TEST REPORT

Report Number: 101277100MPK-001
Project Numbers: G101277100, G101123079 & G101166195
August 07, 2013

Testing performed on the
NextNav Local
Model Number: MARS
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:	Test Authorized by:
Intertek	NextNav LLC
1365 Adams Court	484 Oakmead Parkway
Menlo Park, CA 94025 USA	Sunnyvale, CA 94085, USA

Prepared by: _____ **Date:** August 07, 2013
Krishna K Vemuri

Reviewed by: _____ **Date:** August 07, 2013
Jason Centers

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Report No. 101277100MPK-001

Equipment Under Test:	NextNav Local
Trade Name:	NEXTNAV
Model Numbers:	MARS
Serial Numbers	001
Applicant:	NextNav LLC
Contact:	Waldemar Kunysz
Address:	484 Oakmead Parkway Sunnyvale, CA 94085
Country	USA
Tel. Number:	(408) 400-7850
Email:	wkunysz@nextnav.com
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

Jason Centers
Senior Project 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 MARS 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).

MARS 902-928 MHz Transmitter specification:

Applicant	NextNav, LLC
Manufacturer name & address	484 Oakmead Pkwy, Sunnyvale, CA 94085
Trade Name & Part No.	PN: 200-0013-01
Model number	MARS
FCC ID	A4P-200-0013-01
Use of Product	Radio module
Type of Transmission	Spread Spectrum (CDMA) and time division multiplexing (TDM) with 10% duty cycle (100 ms ON and 900 ms OFF)
Rated RF Output	30 dBm average conducted power
Frequency Range	902-928 MHz
Number of Channel(s)	12 channels with 2.046 MHz necessary bandwidth or 5 channels with 5.115 MHz necessary bandwidth or 3 channel pairs (5.115 and 2.046 MHz) Frequency setting resolution in 1 kHz
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

The Equipment Under Test (EUT), is radio transmitter, operating at 902 - 928 MHz band.
The EUT has 3 operation modes:

- transmitting single signal with nominal bandwidth of 2 MHz
- transmitting single signal with nominal bandwidth of 5 MHz
- transmitting simultaneously dual signals (on two channels) with nominal bandwidths of 2 MHz and 5 MHz

Note: Model: MARS, FCC ID: A4P-200-0013-01 was previously certified for single signal transmitting with 2 MHz nominal bandwidth only. Additional tests were performed on MARS unit to add single signal transmission with 5MHz nominal bandwidth and dual signal simultaneous transmission with 2 MHz and 5 MHz nominal bandwidths. Updated the previous issued report# 101123079MPK-002 issued on April 30, 2013 and with additional test data and issued as report#101277100MPK-001.

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).

Radiated emissions and AC mains conducted emissions measurements were performed according to the procedures in ANSI C63.10. Radiated tests were performed at an antenna to EUT distance of 3 meters, unless stated otherwise in the "Data Sheet" of this report.

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

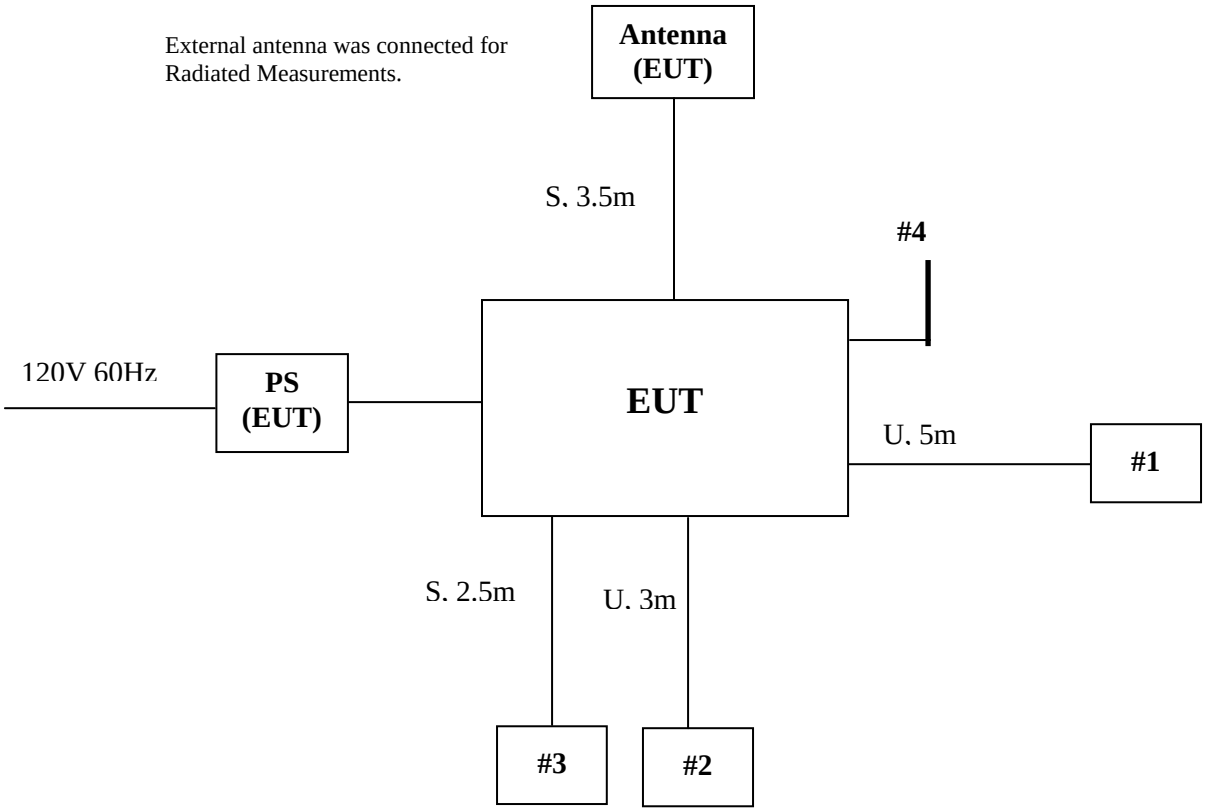
Measurement	Expanded Uncertainty (k=2)	
	0.15 MHz – 1 GHz	1 GHz – 10 GHz
RF Power and Power Density – antenna conducted	0.7 dB	
Unwanted emissions - antenna conducted	1.1 dB	1.3 dB
Bandwidth – antenna conducted	200 Hz	-
Radiated emissions	4.2 dB	3.4 dB
AC mains conducted emissions	2.4 dB	-

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 Labled	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, Sl No. 090094

S = Shielded **U** = Unshielded	**F** = With Ferrite **m** = Length in Meters

3.3 Justification

As stated in sec 2.1, the transmitter is designed to transmit signal on single channels with 2 MHz or 5 MHz nominal bandwidths, and on dual channels simultaneously with 2 MHz and 5 MHz bandwidths. Separate tests were performed for single channel transmissions. In addition unwanted emissions measurements, including emissions caused by inter-modulation, were performed for dual channel transmissions simultaneously.

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.

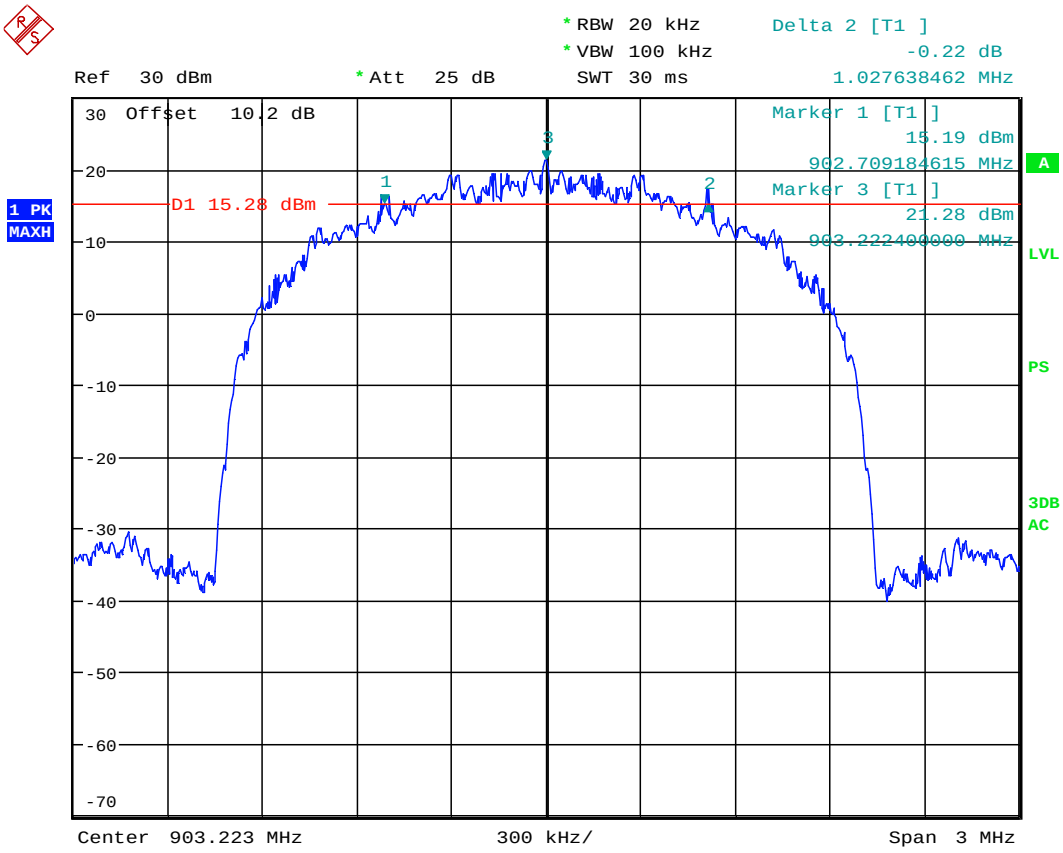
The occupied bandwidth was measured using the built-in spectrum analyzer function for 99% power bandwidth measurement.

4.1.3 Test Result

Mode	Frequency (MHz)	6-dB bandwidth MHz	26-dB bandwidth MHz	Occupied bandwidth MHz
Single channel, 2 MHz channel BW	903.223	1.028	1.90	1.592
	915.000	1.038	1.89	1.586
	926.777	1.024	1.89	1.576
Single channel, 5 MHz channel BW	904.7575	2.829	4.76	3.851
	915.0000	2.804	4.79	3.848
	925.2425	2.829	4.73	3.823

6-dB bandwidth is presented on plots 1.1 – 1.6.
26-dB Bandwidth and Occupied Bandwidth are presented on plots 1.7 – 1.12.

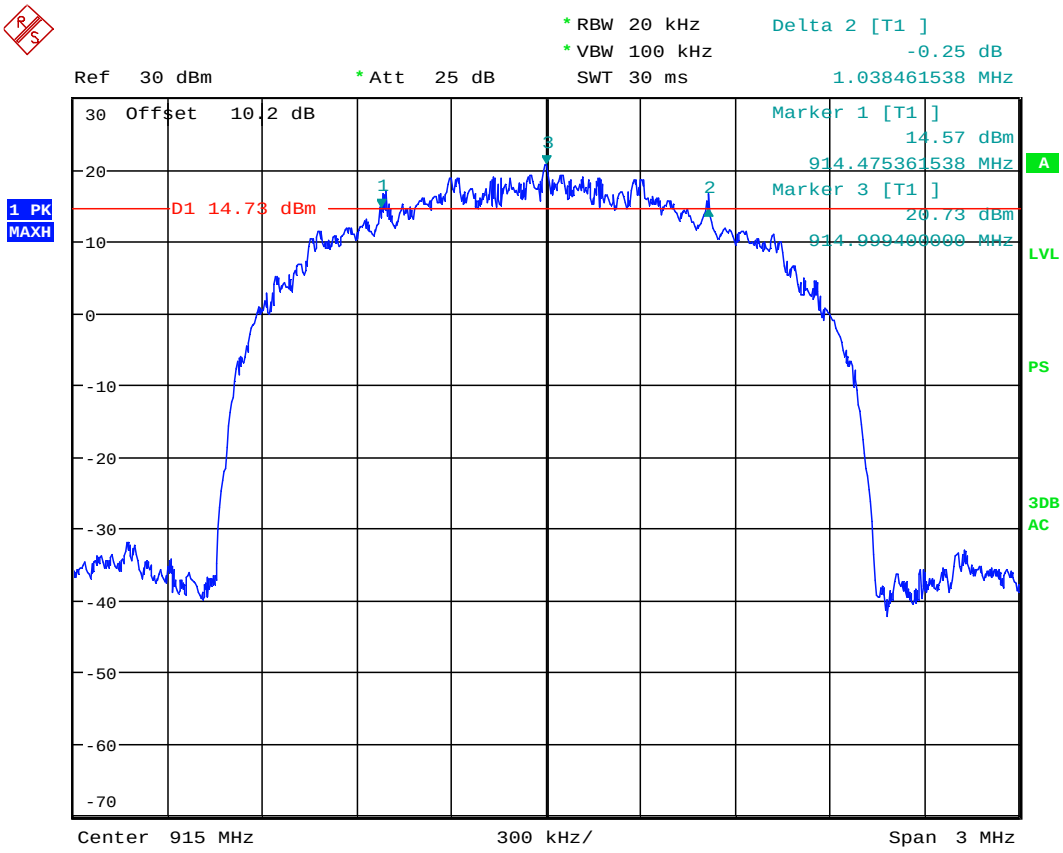
Plot 1. 1



6-dB bandwidth

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

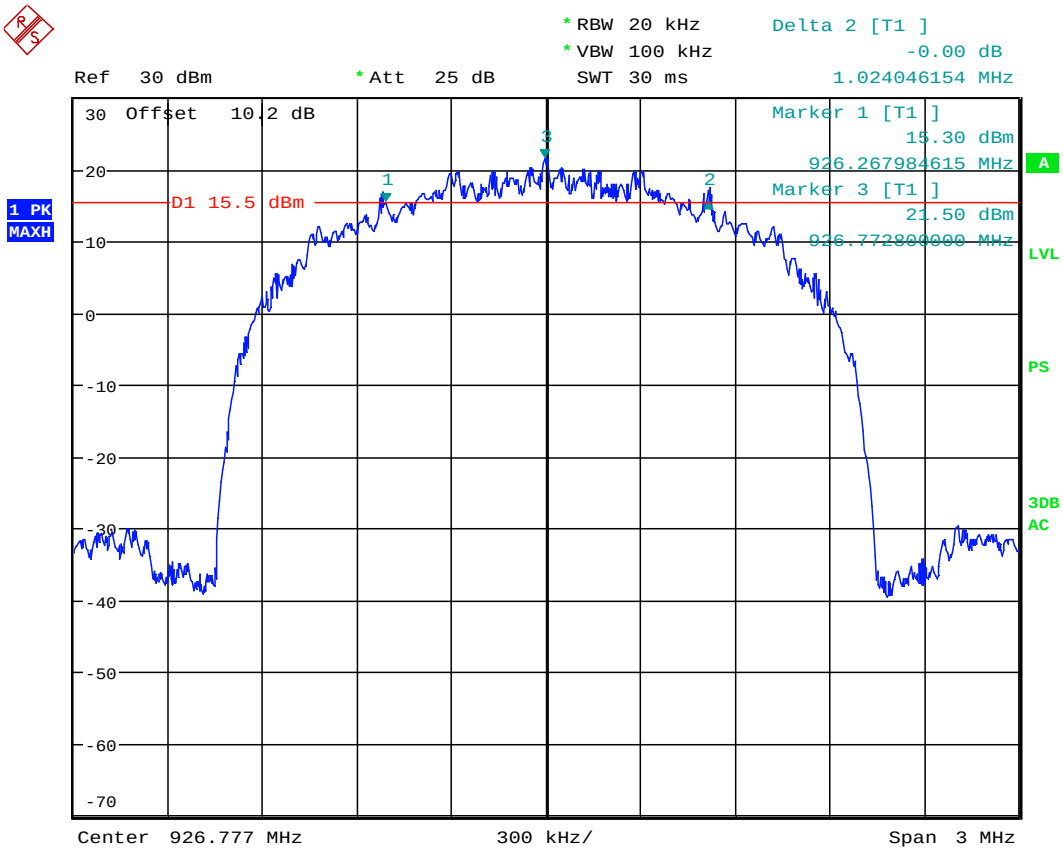
Plot 1. 2



6-dB bandwidth

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

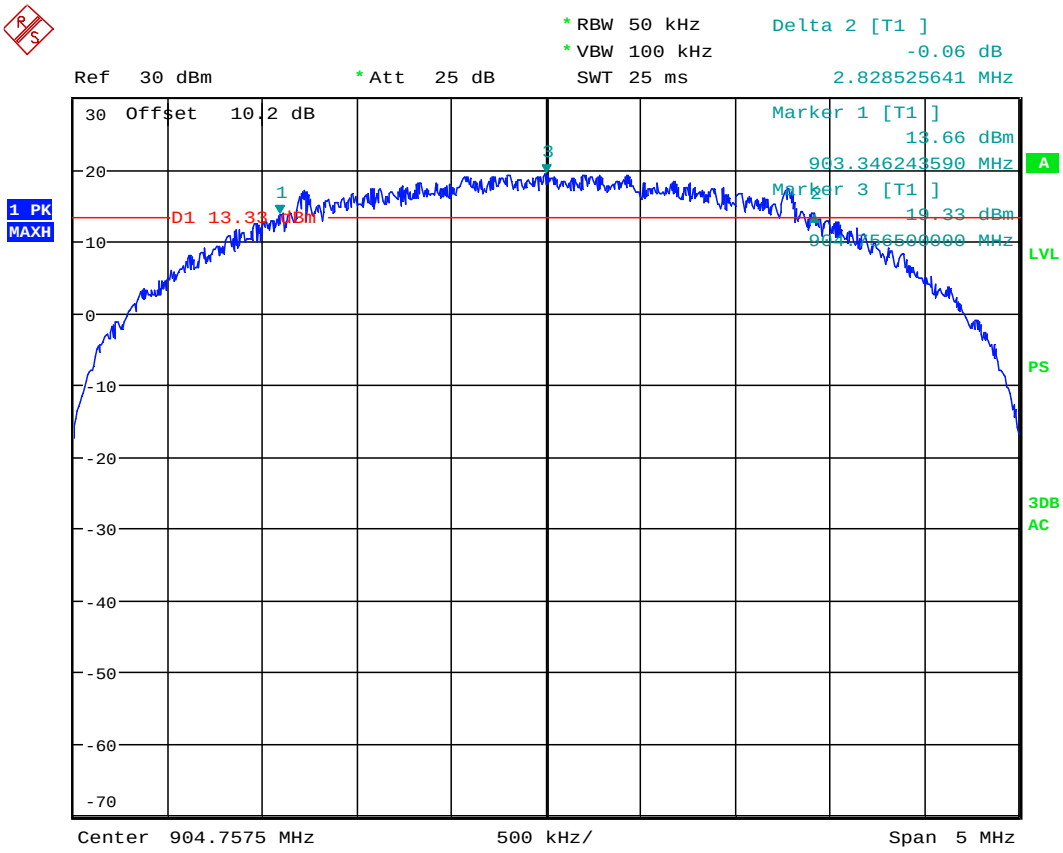
Plot 1. 3



6-dB bandwidth

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

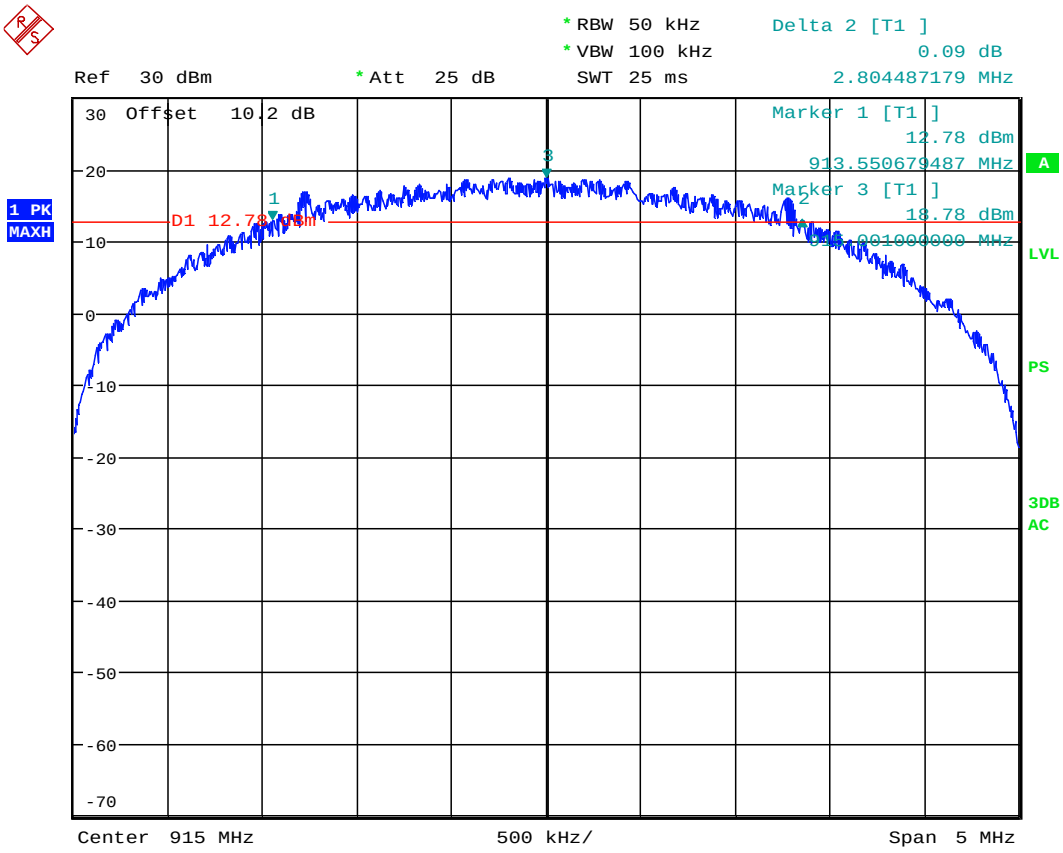
Plot 1. 4



6-dB bandwidth

Date: 3.APR.2013 11:51:00

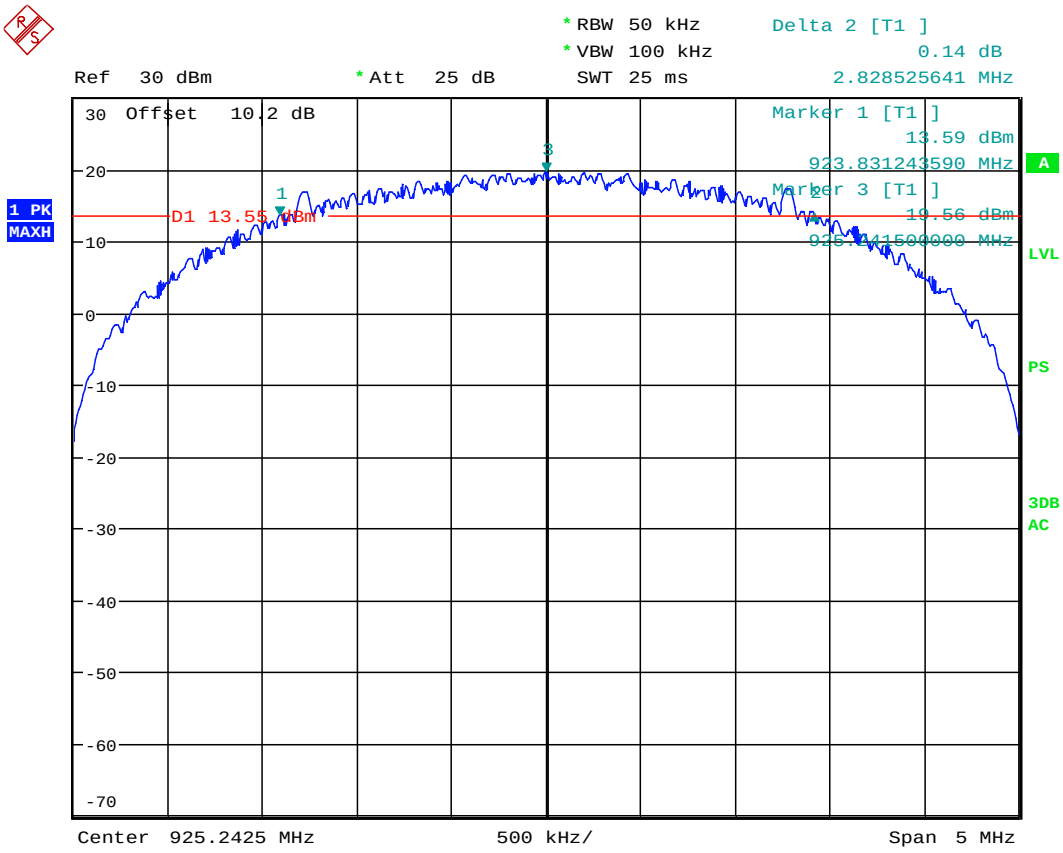
Plot 1. 5



6-dB bandwidth

Date: 3.APR.2013 11:45:11

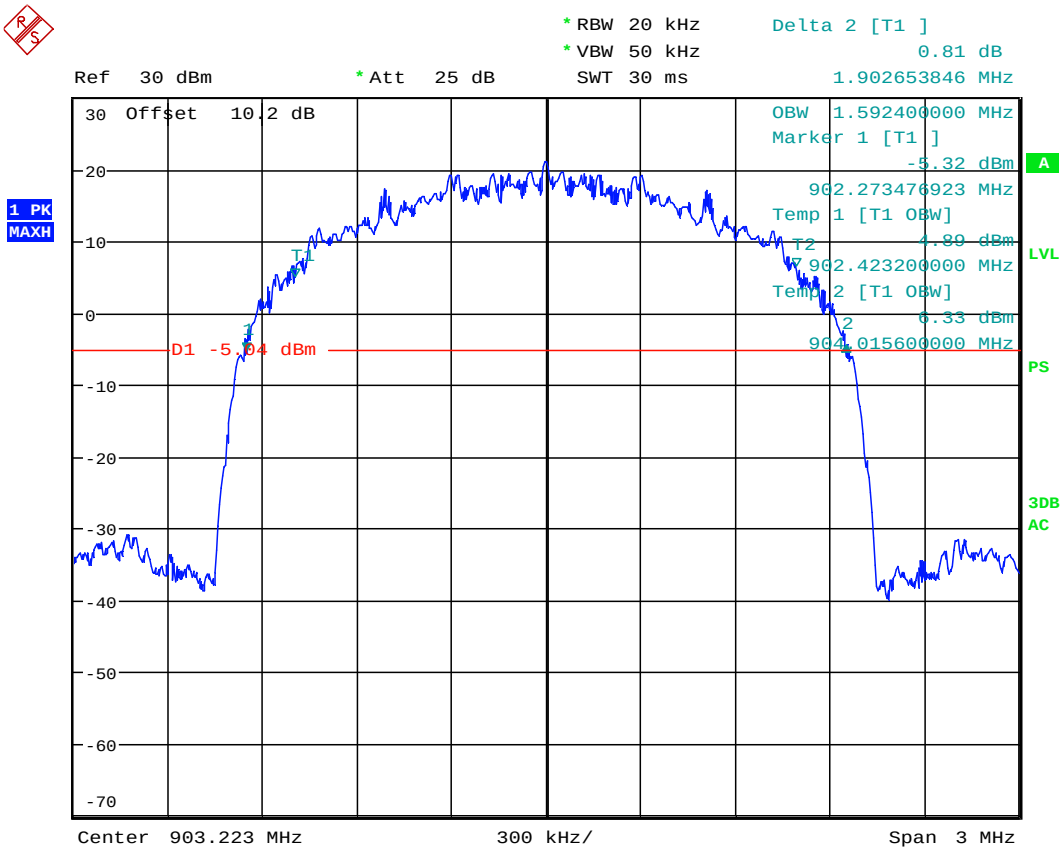
Plot 1. 6



6-dB bandwidth

Date: 3.APR.2013 11:38:38

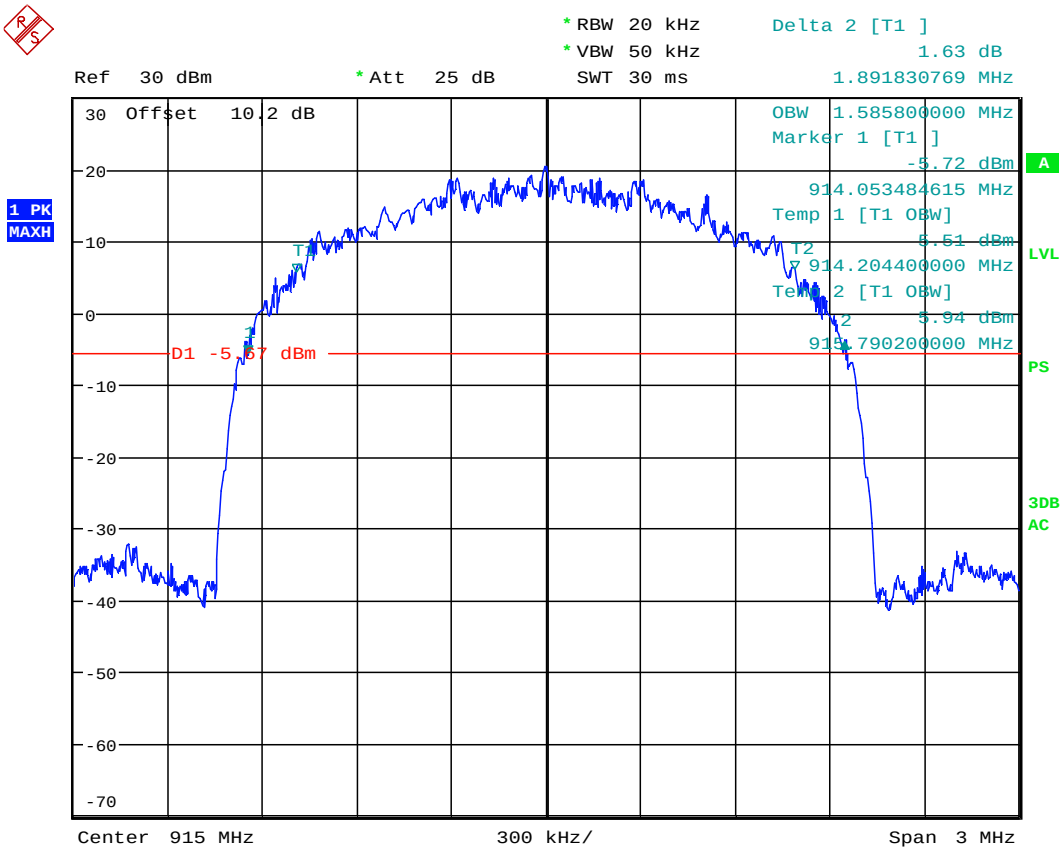
Plot 1. 7



OBW and 26-dB bandwidth

Date: 3.APR.2013 14:24:02

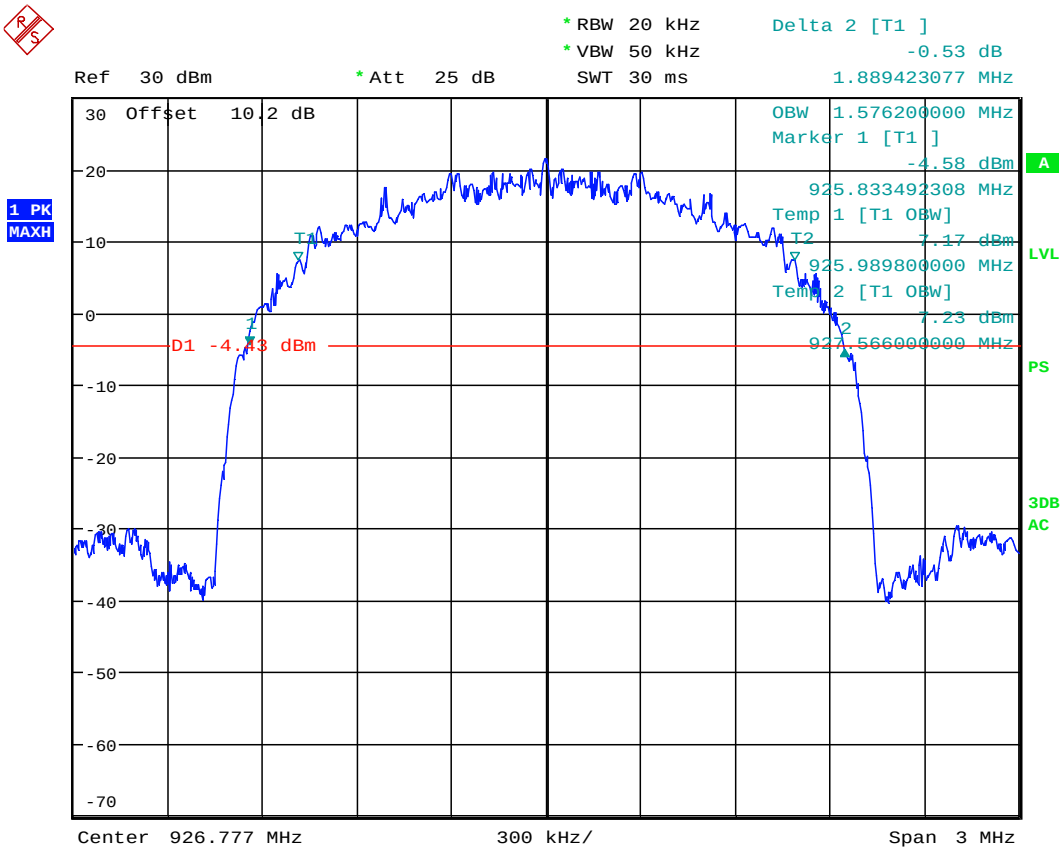
Plot 1. 8



OBW and 26-dB bandwidth

Date: 3.APR.2013 14:28:27

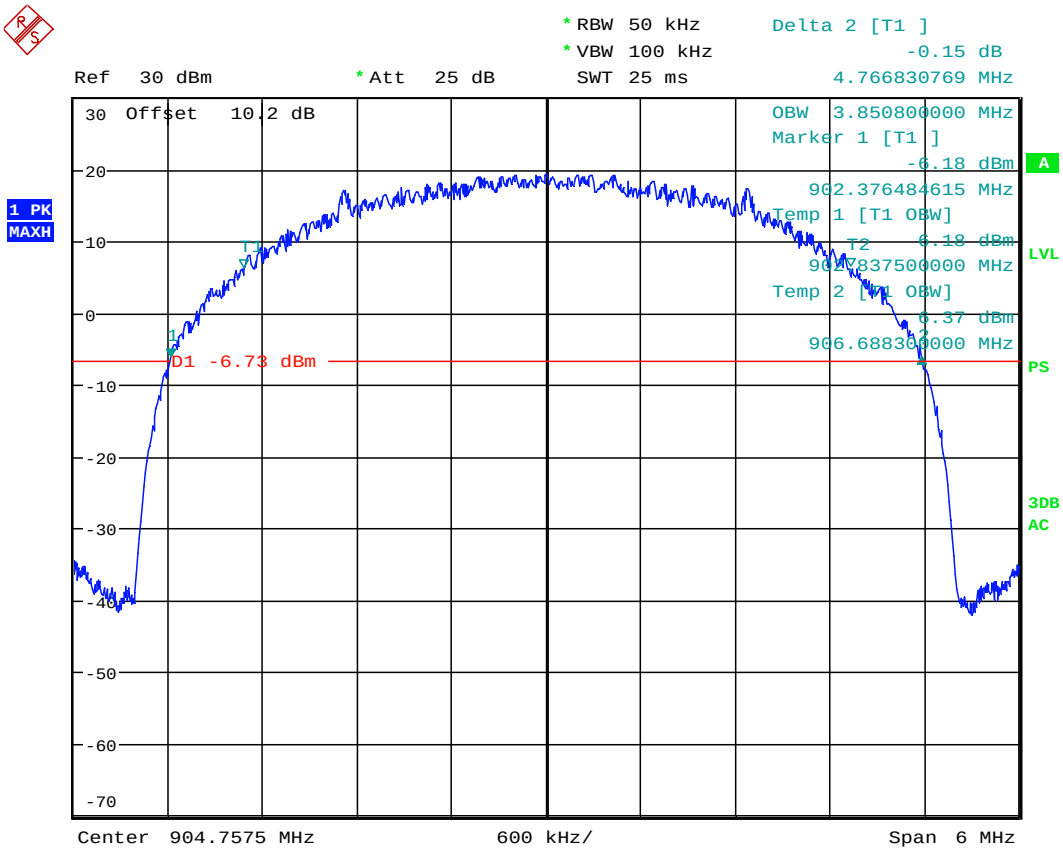
Plot 1. 9



OBW and 26-dB bandwidth

Date: 3.APR.2013 14:34:49

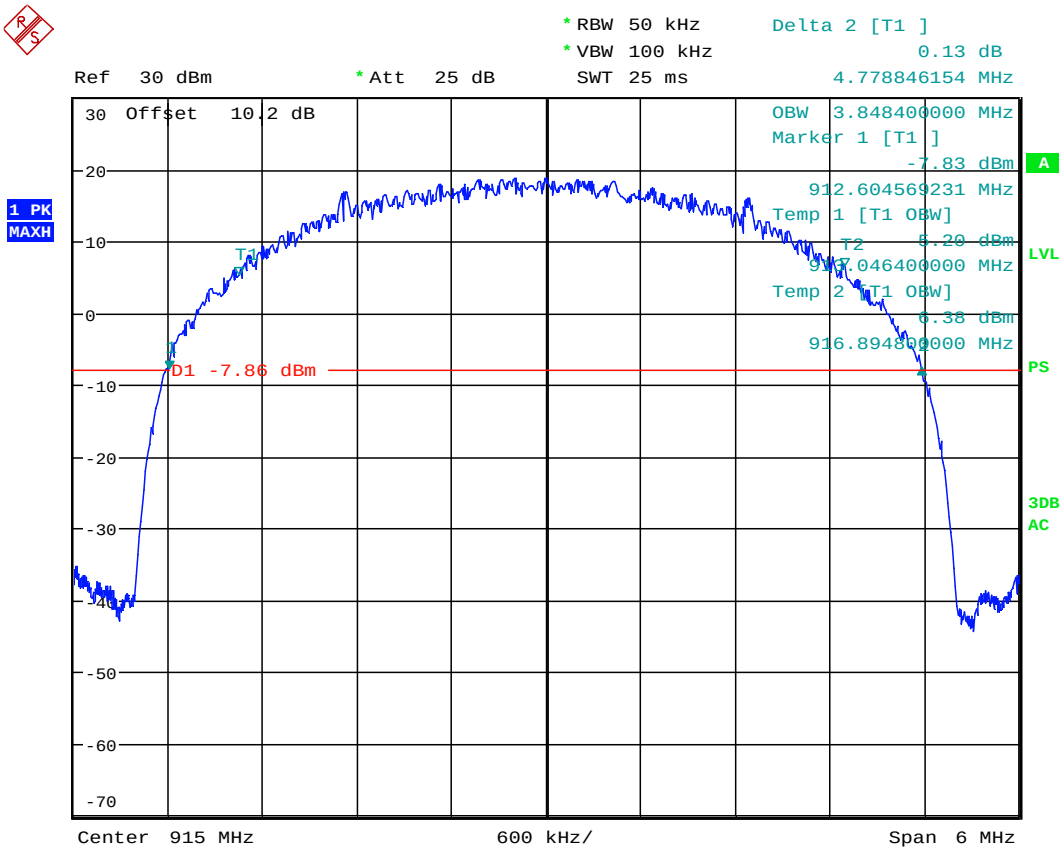
Plot 1. 10



OBW and 26-dB bandwidths

Date: 3.APR.2013 15:00:41

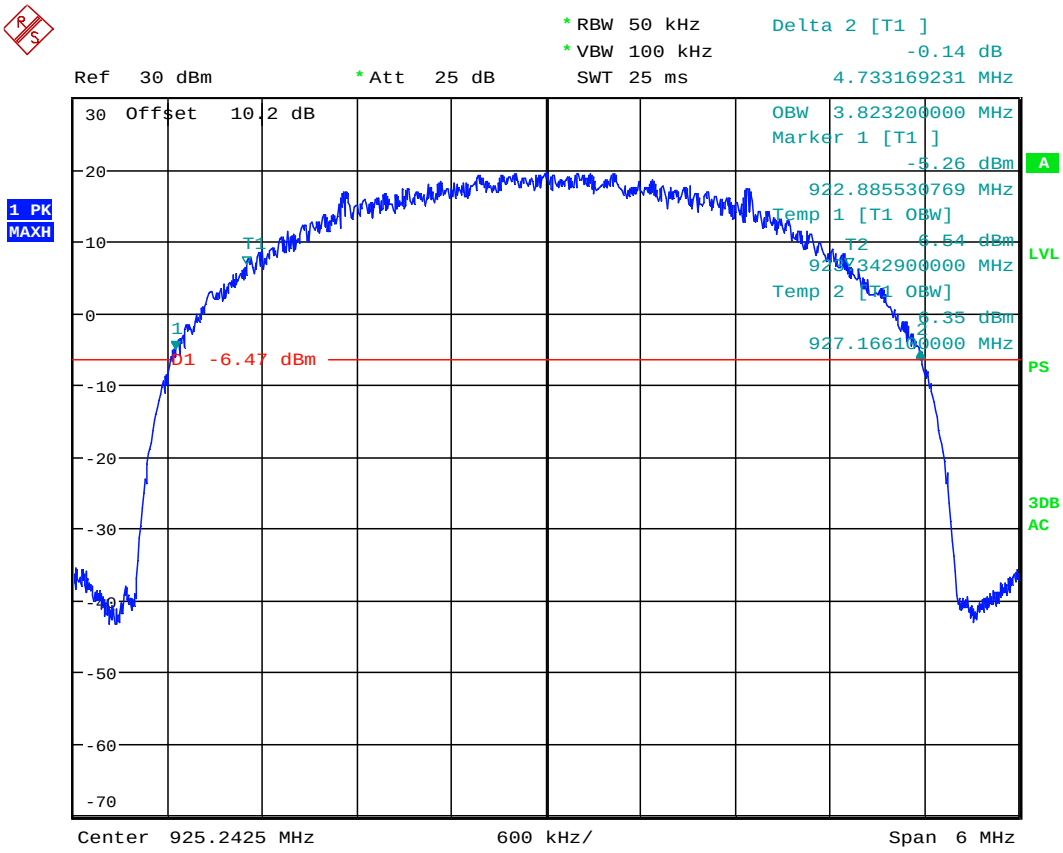
Plot 1. 11



OBW and 26-dB bandwidths

Date: 3.APR.2013 15:08:06

Plot 1. 12



OBW and 26-dB bandwidths

Date: 3.APR.2013 15:12:29

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.

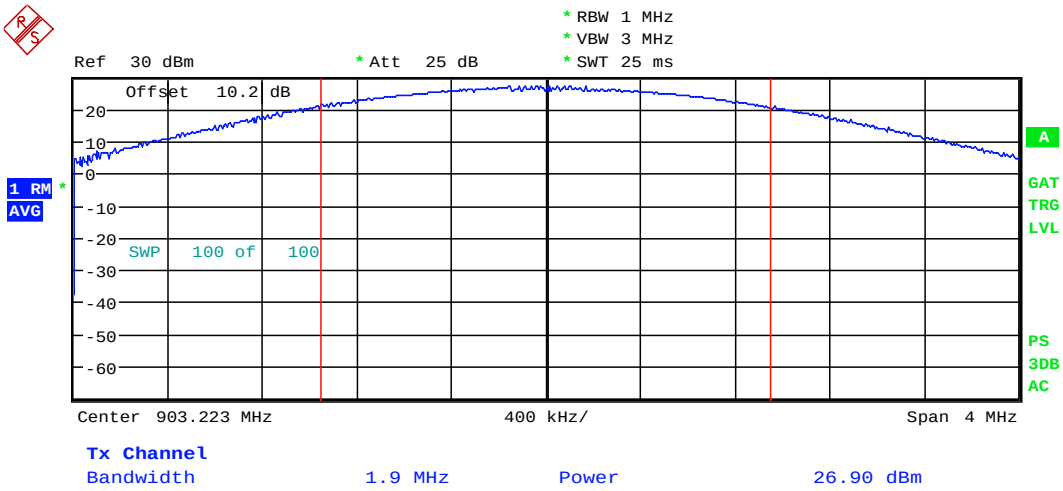
Since the EUT transmits the signal with Duty Cycle (100 ms on-time, 900 ms off-time), signal gating with gate length of 100 ms was used to ensure that the measurements are performed only during on-time transmission.

4.3.3 Test Result

Refer to the following plots for the test result

Mode	Frequency (MHz)	26-dB bandwidth MHz	Conducted Power (average) dBm	Conducted Power (average) W	Plot
Single channel, 2 MHz channel BW	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
Single channel, 5 MHz channel BW	904.7575	4.76	27.1	0.513	2.4
	915.0000	4.79	26.5	0.447	2.5
	925.2425	4.73	27.2	0.525	2.6

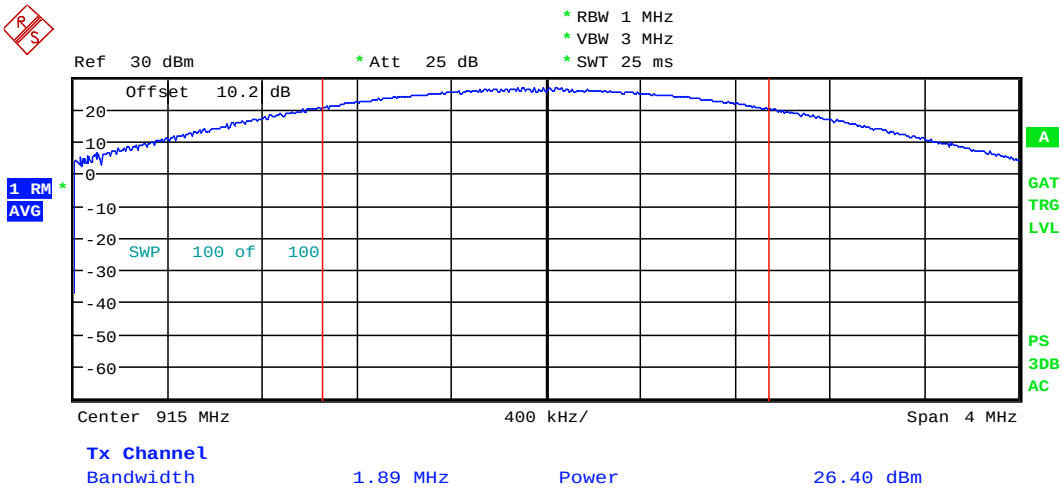
Plot 2. 1



Maximum conducted output power

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

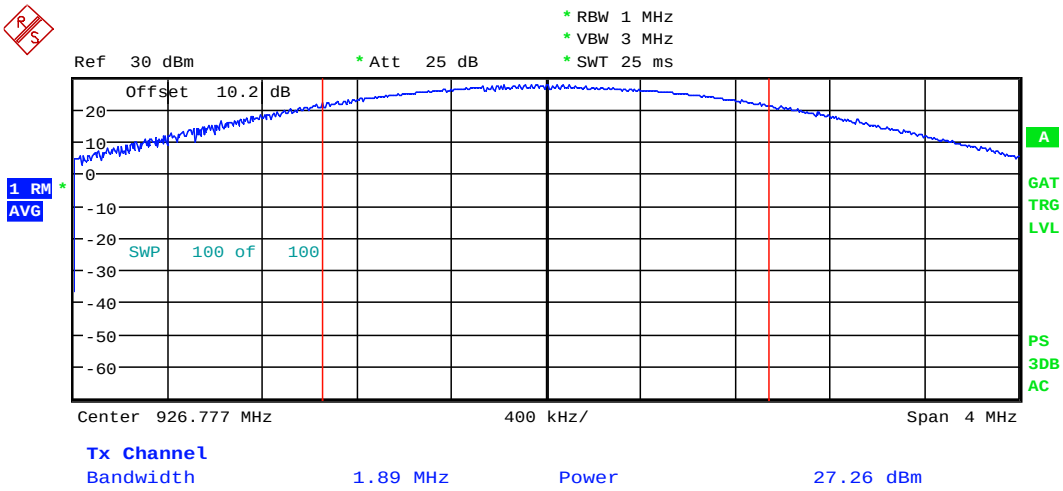
Plot 2. 2



Maximum conducted output power

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

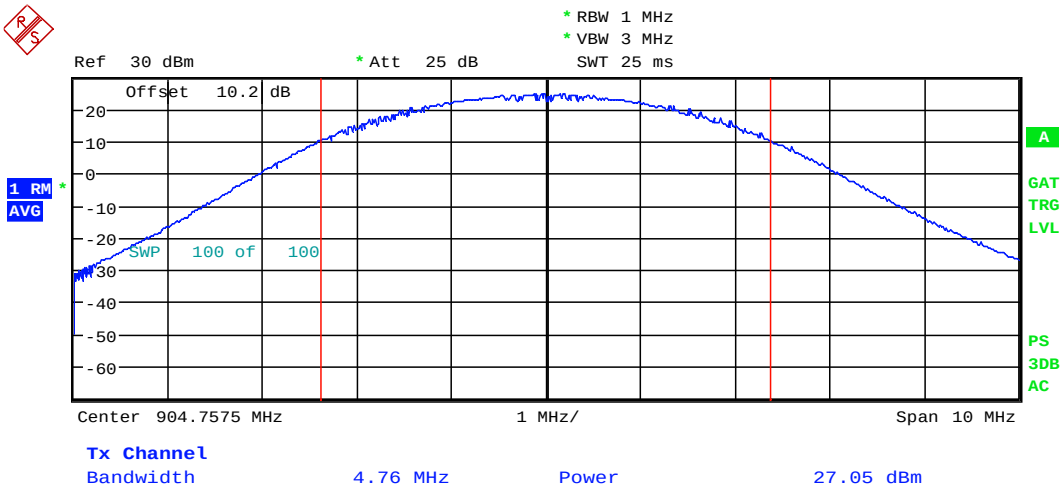
Plot 2. 3



Maximum conducted output power

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

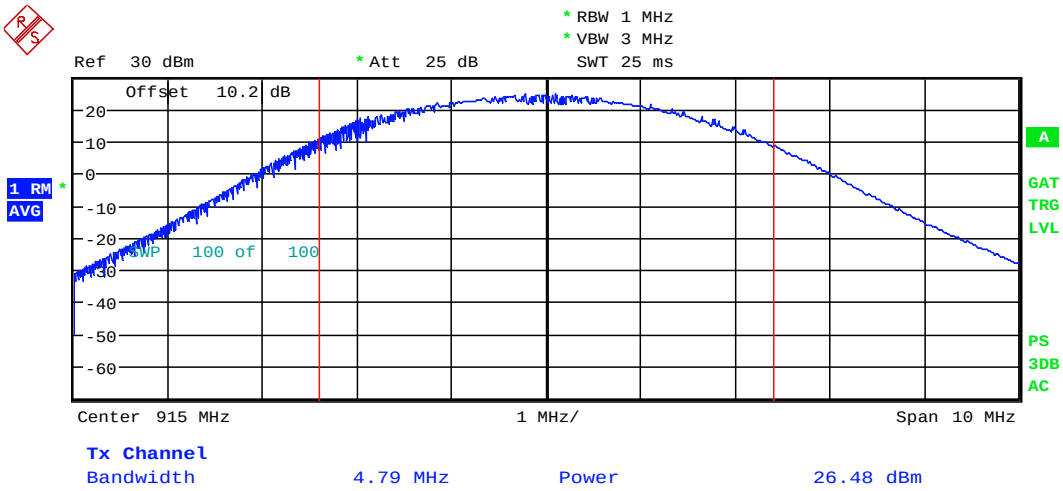
Plot 2. 4



Maximum conducted output power

Date: 3.APR.2013 15:23:59

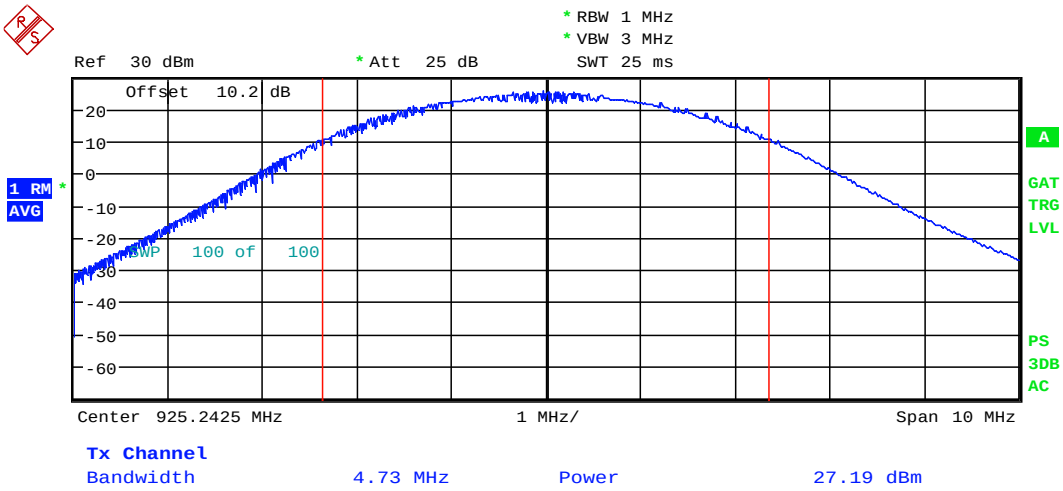
Plot 2. 5



Maximum conducted output power

Date: 3.APR.2013 15:20:11

Plot 2. 6



Maximum conducted output power

Date: 3.APR.2013 15:17:18

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 over100 traces. Spectrum analyzer resolution bandwidth was set to 3 kHz and span to at least 1.5 times the DTS (6 dB) channel bandwidth.

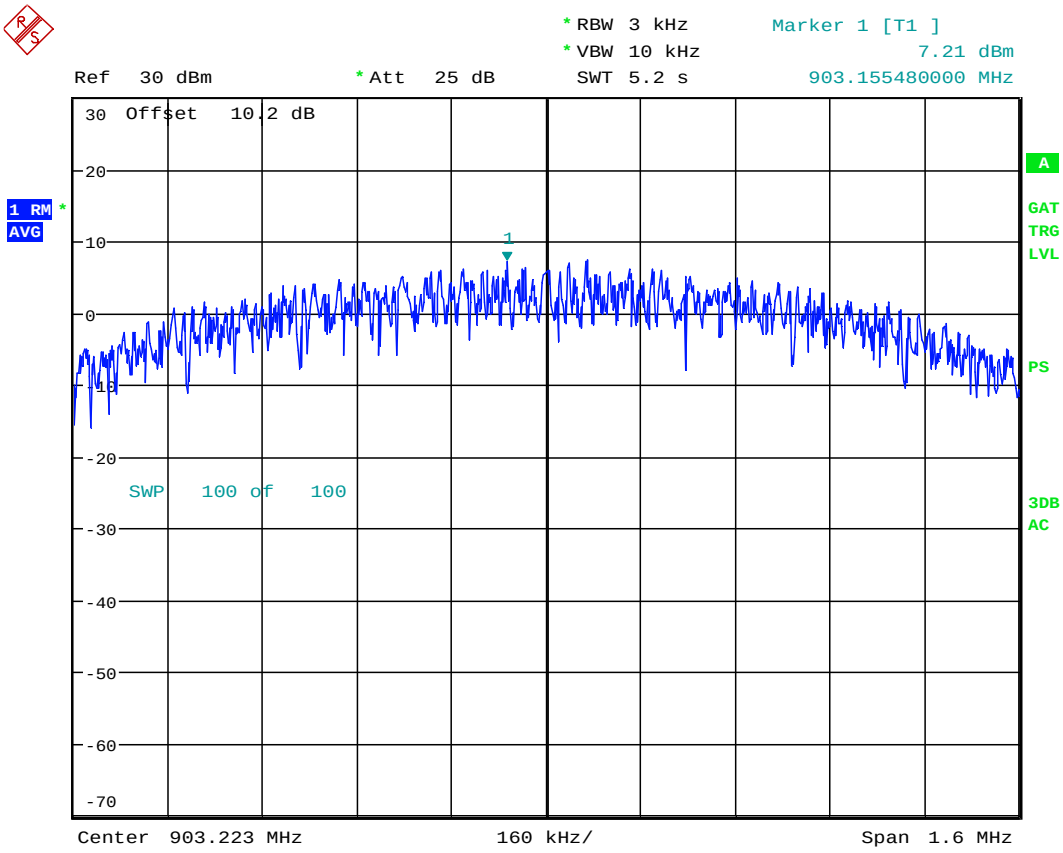
Since the EUT transmits the signal with Duty Cycle (100 ms on-time, 900 ms off-time), signal gating with gate length of 100 ms was used to ensure that the measurements are performed only during on-time transmission.

4.3.3 Test Result

Refer to the following plots for the test result

Mode	Frequency MHz	Maximum Power Spectral Density dBm	Maximum Power Spectral Density Limit dBm	Margin dB	Plot
Single channel, 2 MHz channel BW	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
Single channel, 5 MHz channel BW	904.7575	1.04	8.0	-6.96	3.4
	915.0000	0.36	8.0	-7.64	3.5
	925.2425	1.10	8.0	-6.90	3.6

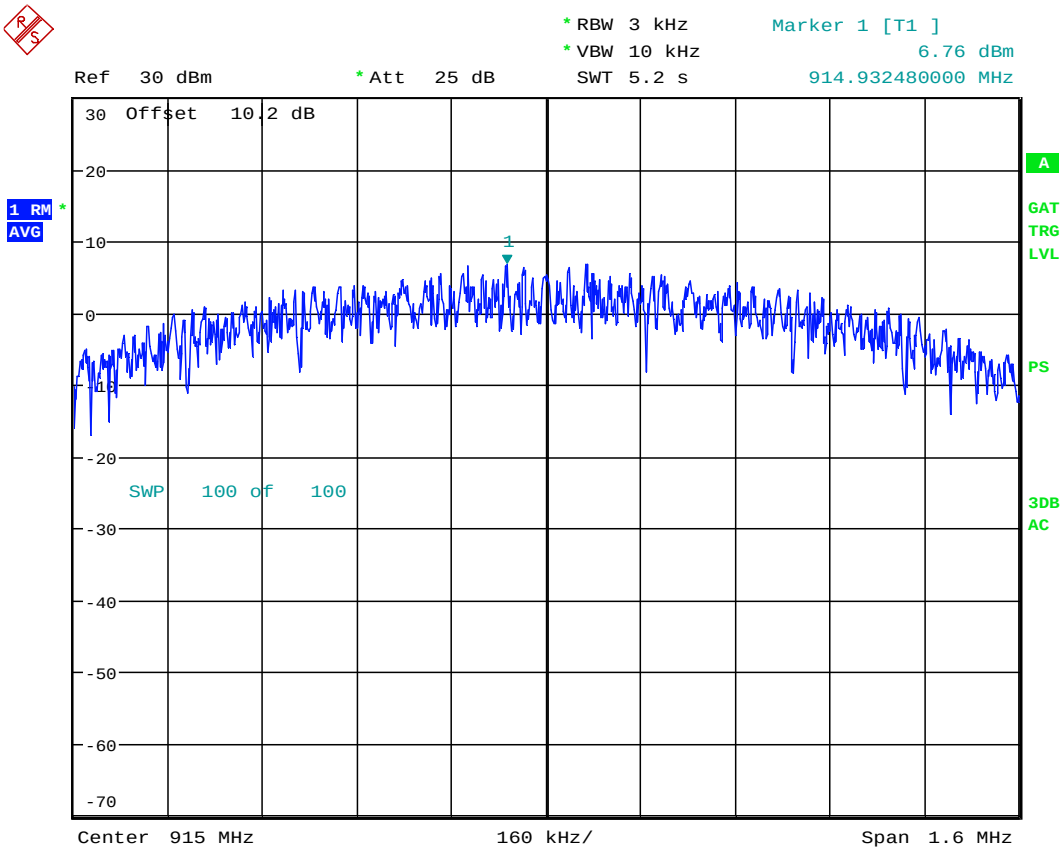
Plot 3. 1



Maximum power spectral density

Date: 28.MAR.2013 13:01:00

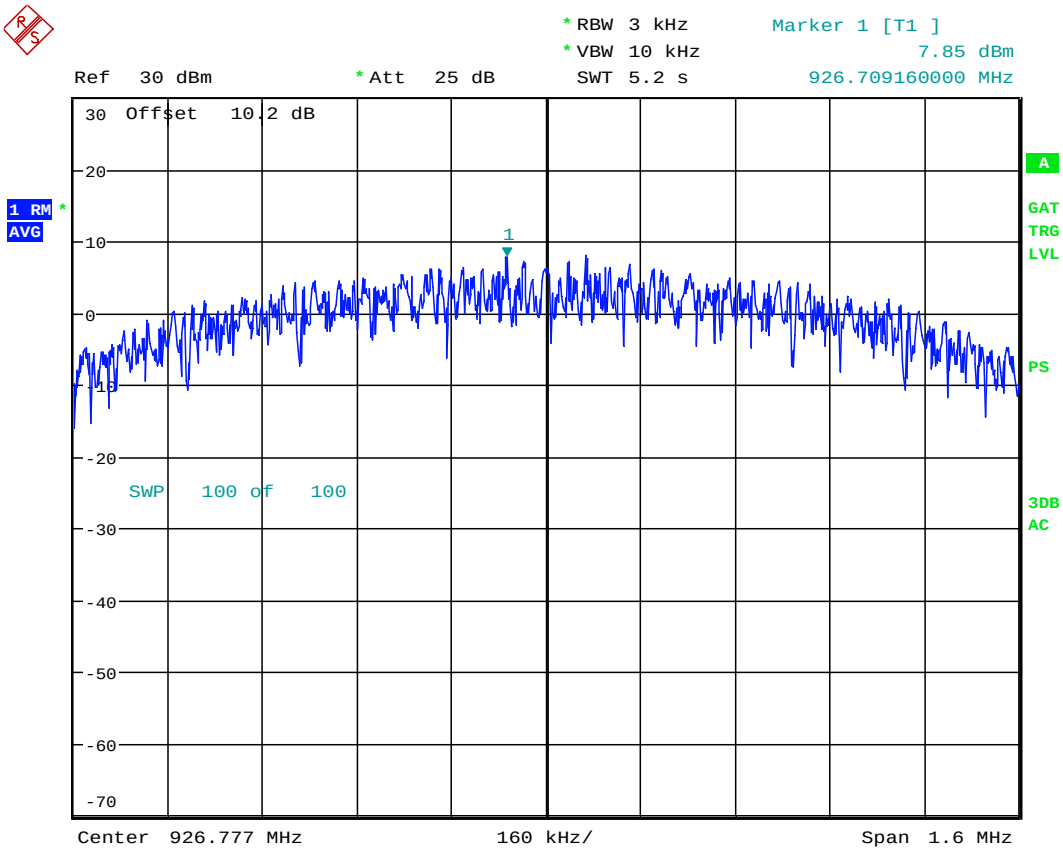
Plot 3. 2



Maximum power spectral density

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

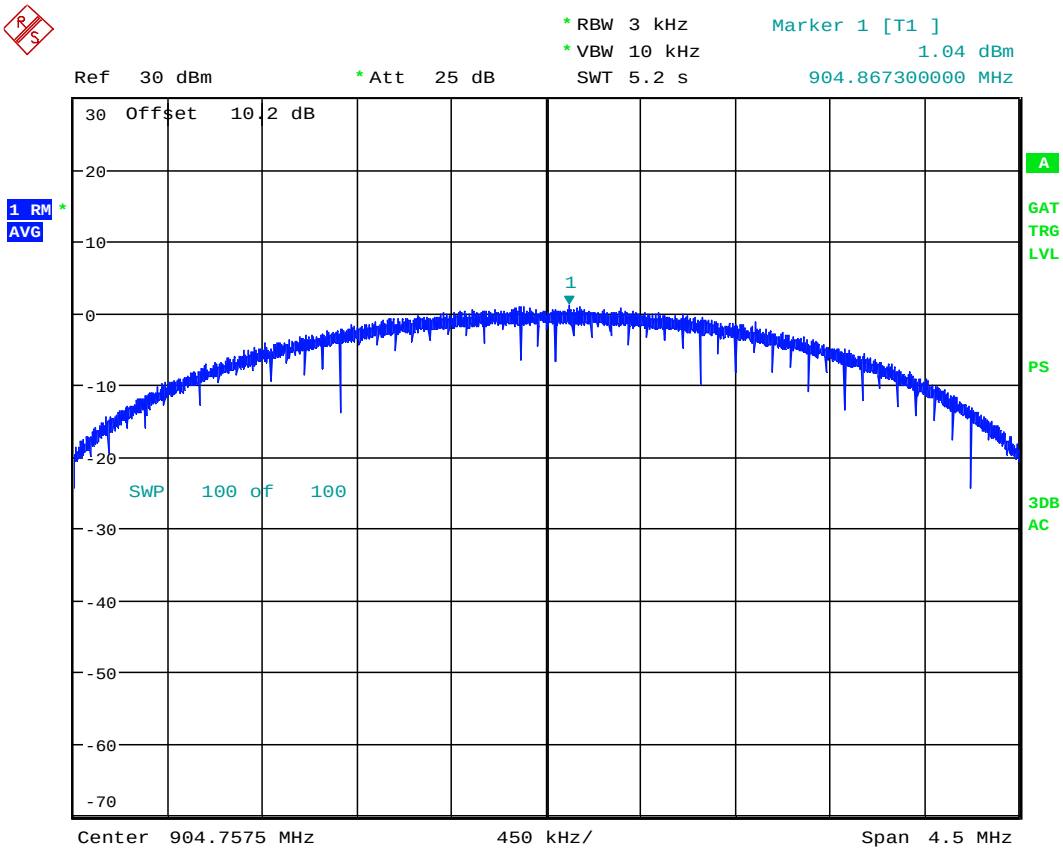
Plot 3. 3



Maximum power spectral density

Date: 1.APR.2013 16:39:57

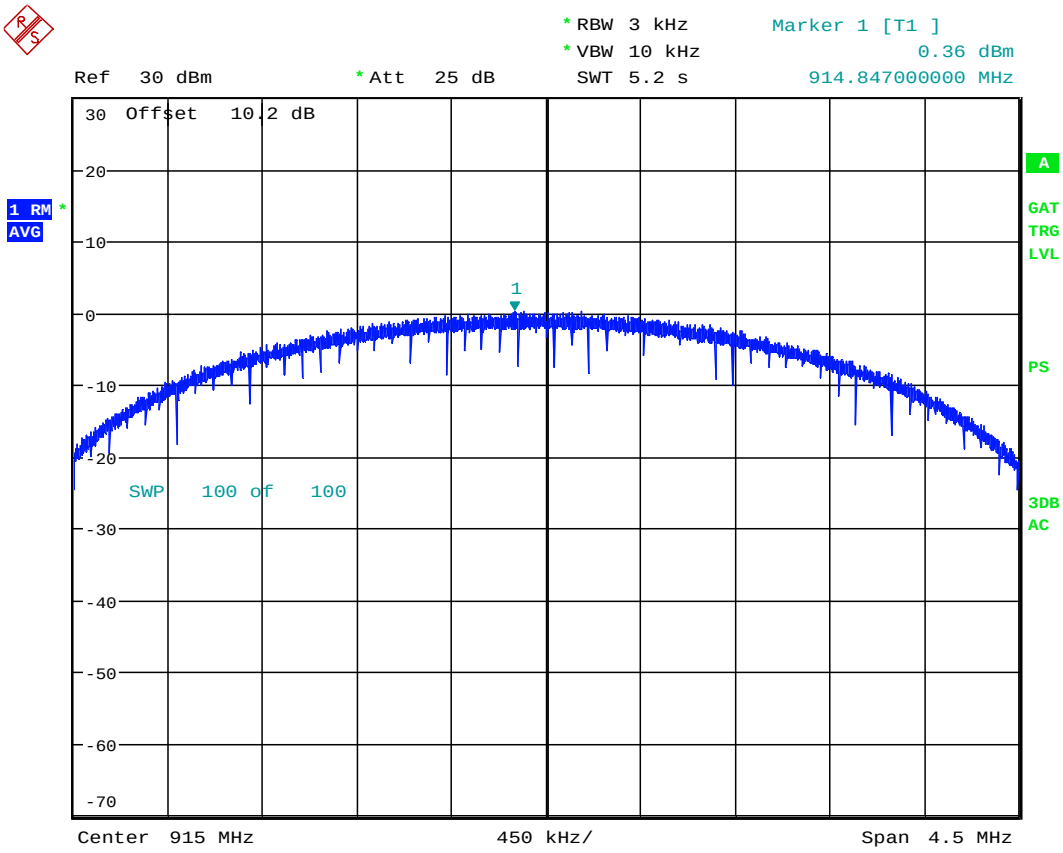
Plot 3. 4



Maximum power spectral density

Date: 2.APR.2013 13:58:46

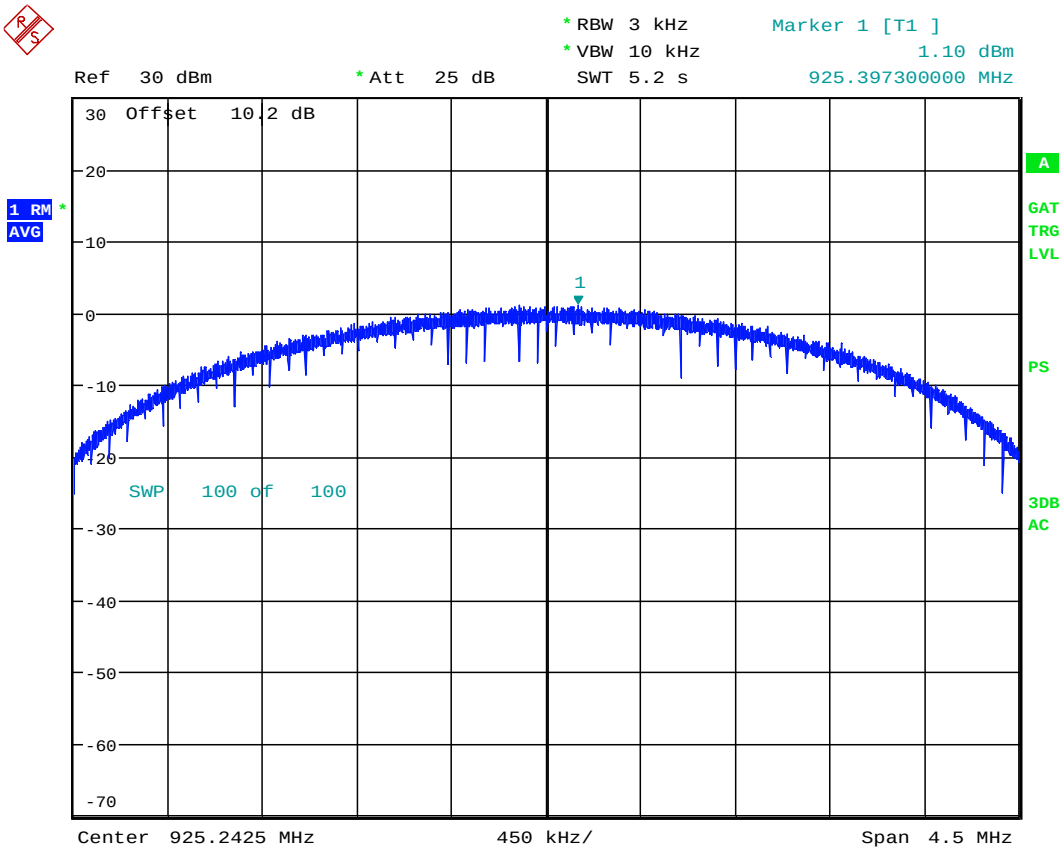
Plot 3. 5



Maximum power spectral density

Date: 2.APR.2013 16:09:50

Plot 3. 6



Maximum power spectral density

Date: 1.APR.2013 19:42:15

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

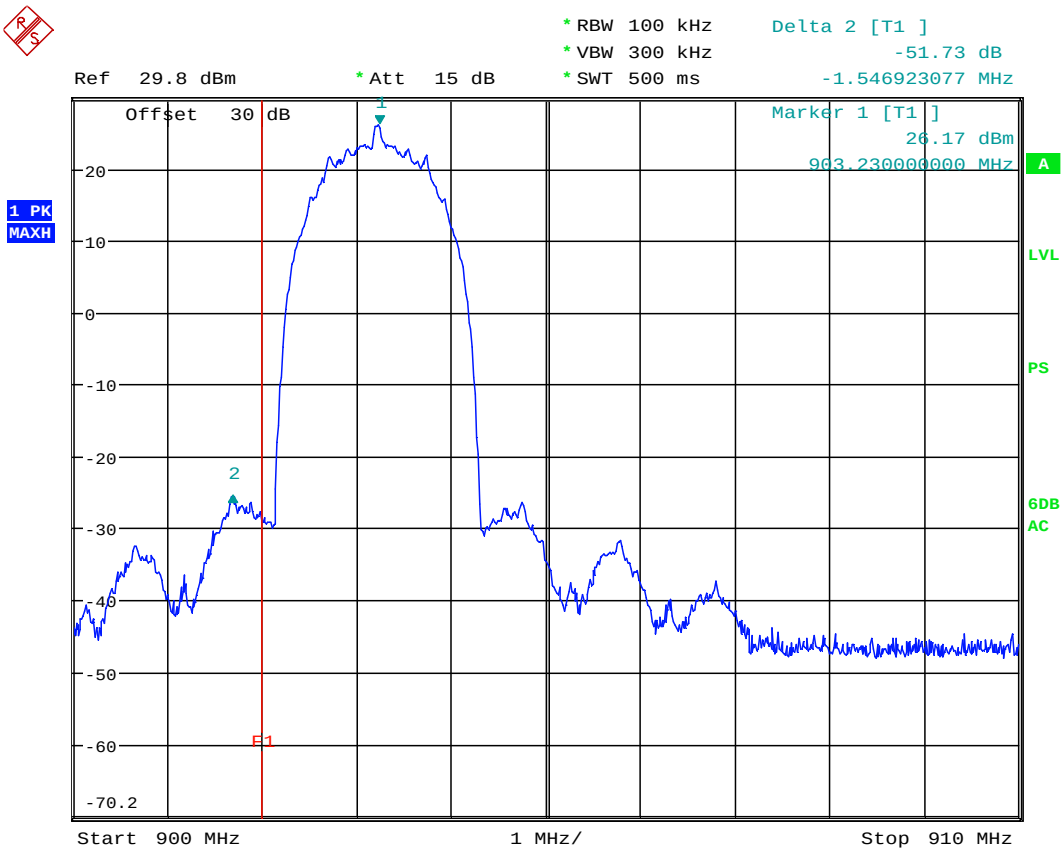
Refer to the following plots 4.1 – 4.42 for unwanted conducted emissions. The test results are summarized in The Table 4.1.

Table 4.1
Unwanted Conducted Emissions

Mode	Frequency MHz	In-band emissions dBm	Worst case Unwanted emissions dBm	Unwanted emissions Attenuation dB	Margin to 30 dB Attenuation Limit dB
Single channel, 2 MHz channel BW	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
Single channel, 5 MHz channel BW	904.7575	21.8	-22.5	44.3	-14.3
	915.0000	21.1	-22.5	43.6	-13.6
	925.2425	22.0	-22.5	44.5	-14.5
Dual channels, 2 and 5 MHz channel BWs	908.4725 904.7525	19.8	-10.6	30.4	-0.4
	916.860 913.140	21.3	-23.3	44.6	-14.6
	926.777 923.057	19.1	-16.7	35.8	-5.8

Results	**Complies**

Plot 4.1

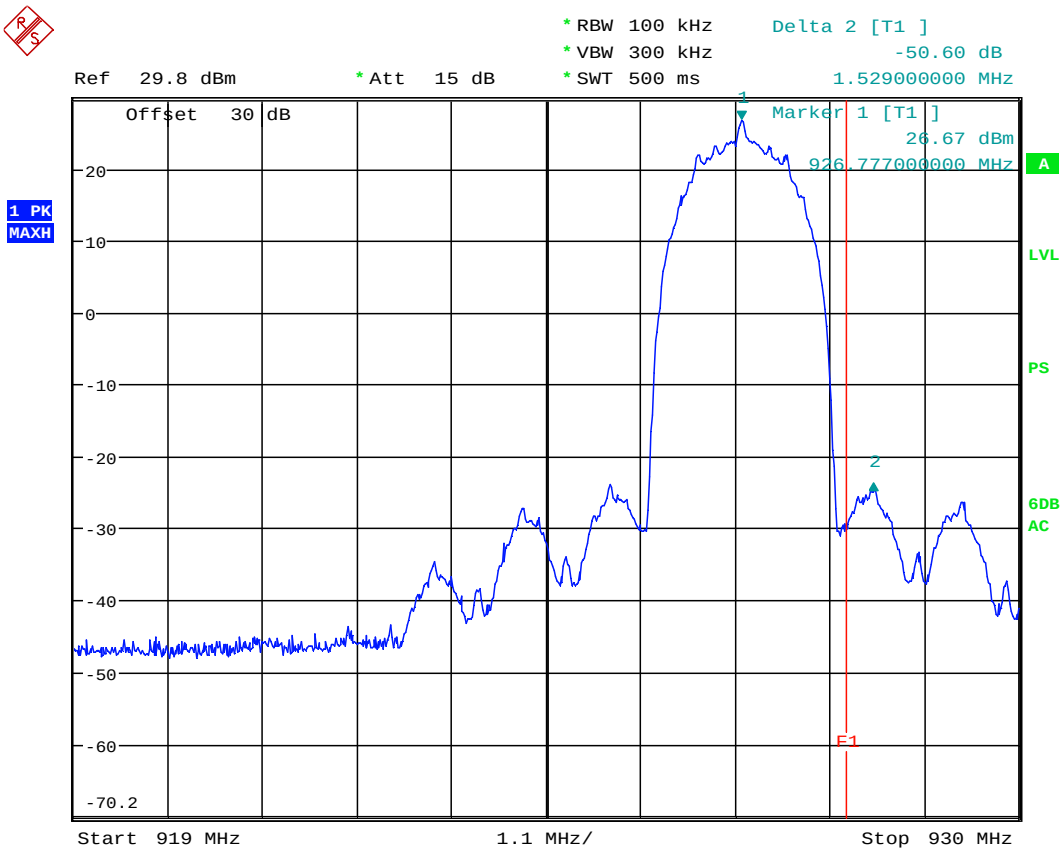


Unwanted conducted emissions

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

Tx @ 903.223 MHz, 2 MHz Channel Bandwidth

Plot 4.2

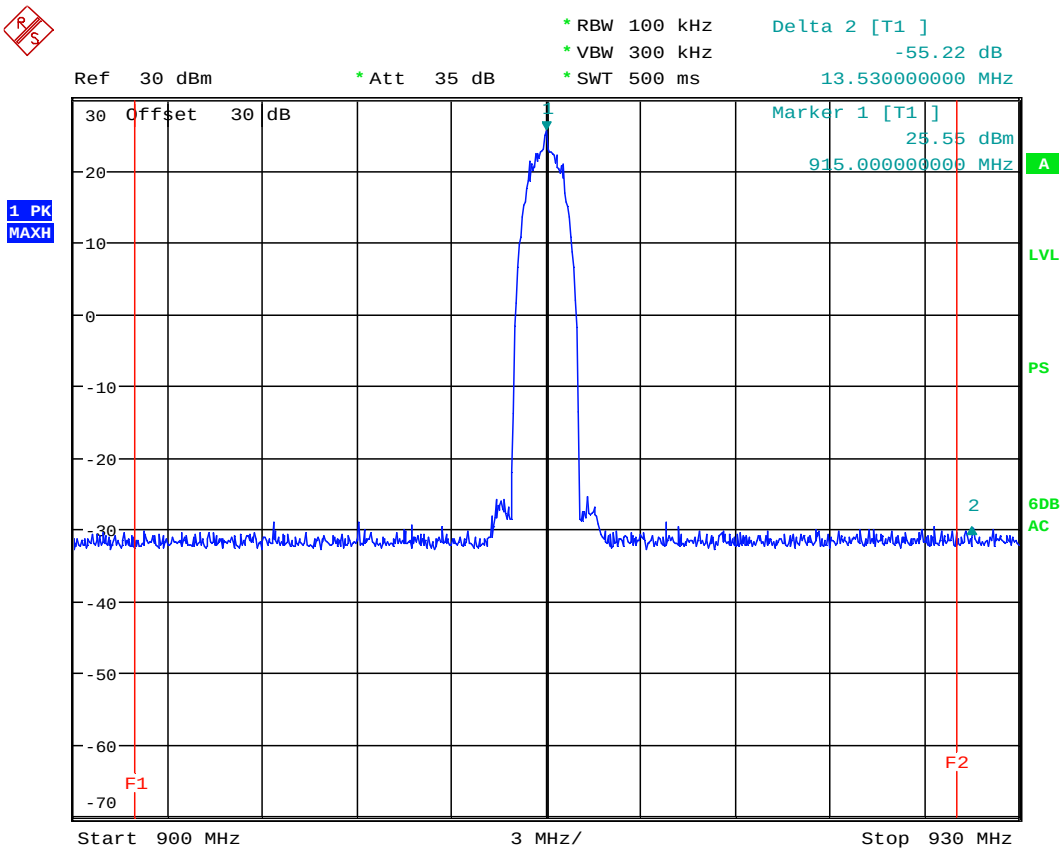


Unwanted conducted emissions

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

Tx @ 926.777 MHz, 2 MHz Channel Bandwidth

Plot 4.3

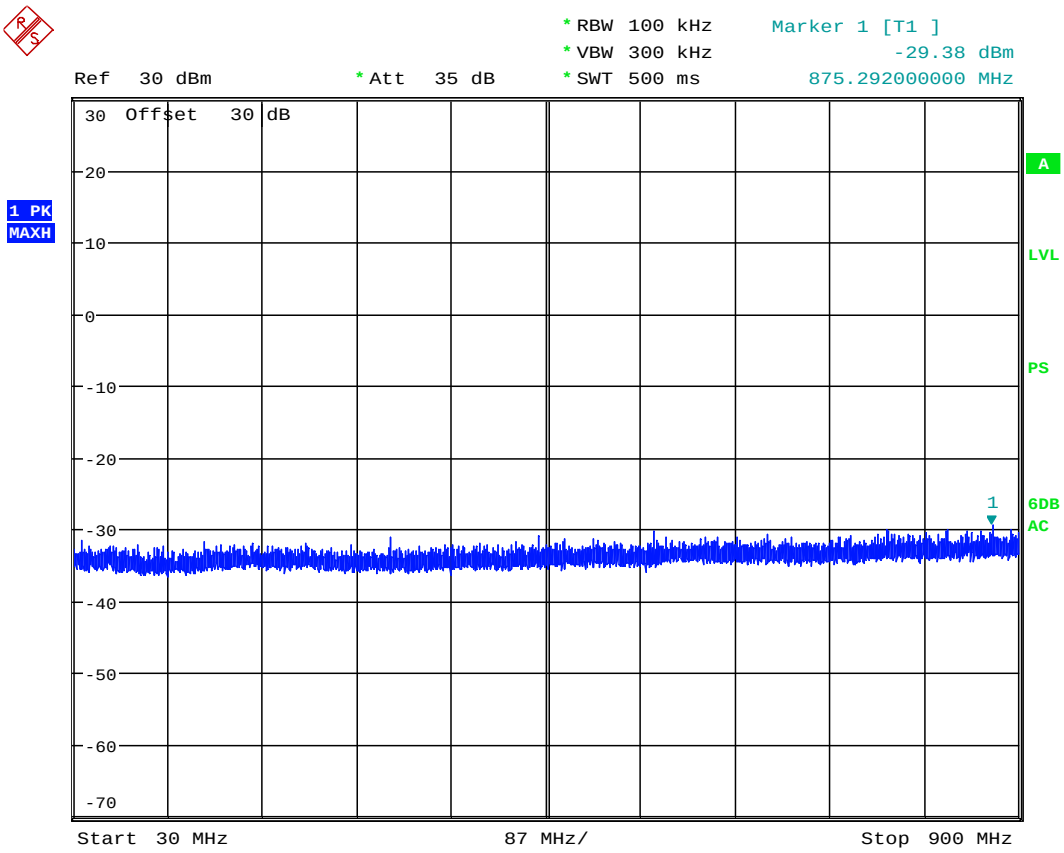


Unwanted conducted emissions

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

Tx @ 915 MHz, 2 MHz Channel Bandwidth

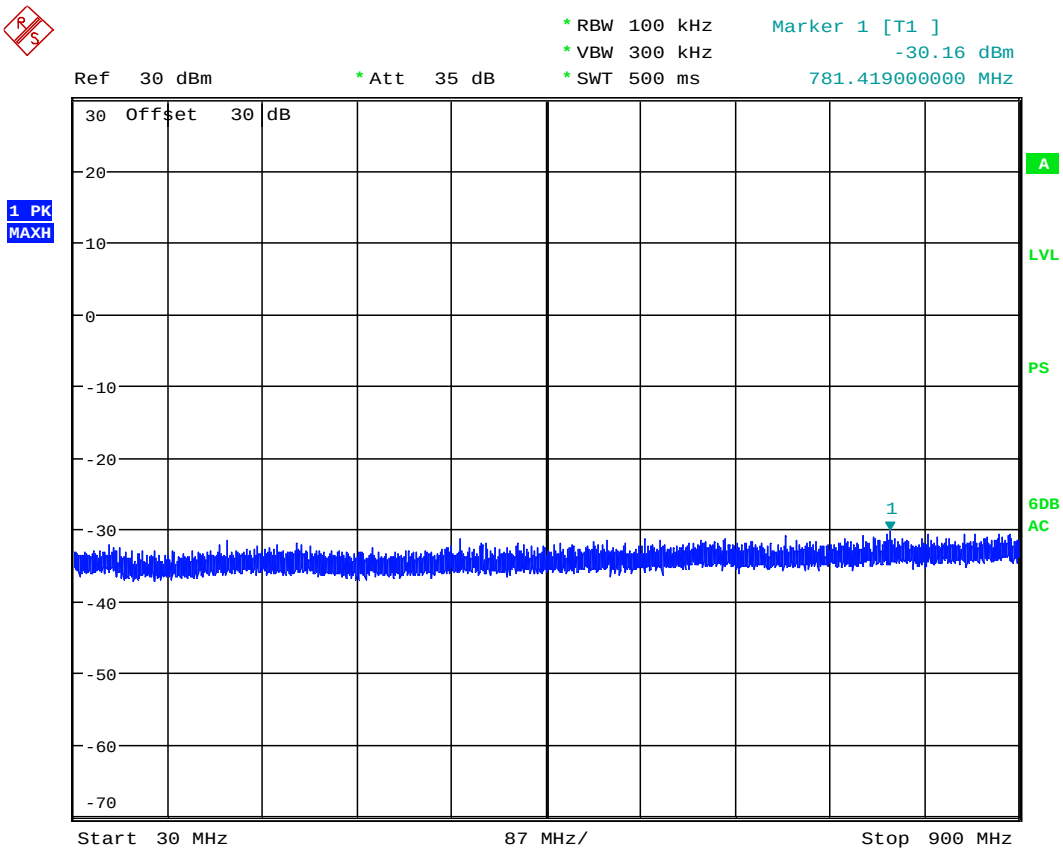
Plot 4.4



Unwanted conducted emissions
Date: 4.APR.2013 19:31:13

Tx @ 903.223 MHz, 2 MHz Channel Bandwidth

Plot 4.5

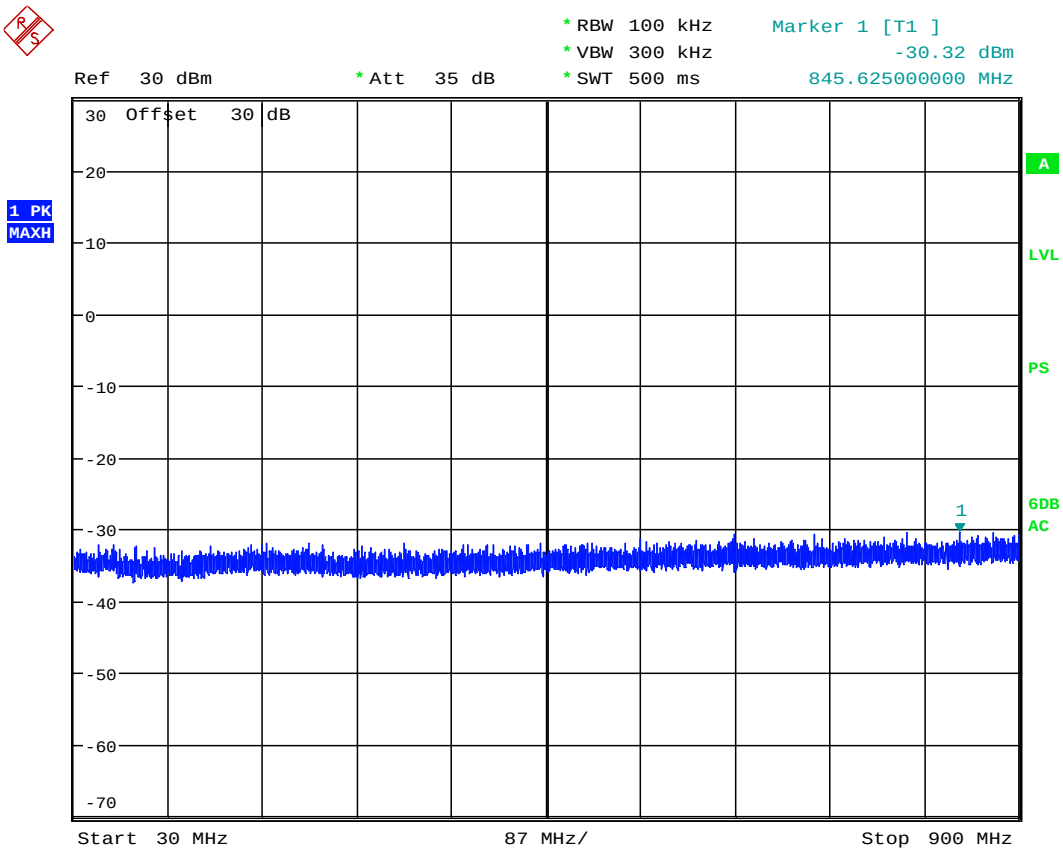


Unwanted conducted emissions

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

Tx @ 915 MHz, 2 MHz Channel Bandwidth

Plot 4.6

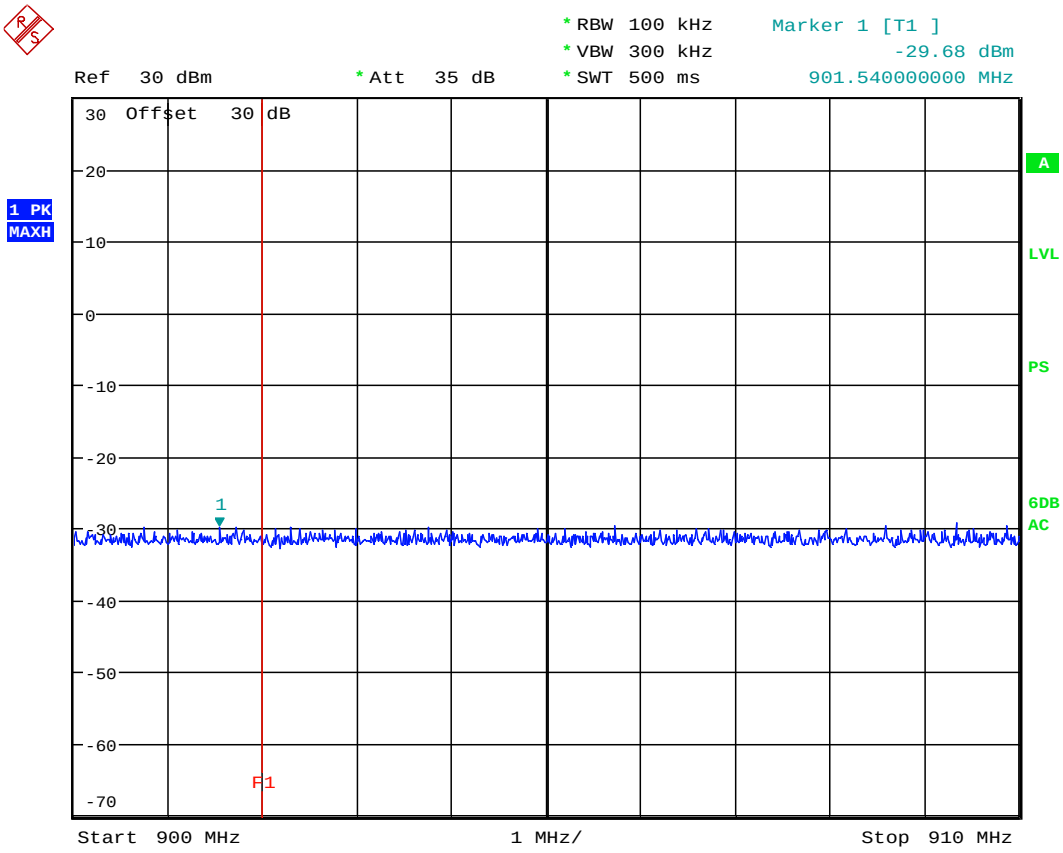


Unwanted conducted emissions

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

Tx @ 926.777 MHz, 2 MHz Channel Bandwidth

Plot 4.7

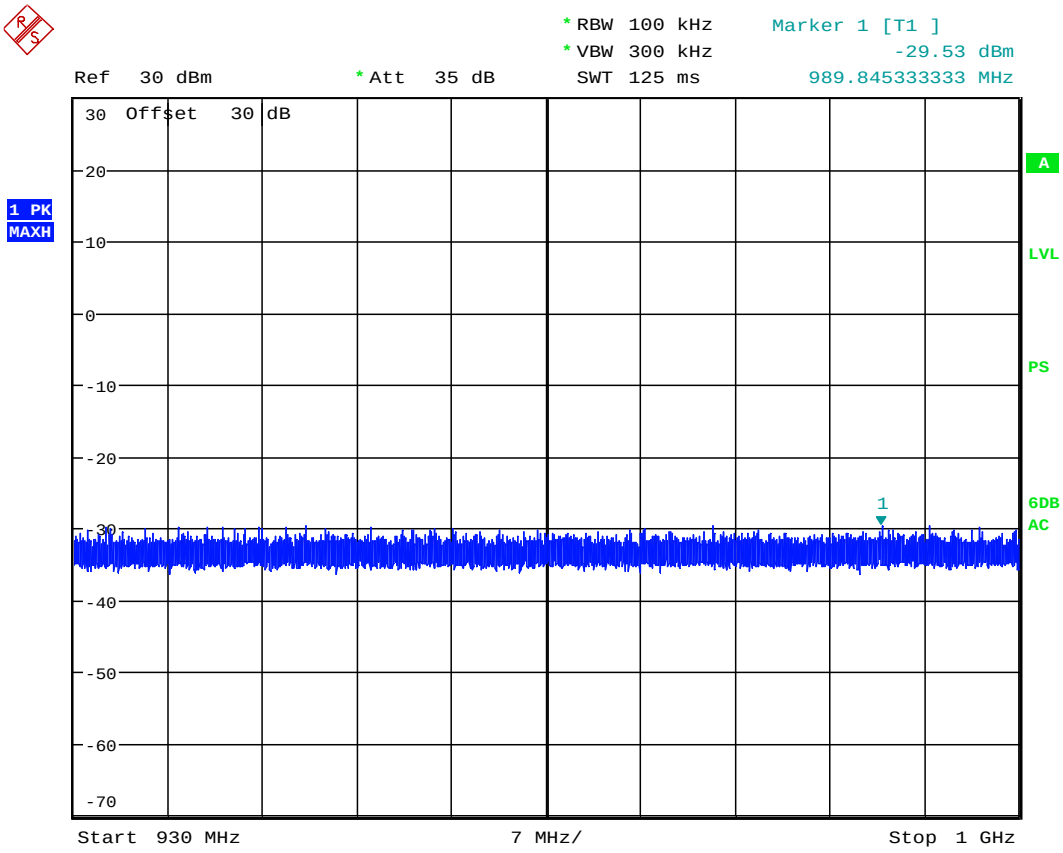


Unwanted conducted emissions

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

Tx @ 926.777 MHz, 2 MHz Channel Bandwidth

Plot 4.8

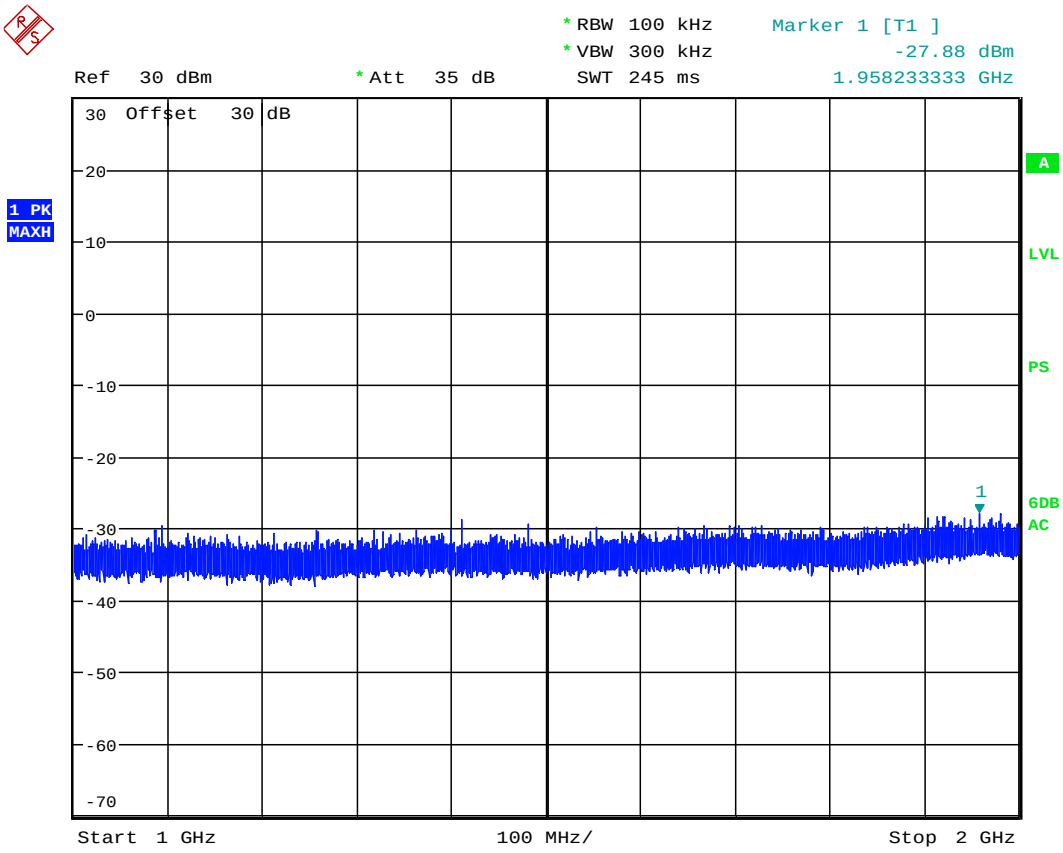


Unwanted conducted emissions

Date: 4.APR.2013 20:53:17

Worst case data when Tx @ 926.777 MHz or Tx @ 915MHz or Tx @ 903.223MHz, with 2 MHz Channel Bandwidth

Plot 4.9

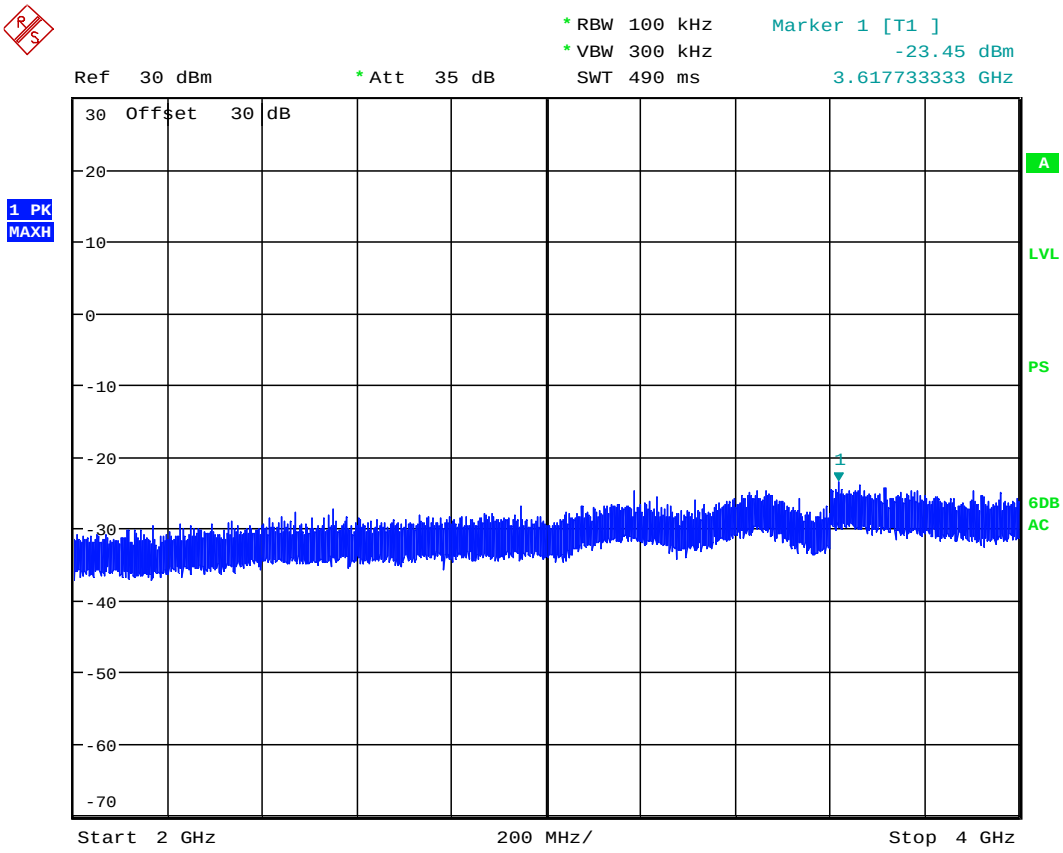


Unwanted conducted emissions

Date: 4.APR.2013 20:54:05

Worst case data when Tx @ 926.777 MHz or Tx @ 915MHz or Tx @ 903.223MHz, with 2 MHz Channel Bandwidth

Plot 4.10

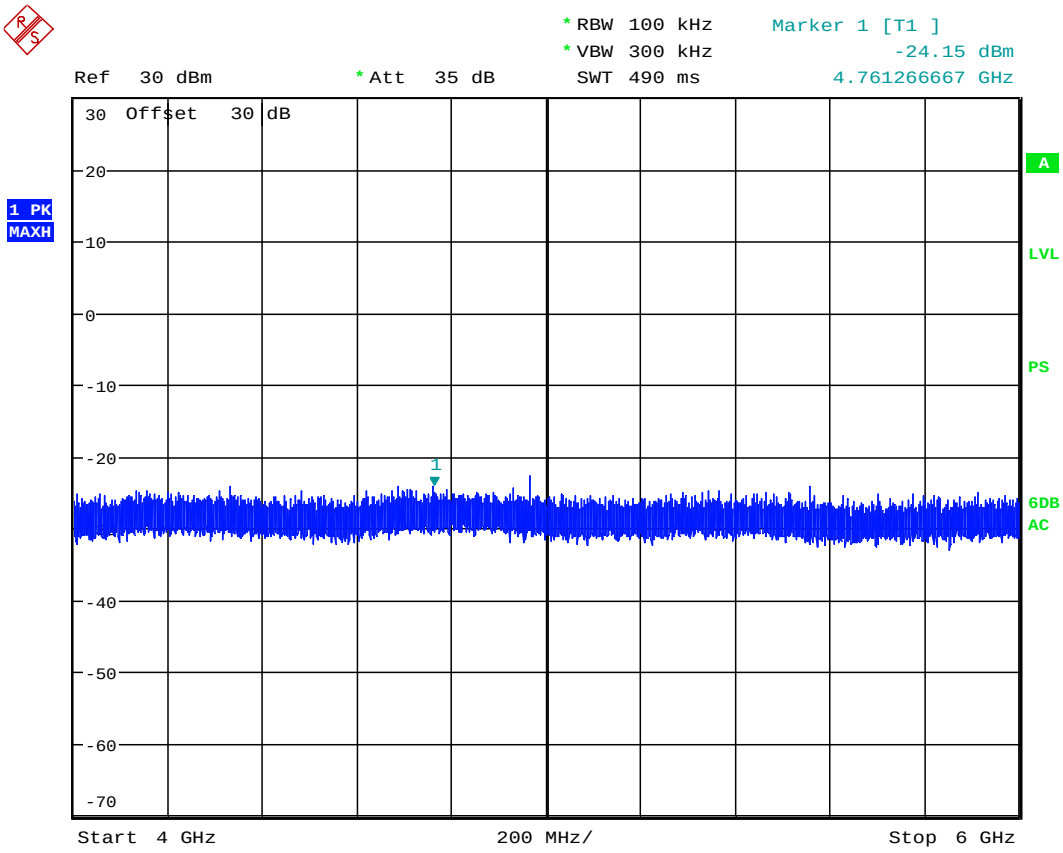


Unwanted conducted emissions

Date: 4.APR.2013 20:54:48

Worst case data when Tx @ 926.777 MHz or Tx @ 915MHz or Tx @ 903.223MHz, with 2 MHz Channel Bandwidth

Plot 4.11

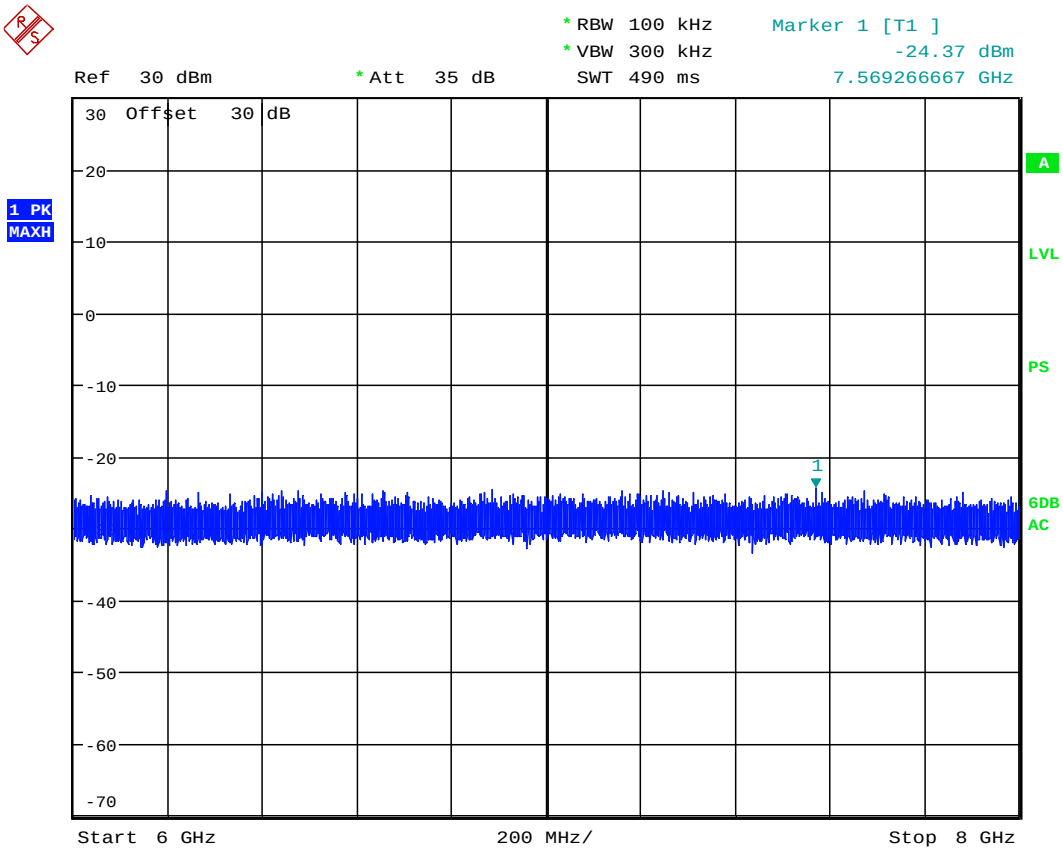


Unwanted conducted emissions

Date: 4.APR.2013 20:55:23

Worst case data when Tx @ 926.777 MHz or Tx @ 915MHz or Tx @ 903.223MHz, with 2 MHz Channel Bandwidth

Plot 4.12

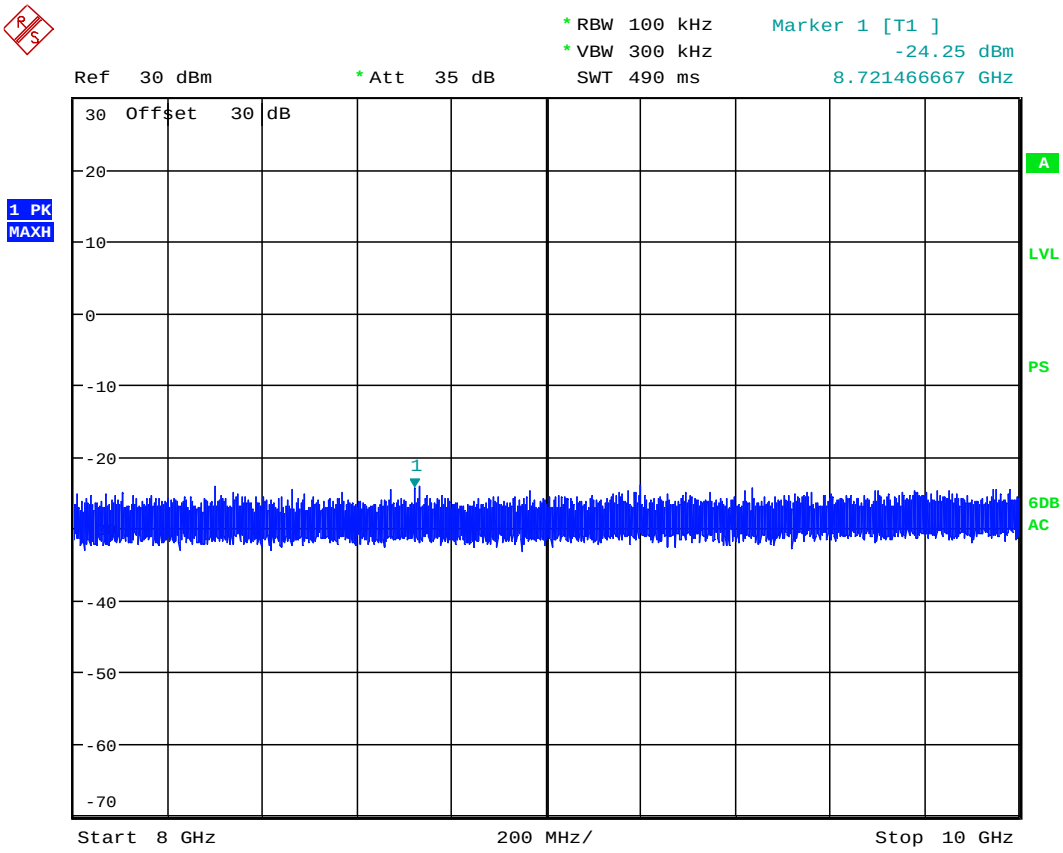


Unwanted conducted emissions

Date: 4.APR.2013 20:55:53

Worst case data when Tx @ 926.777 MHz or Tx @ 915MHz or Tx @ 903.223MHz, with 2 MHz Channel Bandwidth

Plot 4.13

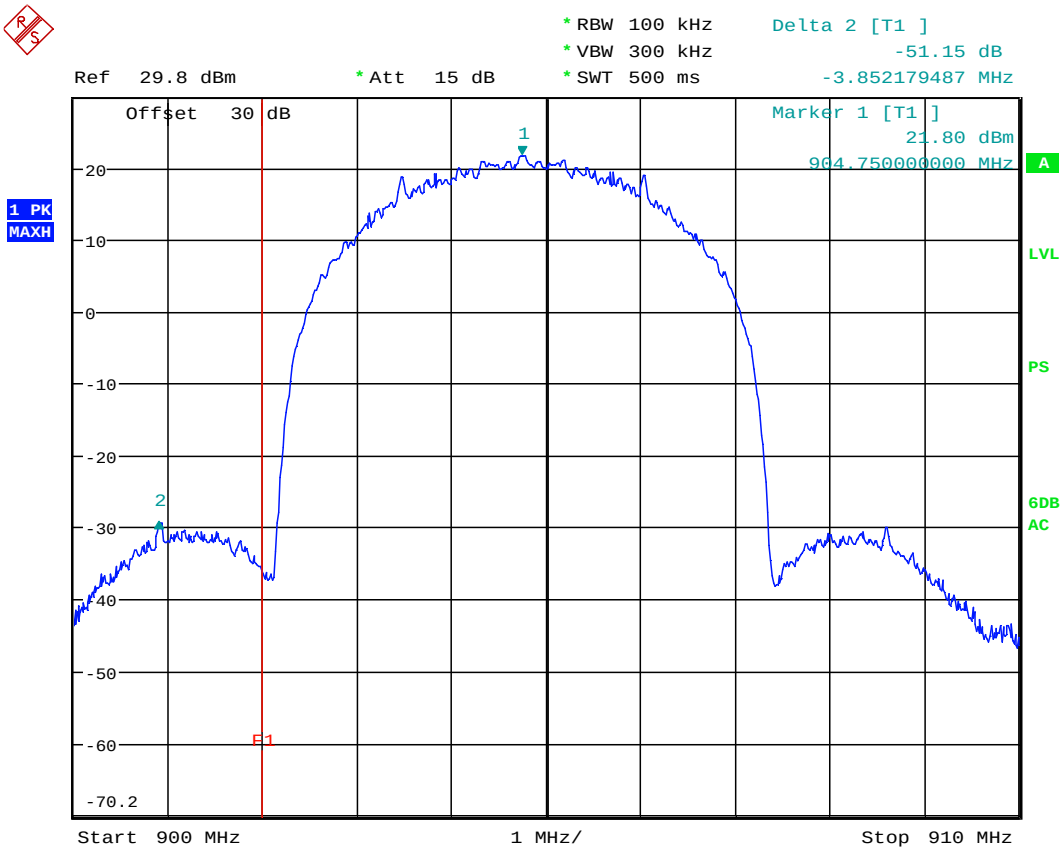


Unwanted conducted emissions

Date: 4.APR.2013 20:56:23

Worst case data when Tx @ 926.777 MHz or Tx @ 915MHz or Tx @ 903.223MHz, with 2 MHz Channel Bandwidth

Plot 4.14

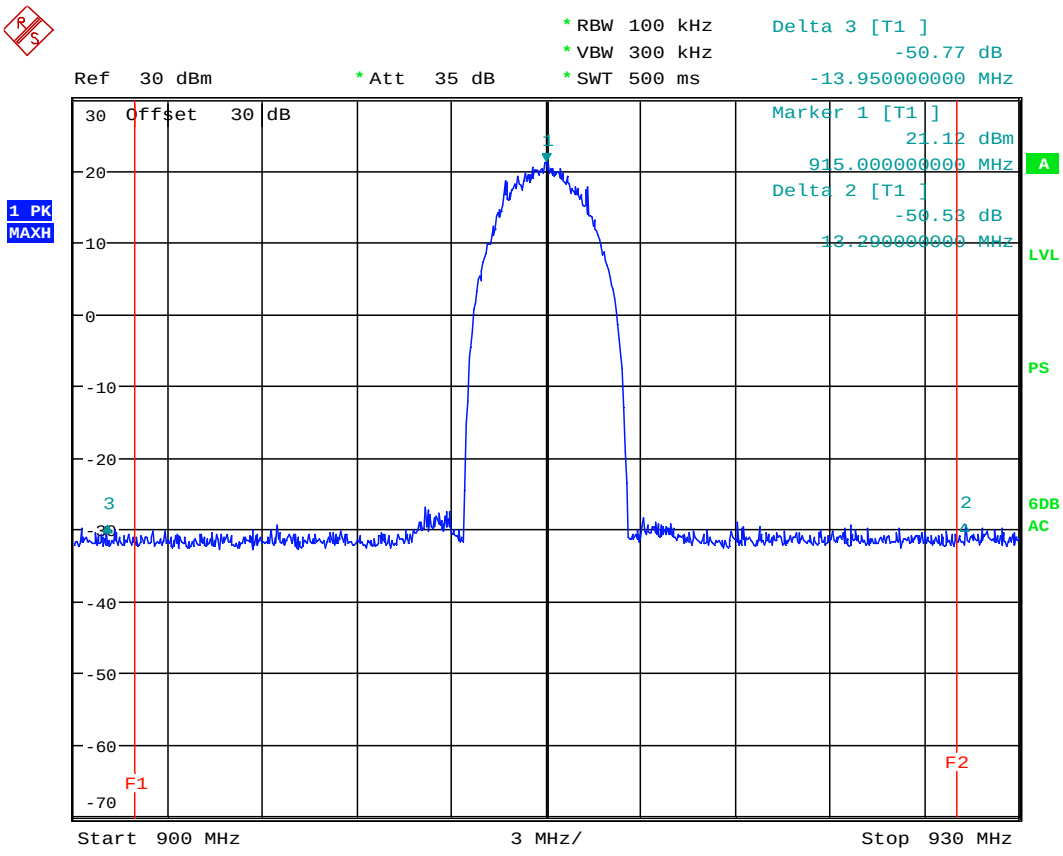


Unwanted conducted emissions

Date: 3.APR.2013 16:59:35

Tx @ 904.7575 MHz, 5 MHz Channel Bandwidth

Plot 4.15

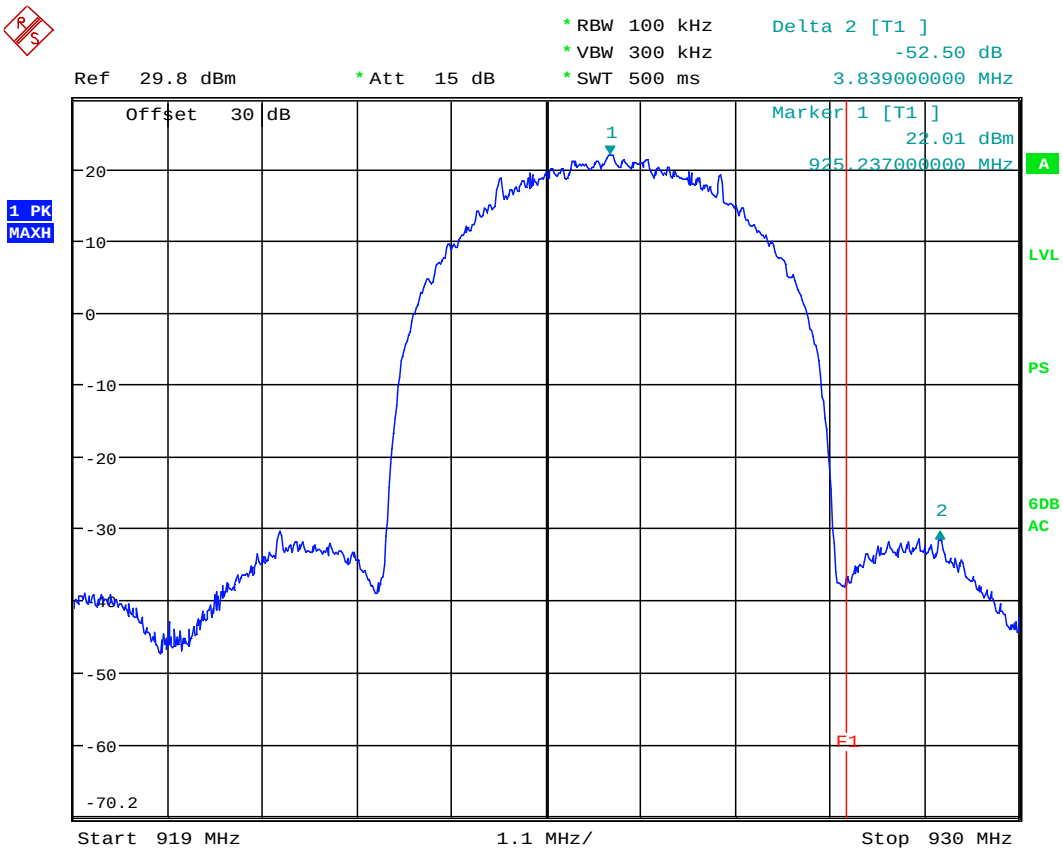


Unwanted conducted emissions

Date: 4.APR.2013 19:23:06

Tx @ 915 MHz, 5 MHz Channel Bandwidth

Plot 4.16

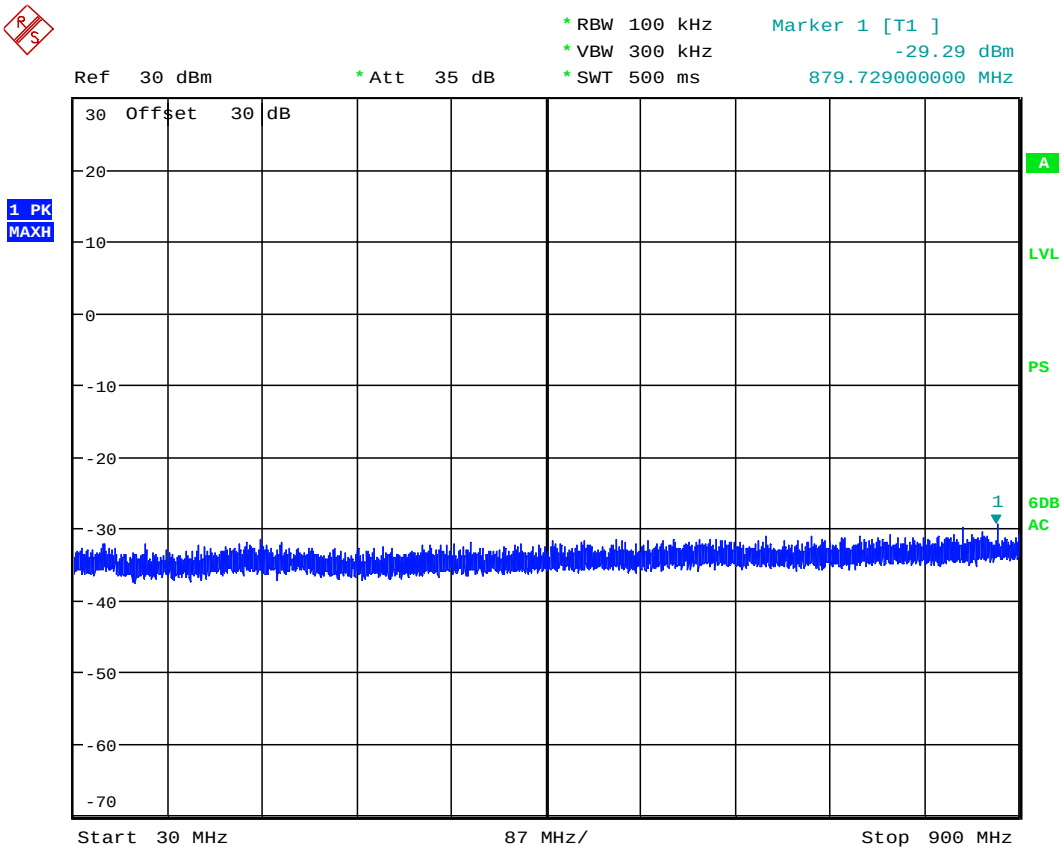


Unwanted conducted emissions

Date: 3.APR.2013 17:27:05

Tx @ 925.2425 MHz, 5 MHz Channel Bandwidth

Plot 4.17

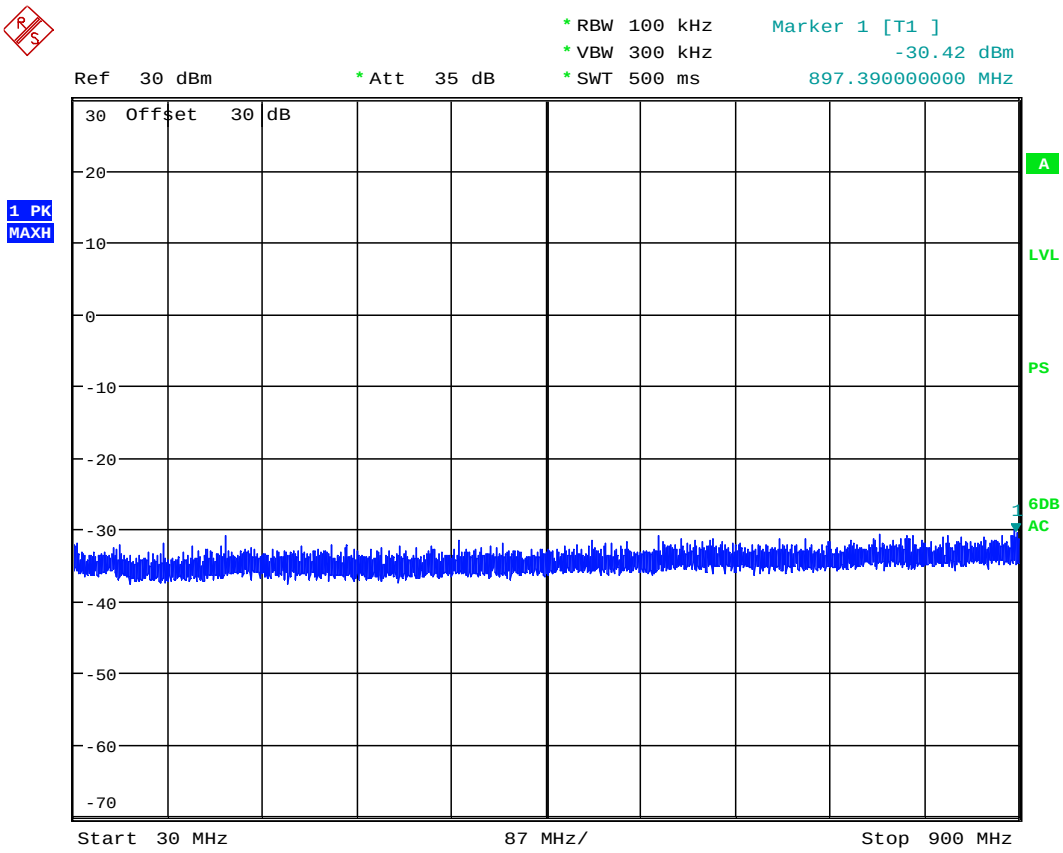


Unwanted conducted emissions

Date: 4.APR.2013 19:41:08

Tx @ 904.7575 MHz, 5 MHz Channel Bandwidth

Plot 4.18

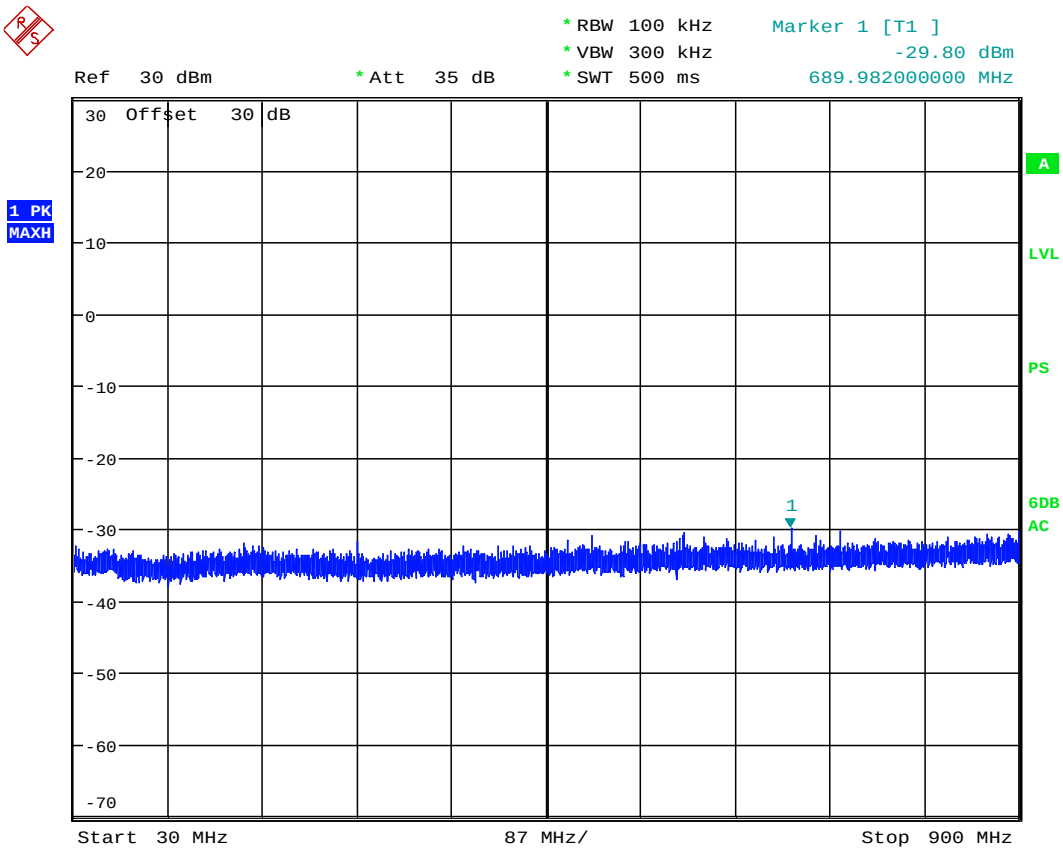


Unwanted conducted emissions

Date: 4.APR.2013 19:42:41

Tx @ 915 MHz, 5 MHz Channel Bandwidth

Plot 4.19

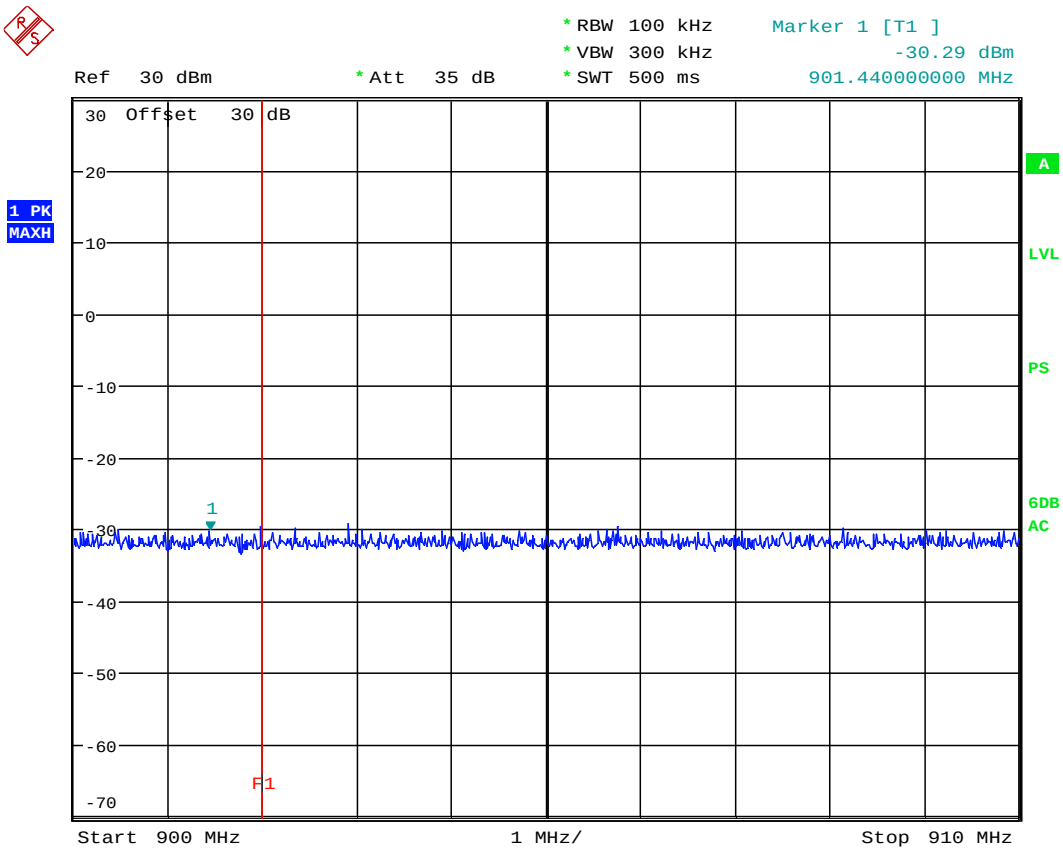


Unwanted conducted emissions

Date: 4.APR.2013 19:43:42

Tx @ 925.2425 MHz, 5 MHz Channel Bandwidth

Plot 4.20

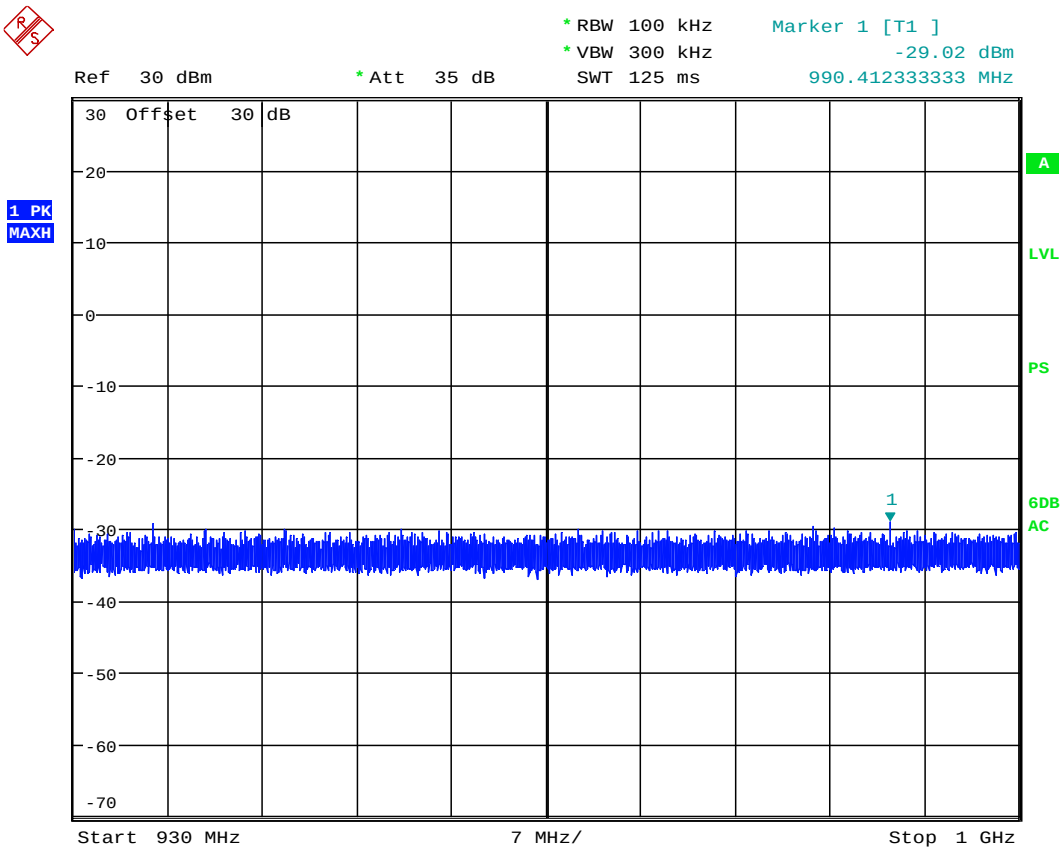


Unwanted conducted emissions

Date: 5.APR.2013 13:04:09

Tx @ 925.2425 MHz, 5 MHz Channel Bandwidth

Plot 4.21

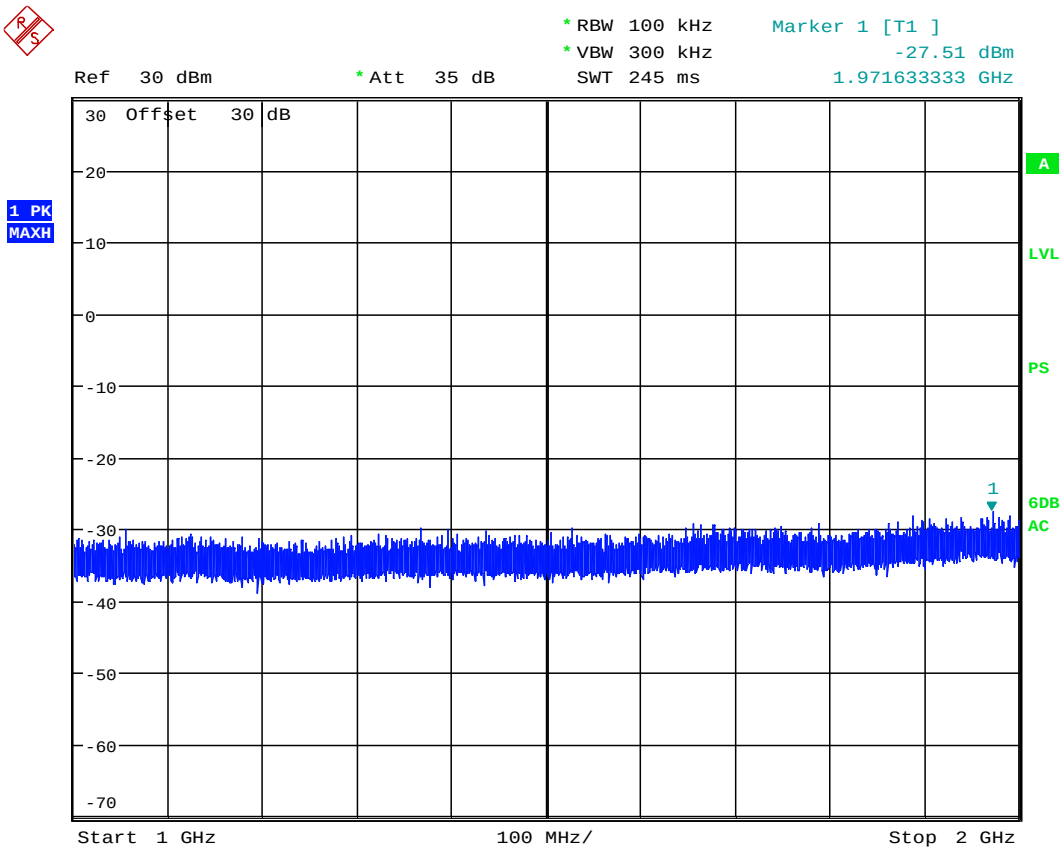


Unwanted conducted emissions

Date: 4.APR.2013 20:59:35

Worst case data when Tx @ 904.7575 MHz , or Tx @ 915 MHz or Tx @ 925.2425 MHz, with 5 MHz Channel Bandwidth

Plot 4.22

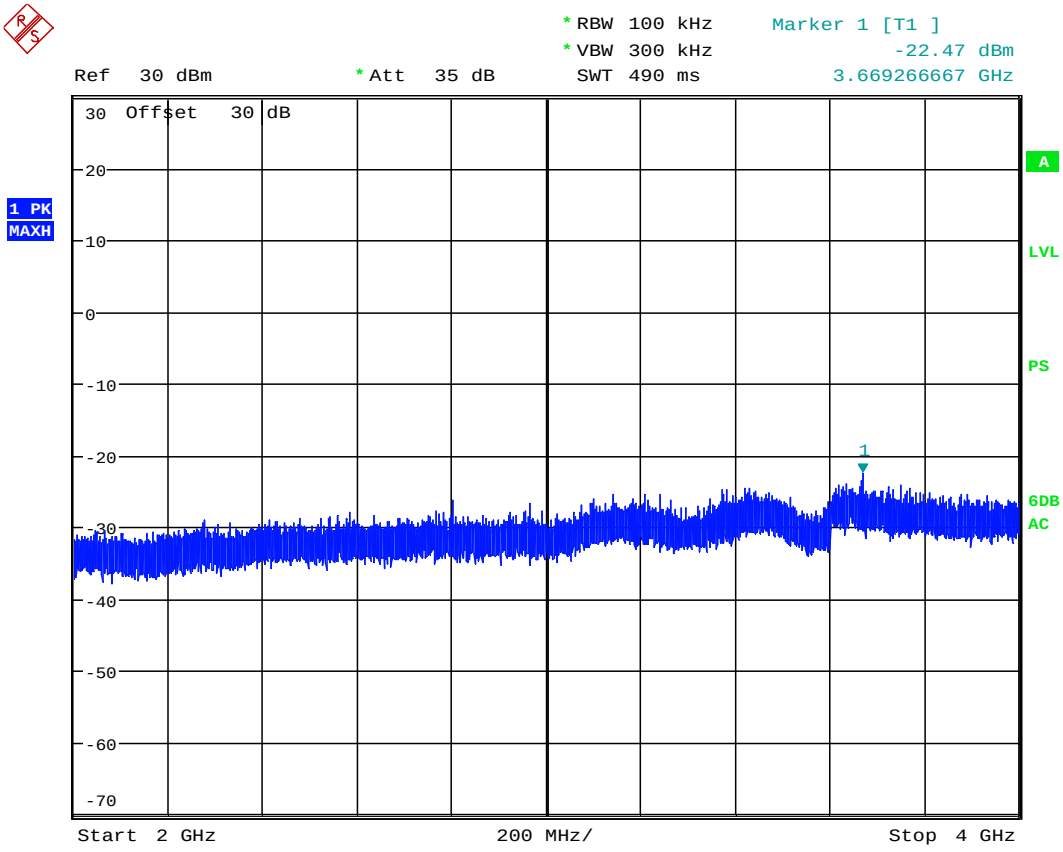


Unwanted conducted emissions

Date: 4.APR.2013 21:00:15

Worst case data when Tx @ 904.7575 MHz , or Tx @ 915 MHz or Tx @ 925.2425 MHz, with 5 MHz Channel Bandwidth

Plot 4.23

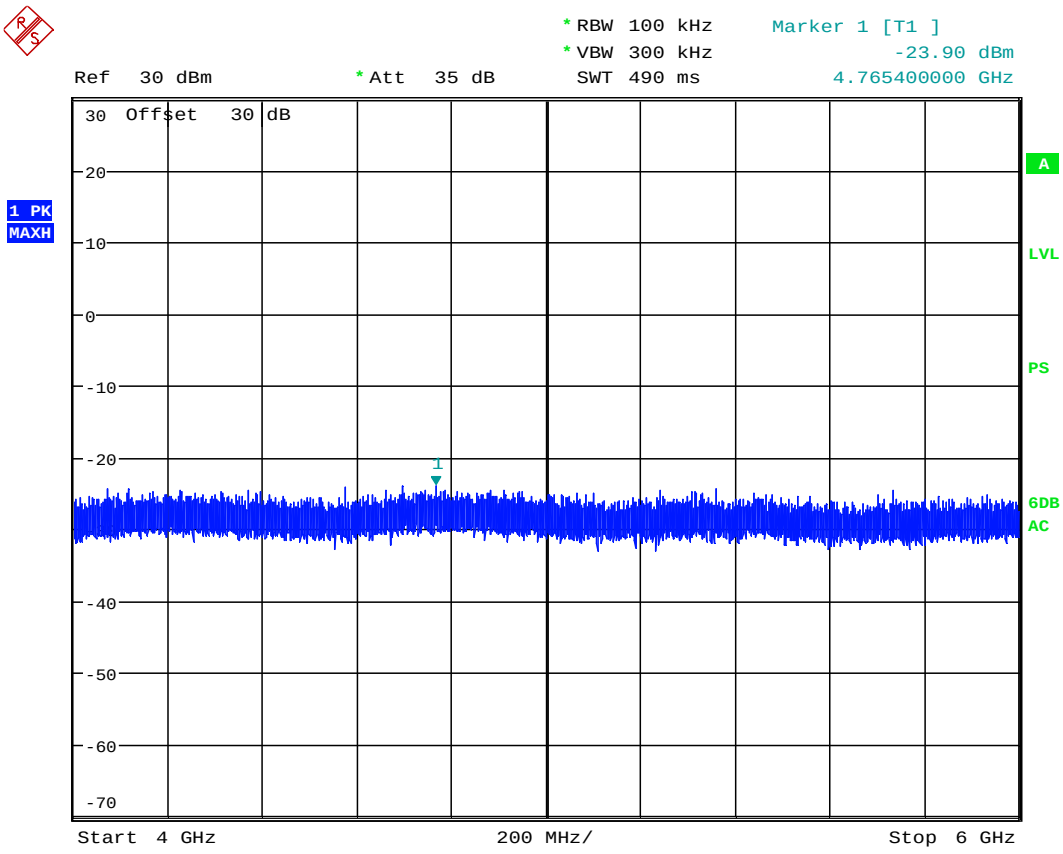


Unwanted conducted emissions

Date: 4.APR.2013 21:00:55

Worst case data when Tx @ 904.7575 MHz , or Tx @ 915 MHz or Tx @ 925.2425 MHz, with 5 MHz Channel Bandwidth

Plot 4.24

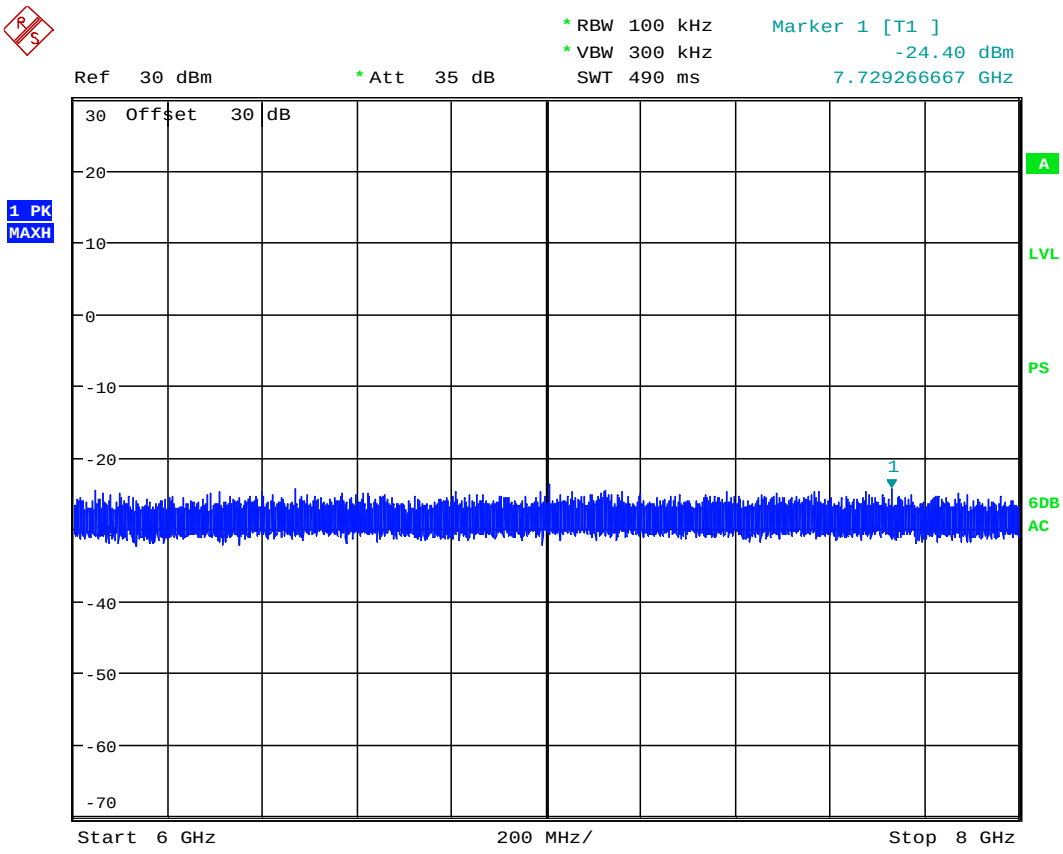


Unwanted conducted emissions

Date: 4.APR.2013 21:01:28

Worst case data when Tx @ 904.7575 MHz , or Tx @ 915 MHz or Tx @ 925.2425 MHz, with 5 MHz Channel Bandwidth

Plot 4.25

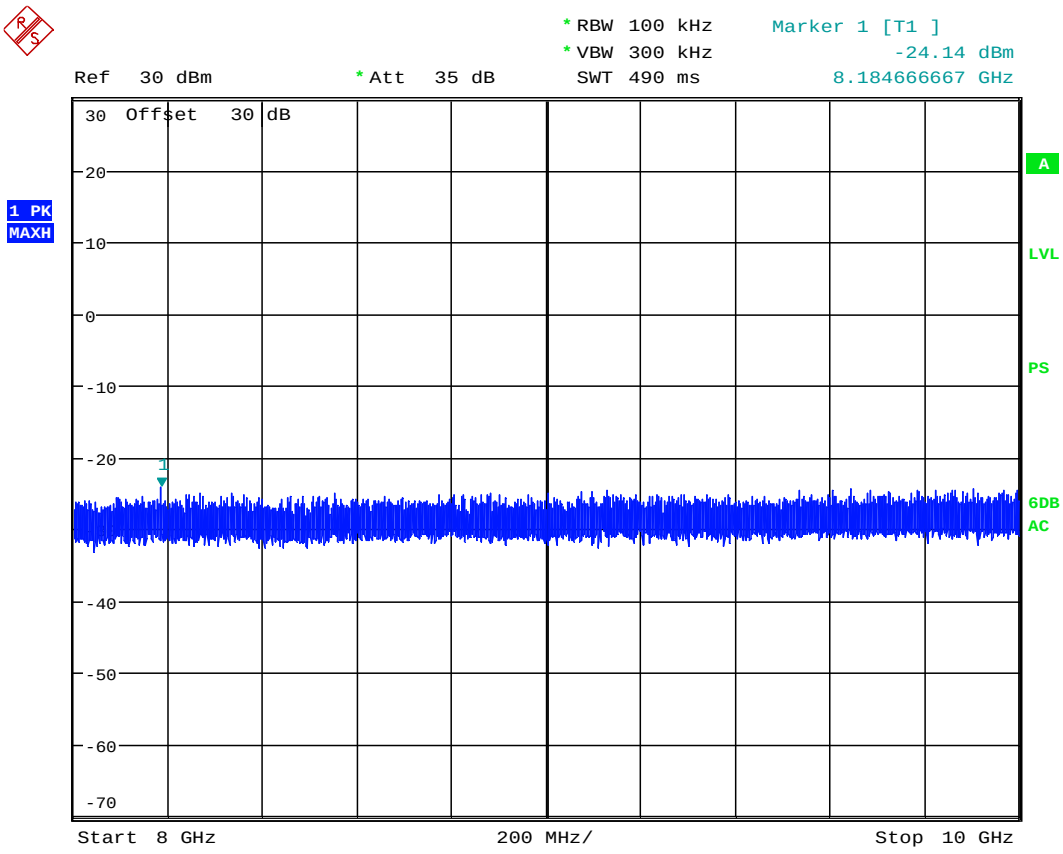


Unwanted conducted emissions

Date: 4.APR.2013 21:02:21

Worst case data when Tx @ 904.7575 MHz , or Tx @ 915 MHz or Tx @ 925.2425 MHz, with 5 MHz Channel Bandwidth

Plot 4.26

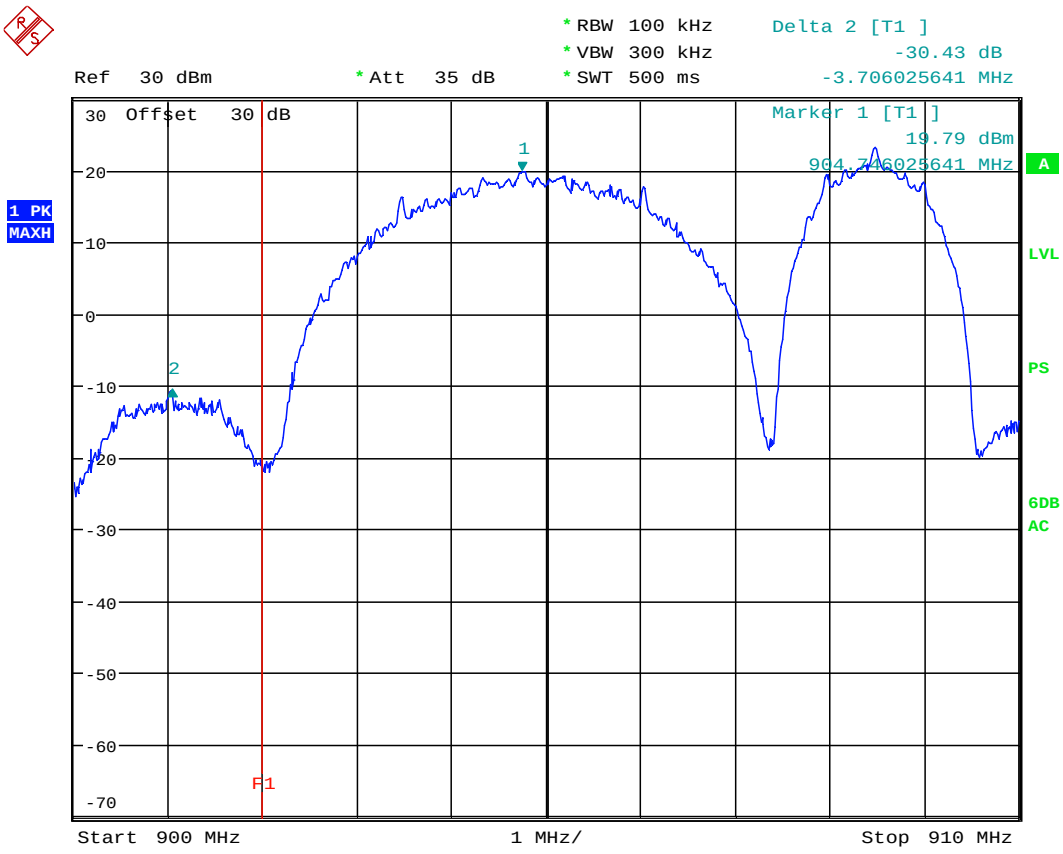


Unwanted conducted emissions

Date: 4.APR.2013 21:02:51

Worst case data when Tx @ 904.7575 MHz , or Tx @ 915 MHz or Tx @ 925.2425 MHz, with 5 MHz Channel Bandwidth

Plot 4.28

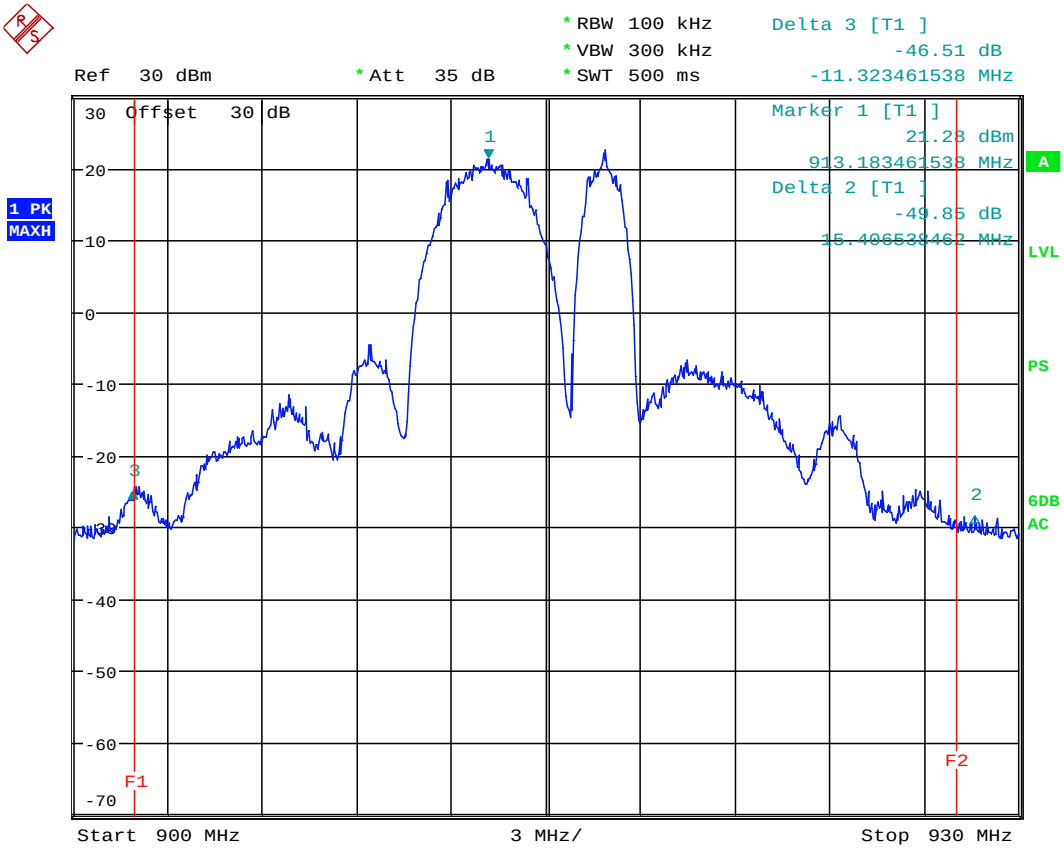


Unwanted conducted emissions

Date: 4.APR.2013 18:40:12

Simultaneous Tx @ Low dual channels with 5 MHz and 2 MHz Channel Bandwidths

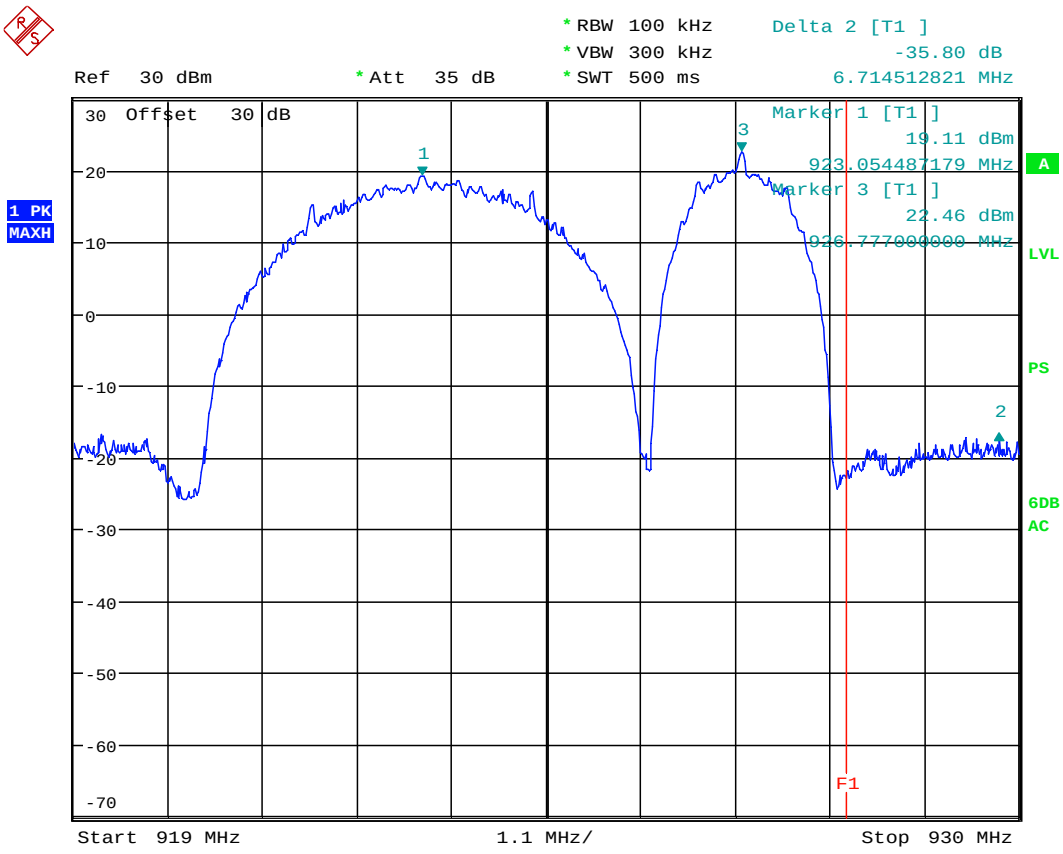
Plot 4.29



Unwanted conducted emissions
Date: 4.APR.2013 19:21:43

Simultaneous Tx @ Middle dual channels with 5 MHz and 2 MHz Channel Bandwidths

Plot 4.30

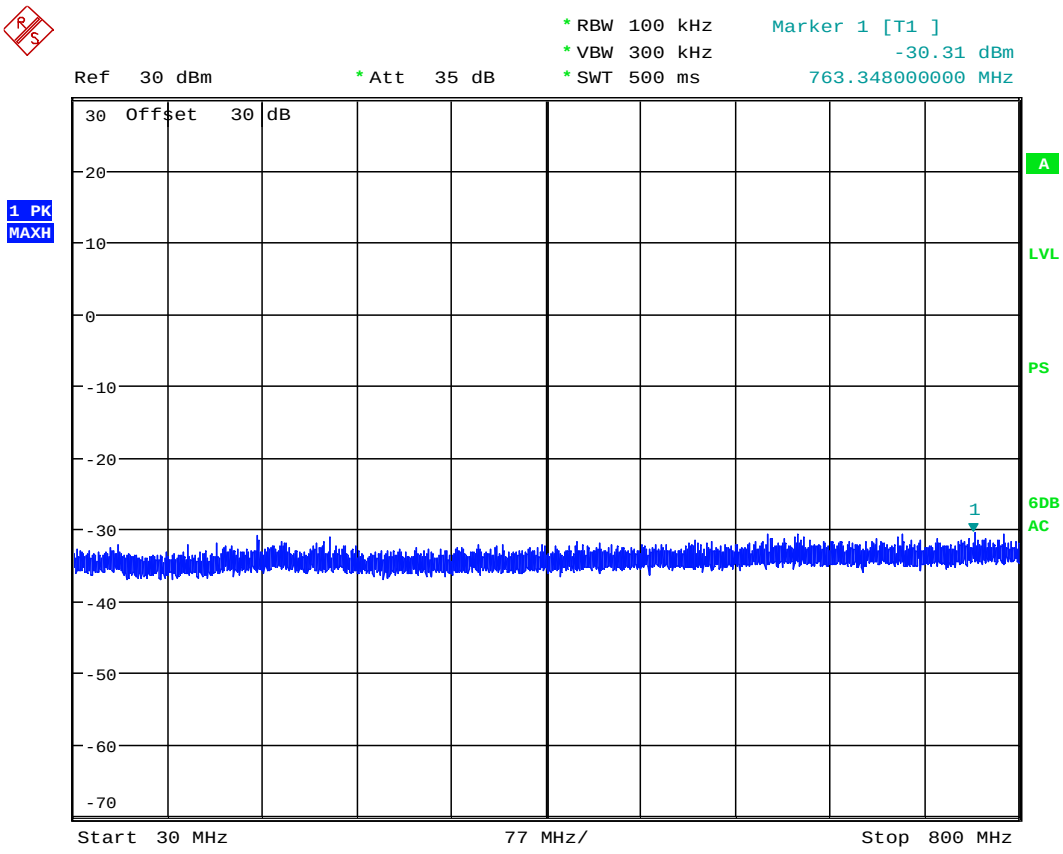


Unwanted conducted emissions

Date: 5.APR.2013 13:09:50

Simultaneous Tx @ High dual channels with 5 MHz and 2 MHz Channel Bandwidths

Plot 4.31

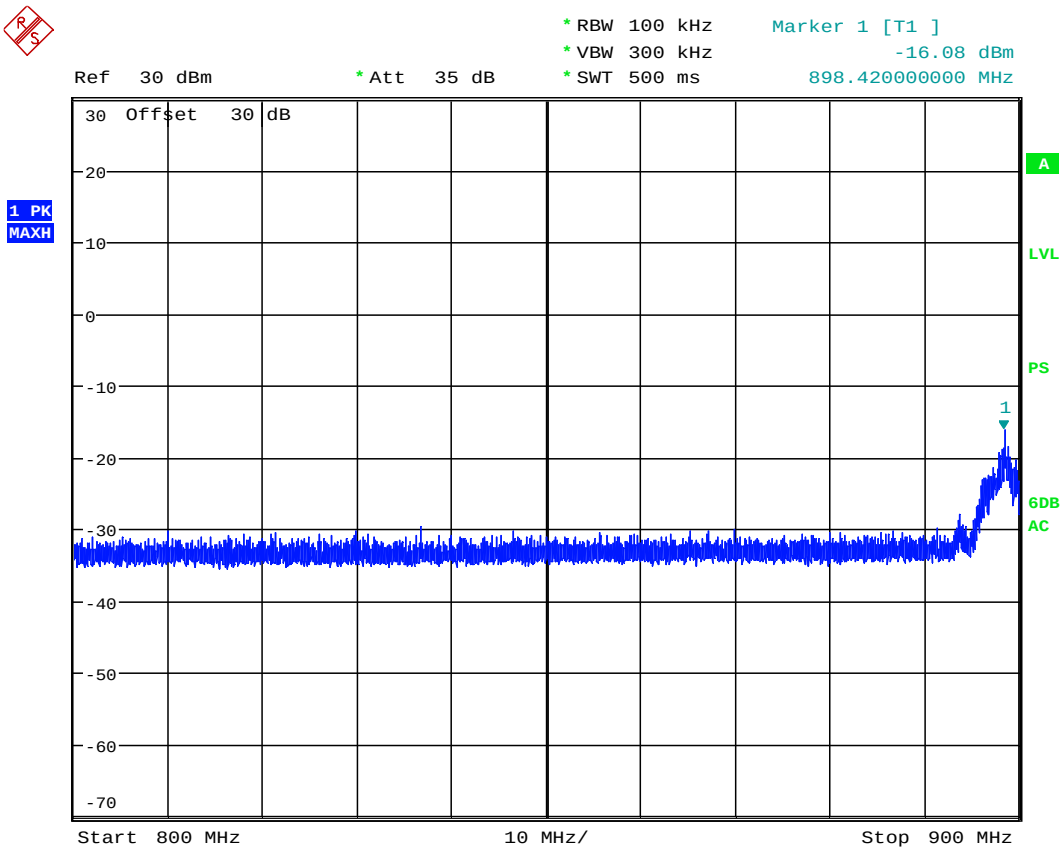


Unwanted conducted emissions

Date: 4.APR.2013 20:13:17

Simultaneous Tx @ Low dual channels with 5 MHz and 2 MHz Channel Bandwidths

Plot 4.32

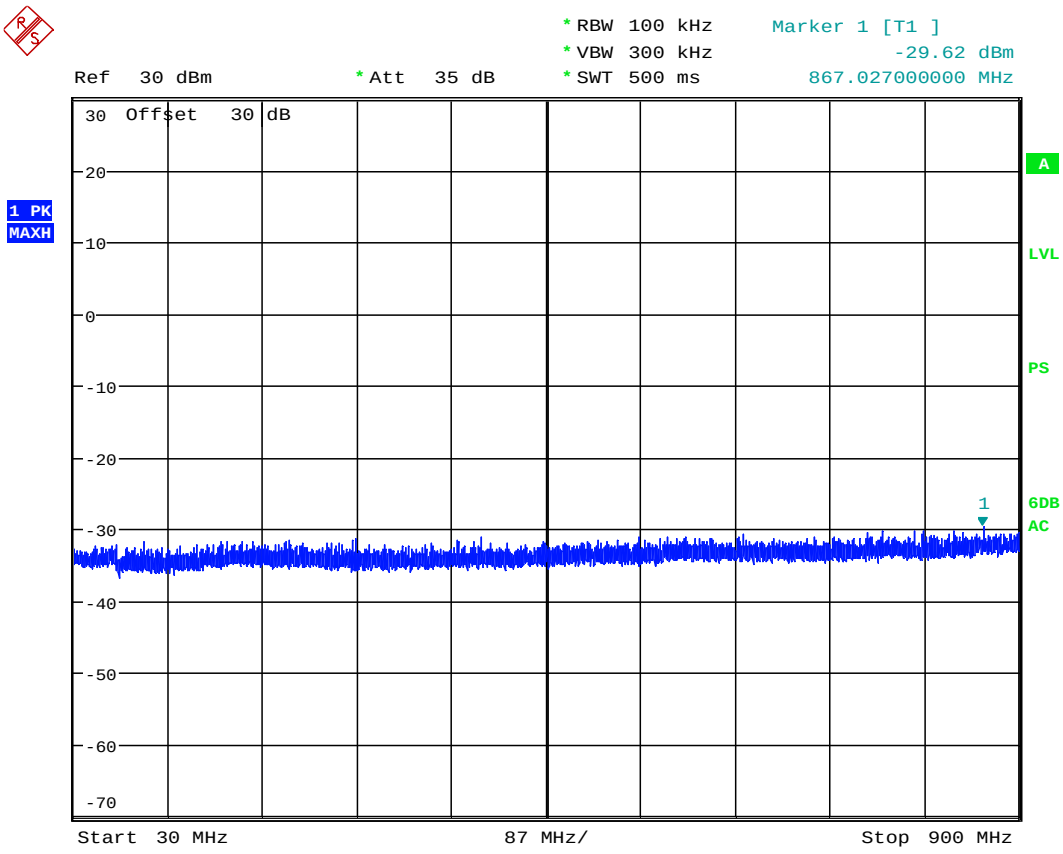


Unwanted conducted emissions

Date: 4.APR.2013 20:14:23

Simultaneous Tx @ Low dual channels with 5 MHz and 2 MHz Channel Bandwidths

Plot 4.33

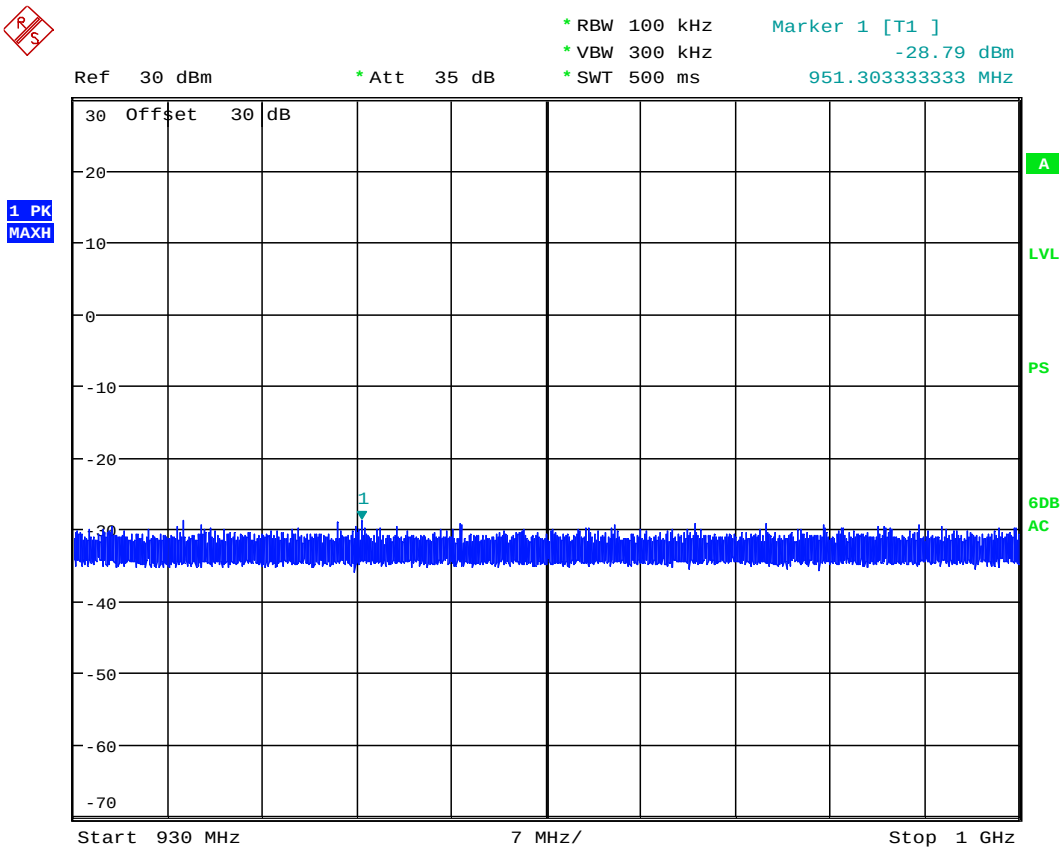


Unwanted conducted emissions

Date: 4.APR.2013 20:26:33

Simultaneous Tx @ Middle dual channels with 5 MHz and 2 MHz Channel Bandwidths

Plot 4.34

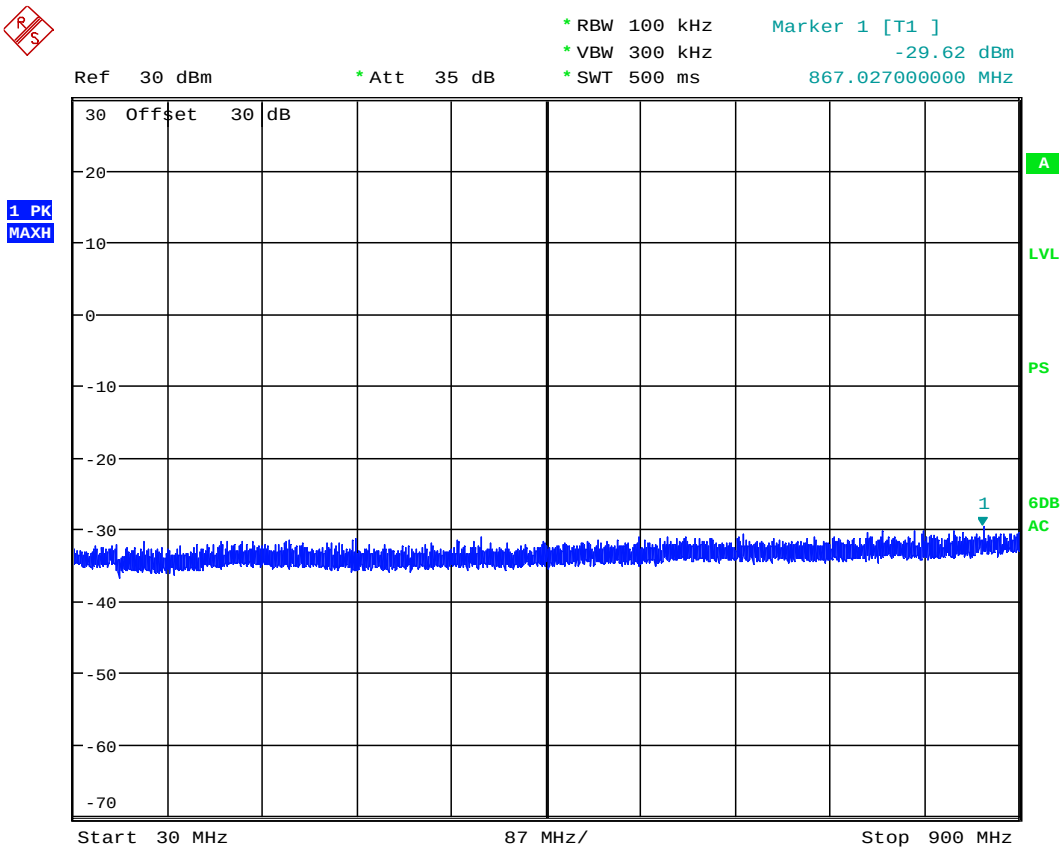


Unwanted conducted emissions

Date: 4.APR.2013 21:14:19

Simultaneous Tx @ Low or Middle dual channels with 5 MHz and 2 MHz Channel Bandwidths

Plot 4.35

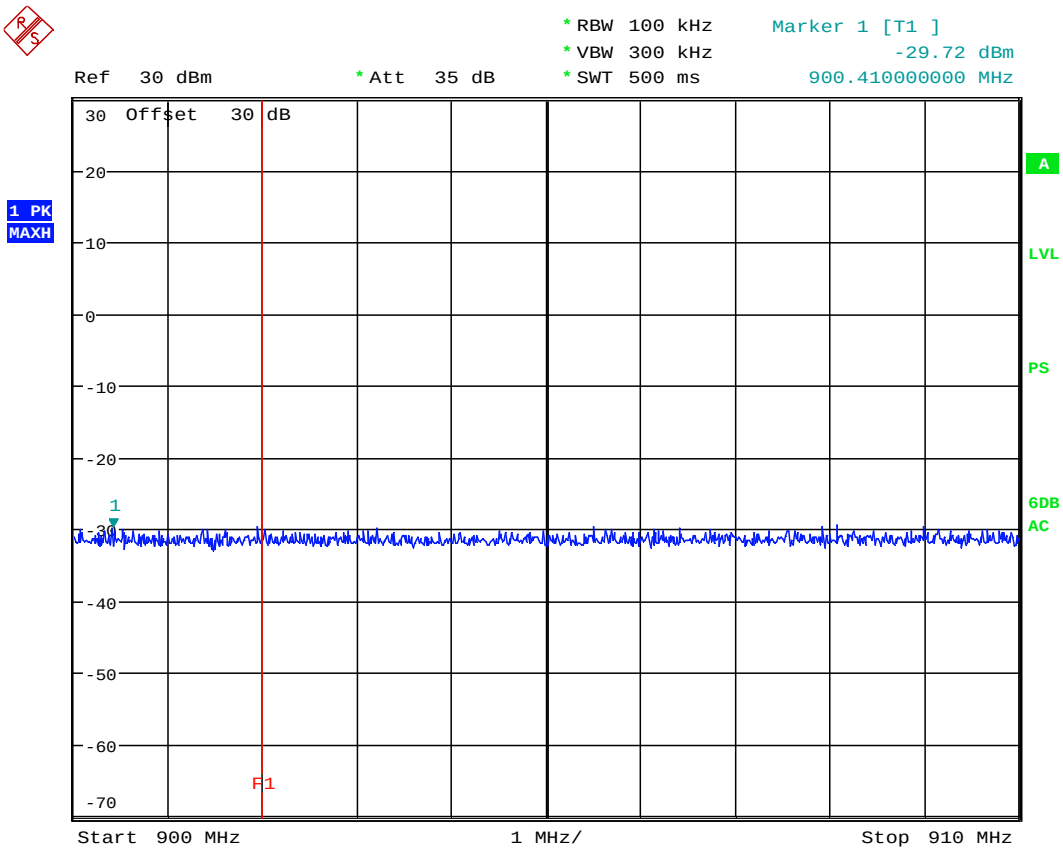


Unwanted conducted emissions

Date: 4.APR.2013 20:26:33

Simultaneous Tx @ High dual channels with 5 MHz and 2 MHz Channel Bandwidths

Plot 4.36

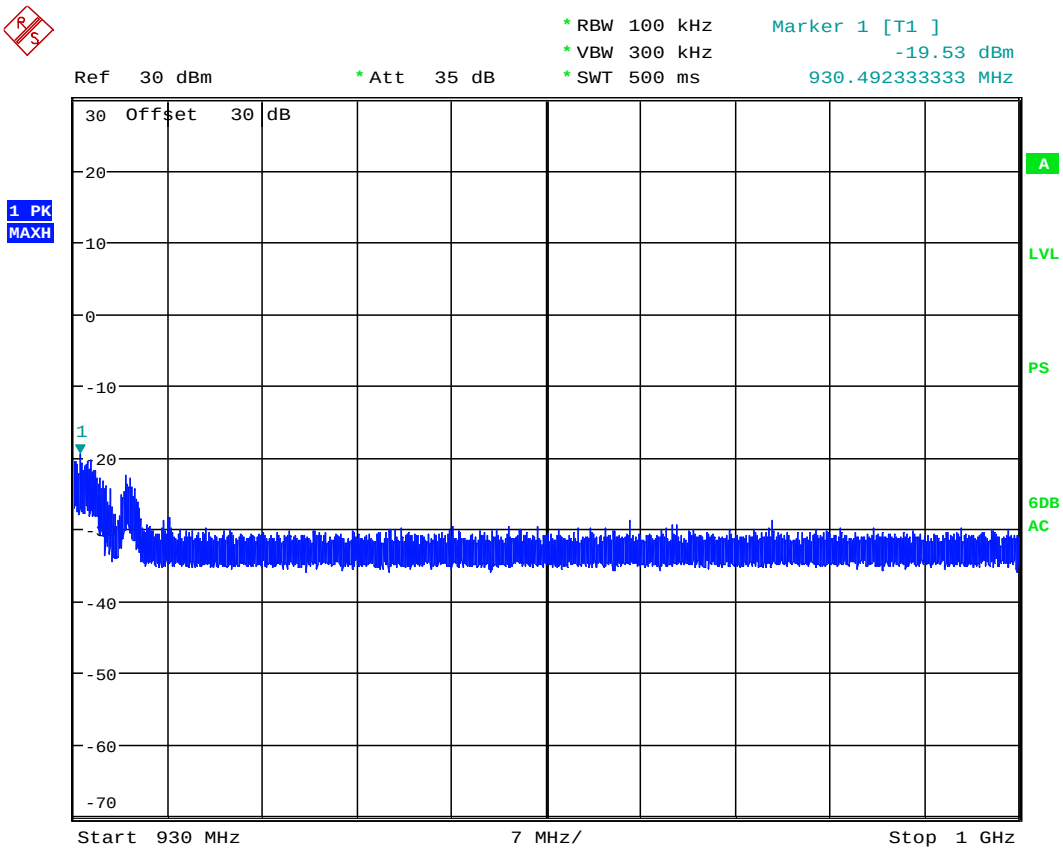


Unwanted conducted emissions

Date: 5.APR.2013 13:05:55

Simultaneous Tx @ High dual channels with 5 MHz and 2 MHz Channel Bandwidths

Plot 4.37

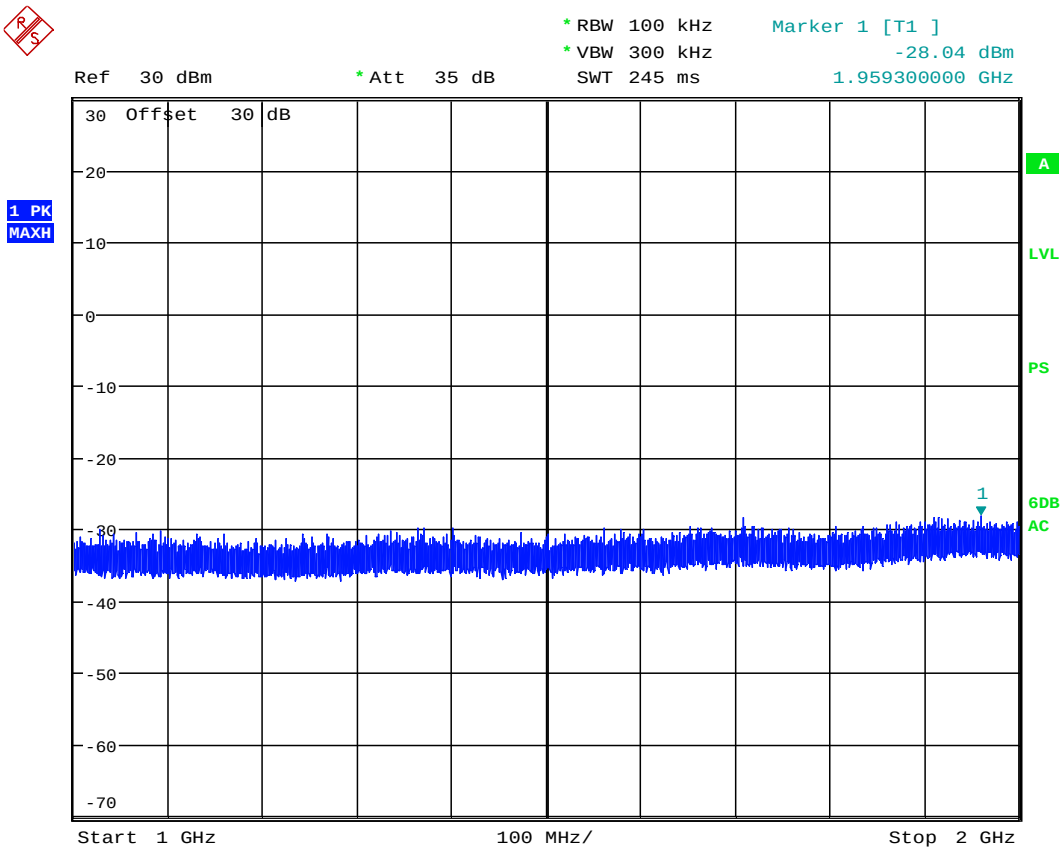


Unwanted conducted emissions

Date: 5.APR.2013 13:12:17

Simultaneous Tx @ High dual channels with 5 MHz and 2 MHz Channel Bandwidths

Plot 4.38

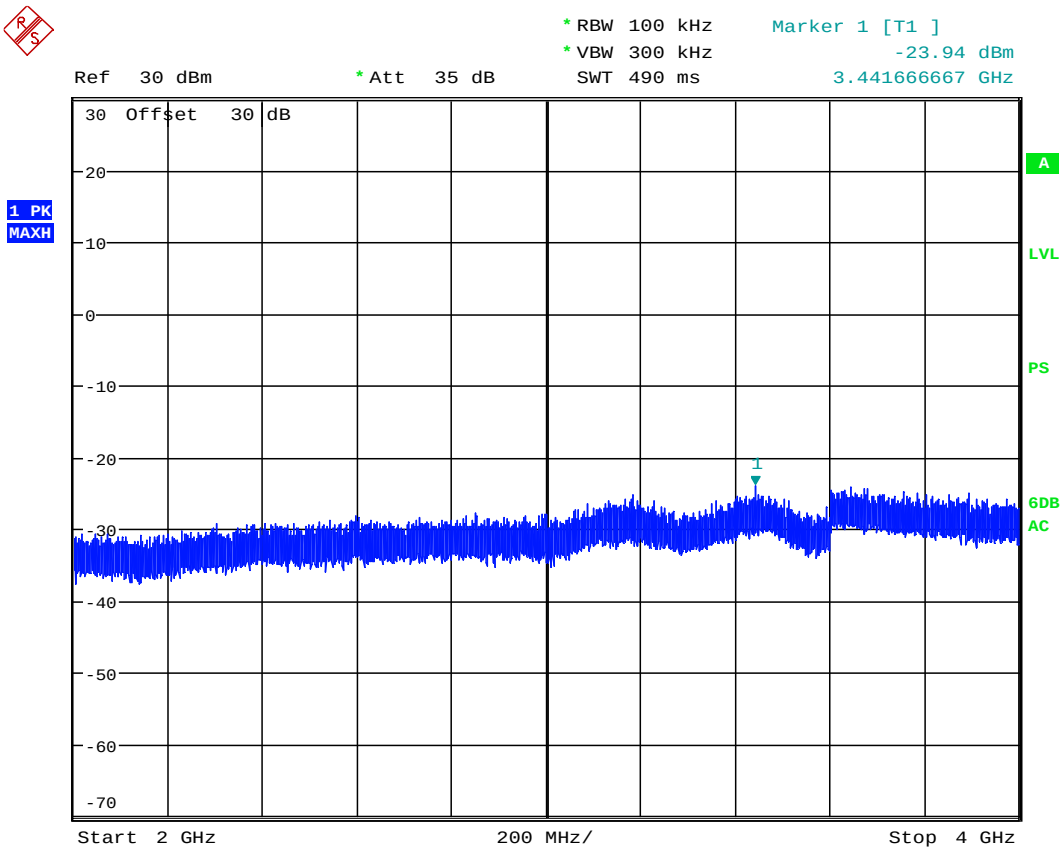


Unwanted conducted emissions

Date: 4.APR.2013 21:15:41

Simultaneous Tx @ Low or Middle or High dual channels with 5 MHz and 2 MHz Channel Bandwidths

Plot 4.39

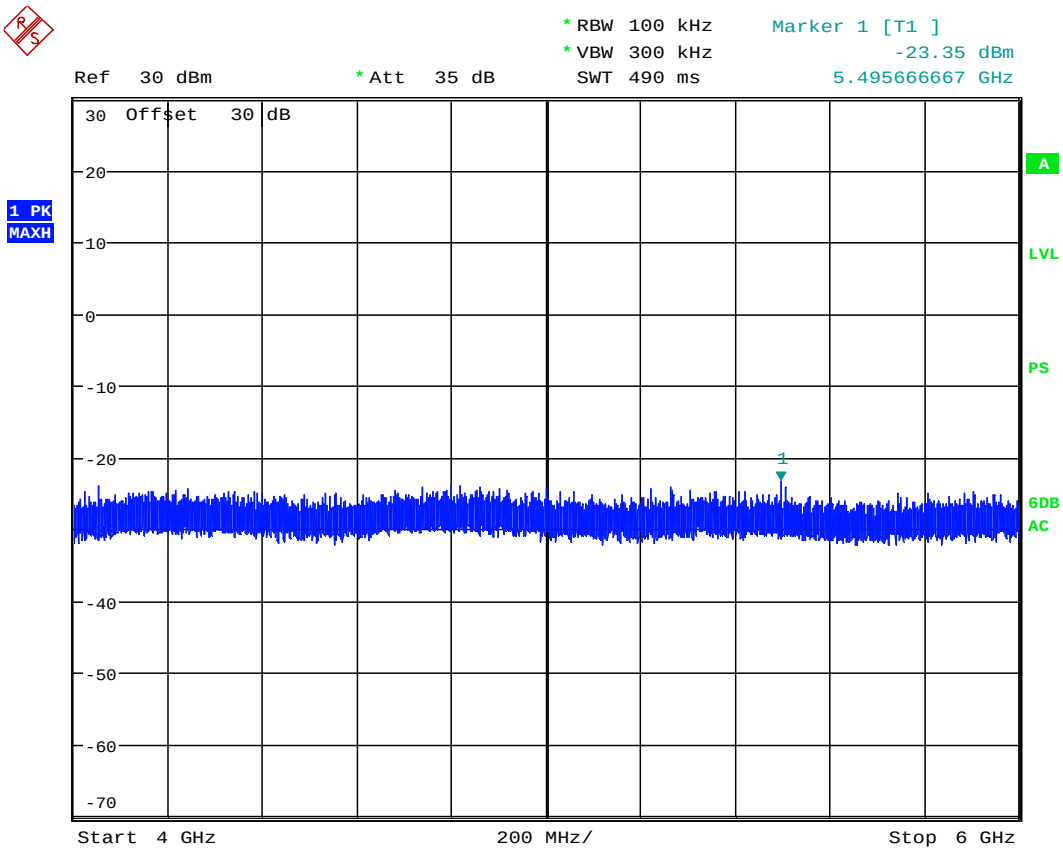


Unwanted conducted emissions

Date: 4.APR.2013 21:17:09

Simultaneous Tx @ Low or Middle or High dual channels with 5 MHz and 2 MHz Channel Bandwidths

Plot 4.40

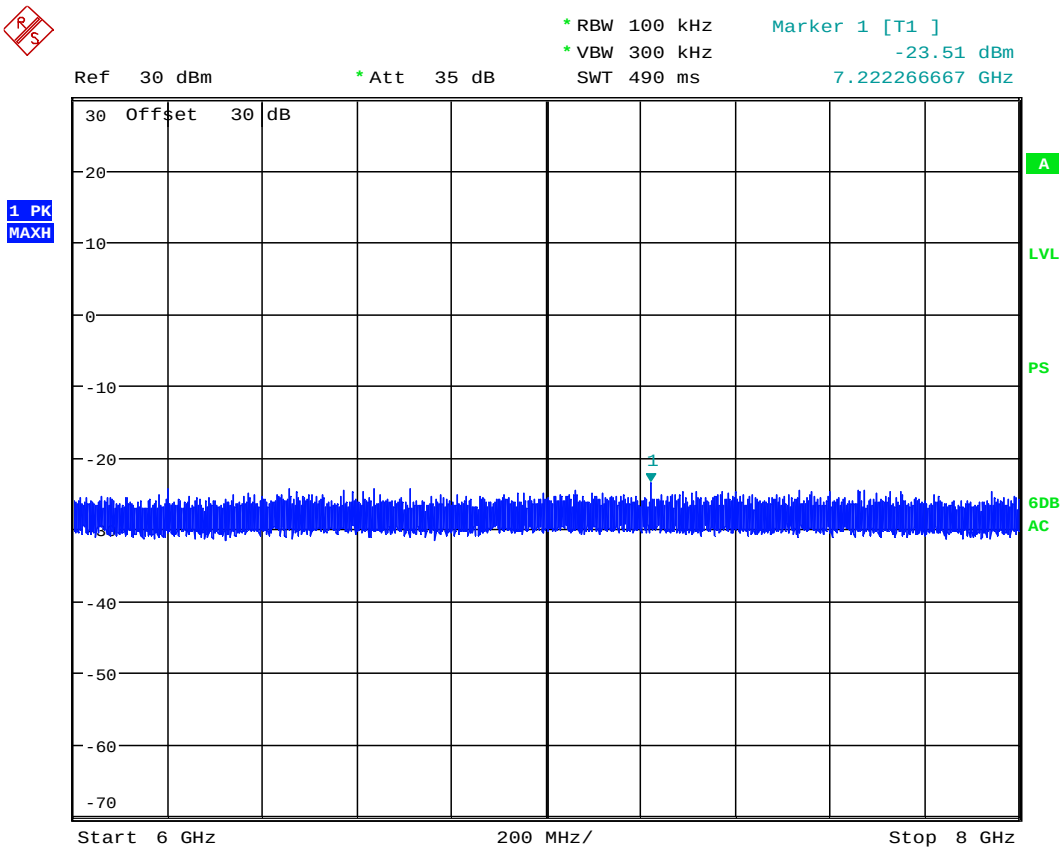


Unwanted conducted emissions

Date: 4.APR.2013 21:17:46

Simultaneous Tx @ Low or Middle or High dual channels with 5 MHz and 2 MHz Channel Bandwidths

Plot 4.41

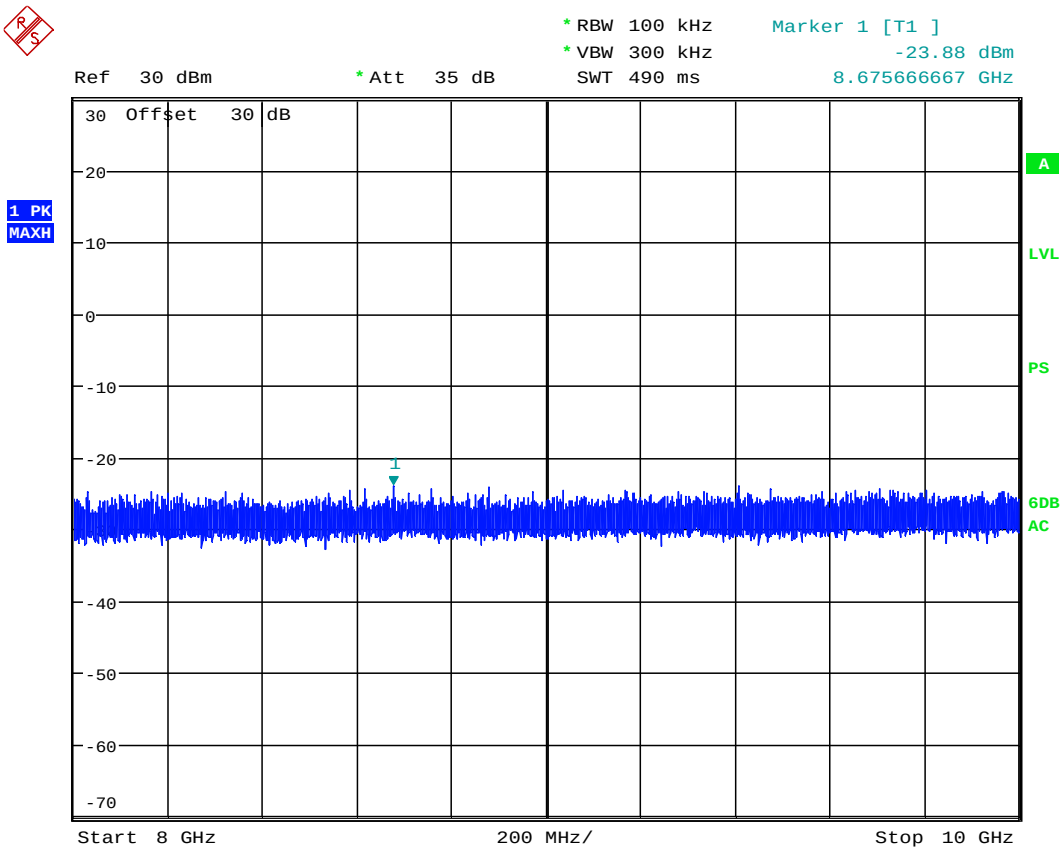


Unwanted conducted emissions

Date: 4.APR.2013 21:18:47

Simultaneous Tx @ Low or Middle or High dual channels with 5 MHz and 2 MHz Channel Bandwidths

Plot 4.42



Unwanted conducted emissions

Date: 4.APR.2013 21:19:25

Simultaneous Tx @ Low or Middle or High dual channels with 5 MHz and 2 MHz Channel Bandwidths

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(µV/m)
RA = Receiver Amplitude (including preamplifier) in dB(µV); 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(µV) 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(µV/m). This value in dB(µV/m) was converted to its corresponding level in µV/m.
RA = 52.0 dB(µV)
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(µV/m).
Level in µV/m = Common Antilogarithm [(32 dBµV/m)/20] = 39.8 µV/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 (Single Channel)

Temperature: 22 C, Humidity : 55 %

Radiated Emissions 30 MHz - 1000 MHz
FCC Part 15 Class B

Operator: KK
7-Apr-13

Model Number: MARS
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: Single Channel, 2MHz BW, 903.223MHz

Radiated Emissions 30 MHz - 1000 MHz
FCC Part 15 Class B

Operator: KK
7-Apr-13

Model Number: MARS
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: Single Channel, 2MHz BW, 915.0MHz

Radiated Emissions 30 MHz - 1000 MHz
FCC Part 15 Class B

Operator: KK
7-Apr-13

Model Number: MARS
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: Single Channel, 2MHz BW, 926.777MHz

Transmitter Radiated Emissions below 1GHz (Single Channel)

Temperature: 22 C, Humidity : 55 %

Radiated Emissions 30 MHz - 1000 MHz
FCC Part 15 Class B

Operator: KK
7-Apr-13

Model Number: MARS
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	38.9	40.0	-1.1	20.2	0.7	18.0
7.435E+07	36.5	40.0	-3.5	29.0	1.0	6.5
7.515E+07	39.1	40.0	-0.9	31.5	1.0	6.6
1.234E+08	38.0	43.5	-5.5	24.5	1.3	12.2
1.637E+08	39.2	43.5	-4.3	29.0	1.5	8.7

Test Mode: Single Channel, 5MHz BW, 904.7575MHz

Radiated Emissions 30 MHz - 1000 MHz
FCC Part 15 Class B

Operator: KK
7-Apr-13

Model Number: MARS
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	39.0	40.0	-1.0	20.3	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	38.3	43.5	-5.2	24.8	1.3	12.2
1.637E+08	39.1	43.5	-4.4	28.9	1.5	8.7

Test Mode: Single Channel, 5MHz BW, 915.0MHz

Radiated Emissions 30 MHz - 1000 MHz
FCC Part 15 Class B

Operator: KK
7-Apr-13

Model Number: MARS
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	36.6	40.0	-3.4	29.1	1.0	6.5
7.515E+07	39.2	40.0	-0.8	31.6	1.0	6.6
1.234E+08	38.0	43.5	-5.5	24.5	1.3	12.2
1.637E+08	39.3	43.5	-4.2	29.1	1.5	8.7

Test Mode: Single Channel, 5MHz BW, 925.2425MHz

Transmitter Radiated Emissions below 1GHz (Dual Channel)

Temperature: 22 C, Humidity : 55 %

Radiated Emissions 30 MHz - 1000 MHz
FCC Part 15 Class B

Operator: KK
7-Apr-13

Model Number: MARS
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	37.1	40.0	-2.9	18.4	0.7	18.0
7.435E+07	35.5	40.0	-4.5	28.0	1.0	6.5
7.515E+07	38.6	40.0	-1.4	31.0	1.0	6.6
1.234E+08	38.1	43.5	-5.4	24.6	1.3	12.2
1.637E+08	39.6	43.5	-3.9	29.4	1.5	8.7

Test Mode: Dual Channels 2MHz and 5MHz, 908.4725MHz and 904.7525MHz

Radiated Emissions 30 MHz - 1000 MHz
FCC Part 15 Class B

Operator: KK
7-Apr-13

Model Number: MARS
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
7.450E+07	38.6	40.0	-1.4	31.0	1.0	6.6
7.510E+07	38.1	40.0	-1.9	30.5	1.0	6.6
1.234E+08	38.0	43.5	-5.5	24.5	1.3	12.2
1.637E+08	39.5	43.5	-4.0	29.3	1.5	8.7

Test Mode: Dual Channels, 2MHz and 5MHz BWs, 916.86MHz and 913.14MHz

Radiated Emissions 30 MHz - 1000 MHz
FCC Part 15 Class B

Operator: KK
7-Apr-13

Model Number: MARS
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	38.7	40.0	-1.3	20.0	0.7	18.0
7.435E+07	36.8	40.0	-3.2	29.3	1.0	6.5
7.515E+07	38.7	40.0	-1.3	31.1	1.0	6.6
1.234E+08	37.7	43.5	-5.8	24.2	1.3	12.2
1.637E+08	40.4	43.5	-3.1	30.2	1.5	8.7

Test Mode: Dual Channels, 2MHz and 5MHz BWs, 926.777MHz and 923.057MHz

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
Single Channel, 2MHz BW, 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
Single Channel, 2MHz BW, 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
Single Channel, 2MHz BW, 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.

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
Single Channel, 5MHz BW, 904.7575MHz							
2714.273	Peak	38.3	-30.1	28.8	37.0	74.0	-37.0
3619.03	Peak	29.8	-31.0	30.9	29.7	74.0	-44.3
4523.788	Peak	38.6	-29.2	32.1	41.5	74.0	-32.5
5428.545	Peak	37.4	-24.1	33.7	47.0	74.0	-27.0
8142.818	Peak	35.5	-24.1	37.1	48.5	74.0	-25.5
9047.575	Peak	36.2	-21.5	37.4	52.1	74.0	-21.9
2714.273	Ave	24.5	-30.1	28.8	23.2	54.0	-30.8
3619.03	Ave	26.8	-31.0	30.9	26.7	54.0	-27.3
4523.788	Ave	25.1	-29.2	32.1	28.0	54.0	-26.0
5428.545	Ave	24.2	-24.1	33.7	33.8	54.0	-20.2
8142.818	Ave	22.7	-24.1	37.1	35.7	54.0	-18.3
9047.575	Ave	22.5	-21.5	37.4	38.4	54.0	-15.6
Single Channel, 5MHz BW, 915.0MHz							
2745.0	Peak	38.8	-30.0	28.8	37.6	74.0	-36.4
3660.0	Peak	38.5	-30.1	31.0	39.4	74.0	-34.6
4575.0	Peak	38.3	-29.0	32.3	41.6	74.0	-32.4
7320.0	Peak	35.7	-22.9	37.3	50.1	74.0	-23.9
8235.0	Peak	35.8	-23.5	37.2	49.5	74.0	-24.5
9150.0	Peak	36.1	-19.6	37.4	53.9	74.0	-20.1
2745.0	Ave	25.3	-30.0	28.8	24.1	54.0	-29.9
3660.0	Ave	25.8	-30.1	31.0	26.7	54.0	-27.3
4575.0	Ave	24.9	-29.0	32.3	28.2	54.0	-25.8
7320.0	Ave	22.4	-22.9	37.3	36.8	54.0	-17.2
8235.0	Ave	22.8	-23.5	37.2	36.5	54.0	-17.5
9150.0	Ave	23.0	-19.6	37.4	40.8	54.0	-13.2
Single Channel, 5MHz BW, 925.2425MHz							
2775.728	Peak	38.7	-30.6	28.7	36.8	74.0	-37.2
3700.97	Peak	38.6	-30.2	31.2	39.6	74.0	-34.4
4626.213	Peak	37.8	-28.3	32.5	42.0	74.0	-32.0
7401.94	Peak	36.3	-24.9	37.5	48.9	74.0	-25.1
8327.183	Peak	36.7	-25.7	37.3	48.3	74.0	-25.7
2775.728	Ave	24.9	-30.6	28.7	23.0	54.0	-31.0
3700.97	Ave	25.1	-30.2	31.2	26.1	54.0	-27.9
4626.213	Ave	24.6	-28.3	32.5	28.8	54.0	-25.2
7401.94	Ave	23.3	-24.9	37.5	35.9	54.0	-18.1
8327.183	Ave	22.7	-25.7	37.3	34.3	54.0	-19.7

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.

Transmitter Radiated Emissions above 1GHz (Dual 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
Dual Channels, 2MHz and 5MHz BWs, 908.4725MHz and 904.7525MHz							
2725.418	Peak	38.7	-30.0	28.8	37.5	74.0	-36.5
3633.89	Peak	39.4	-30.5	31.0	39.9	74.0	-34.1
4542.363	Peak	38.5	-29.1	32.2	41.6	74.0	-32.4
7267.78	Peak	35.7	-23.1	37.2	49.8	74.0	-24.2
8176.253	Peak	36.2	-24.1	37.2	49.3	74.0	-24.7
9084.725	Peak	35.2	-21.6	37.3	50.9	74.0	-23.1
2725.418	Ave	24.8	-30.0	28.8	23.6	54.0	-30.4
3633.89	Ave	26.5	-30.5	31.0	27.0	54.0	-27.0
4542.363	Ave	25.1	-29.1	32.2	28.2	54.0	-25.8
7267.78	Ave	22.6	-23.1	37.2	36.7	54.0	-17.3
8176.253	Ave	22.9	-24.1	37.2	36.0	54.0	-18.0
9084.725	Ave	23.1	-21.6	37.3	38.8	54.0	-15.2
2714.258	Peak	37.8	-30.1	28.8	36.5	74.0	-37.5
3619.01	Peak	39.9	-31.0	30.9	39.8	74.0	-34.2
4523.763	Peak	38.6	-29.2	32.1	41.5	74.0	-32.5
5428.515	Peak	37.9	-24.1	33.7	47.5	74.0	-26.5
8142.773	Peak	36.2	-24.1	37.1	49.2	74.0	-24.8
9047.525	Peak	35.1	-21.5	37.4	51.0	74.0	-23.0
2714.258	Ave	24.9	-30.1	28.8	23.6	54.0	-30.4
3619.01	Ave	26.9	-31.0	30.9	26.8	54.0	-27.2
4523.763	Ave	25.4	-29.2	32.1	28.3	54.0	-25.7
5428.515	Ave	24.2	-24.1	33.7	33.8	54.0	-20.2
8142.773	Ave	22.9	-24.1	37.1	35.9	54.0	-18.1
9047.525	Ave	22.6	-21.5	37.4	38.5	54.0	-15.5

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.

Transmitter Radiated Emissions above 1GHz (Dual 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
Dual Channels, 2MHz and 5MHz BWs, 908.4725MHz and 904.7525MHz							
1100.0	Peak	23.3	2.6	24.2	50.1	74.0	-23.9
1363.5	Peak	24.6	2.8	25.5	52.9	74.0	-21.1
1530.75	Peak	22.7	3.0	25.4	51.1	74.0	-22.9
1646.0	Peak	23.0	2.5	25.3	50.8	74.0	-23.2
1685.0	Peak	23.8	2.5	25.4	51.7	74.0	-22.3
1720.5	Peak	23.9	2.5	25.4	51.8	74.0	-22.2
2250.0	Peak	39.7	-30.9	27.9	36.7	74.0	-37.3
2350.0	Peak	38.2	-30.8	27.6	35.0	74.0	-39.0
2491.75	Peak	39.1	-30.6	28.2	36.7	74.0	-37.3
2795.0	Peak	38.3	-30.2	28.7	36.8	74.0	-37.2
3263.5	Peak	39.4	-31.5	30.1	38.0	74.0	-36.0
3335.5	Peak	39.7	-31.6	30.3	38.4	74.0	-35.6
3351.5	Peak	40.5	-31.7	30.4	39.2	74.0	-34.8
4000.0	Peak	39.2	-30.6	32.0	40.6	74.0	-33.4
4825.0	Peak	37.9	-28.0	32.8	42.7	74.0	-31.3
5405.0	Peak	37.8	-23.7	33.6	47.7	74.0	-26.3
7500.0	Peak	35.6	-24.0	37.4	49.0	74.0	-25.0
8262.5	Peak	36.8	-24.9	37.2	49.1	74.0	-24.9
9100.0	Peak	35.5	-20.0	37.3	52.8	74.0	-21.2
9400.0	Peak	36.0	-22.5	37.6	51.1	74.0	-22.9
1100.0	Ave	10.6	2.6	24.2	37.4	54.0	-16.7
1363.5	Ave	11.1	2.8	25.5	39.4	54.0	-14.6
1530.75	Ave	10.8	3.0	25.4	39.2	54.0	-14.8
1646.0	Ave	10.4	2.5	25.3	38.2	54.0	-15.8
1685.0	Ave	10.6	2.5	25.4	38.5	54.0	-15.5
1720.5	Ave	10.9	2.5	25.4	38.8	54.0	-15.2
2250.0	Ave	25.9	-30.9	27.9	22.9	54.0	-31.1
2350.0	Ave	25.1	-30.8	27.6	21.9	54.0	-32.1
2491.75	Ave	25.7	-30.6	28.2	23.3	54.0	-30.7
2795.0	Ave	24.9	-30.2	28.7	23.4	54.0	-30.6
3263.5	Ave	26.9	-31.5	30.1	25.5	54.0	-28.5
3335.5	Ave	26.2	-31.6	30.3	24.9	54.0	-29.1
3351.5	Ave	26.9	-31.7	30.4	25.6	54.0	-28.4
4000.0	Ave	27.1	-30.6	32.0	28.5	54.0	-25.5
4825.0	Ave	25.8	-28.0	32.8	30.6	54.0	-23.4
5405.0	Ave	25.2	-23.7	33.6	35.1	54.0	-18.9
7500.0	Ave	22.8	-24.0	37.4	36.2	54.0	-17.8
8262.5	Ave	22.7	-24.9	37.2	35.0	54.0	-19.0
9100.0	Ave	22.3	-20.0	37.3	39.6	54.0	-14.4
9400.0	Ave	22.4	-22.5	37.6	37.5	54.0	-16.5

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.

Transmitter Radiated Emissions above 1GHz (Dual 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
Dual Channels, 2MHz and 5MHz BWs, 916.86MHz and 913.14MHz							
2750.58	Peak	38.6	-30.1	28.8	37.3	74.0	-36.7
3667.44	Peak	39.2	-30.1	31.1	40.2	74.0	-33.8
4584.3	Peak	38.6	-29.1	32.3	41.8	74.0	-32.2
7334.88	Peak	35.6	-23.2	37.4	49.8	74.0	-24.2
8251.74	Peak	36.1	-23.6	37.2	49.7	74.0	-24.3
9168.6	Peak	35.2	-19.7	37.4	52.9	74.0	-21.1
2750.58	Ave	24.7	-30.1	28.8	23.4	54.0	-30.6
3667.44	Ave	26.4	-30.1	31.1	27.4	54.0	-26.6
4584.3	Ave	25.0	-29.1	32.3	28.2	54.0	-25.8
7334.88	Ave	22.5	-23.2	37.4	36.7	54.0	-17.3
8251.74	Ave	22.8	-23.6	37.2	36.4	54.0	-17.6
9168.6	Ave	23.0	-19.7	37.4	40.7	54.0	-13.3
2739.42	Peak	37.7	-30.0	28.8	36.5	74.0	-37.5
3652.56	Peak	39.8	-30.0	31.0	40.8	74.0	-33.2
4565.7	Peak	38.5	-29.2	32.3	41.6	74.0	-32.4
7305.12	Peak	37.6	-23.2	37.3	51.7	74.0	-22.3
8218.26	Peak	36.1	-23.7	37.2	49.6	74.0	-24.4
9131.4	Peak	35.3	-19.8	37.3	52.8	74.0	-21.2
2739.42	Ave	24.8	-30.0	28.8	23.6	54.0	-30.4
3652.56	Ave	26.8	-30.0	31.0	27.8	54.0	-26.2
4565.7	Ave	25.2	-29.2	32.3	28.3	54.0	-25.7
7305.12	Ave	24.1	-23.2	37.3	38.2	54.0	-15.8
8218.26	Ave	22.8	-23.7	37.2	36.3	54.0	-17.7
9131.4	Ave	22.8	-19.8	37.3	40.3	54.0	-13.7

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.

Transmitter Radiated Emissions above 1GHz (Dual 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
Dual Channels, 2MHz and 5MHz BWs, 916.86MHz and 913.14MHz							
1100.0	Peak	23.5	2.6	24.2	50.3	74.0	-23.7
1363.5	Peak	24.5	2.8	25.5	52.8	74.0	-21.2
1530.75	Peak	22.7	3.0	25.4	51.1	74.0	-22.9
1646.0	Peak	23.0	2.5	25.3	50.8	74.0	-23.2
1685.0	Peak	23.7	2.5	25.4	51.6	74.0	-22.4
1720.5	Peak	23.9	2.5	25.4	51.8	74.0	-22.2
2250.0	Peak	39.7	-30.9	27.9	36.7	74.0	-37.3
2350.0	Peak	38.2	-30.8	27.6	35.0	74.0	-39.0
2491.75	Peak	39.0	-30.6	28.2	36.6	74.0	-37.4
2795.0	Peak	38.4	-30.2	28.7	36.9	74.0	-37.1
3263.5	Peak	39.4	-31.5	30.1	38.0	74.0	-36.0
3335.5	Peak	39.7	-31.6	30.3	38.4	74.0	-35.6
3351.5	Peak	40.6	-31.7	30.4	39.3	74.0	-34.7
4000.0	Peak	39.2	-30.6	32.0	40.6	74.0	-33.4
4825.0	Peak	37.9	-28.0	32.8	42.7	74.0	-31.3
5405.0	Peak	37.8	-23.7	33.6	47.7	74.0	-26.3
7500.0	Peak	35.5	-24.0	37.4	48.9	74.0	-25.1
8262.5	Peak	36.8	-24.9	37.2	49.1	74.0	-24.9
9100.0	Peak	35.6	-20.0	37.3	52.9	74.0	-21.1
9400.0	Peak	36.1	-22.5	37.6	51.2	74.0	-22.8
1100.0	Ave	10.7	2.6	24.2	37.5	54.0	-16.5
1363.5	Ave	11.0	2.8	25.5	39.3	54.0	-14.7
1530.75	Ave	10.8	3.0	25.4	39.2	54.0	-14.8
1646.0	Ave	10.4	2.5	25.3	38.2	54.0	-15.8
1685.0	Ave	10.5	2.5	25.4	38.4	54.0	-15.6
1720.5	Ave	10.9	2.5	25.4	38.8	54.0	-15.2
2250.0	Ave	25.9	-30.9	27.9	22.9	54.0	-31.1
2350.0	Ave	25.1	-30.8	27.6	21.9	54.0	-32.1
2491.75	Ave	25.8	-30.6	28.2	23.4	54.0	-30.6
2795.0	Ave	25.0	-30.2	28.7	23.5	54.0	-30.5
3263.5	Ave	26.9	-31.5	30.1	25.5	54.0	-28.5
3335.5	Ave	26.2	-31.6	30.3	24.9	54.0	-29.1
3351.5	Ave	27.0	-31.7	30.4	25.7	54.0	-28.3
4000.0	Ave	27.1	-30.6	32.0	28.5	54.0	-25.5
4825.0	Ave	25.8	-28.0	32.8	30.6	54.0	-23.4
5405.0	Ave	25.2	-23.7	33.6	35.1	54.0	-18.9
7500.0	Ave	22.9	-24.0	37.4	36.3	54.0	-17.7
8262.5	Ave	22.7	-24.9	37.2	35.0	54.0	-19.0
9100.0	Ave	22.4	-20.0	37.3	39.7	54.0	-14.3
9400.0	Ave	22.5	-22.5	37.6	37.6	54.0	-16.4

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.

Transmitter Radiated Emissions above 1GHz (Dual 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
Dual Channels, 2MHz and 5MHz BWs, 926.777MHz and 923.057MHz							
2780.331	Peak	38.6	-30.3	28.7	37.0	74.0	-37.0
3707.108	Peak	38.0	-30.2	31.2	39.0	74.0	-35.0
4633.885	Peak	37.8	-28.7	32.5	41.6	74.0	-32.4
7414.216	Peak	35.9	-22.9	37.5	50.5	74.0	-23.5
8340.993	Peak	35.9	-24.5	37.3	48.7	74.0	-25.3
2780.331	Ave	25.0	-30.3	28.7	23.4	54.0	-30.6
3707.108	Ave	25.0	-30.2	31.2	26.0	54.0	-28.0
4633.885	Ave	24.3	-28.7	32.5	28.1	54.0	-25.9
7414.216	Ave	22.7	-22.9	37.5	37.3	54.0	-16.7
8340.993	Ave	22.4	-24.5	37.3	35.2	54.0	-18.8
2769.171	Peak	38.9	-30.7	28.7	36.9	74.0	-37.1
3692.228	Peak	38.7	-30.2	31.1	39.6	74.0	-34.4
4615.285	Peak	37.8	-28.5	32.4	41.7	74.0	-32.3
7384.456	Peak	36.3	-24.2	37.4	49.5	74.0	-24.5
8307.513	Peak	36.8	-25.4	37.2	48.6	74.0	-25.4
2769.171	Ave	25.0	-30.7	28.7	23.0	54.0	-31.0
3692.228	Ave	25.1	-30.2	31.1	26.0	54.0	-28.0
4615.285	Ave	24.7	-28.5	32.4	28.6	54.0	-25.4
7384.456	Ave	23.3	-24.2	37.4	36.5	54.0	-17.5
8307.513	Ave	22.8	-25.4	37.2	34.6	54.0	-19.4

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.

Transmitter Radiated Emissions above 1GHz (Dual 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
Dual Channels, 2MHz and 5MHz BWs, 926.777MHz and 923.057MHz							
1100.0	Peak	23.4	2.6	24.2	50.2	74.0	-23.8
1363.5	Peak	24.5	2.8	25.5	52.8	74.0	-21.2
1530.75	Peak	22.8	3.0	25.4	51.2	74.0	-22.8
1646.0	Peak	23.0	2.5	25.3	50.8	74.0	-23.2
1685.0	Peak	23.8	2.5	25.4	51.7	74.0	-22.3
1720.5	Peak	23.9	2.5	25.4	51.8	74.0	-22.2
2250.0	Peak	39.5	-30.9	27.9	36.5	74.0	-37.5
2350.0	Peak	38.2	-30.8	27.6	35.0	74.0	-39.0
2491.75	Peak	39.1	-30.6	28.2	36.7	74.0	-37.3
2795.0	Peak	38.4	-30.2	28.7	36.9	74.0	-37.1
3263.5	Peak	39.5	-31.5	30.1	38.1	74.0	-35.9
3335.5	Peak	39.7	-31.6	30.3	38.4	74.0	-35.6
3351.5	Peak	40.7	-31.7	30.4	39.4	74.0	-34.6
4000.0	Peak	39.2	-30.6	32.0	40.6	74.0	-33.4
4825.0	Peak	37.9	-28.0	32.8	42.7	74.0	-31.3
5405.0	Peak	37.9	-23.7	33.6	47.8	74.0	-26.2
7500.0	Peak	35.5	-24.0	37.4	48.9	74.0	-25.1
8262.5	Peak	36.9	-24.9	37.2	49.2	74.0	-24.8
9100.0	Peak	35.6	-20.0	37.3	52.9	74.0	-21.1
9400.0	Peak	36.0	-22.5	37.6	51.1	74.0	-22.9
1100.0	Ave	10.6	2.6	24.2	37.4	54.0	-16.6
1363.5	Ave	11.0	2.8	25.5	39.3	54.0	-14.7
1530.75	Ave	10.7	3.0	25.4	39.1	54.0	-14.9
1646.0	Ave	10.5	2.5	25.3	38.3	54.0	-15.7
1685.0	Ave	10.5	2.5	25.4	38.4	54.0	-15.6
1720.5	Ave	10.8	2.5	25.4	38.7	54.0	-15.3
2250.0	Ave	25.9	-30.9	27.9	22.9	54.0	-31.1
2350.0	Ave	25.0	-30.8	27.6	21.8	54.0	-32.2
2491.75	Ave	25.9	-30.6	28.2	23.5	54.0	-30.5
2795.0	Ave	25.0	-30.2	28.7	23.5	54.0	-30.5
3263.5	Ave	26.9	-31.5	30.1	25.5	54.0	-28.5
3335.5	Ave	26.3	-31.6	30.3	25.0	54.0	-29.0
3351.5	Ave	27.0	-31.7	30.4	25.7	54.0	-28.3
4000.0	Ave	27.2	-30.6	32.0	28.6	54.0	-25.4
4825.0	Ave	25.8	-28.0	32.8	30.6	54.0	-23.4
5405.0	Ave	25.2	-23.7	33.6	35.1	54.0	-18.9
7500.0	Ave	23.0	-24.0	37.4	36.4	54.0	-17.6
8262.5	Ave	22.7	-24.9	37.2	35.0	54.0	-19.0
9100.0	Ave	22.6	-20.0	37.3	39.9	54.0	-14.1
9400.0	Ave	22.6	-22.5	37.6	37.7	54.0	-16.3

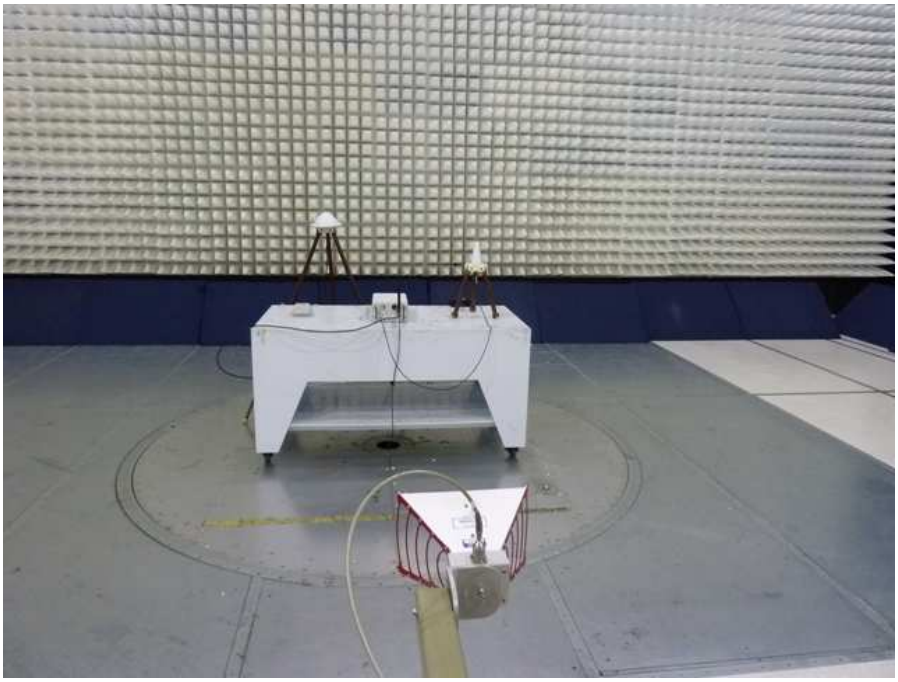
Notes:

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 (μV/m)
RA = Receiver Amplitude (including preamplifier) in dB (μV)
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 = $20\log_{10}$ (measurement distance/specification distance)

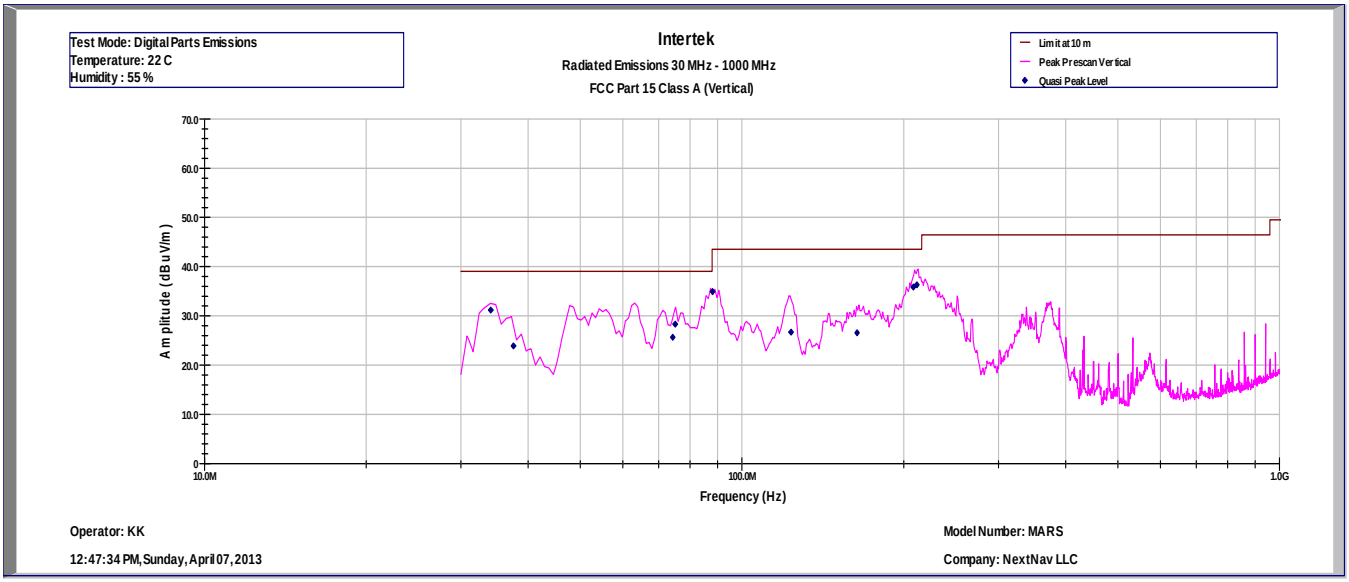
Assume a receiver reading of 52.0 dB (μV) is obtained. The antenna factor of 7.4 dB and cable factor of 1.6 dB is added. The amplifier gain of 29 dB and DCF of 10.5 dB (DCF in this example: $20\log_{10}$ (10/3)) is subtracted, giving field strength of 21.5 dB (μV/m).

RA = 52.0 dB (μV)
AF = 7.4 dB (1/m)
CF = 1.6 dB
AG = 29.0 dB
DCF=10.5 dB
FS = RF + AF + CF – AG – DCF
FS = 52.0 + 7.4 + 1.6 – 29.0 – 10.5
FS = 21.5 dB (μV/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.



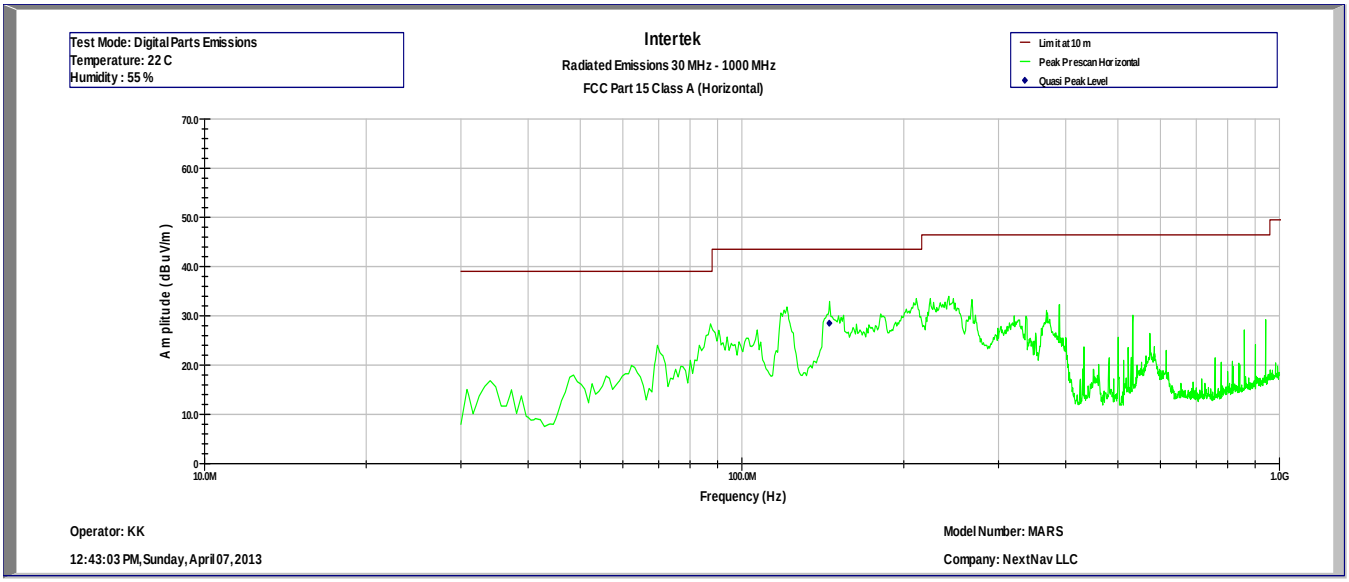
Intertek Testing Services
Radiated Emissions 30 MHz - 1000 MHz
FCC Part 15 Class A (QP-Vertical)

Operator: KK
April 07, 2013

Model Number: MARS
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 %



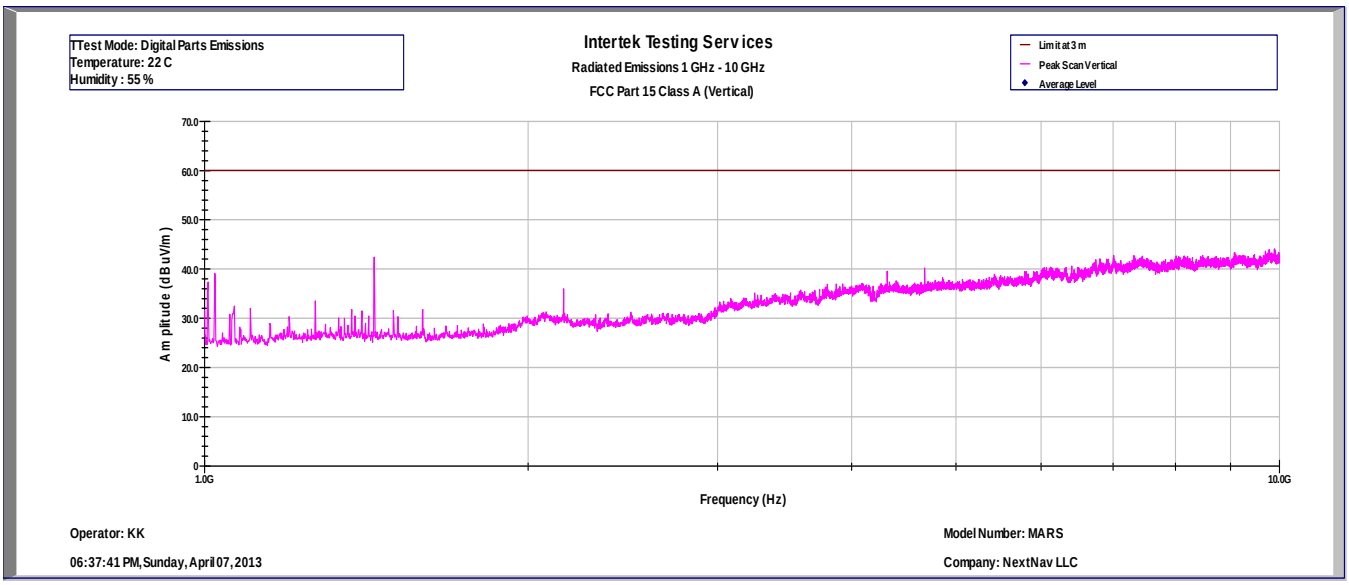
Intertek Testing Services
Radiated Emissions 30 MHz - 1000 MHz
FCC Part 15 Class A (QP-Horizontal)

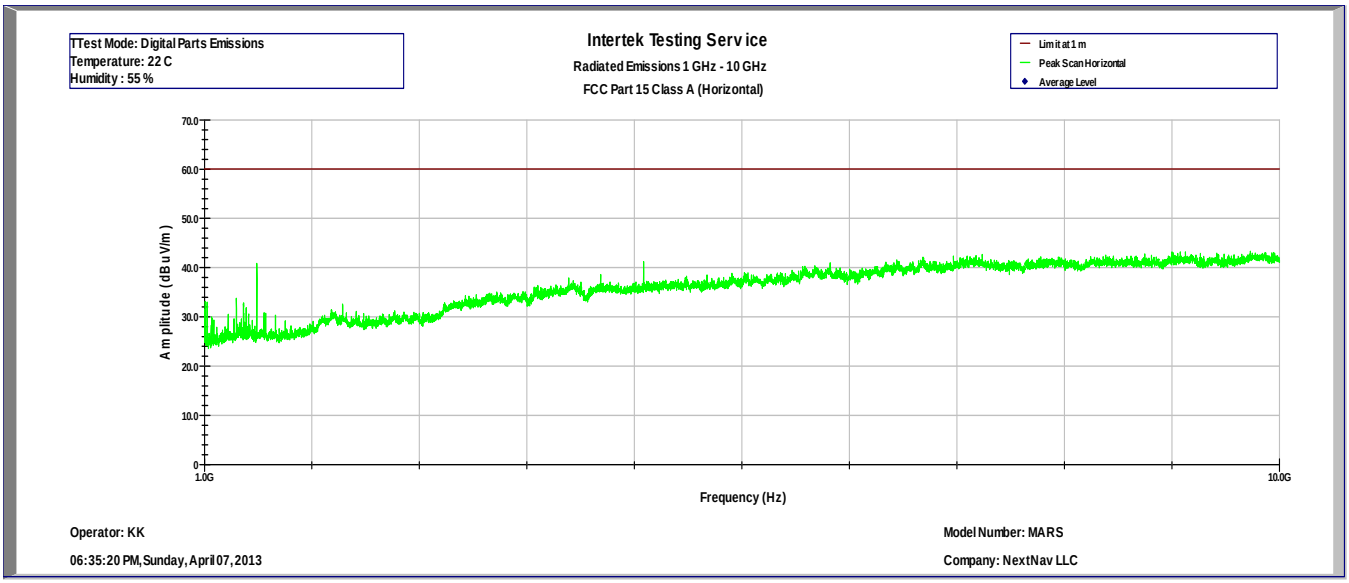
Operator: KK
April 07, 2013

Model Number: MARS
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 %

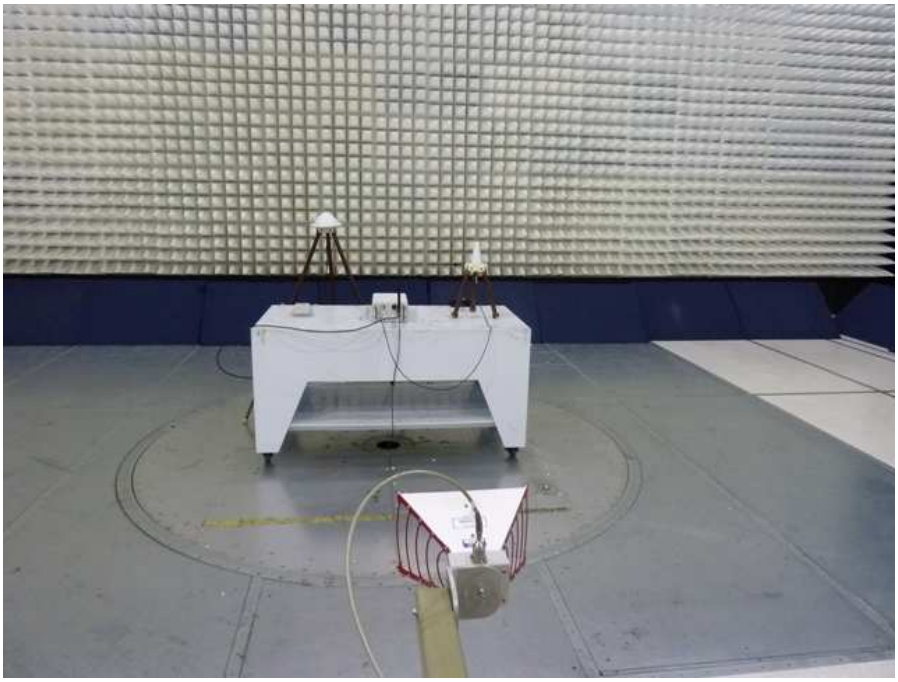

TTest Mode: Digital Parts Emissions
Temperature: 22 C
Humidity : 55 %
Intertek Testing Services
Radiated Emissions 1 GHz - 10 GHz
FCC Part 15 Class A (Vertical)
Limit at 3 m
Peak Scan Vertical
Average Level
Amplitude (dBuV/m)
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0
1.0G
10.0G
Frequency (Hz)
Operator: KK
06:37:41 PM, Sunday, April 07, 2013
Model Number: MARS
Company: NextNav LLC


TTest Mode: Digital Parts Emissions
Temperature: 22 C
Humidity : 55 %
Intertek Testing Service
Radiated Emissions 1 GHz - 10 GHz
FCC Part 15 Class A (Horizontal)
Limit at 1 m
Peak Scan Horizontal
Average Level
Amplitude (dBuV/m)
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0
1.0G
10.0G
Frequency (Hz)
Operator: KK
06:35:20 PM, Sunday, April 07, 2013
Model Number: MARS
Company: NextNav LLC

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.

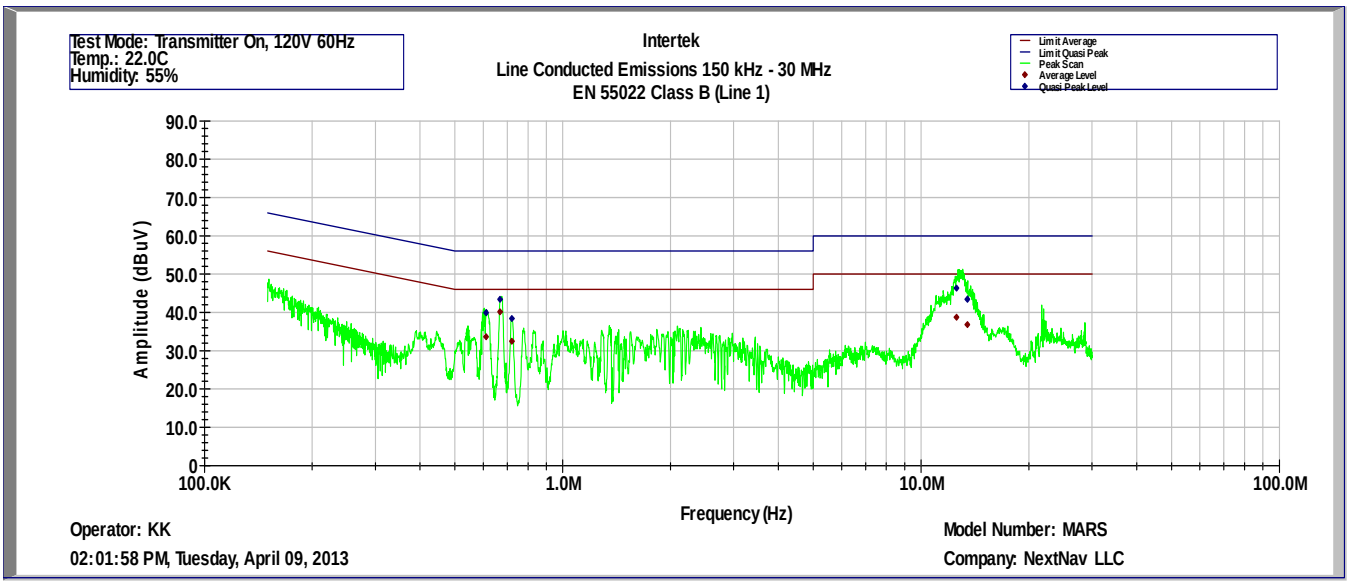
The EUT, where intended for tabletop use, is placed on a table whose top is 0.8m above the ground plane. A vertical, metal reference plane is placed 0.4m from the EUT. The vertical metal reference-plane is at least 2m by 2m. The EUT shall be kept at least 0.8m from any other metal surface or other ground 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)

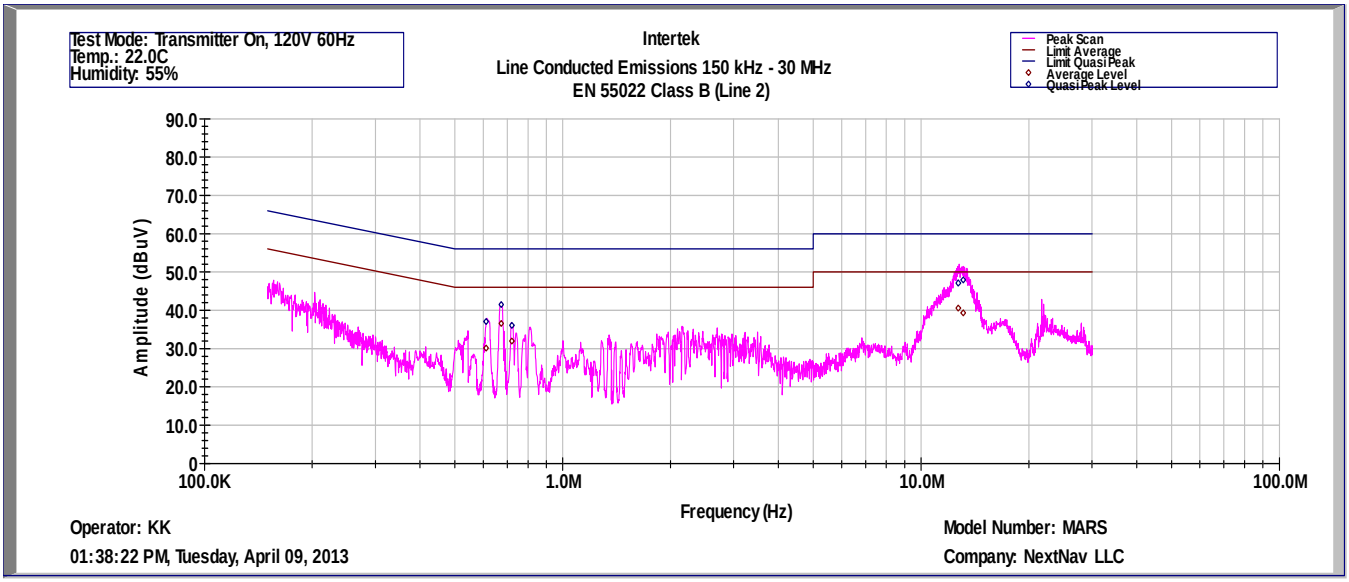
Operator: KK
April 09, 2013

Model Number: MARS
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

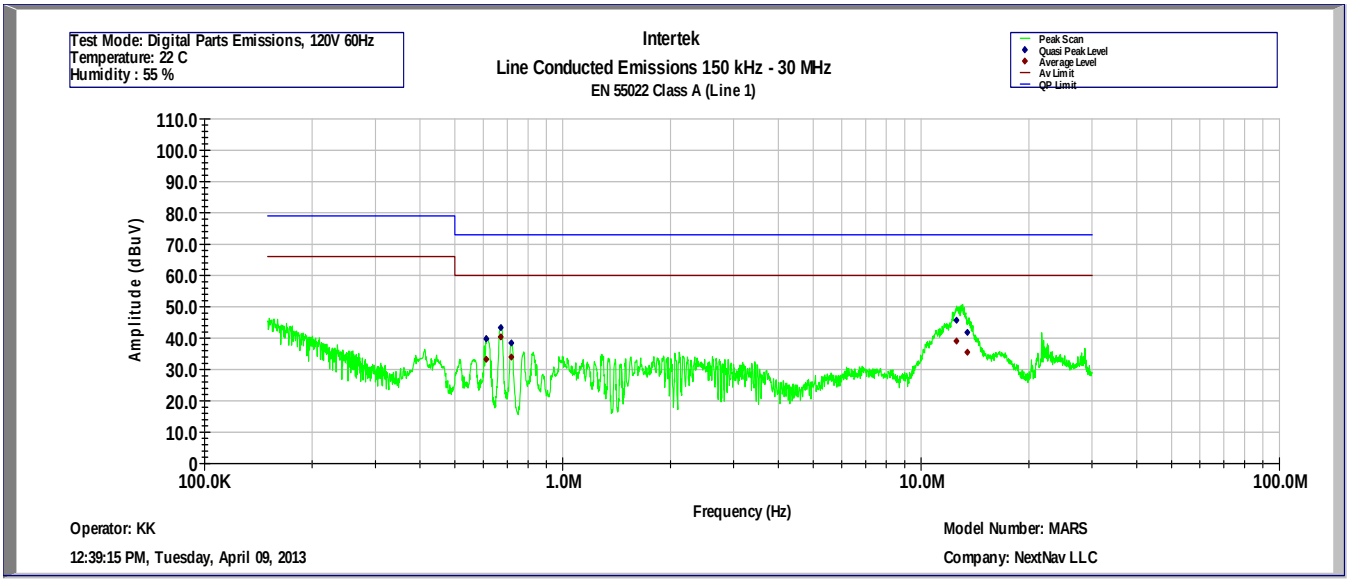
Model Number: MARS
Company: NextNav LLC

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

AC Line Conducted Emission Data, Digital Parts Emissions



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

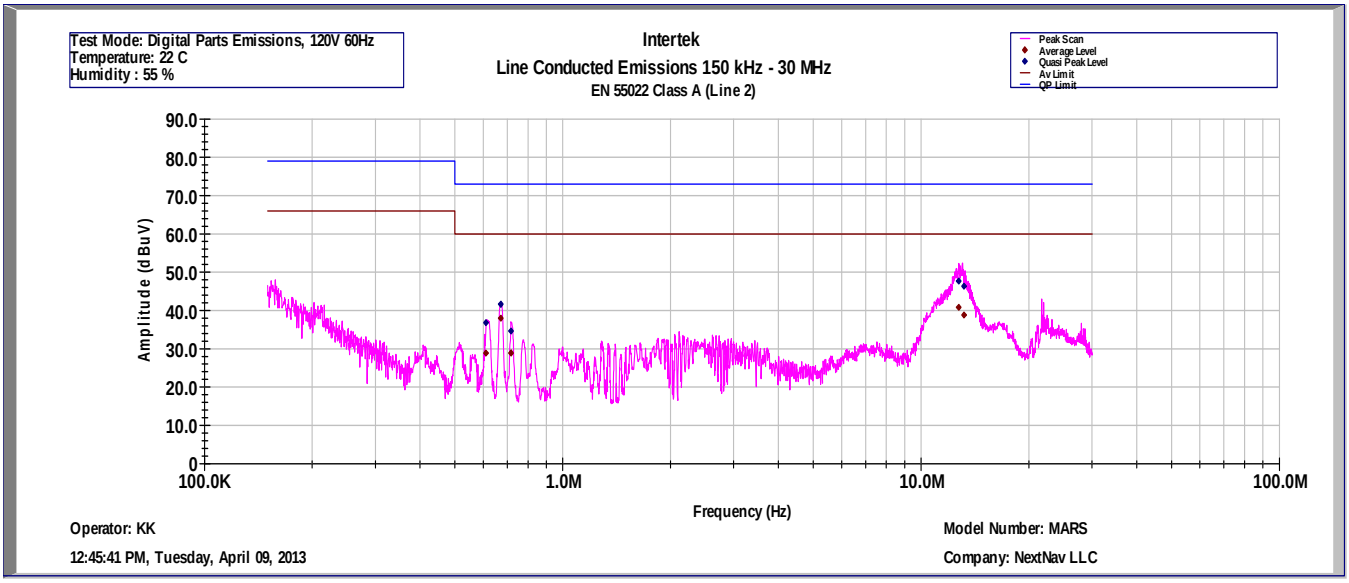
Operator: KK
April 09, 2013

Model Number: MARS
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: MARS
Company: NextNav LLC

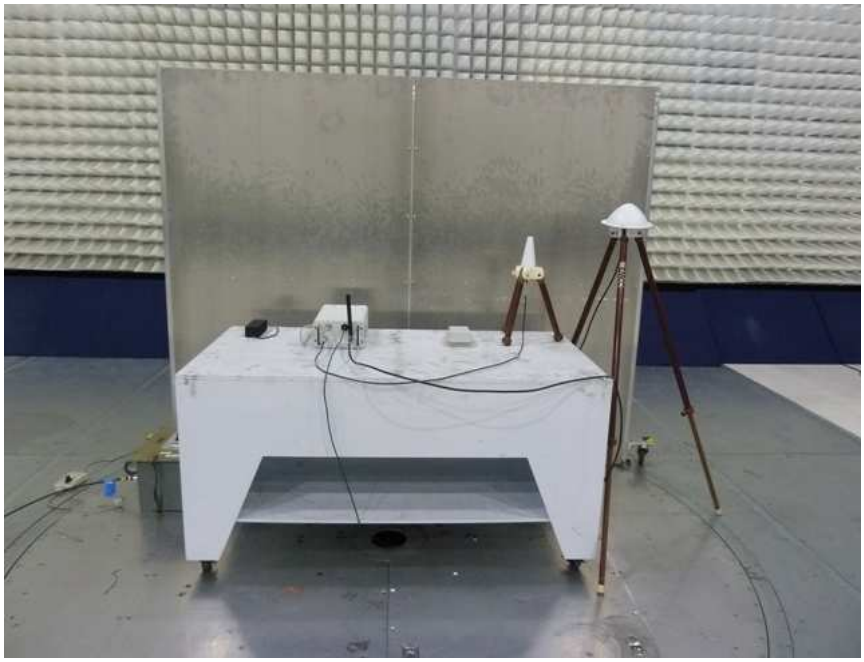
Frequency	Av Level	QP Level	Av Limit	QP Limit	Av Margin	QP Magin
Hz	dBuV	dBuV	dBuV	dBuV	dB	dB
610547	28.8	36.8	60.0	73.0	-31.2	-36.2
671659	38.0	41.6	60.0	73.0	-22.0	-31.4
717327	28.9	34.6	60.0	73.0	-31.1	-38.4
12726600	40.8	47.7	60.0	73.0	-19.2	-25.3
13166900	38.8	46.3	60.0	73.0	-21.2	-26.7

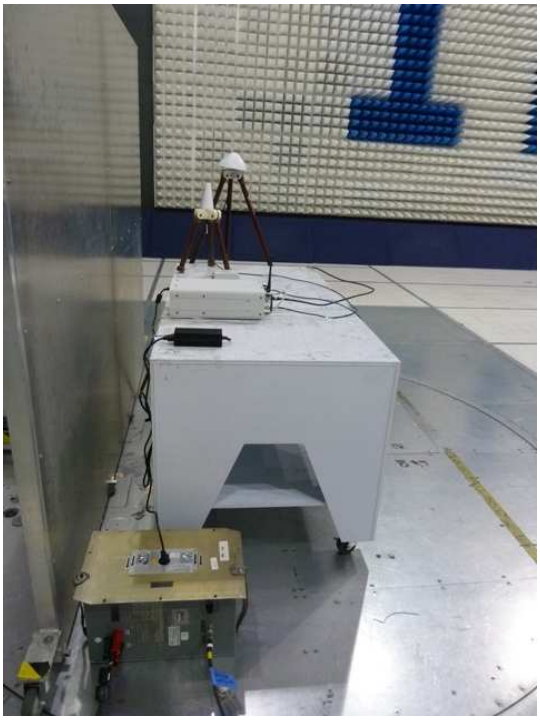
Test Mode: Digital Parts Emissions, 120V 60Hz
Temperature: 22 C
Humidity : 55 %

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, G101277100	KK	August 07, 2013	Original document