

---

# FCC Test Report

---

Report No.: AGC21S120601F2B

**FCC ID** : OR5TWONAV

**PRODUCT DESIGNATION** : TwoNav Ultra

**BRAND NAME** : TwoNav

**TEST MODEL** : TwoNav Ultra

**CLIENT** : CompeGPS Team SL

**DATE OF ISSUE** : Aug. 22, 2012

**STANDARD(S)** : FCC Part 15 Rules

**Attestation of Global Compliance Co., Ltd.**

CAUTION: This report shall not be reproduced except in full without the written permission of the test laboratory and shall not be quoted out of context.

## TABLE OF CONTENTS

<b>1</b>	<b>VERIFICATION OF COMPLIANCE</b>	<b>2</b>
<b>2</b>	<b>GENERAL INFORMATION</b>	<b>3</b>
<b>2.1</b>	<b>PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT)</b>	<b>3</b>
<b>2.2</b>	<b>TEST STANDARDS</b>	<b>4</b>
<b>2.3</b>	<b>RELATED SUBMITTAL(S)/GRANT(S)</b>	<b>4</b>
<b>2.4</b>	<b>TEST METHODOLOGY</b>	<b>4</b>
<b>2.5</b>	<b>TEST FACILITY</b>	<b>4</b>
<b>2.6</b>	<b>ACCESSORIES EQUIPMENT LIST AND DETAILS</b>	<b>5</b>
<b>2.7</b>	<b>EUT PORT&amp;CABLE LIST AND DETAILS</b>	<b>5</b>
<b>3</b>	<b>SUMMARY OF TEST RESULTS</b>	<b>5</b>
<b>4</b>	<b>TEST MODES</b>	<b>5</b>
<b>5</b>	<b>§15.203 - ANTENNA REQUIREMENT</b>	<b>6</b>
<b>5.1</b>	<b>STANDARD APPLICABLE</b>	<b>6</b>
<b>5.2</b>	<b>TEST RESULT</b>	<b>7</b>
<b>6</b>	<b>§15.209, §15.249 RADIATED EMISSION</b>	<b>7</b>
<b>6.1</b>	<b>MEASUREMENT UNCERTAINTY</b>	<b>7</b>
<b>6.2</b>	<b>STANDARD APPLICABLE</b>	<b>8</b>
<b>6.3</b>	<b>TEST EQUIPMENT LIST AND DETAILS</b>	<b>9</b>
<b>6.4</b>	<b>TEST PROCEDURE</b>	<b>9</b>
<b>6.5</b>	<b>TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)</b>	<b>9</b>
<b>6.6</b>	<b>TEST RESULTS</b>	<b>12</b>
<b>7</b>	<b>§15.249 EMISSION BANDWIDTH</b>	<b>17</b>
<b>7.1</b>	<b>STANDARD APPLICABLE</b>	<b>17</b>
<b>7.2</b>	<b>TEST EQUIPMENT LIST AND DETAILS</b>	<b>17</b>
<b>7.3</b>	<b>TEST PROCEDURE</b>	<b>17</b>

**7.4 SUMMARY OF TEST RESULTS/PLOTS.....17**

**1. VERIFICATION OF COMPLIANCE**

Applicant:	CompeGPS Team SL
Applicant Address:	Carrer d'en Draper, 1308350 Arenys de Mar Barcelona-Spain

Manufacturer:	Shenzhen Unistrong Science&Technology Co.,Ltd.
Manufacturer Address:	17/F,Global Digital Bldg,Hi-tech Park,Nanshan,Shenzhen,China
Product Description:	TwoNav Ultra
Brand Name:	TwoNav
Model Name:	TwoNav Ultra
FCC ID:	OR5TWONAV
Report Number:	AGC21S120601F2B
Date of Test:	Aug.17,2012 to Aug.21 , 2012

**WE HEREBY CERTIFY THAT:**

The above equipment was tested by Attestation of Global Compliance(Shenzhen) 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 C63.4 (2003) and the energy emitted by the sample EUT tested as described in this report is in compliance with radiated emission limits of FCC Rules Part 15.249.



Tested By :

Bart Xie

Aug. 22, 2012



Review By :

Forrest Lei

Aug. 22, 2012



Approved By:

Solger Zhang

Aug. 22, 2012

## 2. GENERAL INFORMATION

### 2.1. PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT)

Operation Frequency	2.403 GHz to 2.480GHz
Maximum Output Power	2.65dBm

Modulation	GFSK
Number of channels	78
Antenna Designation	Integrated Antenna
Antenna Gain	0dBi
Power Supply	DC3.7V by Built-in Li-ion Battery
**note: The USB port can transfer data with PC.	

## 2.2. TEST STANDARDS

The following report of is prepared on behalf of the Attestation of Global Compliance Co., Ltd. in accordance with FCC Part 15, Subpart C, and section 15.249, 15.203 and 15.209 of the Federal Communication Commission rules.

The objective is to determine compliance with FCC Part 15, Subpart C, and section 15.249, 15.203 and 15.209 of the Federal Communication Commission rules.

Maintenance of compliance is the responsibility of the manufacturer. Any modification of the product, which result in lowering the emission/immunity, should be checked to ensure compliance has been maintained.

## 2.3. RELATED SUBMITTAL(S)/GRANT(S)

This submittal(s) (test report) is intended for **FCC ID: OR5TWONAV** filing to comply with Section 15.249 of the FCC Part 15, Subpart C Rules.

## 2.4. TEST METHODOLOGY

All measurements contained in this report were conducted with ANSI C63.4-2003, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz.

The equipment under test (EUT) was configured to measure its highest possible emission level. The test modes were adapted accordingly in reference to the Operating Instructions. The EUT was tested in all three orthogonal planes and the worse case was showed.

## 2.5. TEST FACILITY

All measurement facilities used to collect the measurement data are located at

**Attestation of Global Compliance (Shenzhen)Co., Ltd.**

(1&2F, No.2 Building, Huafeng No.1 Technical, Industrial Park, Sanwei, Xixiang, Baoan District, Shenzhen, China)

The test site is constructed and calibrated to meet the FCC requirements in documents ANSI C63.4: 2003.  
FCC register No.: 259865

## 2.6. ACCESSORIES EQUIPMENT LIST AND DETAILS

Device Type	Manufacturer	Model Name	Serial No.	Data Cable	Power Cable
--	--	--	--	--	--

## 2.7. EUT PORT&CABLE LIST AND DETAILS

I/O Port Type	Q'TY	Cable	Tested with
TF Card	1	N/A	1
USB Port	1	1.2m unshielded	1

## 3. SUMMARY OF TEST RESULTS

Description of Test	Result
§15.203 Antenna Requirement	Compliant
§15.207 Power Line Conducted Emission	Compliant
§15.209 General Requirement	Compliant
§15.249 Emission Bandwidth	Compliant
§15.249 Spurious Emission	Compliant

## 4 TEST MODES

No.	TEST MODES
1	2403MHZ TX
2	2440MHZ TX
3	2480MHZ TX

**Note:** Above 3 modes have performed at maximum emission conditions.3 axis have been tested and only the worst mode data recorded in the test report.

## **5. § 15.203 - ANTENNA REQUIREMENT**

### **5.1. STANDARD APPLICABLE**

According to FCC 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 use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of Sections 15.211, 15.213, 15.217, 15.219, or 15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with Section 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this Part are not exceeded.

## **5.2. TEST RESULT**

This product has a permanent antenna, fulfill the requirement of this section.

## **6. §15.209, §15.249 RADIATED EMISSION**

### **6.1. MEASUREMENT UNCERTAINTY**

Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of a radiation emissions measurement is +/-3.2 dB.

## 6.2. STANDARD APPLICABLE

Except as provided in paragraph (b) of this section, the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

<b>Fundamental Frequency (MHz)</b>	<b>Field Strength of Fundamental Field Strength (mV/m)</b>	<b>Field Strength of Harmonics (μV/m)</b>
902-928 MHz	50	500
2400 - 2483.5 MHz	50	500
5725 - 5875 MHz	50	500
24.0 - 24.25 GHz	250	2500

Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

<b>Frequency (MHz)</b>	<b>Field Strength (μV/m)</b>	<b>Measurement Distance (m)</b>
30-88	100*	3
88-216	150*	3
216-960	200*	3
Above 960	500	3

In the above emission table, the tighter limit applies at the band edges.

Frequency (MHz)	Field Strength (µV/m at 3-meter)	Field Strength (dBµV/m at 3-meter)
30-88	100	40
88-216	150	43.5
216-960	200	46
Above 960	500	54

### 6.3. TEST EQUIPMENT LIST AND DETAILS

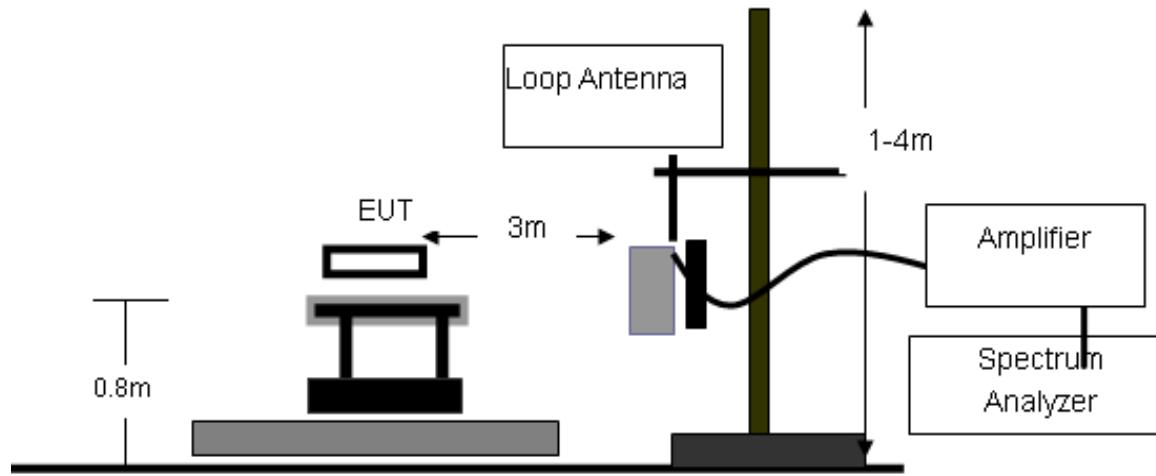
Equipment	Manufacturer	Model	S/N	Cal. Date	Cal. Due
PSA SERIES SPECTRUM ANALYZER	AGILENT	E4440A	US41421290	07/18/2012	07/17/2013
BICONICAL ANTENNA	A.H.	SAS-521-4	128	07/18/2012	07/17/2013
LOOP ANTENNA	R&S	HM525	N/A	07/18/2012	07/17/2013
HORN ANTENNA	EM	EM-AH-10180	N/A	07/18/2012	07/17/2013
AMPLIFIER	EM	EM30180	0607030	07/18/2012	07/17/2013
COAXIAL CABLE	SCHWARZBECK	AK9513	9513-10	07/18/2012	07/17/2013
POSITIONING CONTROLLER	MF	MF-7802	MF780208147	07/18/2012	07/17/2013

### 6.4. TEST PROCEDURE

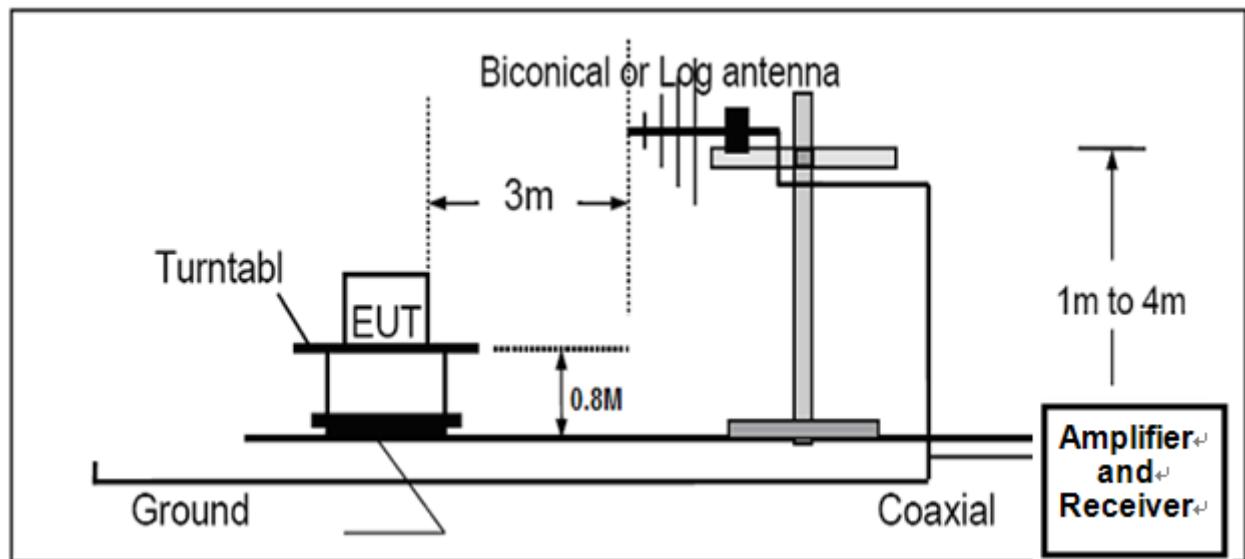
The setup of EUT is according with per ANSI C63.4-2003 measurement procedure. The specification used was with the FCC Part 15.249 and FCC Part 15.209 Limit.

### 6.5. TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)

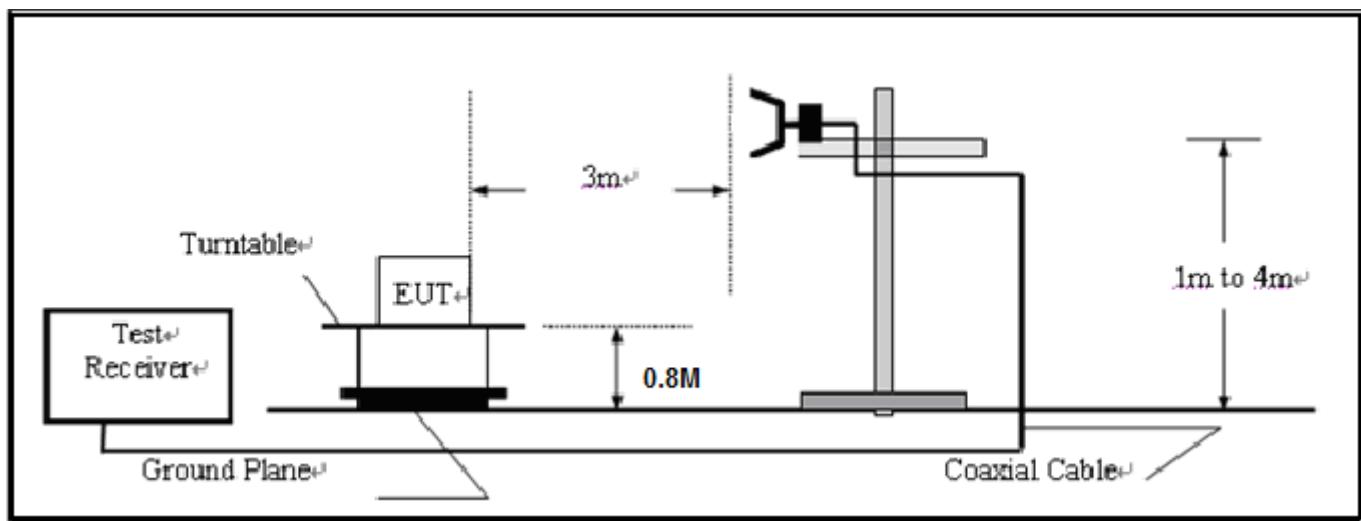
**BELOW 30MHz:**



**30MHz-1000MHz:**



**ABOVE 1000MHz:**



## 6.6. TEST RESULTS

### 6.6.1 TEST RESULT OF RADIATED EMISSION TEST (9KHZ-30MHZ)

Freq. (MHz)	Level (dB uV)	Over Limit (dB)	Limit Line (dB uV)	Remark
--	--	--	--	Seen to Note

\*\*Note:

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

### 6.6.2 TEST RESULT OF RADIATED EMISSION TEST (30MHZ-1GHZ)

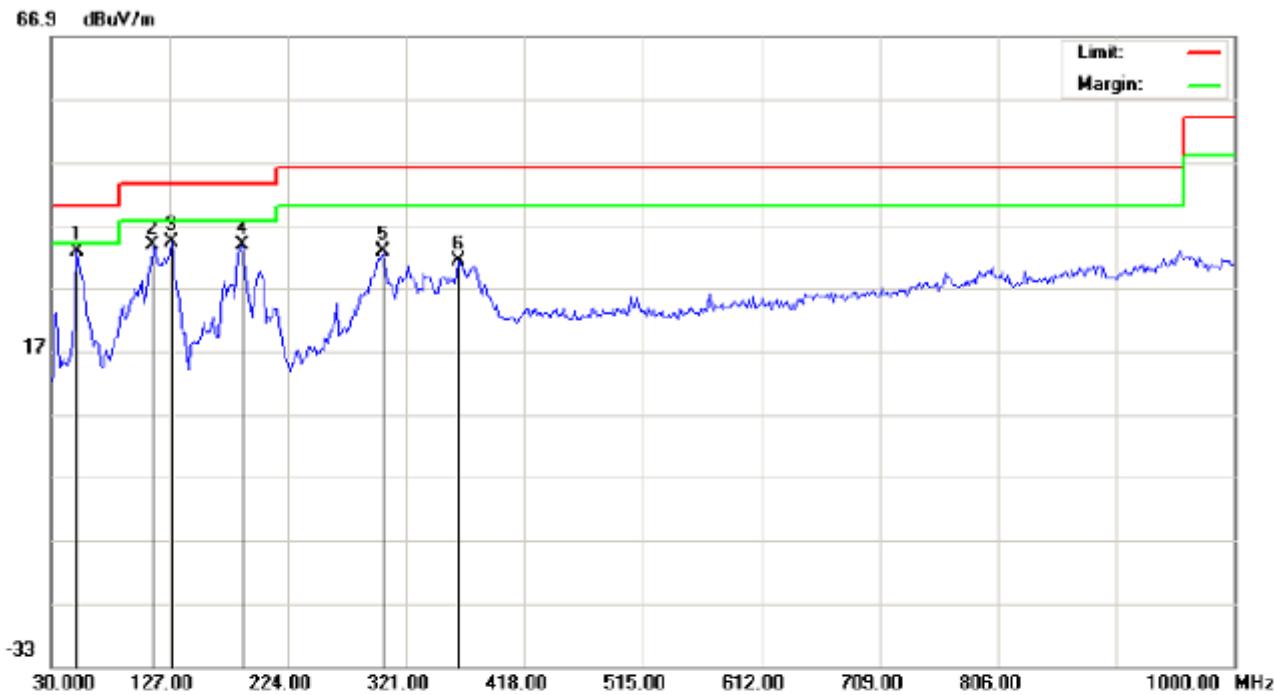
Horizontal:



Site: site #1 Polarization: **Horizontal** Temperature: 26  
Limit: FCC Class B 3M Radiation Power: Humidity: 60 %  
EUT: TwoNav Ultra Distance: 3m  
M/N: TwoNav Ultra  
Mode: Middle channel TX  
Note:

No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		cm	degree	
1		51.0167	23.10	8.25	31.35	40.00	-8.65	peak			
2		114.0666	20.02	16.31	36.33	43.50	-7.17	peak			
3		170.6500	16.91	16.03	32.94	43.50	-10.56	peak			
4	*	185.1999	20.43	15.96	36.39	43.50	-7.11	peak			
5		301.6000	18.00	17.10	35.10	46.00	-10.90	peak			
6		343.6333	11.81	19.00	30.81	46.00	-15.19	peak			

Vertical:

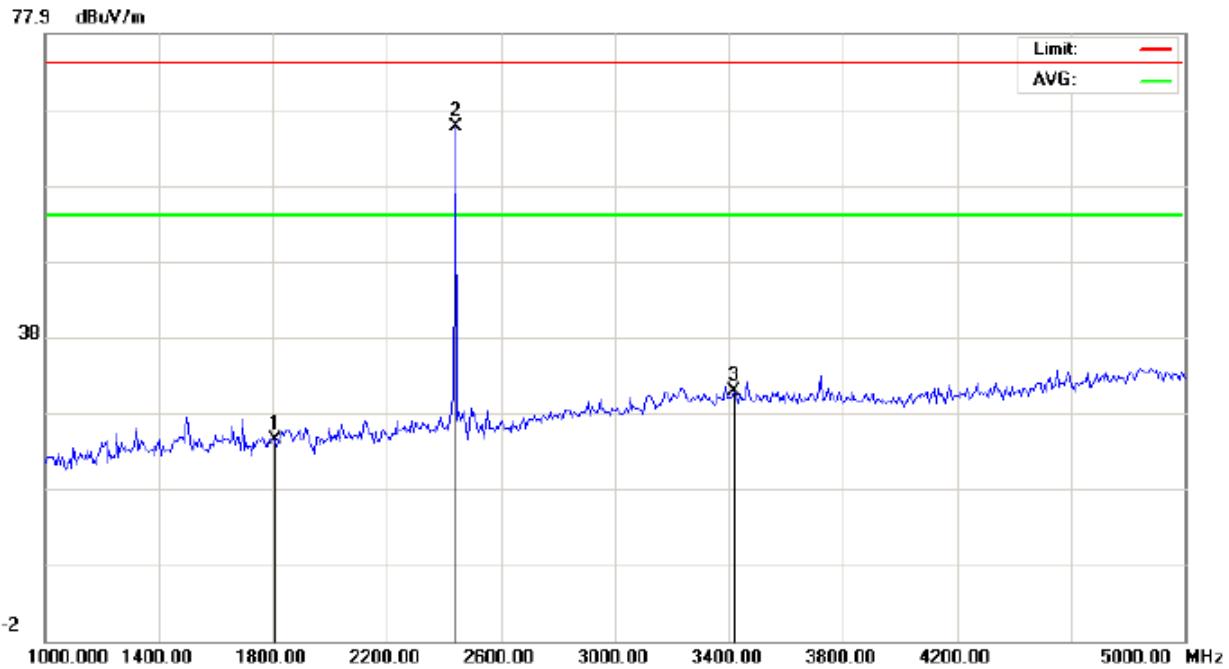


Site: site #1      Polarization: **Vertical**      Temperature: 26  
 Limit: FCC Class B 3M Radiation      Power:      Humidity: 60 %  
 EUT: TwoNav Ultra      Distance: 3m  
 M/N: TwoNav Ultra  
 Mode: Middle Channel TX  
 Note:

No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna	Table	Comment
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		cm	degree	
1	*	51.0167	23.96	8.79	32.75	40.00	-7.25	peak			
2		114.0666	19.95	13.93	33.88	43.50	-9.62	peak			
3		128.6167	17.85	16.49	34.34	43.50	-9.16	peak			
4		186.8166	16.24	17.48	33.72	43.50	-9.78	peak			
5		301.6000	15.78	17.10	32.88	46.00	-13.12	peak			
6		364.6499	12.04	19.14	31.18	46.00	-14.82	peak			

### 6.6.3 TEST RESULT OF RADIATED EMISSION TEST (ABOVE 1000MHZ)

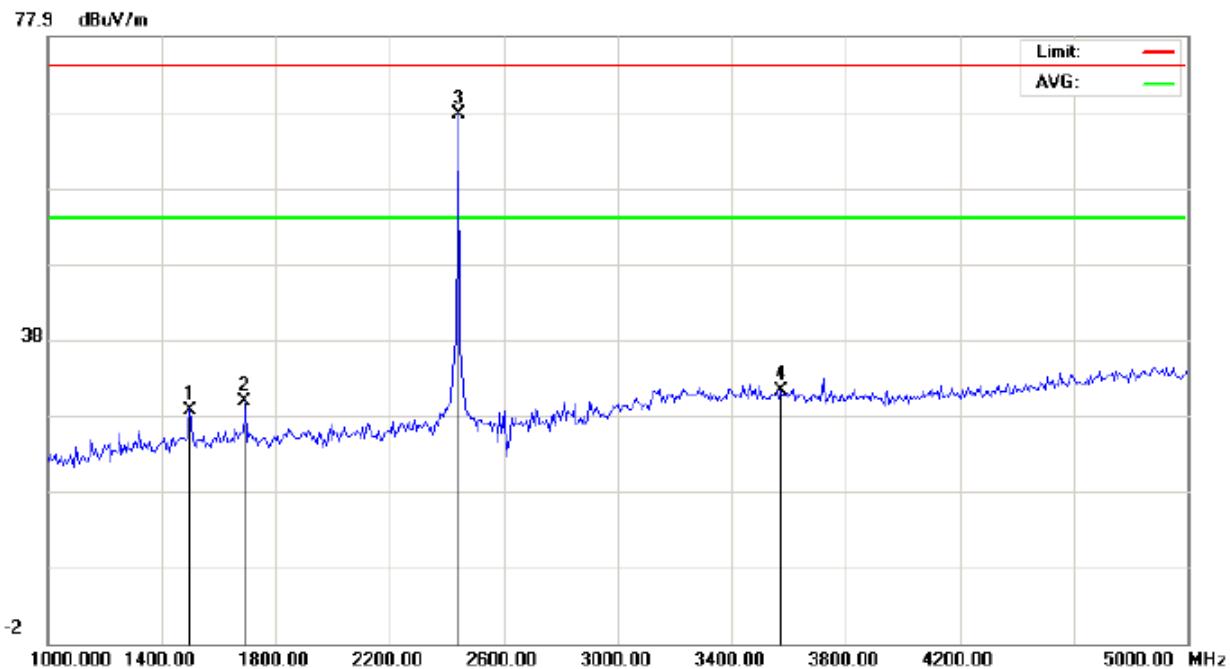
Radiated Emission Measurement



Site: site #1 Polarization: *Horizontal* Temperature: 26  
Limit: FCC Class B 3M Radiation above 1GHZ(PK) Power: Humidity: 60 %  
EUT: TwoNav Ultra Distance: 3m  
M/N: TwoNav Ultra  
Mode: Middle Channel TX  
Note:

No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		cm	degree	
1		1806.667	34.66	-10.19	24.47	74.00	-49.53	peak			
2	*	2440.000	73.84	-8.24	65.60	74.00	-8.40	peak			
3		3420.000	38.61	-7.78	30.83	74.00	-43.17	peak			

### Radiated Emission Measurement



Site: site #1 Polarization: **Vertical** Temperature: 26  
Limit: FCC Class B 3M Radiation above 1GHZ(PK) Power: Humidity: 60 %  
EUT: **TwoNav Ultra** Distance: 3m  
M/N: **TwoNav Ultra**  
Mode: middle channel TX  
Note:

No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		cm	degree	
1		1500.000	39.19	-10.49	28.70	74.00	-45.30	peak			
2		1693.333	40.03	-10.30	29.73	74.00	-44.27	peak			
3	*	2440.000	75.84	-8.24	67.60	74.00	-6.40	peak			
4		3573.333	38.77	-7.53	31.24	74.00	-42.76	peak			

**\*\*Note:**

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

## 7. §15.249 EMISSION BANDWIDTH

### 7.1. STANDARD APPLICABLE

None; for reporting purposes only.

### 7.2. TEST EQUIPMENT LIST AND DETAILS

Equipment	Manufacturer	Model	S/N	Cal. Date	Cal. Due
PSA SERIES SPECTRUM ANALYZER	AGILENT	E4440A	US41421290	07/18/2012	07/17/2013
RECEIVER ANTENNA	ETS	2175	57337	07/18/2012	07/17/2013
COAXIAL CABLE	ETS	SUCOFLEX 104	25498514	07/18/2012	07/17/2013

### 7.3. TEST PROCEDURE

With the EUT's antenna attached, the EUT's 20dB Bandwidth power was received by the test antenna, which was connected to the spectrum analyzer with the START, and STOP frequencies set to the EUT's operation band.

### 7.4. SUMMARY OF TEST RESULTS/PLOTS

Channel	Emission Bandwidth (KHz)	Limit (KHz)
Low	959.310	N/A
Middle	960.247	
High	953.745	

**Test Result: Pass**



## 8FCC LINE CONDUCTED EMISSION TEST

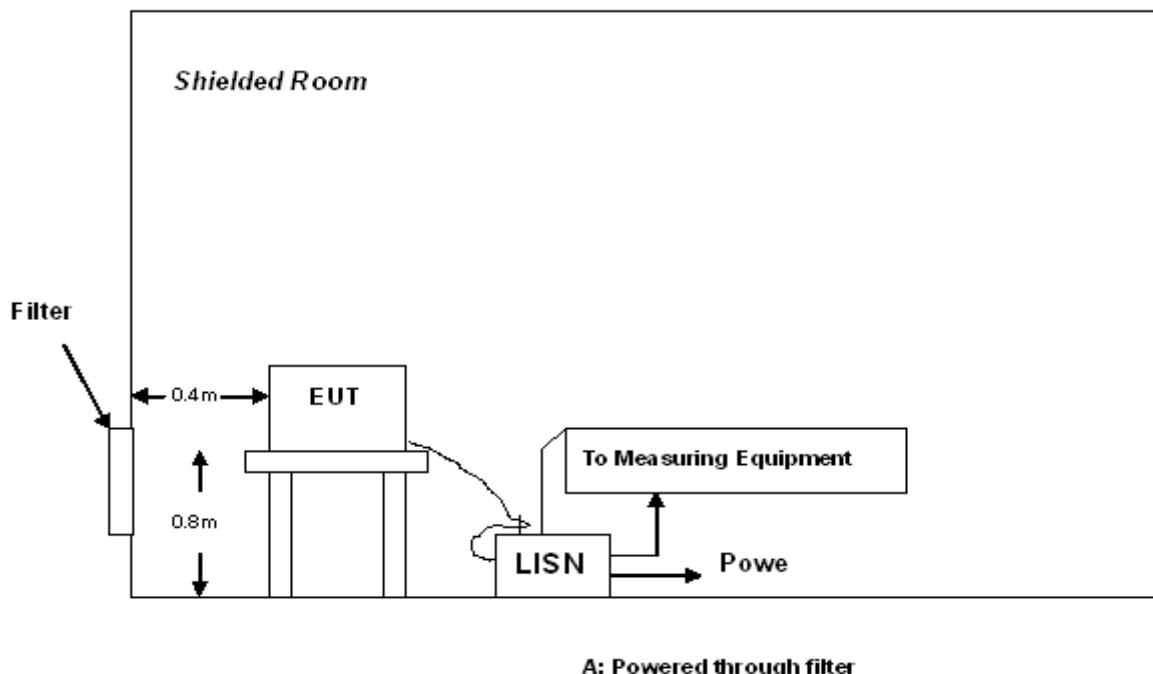
### 8.1 LIMITS

Frequency	Maximum RF Line Voltage	
	Q.P.( dBuV)	Average( dBuV)
150kHz~500kHz	66-56	56-46
500kHz~5MHz	56	46
5MHz~30MHz	60	50

\*\*Note: 1. The lower limit shall apply at the transition frequency.

2. The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz

### 8.2 TEST SETUP



### **8.3 PRELIMINARY PROCEDURE**

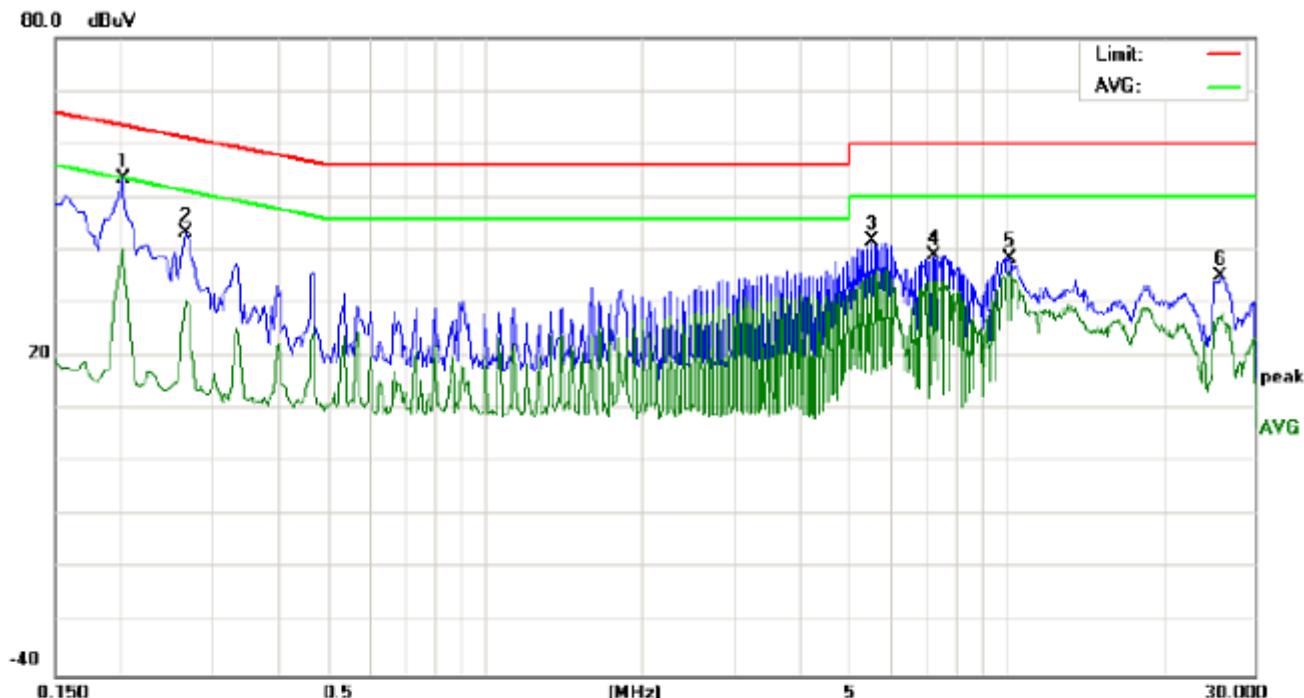
- 1) The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. When the EUT is a tabletop system, a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.4 (see Test Facility for the dimensions of the ground plane used). When the EUT is a floor-standing equipment, it is placed on the ground plane which has a 3-12 mm non-conductive covering to insulate the EUT from the ground plane.
- 2) Support equipment, if needed, was placed as per ANSI C63.4.
- 3) All I/O cables were positioned to simulate typical actual usage as per ANSI C63.4.
- 4) All support equipments received AC120V/60Hz power from a LISN, if any.
- 5) The EUT received power by adapter which received power by a LISN.
- 6) The test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.
- 7) Analyzer / Receiver scanned from 150 kHz to 30MHz for emissions in each of the test modes.
- 8) During the above scans, the emissions were maximized by cable manipulation.
- 9) The following test mode(s) were scanned during the preliminary test.  
Then, the EUT configuration and cable configuration of the above highest emission level were recorded for reference of final testing.

### **8.4 FINAL TEST PROCEDURE**

- 10) EUT and support equipment was set up on the test bench as per step 2 of the preliminary test.
- 11) 2) A scan was taken on both power lines, Line 1 and Line 2, recording at least the six highest emissions. Emission frequency and amplitude were recorded into a computer in which correction factors were used to calculate the emission level and compare reading to the applicable limit. If EUT emission level was less -2dB to the A.V. limit in Peak mode, then the emission signal was re-checked using Q.P and Average detector.
- 12) 3) The test data of the worst case condition(s) was reported on the Summary Data page.

## 8.5 TEST RESULT OF POWER LINE

Line Conducted Emission Test Line 1-L



Site: Conduction Phase: **L1** Temperature: 26

Limit: FCC Class B Conduction(QP) Power: Humidity: 60 %

EUT: TwoNav Ultra

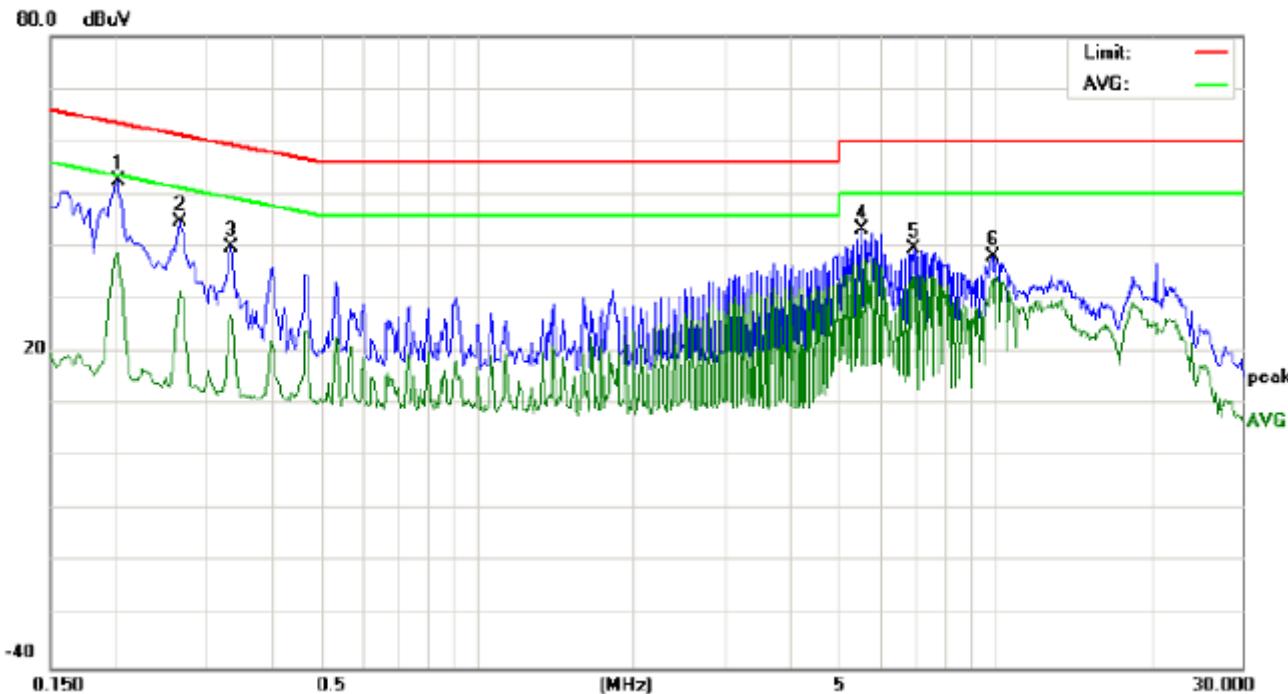
M/N: TwoNav Ultra

Mode: ANT+

Note:

No.	Freq. (MHz)	Reading_Level (dBuV)			Correct Factor	Measurement (dBuV)			Limit (dBuV)		Margin (dB)		P/F	Comment
		Peak	QP	AVG		Peak	QP	AVG	QP	AVG	QP	AVG		
1	0.2020	43.19		30.03	10.22	53.41		40.25	63.52	53.52	-10.11	-13.27	P	
2	0.2660	32.85		20.47	10.28	43.13		30.75	61.24	51.24	-18.11	-20.49	P	
3	5.5500	31.54		25.27	10.25	41.79		35.52	60.00	50.00	-18.21	-14.48	P	
4	7.2860	28.75		24.16	10.34	39.09		34.50	60.00	50.00	-20.91	-15.50	P	
5	10.1620	28.48		25.89	10.09	38.57		35.98	60.00	50.00	-21.43	-14.02	P	
6	25.7340	25.01		17.03	10.11	35.12		27.14	60.00	50.00	-24.88	-22.86	P	

Line Conducted Emission Test Line 2-N



Site: Conduction Phase: **N** Temperature: 26  
Limit: FCC Class B Conduction(QP) Power: Humidity: 60 %  
EUT: **TwoNav Ultra**  
M/N: **TwoNav Ultra**  
Mode: **ANT+**  
Note:

No.	Freq. (MHz)	Reading_Level (dBuV)			Correct Factor	Measurement (dBuV)			Limit (dBuV)		Margin (dB)		P/F	Comment
		Peak	QP	AVG		Peak	QP	AVG	QP	AVG	QP	AVG		
1	0.2020	42.34		28.94	10.22	52.56		39.16	63.52	53.52	-10.96	-14.36	P	
2	0.2680	34.42		21.21	10.28	44.70		31.49	61.24	51.24	-16.54	-19.75	P	
3	0.3339	29.70		16.84	10.30	40.00		27.14	59.35	49.35	-19.35	-22.21	P	
4	5.5460	32.90		27.05	10.25	43.15		37.30	60.00	50.00	-16.85	-12.70	P	
5	7.0180	29.35		24.28	10.36	39.71		34.64	60.00	50.00	-20.29	-15.36	P	
6	9.9580	28.11		23.91	10.11	38.22		34.02	60.00	50.00	-21.78	-15.98	P	

----- END OF REPORT -----