



TEST REPORT

Report Number: 100928878LEX-001

Project Number: G100928878

Testing performed on the
WOLC Node

FCC ID: PUU90001

Industry Canada ID: 10798A- PUU90001

to

47 CFR Part 15. 247:2010

RSS- 210, Issue 8, 2010


For

GE Lighting

Test Performed by:
Intertek
731 Enterprise Drive
Lexington, KY 40510

Test Authorized by:
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Prepared by:


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Date: September 27, 2013

Reviewed by:


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Date: September 27, 2013

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1.0 GENERAL DESCRIPTION

Model:	WOLC Node
Type of EUT:	Light Controller
Sample ID:	D8:28:C9:00:10:00:01:E6 - +15dBm Radiated Sample D8:28:C9:00:10:00:01:FA - +15dBm Conducted Sample D8:28:C9:00:10:00:02:55 - +26dBm Radiated Sample D8:28:C9:00:10:00:02:3C - +26dBm Conducted Sample
FCC ID:	PUU90001
Industry Canada ID:	10798A- PUU90001
Related Submittal(s) Grants:	None
Company:	GE Lighting
Customer:	Mr. Mark Wilbur
Address:	GE Lighting 1975 Noble Rd, Bldg 338 Cleveland, OH 44112
Phone:	(216) 266-3769
Fax:	(216) 606-6599
e-mail:	mark.wilbur2@ge.com
Test Standards:	<input checked="" type="checkbox"/> 47 CFR, Part 15:2010, §15.247 <input checked="" type="checkbox"/> RSS-210, Issue 8, 2010 <input checked="" type="checkbox"/> RSS-Gen, Issue 3, 2010 <input checked="" type="checkbox"/> 47 CFR, Part 15:2010, §15.107 and §15.109, Class A <input checked="" type="checkbox"/> ICES-003, Issue 5:2012 <input type="checkbox"/> Other
Type of radio:	<input checked="" type="checkbox"/> Stand -alone <input type="checkbox"/> Module <input type="checkbox"/> Hybrid
Date Sample Submitted:	September 23, 2013
Test Work Started:	September 23, 2013
Test Work Completed:	September 26, 2013
Test Sample Conditions:	<input type="checkbox"/> Damaged <input type="checkbox"/> Poor (Usable) <input checked="" type="checkbox"/> Good



1.1 Product Description; Test Facility

Product Description:	Light Controller
Transmitter Type:	<input checked="" type="checkbox"/> FHSS <input type="checkbox"/> Digital Modulation <input type="checkbox"/> WiFi <input type="checkbox"/> Blue Tooth
Operating Frequency Range(s):	From 902 to 928MHz
Number of Channels:	50
Modulation:	GFSK
Emission Designator:	492K5F1D
Antenna(s) Info:	Type: Pigtail Gain: 2 dBi Connector Type: Soldered to the board
Antenna Installation:	<input type="checkbox"/> User <input type="checkbox"/> Professional <input checked="" type="checkbox"/> Factory
Transmitter power configuration:	<input type="checkbox"/> Internal battery <input checked="" type="checkbox"/> External power source <input checked="" type="checkbox"/> 120VAC <input type="checkbox"/> 230VAC <input type="checkbox"/> 400VAC <input type="checkbox"/> █ VDC <input type="checkbox"/> Other: █ █ Amp. <input type="checkbox"/> 50Hz <input checked="" type="checkbox"/> 60Hz
Special Test Arrangement:	None
Test Methodology:	Measurements performed according to the procedures in ANSI C63.10-2009 and FCC Public Notice DA 00-705

1.2 EUT Configuration

The equipment under test was operated during the measurement under the following conditions:

- Standby
- Continuous transmissions with hopping function enabled
- Continuous transmissions with hopping function disabled (modulated signal)
- Continuous transmissions with hopping function disabled (un-modulated signal)
- Continuous receiving
- Test program (customer specific)
-

Operating modes of the EUT:

No.	Description
1	Test was performed at low channel, middle channel, and upper channel
2	

Cables:

No.	Type	Length	Designation	Note
1	AC Power	6ft	Power Cord	

Support equipment/Services:

No.	Item	Description
1	None	

1.3 Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Normal

Temperature: +15 to +35 ° C

Humidity: 20-75 %

Atmospheric pressure: 86-106 kPa

Extreme

Temperature: -20 to +50 ° C

Supply voltage: 85% to +115%

1.4 Measurement uncertainty

The expanded uncertainty ($k = 2$) for radiated measurements has been determined to be:

± 4 dB at 10m and ± 5.4 dB at 3m

The expanded uncertainty ($k = 2$) for conducted measurements at antenna terminal has been determined to be:

± 1.0 dB

The expanded uncertainty ($k = 2$) for line conducted measurements has been determined to be:

± 2.6 dB

1.5 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 emissions reading on the EMI Receiver.

The basic equation with a sample calculation is as follows:

$$FS = RA + AF + CF - AG$$

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

RA = Receiver Amplitude in dB(μ V)

CF = Cable Attenuation Factor in dB

AF = Antenna Factor in dB(m^{-1})

AG = Amplifier Gain in dB

Assume a receiver reading of 48.1 dB(μ V) is obtained. The antenna factor of 7.4 dB(m^{-1}) and cable factor of 1.6 dB is added and amplifier gain of 16.0 dB is subtracted giving field strength of 41.1 dB(μ V/m).

$$RA = 48.1 \text{ dB}(\mu\text{V})$$

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

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

$$AG = 16.0 \text{ dB}$$

$$FS = RA + AF + CF - AG$$

$$FS = 48.1 + 7.4 + 1.6 - 16.0$$

$$FS = 41.1 \text{ dB}(\mu\text{V}/\text{m})$$

General notes:



2.0 TEST SUMMARY

Referring to the performance criteria and the operating mode during the tests specified in this report, the equipment complies with the requirements according to the following standards.

TEST SPECIFICATION	TEST PARAMETERS	RESULT
15.247(b), (c) / RSS-210 A8.4	Maximum peak output power	Pass
15.247(e) / RSS-210 A8.1	Hopping channel carrier frequencies separation	Pass
15.247(a) / RSS-210 A8.1	20dB bandwidth of the hopping channel	Pass
15.247(e) / RSS-210 A8.1	Number of hopping frequencies	Pass
15.247(e) / RSS-210 A8.1	Average time of occupancy of hopping frequency	Pass
15.247(d) / RSS-210 A8.5	Antenna conducted spurious and band edge emissions	Pass
15.247(d) / RSS-210 A8.5	Radiated spurious emissions	Pass
15.247(i) / RSS- Gen 5.5	RF Exposure Compliance	Pass
15.207 / RSS-Gen 7.2.2	Transmitter Power Line conducted emissions	Pass
15.109 / ICES-003	Receiver/digital device radiated emissions	Note ¹
15.107 / ICES-003	Digital device conducted emissions	Note ¹

¹ See Intertek Report number 100928878MIN-011A.



3.0 TEST CONDITIONS AND RESULTS

3.1 Maximum peak output power

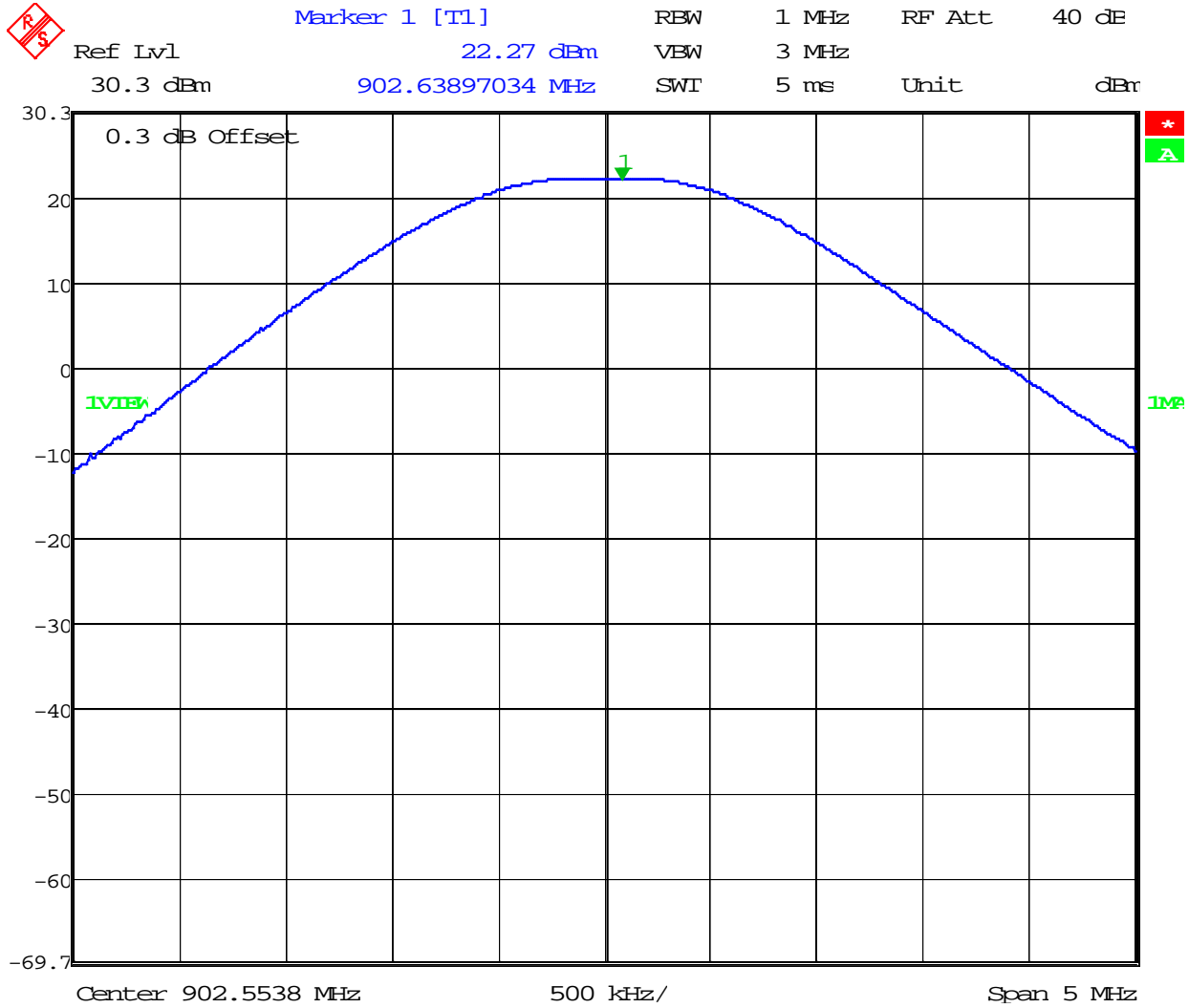
Test location: OATS Anechoic Chamber Other

Test result: **Pass**

Max. Margin: 7.0 dB below the limits

Power Output:	Conducted			
Frequency Range:	<input checked="" type="checkbox"/> 902-928MHz <input type="checkbox"/> 2400-2483.5MHz <input type="checkbox"/> 5725-5850MHz			
Frequency (MHz)	Measured Power dBm	Limit dBm	Limit Reduction dB	Margin dB
902.5538	22.27	30	0	-7.73
914.7413	23.0	30	0	-7.0
927.4366	22.89	30	0	-7.11
902.5538	10.46	30	0	-19.54
915.0	11.49	30	0	-18.51
927.405	10.83	30	0	-19.17
RBW:	<input checked="" type="checkbox"/> 1MHz <input type="checkbox"/> 3MHz <input type="checkbox"/> 10MHz			
VBW:	<input checked="" type="checkbox"/> 1MHz <input type="checkbox"/> 3MHz <input type="checkbox"/> 10MHz			
Antenna Gain:	<input checked="" type="checkbox"/> < 6dBi <input type="checkbox"/> >6dBi and = <input type="text"/> dBi, Output power reduction = <input type="text"/> dB			

Notes: Tested both +26dBm and +15dBm power settings.

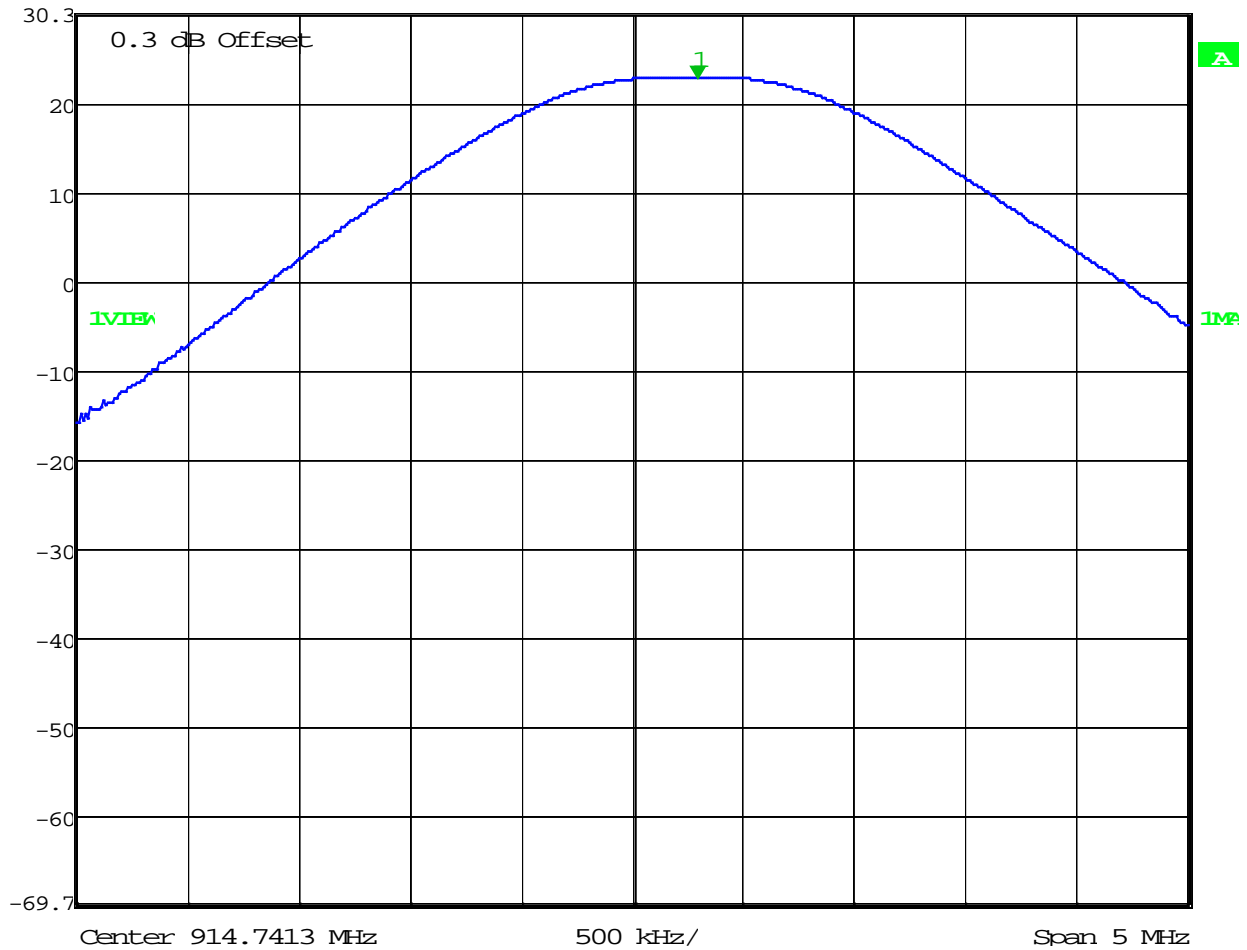


Date: 25.SEP.2013 11:05:14

Graph 3.1.1 – +26dBm Sample



	Marker 1 [T1]	REBW	1 MHz	RF Att	40 dB
Ref Lvl	23.00 dBm	VBW	3 MHz		
30.3 dBm	915.03689118 MHz	SWT	5 ms	Unit	dBm

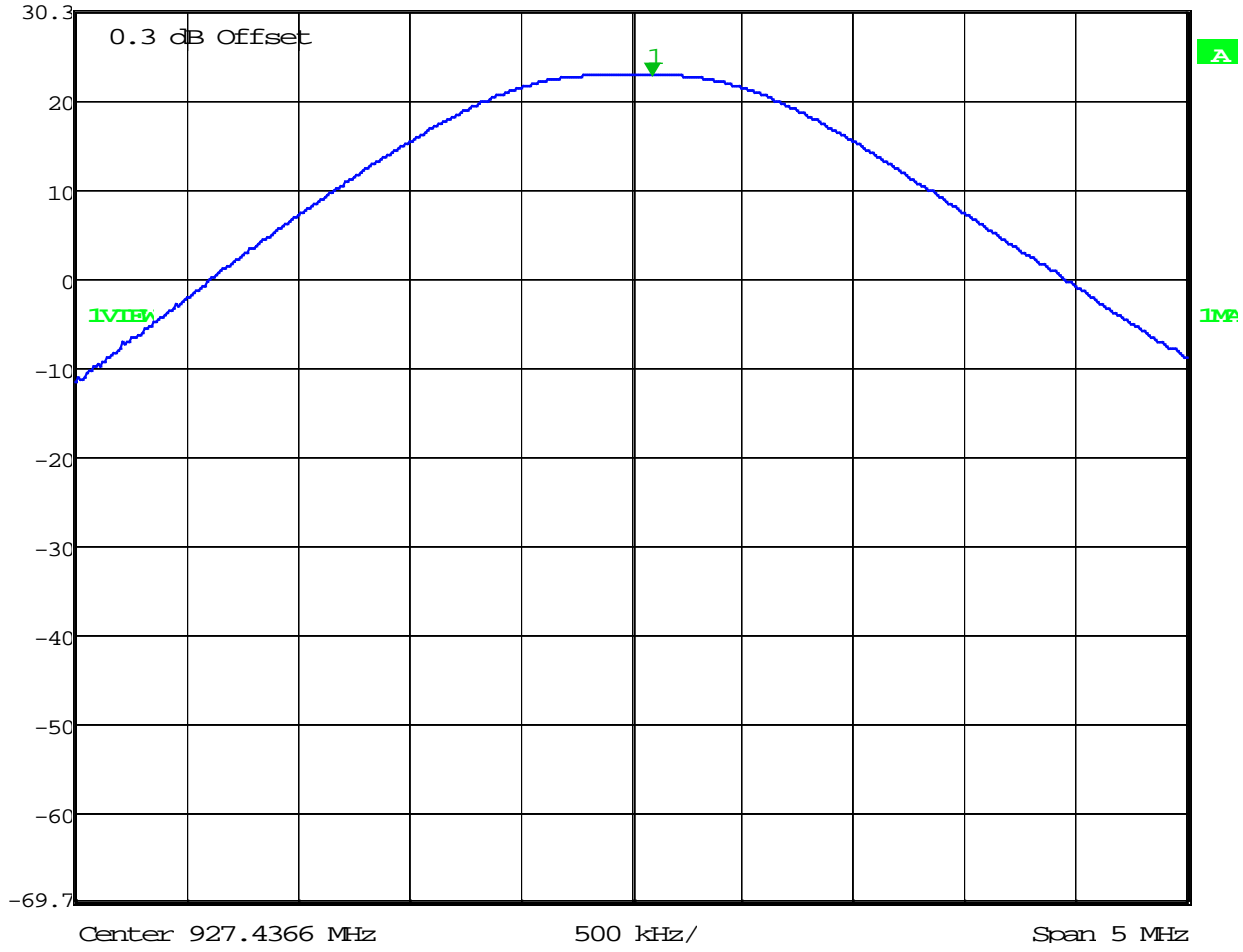


Date: 25.SEP.2013 15:13:39

Graph 3.1.2 - +26dBm Sample



Marker 1 [T1] REW 1 MHz RF Att 40 dB
Ref Lvl 22.89 dBm VBW 3 MHz
30.3 dBm 927.53179038 MHz SWI 5 ms Unit dBm

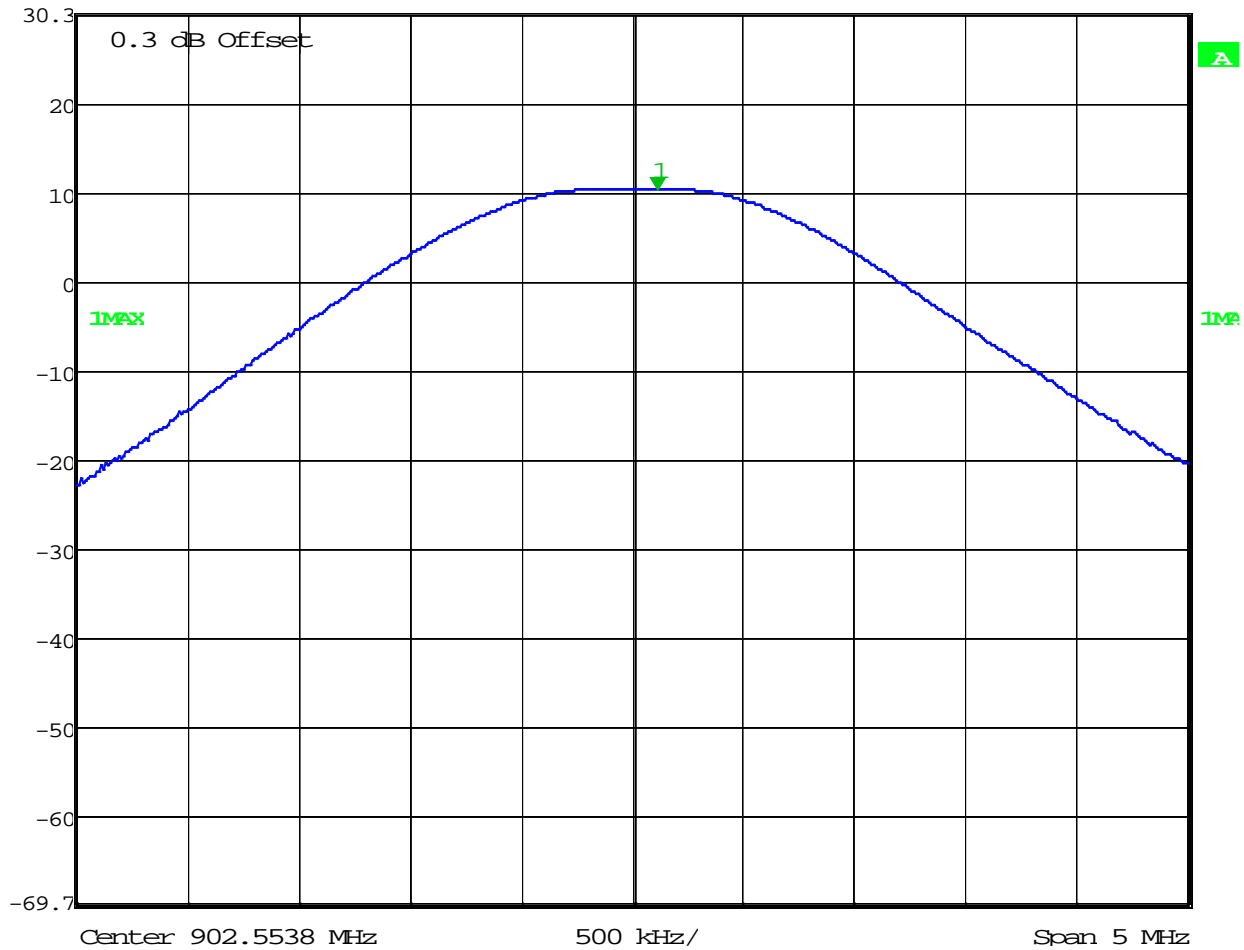


Date: 25.SEP.2013 15:14:44

Graph 3.1.3 - +26dBm Sample



	Marker 1 [T1]	REBW	1 MHz	RF Att	50 dB
Ref Lvl	10.46 dBm	VBW	3 MHz		
30.3 dBm	902.66903046 MHz	SWT	5 ms	Unit	dBm

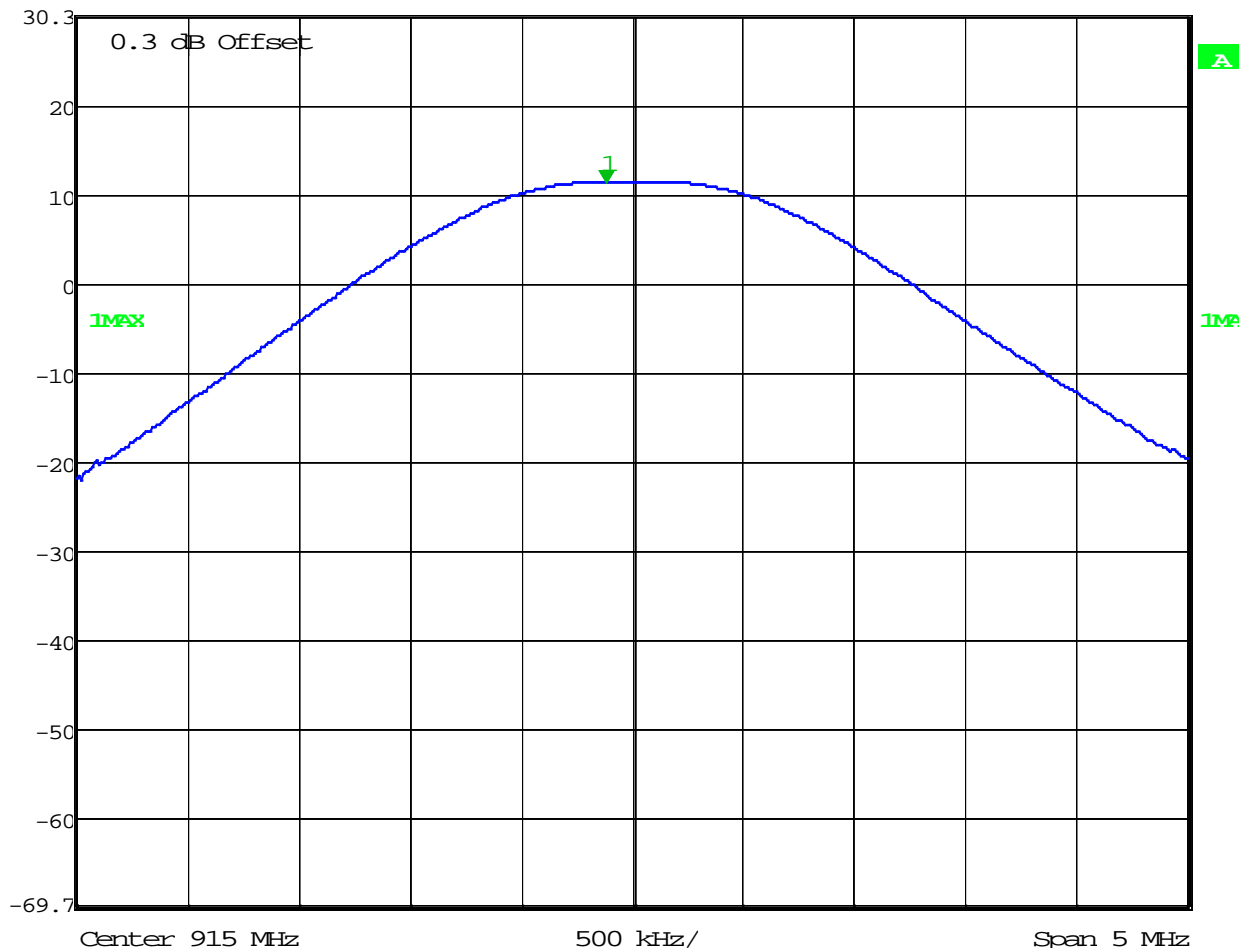


Date: 26.SEP.2013 09:18:17

Graph 3.1.4 – +15dBm Sample



	Marker 1 [T1]	REBW	1 MHz	RF Att	50 dB
Ref Lvl	11.49 dBm	VBW	3 MHz		
30.3 dBm	914.88476954 MHz	SWT	5 ms	Unit	dBm

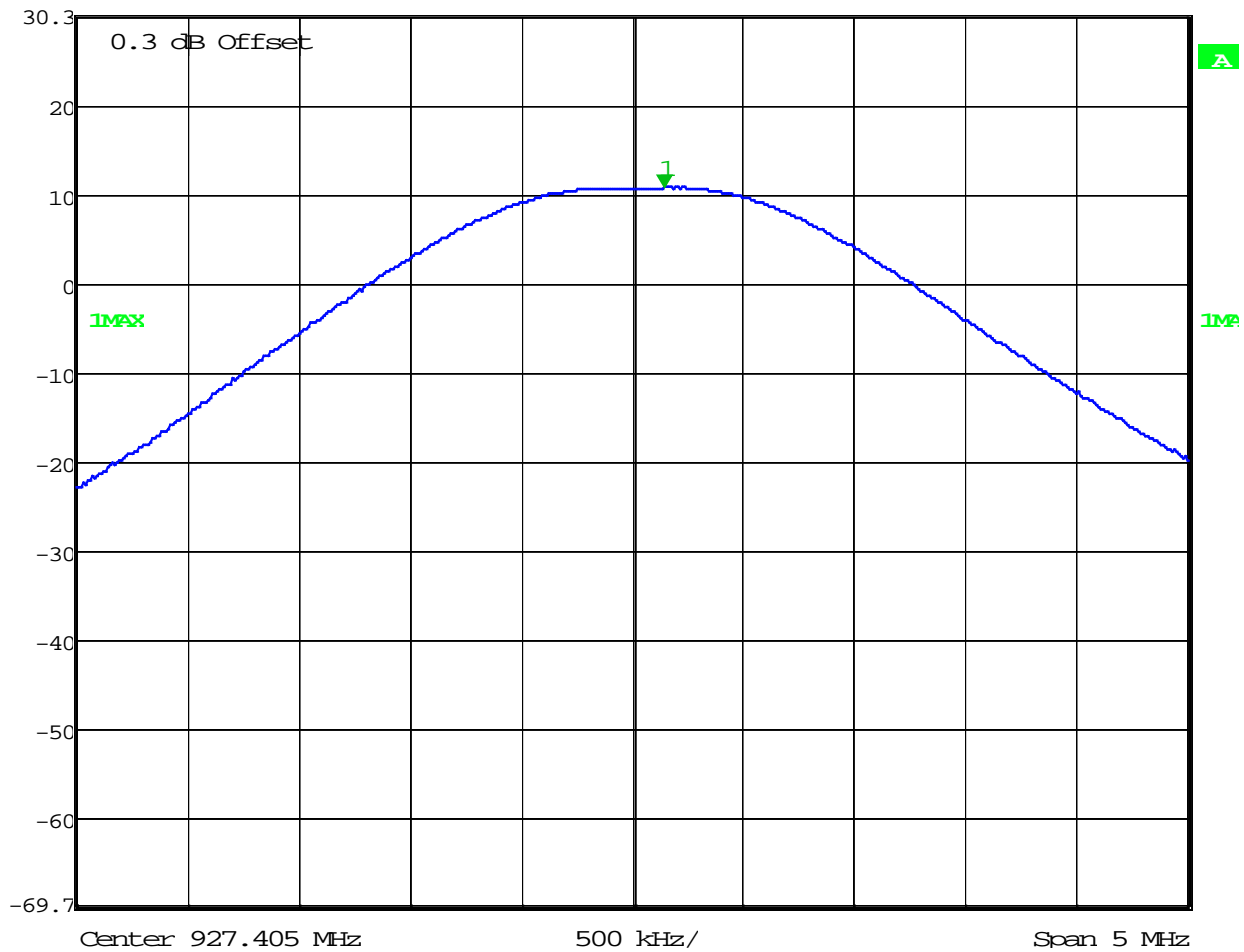


Date: 26.SEP.2013 09:19:27

Graph 3.1.5 - +15dBm Sample



	Marker 1 [T1]	REBW	1 MHz	RF Att	50 dB
Ref Lvl	10.83 dBm	VBW	3 MHz		
30.3 dBm	927.55029058 MHz	SWT	5 ms	Unit	dBm



Date: 26.SEP.2013 09:20:20

Graph 3.1.6 - +15dBm Sample



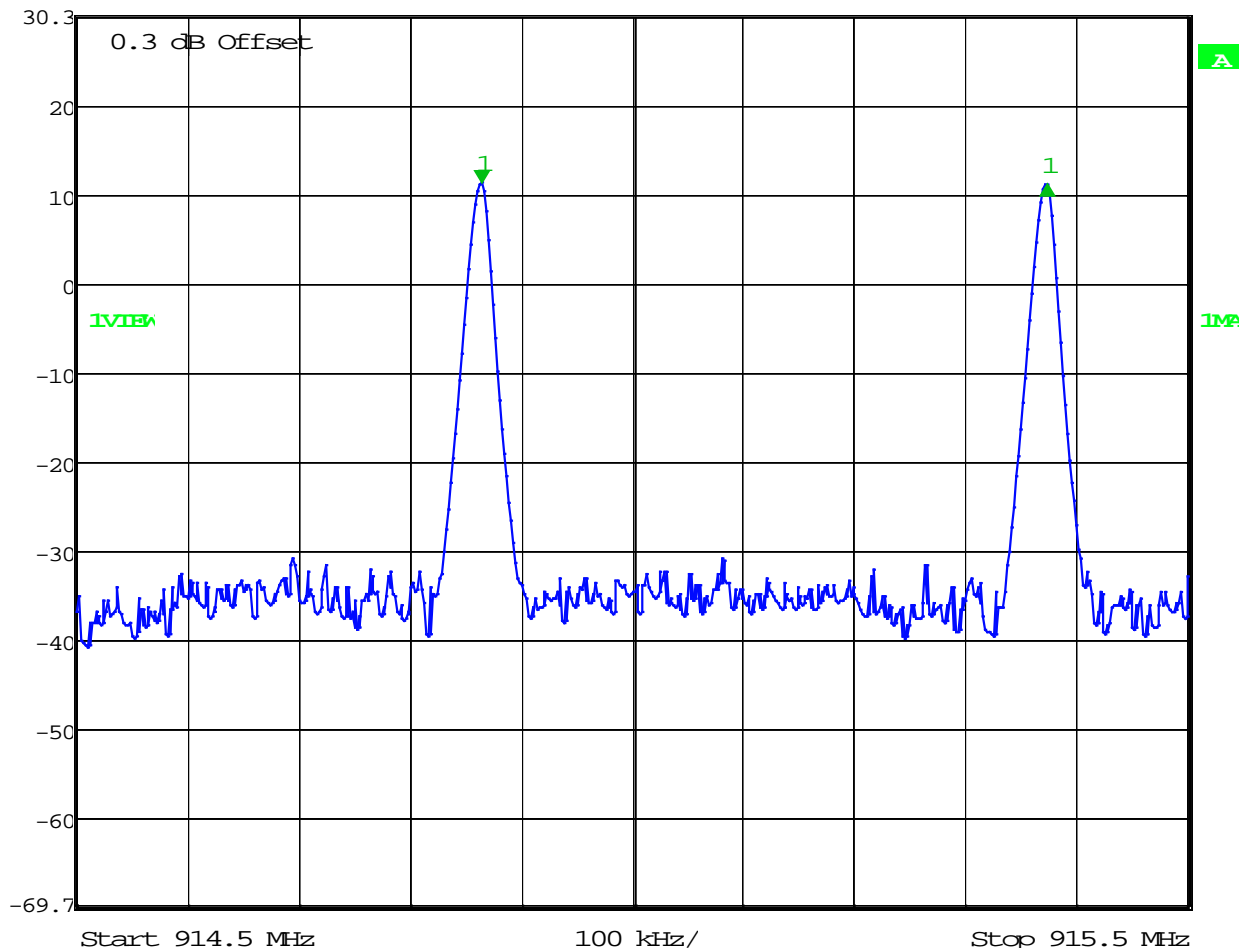
3.2 Hopping channel carrier frequencies separation

Frequency Range:	<input checked="" type="checkbox"/> 902-928MHz	<input type="checkbox"/> 2400-2483.5MHz	<input type="checkbox"/> 5725-5850MHz
Measured Separation (kHz)	Limit (kHz)		Result
509	25		Pass
Limit:	<input checked="" type="checkbox"/> 25kHz <input type="checkbox"/> 20dB channel bandwidth <input type="checkbox"/> 2/3 of 20dB channel bandwidth		
Span:	[redacted] kHz		
RBW:	<input type="checkbox"/> 3kHz <input checked="" type="checkbox"/> 10kHz <input type="checkbox"/> 100kHz <input type="checkbox"/> other [redacted] kHz		
VBW:	<input type="checkbox"/> 3kHz <input checked="" type="checkbox"/> 10kHz <input type="checkbox"/> 100kHz <input type="checkbox"/> other [redacted] kHz		

Notes: Tested both +26dBm and +15dBm samples.



Delta 1 [T1] RBW 10 kHz RF Att 50 dB
Ref Lvl -0.06 dB VBW 10 kHz
30.3 dBm 509.01803607 kHz SWI 25 ms Unit dBm



Date: 26.SEP.2013 09:23:11

Graph 3.2.2 - +15dBm sample



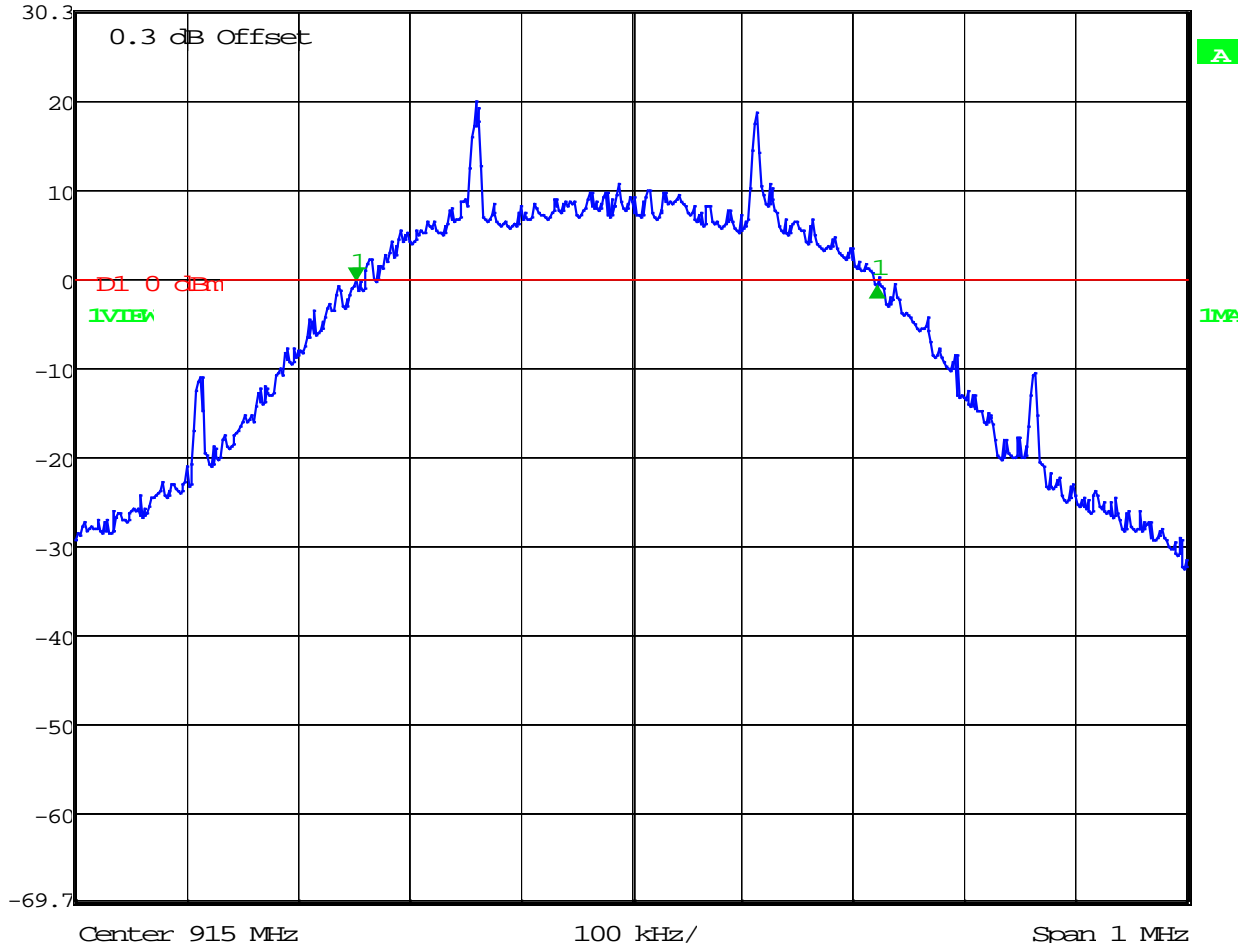
3.3 20dB bandwidth of the hopping channel

Frequency Range:		<input checked="" type="checkbox"/> 902-928MHz <input type="checkbox"/> 2400-2483.5MHz <input type="checkbox"/> 5725-5850MHz			
Sample	Low Frequency Channel (kHz)	Middle Frequency Channel (kHz)	Upper Frequency Channel (kHz)	Limit (kHz)	Result
+26dBm	464.92	468.94	478.95	500	Pass
+15dBm	480.96	476.95	490.98	500	Pass
Span:		1MHz			
RBW:		<input type="checkbox"/> 3kHz <input type="checkbox"/> 10kHz <input type="checkbox"/> 100kHz <input checked="" type="checkbox"/> other 5kHz			
VBW:		<input type="checkbox"/> 3kHz <input type="checkbox"/> 10kHz <input type="checkbox"/> 100kHz <input checked="" type="checkbox"/> other 10kHz			

Notes: Tested both +26dBm and +15dBm power settings.



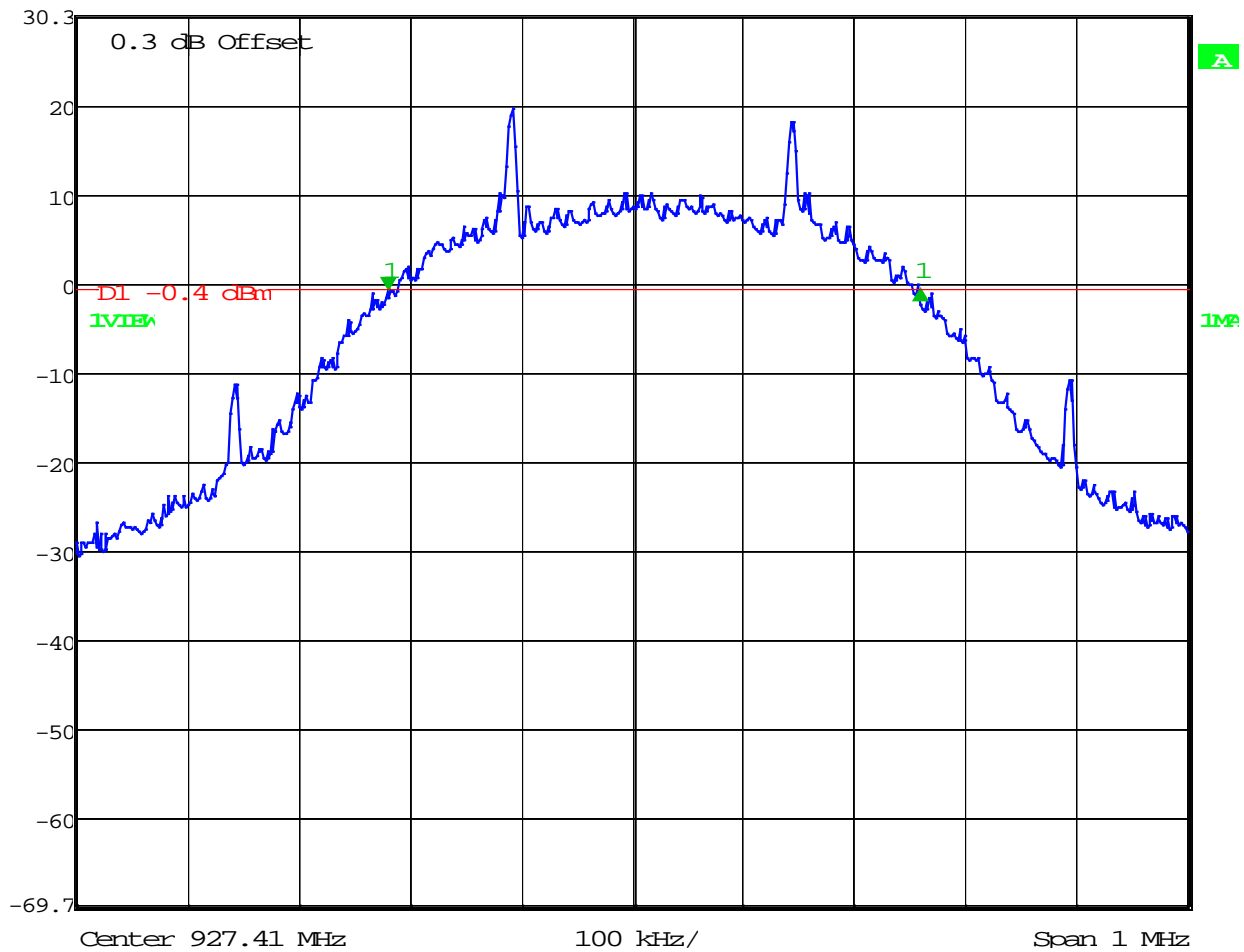
Delta 1 [T1] RBW 5 kHz RF Att 40 dB
Ref Lvl -0.68 dB VBW 10 kHz
30.3 dBm 468.93787575 kHz SWI 100 ms Unit dBm



Date: 25.SEP.2013 15:32:19

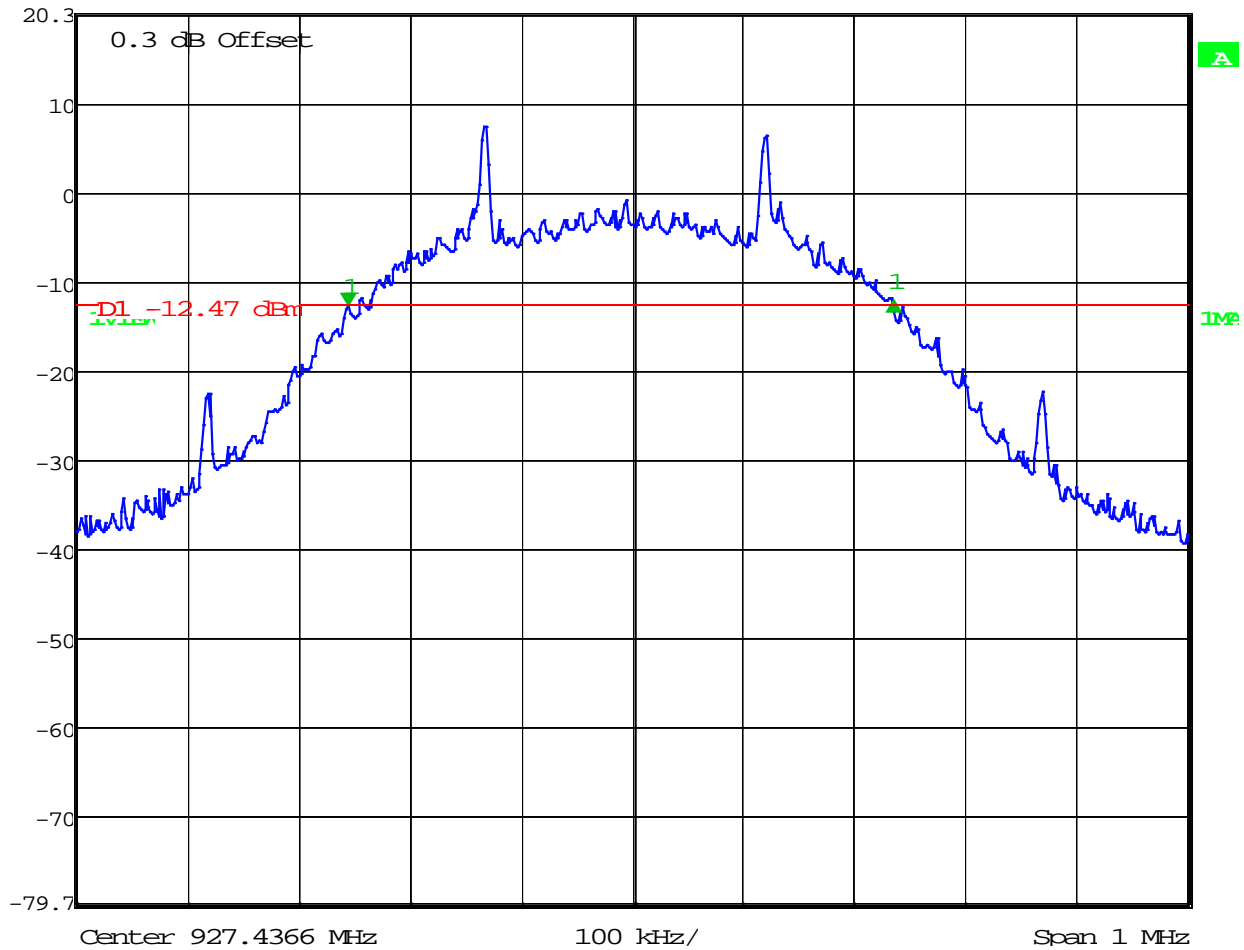
Graph 3.3.2 - +26dBm Sample

	Delta 1 [T1]	RBW	5 kHz	RF Att	40 dB
Ref Lvl	-0.04 dB	VBW	10 kHz		
30.3 dBm	478.95791583 kHz	SWT	100 ms	Unit	dBm



Date: 25.SEP.2013 15:33:49
Graph 3.3.3 - +26dBm Sample

	Delta 1 [T1]	REBW	5 kHz	RF Att	50 dB
Ref Lvl	0.39 dB	VBW	10 kHz		
20.3 dBm	490.98196393 kHz	SWT	100 ms	Unit	dBm



Date: 26.SEP.2013 09:41:52

Graph 3.3.6 - +15dBm Sample



3.4 Number of hopping frequencies

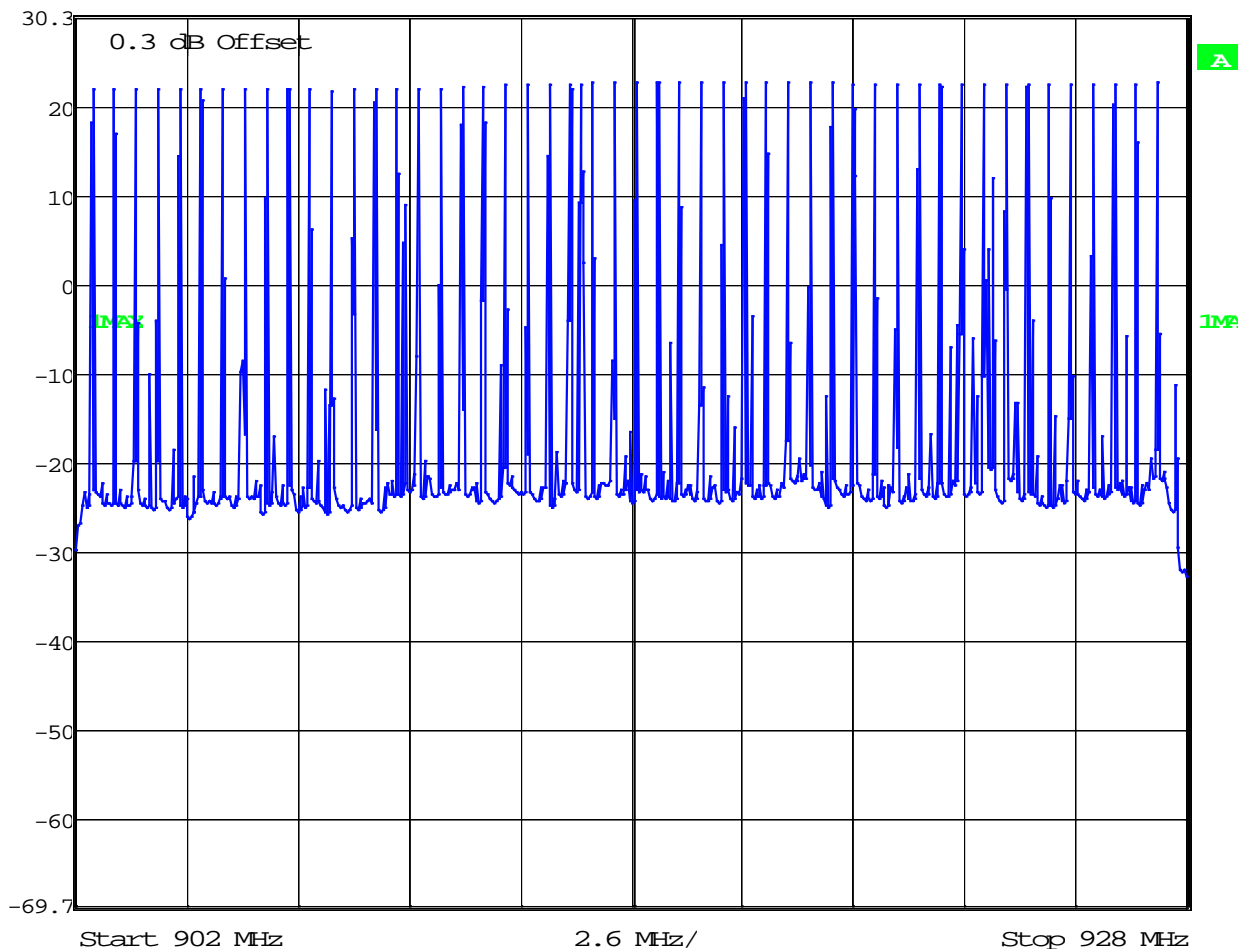
Frequency Range:	<input checked="" type="checkbox"/> 902-928MHz	<input type="checkbox"/> 2400-2483.5MHz	<input type="checkbox"/> 5725-5850MHz
Measured Number	Requirements		Result
50	25		Pass
Channel 20dB Bandwidth:	<input type="checkbox"/> <250kHz <input checked="" type="checkbox"/> ≥250kHz		

Notes: Tested both +26dBm and +15dBm power settings.



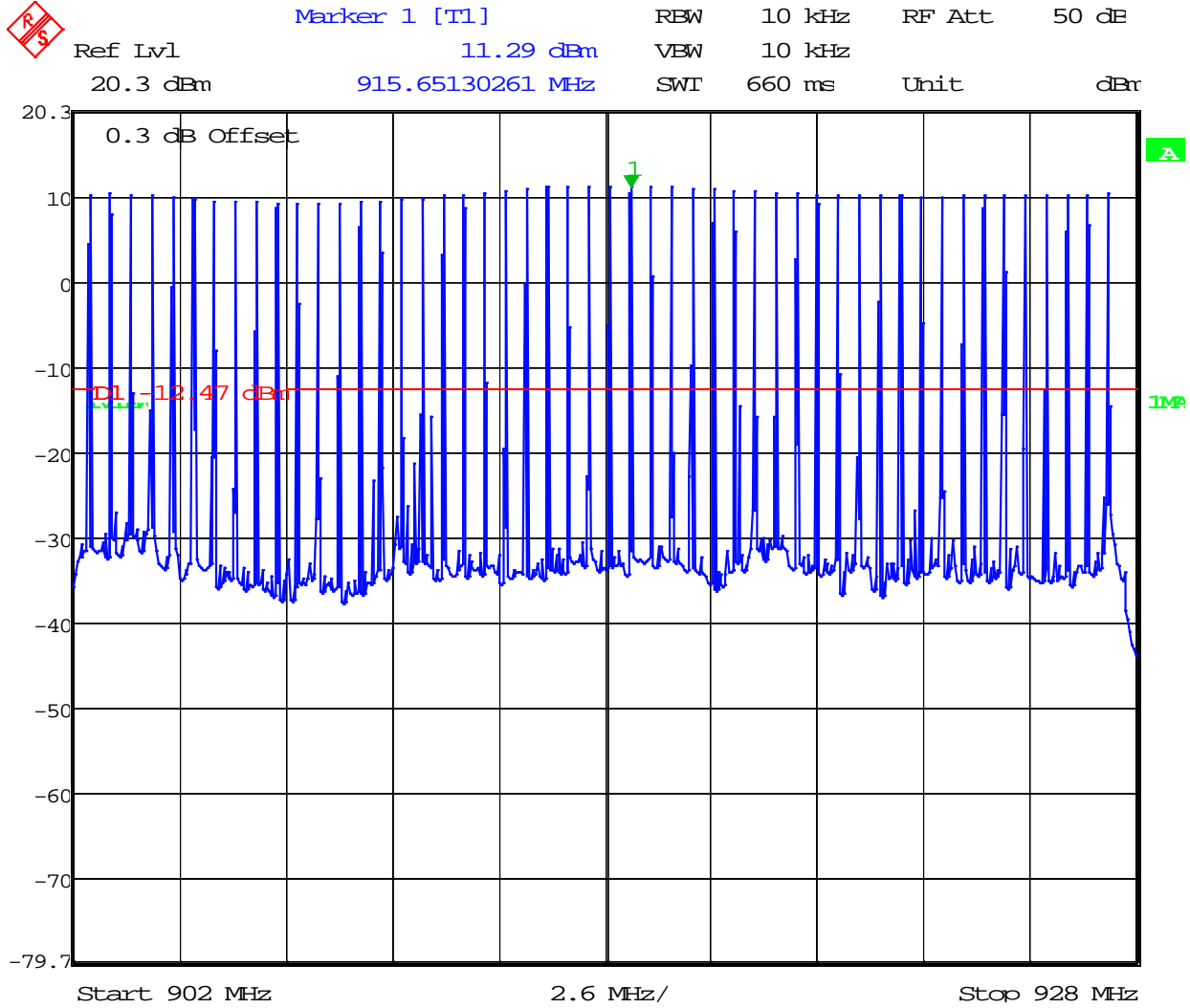
Ref Lvl
30.3 dBm

RBW 10 kHz RF Att 40 dB
VBW 10 kHz
SWT 660 ms Unit dBm



Date: 25.SEP.2013 15:51:40

Graph 3.4.1 - +26dBm Sample



Date: 26.SEP.2013 10:16:24

Graph 3.4.2 - +15dBm Sample



3.5 Average time of occupancy of hopping frequency

Frequency Range:	<input checked="" type="checkbox"/> 902-928MHz	<input type="checkbox"/> 2400-2483.5MHz	<input type="checkbox"/> 5725-5850MHz
Measured / Calculated Time sec	Period sec	Limit sec	Result
0.384	10	0.4	Pass
Period:	<input checked="" type="checkbox"/> 10s <input type="checkbox"/> 20s <input type="checkbox"/> 30s <input checked="" type="checkbox"/> 0.4s multiplied by the channel number		
Channel 20dB Bandwidth:	<input type="checkbox"/> <250kHz <input checked="" type="checkbox"/> ≥250kHz		

Time of occupancy calculation:

The minimum measured repetition of the channel occupancy (repetition) = 1 time in 60 sec
Single occupancy duration (single duration) = 0.384 sec
Period = 10 sec

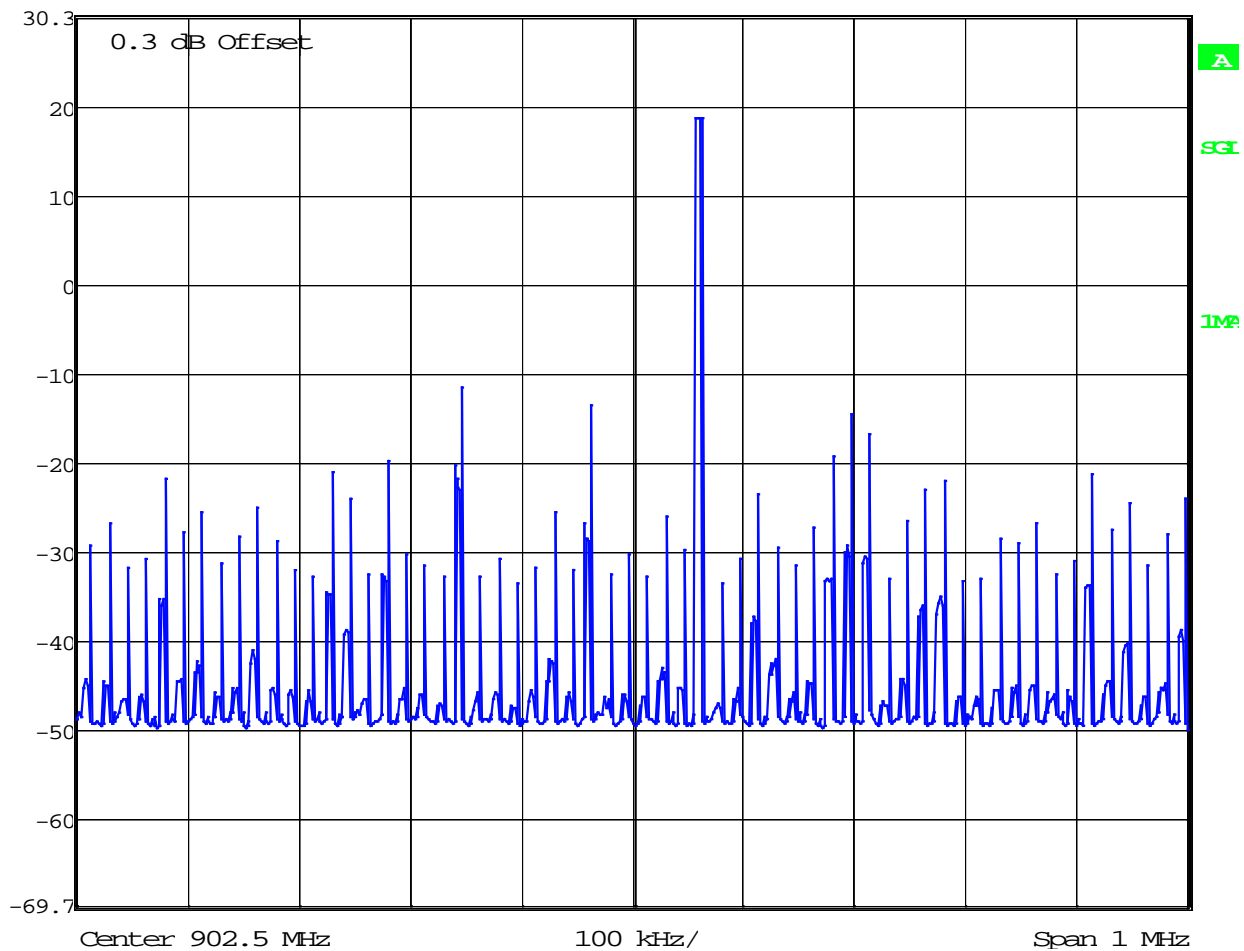
Time of occupancy = (single duration) x (repetition) = 0.384 x 1 = 0.384 sec

Notes: Both +26dBm and +15dBm Samples were evaluated.



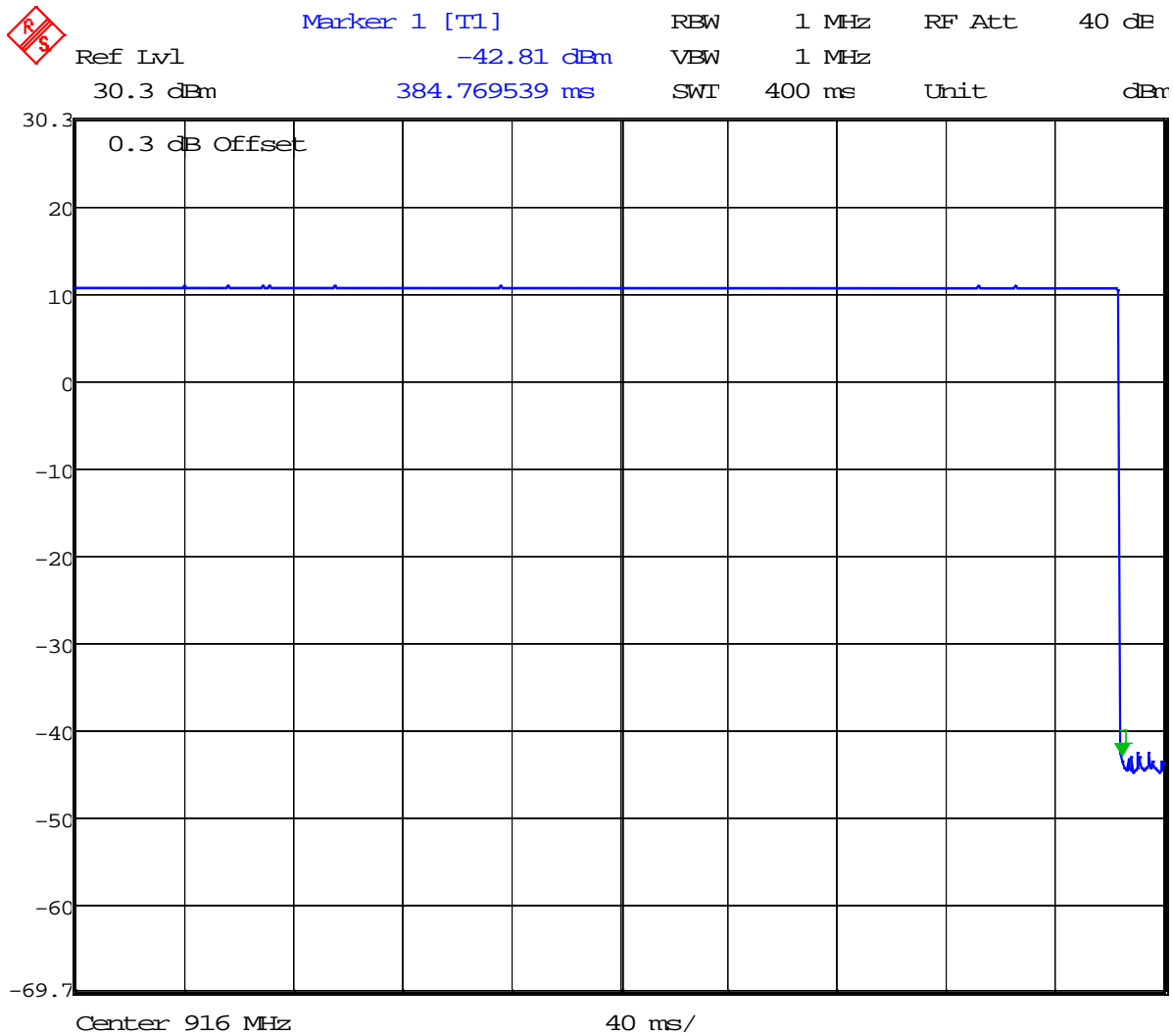
Ref Lvl
30.3 dBm

RBW 100 kHz RF Att 40 dB
VBW 100 kHz
SWT 60 s Unit dBm



Date: 25.SEP.2013 16:09:23

Graph 3.5.1 - +26dBm Sample

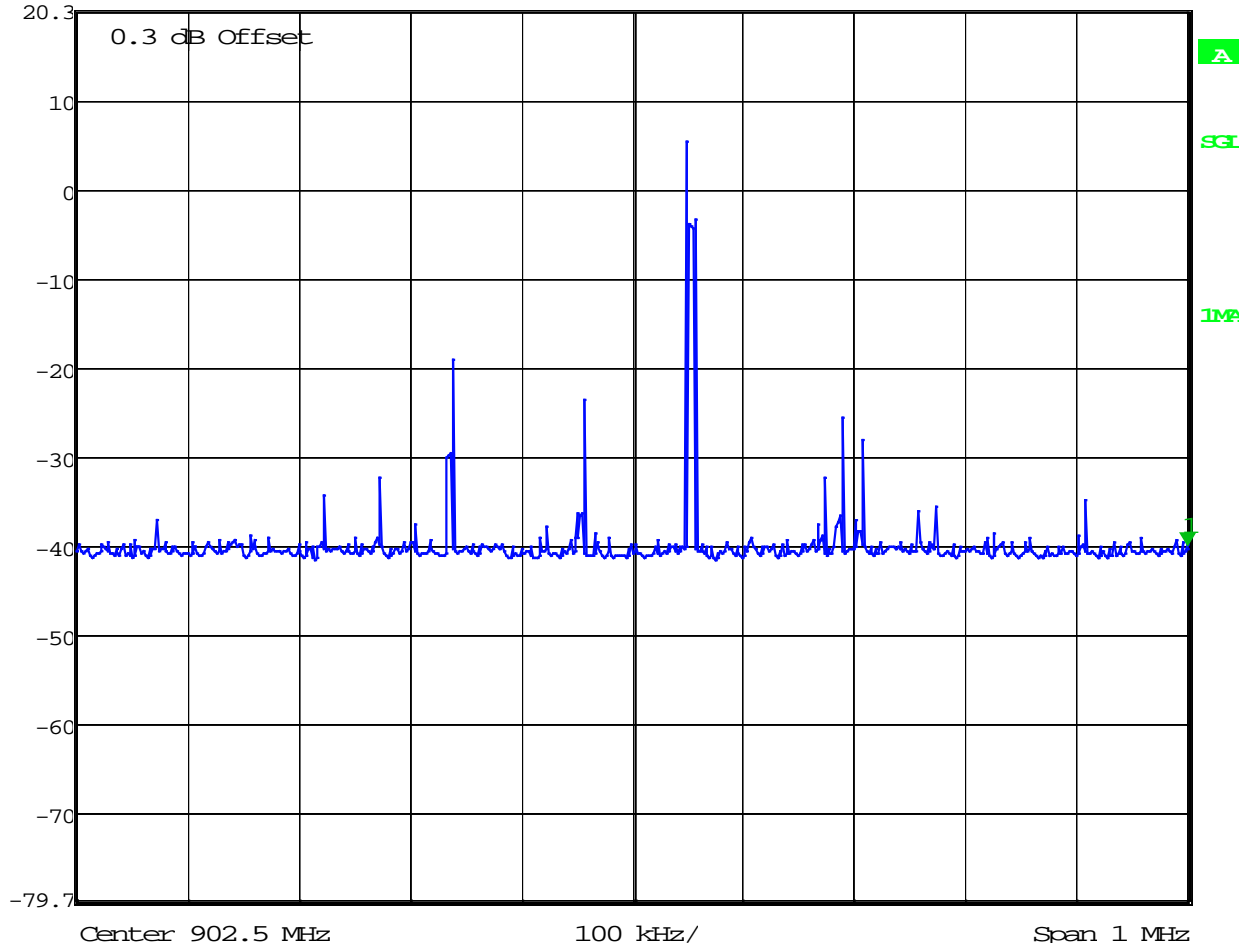


Date: 25.SEP.2013 16:13:21
Note: No video trigger delay was set

Graph 3.5.2 - +26dBm Sample

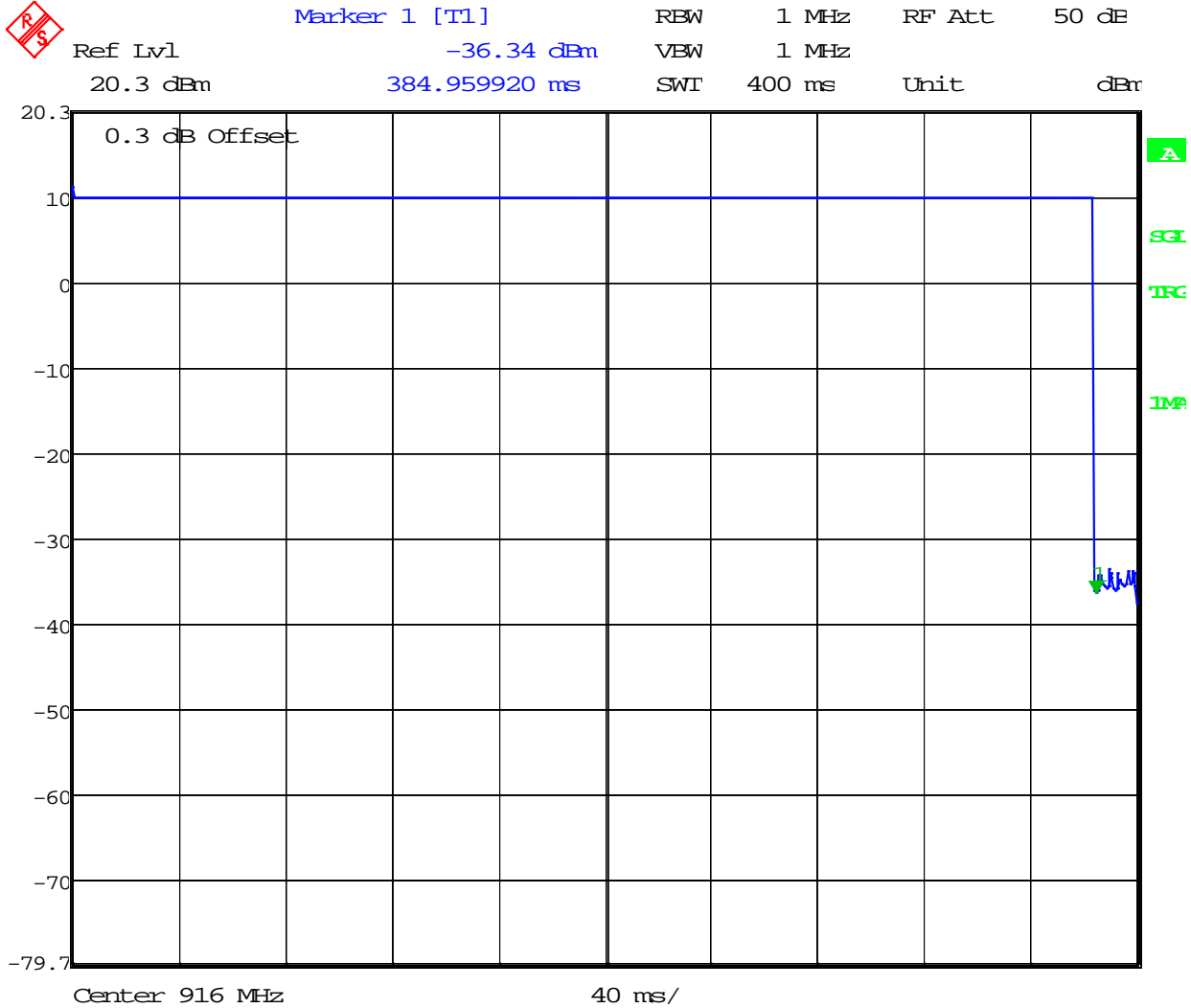


Marker 1 [T1] RBW 100 kHz RF Att 50 dB
Ref Lvl -39.89 dBm VBW 100 kHz
20.3 dBm 903.0000000 MHz SWI 60 s Unit dBm



Date: 26.SEP.2013 10:46:41

Graph 3.5.1 - +15dBm Sample



Date: 26.SEP.2013 10:49:18
Note: No video trigger delay was set

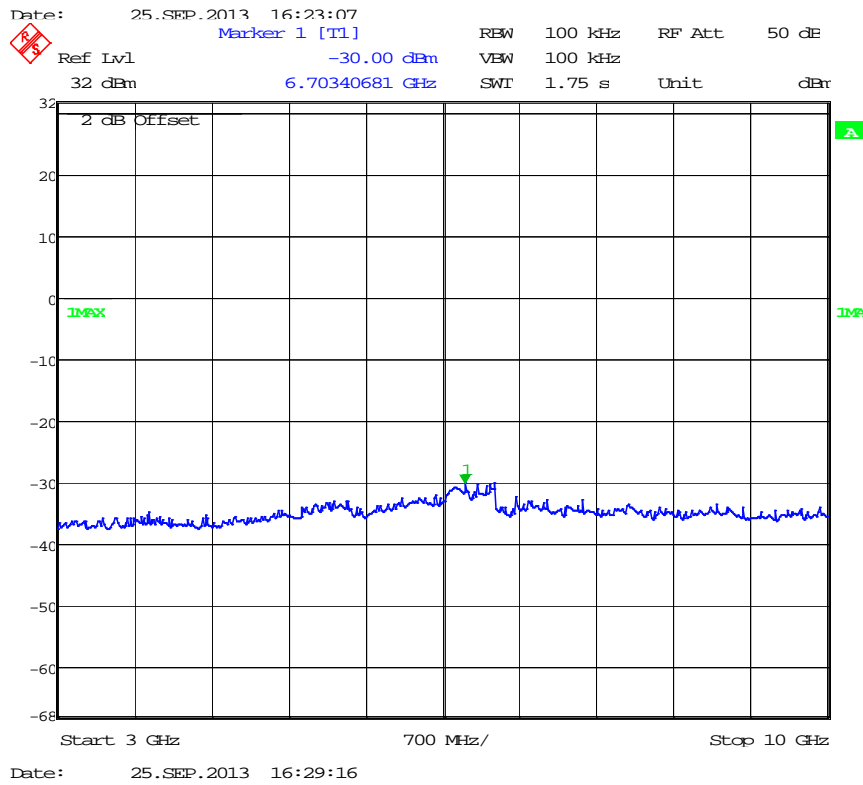
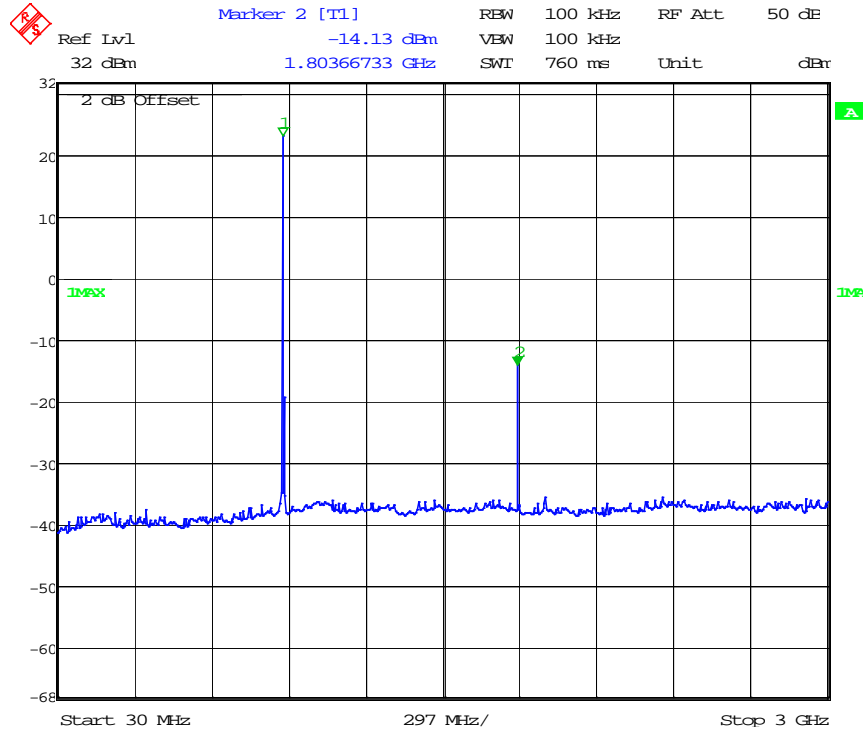
Graph 3.5.2 - +15dBm Sample



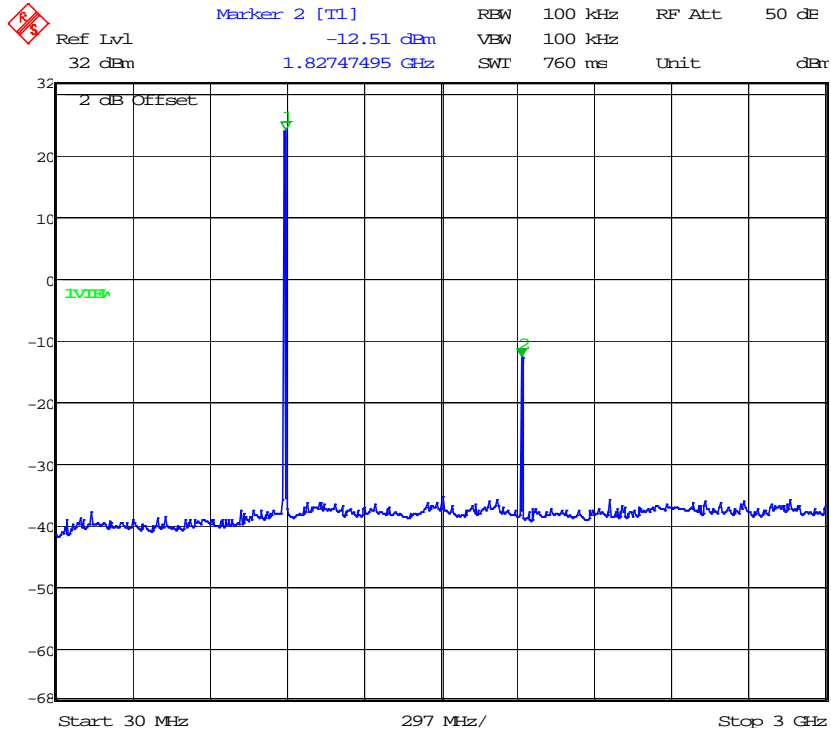
3.6 Antenna conducted spurious emissions

Frequency Range:	<input checked="" type="checkbox"/> 902-928MHz <input type="checkbox"/> 2400-2483.5MHz <input type="checkbox"/> 5725-5850MHz	
	Minimum Measured Attenuation dB	Minimum Allowed Attenuation dB
Low Frequency Channel	>20dB	20
Middle Frequency Channel	>20dB	20
Upper Frequency Channel	>20dB	20
Analyzer Settings:	<input checked="" type="checkbox"/> RBW=100KHz	
Minimum Allowed Attenuation:	<input checked="" type="checkbox"/> 20dB <input type="checkbox"/> 30dB (for digital systems with conducted power measured using RMS averaging over a time interval)	

Notes: Both +26dBm and +15dBm samples were evaluated.

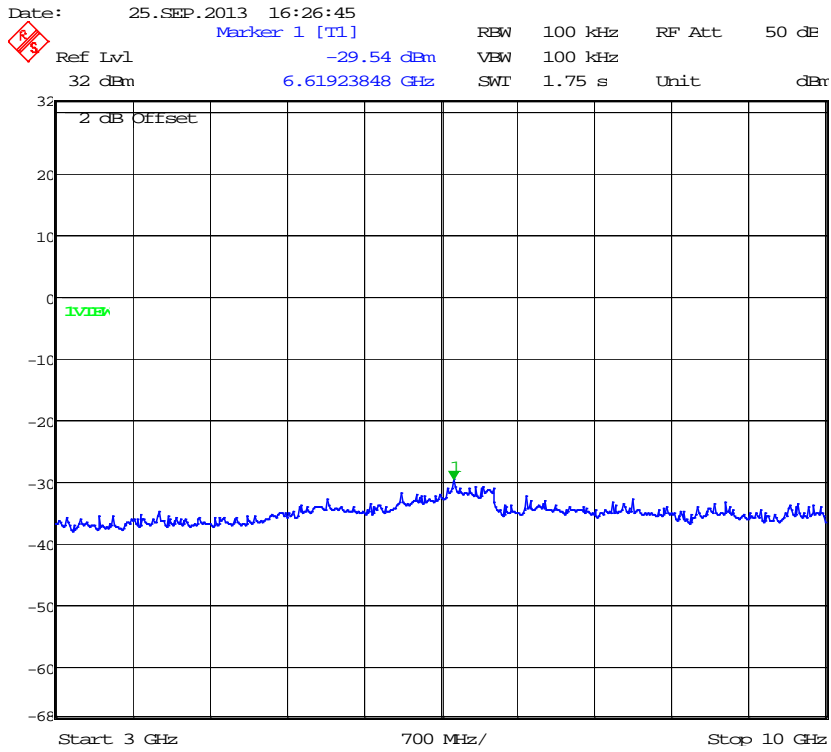
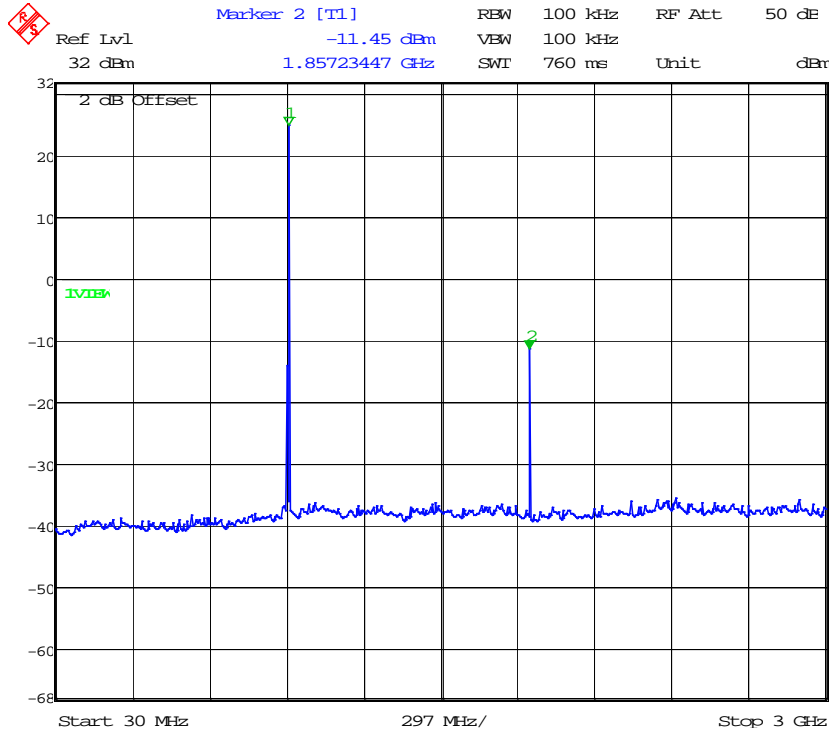


Graph 3.6.1 - +26dBm Sample

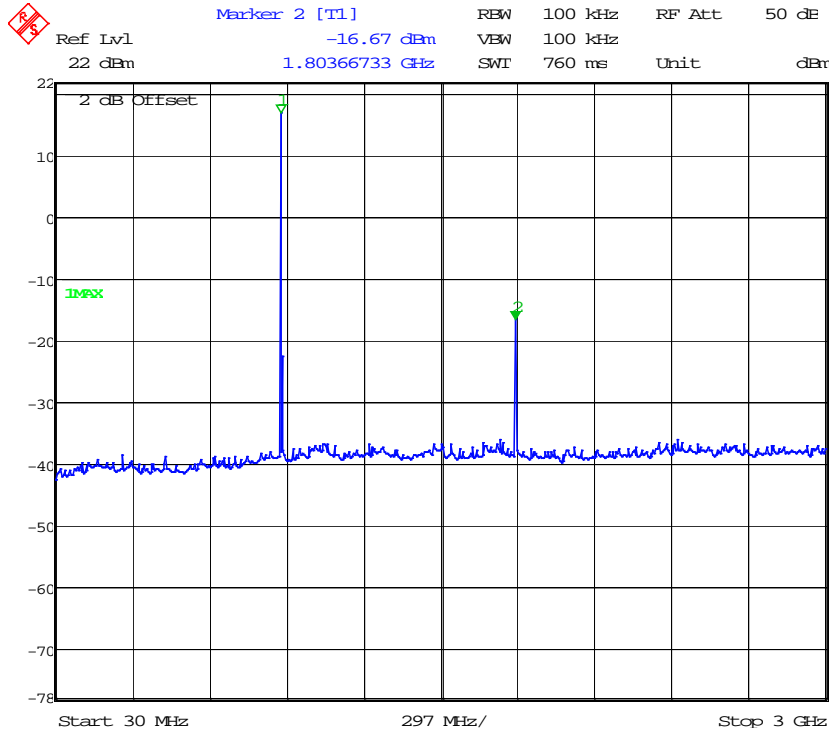


Date: 25.SEP.2013 16:30:32

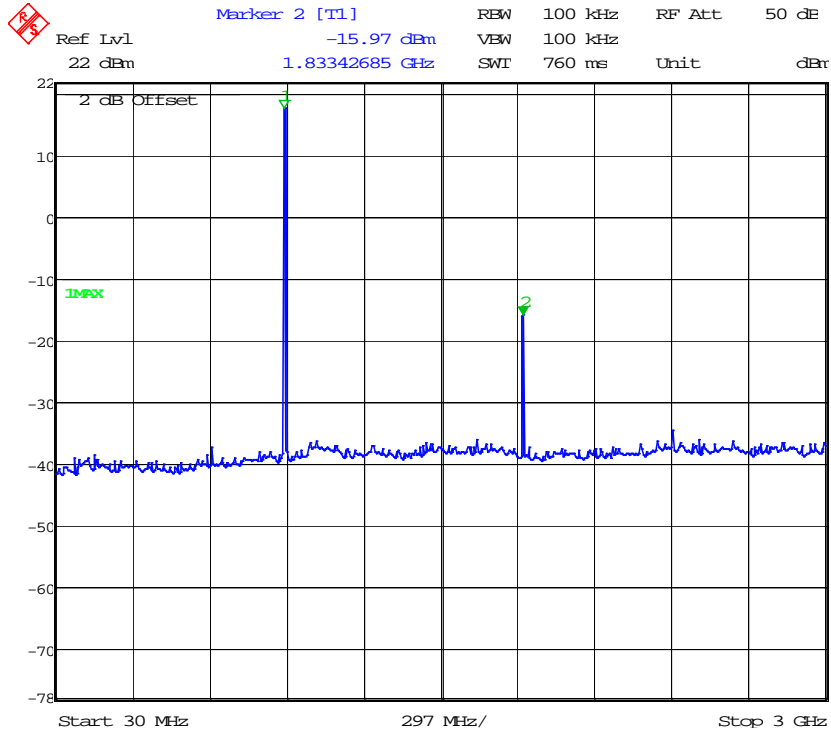
Graph 3.6.2 - +26dBm Sample



Date: 25.SEP.2013 16:31:45
Graph 3.6.3 - +26dBm Sample

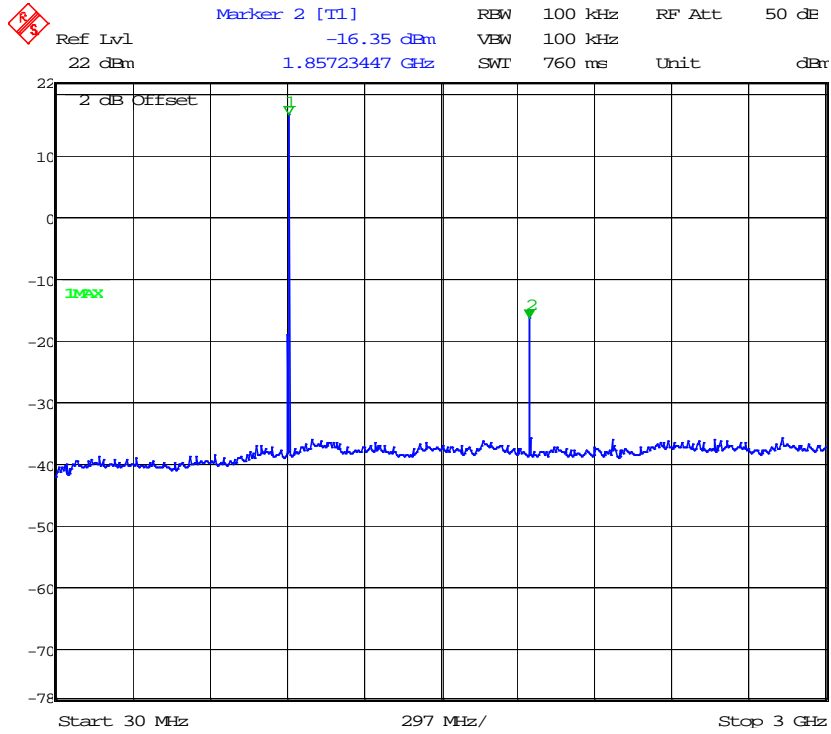


Date: 26.SEP.2013 11:21:47
Graph 3.6.4 - +15dBm Sample



Date: 26.SEP.2013 11:22:42

Graph 3.6.5 - +15dBm Sample



Date: 26.SEP.2013 11:24:52

Graph 3.6.6 - +15dBm Sample



3.6.1 Antenna conducted band edge compliance

Hopping disabled – 26dBm Sample

Frequency Range:	<input checked="" type="checkbox"/> 902-928MHz <input type="checkbox"/> 2400-2483.5MHz <input type="checkbox"/> 5725-5850MHz		
	Minimum Measured Attenuation dB	Minimum Allowed Attenuation dB	Margin dB
Low Frequency Channel (902MHz)	39.75	20	-19.75
Upper Frequency Channel (928MHz)	38.67	20	-18.67
Analyzer Settings:	<input checked="" type="checkbox"/> RBW=100KHz		
Minimum Allowed Attenuation:	<input checked="" type="checkbox"/> 20dB <input type="checkbox"/> 30dB (for digital systems with conducted power measured using RMS averaging over a time interval)		

Hopping enabled – 26dBm Sample

Frequency Range:	<input checked="" type="checkbox"/> 902-928MHz <input type="checkbox"/> 2400-2483.5MHz <input type="checkbox"/> 5725-5850MHz		
	Minimum Measured Attenuation dB	Minimum Allowed Attenuation dB	Margin dB
Low Frequency Channel (902MHz)	42.34	20	-22.34
Upper Frequency Channel (928MHz)	41.52	20	-21.52
Analyzer Settings:	<input checked="" type="checkbox"/> RBW=100KHz		
Minimum Allowed Attenuation:	<input checked="" type="checkbox"/> 20dB <input type="checkbox"/> 30dB (for digital systems with conducted power measured using RMS averaging over a time interval)		



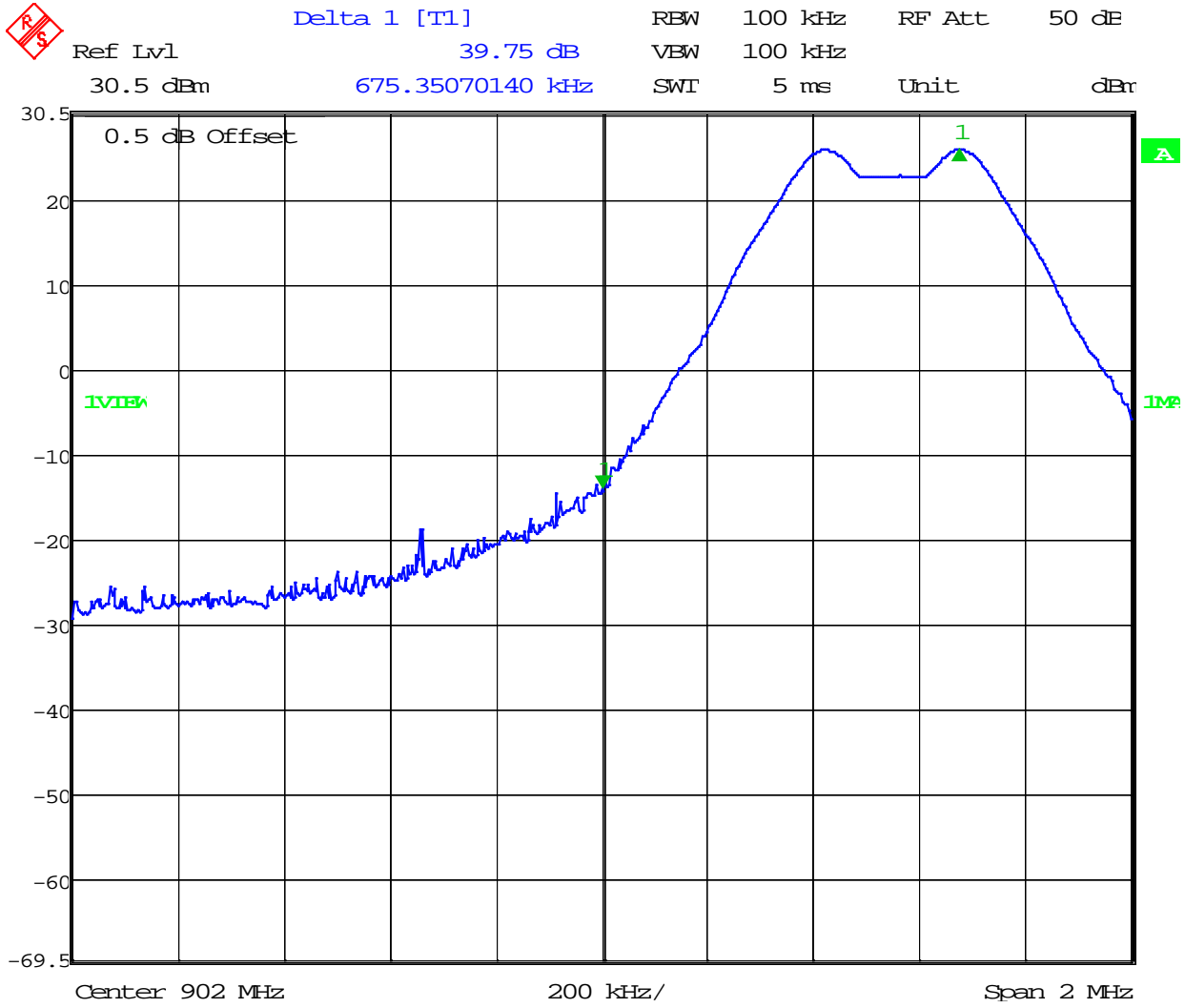
Hopping disabled –15dBm Sample

Frequency Range:	<input checked="" type="checkbox"/> 902-928MHz <input type="checkbox"/> 2400-2483.5MHz <input type="checkbox"/> 5725-5850MHz		
	Minimum Measured Attenuation dB	Minimum Allowed Attenuation dB	Margin dB
Low Frequency Channel (902MHz)	34.52	20	-14.52
Upper Frequency Channel (928MHz)	36.29	20	-16.29
Analyzer Settings:	<input checked="" type="checkbox"/> RBW=100KHz		
Minimum Allowed Attenuation:	<input checked="" type="checkbox"/> 20dB <input type="checkbox"/> 30dB (for digital systems with conducted power measured using RMS averaging over a time interval)		

Hopping enabled – 15dBm Sample

Frequency Range:	<input checked="" type="checkbox"/> 902-928MHz <input type="checkbox"/> 2400-2483.5MHz <input type="checkbox"/> 5725-5850MHz		
	Minimum Measured Attenuation dB	Minimum Allowed Attenuation dB	Margin dB
Low Frequency Channel (902MHz)	37.33	20	-17.33
Upper Frequency Channel (928MHz)	38.51	20	-18.51
Analyzer Settings:	<input checked="" type="checkbox"/> RBW=100KHz		
Minimum Allowed Attenuation:	<input checked="" type="checkbox"/> 20dB <input type="checkbox"/> 30dB (for digital systems with conducted power measured using RMS averaging over a time interval)		

Notes: Tested both +26dBm and +15dBm power settings.



Date: 25.SEP.2013 16:36:17

Graph 3.6.4 (hopping disabled) – Low Channel - +26dBm Sample



Delta 1 [T1]

RBW 100 kHz RF Att 50 dB

Ref Lvl 42.34 dB

VBW 100 kHz

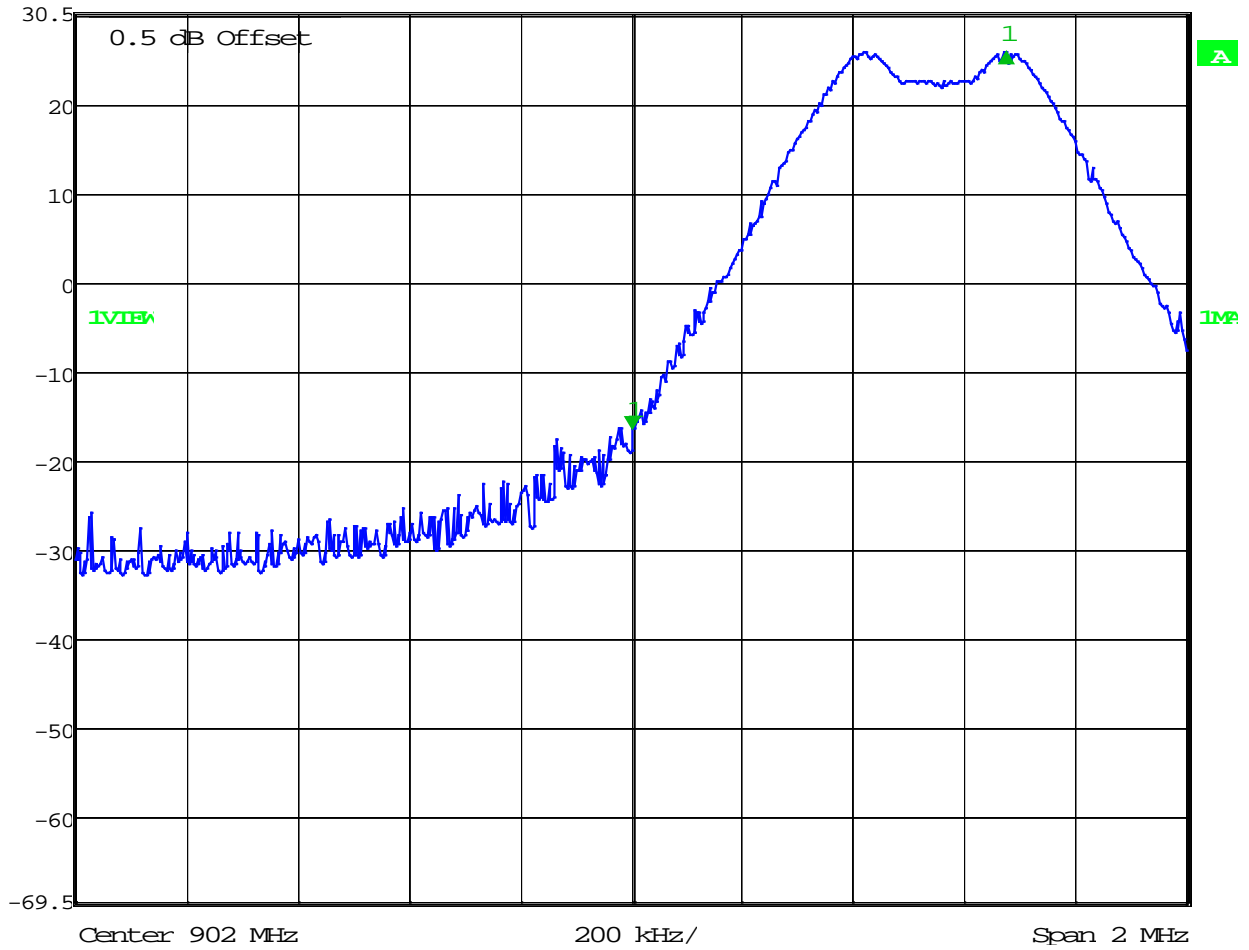
30.5 dBm

675.35070140 kHz

SWT 5 ms

Unit

dBm



Date: 25.SEP.2013 16:40:21

Graph 3.6.5 (hopping enabled) – Low Channel - +26dBm Sample



Delta 1 [T1]

RBW 100 kHz RF Att 50 dB

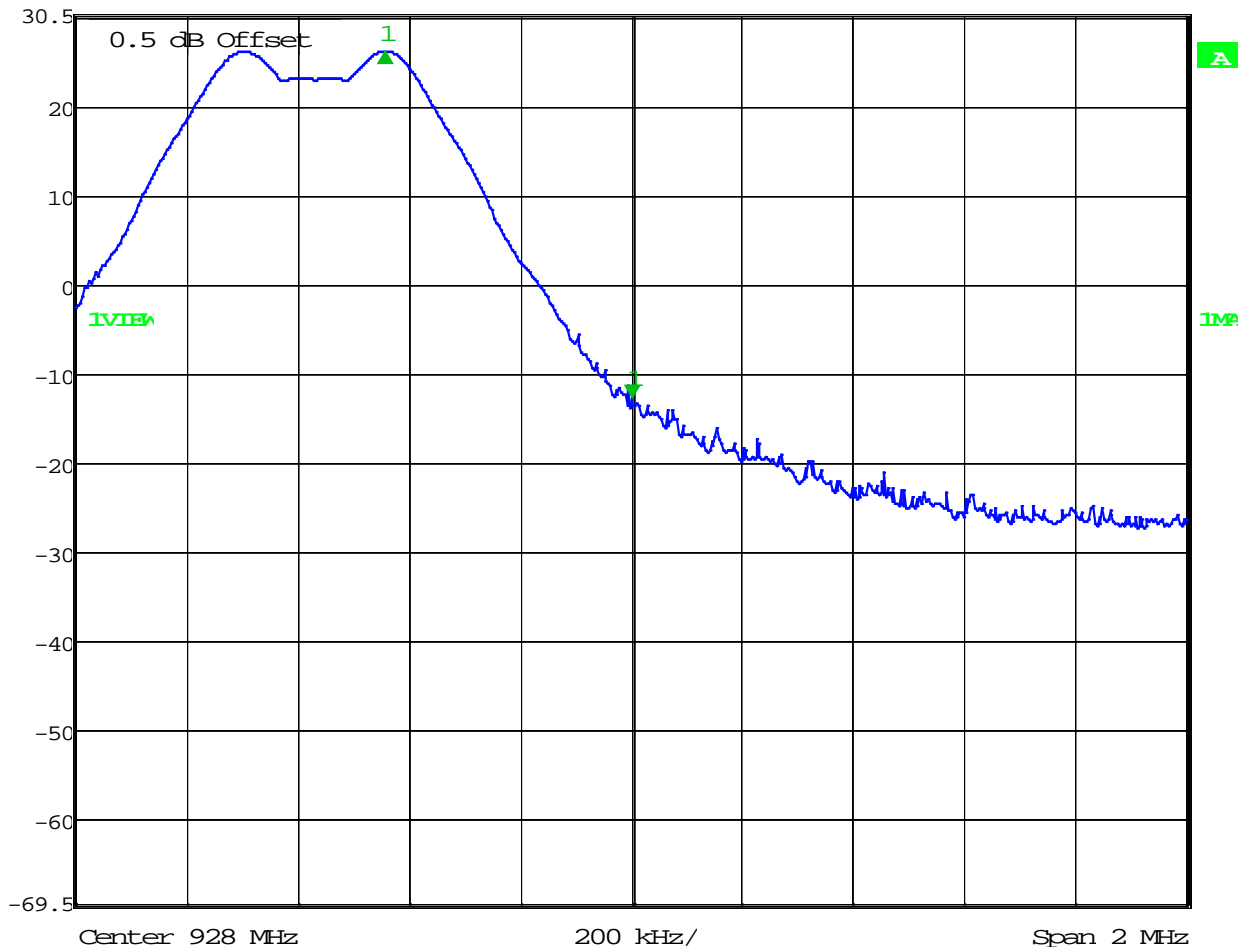
Ref Lvl 38.67 dB

VBW 100 kHz

30.5 dBm -442.88577154 kHz

SWT 5 ms

Unit dBm

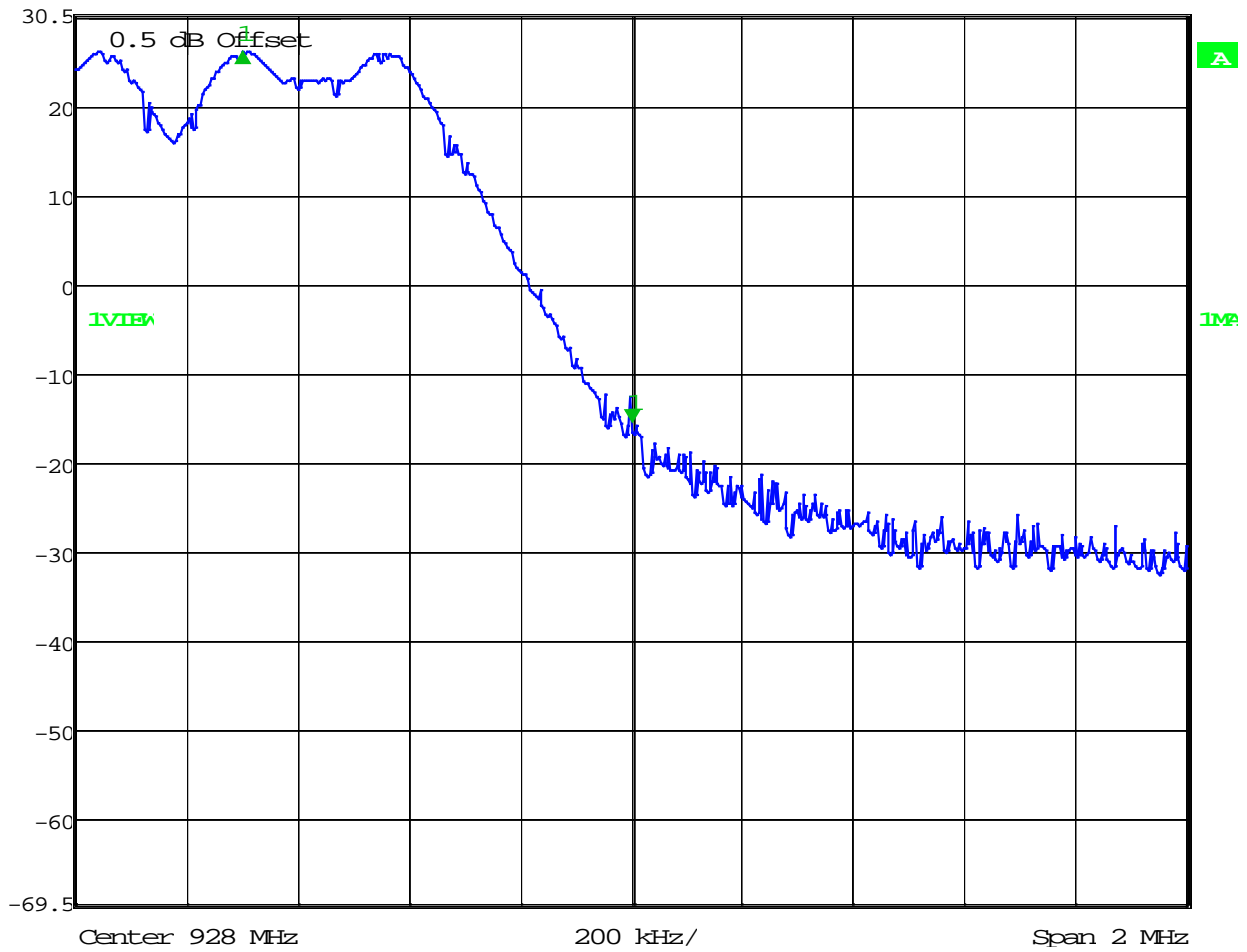


Date: 25.SEP.2013 16:41:54

Graph 3.6.6 (hopping disabled) – High Channel - +26dBm Sample



Delta 1 [T1] RBW 100 kHz RF Att 50 dB
Ref Lvl 41.52 dB VBW 100 kHz
30.5 dBm -699.39879760 kHz SWI 5 ms Unit dBm



Date: 25.SEP.2013 16:43:13

Graph 3.6.7 (hopping enabled) – High Channel - +26dBm Sample



Delta 1 [T1]

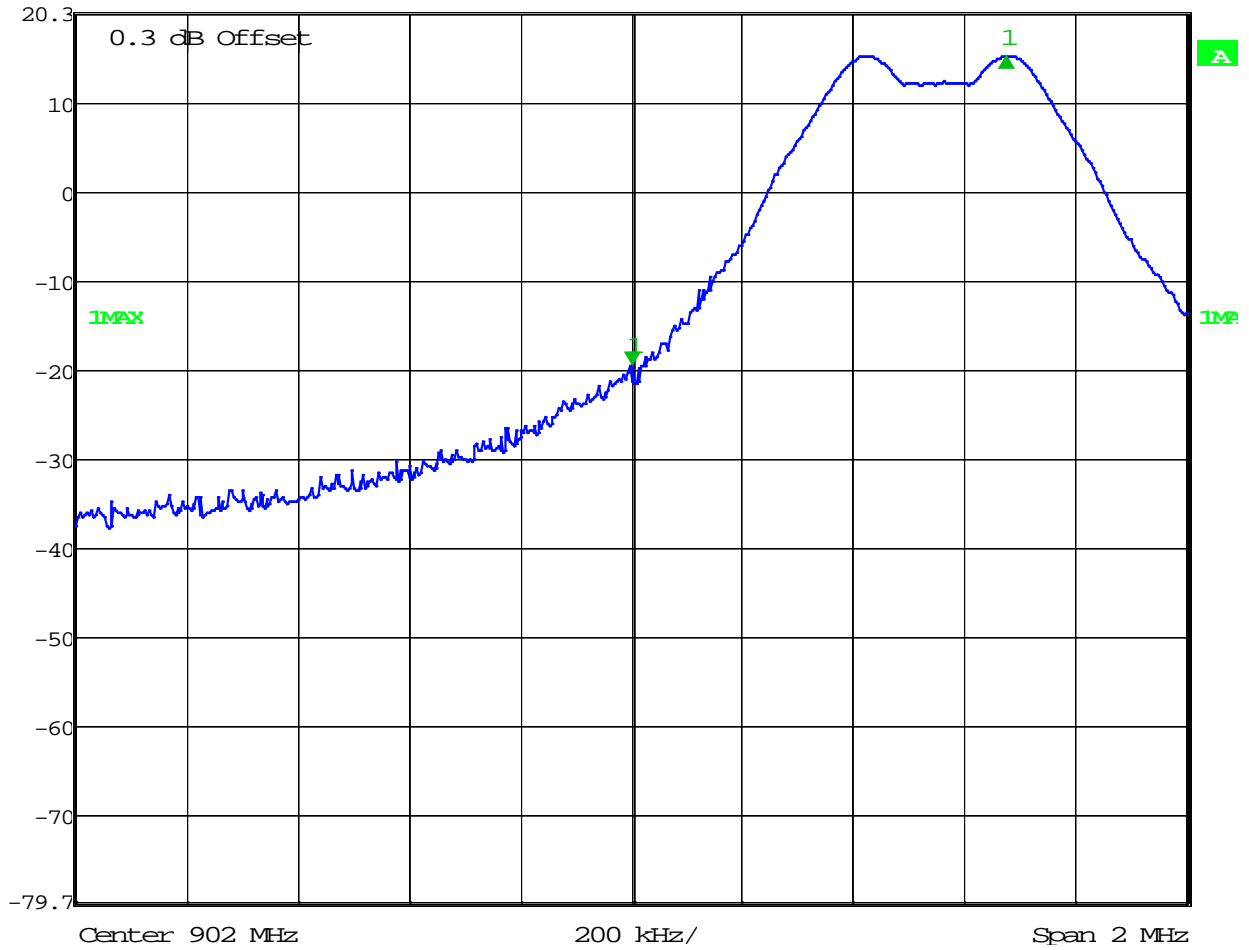
RBW 100 kHz RF Att 50 dB

Ref Lvl 20.3 dBm 34.62 dB

VBW 100 kHz

675.35070140 kHz

SWT 5 ms Unit dBm



Date: 26.SEP.2013 11:26:20

Graph 3.6.8 (hopping disabled) – Low Channel - +15dBm Sample



Delta 1 [T1]

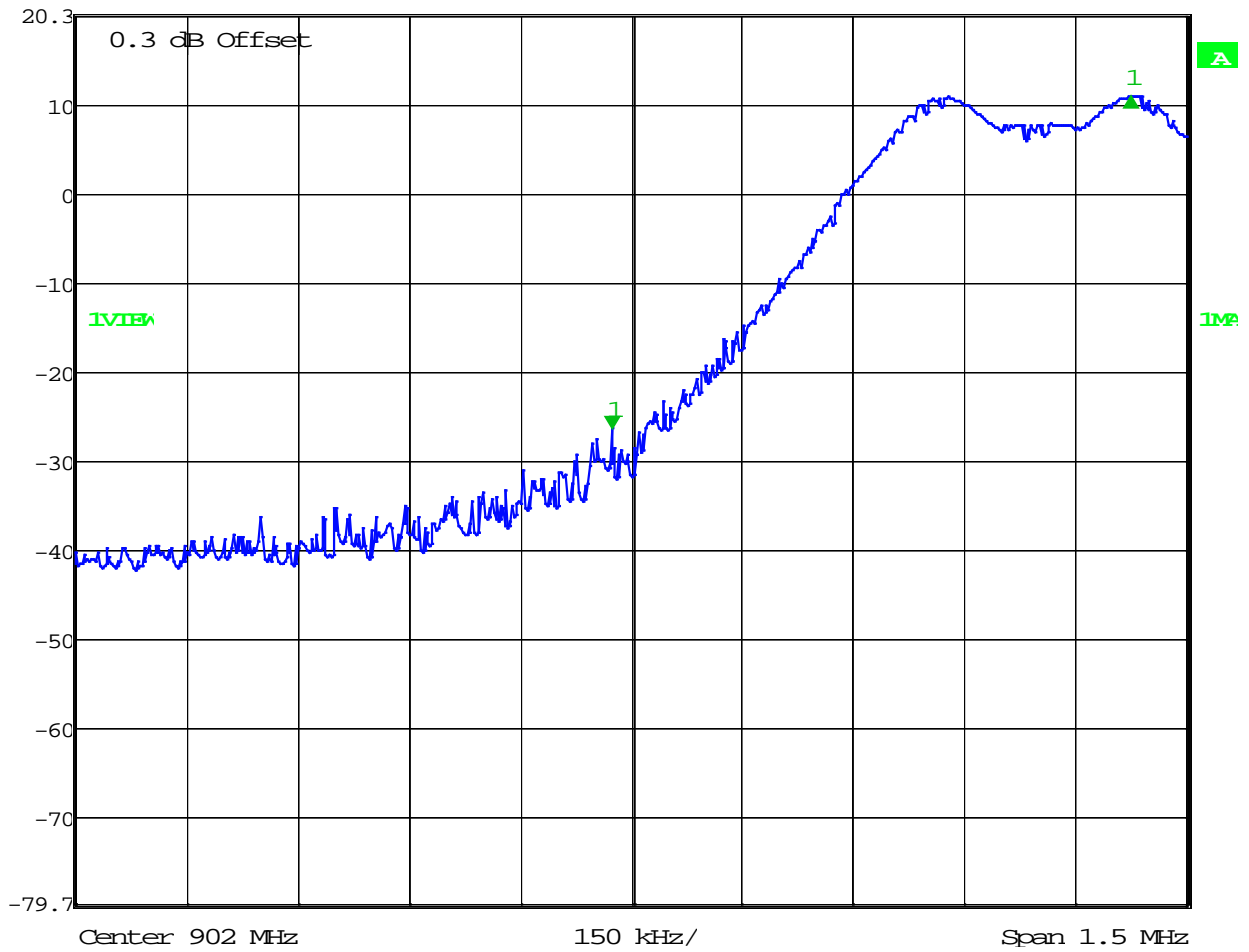
RBW 100 kHz RF Att 50 dB

Ref Lvl 37.33 dB

VBW 100 kHz

20.3 dBm 701.90380762 kHz

SWT 5 ms Unit dBm

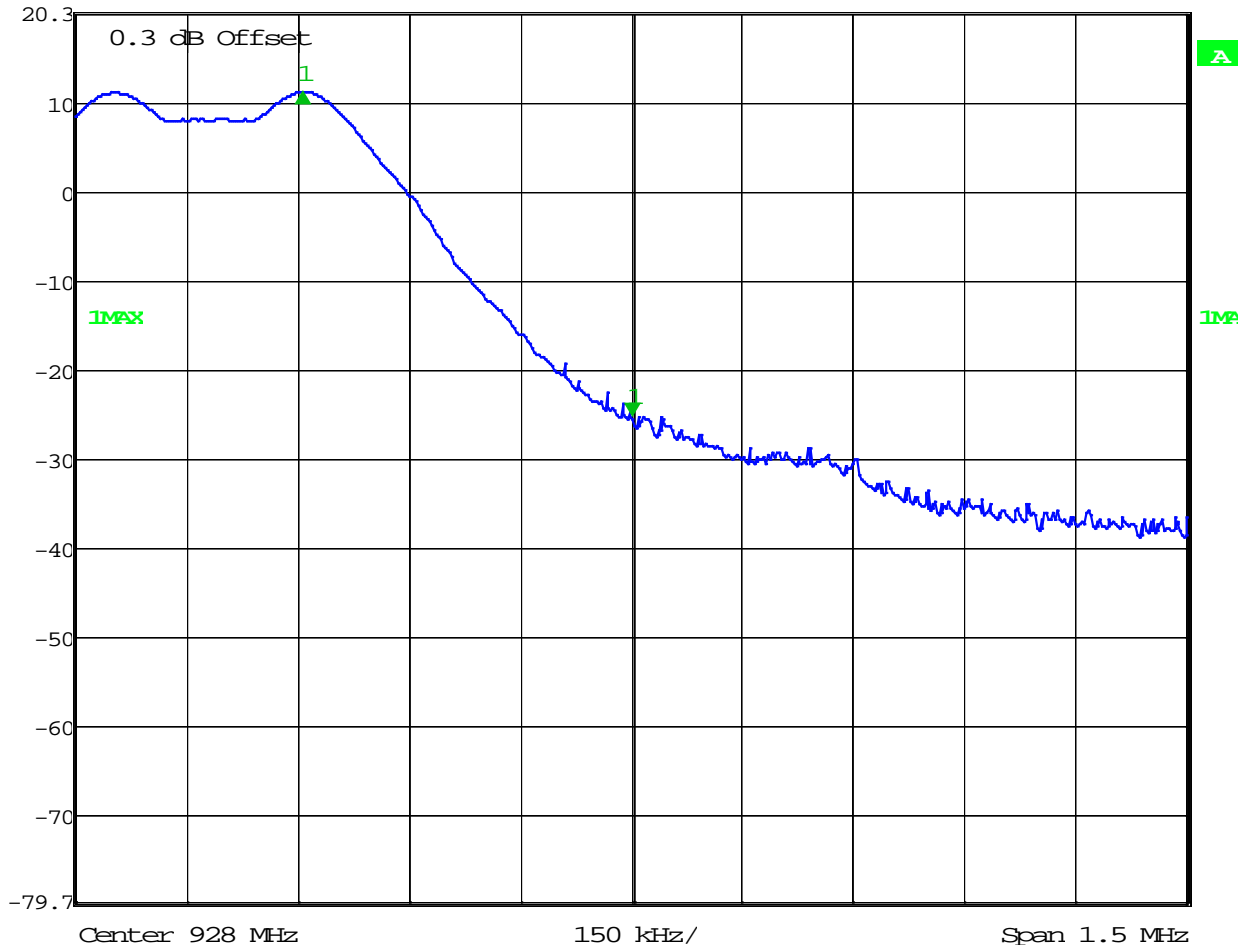


Date: 26.SEP.2013 11:30:18

Graph 3.6.9 (hopping enabled) – Low Channel - +15dBm Sample



	Delta 1 [T1]	RBW	100 kHz	RF Att	50 dB
Ref Lvl	36.29 dB	VBW	100 kHz		
20.3 dBm	-443.38677355 kHz	SWT	5 ms	Unit	dBm

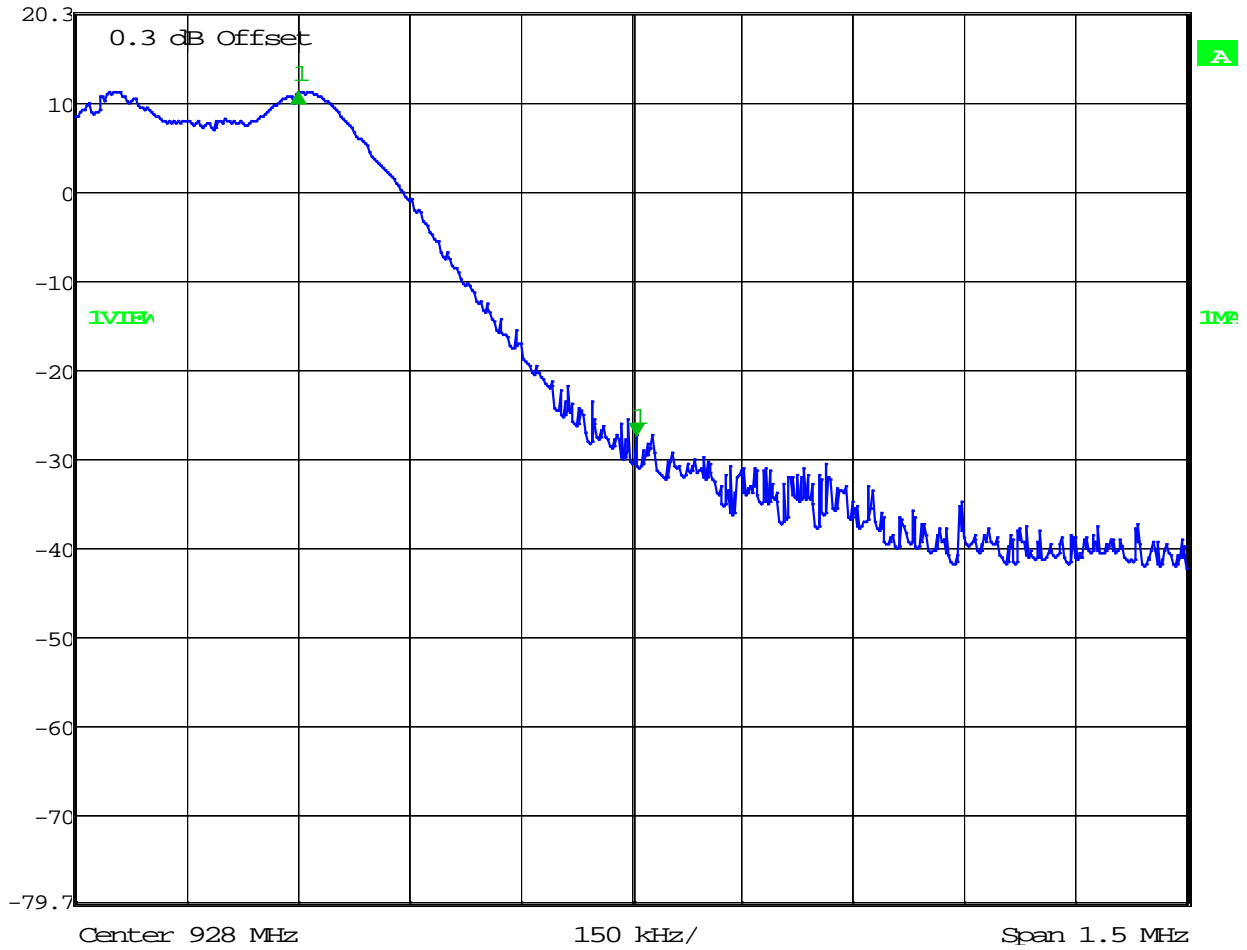


Date: 26.SEP.2013 11:33:42

Graph 3.6.10 (hopping disabled) – High Channel - +15dBm Sample



Delta 1 [T1] RBW 100 kHz RF Att 50 dB
Ref Lvl 38.51 dB VBW 100 kHz
20.3 dBm -458.41683367 kHz SWI 5 ms Unit dBm



Date: 26.SEP.2013 11:32:30

Graph 3.6.11 (hopping enabled) – High Channel - +15dBm Sample



3.7 Radiated spurious emissions

Test location: OATS Anechoic Chamber Other
Test distance: 10 meters 3 meters
Frequency Range: 30MHz-10GHz
Test result: **Pass**
Max. Margin: 10.8 dB below the limits

Date:	9/23/13-9/24/13	Result: Pass
Tested by:	Jason Centers	
Standard:	FCC part 15.247(d)	
Test Point:	Enclosure	
Operation mode:	See page 5	
Note:	Fundamental frequency and harmonics outside restricted band of operation per FCC 15.205 are excluded from the tables.	

TX Channel	Spurious Frequency	Polarity	Corr. Peak Reading. (dBuV/m)	Corr. Avg Reading. (dBuV/m)	Peak Limit (dBuV/m)	Avg. Limit (dBuV/m)	Results	Comments
0	3.6095 GHz	V	48.172	39.982	74	54	Compliant	
	4.5128 GHz	V	43.56	31.75	74	54	Compliant	
	5.4144 GHz	V	49.922	41.242	74	54	Compliant	
	8.1217 GHz	V	53.817	43.167	74	54	Compliant	
	9.0268 GHz	V	52.095	39.205	74	54	Compliant	
	3.6096 GHz	H	49.173	41.933	74	54	Compliant	
	4.512 GHz	H	41.909	31.519	74	54	Compliant	
	5.4162 GHz	H	51.07	40.85	74	54	Compliant	
	8.1216 GHz	H	51.047	38.817	74	54	Compliant	
9.0242 GHz	H	50.529	38.789	74	54	Compliant		
24	2.7442 GHz	V	37.729	24.999	74	54	Compliant	
	3.6594 GHz	V	48.398	40.928	74	54	Compliant	
	4.5742 GHz	V	43.416	33.776	74	54	Compliant	
	7.3189 GHz	V	47.271	35.011	74	54	Compliant	
	8.2361 GHz	V	51.856	41.176	74	54	Compliant	
	9.1513 GHz	V	49.893	37.973	74	54	Compliant	
	2.7446 GHz	H	37.859	28.529	74	54	Compliant	
	3.6595 GHz	H	48.658	41.388	74	54	Compliant	
	4.574 GHz	H	42.136	29.366	74	54	Compliant	
	7.3208 GHz	H	46.377	32.767	74	54	Compliant	
8.2361 GHz	H	49.586	38.046	74	54	Compliant		
9.1486 GHz	H	50.667	37.907	74	54	Compliant		
49	2.7818 GHz	V	40.373	29.052	74	54	Compliant	
	3.7102 GHz	V	43.396	32.516	74	54	Compliant	
	4.6378 GHz	V	44.262	34.372	74	54	Compliant	
	7.418 GHz	V	48.432	34.992	74	54	Compliant	
	8.3477 GHz	V	49.474	36.624	74	54	Compliant	
	2.7823 GHz	H	38.673	30.213	74	54	Compliant	
	3.7092 GHz	H	43.513	34.069	74	54	Compliant	
	4.6363 GHz	H	44.125	33.485	74	54	Compliant	
	7.42 GHz	H	48.673	34.765	74	54	Compliant	
8.3479 GHz	H	48.813	36.733	74	54	Compliant		

Table 3.7.1 – 26dBm Sample



TX Channel	Spurious Frequency	Polarity	Corr. Peak Reading. (dBuV/m)	Corr. Avg Reading. (dBuV/m)	Peak Limit (dBuV/m)	Avg. Limit (dBuV/m)	Results	Comments
0	3.6095 GHz	V	52.095	39.205	74	54	Compliant	
	4.5128 GHz	V	35.92	26.36	74	54	Compliant	
	5.4161 GHz	V	44.339	32.349	74	54	Compliant	
	8.1217 GHz	V	43.867	34.107	74	54	Compliant	
	9.0268 GHz	V	44.285	34.555	74	54	Compliant	
	3.6096 GHz	H	34.063	24.603	74	54	Compliant	
	4.512 GHz	H	34.589	26.009	74	54	Compliant	
	5.416 GHz	H	46.479	36.309	74	54	Compliant	
	8.1216 GHz	H	43.747	34.177	74	54	Compliant	
9.0242 GHz	H	44.019	34.629	74	54	Compliant		
24	2.7442 GHz	V	31.299	22.189	74	54	Compliant	
	3.6594 GHz	V	35.737	26.237	74	54	Compliant	
	4.5742 GHz	V	38.736	26.466	74	54	Compliant	
	7.3191 GHz	V	43.982	33.262	74	54	Compliant	
	8.2361 GHz	V	46.136	35.166	74	54	Compliant	
	9.1513 GHz	V	45.323	35.763	74	54	Compliant	
	2.7449 GHz	H	32.31	23.45	74	54	Compliant	
	3.6604 GHz	H	38.417	26.467	74	54	Compliant	
	4.5742 GHz	H	36.156	26.486	74	54	Compliant	
	7.3208 GHz	H	42.077	33.287	74	54	Compliant	
	8.2361 GHz	H	44.466	35.036	74	54	Compliant	
	9.1486 GHz	H	44.817	35.577	74	54	Compliant	
49	2.7818 GHz	V	32.862	23.992	74	54	Compliant	
	3.7102 GHz	V	35.546	27.176	74	54	Compliant	
	4.6379 GHz	V	37.702	27.342	74	54	Compliant	
	7.418 GHz	V	43.992	34.142	74	54	Compliant	
	8.3477 GHz	V	48.023	34.673	74	54	Compliant	
	2.7825 GHz	H	36.923	25.013	74	54	Compliant	
	3.7092 GHz	H	35.809	26.089	74	54	Compliant	
	4.6362 GHz	H	36.244	26.374	74	54	Compliant	
	7.4199 GHz	H	43.465	32.875	74	54	Compliant	
8.348 GHz	H	44.743	33.793	74	54	Compliant		

Table 3.7.2 – 15dBm Sample



3.8 RF Exposure Compliance

The maximum measured antenna conducted power, P is 23.0 dBm

The antenna gain, G is 2dBi

The maximum EIRP power = P + G

EIRP = 23.0 + 2 = 25.0 dBm, or 0.3162 W

The limits for Maximum Permissible Exposure (MPE) for transmitter operating at 902-928MHz, MPE is $914.7/1500 = 0.6098\text{mW/cm}^2$, or 6.1W/m^2

The Power Density, S is related to EIRP with the equation:

$S = \text{EIRP} / 4\pi D^2$, where D is the safe separation distance and = 0.4m, or 40cm

$S = 3162\text{mW} / 4\pi(40)^2$,

$S = 0.1572 \text{ mW/cm}^2$, or below the Maximum Permissible Exposure (MPE) of 6.1W/m^2

3.9 Transmitter power line conducted emissions

Test location: OATS Anechoic Chamber Other

Test result: **Pass**

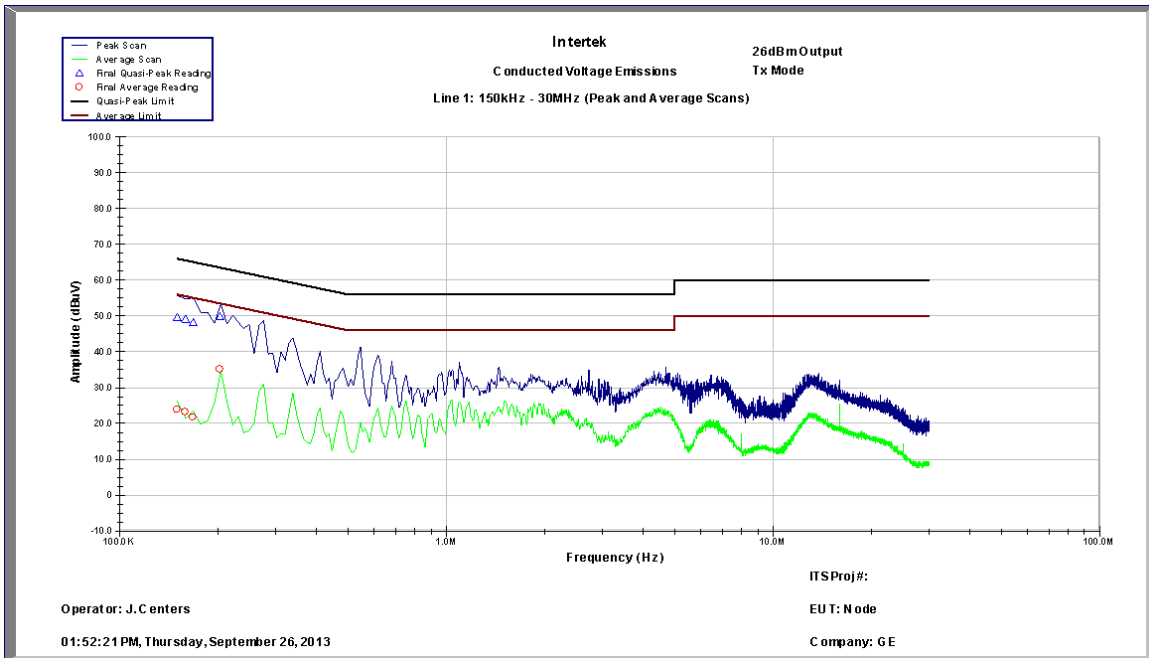
Frequency range: 0.15MHz-30MHz

Max. Emissions margin: 13.3dB below the limits

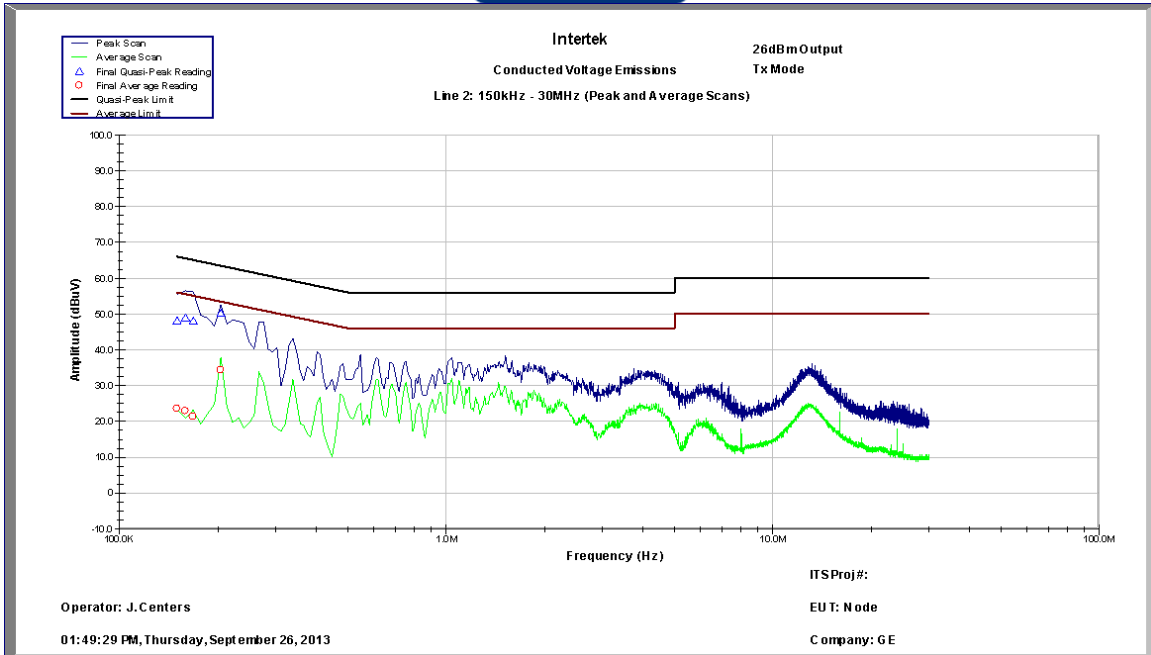
Notes: None

Conducted Voltage Emissions on Power Lines								
Test Engineer: J. Centers		Start Date: 9/26/2013		End Date: 9/26/2013				
Temperature: 24.2C		Humidity: 44.40%		Pressure: 982.05mbar				
Specification: 15.207		Test Limit: Class B		RBW: 9kHz				
Notes: Tx Mode								
Line	Frequency (MHz)	Quasi-Peak (dBuV)	Quasi-Peak Limit (dBuV)	Quasi-Peak Delta (dB)	Average (dBuV)	Average Limit (dBuV)	Average Delta (dB)	Results
L1	150.0 KHz	49.5	66	-16.5	23.8	56	-32.2	Compliant
L1	159.0 KHz	49.08	65.52	-16.43	23.16	55.52	-32.35	Compliant
L1	168.0 KHz	48.04	65.06	-17.02	21.64	55.06	-33.42	Compliant
L1	202.7 KHz	49.72	63.5	-13.78	35.06	53.5	-18.44	Compliant
L2	150.0 KHz	48.02	66	-17.98	23.49	56	-32.51	Compliant
L2	159.0 KHz	48.86	65.52	-16.65	22.85	55.52	-32.66	Compliant
L2	168.0 KHz	47.98	65.06	-17.08	21.27	55.06	-33.79	Compliant
L2	204.0 KHz	50.15	63.45	-13.3	34.29	53.45	-19.16	Compliant

Table 3.9.1 – 26dBm Sample



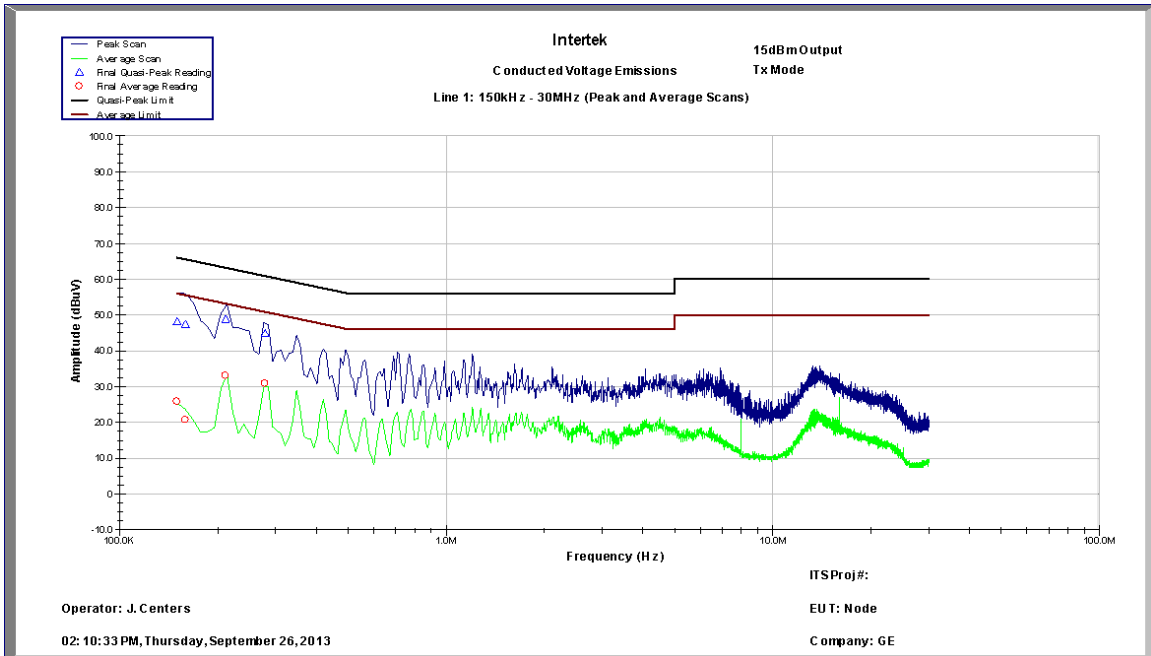
Graph 3.9.1 – 26dBm Sample



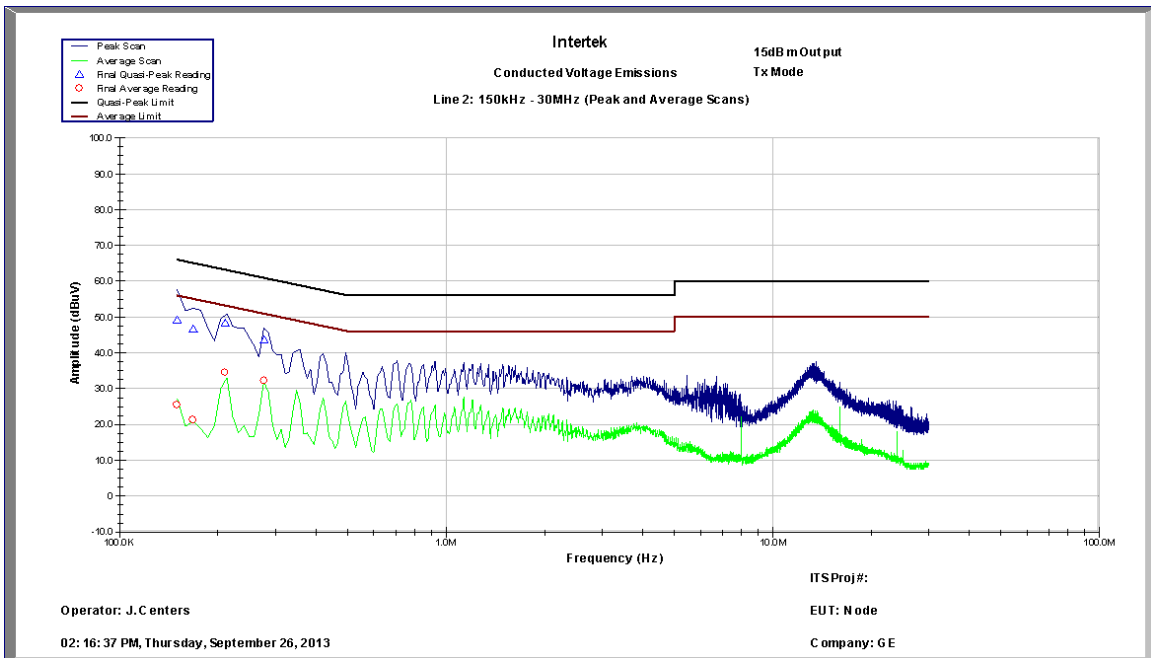
Graph 3.9.2 – 26dBm Sample

Conducted Voltage Emissions on Power Lines								
Test Engineer:	J. Centers	Start Date:	9/26/2013	End Date:	9/26/2013			
Temperature:	24.2C	Humidity:	44.40%	Pressure:	982.05mbar			
Specification:	15.207	Test Limit:	Class B	RBW:	9kHz			
Notes:	Tx Mode							
Line	Frequency (MHz)	Quasi-Peak (dBuV)	Quasi-Peak Limit (dBuV)	Quasi-Peak Delta (dB)	Average (dBuV)	Average Limit (dBuV)	Average Delta (dB)	Results
L1	150.0 KHz	48.07	66	-17.93	25.76	56	-30.24	Compliant
L1	159.0 KHz	47.36	65.52	-18.15	20.67	55.52	-34.84	Compliant
L1	211.1 KHz	48.77	63.16	-14.39	32.96	53.16	-20.2	Compliant
L1	278.6 KHz	44.78	60.86	-16.08	30.8	50.86	-20.06	Compliant
L2	150.0 KHz	49.16	66	-16.84	25.35	56	-30.65	Compliant
L2	168.0 KHz	46.6	65.06	-18.46	21.21	55.06	-33.85	Compliant
L2	210.4 KHz	48.26	63.19	-14.93	34.45	53.19	-18.74	Compliant
L2	277.1 KHz	43.54	60.9	-17.36	32.17	50.9	-18.73	Compliant

Table 3.9.1 – 15dBm Sample



Graph 3.9.1 – 15dBm Sample



Graph 3.9.2 – 15dBm Sample



4.0 TEST EQUIPMENT

Description	Serial Number	Manufacturer	Model	Cal. Date	Cal. Due
EMI Test Receiver	10887490.26	Rohde & Schwarz	ESI26	9/15/2012	9/14/2013
Preamplifier	987410	Miteq	AFS44-00102000-30-10P-44	9/4/2012	9/4/2013
Biconnilog Antenna	00051864	ETS	3142C	12/14/2012	12/14/2013
Horn Antenna	00156319	ETS	3117	4/24/2013	4/24/2014
System Controller	121701-1	Sunol Sciences	SC99V	Time of Use	Time of Use
LISN	3333	Teseq	NNB52	3/11/2013	3/11/2014
High Pass Filter	109	Micro-Tronics	HPM50108	Time of Use	Time of Use