

TEST REPORT

Report Number: 101123079MPK-002
Project Numbers: G101123079, G101166195
April 30, 2013

Testing performed on the
NextNav Local
Model Number: 200-0013-01
FCC ID: A4P-200-0013-01
to

FCC Part 15 Subpart C (15.247)
FCC Part 15, Subpart B

for

NextNav LLC

Test Performed by:
Intertek
1365 Adams Court
Menlo Park, CA 94025 USA

Test Authorized by:
NextNav LLC
484 Oakmead Parkway
Sunnyvale, CA 94085, USA

Prepared by: 
Krishna K Vemuri

Date: April 30, 2013

Reviewed by: 
David Chernomordik

Date: April 30, 2013

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VERIFICATION OF COMPLIANCE

Report No. 101123079MPK-002

Verification is hereby issued to the named APPLICANT and is VALID ONLY for the equipment identified hereon for use under the rules and regulations listed below.

Equipment Under Test:

NextNav Local

Trade Name:

NEXTNAV

Model Numbers:

200-0013-01

Serial Numbers

001

Applicant:

NextNav LLC

Contact:

Waldemar Kunysz

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Country

Sunnyvale, CA 94085

USA

Tel. Number:

(408) 400-7850

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Applicable Regulation:

FCC Part 15 Subpart C (15.247)

FCC Part 15, Subpart B

Date of Test:

April 01 - 14, 2013

We attest to the accuracy of this report:

Krishna K Vemuri
EMC Senior Staff Engineer

David Chernomordik
Senior EMC Engineer

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1.0 Summary of Tests

Test	Reference FCC	Result
RF Output Power	15.247(b)(3)	Complies
6 dB Bandwidth	15.247(a)(2)	Complies
Power Density	15.247(e)	Complies
Out of Band Antenna Conducted Emission	15.247(d)	Complies
Transmitter Radiated Emissions	15.247(d), 15.209, 15.205	Complies
AC Conducted Emission	15.207	Complies
Radiated Emission from Digital Part and Receiver	15.109	Complies
Antenna Requirement	15.203	Complies.
RF Exposure	15.247(i)	Complies

EUT receive date: April 01, 2013**EUT receive condition:** The pre-production version of the EUT was received in good condition with no apparent damage. As declared by the Applicant, it is identical to the production units.**Test start date:** April 01, 2013**Test completion date:** April 14, 2013

The test results in this report pertain only to the item tested.

2.0 General Information

2.1 Product Description

The model 200-0013-01 is a 902-928 MHz frequency spread spectrum radio module. It is designed to be used in various indoor positioning applications like warehouses, shopping malls, large industrial complexes, etc. The radio transmits non-continuous (CDMA/TDMA format) GPS like signal that allows a user to determine its 3D position without any aid from the external network or service provider.

The unit incorporates two additional modules:

1. The EVDO modem (Raven-XE from Sierra Wireless),
FCC & IC certified: FCC ID: N7N-MC5725 and IC: 2Y17C-MC5725
2. GPS Receiver (OEMStar PN: 01018669, NovAtel Inc).

FCC ID: A4P-200-0013-01 Transmitter specification

Applicant	NextNav, LLC
Manufacturer name & address	484 Oakmead Pkwy, Sunnyvale, CA 94085
Part Number	PN: 200-0013-01
Use of Product	Radio module
Type of Transmission	Spread Spectrum (CDMA) and time division multiplexing (TDM) with 10% and 20% duty cycle: 100 ms ON or 200 ms ON in 1 s interval
Rated RF Output	30 dBm average conducted power
Frequency Range	902-928 MHz
Number of Channel(s)	12 channels
Modulation Type	BPSK/CDMA/TDMA
Data Rate	100 Hz
Antenna(s) type & Gain	Omni ceiling antenna (PN:MPA-806-N), N jack, std omni operation, Max gain: 2.5dBi, frequency: 806-960 MHz

2.2 Related Submittal(s) Grants

None.

2.3 Test Facility

The test site used to collect the radiated data is site 1 (10-m semi-anechoic chamber). This test facility and site measurement data have been fully placed on file with the FCC, IC and A2LA accredited.

2.4 Test Methodology

Antenna conducted measurements were performed according to the FCC documents "Guidance for Performing Compliance Measurement on Digital Transmission Systems (DTS) Operating under §15.247" (KDB 558074).

Both AC mains line-conducted and radiated emissions measurements were performed according to the procedures in ANSI C63.4. Radiated tests were performed at an antenna to EUT distance of 3 meters, unless stated otherwise in the "**Data Sheet**" of this Application.

All other measurements were made in accordance with the procedures in part 2 of CFR 47.

2.5 Measurement Uncertainty

Compliance with the limits was based on the results of the measurements and doesn't take into account the measurement uncertainty.

Estimated Measurement Uncertainty

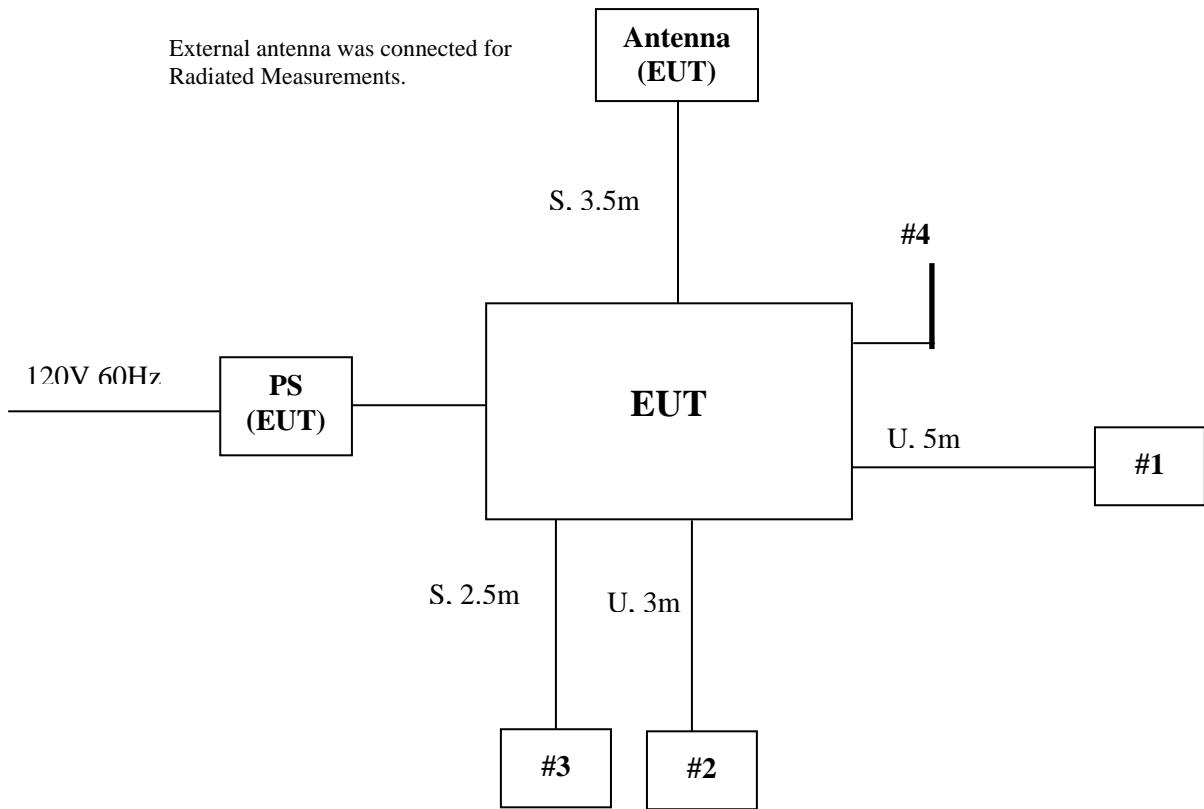
Measurement	Expanded Uncertainty (k=2)		
	0.15 MHz – 1 GHz	1 GHz – 2.5 GHz	> 2.5 GHz
RF Power and Power Density – antenna conducted	-	0.7 dB	-
Unwanted emissions - antenna conducted	1.1 dB	1.3 dB	1.9 dB
Bandwidth – antenna conducted	-	30 Hz	-
Radiated emissions	4.2 dB	3.4 dB	3.6 dB
AC mains conducted emissions	2.4 dB	-	-

3.0 System Test Configuration

3.1 Support Equipment

Item #	Description	Model No./ Part No.	Serial No.
1	Dell Laptop	Vostro	596JDT1
2	ETHERNET SWITCH	420-0002-01	Not Labeled
3	ACTIVE L1 GPS BUOY ANTENNA	BL1R-XTB-1-FKM	283661
4	EVDO Antenna	Not Labeled	Not Labeled

3.2 Block Diagram of Test Setup



EUT PS: V-INFINITY Power Supply, Model: ETS240625U

EUT Antenna: Amphenol Antenna solutions, MPA-806-N, SI No. 090094

S = Shielded
U = Unshielded

F = With Ferrite
m = Length in Meters

3.3 Justification

To show compliance with the FCC Rules, the document 55074 “Guidance for Performing Compliance Measurements on Digital Transmission System (DTS) Operating Under §15.247” was used

3.4 Mode of Operation During Test

During transmitter testing, the transmitter was setup to transmit at maximum RF power on low, middle and high channels.

3.5 Modifications Required for Compliance

Intertek installed no modifications during compliance testing in order to bring the product into compliance.

3.6 Additions, Deviations and Exclusions from Standards

No additions, deviations or exclusions from the standard were made.

4.0 Measurement Results

4.1 6-dB Bandwidth, 26-dB Bandwidth and Occupied Bandwidth FCC Rule 15.247(a)(2)

4.1.1 Requirement

The minimum 6-dB bandwidth shall be at least 500 kHz

4.1.2 Procedure

The Procedure described in the FCC Publication 558074 was used.

The antenna port of the EUT was connected to the input of a spectrum analyzer (SA). For each RF output channel investigated, the spectrum analyzer center frequency was set to the channel carrier. A PEAK output reading was taken, a DISPLAY line was drawn 26 dB or 6 dB lower than PEAK level. The 26-dB or 6-dB bandwidth was determined from where the channel output spectrum intersected the display line.

The occupied bandwidth was measured using the built-in spectrum analyzer function for 99% power bandwidth measurement.

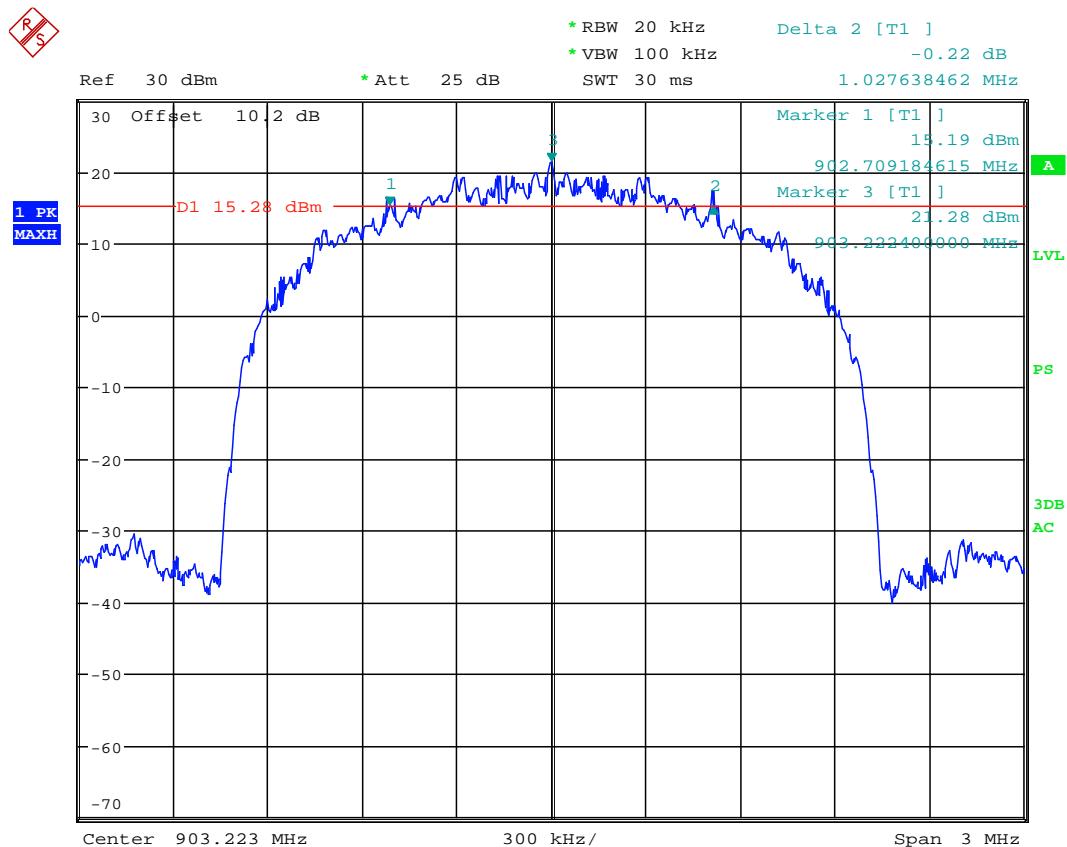
4.1.3 Test Result

Frequency (MHz)	6-dB bandwidth MHz	26-dB bandwidth MHz	Occupied bandwidth MHz
903.223	1.028	1.90	1.592
915.000	1.038	1.89	1.586
926.777	1.024	1.89	1.576

6-dB bandwidth is presented on plots 1.1 – 1.3.

26-dB Bandwidth and Occupied Bandwidth are presented on plots 1.4 – 1.6.

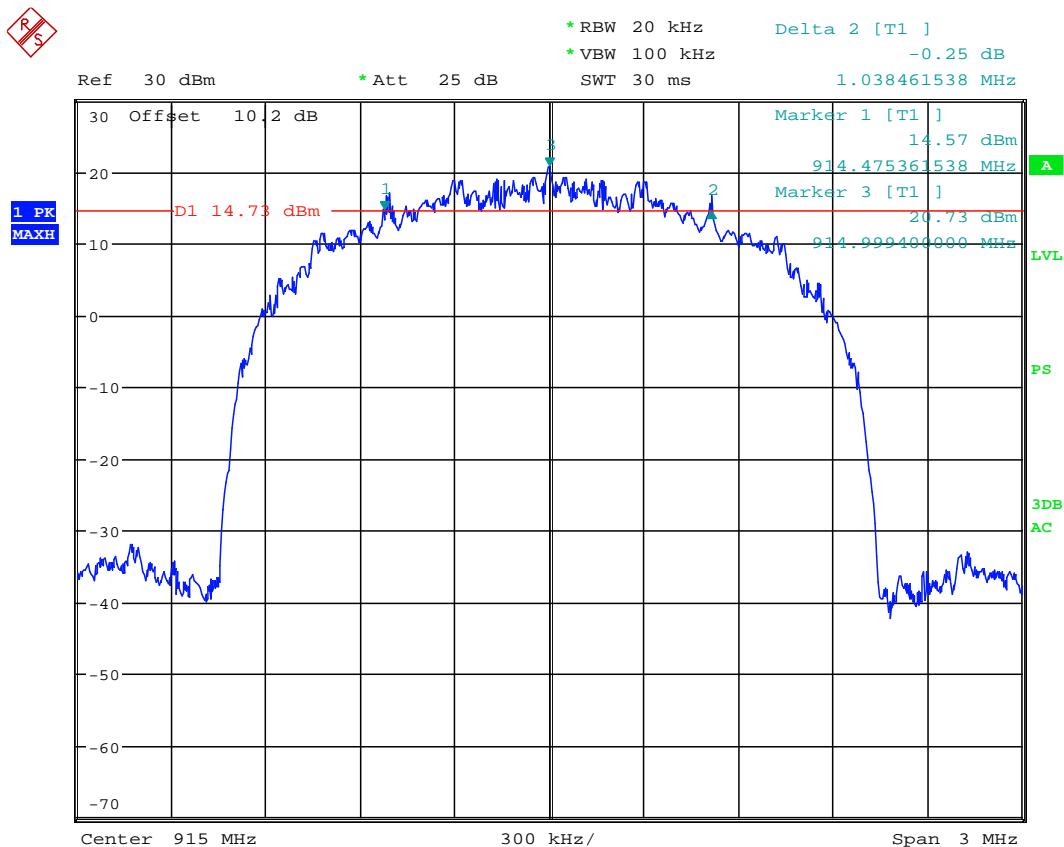
Plot 1.1



6-dB bandwidth

Date: 3.APR.2013 12:12:39

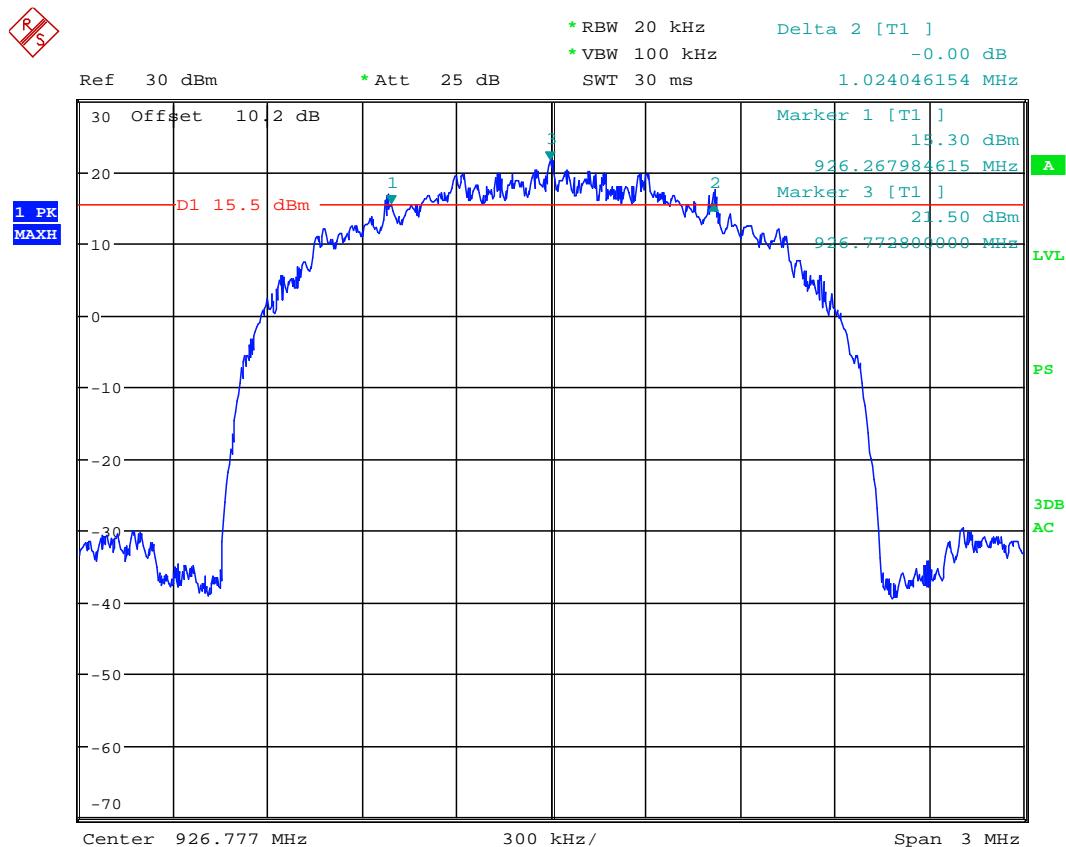
Plot 1. 2



6-dB bandwidth

Date: 3.APR.2013 12:17:06

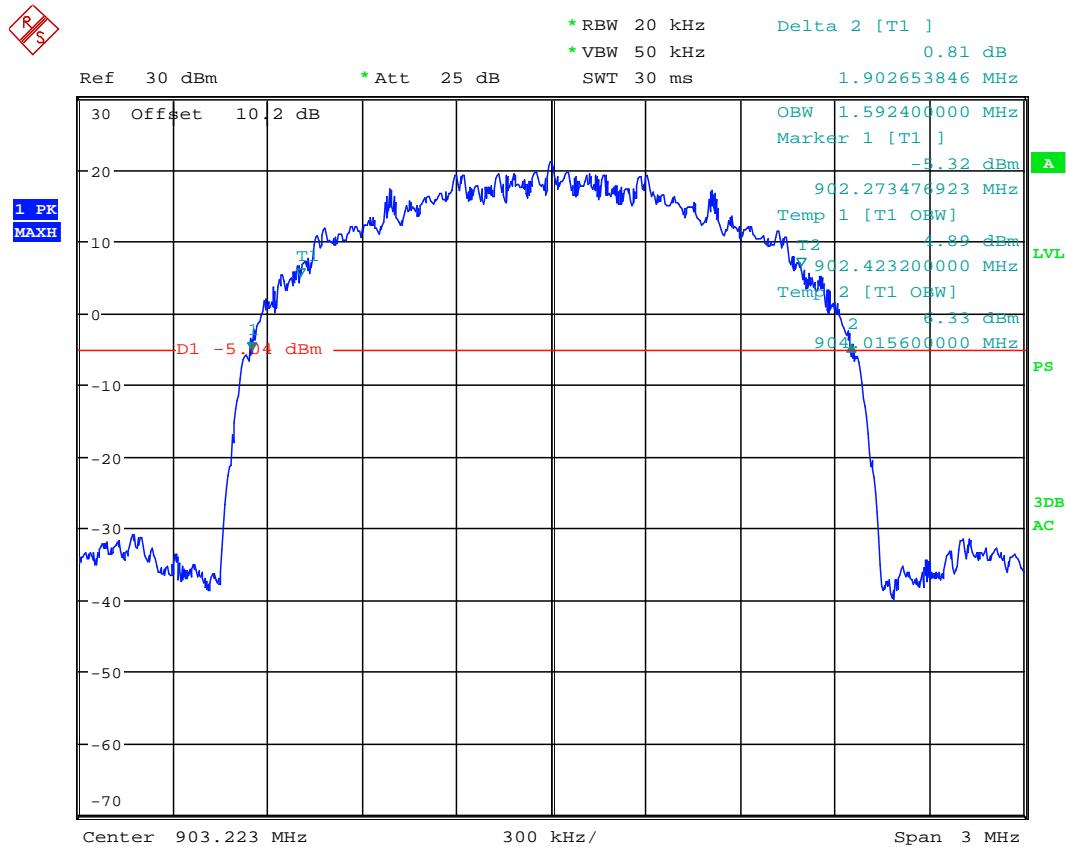
Plot 1. 3



6-dB bandwidth

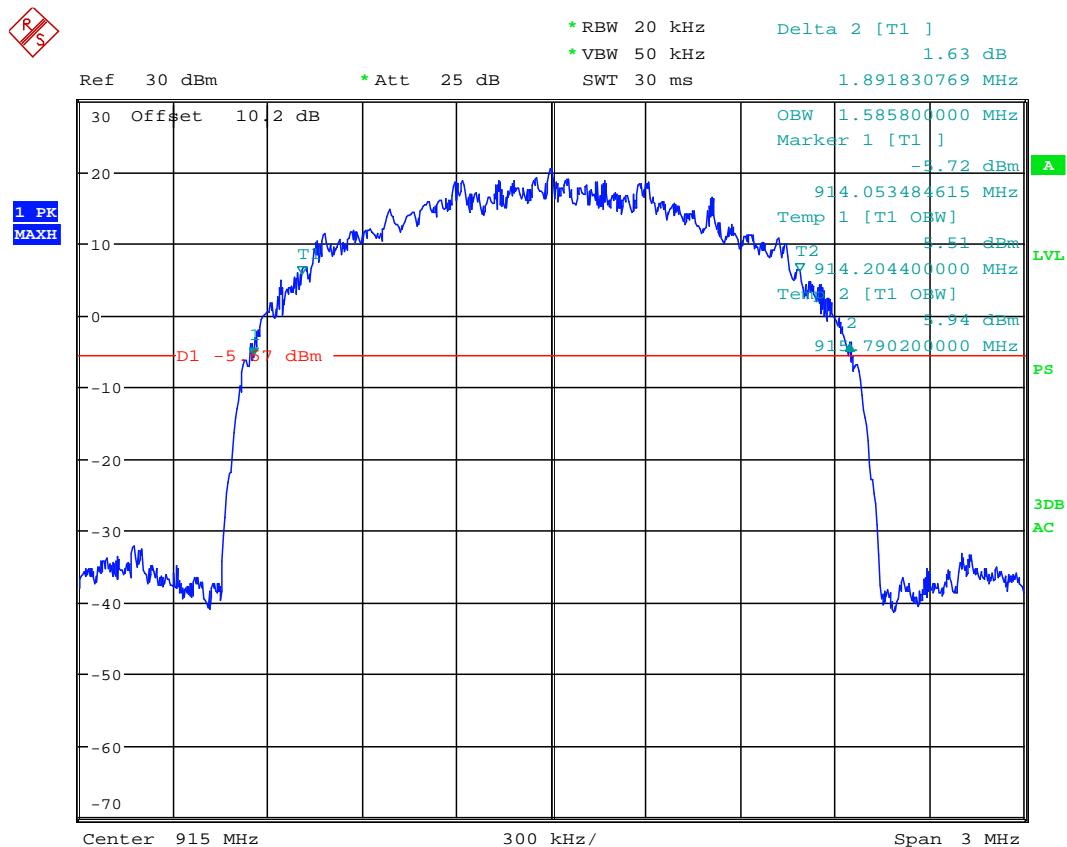
Date: 3.APR.2013 12:22:08

Plot 1.4



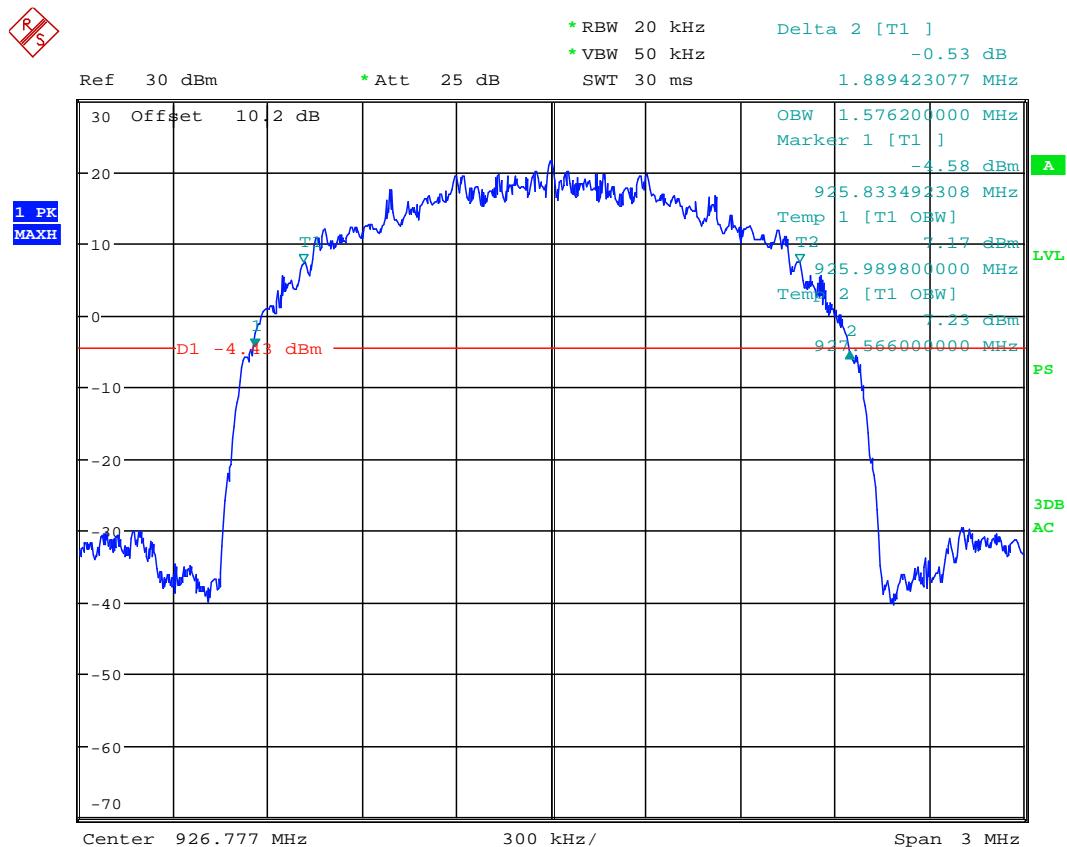
OBW and 26-dB bandwidth
Date: 3.APR.2013 14:24:02

Plot 1.5



OBW and 26-dB bandwidth
Date: 3.APR.2013 14:28:27

Plot 1.6



OBW and 26-dB bandwidth
Date: 3.APR.2013 14:34:49

4.2 Maximum Conducted Output Power at Antenna Terminals FCC Rule 15.247(b)(3)

4.2.1 Requirement

For antennas with gains of 6 dBi or less, maximum allowed transmitter output is 1 watt or 30 dBm. For antennas with gains greater than 6 dBi, transmitter output level must be decreased appropriately, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

4.2.2 Procedure

The antenna port of the EUT was connected to the input of a spectrum analyzer/power meter to measure the Maximum Conducted Transmitter Output Power.

The procedure described in FCC Publication 558074, was used. Specifically, section 8.2.2., Option 2, with RMS detector using the spectrum analyzer's band power measurement function with band limits set equal to the EBW (26 dB bandwidth) band edges.

Since the EUT transmits the signal with Duty Cycle (100 ms on-time, 900 ms off-time), signal gating with gate length of 100 ms was used to ensure that the measurements are performed only during on-time transmission.

4.3.3 Test Result

Refer to the following plots for the test result

Frequency (MHz)	26-dB bandwidth MHz	Conducted Power (average) dBm	Conducted Power (average) W	Plot
903.223	1.90	26.9	0.490	2.1
915.000	1.89	26.4	0.437	2.2
926.777	1.89	27.7	0.589	2.3

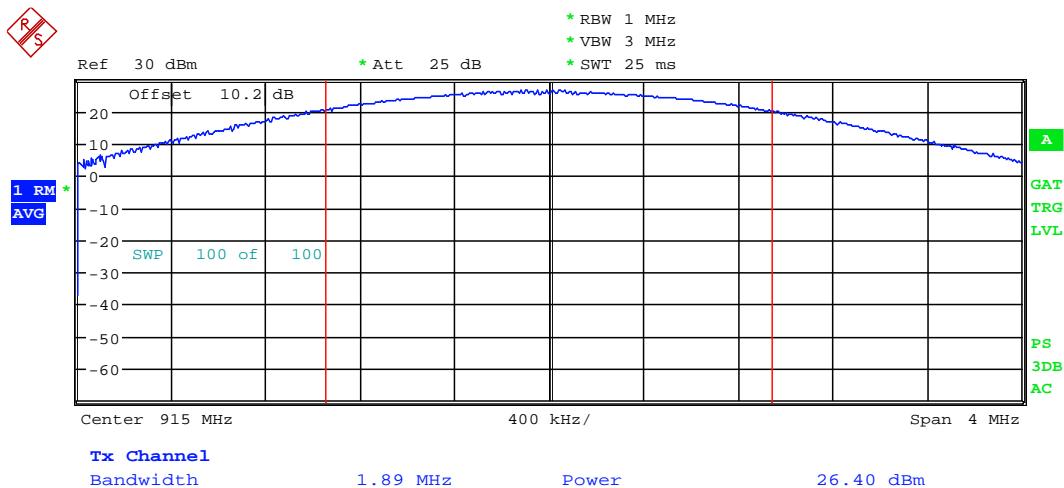
Plot 2. 1



Maximum conducted output power

Date: 9.APR.2013 15:58:55

Plot 2. 2



Maximum conducted output power

Date: 9.APR.2013 15:49:23

Plot 2. 3



Maximum conducted output power

Date: 9.APR.2013 15:54:09

4.3 Maximum Power Spectral Density FCC 15.247 (e)

4.3.1 Requirement

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna should not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

4.3.2 Procedure

The antenna port of the EUT was connected to the input of a spectrum analyzer to measure the Transmitter Power Density (PSD).

The procedure described in FCC Publication 558074 was used. Specifically, section 9.2, Option 2, with RMS detector and trace averaging mode over 100 traces. Spectrum analyzer resolution bandwidth was set to 3 kHz and span to at least 1.5 times the DTS (6 dB) channel bandwidth.

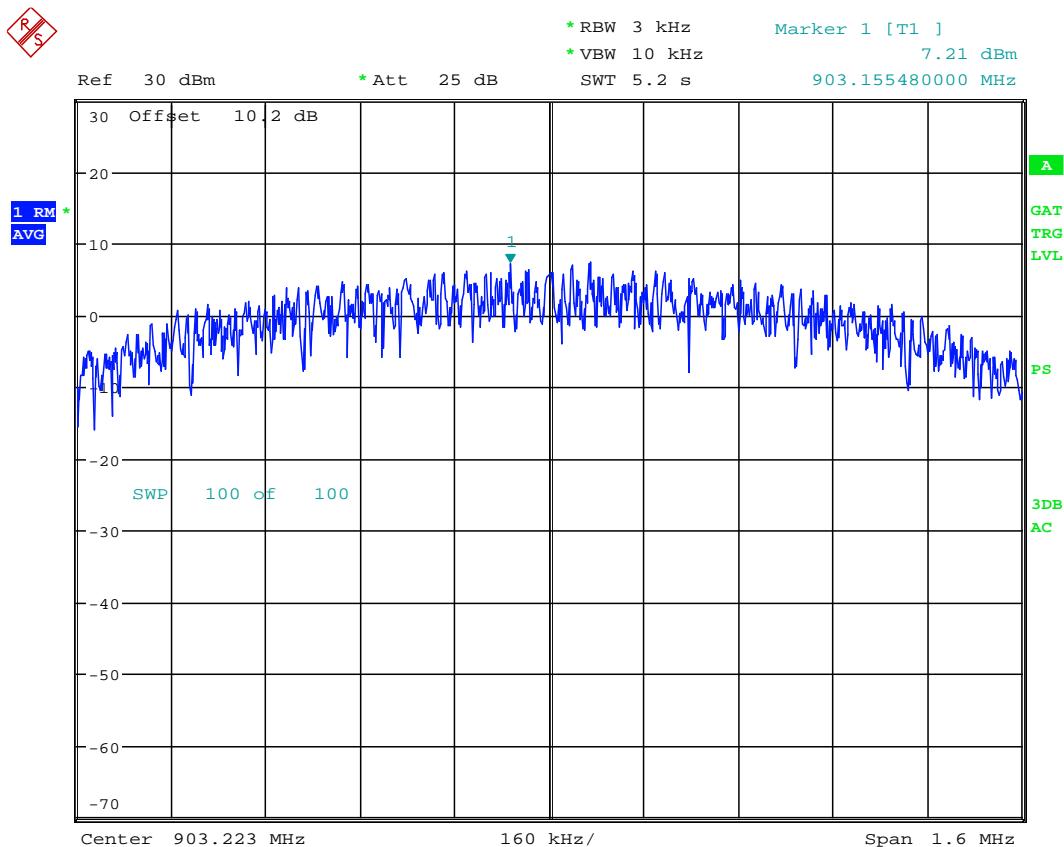
Since the EUT transmits the signal with Duty Cycle (100 ms on-time, 900 ms off-time), signal gating with gate length of 100 ms was used to ensure that the measurements are performed only during on-time transmission.

4.3.3 Test Result

Refer to the following plots for the test result

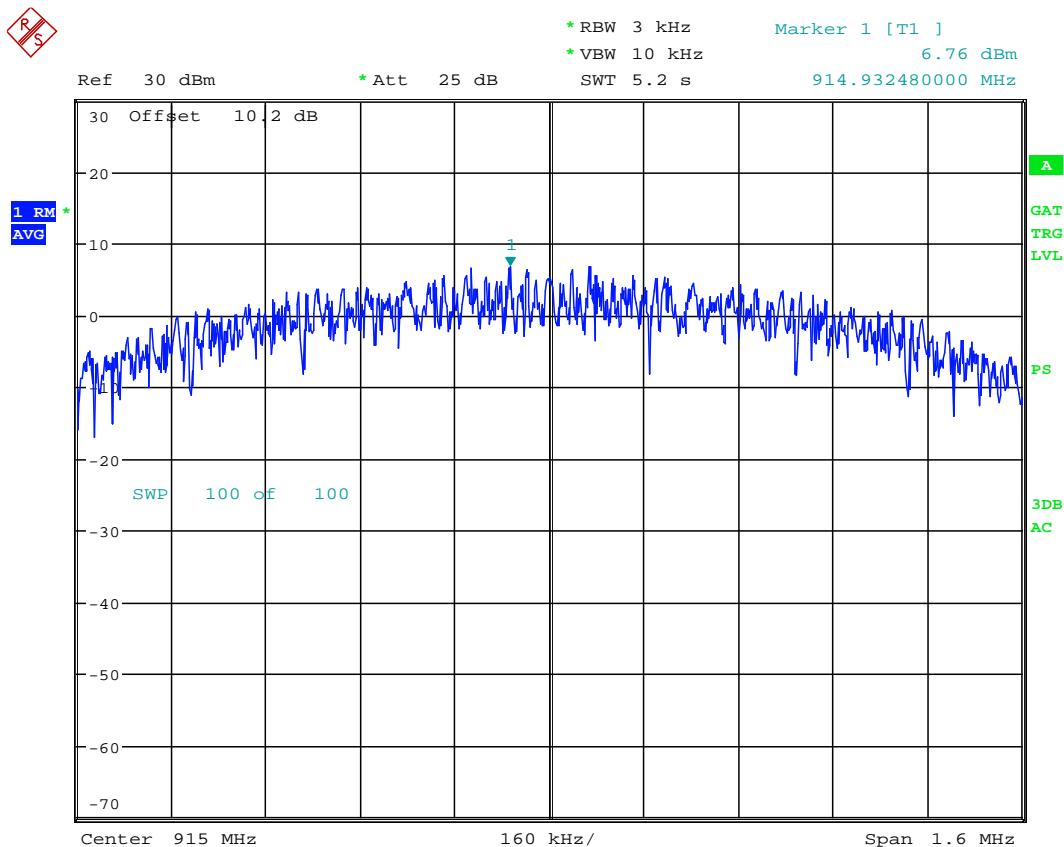
Frequency MHz	Maximum Power Spectral Density dBm	Maximum Power Spectral Density Limit dBm	Margin dB	Plot
903.223	7.21	8.0	-0.79	3.1
915.000	6.76	8.0	-1.24	3.2
926.777	7.85	8.0	-0.15	3.3

Plot 3. 1



Maximum power spectral density
Date: 28.MAR.2013 13:01:00

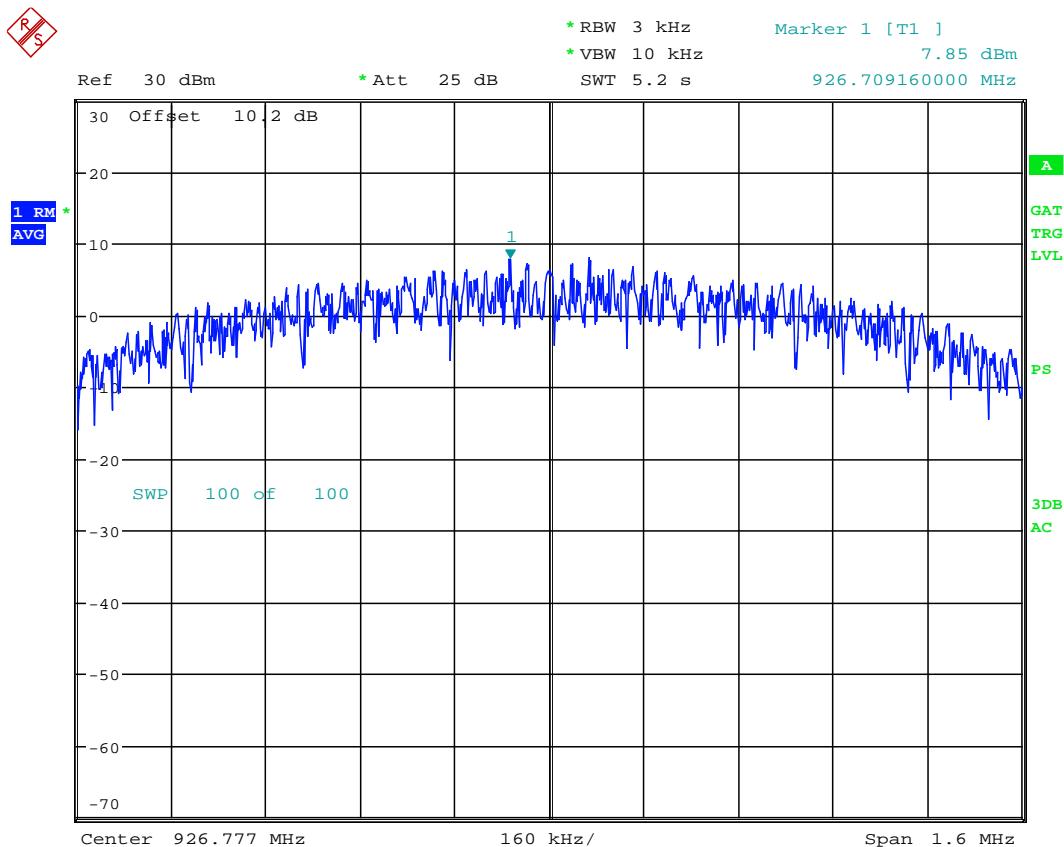
Plot 3.2



Maximum power spectral density

Date: 2.APR.2013 17:52:39

Plot 3.3



Maximum power spectral density
Date: 1.APR.2013 16:39:57

4.4 Unwanted Conducted Emissions FCC 15.247(d)

4.4.1 Requirement

In any 100 kHz bandwidth outside the EUT pass-band, the RF power shall be below the maximum in-band 100 kHz emissions by at least 20 dB (if peak power of in-band emission is measured) or 30 dB (if average power of in-band emission is measured).

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)

4.4.2 Procedure

A spectrum analyzer was connected to the antenna port of the transmitter. Analyzer Resolution Bandwidth was set to 100 kHz. For each channel investigated, the in-band and unwanted peak emission measurements (with max hold) were performed.

The unwanted emissions include out-of-band, spurious and inter-modulation emissions when two simultaneous channels were transmitted.

The unwanted emissions were measured from 30 MHz to 10 GHz.

4.4.3 Test Result

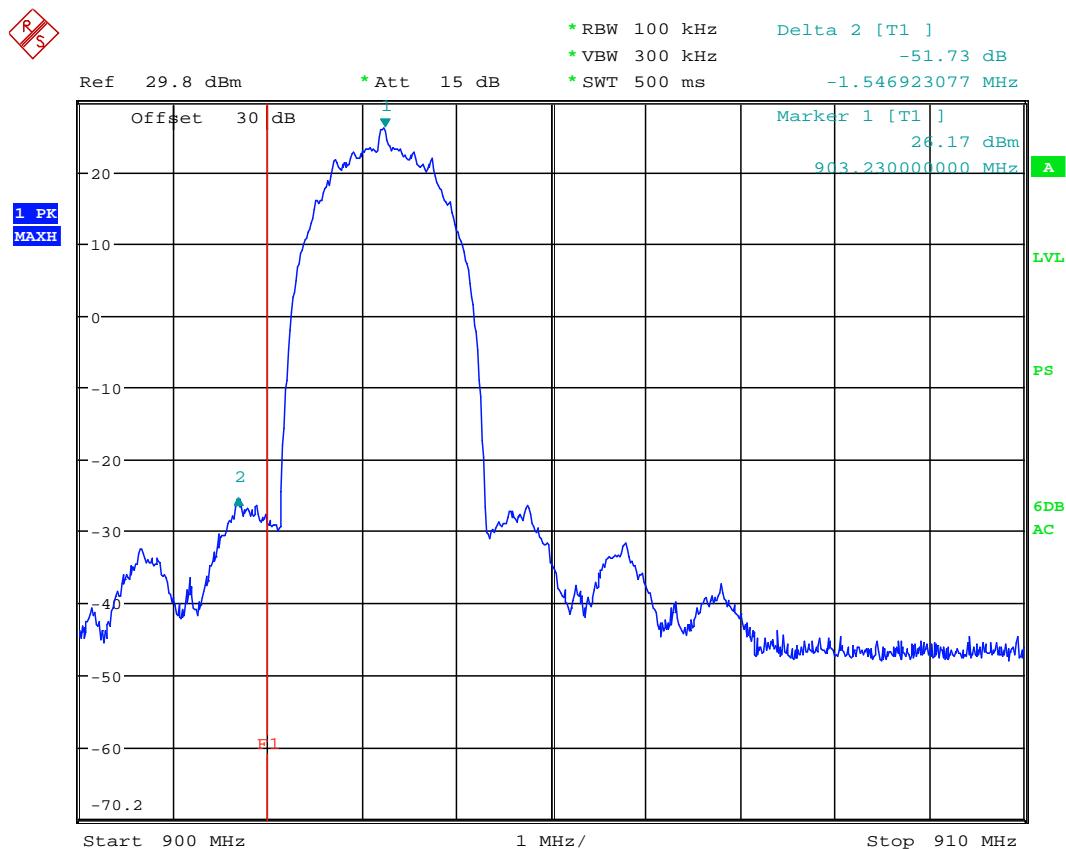
Refer to the following plots 4.1 – 4.42 for unwanted conducted emissions. The test results are summarized in The Table 4.1.

Table 4.1
Unwanted Conducted Emissions

Frequency MHz	In-band emissions dBm	Worst case Unwanted emissions dBm	Unwanted emissions Attenuation dB	Margin to 30 dB Attenuation Limit dB
903.223	26.2	-23.5	49.7	-19.7
915.000	25.6	-23.5	49.1	-19.1
926.777	26.7	-23.5	50.2	-20.2

Results	Complies
----------------	-----------------

Plot 4.1

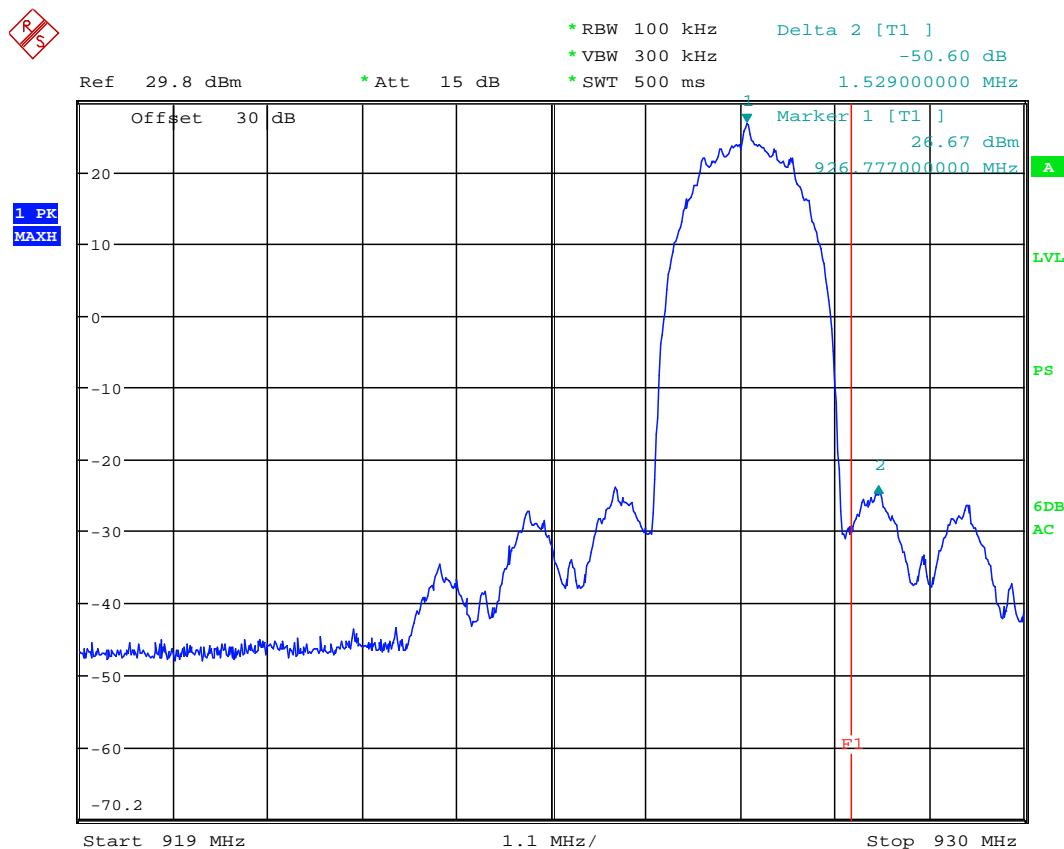


Unwanted conducted emissions

Date: 3.APR.2013 16:57:40

Tx @ 903.223 MHz

Plot 4.2

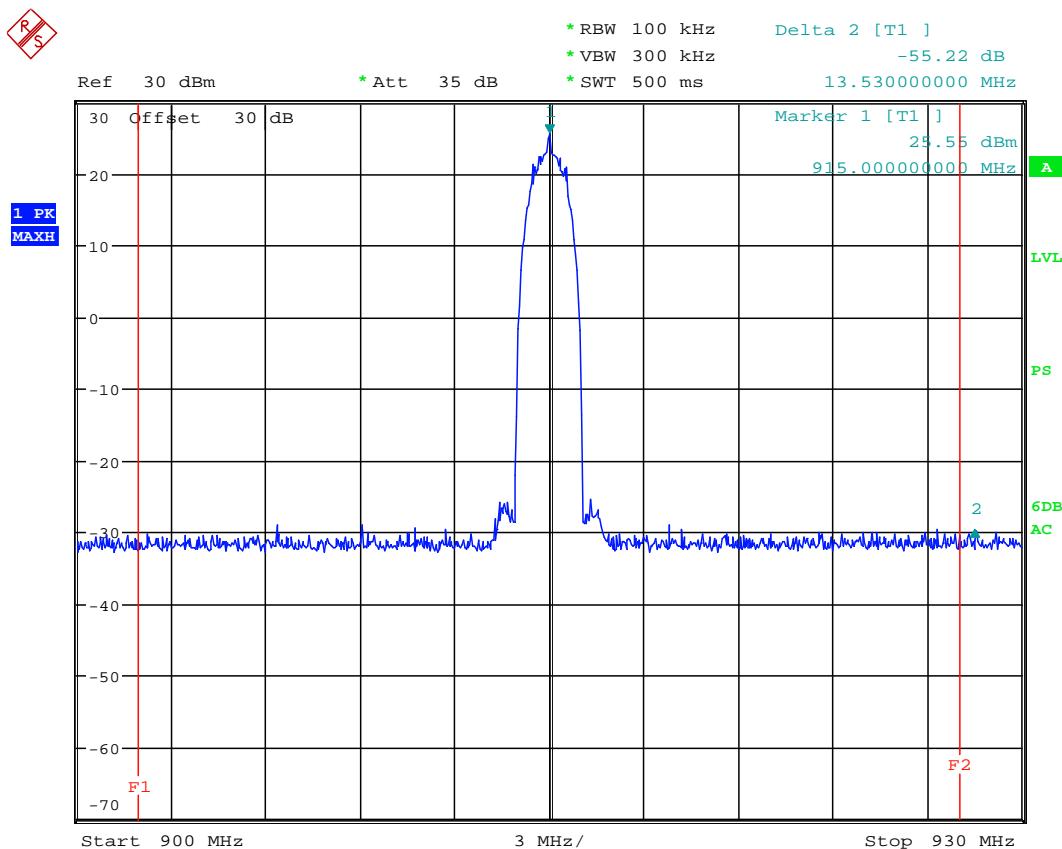


Unwanted conducted emissions

Date: 3.APR.2013 17:25:30

Tx @ 926.777 MHz

Plot 4.3

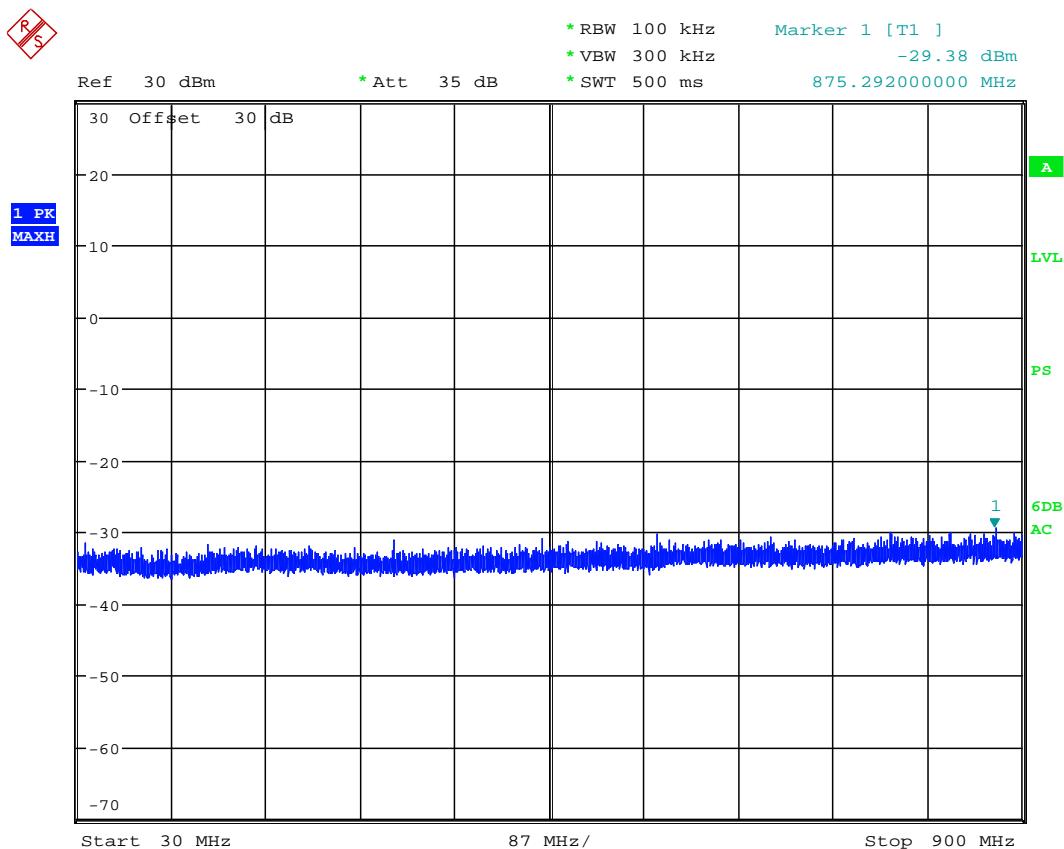


Unwanted conducted emissions

Date: 4.APR.2013 19:16:59

Tx @ 915 MHz

Plot 4.4

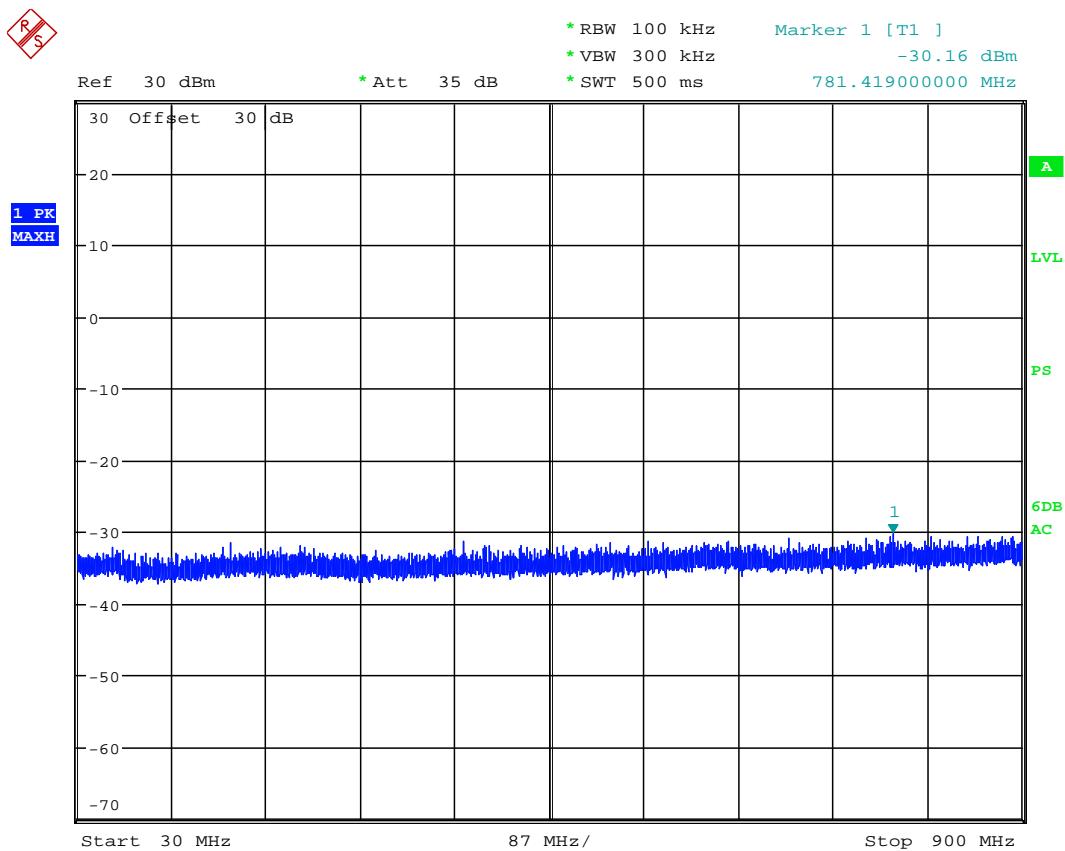


Unwanted conducted emissions

Date: 4.APR.2013 19:31:13

Tx @ 903.223 MHz

Plot 4.5

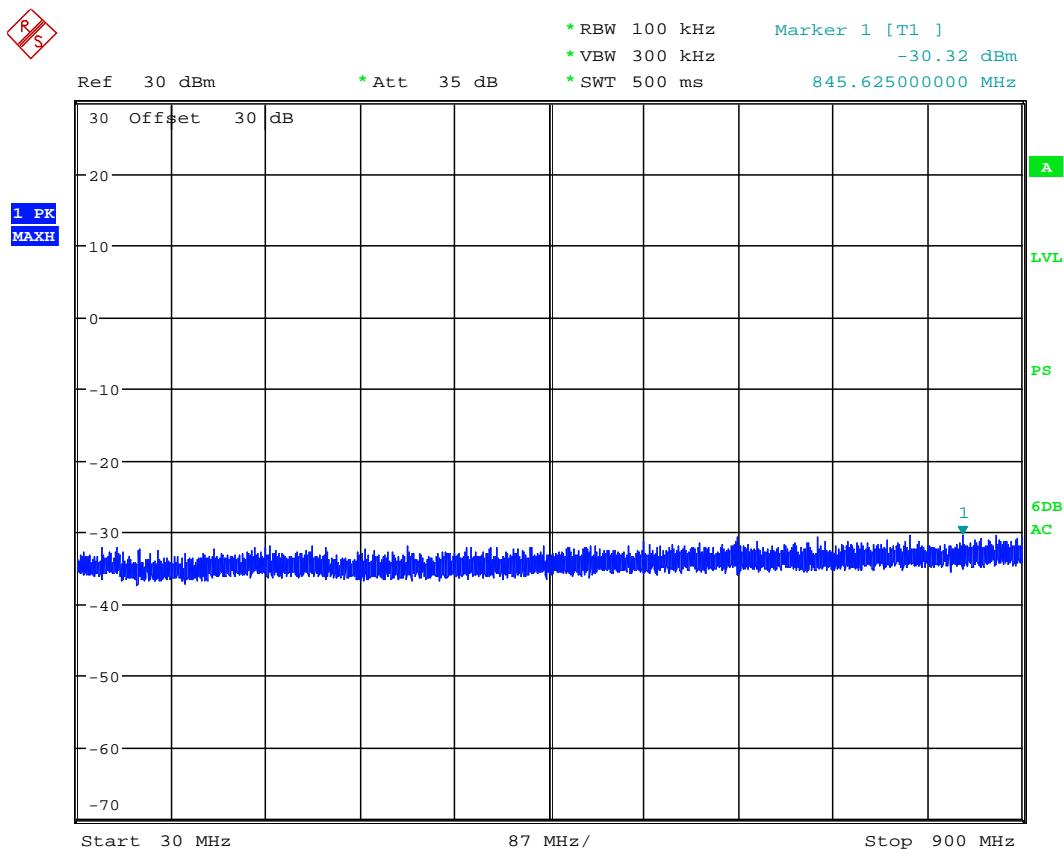


Unwanted conducted emissions

Date: 4.APR.2013 19:32:34

Tx @ 915 MHz

Plot 4.6

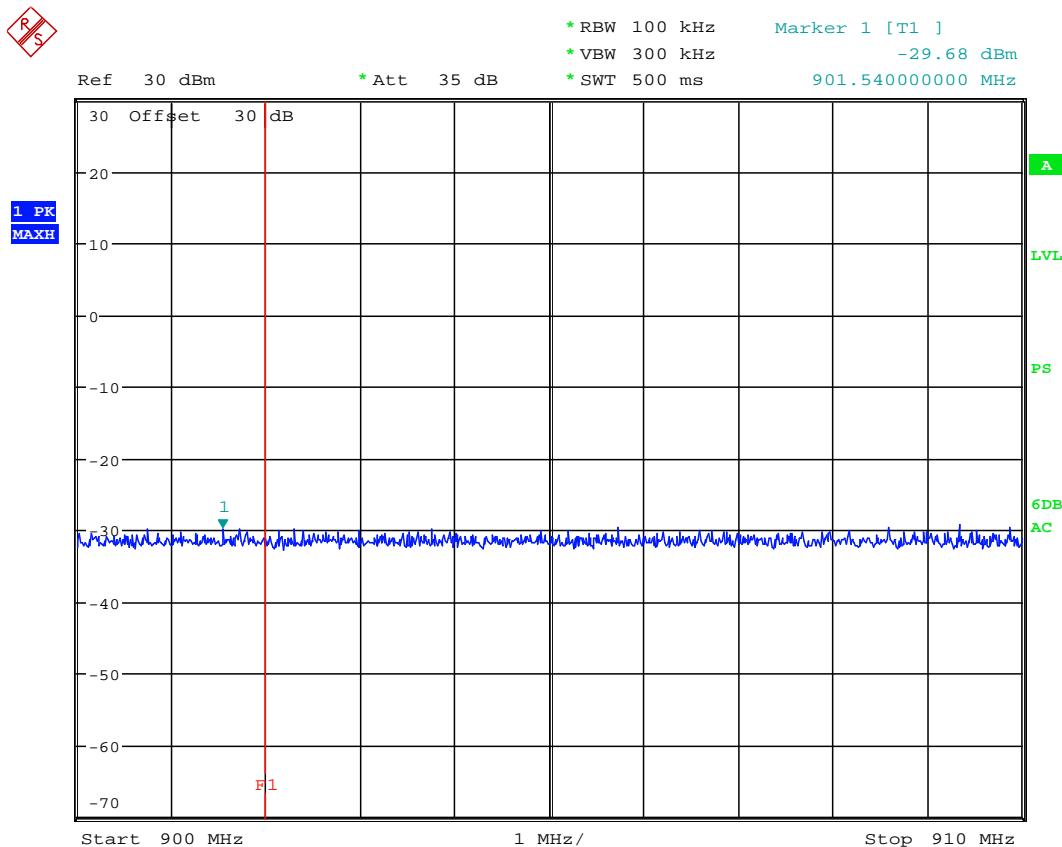


Unwanted conducted emissions

Date: 4.APR.2013 19:33:29

Tx @ 926.777 MHz

Plot 4.7



Unwanted conducted emissions

Date: 5.APR.2013 13:02:55

Tx @ 926.777 MHz

4.5 Transmitter Radiated Emissions

FCC Rule 15.247(d), 15.209, 15.205

4.5.1 Requirement

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)).

In any 100 kHz bandwidth outside the EUT pass-band, the RF power shall be below the maximum in-band 100 kHz emissions by at least 20 dB (if peak power of in-band emission is measured) or 30 dB (if average power of in-band emission is measured).

4.5.2 Procedure

Radiated emission measurements were performed from 30 MHz to 10 GHz. Spectrum Analyzer Resolution Bandwidth is 100 kHz or greater for frequencies 30 MHz to 1000 MHz, 1 MHz for frequencies above 1000 MHz. Above 1000 MHz Peak and Average measurements were performed.

The EUT is placed on a plastic turntable that is 80 cm in height. If the EUT attaches to peripherals, they are connected and operational (as typical as possible). During testing, all cables were manipulated to produce worst-case emissions. The signal is maximized through rotation. The antenna height and polarization are varied during the search for maximum signal level. The antenna height is varied from 1 to 4 meters.

Radiated emissions are taken at three meters for frequencies above 1 GHz and at 10 meters for frequencies below 1 GHz.

Data is included of the worst-case configuration (the configuration which resulted in the highest emission levels).

4.5.3 Field Strength Calculation

Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CF – AG; if measurement is performed at a distance other than specified in the rule, a Distance Correction Factor (DCF) shall be added.

Where FS = Field Strength in dB(μ V/m)

RA = Receiver Amplitude (including preamplifier) in dB(μ V); AF = Antenna Factor in dB(1/m)

CF = Cable Attenuation Factor in dB; AG = Amplifier Gain in dB

Assume a receiver reading of 52.0 dB(μ V) is obtained. The antennas factor of 7.4 dB(1/m) and cable factor of 1.6 dB is added. The amplifier gain of 29 dB is subtracted, giving field strength of 32 dB(μ V/m). This value in dB(μ V/m) was converted to its corresponding level in μ V/m.

RA = 52.0 dB(μ V)

AF = 7.4 dB(1/m)

CF = 1.6 dB

AG = 29.0 dB

FS = 52.0+7.4+1.6-29.0 = 32 dB(μ V/m).

Level in μ V/m = Common Antilogarithm [(32 dB μ V/m)/20] = 39.8 μ V/m.

4.5.3 Test Results

The data on the following pages list the significant emission frequencies, the limit and the margin of compliance.

The EUT passed the test by 0.8 dB.

Transmitter Radiated Emissions below 1GHz

Temperature: 22 C, Humidity : 55 %

Radiated Emissions 30 MHz - 1000 MHz

FCC Part 15 Class B

Operator: KK

7-Apr-13

Model Number: 200-0013-01

Company: NextNav LLC

Frequency	Quasi Pk FS	Limit@3m	Margin	RA	Cable	AF
Hz	dB(uV/m)	dB(uV/m)	dB	dB(uV)	dB	dB(1/m)
3.758E+07	39.2	40.0	-0.8	20.5	0.7	18.0
7.435E+07	36.9	40.0	-3.1	29.4	1.0	6.5
7.515E+07	38.8	40.0	-1.2	31.2	1.0	6.6
1.234E+08	40.2	43.5	-3.3	26.7	1.3	12.2
1.637E+08	39.7	43.5	-3.8	29.5	1.5	8.7

Test Mode: Tx @ 903.223MHz

Radiated Emissions 30 MHz - 1000 MHz

FCC Part 15 Class B

Operator: KK

7-Apr-13

Model Number: 200-0013-01

Company: NextNav LLC

Frequency	Quasi Pk FS	Limit@3m	Margin	RA	Cable	AF
Hz	dB(uV/m)	dB(uV/m)	dB	dB(uV)	dB	dB(1/m)
3.758E+07	39.1	40.0	-0.9	20.4	0.7	18.0
7.435E+07	36.5	40.0	-3.5	29.0	1.0	6.5
7.515E+07	38.9	40.0	-1.1	31.3	1.0	6.6
1.234E+08	39.9	43.5	-3.6	26.4	1.3	12.2
1.637E+08	39.5	43.5	-4.0	29.3	1.5	8.7

Test Mode: Tx @ 915.0MHz

Radiated Emissions 30 MHz - 1000 MHz

FCC Part 15 Class B

Operator: KK

7-Apr-13

Model Number: 200-0013-01

Company: NextNav LLC

Frequency	Quasi Pk FS	Limit@3m	Margin	RA	Cable	AF
Hz	dB(uV/m)	dB(uV/m)	dB	dB(uV)	dB	dB(1/m)
3.758E+07	38.8	40.0	-1.2	20.1	0.7	18.0
7.435E+07	36.7	40.0	-3.3	29.2	1.0	6.5
7.515E+07	39.1	40.0	-0.9	31.5	1.0	6.6
1.234E+08	38.4	43.5	-5.1	24.9	1.3	12.2
1.637E+08	39.1	43.5	-4.4	28.9	1.5	8.7

Test Mode: Tx @ 926.777MHz

Transmitter Radiated Emissions above 1GHz (Single Channel)

Frequency	Detector	SA reading	Corr. Factor	Antenna factor	FS at 3m	FS Limit	Margin
MHz		dB(uV)	dB	dB(1/m)	dB(uV/m)	dB(uV/m)	dB
Tx @ 903.223MHz							
2709.669	Peak	37.7	-30.0	28.8	36.5	74.0	-37.5
3612.892	Peak	39.7	-30.8	30.9	39.8	74.0	-34.2
4516.115	Peak	39.0	-29.4	32.1	41.7	74.0	-32.3
5419.338	Peak	37.7	-24.7	33.7	46.7	74.0	-27.3
8129.007	Peak	36.6	-22.8	37.1	50.9	74.0	-23.1
9032.23	Peak	35.9	-21.2	37.4	52.1	54.0	-21.9
2709.669	Ave	24.8	-30.0	28.8	23.6	54.0	-30.4
3612.892	Ave	26.7	-30.8	30.9	26.8	54.0	-27.2
4516.115	Ave	25.4	-29.4	32.1	28.1	54.0	-25.9
5419.338	Ave	24.0	-24.7	33.7	33.0	54.0	-21.0
8129.007	Ave	22.4	-22.8	37.1	36.7	54.0	-17.3
9032.23	Ave	22.6	-21.2	37.4	38.8	54.0	-15.2
Tx @ 915.0MHz							
2745.0	Peak	38.2	-30.0	28.8	37.0	74.0	-37.0
3660.0	Peak	38.2	-30.1	31.0	39.1	74.0	-34.9
4575.0	Peak	38.1	-29.0	32.3	41.4	74.0	-32.6
7320.0	Peak	35.8	-22.9	37.3	50.2	74.0	-23.8
8235.0	Peak	35.9	-23.5	37.2	49.6	74.0	-24.4
9150.0	Peak	35.7	-19.6	37.4	53.5	74.0	-20.5
2745.0	Ave	25.1	-30.0	28.8	23.9	54.0	-30.1
3660.0	Ave	25.7	-30.1	31.0	26.6	54.0	-27.4
4575.0	Ave	24.7	-29.0	32.3	28.0	54.0	-26.0
7320.0	Ave	22.3	-22.9	37.3	36.7	54.0	-17.3
8235.0	Ave	22.4	-23.5	37.2	36.1	54.0	-17.9
9150.0	Ave	22.6	-19.6	37.4	40.4	54.0	-13.6
Tx @ 926.777MHz							
2780.331	Peak	38.7	-30.3	28.7	37.1	74.0	-36.9
3707.108	Peak	38.1	-30.2	31.2	39.1	74.0	-34.9
4633.885	Peak	37.8	-28.7	32.5	41.6	74.0	-32.4
7414.216	Peak	35.8	-22.9	37.5	50.4	74.0	-23.6
8340.993	Peak	35.8	-24.5	37.3	48.6	74.0	-25.4
2780.331	Ave	25.1	-30.3	28.7	23.5	54.0	-30.5
3707.108	Ave	25.1	-30.2	31.2	26.1	54.0	-27.9
4633.885	Ave	24.3	-28.7	32.5	28.1	54.0	-25.9
7414.216	Ave	22.6	-22.9	37.5	37.2	54.0	-16.8
8340.993	Ave	22.3	-24.5	37.3	35.1	54.0	-18.9

Notes:

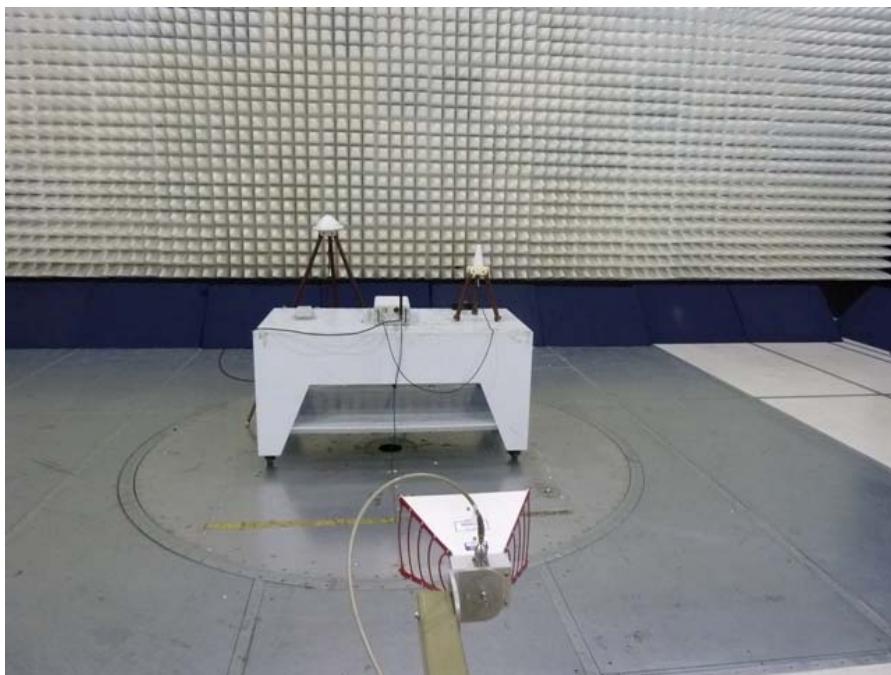
- a) RBW = 1 MHz, VBW = 1 MHz - for peak measurements
RBW = 1MHz, VBW = 10 Hz - for average measurements
- b) Correction Factor: Cable loss + High Pass Filter loss - Pre-amplifier gain
- c) FS at 3m = SA reading + Correction Factor + Antenna factor
- d) Measurements made at 3 meters distance. Radiated emission measurements were performed up to 10GHz. No other emissions were detected above the noise floor which is at least 10 dB below the limit.

4.5.4 Test setup photographs

The following photographs show the testing configurations used.



4.6.4 Test Setup Photographs



4.6 Radiated Emissions from Digital Parts
FCC Ref: 15.109

4.6.1 Requirement

Limits for Electromagnetic Radiated Emissions, FCC Section 15.109(b) and ICES 003 *

Frequency (MHz)	Class A at 10m dB(µV/m)	Class B at 3m dB(µV/m)
30-88	39	40.0
88-216	43.5	43.5
216-960	46.4	46.0
Above 960	49.5	54.0

* According to FCC Part 15.109(g) an alternative to the radiated emission limits shown above, digital devices may be shown to comply with the limit of CISPR Pub. 22

4.6.2 Procedure

Measurements are conducted with a quasi-peak detector instrument in the frequency range of 30 MHz to 1000 MHz and with the average detector instrument in the frequency range above 1000 MHz. The measuring receiver meets the requirements of Section One of CISPR 16 and the measuring antenna correlates to a balanced dipole.

Measurements of the radiated field are made with the antenna located at a distance of 10 meters from the EUT. If the field-strength measurements at 10m cannot be made because of high ambient noise level or for other reasons, measurements of Class B equipment may be made at a closer distance, for example 3m. An inverse proportionality factor of 20 dB per decade should be used to normalize the measured data to the specified distance for determining compliance.

The antenna is adjusted between 1m and 4m in height above the ground plane for maximum meter reading at each test frequency.

The antenna-to-EUT azimuth is varied during the measurement to find the maximum field-strength readings.

The antenna-to-EUT polarization (horizontal and vertical) is varied during the measurements to find the maximum field-strength readings.

The EUT, where intended for tabletop use, is placed on a table whose top is 0.8m above the ground plane. The table is constructed of non-conductive materials. Its dimensions are 1m by 1.5m, but may be extended for a larger EUT.

Floor standing EUTs are placed on a horizontal metal ground plane and isolated from the ground plane by 3 to 12 mm of insulating material.

Equipment setup for radiated disturbance tests followed the guidelines of ANSI C63.4 (2003).

Example Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor to from the measured reading, followed by subtracting the Amplifier Gain (if any) and Distance Correction Factor (if any). The basic equation with a sample calculation is as follows:

$$FS = RA + AF + CF - PA - DCF$$

Where FS = Field Strength in dB (μ V/m)

RA = Receiver Amplitude (including preamplifier) in dB (μ V)

CF = Cable Attenuation Factor in dB

AF = Antenna Factor in dB (1/m)

AG = Amplifier Gain in dB

DCF=Distance Correction Factor in dB

(Formula: $DCF = 20\log_{10}(\text{measurement distance}/\text{specification distance})$)

Assume a receiver reading of 52.0 dB (μ V) is obtained. The antenna factor of 7.4 dB and cable factor of 1.6 dB is added. The amplifier gain of 29 dB and DCF of 10.5 dB (DCF in this example: $20\log_{10}(10/3)$) is subtracted, giving field strength of 21.5 dB (μ V/m).

$$RA = 52.0 \text{ dB } (\mu\text{V})$$

$$AF = 7.4 \text{ dB } (1/\text{m})$$

$$CF = 1.6 \text{ dB}$$

$$AG = 29.0 \text{ dB}$$

$$DCF=10.5 \text{ dB}$$

$$FS = RF + AF + CF - AG - DCF$$

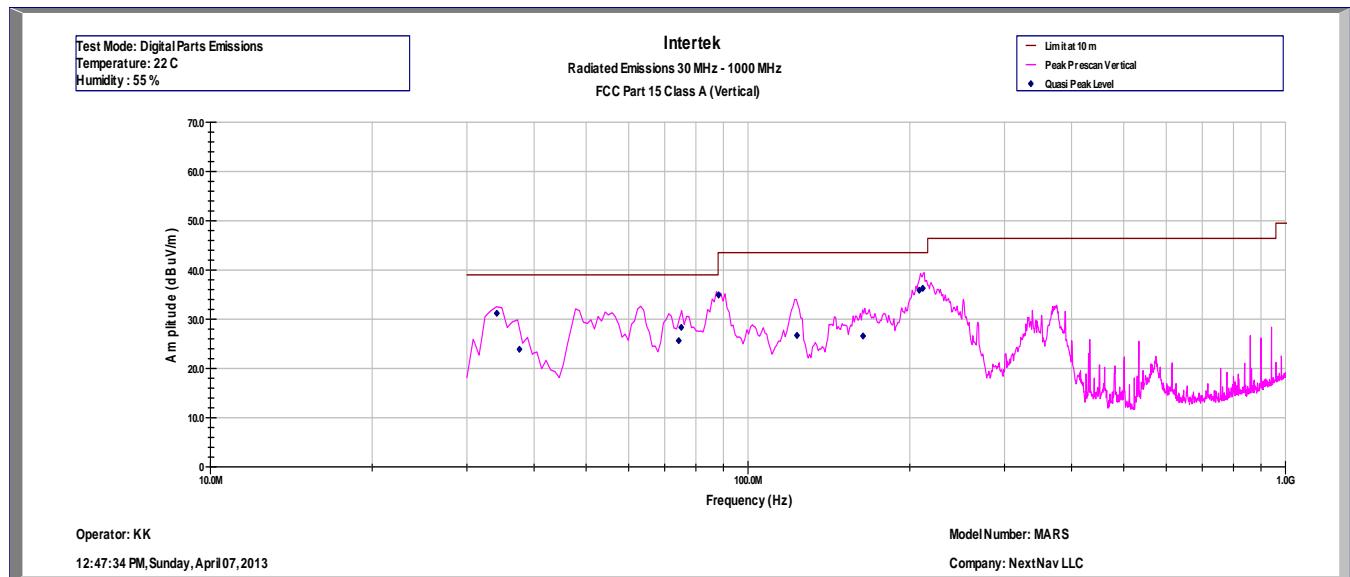
$$FS = 52.0 + 7.4 + 1.6 - 29.0 - 10.5$$

$$FS = 21.5 \text{ dB } (\mu\text{V}/\text{m})$$

4.6.3 Test Results

Radiated emission measurements were performed from 30 MHz to 1000 MHz. Spectrum Analyzer Resolution Bandwidth is 100 kHz or greater below 1000 MHz and 1 MHz - above 1000 MHz.

The EUT passed by 7.2 dB for Class A.



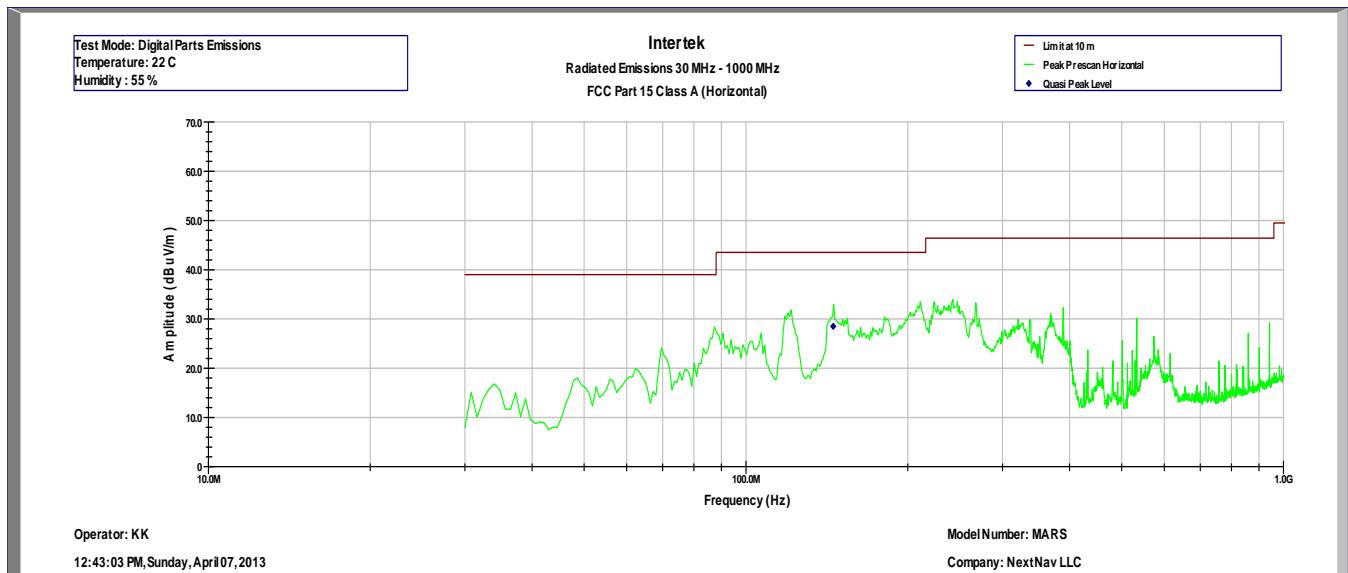
Intertek Testing Services
Radiated Emissions 30 MHz - 1000 MHz
FCC Part 15 Class A (QP-Vertical)

Operator: KK
April 07, 2013

Model Number: 200-0013-01
Company: NextNav LLC

Frequency	Quasi Pk FS	Limit@10m	Margin	RA	CF	AG	AF	DCF
Hz	dB(uV/m)	dB(uV/m)	dB	dB	dB	dB	dB(1/m)	dB
3.410E+07	31.2	39.0	-7.8	54.8	0.7	32.1	18.3	10.5
3.758E+07	23.9	39.0	-15.1	47.8	0.7	32.1	18.0	10.5
7.435E+07	25.6	39.0	-13.4	60.7	1.0	32.1	6.5	10.5
7.515E+07	28.3	39.0	-10.7	63.3	1.0	32.1	6.6	10.5
8.815E+07	34.9	43.5	-8.6	68.3	1.1	32.1	8.1	10.5
1.234E+08	26.7	43.5	-16.8	55.7	1.3	32.0	12.2	10.5
1.637E+08	26.6	43.5	-16.9	58.9	1.5	32.0	8.7	10.5
2.083E+08	35.9	43.5	-7.6	65.7	1.7	32.0	11.0	10.5
2.115E+08	36.3	43.5	-7.2	65.9	1.7	32.0	11.2	10.5

Test Mode: Digital Parts Emissions
Temperature: 22 C
Humidity: 55 %



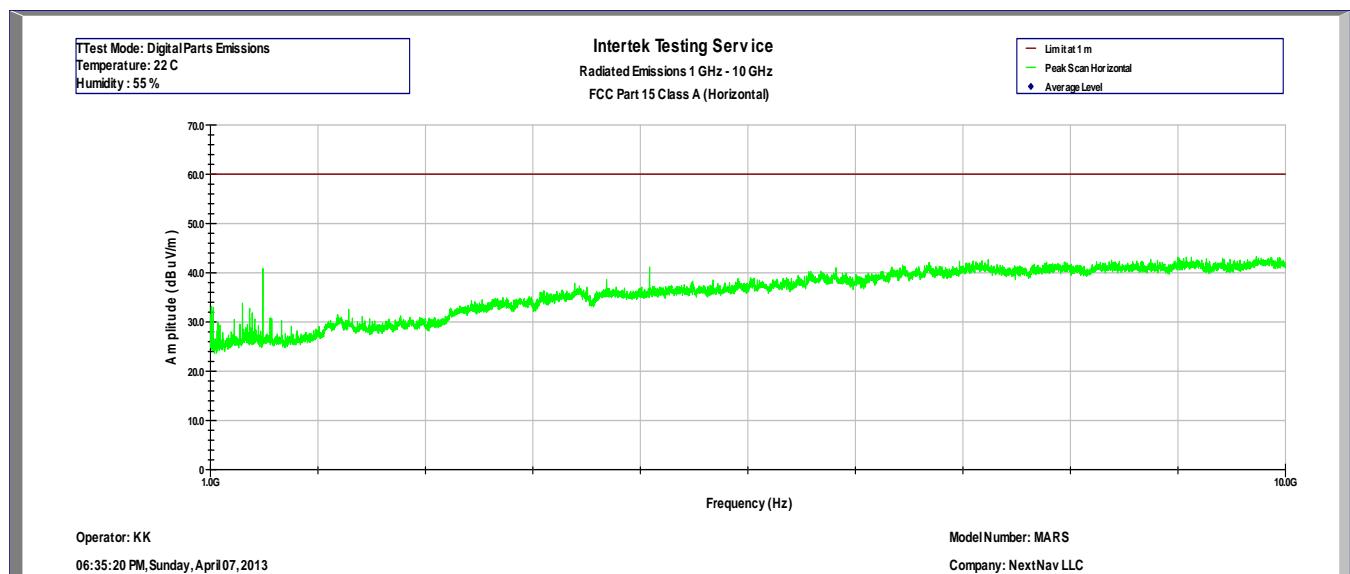
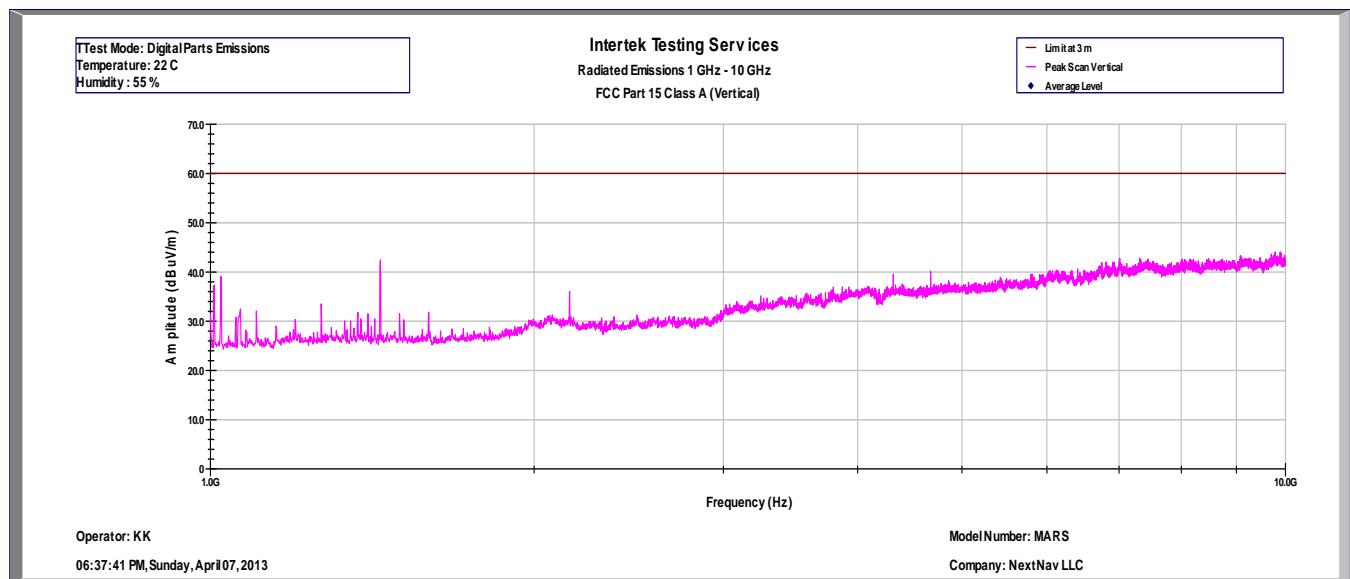
Intertek Testing Services
Radiated Emissions 30 MHz - 1000 MHz
FCC Part 15 Class A (QP-Horizontal)

Operator: KK
April 07, 2013

Model Number: 200-0013-01
Company: NextNav LLC

Frequency	Quasi Pk FS	Limit@10m	Margin	RA	CF	AG	AF	DCF
Hz	dB(uV/m)	dB(uV/m)	dB	dB	dB	dB	dB(1/m)	dB
1.454E+08	28.5	43.5	-15.0	60.6	1.4	32.0	9.0	10.5

Test Mode: Digital Parts Emissions
Temperature: 22 C
Humidity : 55 %

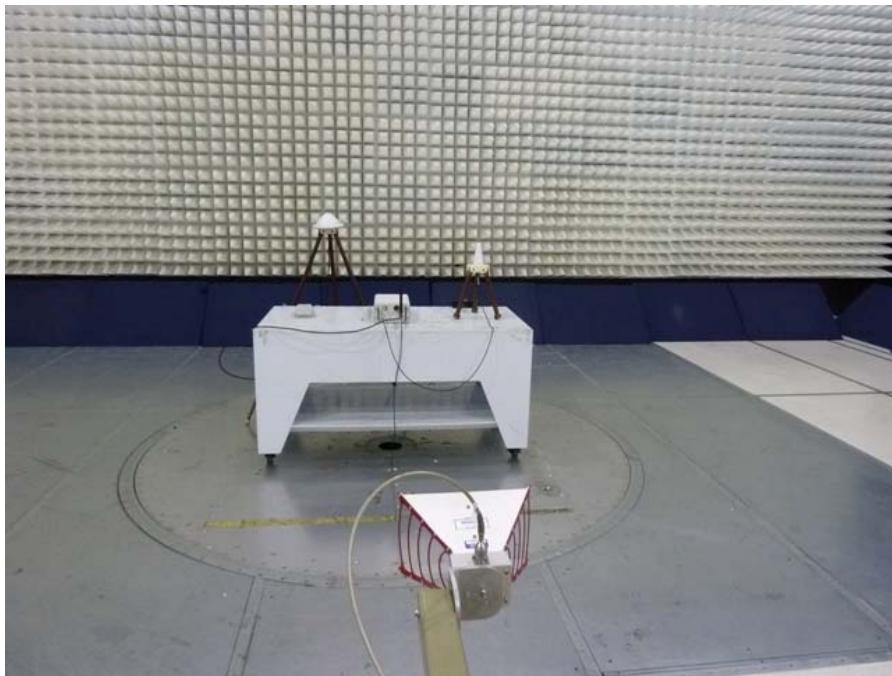


4.6.4 Test setup photographs

The following photographs show the testing configurations used.



4.6.4 Test Setup Photographs



4.7 AC Line Conducted Emission
FCC 15.207, 15.107

4.7.1 Requirement

Frequency Band MHz	Class B Limit dB(µV)		Class A Limit dB(µV)	
	Quasi-Peak	Average	Quasi-Peak	Average
0.15-0.50	66 to 56 *	56 to 46 *	79	66
0.50-5.00	56	46	73	60
5.00-30.00	60	50	73	60

*Note: *Decreases linearly with the logarithm of the frequency
At the transition frequency the lower limit applies.*

4.7.2 Procedure

Measurements are carried out using quasi-peak and average detector receivers in accordance with CISPR 16. An AMN is required to provide a defined impedance at high frequencies across the power feed at the point of measurement of terminal voltage and also to provide isolation of the circuit under test from the ambient noise on the power lines. An AMN as defined in CISPR 16 shall be used.

The EUT is located so that the distance between the boundary of the EUT and the closest surface of the AMN is 0.8m.

Where a flexible mains cord is provided by the manufacturer, this shall be 1m long or if in excess of 1m, the excess cable is folded back and forth as far as possible so as to form a bundle not exceeding 0.4m in length.

The EUT is arranged and connected with cables terminated in accordance with the product specification.

Conducted disturbance is measured between the phase lead and the reference ground, and between the neutral lead and the reference ground. Both measured values are reported.

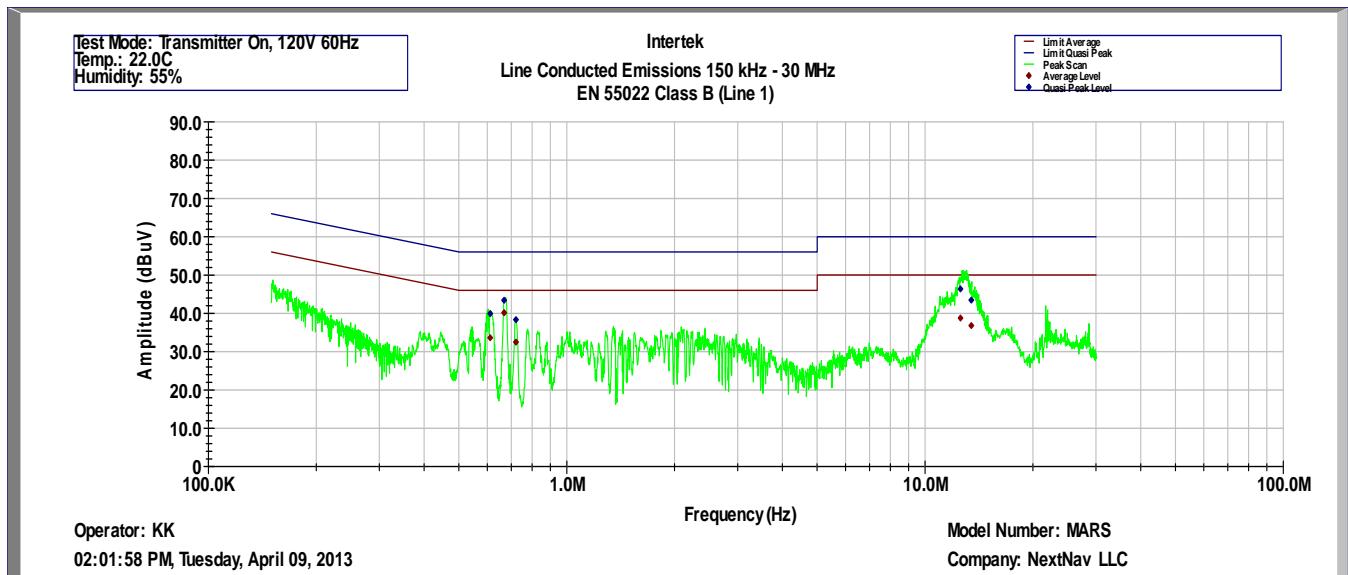
The EUT, where intended for tabletop use, is placed on a table whose top is 0.8m above the ground plane. A vertical, metal reference plane is placed 0.4m from the EUT. The vertical metal reference-plane is at least 2m by 2m. The EUT shall be kept at least 0.8m from any other metal surface or other ground plane not being part of the EUT. The table is constructed of non-conductive materials. Its dimensions are 1m by 1.5m, but may be extended for larger EUT.

Floor standing EUT are placed on a horizontal metal ground plane and isolated from the ground plane by resting on an insulating material. The metal ground plane extends at least 0.5m beyond the boundaries of the EUT and has minimum dimensions of 2m by 2m.

Equipment setup for conducted disturbance tests followed the guidelines of ANSI C63.4.

4.7.3 Test Result

AC Line Conducted Emission Data, EUT in transmitting mode



Intertek Testing Services
Line Conducted Emissions 150 kHz - 30 MHz
EN 55022 Class B (Line 1)

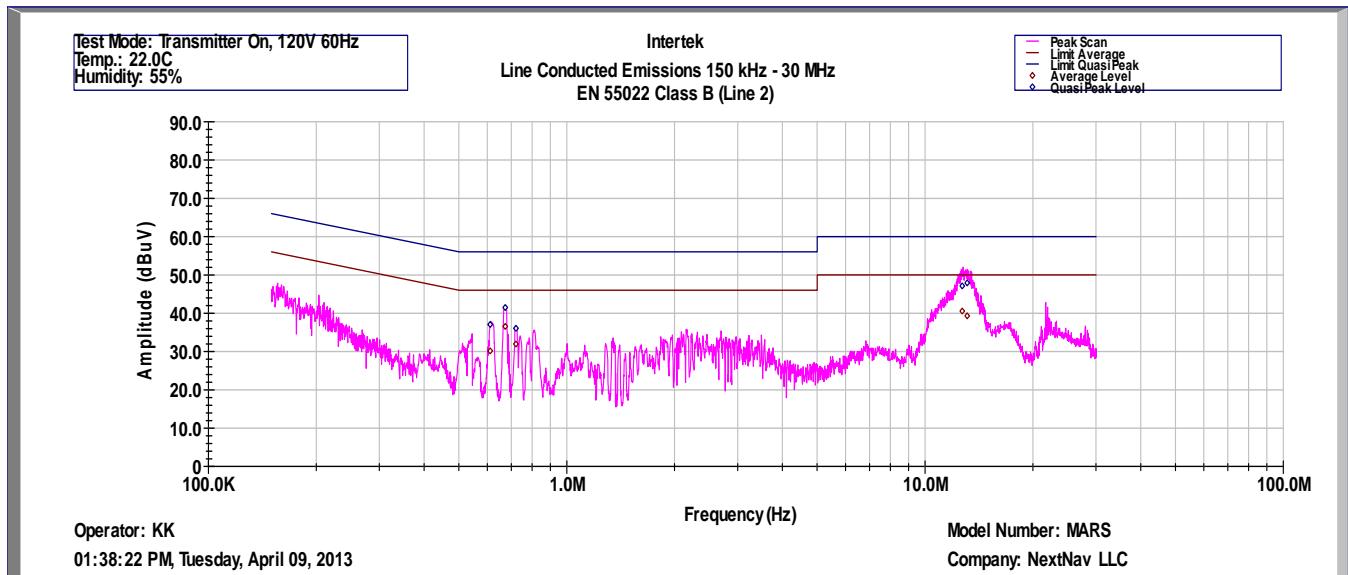
Operator: KK
April 09, 2013

Model Number: 200-0013-01
Company: NextNav LLC

Frequency	Av Level	QP Level	Av Limit	QP Limit	Av Margin	QP Margin
Hz	dBuV	dBuV	dBuV	dBuV	dB	dB
611354	33.6	39.9	46	56	-12.4	-16.1
668686	40.2	43.4	46	56	-5.8	-12.6
721335	32.5	38.3	46	56	-13.5	-17.7
12554500	38.8	46.3	50	60	-11.2	-13.7
13458800	36.8	43.4	50	60	-13.2	-16.6

Test Mode: Transmitter On, 120V 60Hz
Temp.: 22.0C
Humidity: 55%

AC Line Conducted Emission Data, EUT in transmitting mode



Intertek Testing Services
 Line Conducted Emissions 150 kHz - 30 MHz
 EN 55022 Class B (Line 2)

Operator: KK
 April 09, 2013

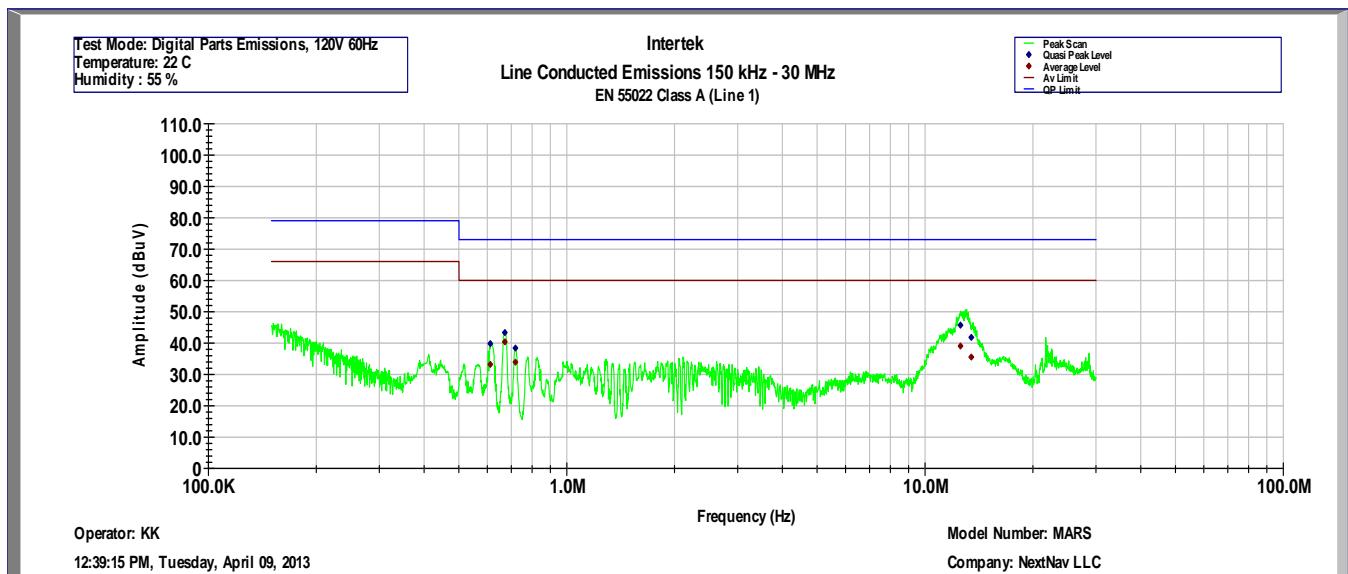
Model Number: 200-0013-01
 Company: NextNav LLC

Frequency	Av Level	QP Level	Av Limit	QP Limit	Av Margin	QP Margin
Hz	dBuV	dBuV	dBuV	dBuV	dB	dB
611098	30.1	37.0	46.0	56.0	-15.9	-19.0
673594	36.5	41.5	46.0	56.0	-9.5	-14.5
721014	31.9	36.1	46.0	56.0	-14.1	-19.9
12692300	40.6	47.1	50.0	60.0	-9.4	-12.9
13103800	39.3	47.9	50.0	60.0	-10.7	-12.1

Test Mode: Transmitter On, 120V 60Hz
 Temp.: 22.0C
 Humidity: 55%

Results	Complies by 5.8 dB
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AC Line Conducted Emission Data, Digital Parts Emissions



Intertek
Line Conducted Emissions 150 kHz - 30 MHz
EN 55022 Class A (Line 1)

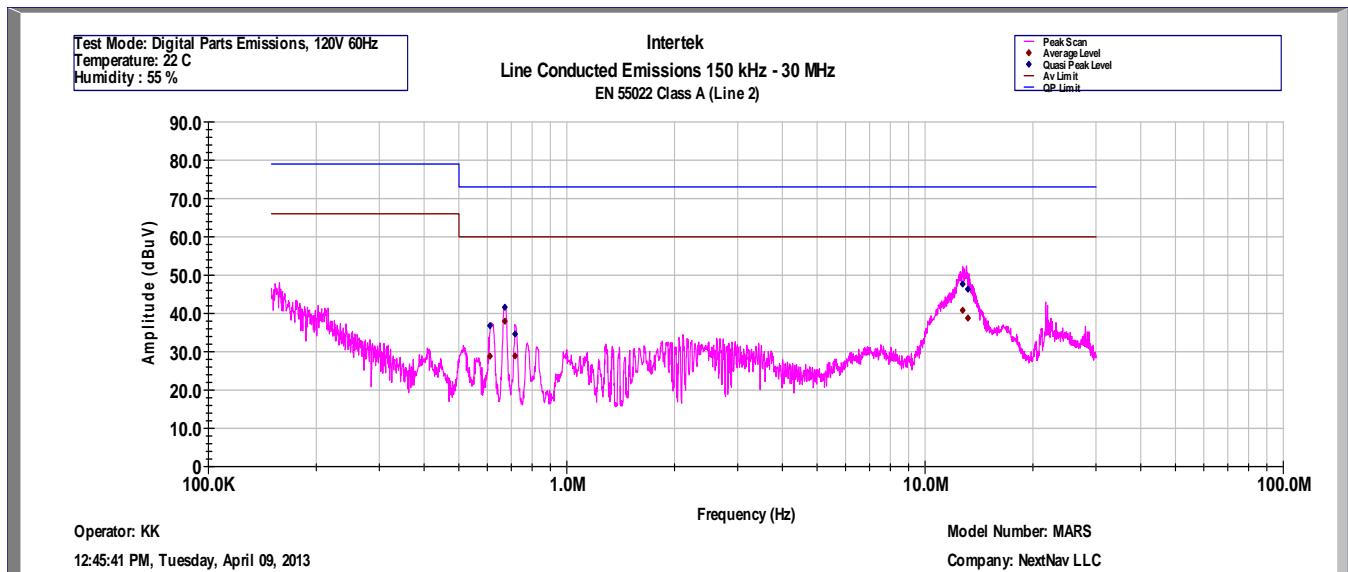
Operator: KK
April 09, 2013

Model Number: 200-0013-01
Company: NextNav LLC

Frequency	Av Level	QP Level	Av Limit	QP Limit	Av Margin	QP Magin
Hz	dBuV	dBuV	dBuV	dBuV	dB	dB
611712	33.2	39.8	60.0	73.0	-26.8	-33.2
671491	40.4	43.4	60.0	73.0	-19.6	-29.6
718821	33.9	38.4	60.0	73.0	-26.1	-34.6
12552500	39.0	45.7	60.0	73.0	-21.0	-27.3
13458900	35.5	41.8	60.0	73.0	-24.5	-31.2

Test Mode: Digital Parts Emissions, 120V 60Hz
Temperature: 22 C
Humidity: 55 %

AC Line Conducted Emission Data, Digital Parts Emissions



Intertek
 Line Conducted Emissions 150 kHz - 30 MHz
 EN 55022 Class A (Line 2)

Operator: KK
 April 09, 2013

Model Number: 200-0013-01
 Company: NextNav LLC

Frequency	Av Level	QP Level	Av Limit	QP Limit	Av Margin	QP Magin
Hz	dBuV	dBuV	dBuV	dBuV	dB	dB
610547	28.8	36.8	60.0	73.0	-31.2	-36.2
671659	38.0	41.6	60.0	73.0	-22.0	-31.4
717327	28.9	34.6	60.0	73.0	-31.1	-38.4
12726600	40.8	47.7	60.0	73.0	-19.2	-25.3
13166900	38.8	46.3	60.0	73.0	-21.2	-26.7

Test Mode: Digital Parts Emissions, 120V 60Hz
 Temperature: 22 C
 Humidity : 55 %

Results

Complies by 19.6 dB

4.7.4 Test Configuration Photographs

The following photographs show the testing configurations used.



5.0 List of Test Equipment

Measurement equipment used for emission compliance testing utilized the equipment on the following list:

Equipment	Manufacturer	Model/Type	Serial #	Cal Int	Cal Due
RF Filter Section	Hewlett Packard	85460A	3448A00267	12	03/12/14
EMI Receiver	Hewlett Packard	8546A	3710A00373	12	03/12/14
Spectrum Analyzer	Rohde&Schwarz	FSU	200482	12	04/05/13
Spectrum Analyzer	Rohde&Schwarz	FSP-40	100030	12	11/19/13
Spectrum Analyzer	Rohde and Schwartz	ESU	100172	12	10/05/13
BI-Log Antenna	ARA	LPB-2513/A	1154	12	07/12/13
Horn Antenna	EMCO	3115	9107-3712	12	12/06/13
Horn Antenna	EMCO	3115	00126795	12	11/15/13
Pyramidal Horn Antenna	EMCO	3160-09	Not Labeled	#	#
Pyramidal Horn Antenna	EMCO	3160-10	Not Labeled	#	#
Pre-Amplifier	Sonoma	310N	293620	12	11/20/13
Pre-Amplifier	Miteq	AMF-4D-001180-24-10P	799159	12	09/10/13
Pre-Amplifier	Miteq	JSD44-18004000-30-5P	1071636	12	05/11/13
Signal Generator	Hewlett Packard	SMR40	100445	12	09/06/13
LISN	FCC	FCC-LISN-50-50-M-H	2012	12	06/28/13

No Calibration required

6.0 Document History

Revision/ Job Number	Writer Initials	Date	Change
1.0 / G101123079, G101166195	KK	April 15, 2013	Original document