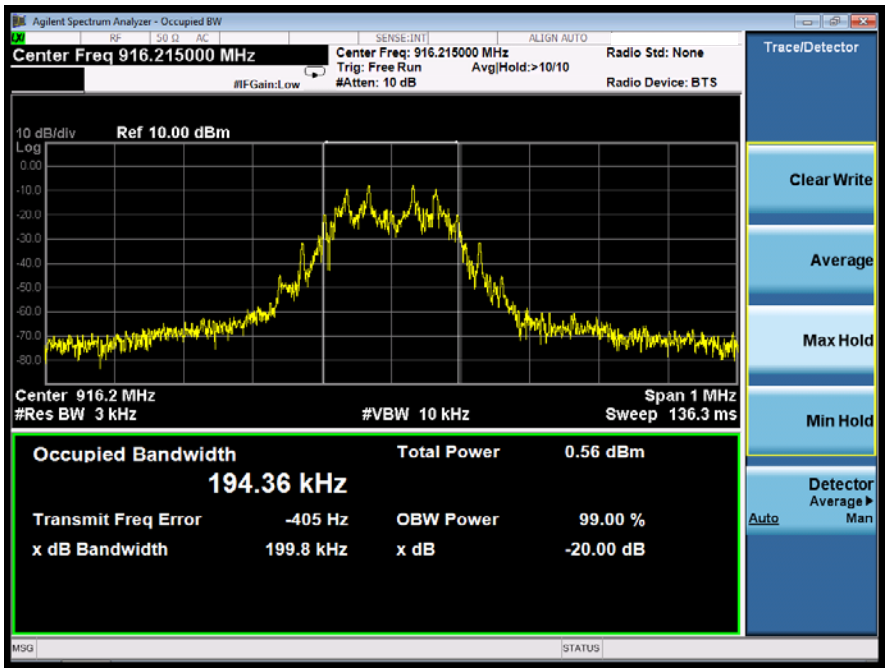
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	Agilent	E4407B	88156318	05/17/2014	05/16/2015

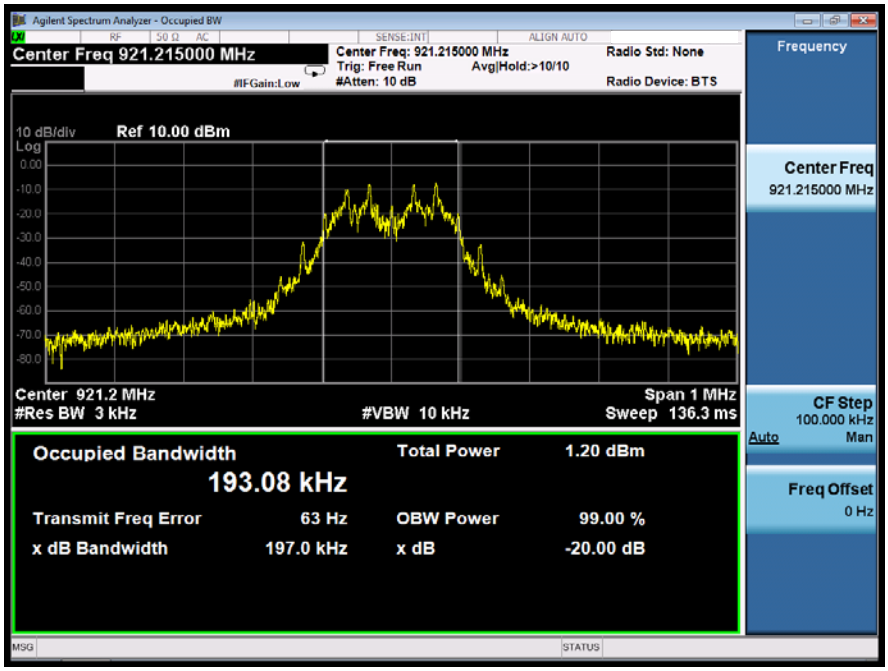
6.4. Measurement Results:

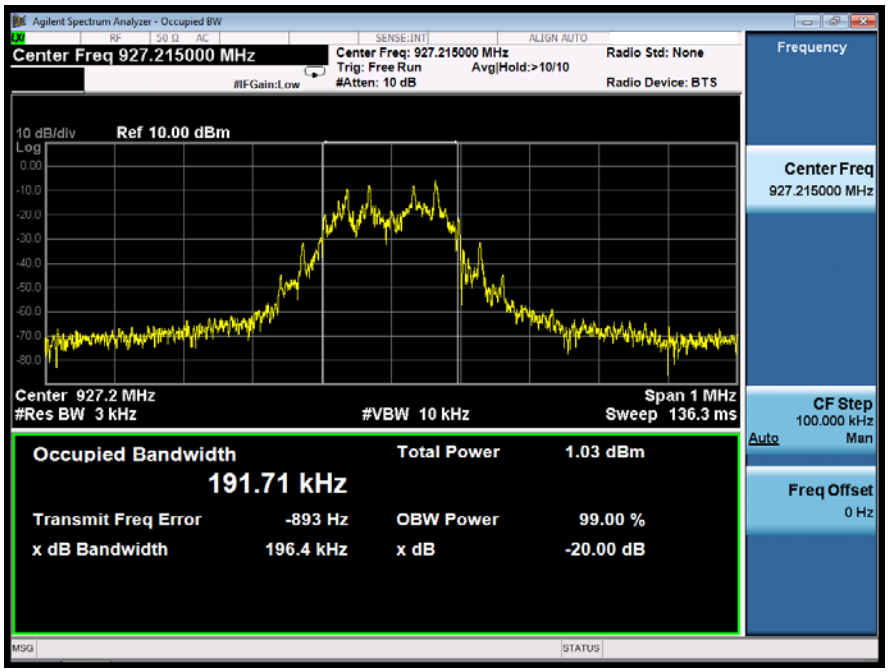
20dB Bandwidth test data Chart:

Spectrum Detector:	PK	Test Date :	April 15, 2015
Test By:	Joe	Temperature :	26℃
Test Result:	PASS	Humidity :	60 %
Modulation:	GFSK		

Channel	Channel frequency (MHz)	20dB Down BW(kHz)
1	916.215	199.80
2	921.215	197.00
3	927.215	196.40


Agilent Spectrum Analyzer - Occupied BW
Center Freq 916.215000 MHz
Center Freq: 916.215000 MHz
Trig: Free Run
Avg|Hold:>10/10
#Atten: 10 dB
Radio Std: None
Radio Device: BTS
Trace/Detector
10 dB/div
Ref 10.00 dBm
Clear Write
Average
Max Hold
Min Hold
Center 916.2 MHz
#Res BW 3 kHz
#VBW 10 kHz
Span 1 MHz
Sweep 136.3 ms
Occupied Bandwidth
194.36 kHz
Total Power 0.56 dBm
Transmit Freq Error -405 Hz
OBW Power 99.00 %
x dB Bandwidth 199.8 kHz
x dB -20.00 dB
Detector
Average
Auto
Man
MSG
STATUS


Agilent Spectrum Analyzer - Occupied BW
Center Freq 921.215000 MHz
Center Freq: 921.215000 MHz
Trig: Free Run
Avg|Hold:>10/10
#Atten: 10 dB
Radio Std: None
Radio Device: BTS
Frequency
10 dB/div
Ref 10.00 dBm
Center Freq
921.215000 MHz
Center 921.2 MHz
#Res BW 3 kHz
#VBW 10 kHz
Span 1 MHz
Sweep 136.3 ms
CF Step
100.000 kHz
Auto
Man
Occupied Bandwidth
193.08 kHz
Total Power 1.20 dBm
Transmit Freq Error 63 Hz
OBW Power 99.00 %
x dB Bandwidth 197.0 kHz
x dB -20.00 dB
Freq Offset
0 Hz
MSG
STATUS


Agilent Spectrum Analyzer - Occupied BW
Center Freq 927.215000 MHz
Center Freq: 927.215000 MHz
Trig: Free Run
Avg|Hold:>10/10
#Atten: 10 dB
Radio Std: None
Radio Device: BTS
Frequency
10 dB/div
Ref 10.00 dBm
Center Freq
927.215000 MHz
Center 927.2 MHz
#Res BW 3 kHz
#VBW 10 kHz
Span 1 MHz
Sweep 136.3 ms
CF Step
100.000 kHz
Auto
Man
Occupied Bandwidth
191.71 kHz
Total Power
1.03 dBm
Transmit Freq Error
-893 Hz
OBW Power
99.00 %
x dB Bandwidth
196.4 kHz
x dB
-20.00 dB
Freq Offset
0 Hz
MSG
STATUS

7. BAND EDGE TEST

7.1. Measurement Procedure

1. The EUT was Operating in hopping mode or could be controlled its channel. Printed out test result from the spectrum by hard copy function.
2. The EUT was placed on a turn table which is 0.8m above ground plane.
3. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
4. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
5. Repeat above procedures until all frequency measured were complete.

7.2. Test SET-UP (Block Diagram of Configuration)

As 5.2 Test set up (B) and (C)

7.3. Measurement Equipment Used:

Same as 5.3 Radiated Emission Measurement.

7.4. Measurement Results:

All modulations and hopping mode have been tested, and the worst result GFSK and hopping mode recorded as below:

Spectrum Detector:	PK/AV	Test Date :	April 15, 2015
Test By:	Andy	Temperature :	28 ℃
Test channel:	Mode 1	Humidity :	65 %

Freq. (MHz)	Ant.Pol. H/V	Emission Level (dBuV/m)	Limit 3m (dBuV/m)	Margin (dB)	Note
899.84	V	26.44	46.00	-20.56	PK
905.93	V	29.00	46.00	-18.00	PK
913.62	V	34.84	46.00	-12.16	PK
920.99	V	27.19	46.00	-19.81	PK
926.44	V	27.38	46.00	-19.62	PK
931.41	V	26.71	46.00	-20.29	PK
895.19	H	26.08	46.00	-20.92	PK
908.17	H	35.29	46.00	-11.71	PK
909.94	H	39.25	46.00	-7.75	PK
916.19	H	32.98	46.00	-14.02	PK
918.43	H	29.81	46.00	-17.19	PK
926.76	H	26.80	46.00	-20.20	PK

Spectrum Detector:	PK/AV	Test Date :	April 15, 2015
Test By:	Andy	Temperature :	28 ℃
Test channel:	Mode 3	Humidity :	65 %

Freq. (MHz)	Ant.Pol. H/V	Emission Level (dBuV/m)	Limit 3m (dBuV/m)	Margin (dB)	Note
899.84	V	26.44	46.00	-20.56	PK
905.93	V	29.00	46.00	-18.00	PK
913.62	V	34.84	46.00	-12.16	PK
920.99	V	27.19	46.00	-19.81	PK
926.44	V	27.38	46.00	-19.62	PK
931.41	V	26.71	46.00	-20.29	PK
895.19	H	26.08	46.00	-20.92	PK
908.17	H	35.29	46.00	-11.71	PK
909.94	H	39.25	46.00	-7.75	PK
916.19	H	32.98	46.00	-14.02	PK
918.43	H	29.81	46.00	-17.19	PK
926.76	H	26.80	46.00	-20.20	PK

8. Antenna Application

8.1. Antenna Requirement

For intentional device, according to FCC 47 CFR Section 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.

8.2. Result

PASS.

The EUT has 1 antenna: a Dipole Antenna for, the gain is 2.0dBi;

Note:
- ☐ Antenna use a permanently attached antenna which is not replaceable.
- ☒ Not using a standard antenna jack(rp-sma connector)
- ☐ The antenna has to be professionally installed (please provide method of installation)

which in accordance to section 15.203, please refer to the internal photos.