TEST REPORT

Report Number: 100928878MIN-011B
Project Number: G100928878

Testing performed on the
WOLC Gateway

FCC ID: PUU90002
Industry Canada ID: 10798A- PUU90002

to
47 CFR Part 15. 247:2010
RSS- 210, Issue 8, 2010

For
GE Lighting

Test Performed by:
Intertek Testing Services NA, Inc.
7250 Hudson Blvd., Suite 100
Oakdale, MN 55128 USA

Test Authorized by:
GE Lighting
1975 Noble Rd, Bldg 338
Cleveland, OH 44112 USA

Prepared by: _____ Date: August 16, 2013
Uri Spector

Reviewed by: _____ Date: August 16, 2013
Simon Khazon

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1.0 GENERAL DESCRIPTION

Model:	WOLC Gateway
Type of EUT:	Communication Gateway
Intertek Sample ID:	MIN1212041500-001
FCC ID:	PUU90002
Industry Canada ID:	10798A- PUU90002
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:	☒ 47 CFR, Part 15:2010, §15.247 ☒ RSS–210, Issue 8, 2010 ☒ RSS-Gen, Issue 3, 2010 ☒ 47 CFR, Part 15:2010, §15.107 and §15.109, Class A ☒ ICES-003, Issue 5:2012 ☐ Other
Type of radio:	☐ Stand -alone ☐ Module ☐ Hybrid
Date Sample Submitted:	December 10, 2012
Test Work Started:	December 10, 2012
Test Work Completed:	July 15, 2013
Test Sample Conditions:	☐ Damaged ☐Poor (Usable) ☒ Good

1.1 Product Description; Test Facility

Product Description:	Communication Gateway
Transmitter Type:	☒ FHSS ☐ Digital Modulation ☐ WiFi ☐ Blue Tooth
Operating Frequency Range(s):	From 902 to 928MHz
Number of Channels:	50
Modulation:	GFSK
Emission Designator:	498K4F1D
Antenna(s) Info:	Type: Omni Directional Antenna Gain: 3 dBi Connector Type: N-Type connector
Antenna Installation:	☐ User ☐ Professional ☒ Factory
Transmitter power configuration:	☐ Internal battery ☒ External power source ☒ 120VAC ☐ 230VAC ☐ 400VAC ☐ VDC ☐ Other: Amp. ☐ 50Hz ☒ 60Hz
Special Test Arrangement:	None
Test Facility Accreditation:	A2LA (Certificate No. 1427.01)
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(µV/m)
RA = Receiver Amplitude in dB(µV)
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(µV) 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(µV/m).

RA = 48.1 dB(µV)
AF = 7.4 dB(m^{-1})
CF = 1.6 dB
AG = 16.0 dB
FS = RA + AF + CF - AG
FS = 48.1 + 7.4 + 1.6 – 16.0
FS = 41.1 dB(µV/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	Pass
15.107 / ICES-003	Digital device conducted emissions	Pass

3.0 TEST CONDITIONS AND RESULTS

3.1 Maximum peak output power

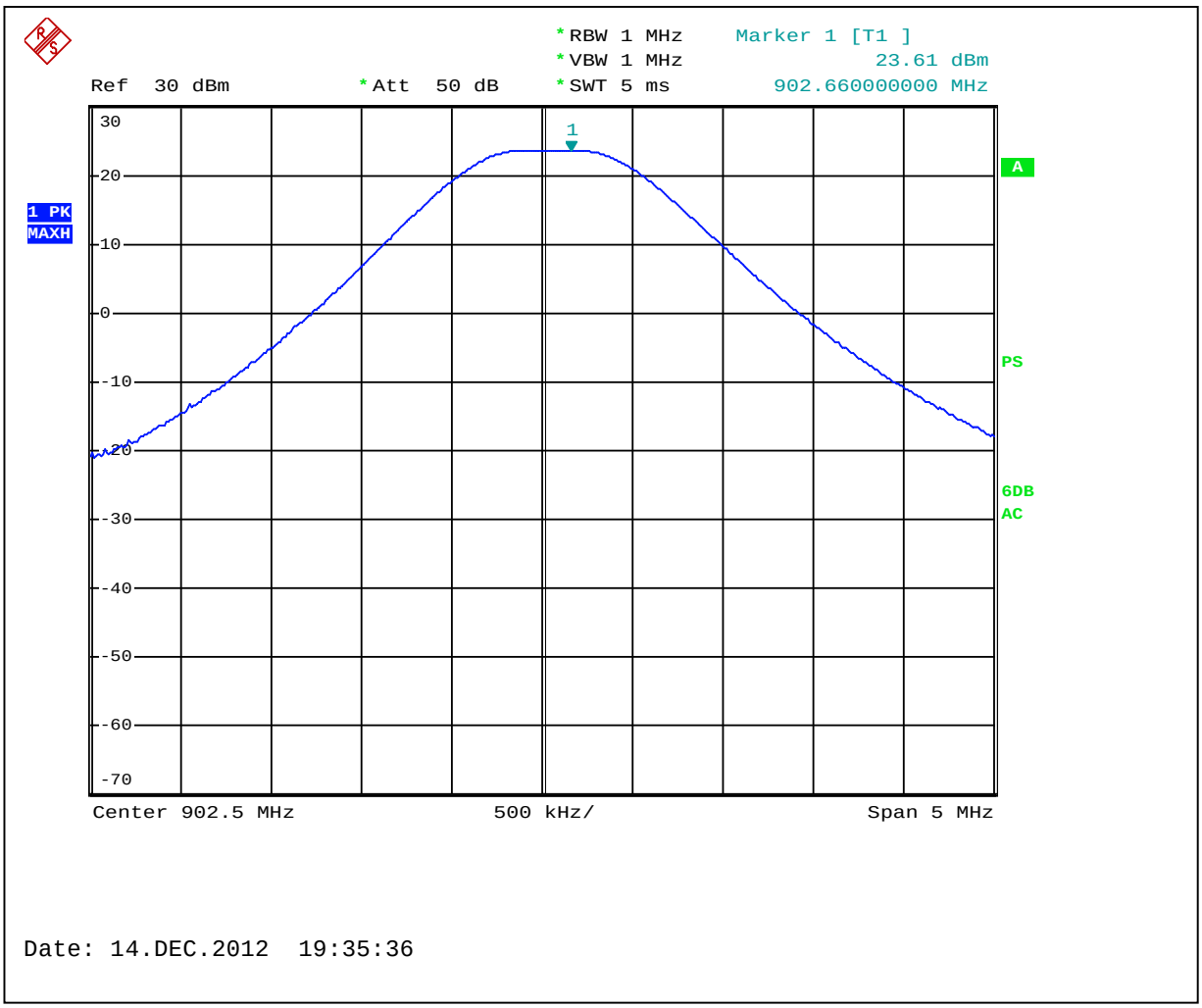
Test location: ☐ OATS ☒ Anechoic Chamber ☐ Other

Test result: **Pass**

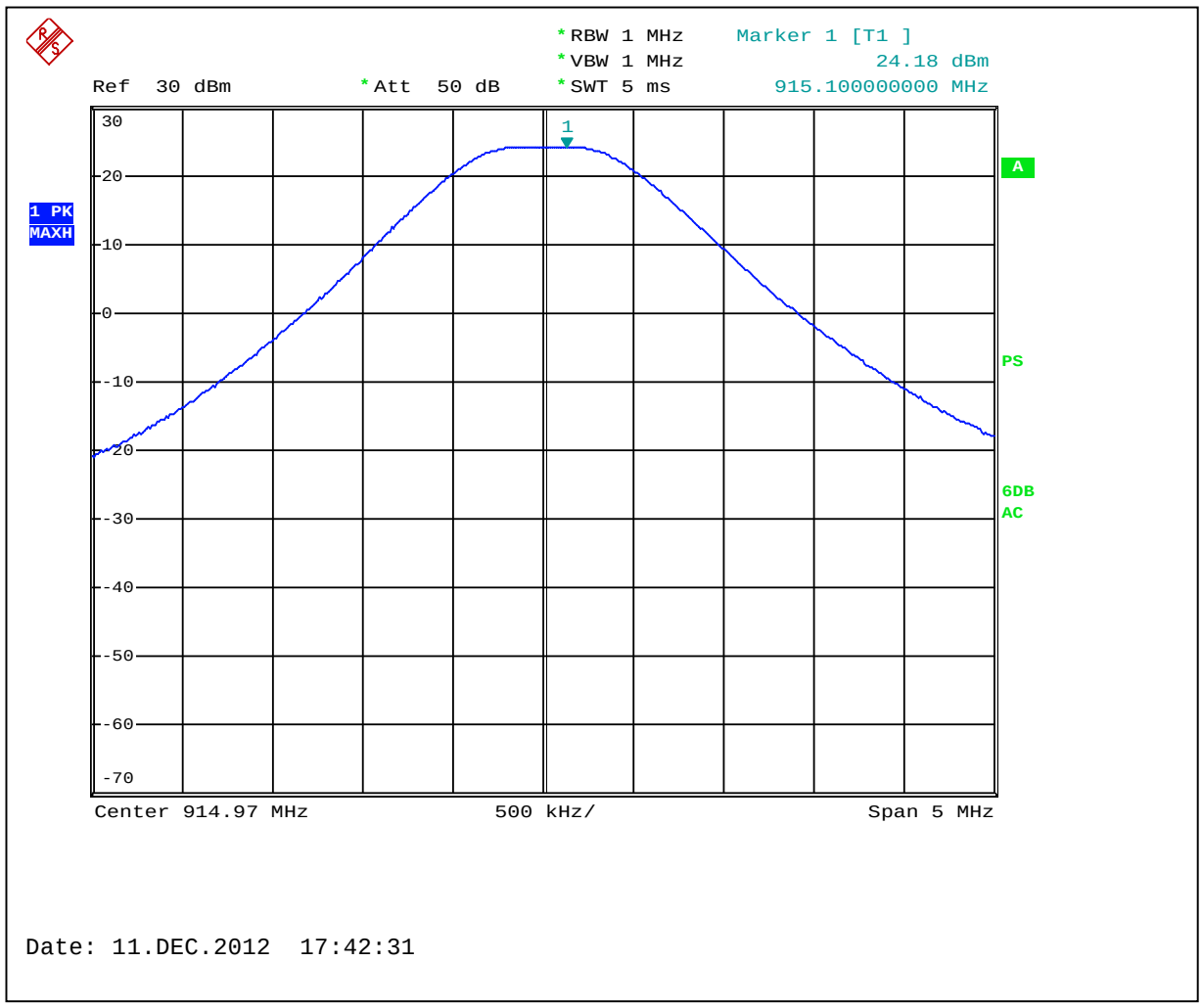
Max. Margin: 11.0dB below the limits

Power Output:	**Conducted**					
Frequency Range:	☒ 902-928MHz ☐ 2400-2483.5MHz ☐ 5725-5850MHz					
Low Frequency MHz	**Measured power dBm**	**Attenuaton dB**	**Power at Antenna dBm**	**Limit dBm**	**Limit Reduction dB**	**Margin dB**
902.50	23.6	0.7	24.3	30	0	-5.7
Middle Frequency MHz						
914.97	24.2	0.7	24.9	30	0	-5.1
Upper Frequency MHz						
927.45	23.9	0.7	24.6	30	0	-5.4
RBW:	☒ 1MHz ☐ 3MHz ☐ 10MHz					
VBW:	☒ 1MHz ☐ 3MHz ☐ 10MHz					
Antenna Gain:	☒ < 6dBi ☐ >6dBi and = dBi, Output power reduction = dB					

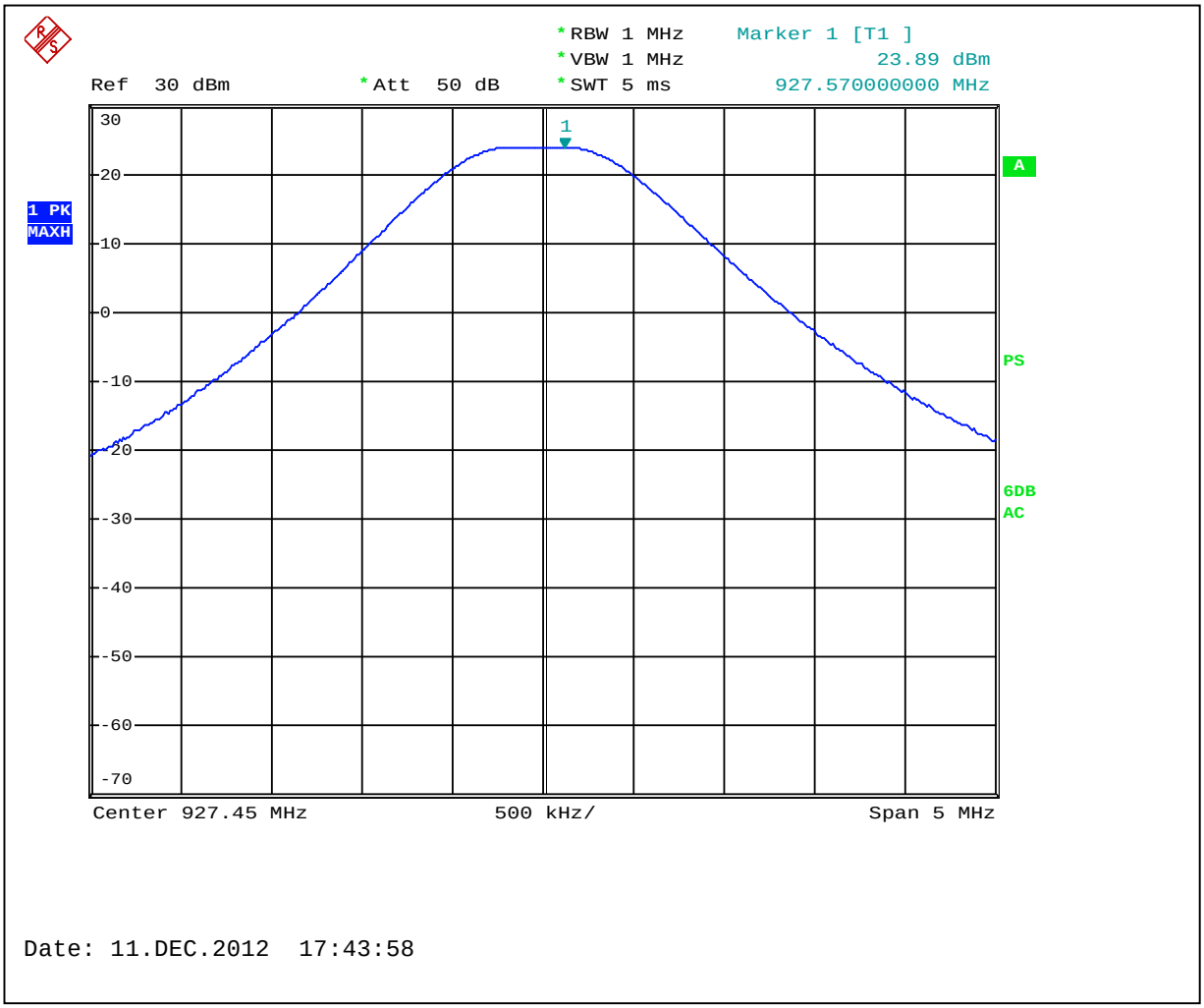
Notes:


*RBW 1 MHz
*VBW 1 MHz
*SWT 5 ms
Marker 1 [T1]
23.61 dBm
902.660000000 MHz
Ref 30 dBm
*Att 50 dB
1 PK
MAXH
A
PS
6DB
AC
30
20
10
0
-10
-20
-30
-40
-50
-60
-70
1
Center 902.5 MHz
500 kHz/
Span 5 MHz
Date: 14.DEC.2012 19:35:36

Graph 3.1.1


*RBW 1 MHz
*VBW 1 MHz
*SWT 5 ms
Marker 1 [T1]
24.18 dBm
915.100000000 MHz
Ref 30 dBm
*Att 50 dB
1 PK
MAXH
A
PS
6DB
AC
30
20
10
0
-10
-20
-30
-40
-50
-60
-70
Center 914.97 MHz
500 kHz/
Span 5 MHz
Date: 11.DEC.2012 17:42:31

Graph 3.1.2

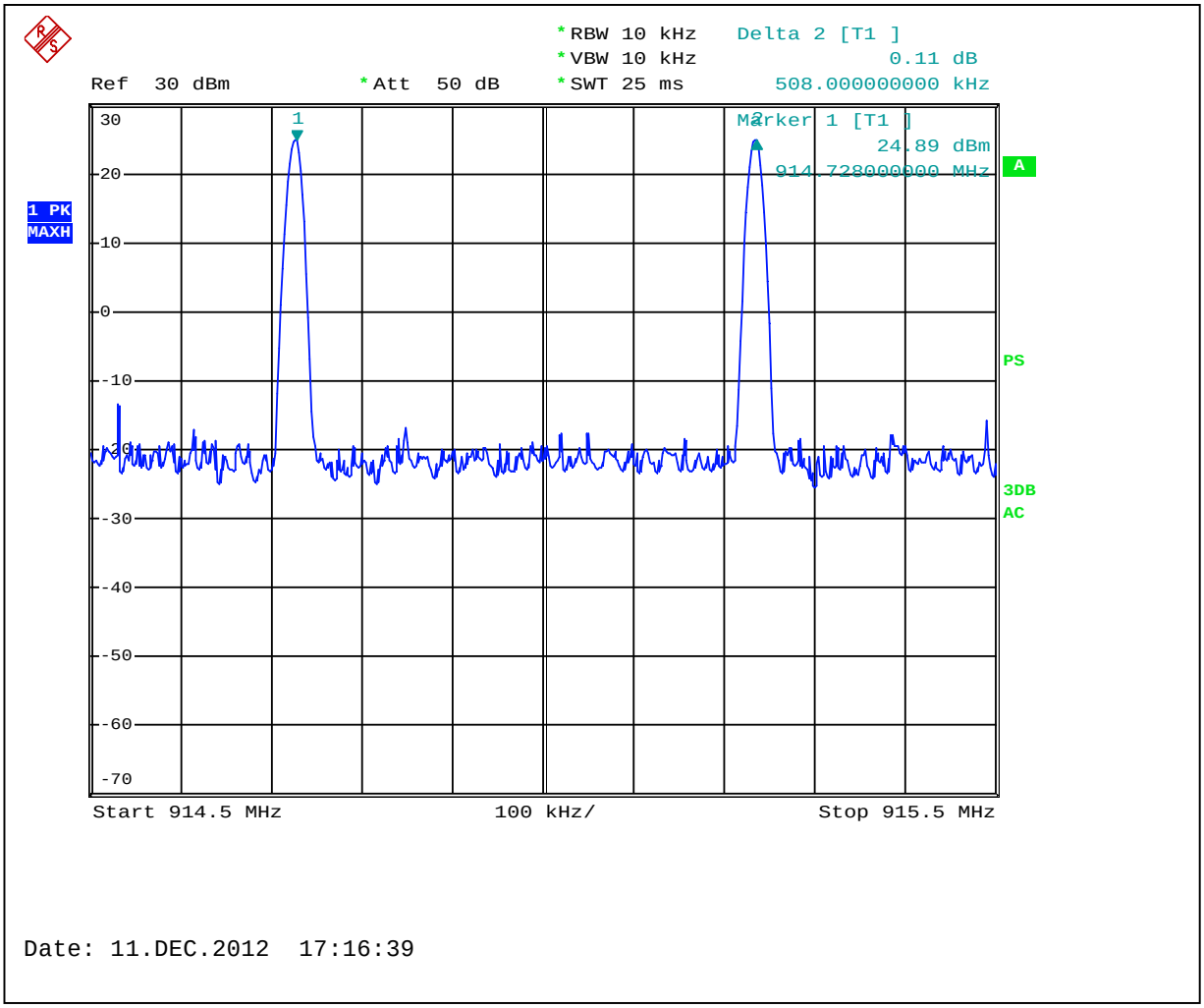

*RBW 1 MHz
*VBW 1 MHz
*SWT 5 ms
Marker 1 [T1]
23.89 dBm
927.570000000 MHz
Ref 30 dBm
*Att 50 dB
1 PK
MAXH
A
PS
6DB
AC
30
20
10
0
-10
-20
-30
-40
-50
-60
-70
Center 927.45 MHz
500 kHz/
Span 5 MHz
Date: 11.DEC.2012 17:43:58

Graph 3.1.3

3.2 Hopping channel carrier frequencies separation

Frequency Range:	☒ 902-928MHz ☐ 2400-2483.5MHz ☐ 5725-5850MHz	
Measured Separation (kHz)	**Limit (kHz)**	**Result**
508	25	**Pass**
Limit:	☒ 25kHz ☐ 20dB channel bandwidth ☐ 2/3 of 20dB channel bandwidth	
Span:	kHz	
RBW:	☐ 3kHz ☒ 10kHz ☐ 100kHz ☐ other kHz	
VBW:	☐ 3kHz ☒ 10kHz ☐ 100kHz ☐ other kHz	

Notes: None

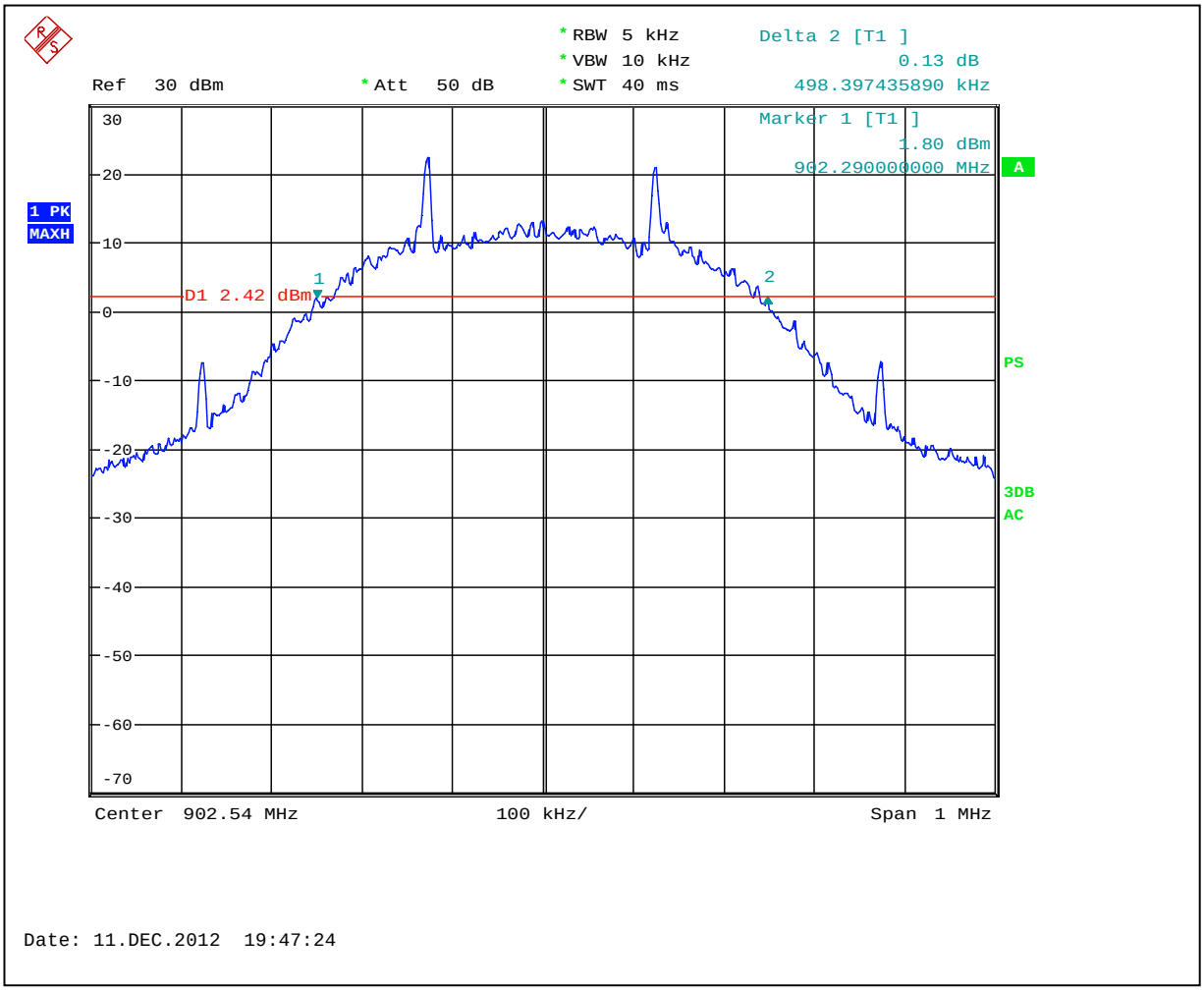

*RBW 10 kHz
*VBW 10 kHz
*SWT 25 ms
Delta 2 [T1]
0.11 dB
508.000000000 kHz
Ref 30 dBm
*Att 50 dB
Marker 1 [T1]
24.89 dBm
914.728000000 MHz
1 PK
MAXH
A
PS
3DB
AC
30
20
10
0
-10
-20
-30
-40
-50
-60
-70
Start 914.5 MHz
100 kHz/
Stop 915.5 MHz
Date: 11.DEC.2012 17:16:39

Graph 3.2.1

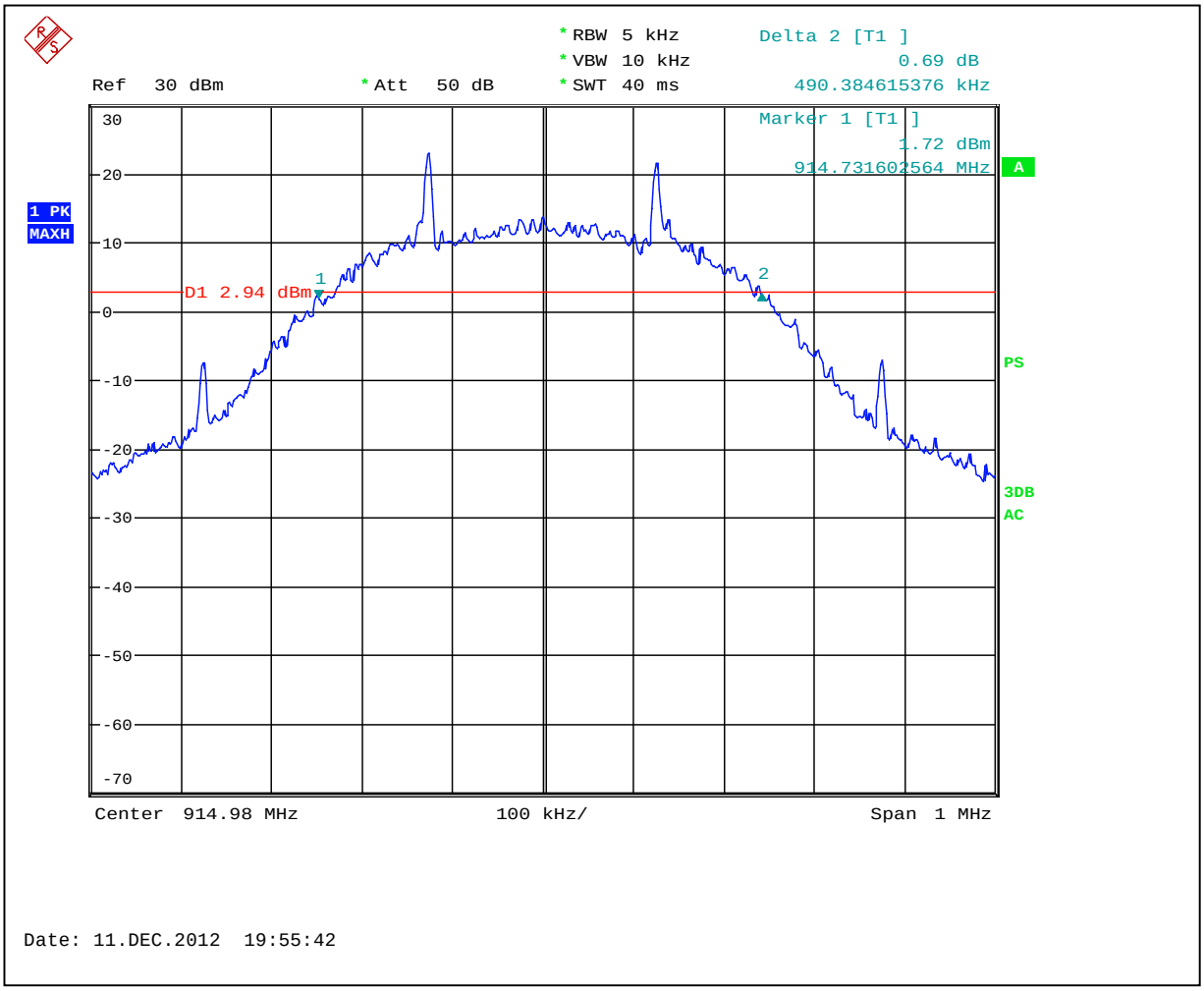
3.3 20dB bandwidth of the hopping channel

Frequency Range:	☒ 902-928MHz ☐ 2400-2483.5MHz ☐ 5725-5850MHz			
Low Frequency Channel (kHz)	**Middle Frequency Channel (kHz)**	**Upper Frequency Channel (kHz)**	**Limit (kHz)**	**Result**
498.4	490.4	488.8	500	**Pass**
Span:	1MHz			
RBW:	☐ 3kHz ☐ 10kHz	☐ 100kHz	☒ other 5kHz	
VBW:	☐ 3kHz ☐ 10kHz	☐ 100kHz	☒ other 10kHz	

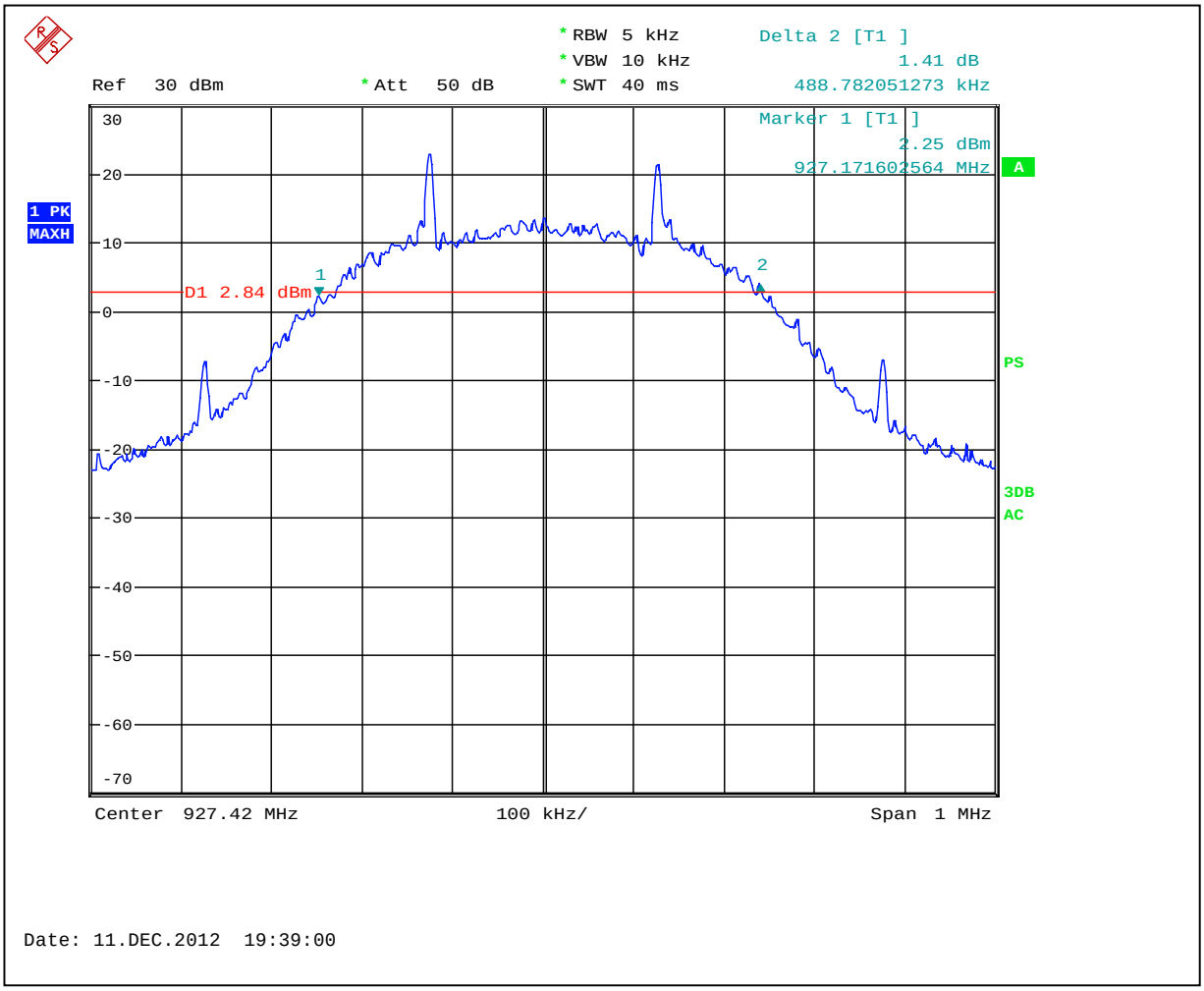
Notes: None


RBW 5 kHz
VBW 10 kHz
SWT 40 ms
Delta 2 [T1]
0.13 dB
498.397435890 kHz
Ref 30 dBm
Att 50 dB
Marker 1 [T1]
1.80 dBm
902.290000000 MHz
A
1 PK
MAXH
D1 2.42 dBm
PS
3DB
AC
Center 902.54 MHz
100 kHz/
Span 1 MHz
Date: 11.DEC.2012 19:47:24

Graph 3.3.1


RBW 5 kHz
VBW 10 kHz
SWT 40 ms
Delta 2 [T1]
0.69 dB
490.384615376 kHz
Ref 30 dBm
Att 50 dB
Marker 1 [T1]
1.72 dBm
914.731602564 MHz
A
1 PK
MAXH
D1 2.94 dBm
PS
3DB
AC
Center 914.98 MHz
100 kHz/
Span 1 MHz
Date: 11.DEC.2012 19:55:42

Graph 3.3.2

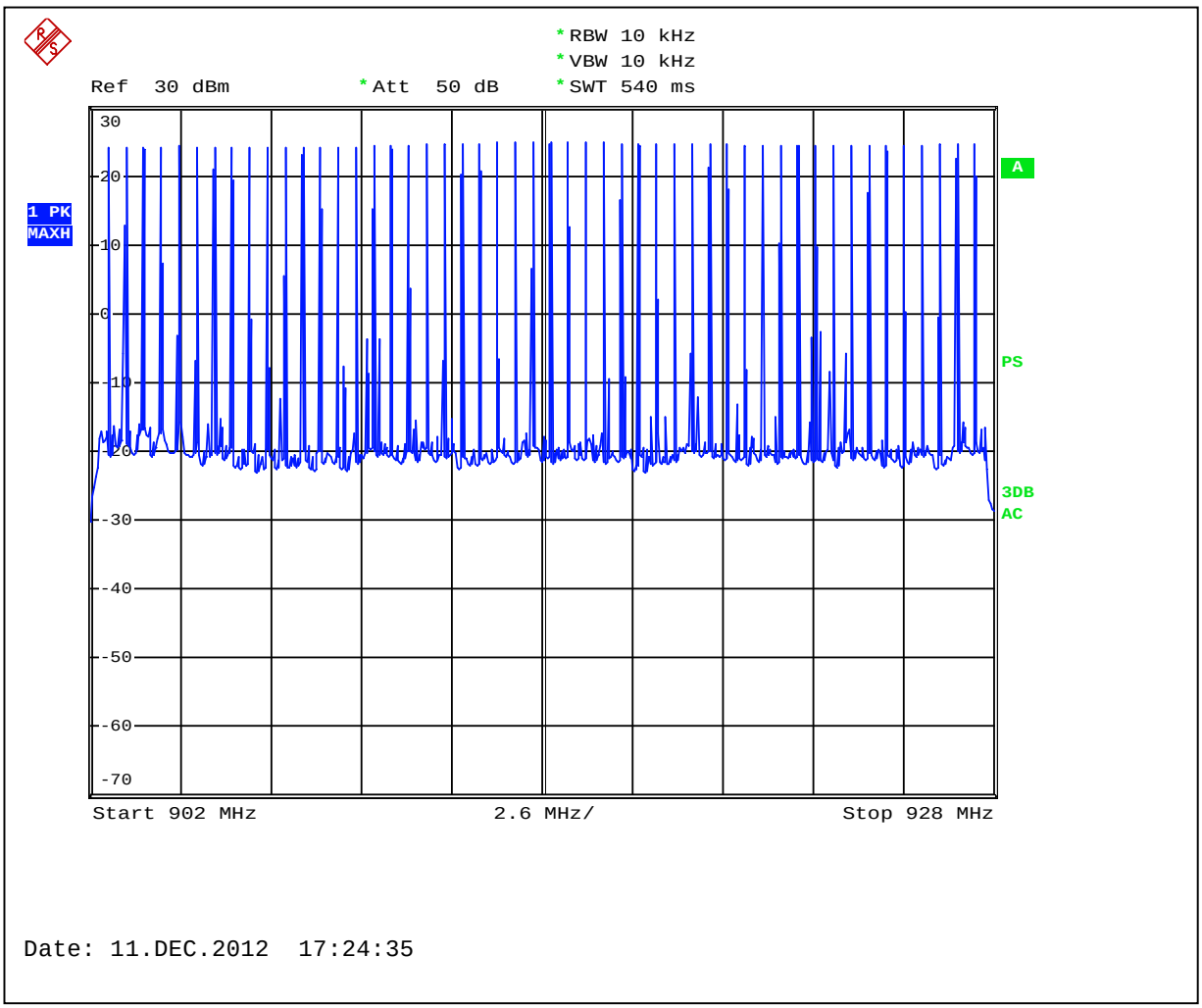

RBW 5 kHz
VBW 10 kHz
SWT 40 ms
Delta 2 [T1]
1.41 dB
488.782051273 kHz
Marker 1 [T1]
2.25 dBm
927.171602564 MHz
Ref 30 dBm
Att 50 dB
1 PK
MAXH
A
PS
3DB
AC
D1 2.84 dBm
30
20
10
0
-10
-20
-30
-40
-50
-60
-70
Center 927.42 MHz
100 kHz/
Span 1 MHz
Date: 11.DEC.2012 19:39:00

Graph 3.3.3

3.4 Number of hopping frequencies

Frequency Range:	☒ 902-928MHz ☐ 2400-2483.5MHz ☐ 5725-5850MHz	
Measured Number	**Requirements**	**Result**
50	25	**Pass**
Channel 20dB Bandwidth:	☐ <250kHz ☒ ≥250kHz	

Notes: None


*RBW 10 kHz
*VBW 10 kHz
Ref 30 dBm
*Att 50 dB
*SWT 540 ms
30
20
10
0
-10
-20
-30
-40
-50
-60
-70
1 PK
MAXH
A
PS
3DB
AC
Start 902 MHz
2.6 MHz/
Stop 928 MHz
Date: 11.DEC.2012 17:24:35

Graph 3.4.1

3.5 Average time of occupancy of hopping frequency

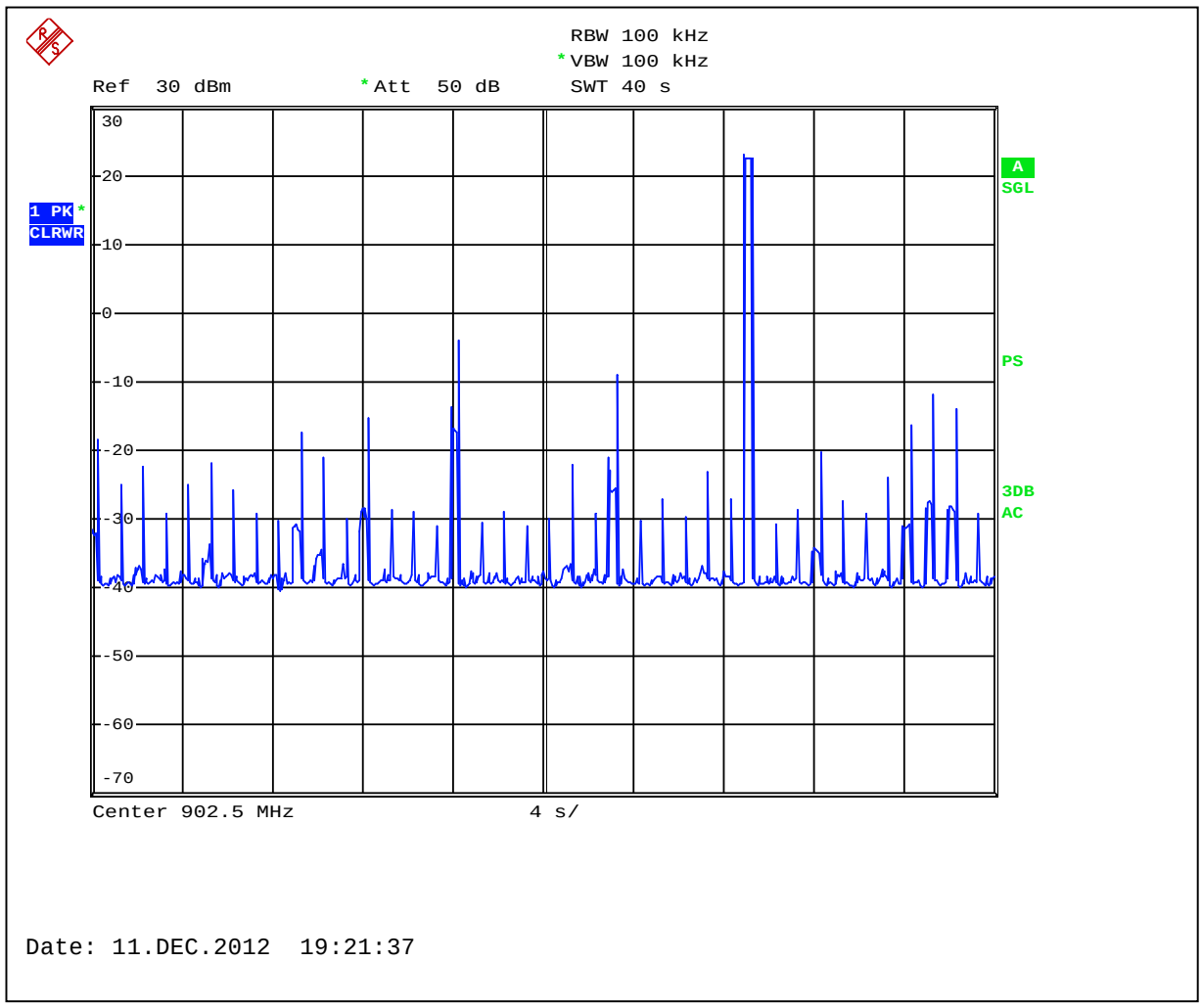
Frequency Range:	☒ 902-928MHz ☐ 2400-2483.5MHz ☐ 5725-5850MHz		
Measured / Calculated Time sec	**Period sec**	**Limit sec**	**Result**
0.385	10	0.4	**Pass**
Period:	☒ 10s ☐ 20s ☐ 30s ☒ 0.4s multiplied by the channel number		
Channel 20dB Bandwidth:	☐ <250kHz ☒ ≥250kHz		

Time of occupancy calculation:

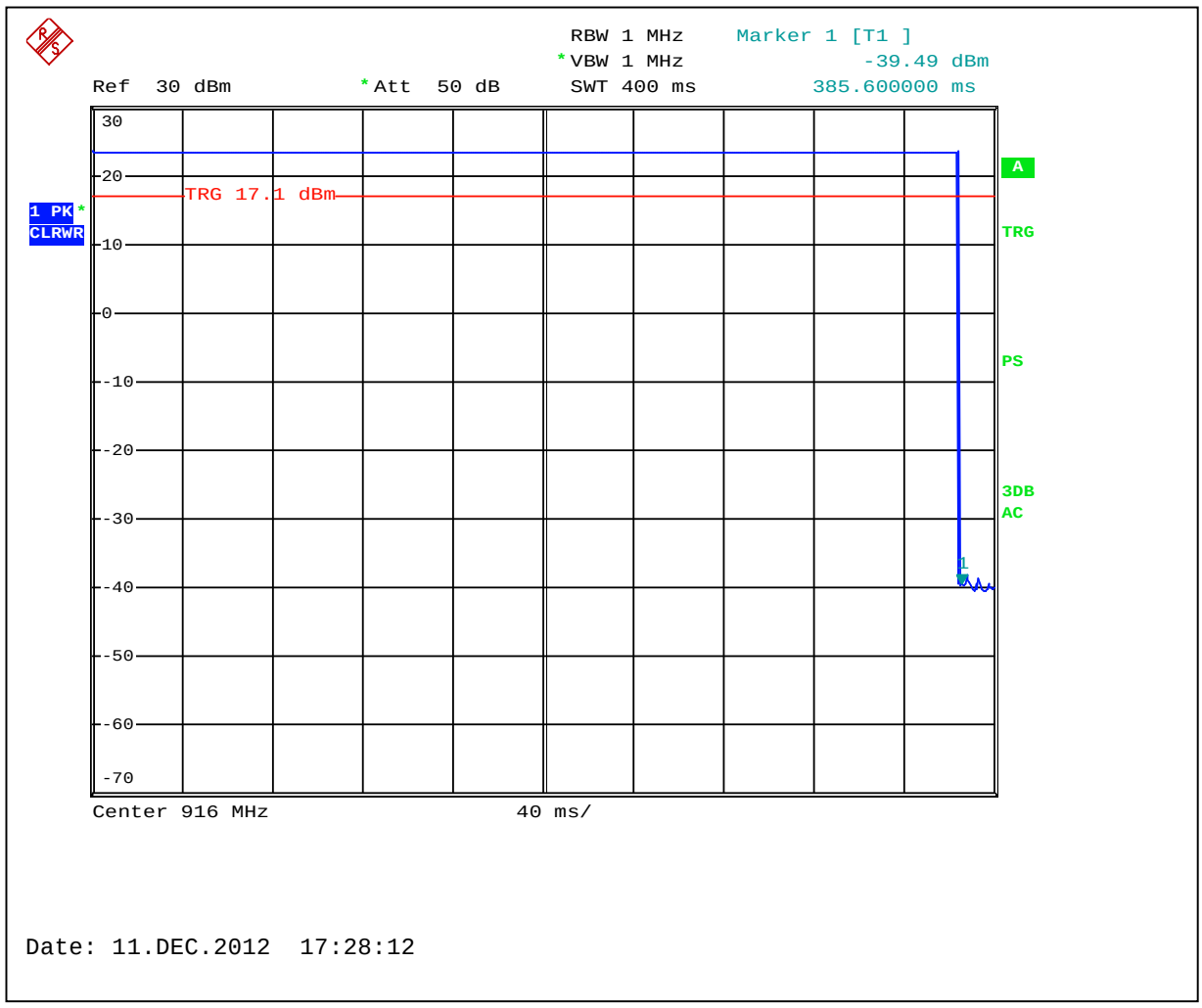
The minimum measured repetition of the channel occupancy (repetition) = 1 time in 40 sec
Single occupancy duration (single duration) = 0.385 sec
Period = 10 sec

Time of occupancy = (single duration) x (repetition) = 0.385 x 1 = 0.385 sec

Notes: None


RBW 100 kHz
*VBW 100 kHz
Ref 30 dBm
*Att 50 dB
SWT 40 s
30
20
10
0
-10
-20
-30
-40
-50
-60
-70
1 PK *
CLRWR
A
SGL
PS
3DB
AC
Center 902.5 MHz
4 s/
Date: 11.DEC.2012 19:21:37

Graph 3.5.1



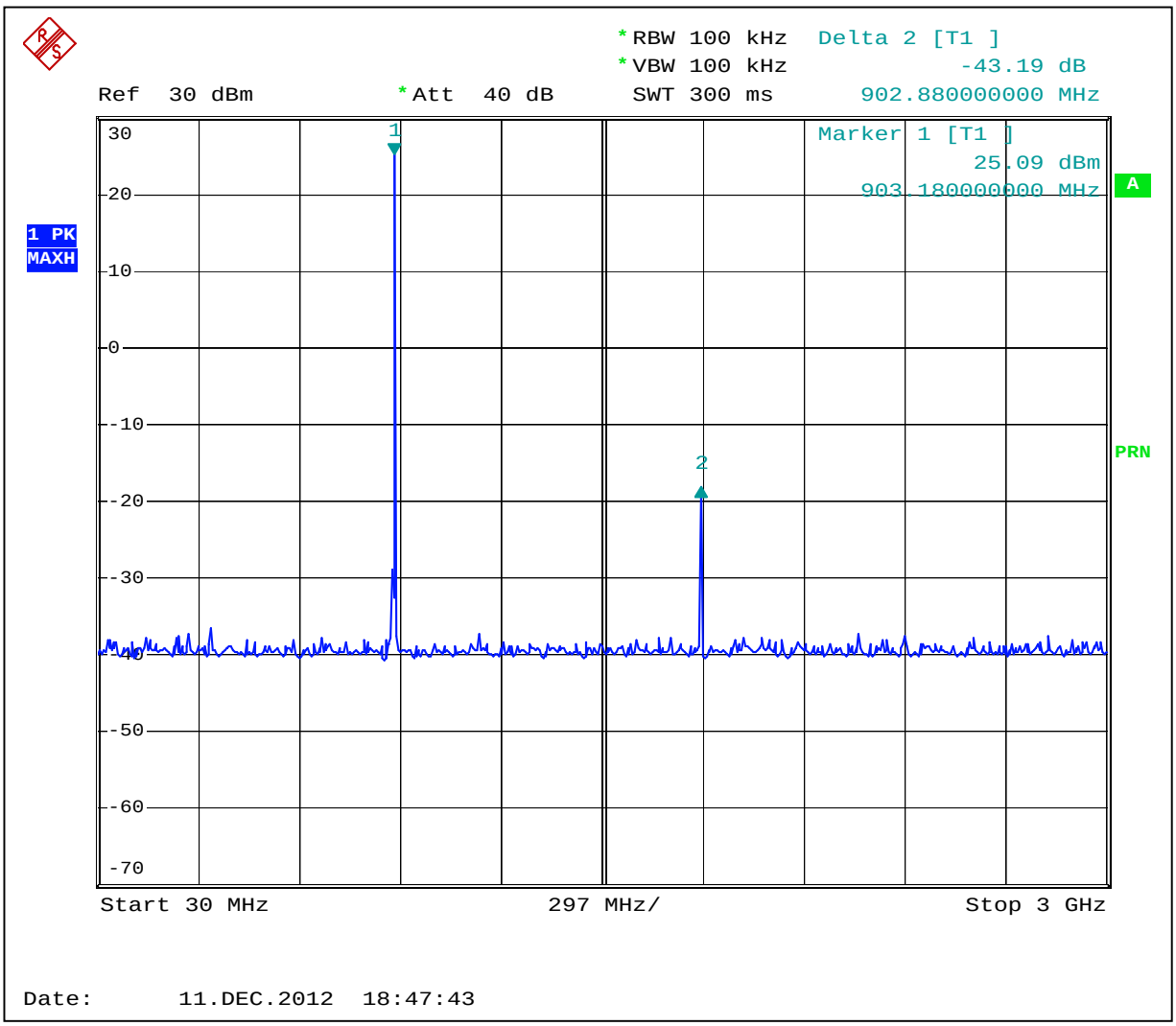
Note: No video trigger delay was set

Graph 3.5.2

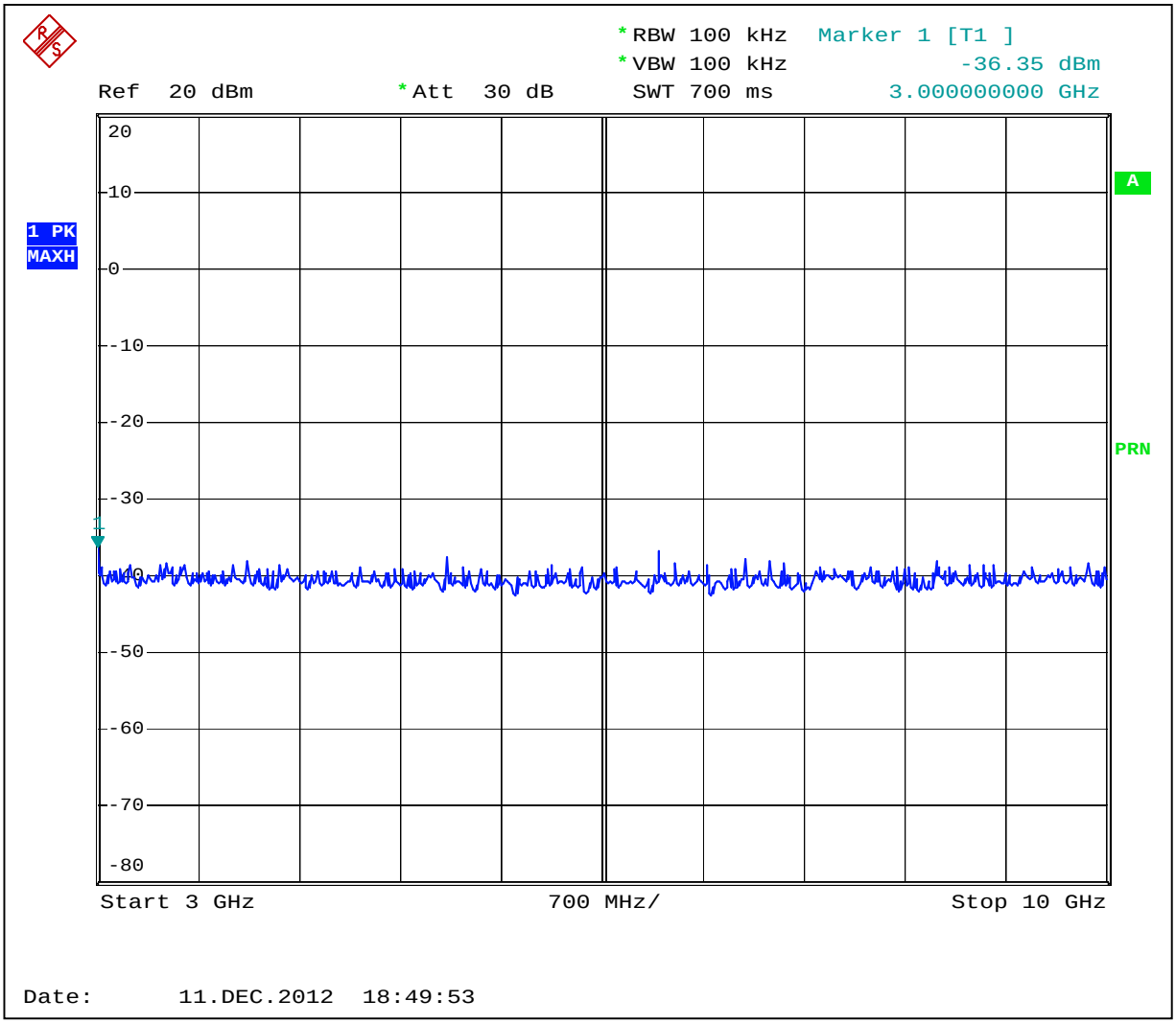
3.6 Antenna conducted spurious emissions

Frequency Range:	☒ 902-928MHz ☐ 2400-2483.5MHz ☐ 5725-5850MHz		
	Minimum Measured Attenuation dB	**Minimum Allowed Attenuation dB**	**Margin dB**
Low Frequency Channel	43.2	20	-23.2
Middle Frequency Channel	44.7	20	-24.7
Upper Frequency Channel	42.9	20	-22.9
Analyzer Settings:	☒ RBW=100KHz		
Minimum Allowed Attenuation:	☒ 20dB ☐ 30dB (for digital systems with conducted power measured using RMS averaging over a time interval)		

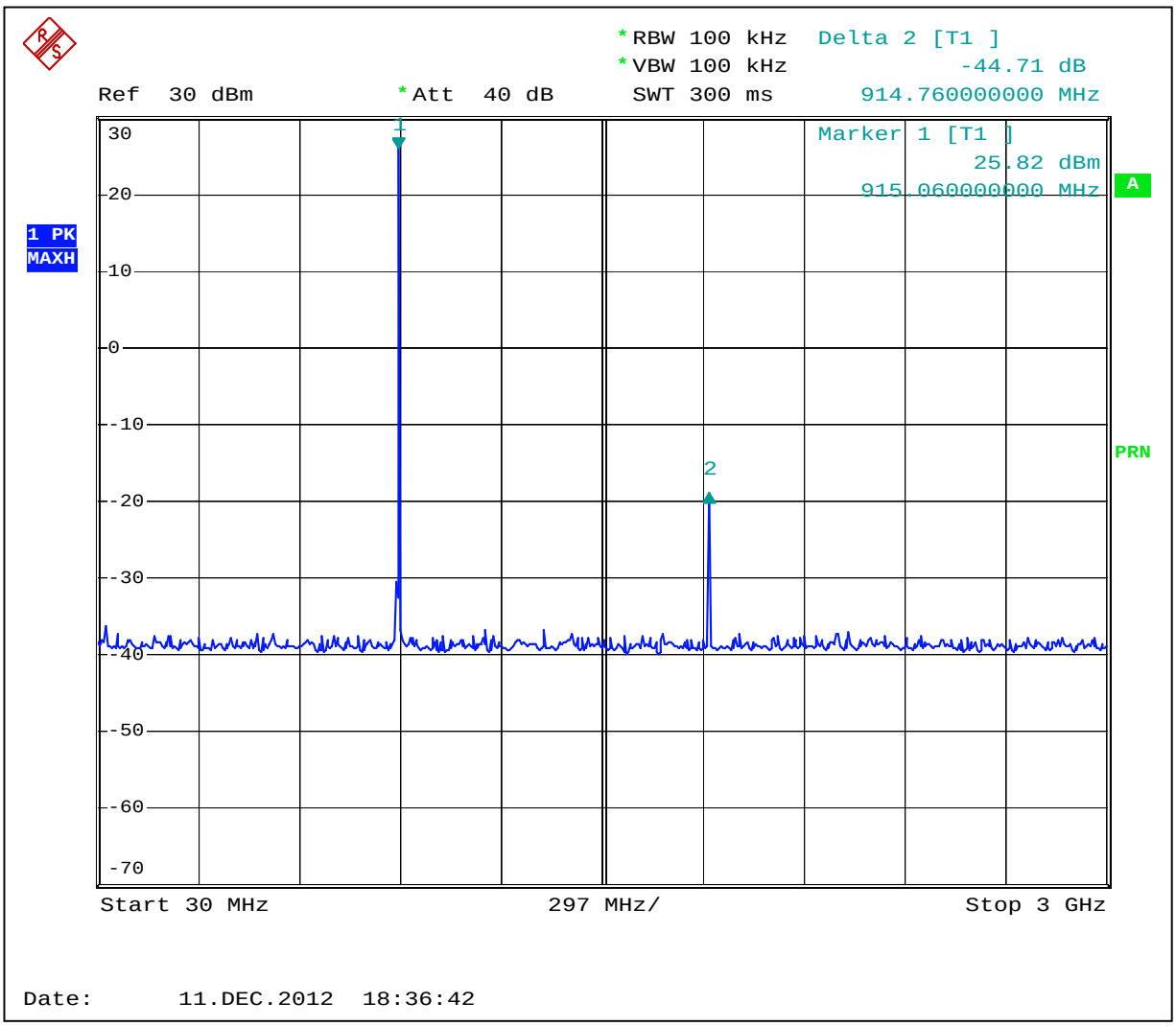
Notes: None


*RBW 100 kHz
*VBW 100 kHz
Delta 2 [T1]
-43.19 dB
902.880000000 MHz
Ref 30 dBm
*Att 40 dB
SWT 300 ms
Marker 1 [T1]
25.09 dBm
903.180000000 MHz
1 PK
MAXH
A
PRN
30
20
10
0
-10
-20
-30
-40
-50
-60
-70
Start 30 MHz
297 MHz/
Stop 3 GHz
Date: 11.DEC.2012 18:47:43

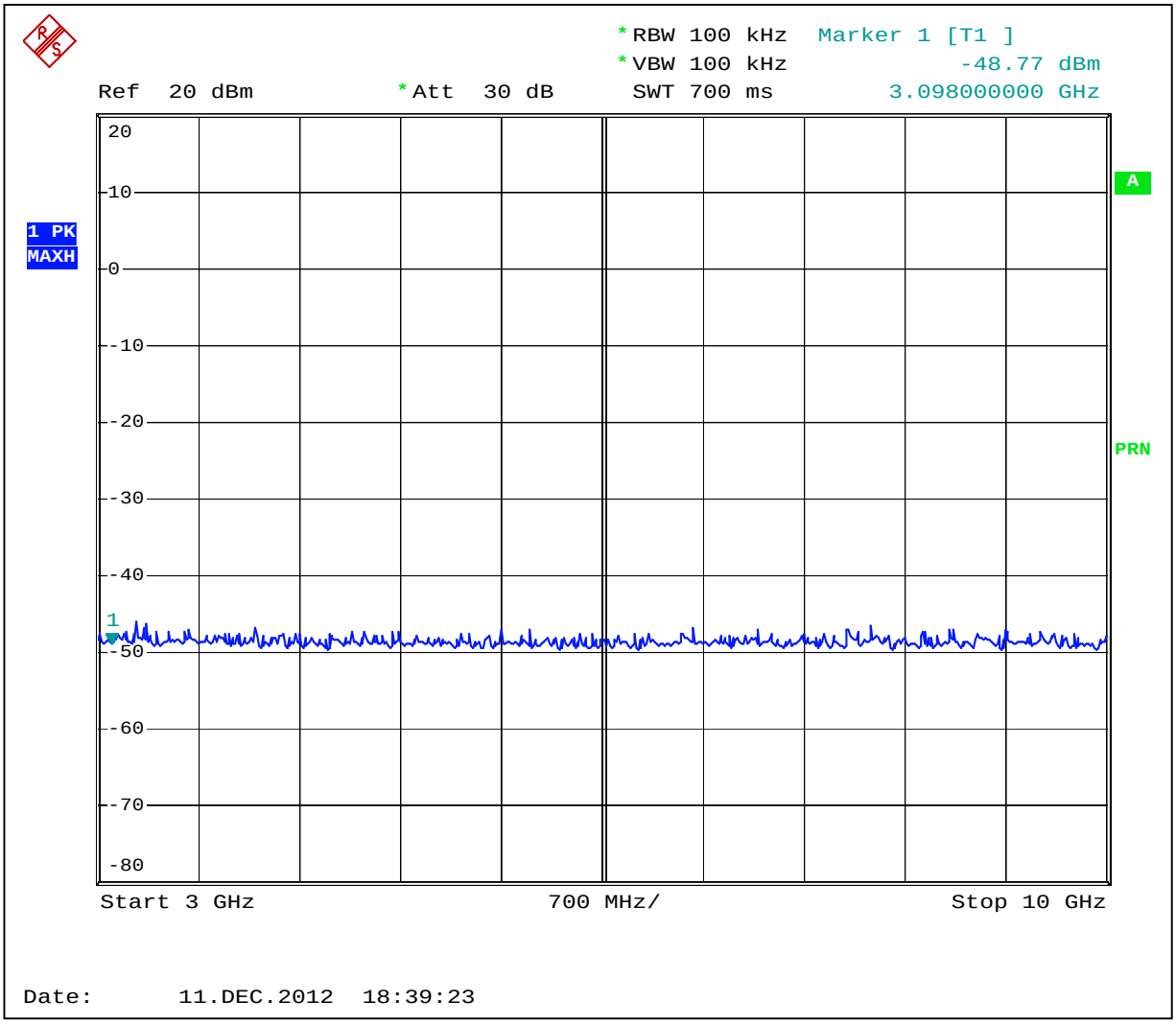
Graph 3.6.1


*RBW 100 kHz
Marker 1 [T1]
*VBW 100 kHz
-36.35 dBm
Ref 20 dBm
*Att 30 dB
SWT 700 ms
3.000000000 GHz
1 PK
MAXH
A
PRN
20
10
0
-10
-20
-30
-40
-50
-60
-70
-80
Start 3 GHz
700 MHz/
Stop 10 GHz
Date: 11.DEC.2012 18:49:53

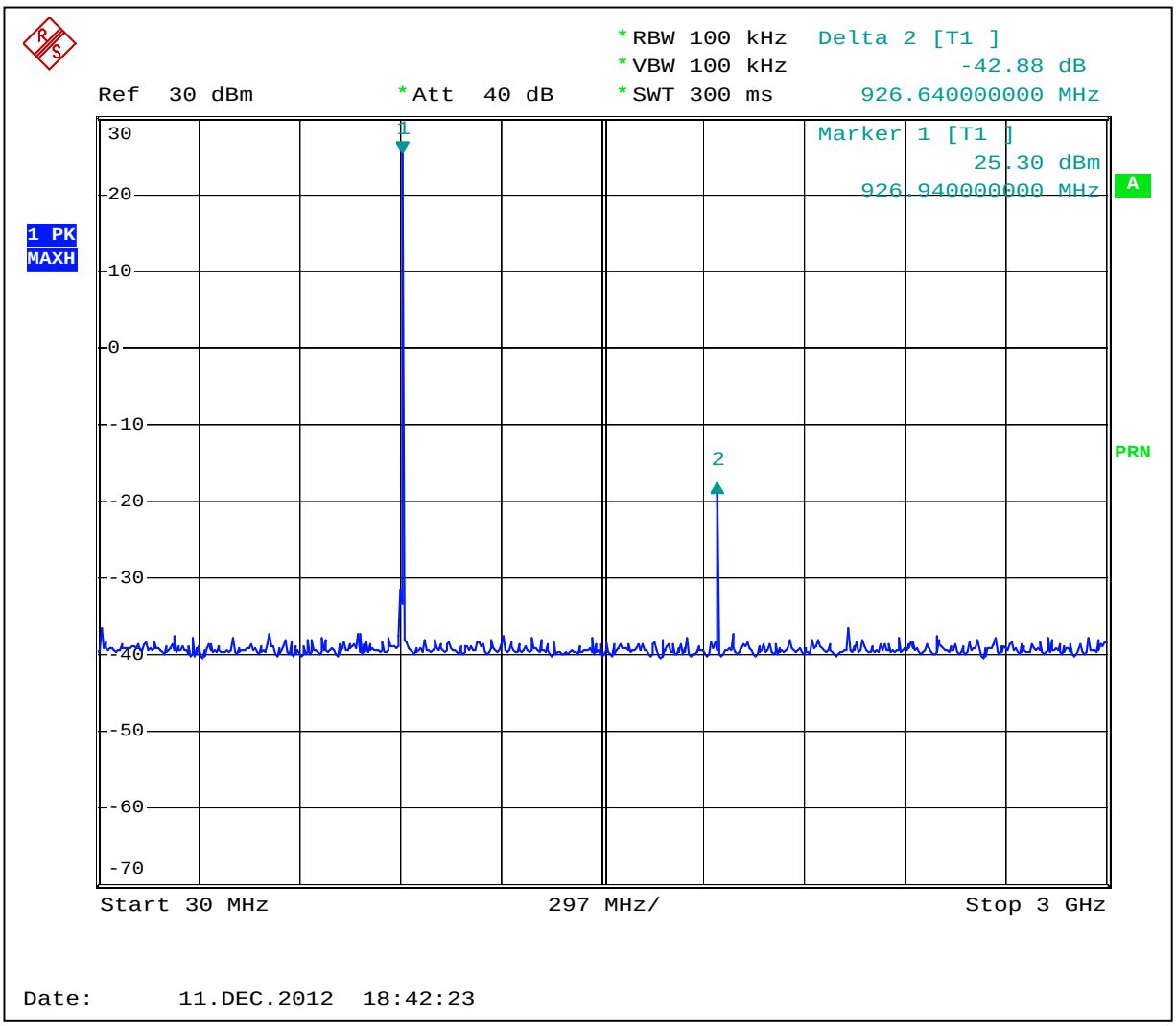
Graph 3.6.2


*RBW 100 kHz
Delta 2 [T1]
*VBW 100 kHz
-44.71 dB
Ref 30 dBm
*Att 40 dB
SWT 300 ms
914.760000000 MHz
Marker 1 [T1]
25.82 dBm
915.060000000 MHz
1 PK
MAXH
A
PRN
30
20
10
0
-10
-20
-30
-40
-50
-60
-70
Start 30 MHz
297 MHz/
Stop 3 GHz
Date: 11.DEC.2012 18:36:42

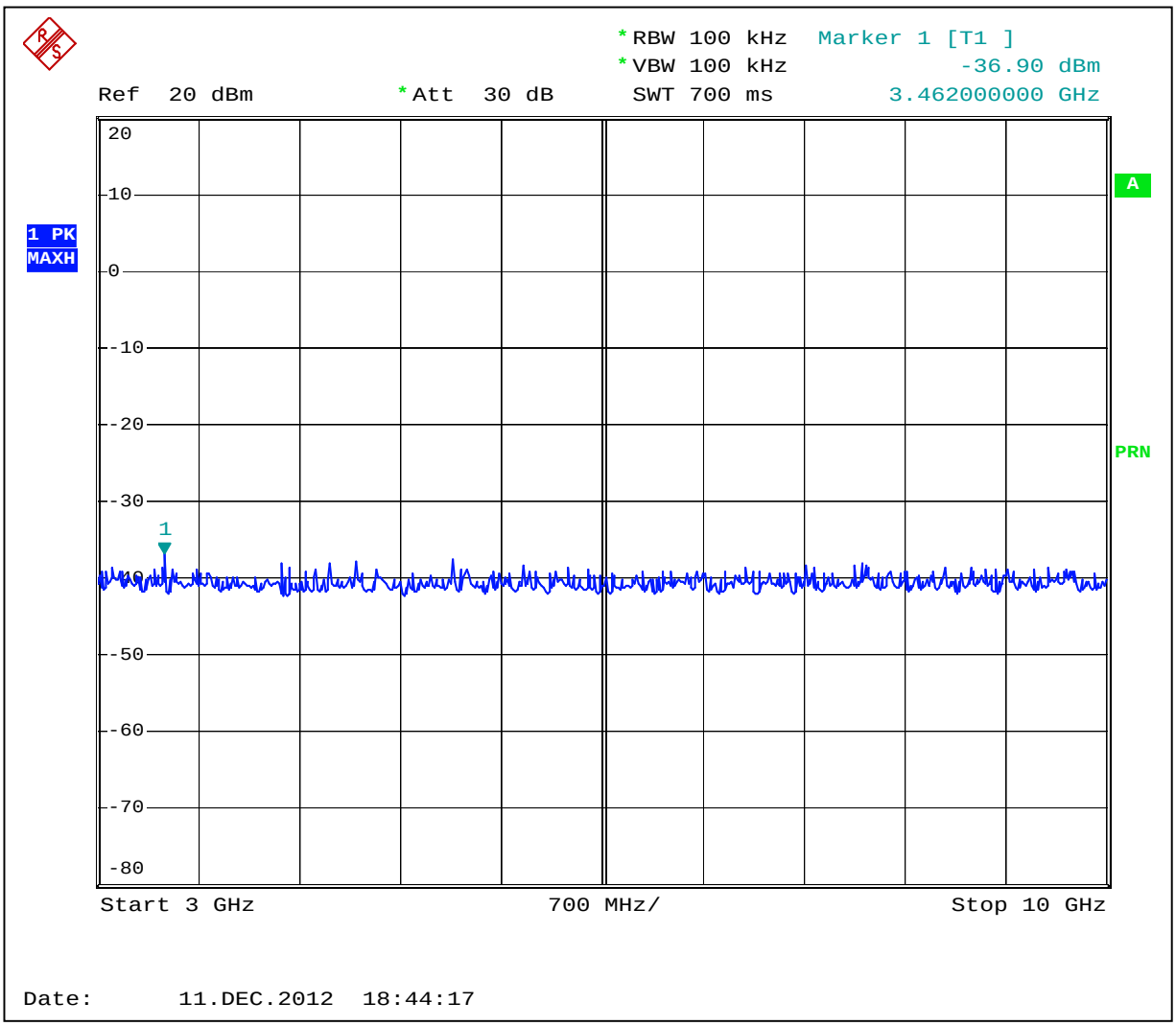
Graph 3.6.3


*RBW 100 kHz
Marker 1 [T1]
*VBW 100 kHz
-48.77 dBm
Ref 20 dBm
*Att 30 dB
SWT 700 ms
3.098000000 GHz
20
10
0
-10
-20
-30
-40
-50
-60
-70
-80
1 PK
MAXH
A
PRN
1
Start 3 GHz
700 MHz/
Stop 10 GHz
Date: 11.DEC.2012 18:39:23

Graph 3.6.4


*RBW 100 kHz
Delta 2 [T1]
*VBW 100 kHz
-42.88 dB
Ref 30 dBm
*Att 40 dB
*SWT 300 ms
926.640000000 MHz
Marker 1 [T1]
25.30 dBm
926.940000000 MHz
1 PK
MAXH
A
PRN
30
20
10
0
-10
-20
-30
-40
-50
-60
-70
Start 30 MHz
297 MHz/
Stop 3 GHz
Date: 11.DEC.2012 18:42:23

Graph 3.6.5


*RBW 100 kHz
Marker 1 [T1]
*VBW 100 kHz
-36.90 dBm
Ref 20 dBm
*Att 30 dB
SWT 700 ms
3.462000000 GHz
1 PK
MAXH
A
PRN
20
10
0
-10
-20
-30
-40
-50
-60
-70
-80
Start 3 GHz
700 MHz/
Stop 10 GHz
Date: 11.DEC.2012 18:44:17

Graph 3.6.6

3.6.1 Antenna conducted band edge compliance

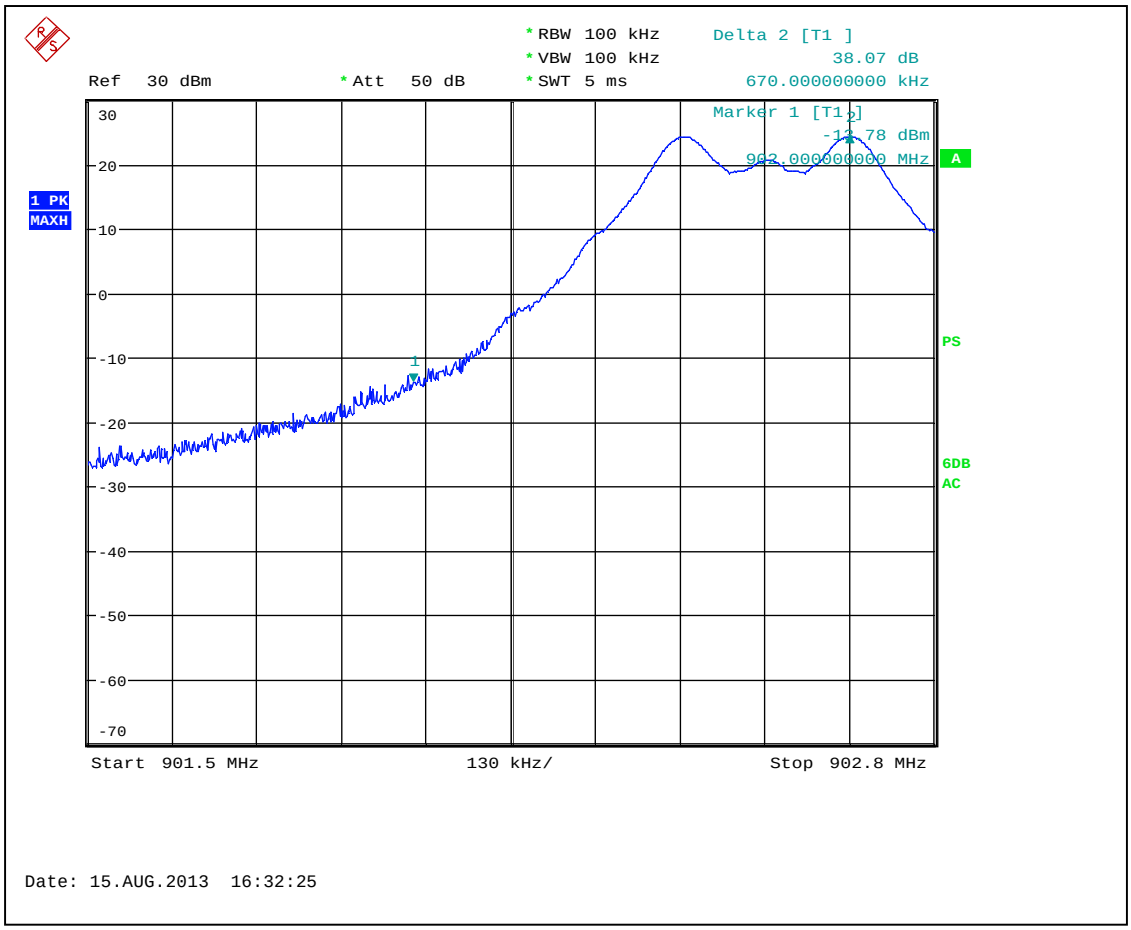
Hopping disabled

Frequency Range:	☒ 902-928MHz ☐ 2400-2483.5MHz ☐ 5725-5850MHz		
	Minimum Measured Attenuation dB	**Minimum Allowed Attenuation dB**	**Margin dB**
Low Frequency Channel (902MHz)	38.1	20	-18.1
Upper Frequency Channel (928MHz)	37.5	20	-17.5
Analyzer Settings:	☒ RBW=100KHz		
Minimum Allowed Attenuation:	☒ 20dB ☐ 30dB (for digital systems with conducted power measured using RMS averaging over a time interval)		

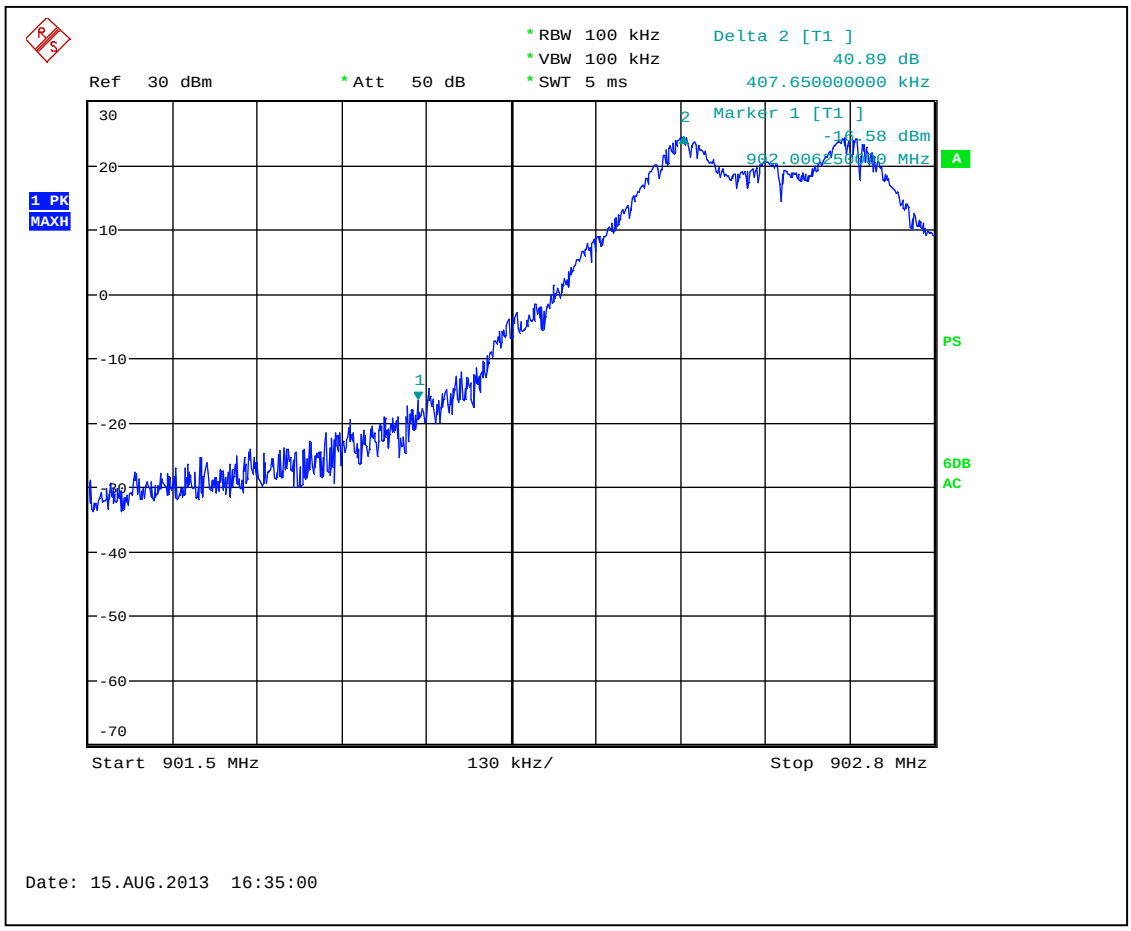
Hopping enabled

Frequency Range:	☒ 902-928MHz ☐ 2400-2483.5MHz ☐ 5725-5850MHz		
	Minimum Measured Attenuation dB	**Minimum Allowed Attenuation dB**	**Margin dB**
Low Frequency Channel (902MHz)	40.9	20	-20.9
Upper Frequency Channel (928MHz)	43.1	20	-23.1
Analyzer Settings:	☒ RBW=100KHz		
Minimum Allowed Attenuation:	☒ 20dB ☐ 30dB (for digital systems with conducted power measured using RMS averaging over a time interval)		

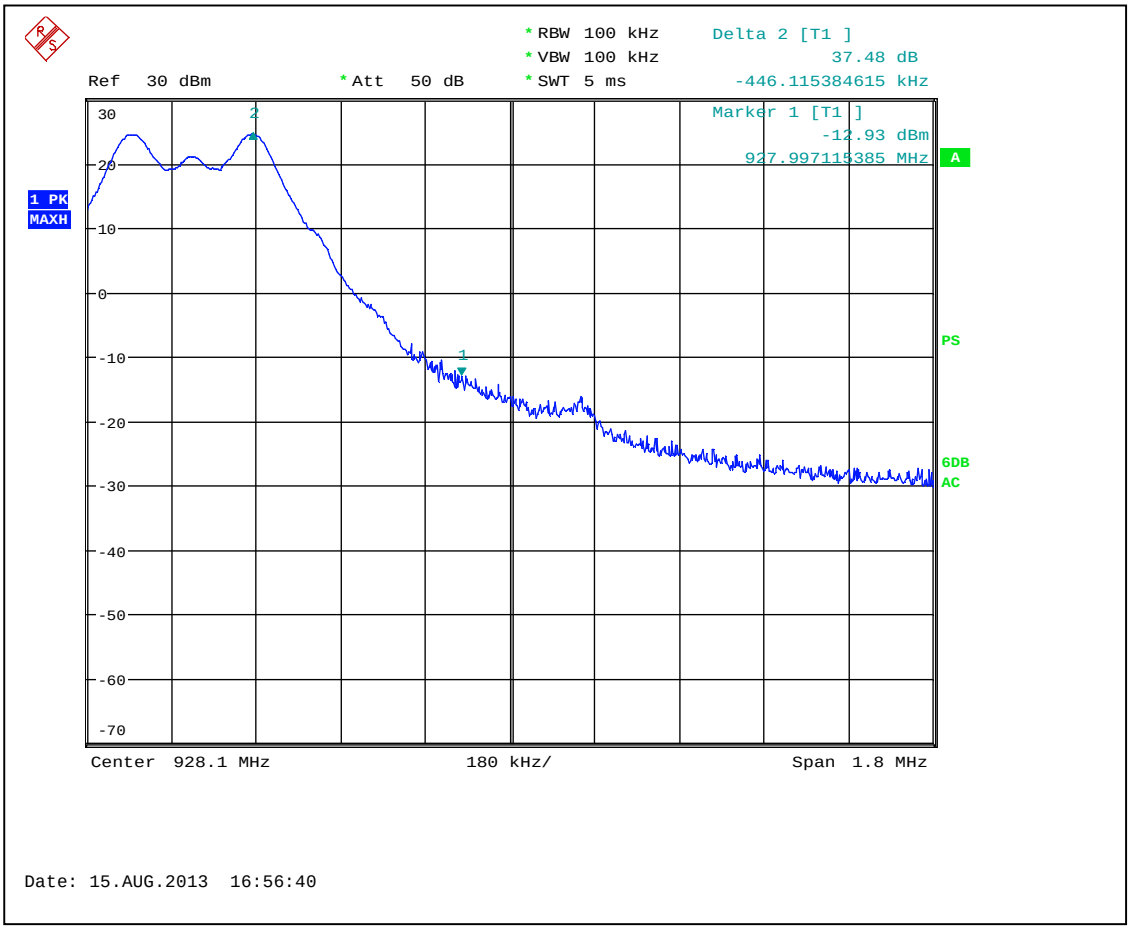
Notes: Graphs 3.6.4 and 3.6.5 show Band-edge compliance for low frequency channel. Graphs 3.6.6 and 3.6.7 show Band-edge compliance for high frequency channel.



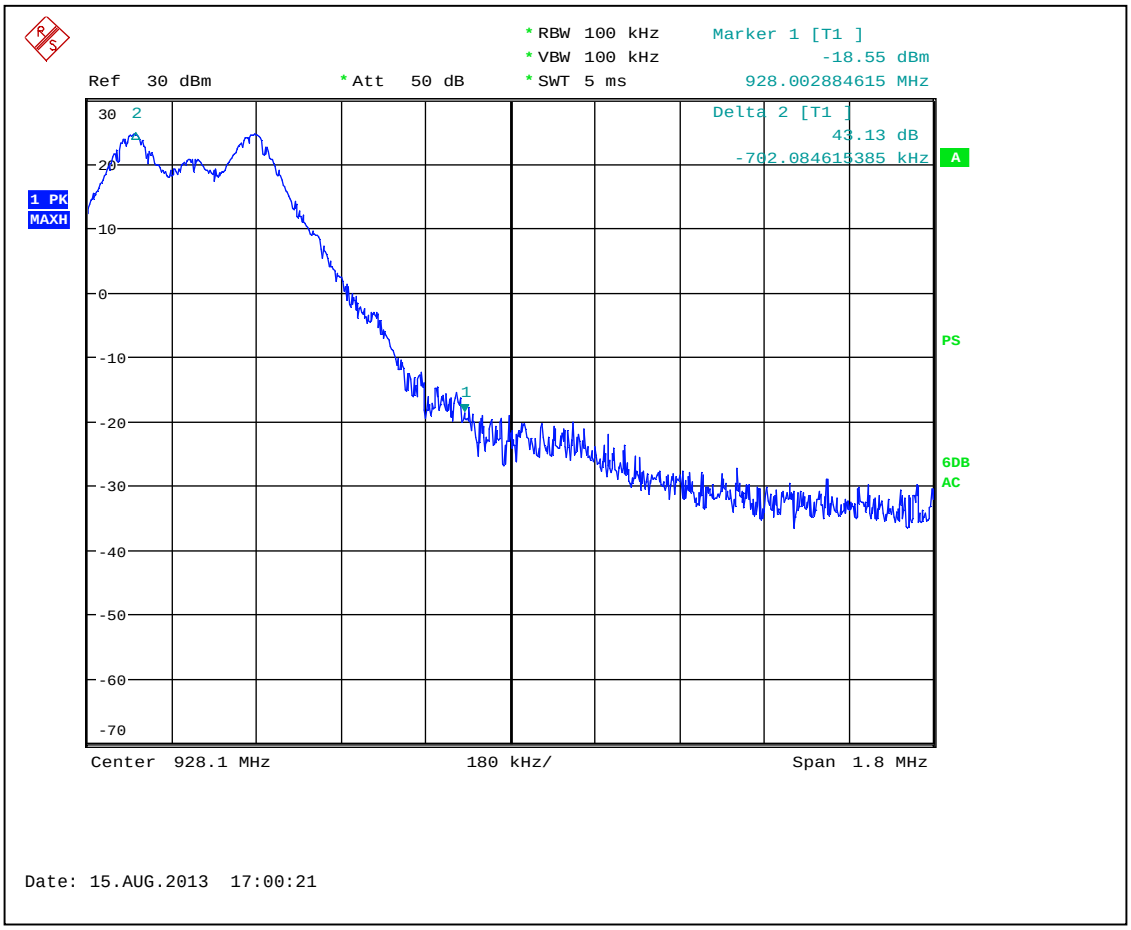
Graph 3.6.4 (hopping disabled)



Graph 3.6.5 (hopping enabled)



Graph 3.6.6 (hopping disabled)



Graph 3.6.7 (hopping enabled)

3.7 Radiated spurious emissions

Test location: ☐ OATS ☒ Anechoic Chamber ☐ Other

Test distance: ☐ 10 meters ☒ 3 meters

Frequency Range: 30MHz-10GHz

Test result: **Pass**

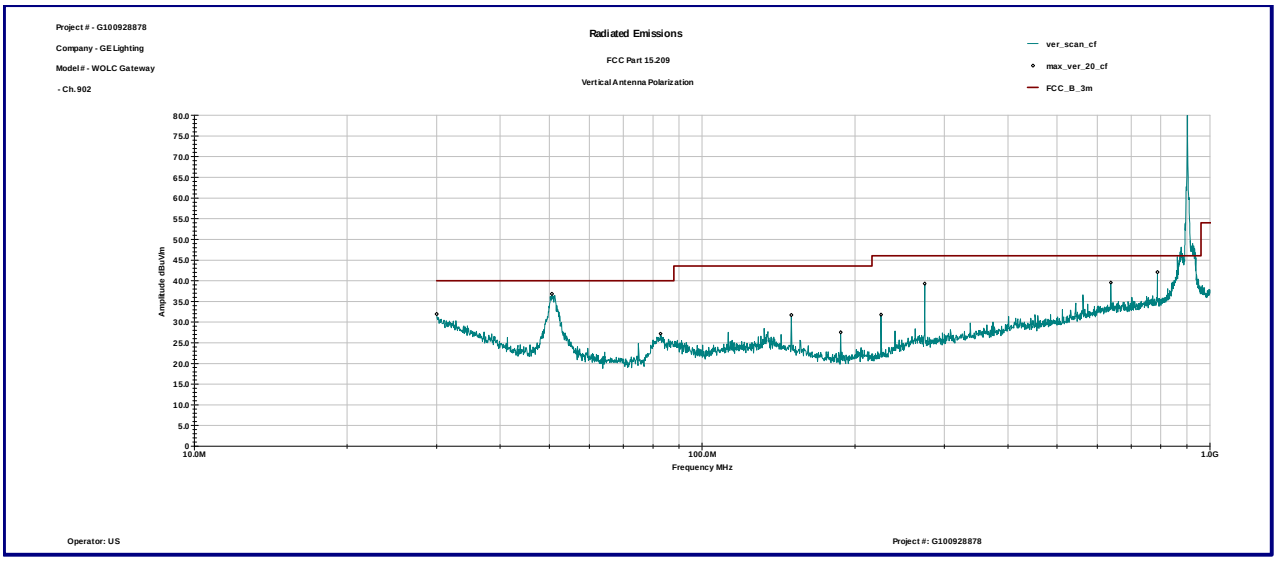
Max. Margin: 8.1dB below the limits

Date:	December 14, 2012	**Result:** **Pass**
Tested by:	Uri Spector	
Standard:	FCC part 15.247(d)	
Test Point:	Enclosure	
Operation mode:	See page 5	
Note:	Emissions at fundamental frequency, spurious emissions and harmonics outside restricted band of operation per FCC 15.205, and spurious emissions not related with transmitter operations were excluded from the Table.	

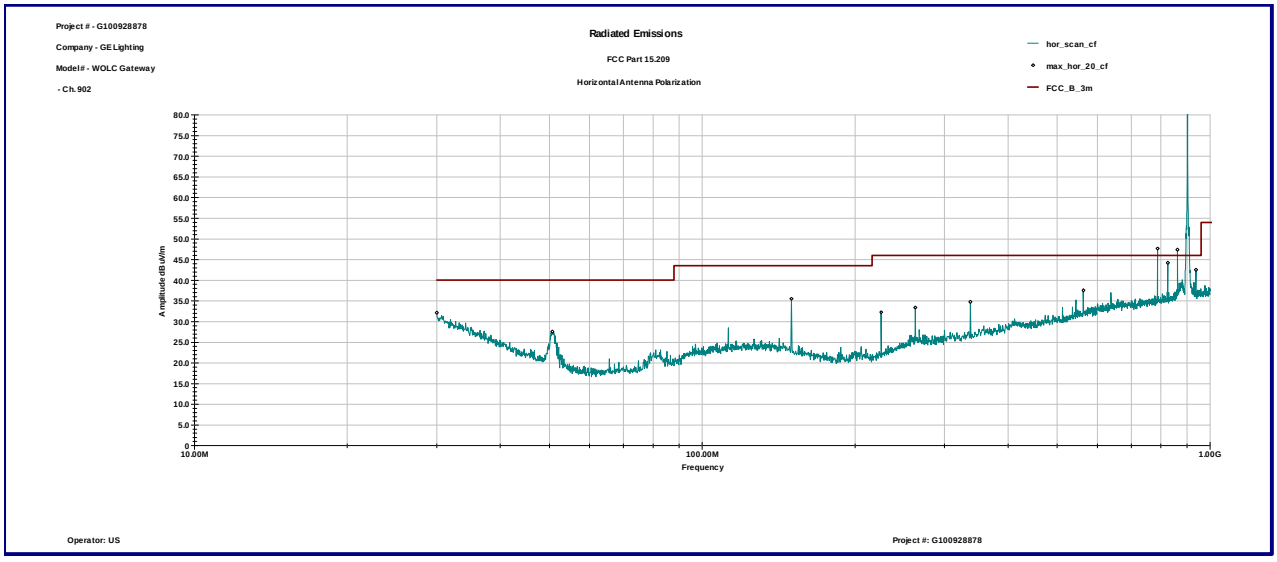
Table 3.7.1

Frequency MHz	Antenna Polarity	Peak Reading dBµV	Total C.F. dB1/m	Pre-Amp. Gain (dB)	Total at 3m dBµV/m	Limit dBµV/m	Margin dB
Channel 902							
1.3015 GHz	V	50.0	26.8	41.9	34.9	54.0	-19.1
2.71 GHz	V	50.9	32.4	40.4	42.8	54.0	-11.2
2.71 GHz	H	54.1	32.3	40.4	45.9	54.0	-8.1
Channel 915							
2.746 GHz	V	50.1	32.5	40.4	42.2	54.0	-11.8
2.746 GHz	H	52.8	32.4	40.4	44.8	54.0	-9.2
Channel 928							
2.7865 GHz	V	46.9	32.7	40.5	39.1	54.0	-14.9
2.7865 GHz	H	50.2	32.6	40.5	42.4	54.0	-11.6
4.6405 GHz	H	44.1	36.9	39.3	41.7	54.0	-12.3

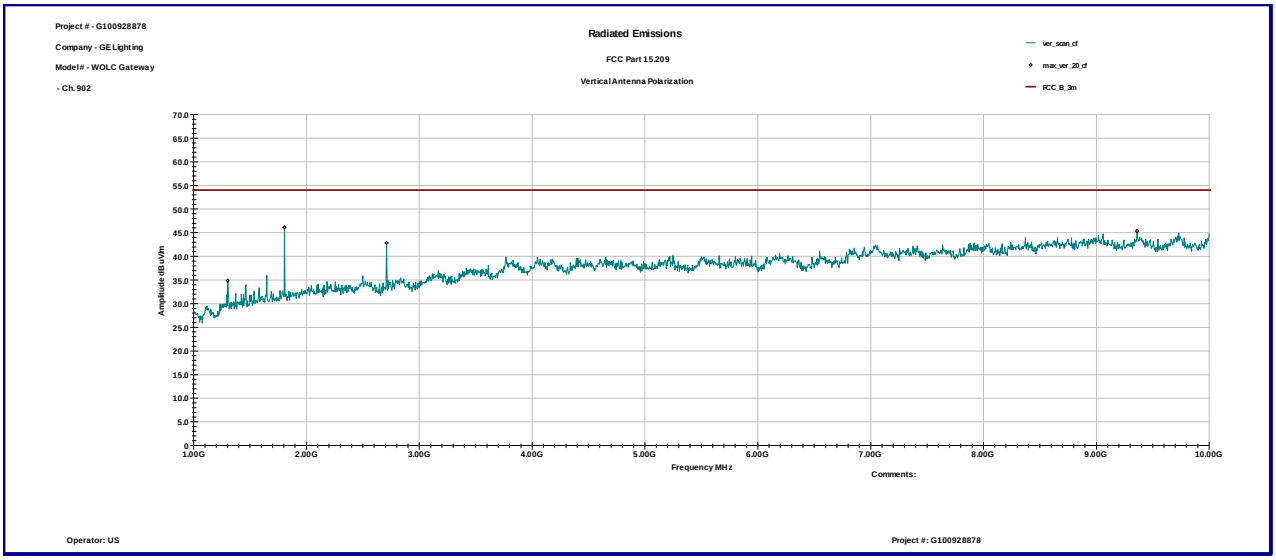
Comment:



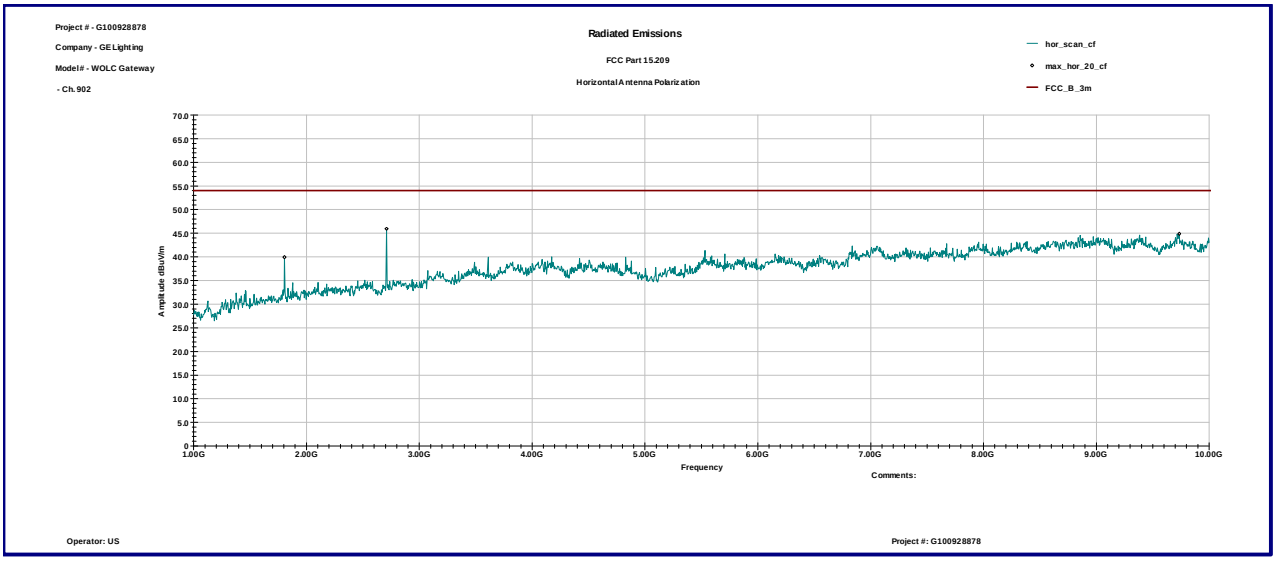
Graph 3.7.1



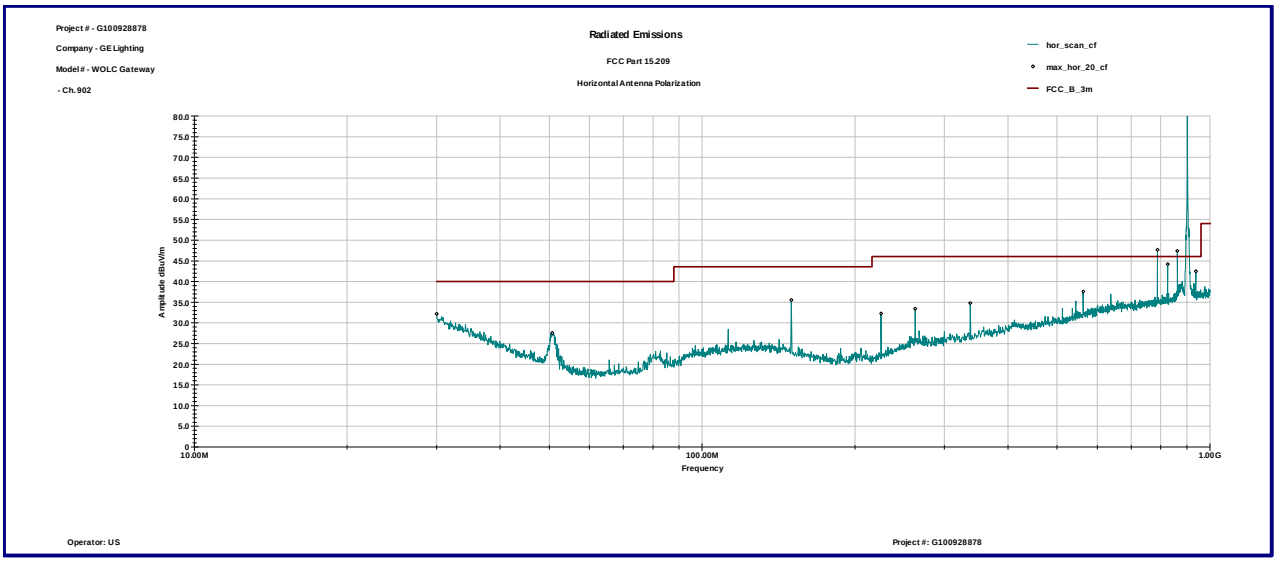
Graph 3.7.2



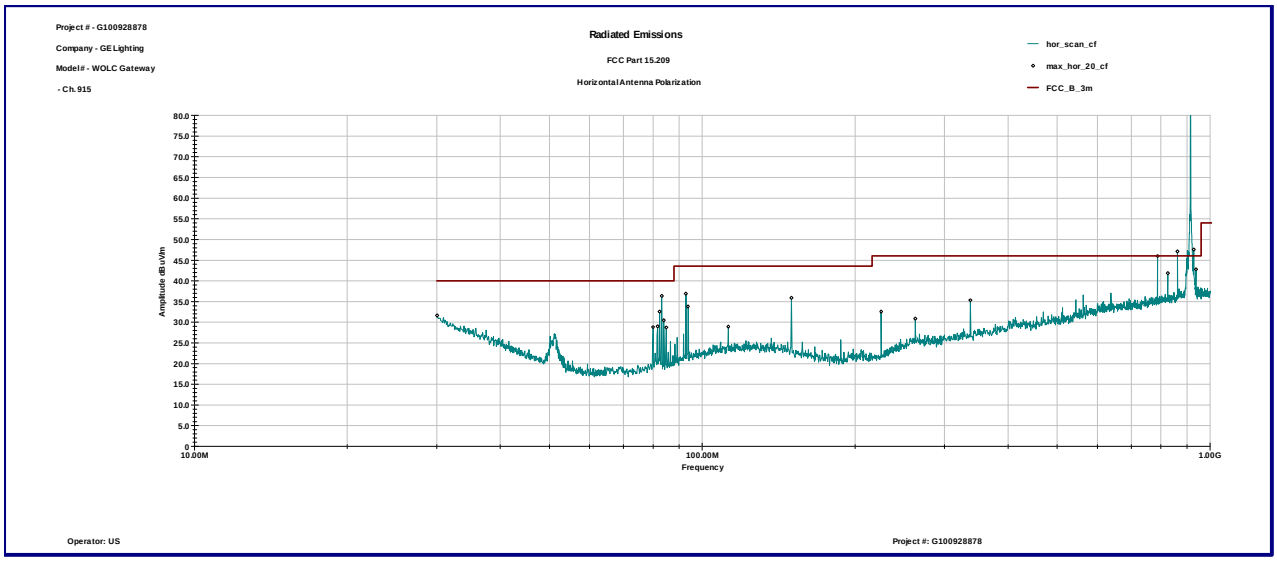
Graph 3.7.3



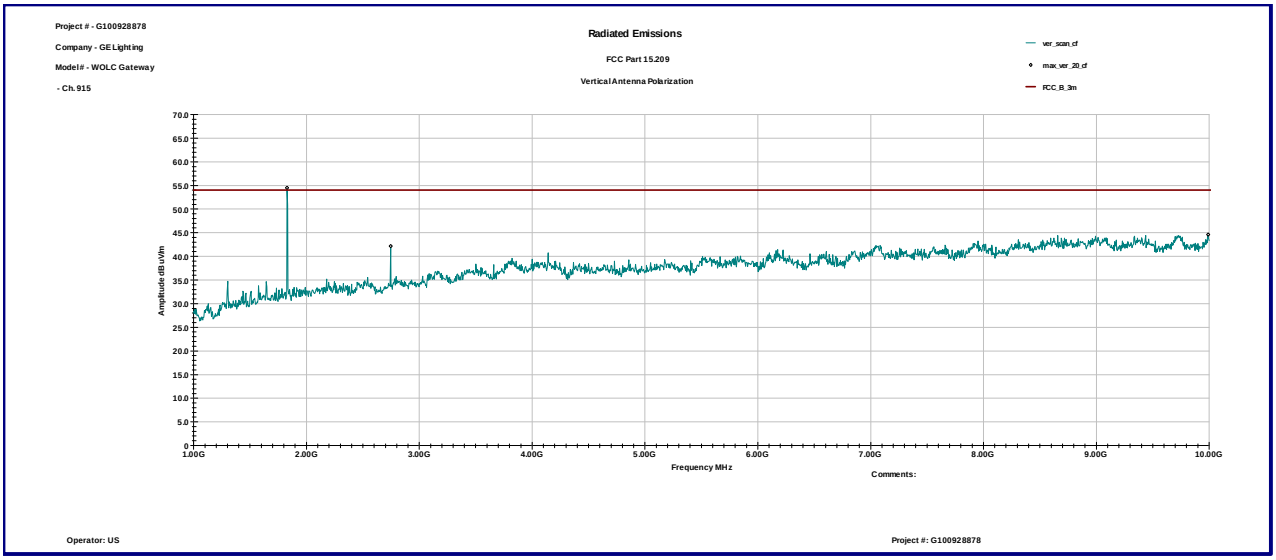
Graph 3.7.4



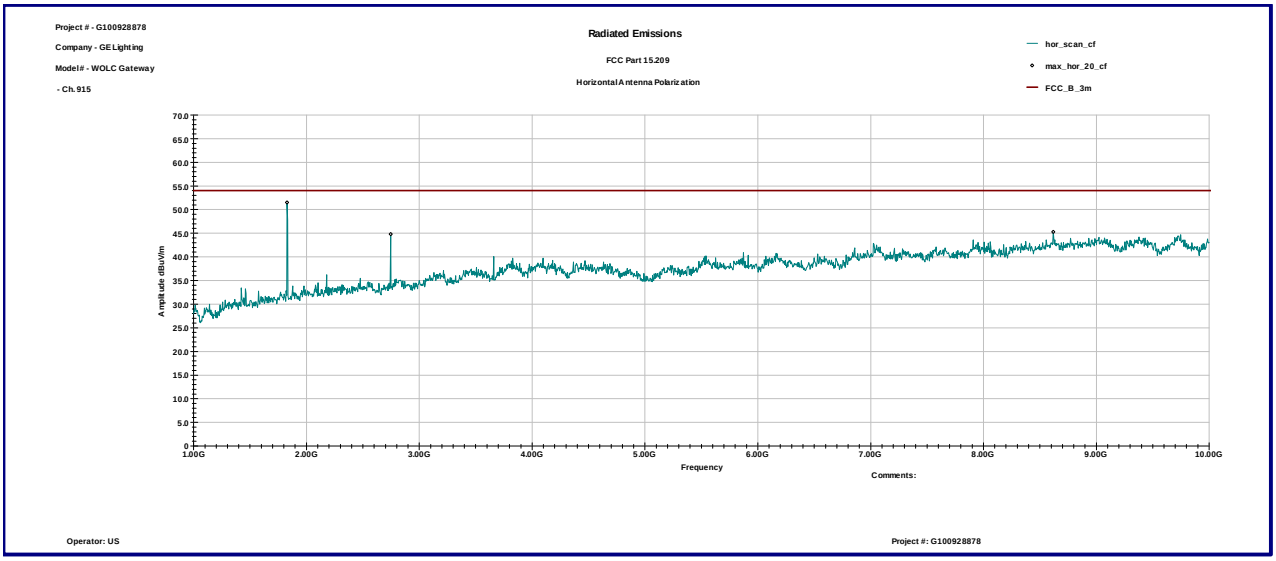
Graph 3.7.5



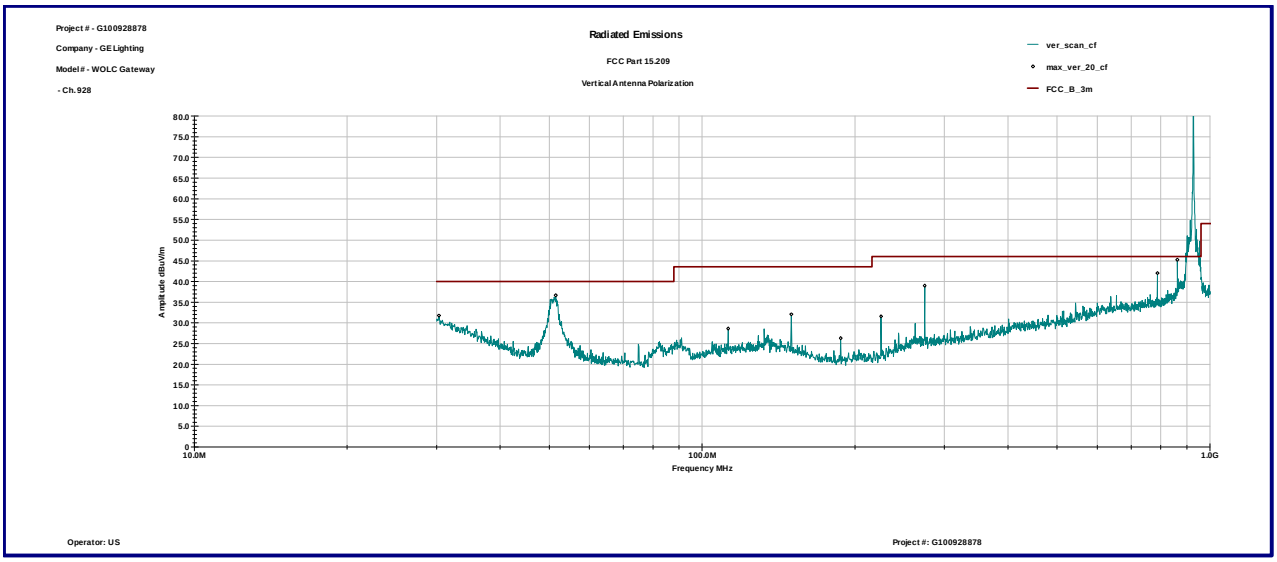
Graph 3.7.6



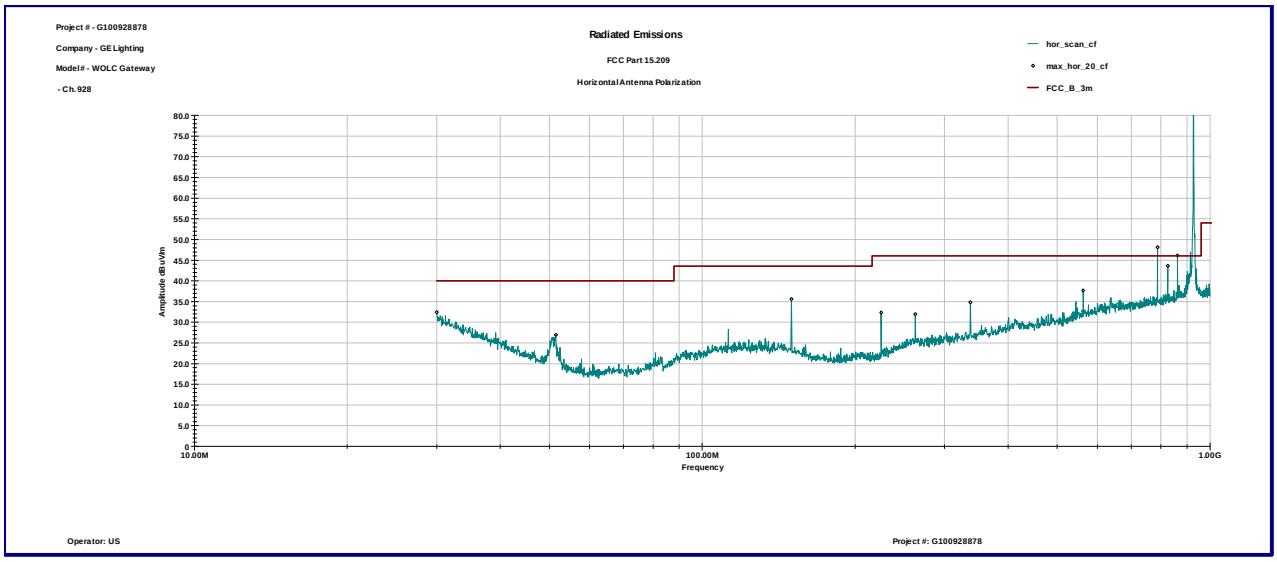
Graph 3.7.7



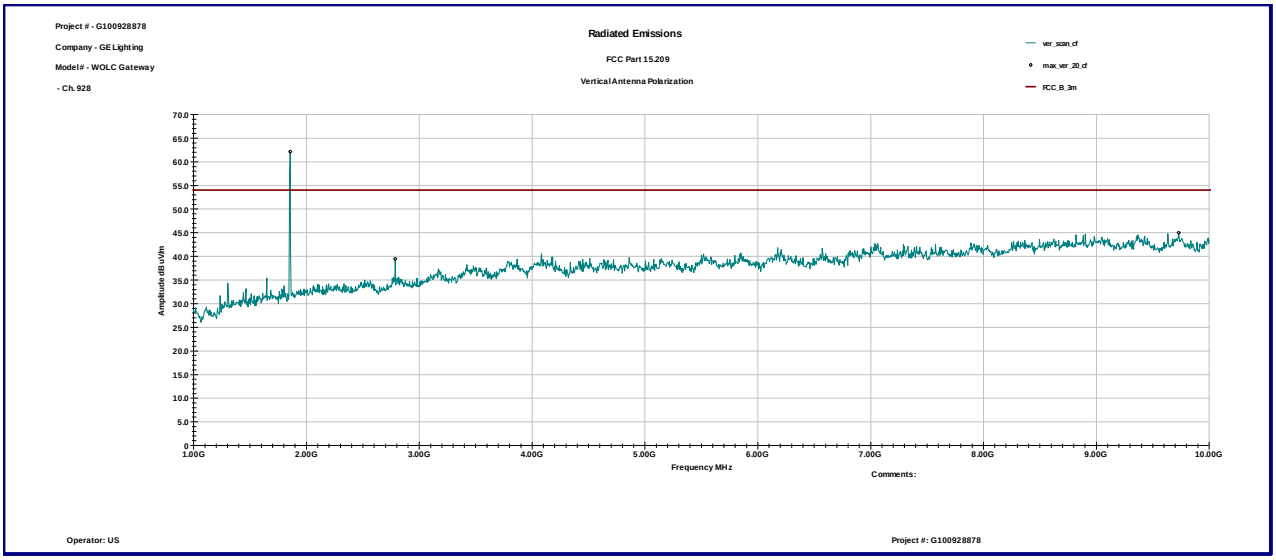
Graph 3.7.8



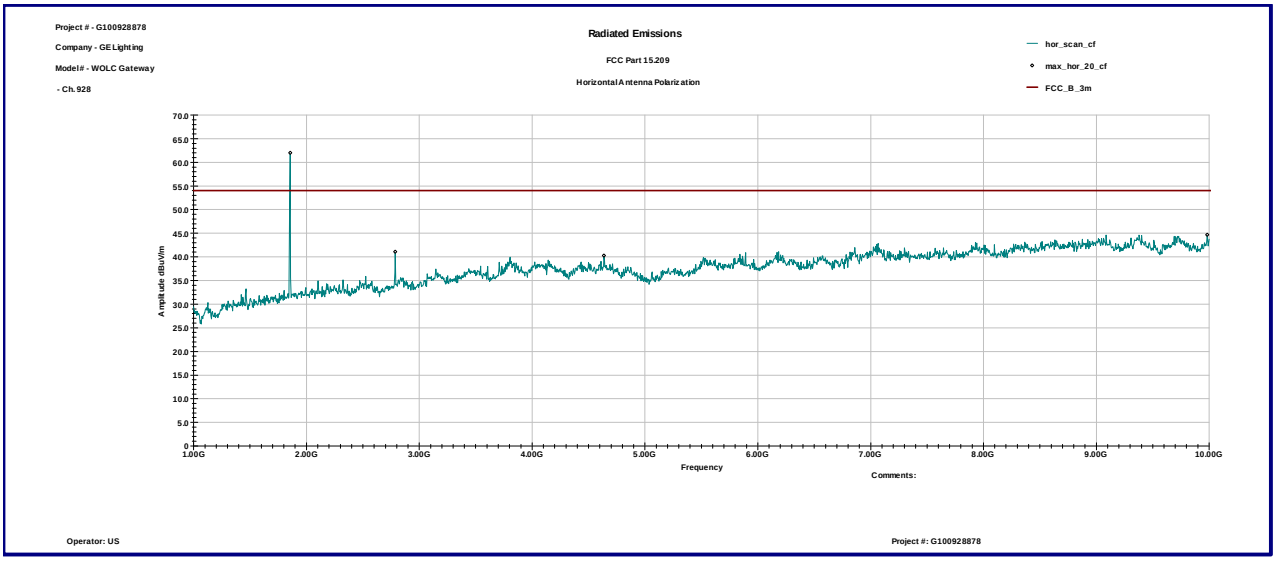
Graph 3.7.9



Graph 3.7.10



Graph 3.7.11



Graph 3.7.12

3.8 RF Exposure Compliance

The maximum measured antenna conducted power, P is 24.9dBm

The antenna gain, G is 3dBi

The maximum EIRP power = P + G
ERP = 24.9+ 3= 27.9dBm, or 0.616W

The limits for Maximum Permissible Exposure (MPE) for transmitter operating at 902-928MHz, MPE is 928/1500 = 0.619mW/cm^2, or 6.2W/m^2

The Power Density, S is related to EIRP with the equation:
S = EIRP / 4πD^2, where D is the safe separation distance and = 0.2m, or 20cm
S = 0.616 / 4π0.2^2,
S = 1.225mW/cm^{2,}, or below the Maximum Permissible Exposure (MPE) of 6.2W/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: 4.3dB below the limits

Notes: None

Date:	December 13, 2012	**Result:** **Pass**
Tested by:	Uri Spector	
Standard:	FCC Part 15.207	
Test Point:	AC Power Line	
Operation mode:	See page 5	
Note:	None	

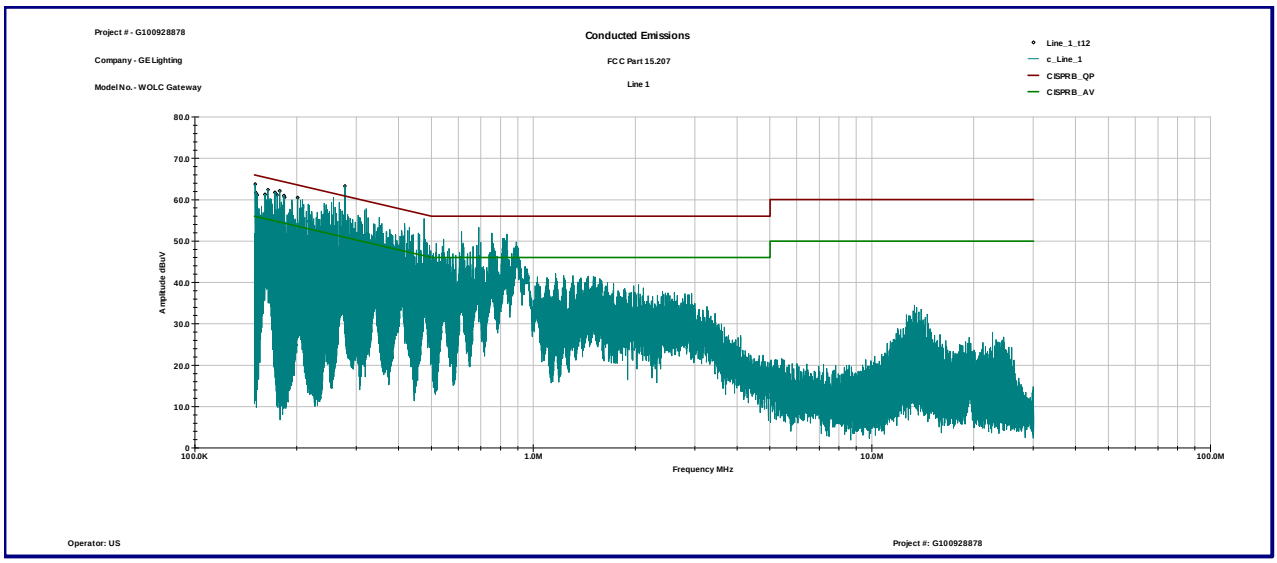
Table 3.9.1

Line 1

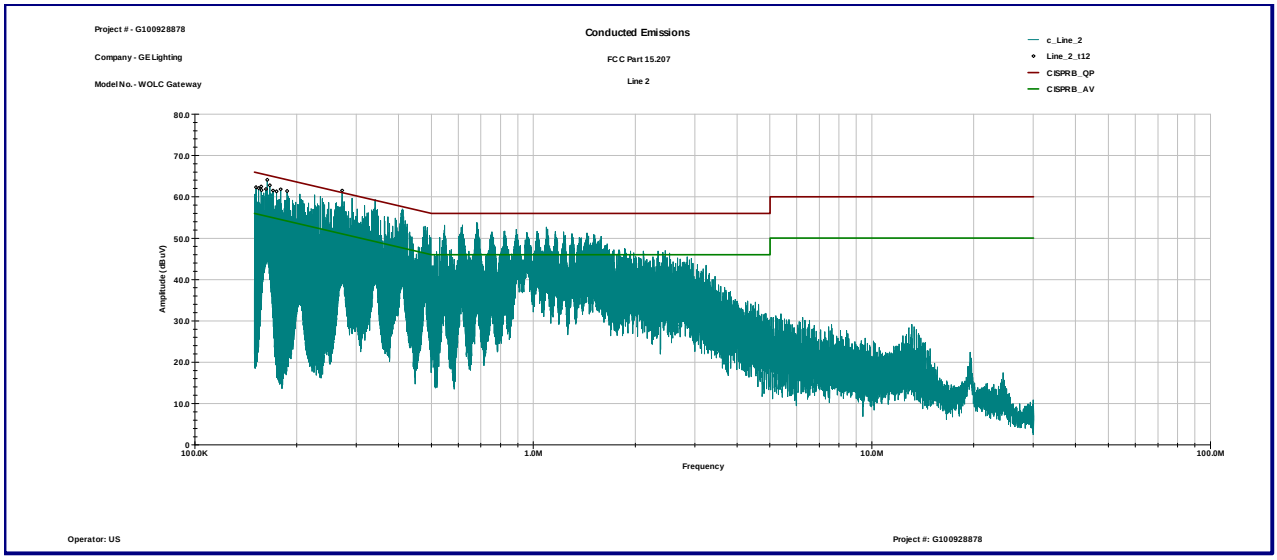
Frequency MHz	QP dBµV	AVG dBµV	Cable Loss dB	QP Lim dBµV	AVG Lim dBµV	QP Margin dB	AVG Margin dB
0.154	51.5	25.0	0.1	65.8	55.8	-14.2	-30.7
0.163	52.0	42.2	0.1	65.3	55.3	-13.2	-13.0
0.272	55.5	40.8	0.1	61.1	51.1	-5.4	-10.1
0.340	54.8	39.4	0.1	59.2	49.2	-4.3	-9.7
0.684	50.2	33.3	0.2	56.0	46.0	-5.6	-12.5
1.092	49.5	35.9	0.2	56.0	46.0	-6.3	-9.9

Line 2

Frequency MHz	QP dBµV	AVG dBµV	Cable Loss dB	QP Lim dBµV	AVG Lim dBµV	QP Margin dB	AVG Margin dB
0.151	51.4	24.0	0.1	65.9	55.9	-14.5	-31.9
0.178	49.8	21.3	0.1	64.6	54.6	-14.7	-33.2
0.277	47.8	28.6	0.1	60.9	50.9	-13.0	-22.2
0.476	42.5	28.5	0.1	56.4	46.4	-13.8	-17.8
0.689	42.4	27.8	0.2	56.0	46.0	-13.4	-18.0
0.835	44.9	32.7	0.2	56.0	46.0	-10.9	-13.1
1.500	35.8	24.8	0.3	56.0	46.0	-19.9	-20.9



Graph 3.9.1



Graph 3.9.2

3.10 Receiver/digital device radiated emissions

Test location: ☐ OATS ☒ Anechoic Chamber

Test distance: ☐ 10 meters ☒ 3 meters

Test result: **Pass**

Frequency range: 30MHz-5000MHz

Max. Emissions margin: 9.2 dB below the limits

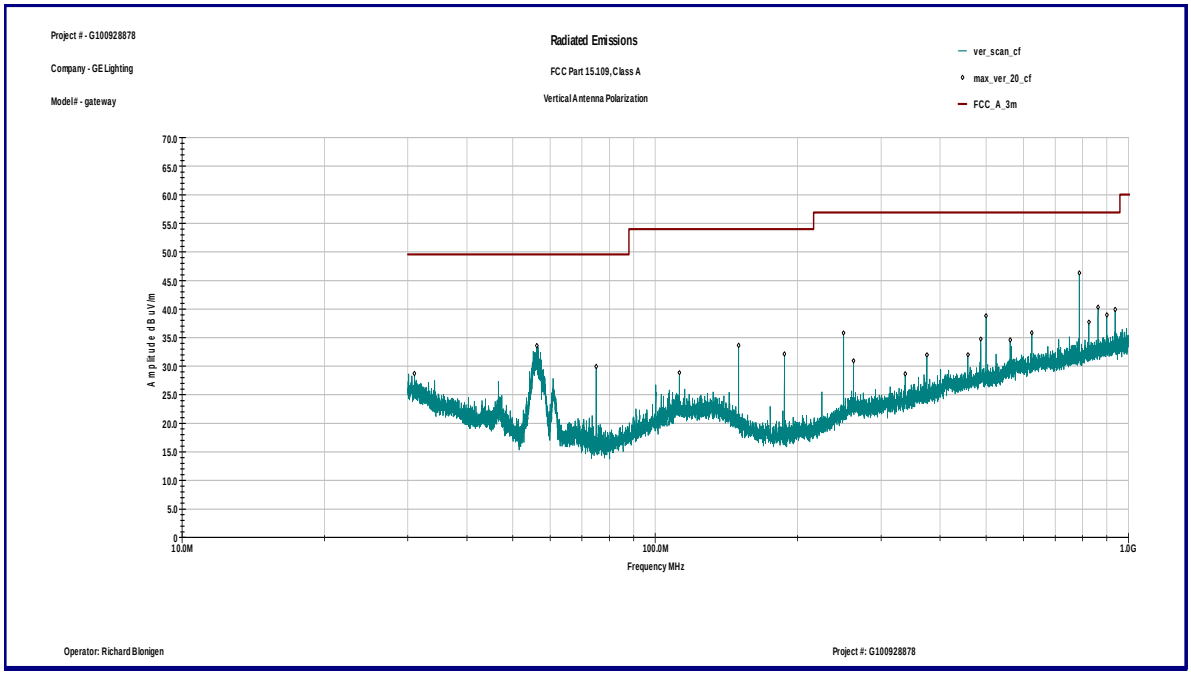
Notes: None

Date:	July 15, 2013	**Result:** **Pass**
Tested by:	Richard Blonigen	
Standard:	FCC Part 15.109, Class A	
Test Point:	Enclosure	
Operation mode:	See page 5	
Note:	None	

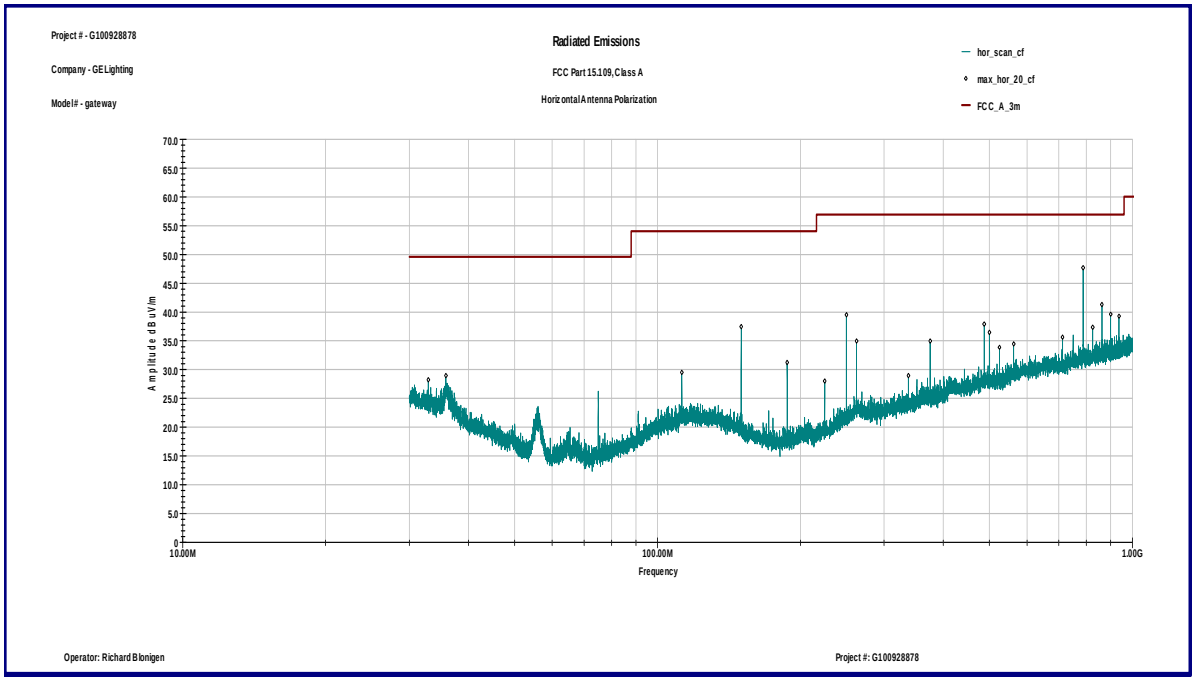
Table 3.10.1

Frequency	Ant. Polarity	Peak Reading dBµV	Total C.F. dB1/m	Total at 3m dBµV/m	Limit dBµV/m	Margin dB
30.982 MHz	V	8.9	19.8	28.7	49.5	-20.8
56.232 MHz	V	25.6	8.0	33.6	49.5	-16.0
74.999 MHz	V	21.9	8.1	29.9	49.5	-19.6
499.98 MHz	V	18.1	20.7	38.8	56.9	-18.1
787.66 MHz	V	22.2	24.1	46.3	56.9	-10.6
862.59 MHz	V	15.3	25.0	40.3	56.9	-16.6
900.06 MHz	V	13.5	25.4	38.9	56.9	-18.0
937.54 MHz	V	14.2	25.7	39.9	56.9	-17.0
32.91 MHz	H	9.5	18.7	28.2	49.5	-21.3
150.03 MHz	H	24.7	12.8	37.4	54.0	-16.5
250.05 MHz	H	24.8	14.7	39.5	56.9	-17.4
487.48 MHz	H	17.2	20.7	37.9	56.9	-19.0
787.66 MHz	H	23.6	24.1	47.7	56.9	-9.2
824.91 MHz	H	12.6	24.8	37.3	56.9	-19.6
862.59 MHz	H	16.3	25.0	41.3	56.9	-15.6
900.06 MHz	H	14.2	25.4	39.6	56.9	-17.3
937.54 MHz	H	13.5	25.7	39.3	56.9	-17.6

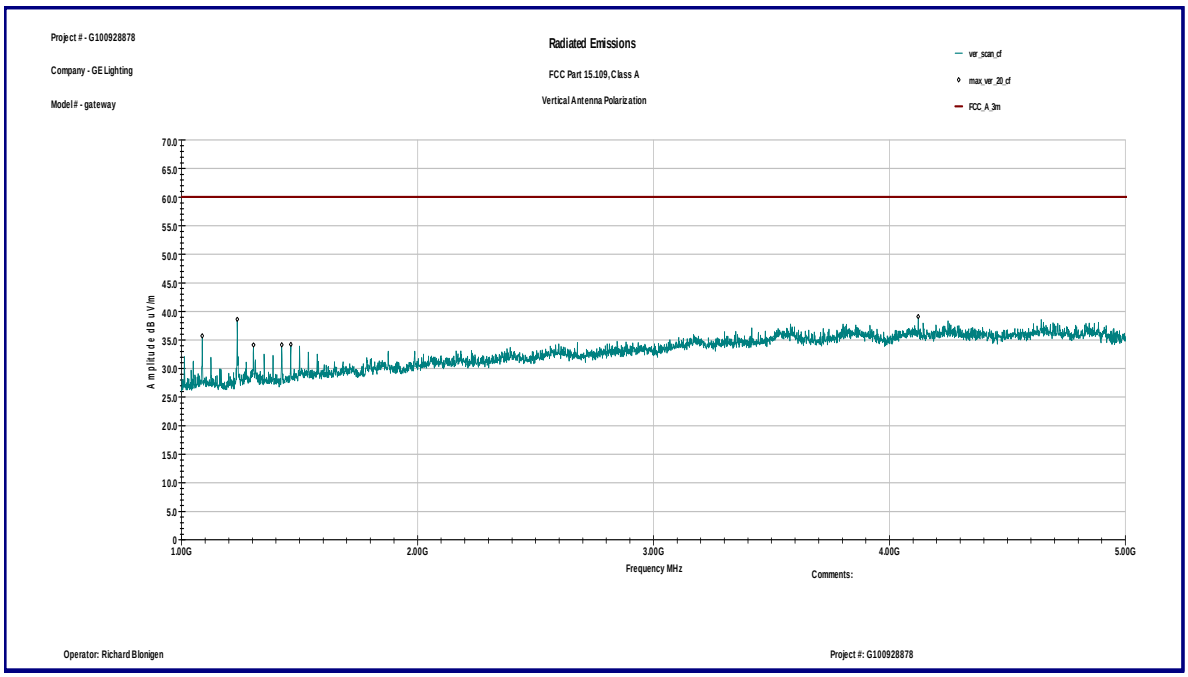
Frequency MHz	Antenna Polarity	Peak Reading dBµV	Total C.F. dB1/m	Pre-Amp. Gain (dB)	Total at 3m dBµV/m	Limit dBµV/m	Margin dB
1.087 GHz	V	51.9	25.9	42.1	35.7	60.0	-24.3
1.236 GHz	V	54.1	26.5	42.0	38.6	60.0	-21.4
1.305 GHz	V	49.2	26.8	41.9	34.1	60.0	-25.9
1.425 GHz	V	48.7	27.3	41.9	34.1	60.0	-25.9
1.463 GHz	V	48.6	27.5	41.8	34.2	60.0	-25.8
4.122 GHz	V	42.4	36.6	39.9	39.1	60.0	-20.9
1.05 GHz	H	48.2	25.8	42.1	31.9	60.0	-28.1
1.854 GHz	H	47.5	29.2	41.2	35.5	60.0	-24.5
4.705 GHz	H	39.9	37.0	39.3	37.6	60.0	-22.4



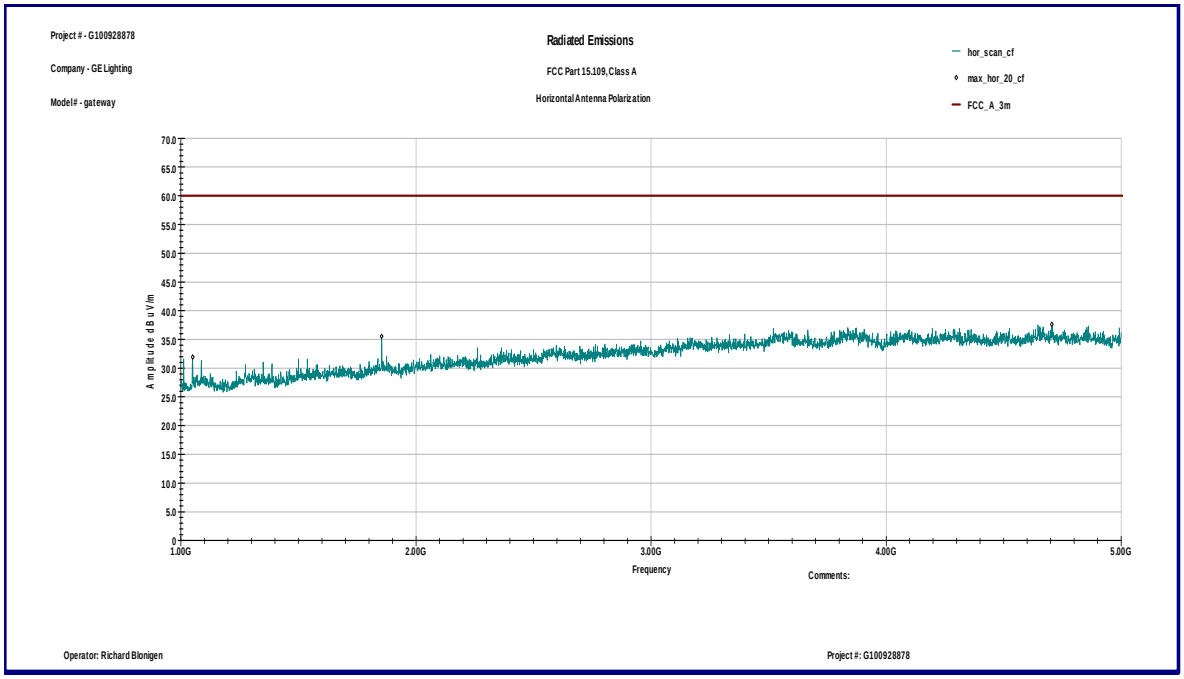
Graph 3.10.1



Graph 3.10.2



Graph 3.10.3



Graph 3.10.4

3.11 Digital device conducted emissions

Test location: ☐ OATS ☒ Anechoic Chamber ☐ Other

Test result: **Pass**

Frequency range: 0.15MHz-30MHz

Max. Emissions margin: 2.7 dB below the limits

Notes: None

Date:	July 15, 2013	**Result:**	**Pass**
Tested by:	Richard Blonigen		
Standard:	FCC Part 15.107, Class A		
Test Point:	Line 1 and Line 2		
Operation mode:	See page 5		
Note:	None		

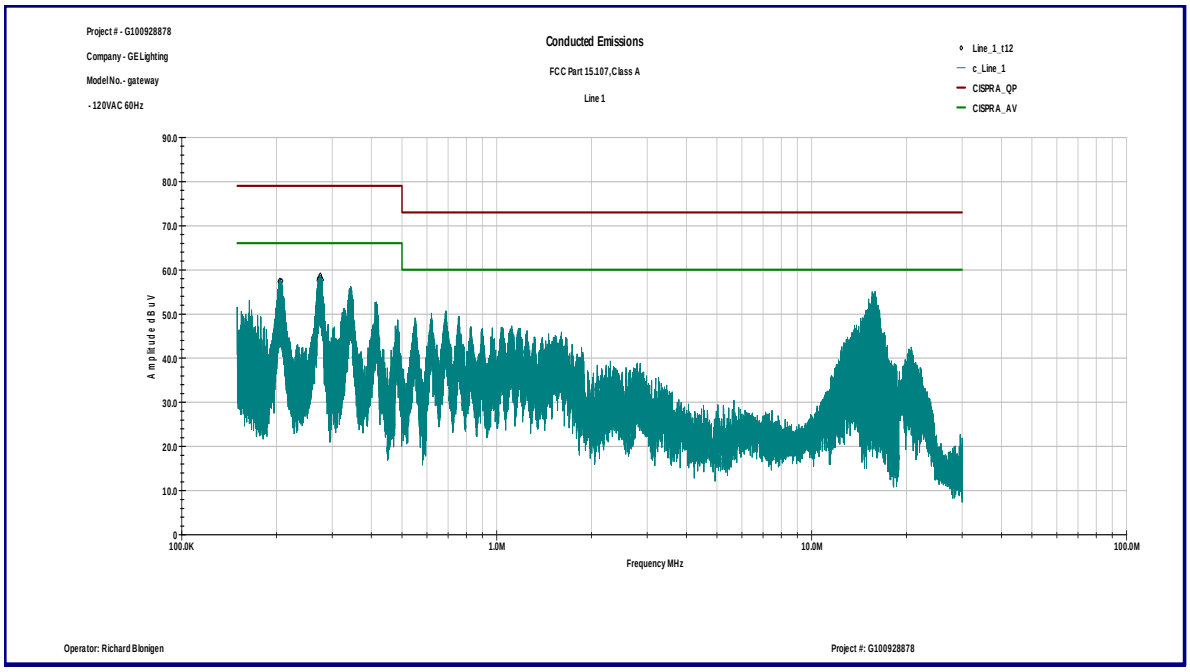
Table 3.11.1

Line 1

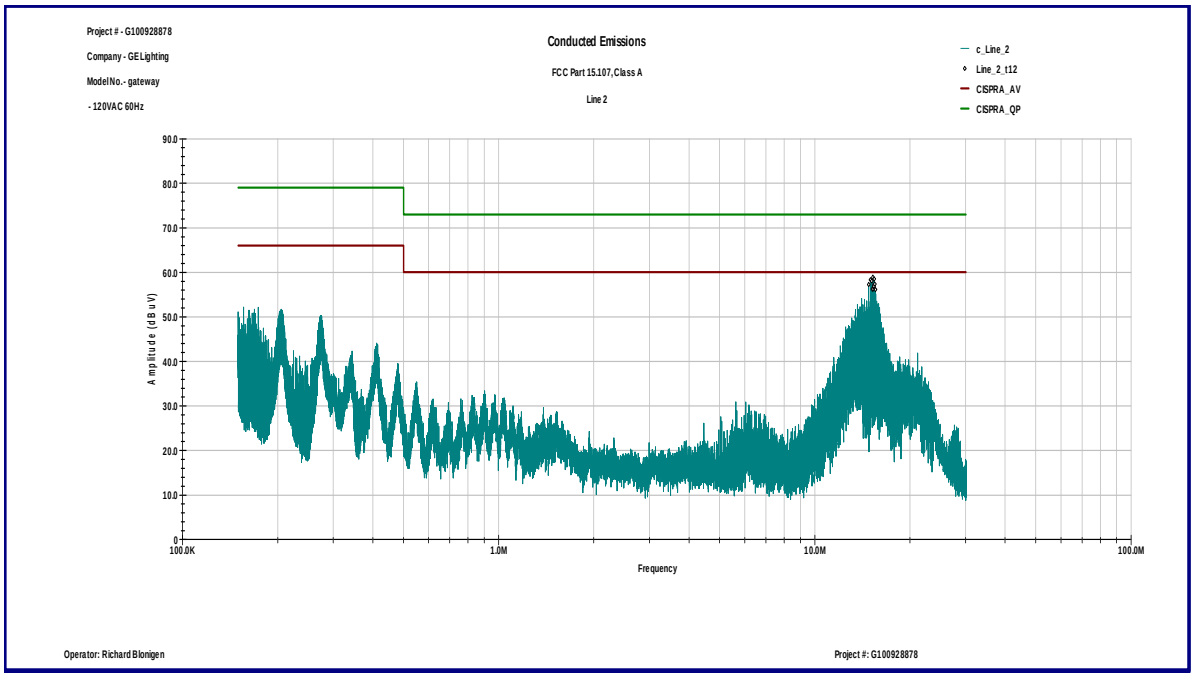
Frequency	Peak dBµV	QP dBµV	AVG dBµV	QP Limit dBµV	AVG Limit dBµV	QP Margin dB	AVG Margin dB
204.0 KHz	57.4	N/A	N/A	79.0	66.0	-21.6	-8.6
205.02 KHz	57.6	N/A	N/A	79.0	66.0	-21.4	-8.4
205.66 KHz	57.3	N/A	N/A	79.0	66.0	-21.8	-8.8
207.27 KHz	57.5	N/A	N/A	79.0	66.0	-21.5	-8.5
271.04 KHz	57.6	N/A	N/A	79.0	66.0	-21.4	-8.4
271.59 KHz	58.0	N/A	N/A	79.0	66.0	-21.0	-8.0
272.64 KHz	57.9	N/A	N/A	79.0	66.0	-21.1	-8.1
274.67 KHz	58.4	N/A	N/A	79.0	66.0	-20.6	-7.6
275.22 KHz	58.8	N/A	N/A	79.0	66.0	-20.2	-7.2
276.7 KHz	58.2	N/A	N/A	79.0	66.0	-20.8	-7.8
277.31 KHz	57.8	N/A	N/A	79.0	66.0	-21.2	-8.2
278.73 KHz	57.7	N/A	N/A	79.0	66.0	-21.3	-8.3

Line 2

Frequency	Peak dBµV	QP dBµV	AVG dBµV	QP Limit dBµV	AVG Limit dBµV	QP Margin dB	AVG Margin dB
14.796 MHz	57.3	N/A	N/A	73.0	60.0	-15.8	-2.8
15.21 MHz	56.2	N/A	N/A	73.0	60.0	-16.8	-3.8
15.272 MHz	56.3	N/A	N/A	73.0	60.0	-16.8	-3.8
15.318 MHz	57.0	N/A	N/A	73.0	60.0	-16.0	-3.0
15.342 MHz	56.7	N/A	N/A	73.0	60.0	-16.3	-3.3
15.381 MHz	56.9	N/A	N/A	73.0	60.0	-16.1	-3.1
15.399 MHz	N/A	53.9	33.6	73.0	60.0	-19.2	-26.4
15.462 MHz	N/A	54.1	34.3	73.0	60.0	-19.0	-25.7
15.466 MHz	57.3	N/A	N/A	73.0	60.0	-15.7	-2.7
15.532 MHz	56.1	N/A	N/A	73.0	60.0	-16.9	-3.9



Graph 3.11.1



Graph 3.11.2

4.0 TEST EQUIPMENT

DESCRIPTION	MANUFACTURER	MODEL	SERIAL NO.	INTERTEK ID	CAL DUE	USED
Spectrum Analyzer	R & S	FSP 40	100024	12559	11/29/2013	☒
Spectrum Analyzer	R & S	ESU	100398	25283	12/19/2013	☒
Spectrum Analyzer	R & S	ESCI	100358	12909	07/02/2013	☒
Bicono-Log Antenna	Teseq	CBL6112D	32859	25289	08/09/2013	☒
Horn Antenna	EMCO	3115	9507-4513	9936	05/16/2013	☒
Horn Antenna	EMCO	3115	6579	15580	07/19/2013	☐
Waveguide Horn Antenna	EMCO	3116	9904-2423	9705	11/07/2013	☐
LISN	Fischer Custom Communications	FCC-LISN-2 MOD.SD	316	9945	07/17/2013	☒
LISN	Solar Electronics	9252-50-R-24-BNC	068545	MIN-0060	02/07/2014	☒
System	Quantum Change	TILE! Instrument Control	Ver. 3.4.K.29	15259	VBU	☒
Spectrum Analyzer	R & S	ESU	100398	25283	12/19/2013	☒