



RADIO TEST REPORT

47 CFR FCC PART 15.247

RSS-GEN ISSUE 4

RSS-247 ISSUE 1

Report Number:	CFR- CEN-GWEXER-11242015
Test Dates:	11/ 10, 13, 16, 18, 19, 20, 23 /2015

EWO:	2151
-------------	------

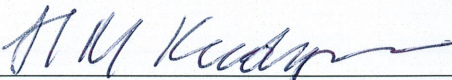
Models:	CEN-GWEXER
----------------	------------

FCC ID:	EROCENGWEXER
IC:	5683C-CENGWEXER

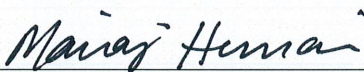
FRN:	0005022819
ADDRESS:	15 Volvo Dr, Rockleigh, NJ 07647

Report Date: 12/23/2015

Test Result: Pass

Prepared by: 
Hirayr M. Kudyan, Senior Compliance Engineer,
Ph.D., P.E., NCE

Date: 11/24/2015

Reviewed by: 
Mairaj Hussain, Global Compliance Manager

Date: 12/23/2015



Contents

1. REFERENCE STANDARDS	4
1.1 TEST FACILITY	4
2. SYSTEM TEST CONFIGURATION	5
2.1 PRODUCT DESCRIPTION	5
2.2 BLOCK DIAGRAM.....	5
2.3 EUT SETUP JUSTIFICATION	7
2.4 EUT EXERCISE SOFTWARE AND MODE(S) OF OPERATION.....	7
2.5 CABLES.....	11
2.6 SPECIAL ACCESSORIES.....	11
2.7 SUPPORT EQUIPMENT.....	12
2.8 EQUIPMENT MODIFICATION	12
2.9 TEST EQUIPMENT	13
3. TEST RESULTS.....	14
3.1 COMPLIANCE STATEMENT	14
3.2 ANTENNA REQUIREMENTS	15
3.3 6 DB BANDWIDTH.....	15
3.2 99% BANDWIDTH	19
POWER OUTPUT	23
3.4 BAND EDGE CONDUCTED	30
3.5 CONDUCTED SPURIOUS EMISSIONS.....	33
3.6 POWER SPECTRAL DENSITY.....	39
3.7 RADIATED SPURIOUS EMISSIONS	44
3.8 TRANSMITTER AC POWER LINE CONDUCTED EMISSIONS	54
3.9 DUTY CYCLE CORRECTION FACTOR (DCCF) MEASUREMENTS.....	61



This document shall not be reproduced, except in full, without written approval from Crestron Electronics, Inc.

Revision History

Revision	Description	Date
00	Initial release	11/24/2015



1. Reference Standards

Measurements were performed according to the following procedures and standards:

- 1) ANSI C63.4: 2014
- 2) FCC Publication, "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating under §15.247", June 5, 2014
- 3) Industry Canada RSS-Gen Issue 4
- 4) Industry Canada RSS-247 Issue 1
- 5) Industry Canada ICES-003 Issue 5

All measurements were performed in a 3-meter semi-anechoic chamber and the control room.

1.1 Test Facility

The 3-meter semi-anechoic chamber used to collect conducted and radiated emission data is located at 22 Link Drive, Rockleigh, New Jersey. This test facility has been placed on file with the FCC, Registration Number: 412871, and Industry Canada, Site Number: 5683C-1.

2. System Test Configuration

2.1 Product Description

The equipment under test (EUT) is an infiNET EX™ Gateway, manufactured by Crestron Electronics, Inc. The EUT software facilitates broadcasting its ID as being CEN. The EUT can be powered by 24V power supply or PoE injector.

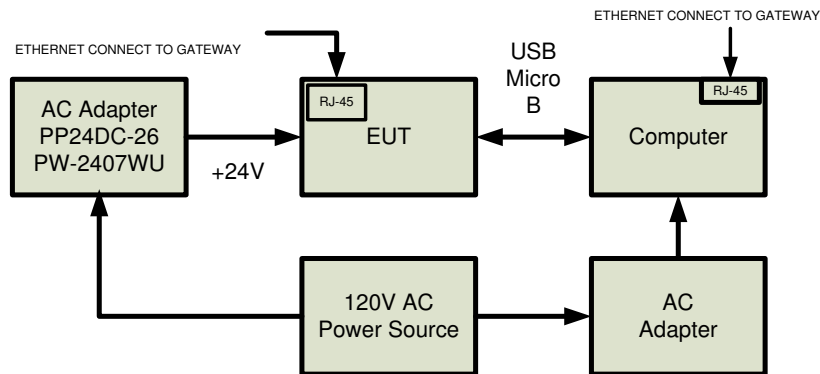
Model Number: CEN-GWEXER (Power by Power supply)
 CEN-GWEXER-PWE (Power by PoE)

2.2 Block Diagram

The EUT can be powered either by a 24VDC or a PoE AC Adaptor. Prior to test start a PC is used to set up EUT operation, via the USB port, then removed for testing. The block diagrams for both modes of operation are shown below:

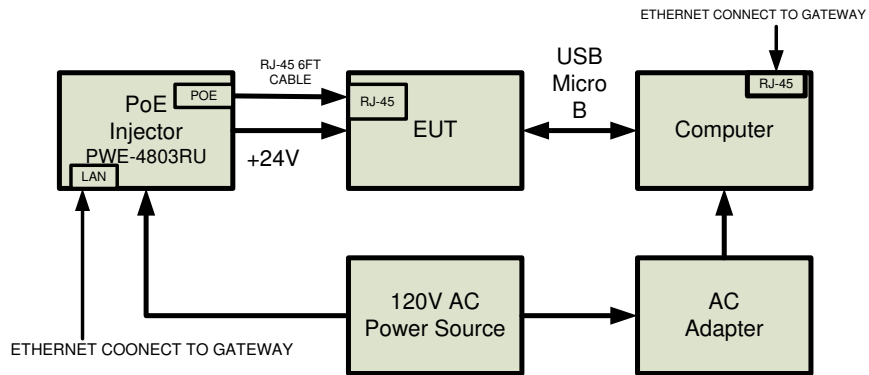
24VDC Mode of Operation

AC Power Adapter; PYNG-GATEWAY and CEN-GWEXER



PoE Mode of Operation

Block Diagram



2.3 EUT Setup Justification

The EUT system was configured for testing in a representative user configuration with nominal interface data activity and typical loading. For radiated and conducted radio emissions testing, “*rftelec*” command was used to control RF power modulation, frequency and level. For radio Duty-Cycle measurements the “*testpacket*” command was used to have the EUT send packets to a typical client device (Crestron CLW-DIMEX-P).

2.4 EUT Exercise Software and Mode(s) of Operation

For radio Conducted and Radiated tests, the EUTs were configured to transmit continuously, with pseudorandom carrier modulation, mostly over the following channels:

- Channel 11 (2405 MHz)
- Channel 18 (2440 MHz)
- Channel 24 (2470 MHz)
- Channel 25 (2475 MHz)
- Channel 26 (2480 MHz)

During radio conducted emissions tests, the EUTs were controlled via their USB port. For radio radiated (including duty-cycle measurement) tests the EUTs were controlled via their LAN port.

Step-by-step Operating Instructions:


After configuring one of the above test setups, establish connection over the EUT USB port.

Setup EUT via its USB port using a Laptop Computer with Crestron Toolbox, V 2.39.232:

Load normal application firmware to CEN-GWEXER

Double click Crestron Toolbox, found from a computer desktop

Click Tools – Text Console

Click pencil icon , located on the bottom of the Text Console screen

Check USB

Device Type: Generic Console

Click OK

Select Text console  and Press ENTER until “CEN-GWEXER>” shows up.



The IP address of the EUT is determined by entering the “est” command:

```
CEN-GWEXER>est
MAC Address: 00.10.7f.05.1e.65
DHCP: Enabled
IP Address: 172.30.128.63
Subnet Mask: 255.255.240.0
Def Router : 172.30.128.1
Pri DNS IP: 192.168.200.133
DHCP Server IP: 192.168.200.242
Offered Lease Time: 3600 seconds
Time to Renew Lease: 1560 seconds
Time to Rebind Lease: 2760 seconds
```

Once the IP address of the EUT is known, the EUT may also be controlled via its LAN port, using the Text Console window of the Crestron Toolbox application.

Radio emissions (conducted or radiated) testing

The command for producing pseudorandom modulated RF power at the EUT antenna port, in a specific channel continuously is:

```
rftelec 1 <channel #> <power setting>
```

<channel> can take an integral value over the interval [11, 26]

<power setting> can take an integral value in the interval [213, 264] (see 2nd column of the Table below), corresponding to the listed power levels in dBm, in the 3rd, 4th and 5th columns for Channels 11, 18 and 26 respectively:



EM357 Power set (dBm)	Power setting command manually- signed hexadecimal	2405 (MHz) output power (dBm)	2440 (MHz) output power (dBm)	2480 (MHz) output power (dBm)
-43	213	-37.99	-38.41	-39.03
-26	230	-3.643	-4.257	-5.086
-20	236	2.142	1.556	0.727
-17	239	5.661	5.059	4.241
-14	242	8.040	7.448	6.628
-12	244	9.957	8.370	8.561
-11	245	11.462	10.898	10.098
-9	247	12.775	12.200	11.418
-8	248	13.920	13.360	12.580
-7	249	14.834	14.270	13.568
-6	250	15.653	15.131	14.364
-5	251	16.287	15.874	15.140
-4	252	17.594	17.126	16.429
-3	253	18.562	18.140	17.489
-2	254	19.093	18.744	18.241
-1	255	19.693	19.370	18.929
0	256	20.135	19.927	19.615
1	257	20.548	20.325	20.062
2	258	20.800	20.618	20.411
3	259	21.051	20.881	20.658
4	260	21.303	21.205	21.050
5	261	21.331	21.238	21.205
6	262	21.367	21.323	21.228
7	263	21.457	21.352	21.263
8	264	21.462	21.420	21.356

The command for stopping the generation of RF power at the EUT antenna port is:

rftelec 0



Duty Cycle measurement testing

The EUT(gateway) was made to “acquire” clients and then send packets to a sample client (Crestron CLW-DIMEX-P) placed near the EUT, using the following procedures:

Acquiring

- CEN-GWEXER>**acquire start**
acquire started
- On the EUT, press the Backlight button four times, holding it down on the fourth press (press, press, press, press+hold). After a few seconds, the backlight flashes, indicating the remote is now in Acquire mode.
- Upon a successful acquire, toolbox screen shows a similar message:
CEN>[FAh][B3h] Active 000d6f00048c7b7a 00000000 Y 07 Y HR-100 [v0.006.0072,
#00000000] [FBh]
- CEN-GWEXER >**acquire stop**
acquire stopped
CEN>[FAh][B1h] Acquire Ended.[FBh]
[FAh][B1h] Acquire Ended.[FBh]

The EUT activity LED turns on (green)

Sending 50,000 Packets

CEN-GWEXER >**testpacket 1 all 50000 56 50**



2.5 Cables

Qty	Description	Length (feet)	From - To	Type	Shielded/Unshielded
1	LAN cable	25	EUT-to-LAN jack outside EMC chamber	CAT5	Not shielded
1	USB cable	6	Laptop PC –to- EUT	USB	Shielded
1	Power cord	6	PoE Adaptor –to- AC jack	Power cord	Not shielded

2.6 Special Accessories

There are no special accessories for compliance of this EUT.



2.7 Support equipment

Qty	Description	Manufacturer	Model No	Serial No
1	24VDC-AC Adaptor (wall type)	Crestron	PW-XXXWUL	n/a
1	802.3af PoE Injector, 100Mb (brick)	Crestron	PWE-48003RU	n/a
1	Laptop PC	Dell	LATITUDE/E6500	2ZV4ZK1
1	Wireless in-wall dimmer	Crestron	CLW-DIMEX-P	X121662

2.8 Equipment Modification

There were no modifications installed during compliance measurements.



2.9 Test Equipment

Equipment Type	Frequency Range	Manufacturer	Model No.	Serial No.	Cal. Done by	Cal. Date	Cal. Due Date
R&S EMI Receiver	20 Hz – 40 GHz	ROHDE & SCHWARZ	ESU40	100076	R & S	09/17/2015	09/17/2016
Teseq Bilog Antenna	30 MHz – 2 GHz	Teseq	CBL 6112D	25231	Liberty Lab Inc.	09/08/2015	09/08/2016
ETS-Lindgren Double Ridge Horn Antenna	1 GHz – 18 GHz	ETS	3117	00047560	Liberty Lab Inc.	09/04/2015	09/04/2016
R&S Preamplifier	1GHz – 18 GHz	ROHDE & SCHWARZ	TS-PR18	100044	Liberty Lab Inc.	09/08/2015	09/08/2016
ETS-Lindgren Standard Gain Horn Antenna	18 GHz – 26.5 GHz	ETS	3160-09	00078911	Liberty Lab Inc.	09/08/2015	09/08/2016
R&S Preamplifier	18 GHz – 26.5 GHz	ROHDE & SCHWARZ	TS-PR26	100030	Liberty Lab Inc.	09/08/2015	09/08/2016

All instruments are calibrated in accordance with the manufacturer's recommendations.

All antennas are calibrated per ANSI C63.5.

All equipment is calibrated using standards traceable to NIST or other nationally recognized calibration system.

3. Test Results

3.1 Compliance Statement

Rule Section		Description	Date of Test (mm/dd/yy)	Test Engineer	Results
FCC	IC				
§15.203	§8.3 of RSS-Gen	Antenna Requirement	-	-	Complies
§15.247(a)(2)	§5.2(1) of RSS-247	6 dB Bandwidth, 500 kHz	11/16/2015	Hirayr M. Kudyán	Complies
N/A	§6.6 of RSS-Gen	99% Occupied Bandwidth	11/16/2015	Hirayr M. Kudyán	(for reporting purpose)
§15.247(b)(3)	§5.4(4) of RSS-247	Power Output, conducted, 1 Watt (30dBm)	11/16/2015	Hirayr M. Kudyán	Complies
§15.247(d)	§A5.5 of RSS-247	Band Edge	11/16/2015	Hirayr M. Kudyán	Complies
§15.247(d)	§5.5 of RSS-247	Conducted Spurious Emissions, -20 dBc	11/16/2015	Hirayr M. Kudyán	Complies
§15.247(e)	§5.2(2) of RSS-247	Power Spectral Density (PSD), 8 dBm in any 3 kHz band.	11/16/2015	Hirayr M. Kudyán	Complies
§15.205, §15.209, §15.247(d)	§5.5 of RSS-247; §8.9 of RSS-Gen	Radiated Spurious Emissions	11 / 10, 11, 13, 15, 17, 18, 20, 23 / 2015	Hirayr M. Kudyán	Complies*
§15.207	§8.8 of RSS-Gen	Transmitter AC Power Line Conducted Emissions	11 / 9, 10 / 2015	Hirayr M. Kudyán	Complies

*See limitations on Channel 25 and 26 power level settings to meet Upper Band Edge criteria under Radiated Spurious Emissions.

Note:

The channels selected for tests were 11, 18, 25 and 26.



3.2 Antenna Requirements

The EUT uses an RP SMA antenna. Antenna model and gain are as follows:

EUT	Antenna Make/Model	Gain (Peak)
CEN-GWEXER	Z&Y / CO47-RF-002	2dBi±0.5

The antenna exhibit for details.

3.3 6 dB bandwidth

Criterion: The minimum 6 dB bandwidth shall be at least 500 kHz.

Test Procedure: Per 558074 D01 DTS Meas Guidance v03r02 § 8.

- a) Set RBW = 100 kHz.
- b) Set the video bandwidth (VBW) $\geq 3 \times$ RBW.
- c) Detector = Peak.
- d) Trace mode = max hold.
- e) Sweep = auto couple.
- f) Allow the trace to stabilize.
- g) Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

All Conducted Radio tests were done in 24VDC mode for both EUTs.

CEN-GWEXER (24VDC Mode)

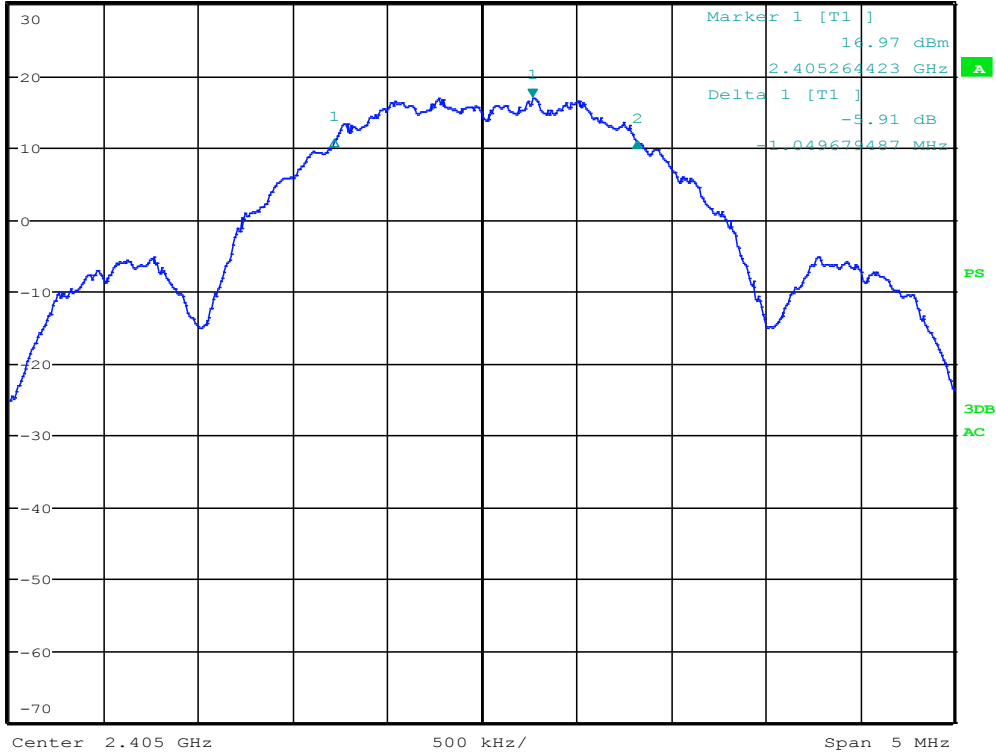
Channel	Frequency(MHz)	6 dB Bandwidth(kHz)
11	2405	1602.6
18	2440	1634.6
26	2480	1610.6

6 dB Bandwidth, Channel 11: CEN-GWEXER (24VDC Mode)



Ref 30 dBm *Att 50 dB RBW 100 kHz Delta 2 [T1] -6.28 dB
 *VBW 300 kHz SWT 2.5 ms 552.884615392 kHz

1 PK
VIEW



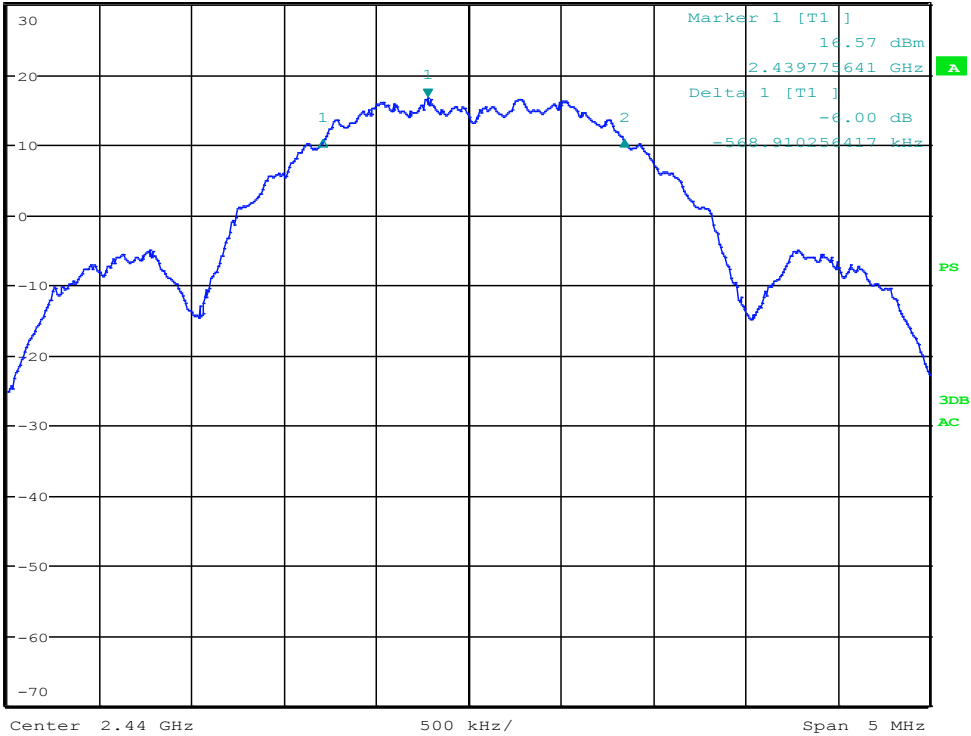
Date: 8.DEC.2015 15:15:27

6 dB Bandwidth, Channel 18: CEN-GWEXER (24VDC Mode)



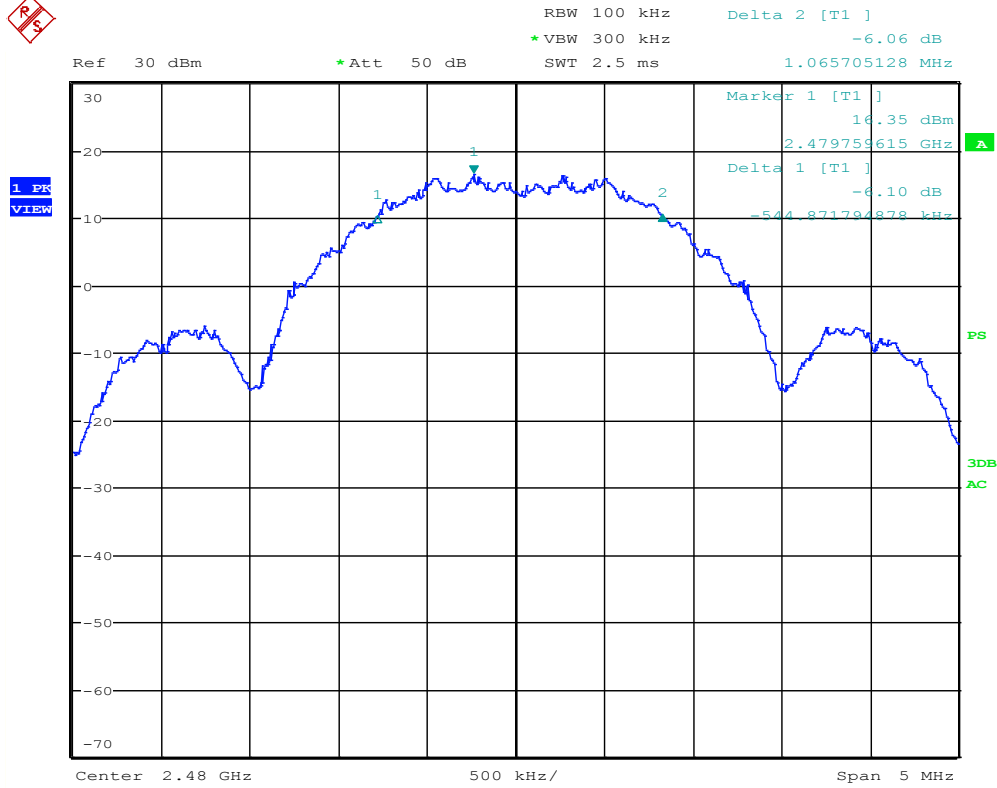
Ref 30 dBm *Att 50 dB RBW 100 kHz Delta 2 [T1] -5.92 dB
 *VBW 300 kHz 1.065705128 MHz
 SWT 2.5 ms

1 PK
VIEW



Date: 8.DEC.2015 15:09:11

6 dB Bandwidth, Channel 26: CEN-GWEXER (24VDC Mode)



Date: 8.DEC.2015 15:12:19



3.2 99% Bandwidth

Performance Criterion: The minimum 26dB bandwidth from the Peak.

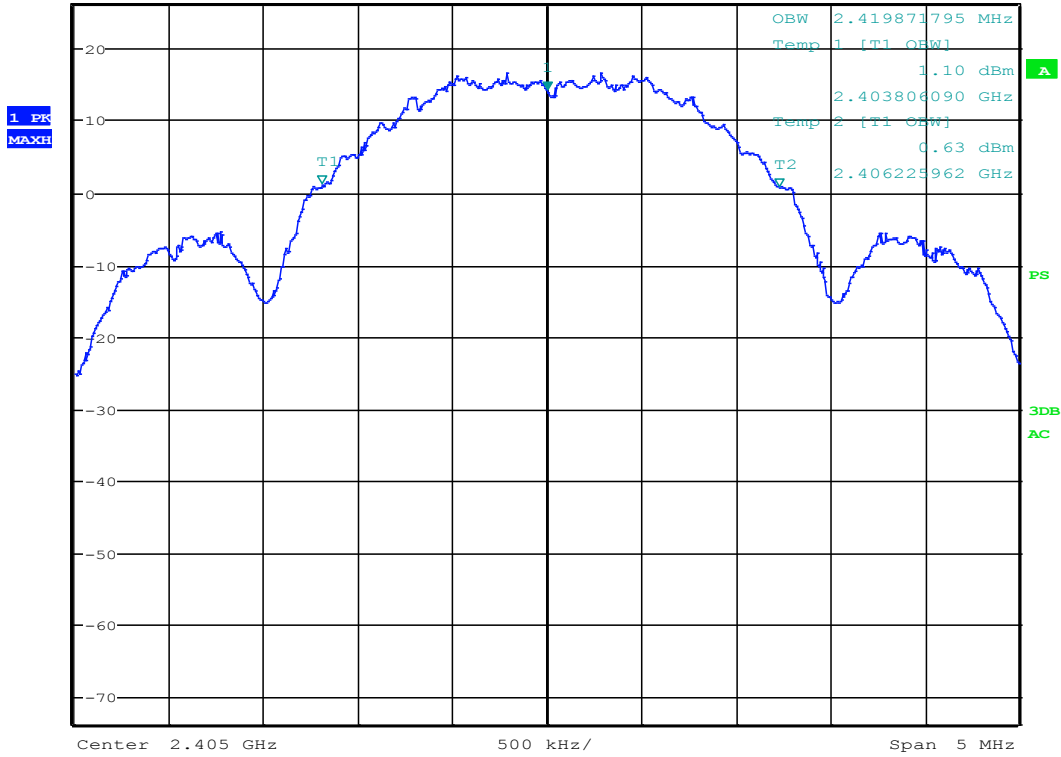
CEN-GWEXER (24VDC Mode)

Channel	Frequency(MHz)	99% dB Bandwidth(MHz)
11	2405	2419.9
18	2440	2459.9
26	2480	2443.9

99% dB Bandwidth, Channel 11: CEN-GWEXER (24VDC Mode)



*RBW 100 kHz Marker 1 [T1]
 *VBW 300 kHz 14.11 dBm
 Ref 26 dBm *Att 50 dB SWT 2.5 ms 2.405000000 GHz

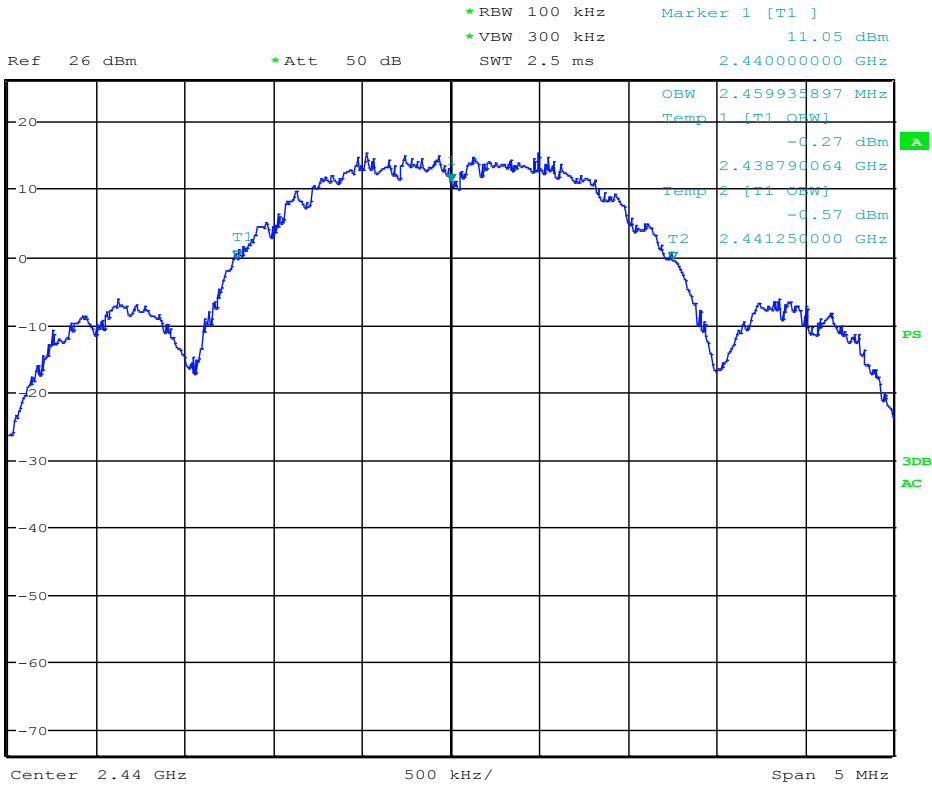


Date: 16.NOV.2015 17:24:19

99% dB Bandwidth, Channel 18: CEN-GWEXER (24VDC Mode)



1. PR
MAGCH

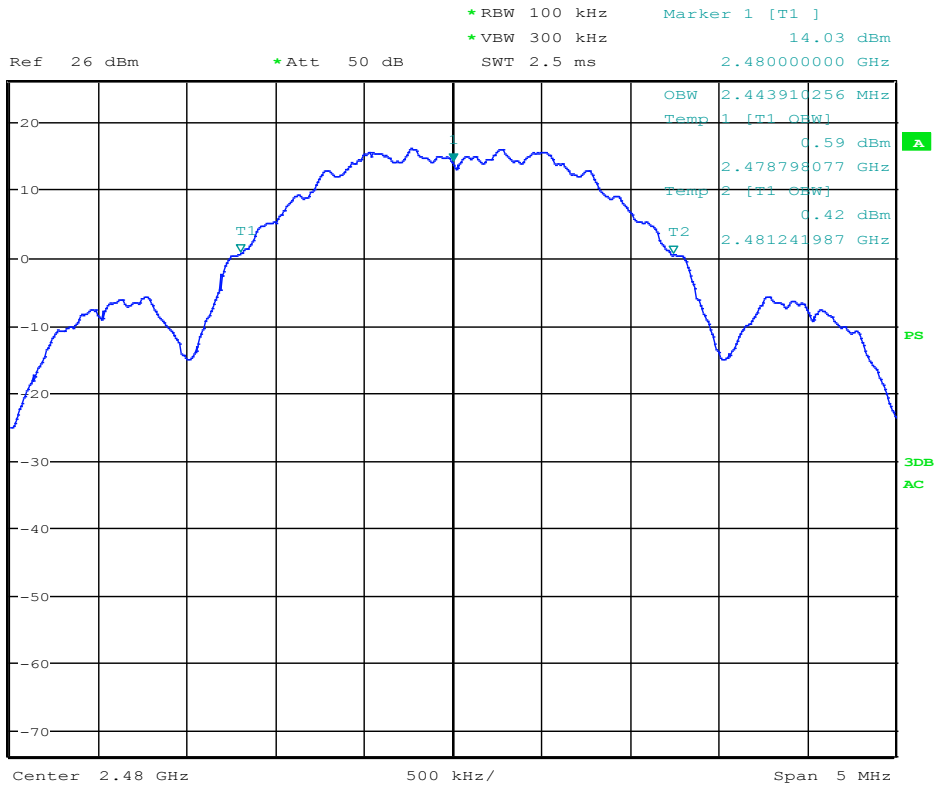


Date: 16.NOV.2015 17:22:21

99% dB Bandwidth, Channel 26: CEN-GWEXER (24VDC Mode)



1. PK
MAX



Date: 16.NOV.2015 17:20:20



Power Output

Criterion: The maximum peak conducted output power shall not exceed 1 Watt or 30 dBm

Test Procedure: Per 558074 D01 DTS Meas Guidance v03r02 § 9.1.1

- a) Set the RBW \geq *DTS bandwidth*.
- b) Set VBW $\geq 3 \times$ RBW.
- c) Set span $\geq 3 \times$ RBW
- d) Sweep time = auto couple.
- e) Detector = peak.
- f) Trace mode = max hold.
- g) Allow trace to fully stabilize.
- h) Use peak marker function to determine the peak amplitude level.

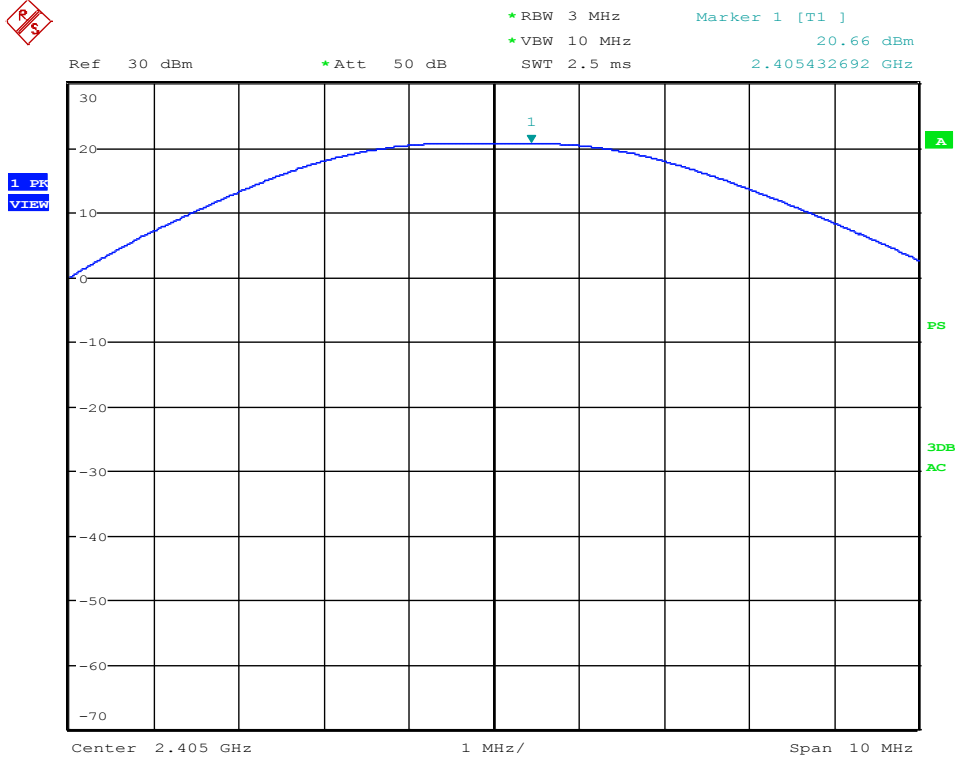


CEN-GWEXER (24VDC Mode)

Channel	Frequency(MHz)	Output Power Level Setting (hexadecimal)	Measured Power	
			dBm	mW
11	2405	256	20.66	116.41
18	2440	256	20.40	109.65
24	2470	256	20.13	103.04
25	2475	254	19.22	83.56
26	2480	230	-3.51	0.45



Power Output, Channel 11: CEN-GWEXER (24VDC Mode)



Date: 8.DEC.2015 17:33:21



Power Output, Channel 18: CEN-GWEXER (24VDC Mode)

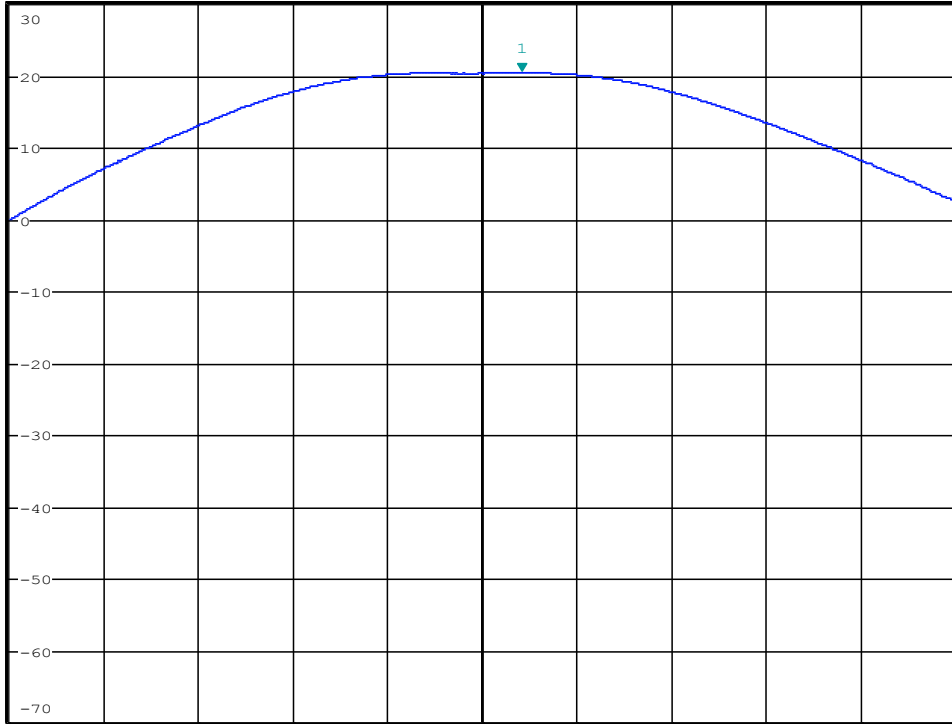


*RBW 3 MHz Marker 1 [T1]
*VBW 10 MHz 20.40 dBm
SWT 2.5 ms 2.440416667 GHz

Ref 30 dBm

*Att 50 dB

1 PK
VIEW



Center 2.44 GHz

1 MHz/

Span 10 MHz

Date: 8.DEC.2015 17:35:25

Power Output, Channel 24: CEN-GWEXER (24VDC Mode)

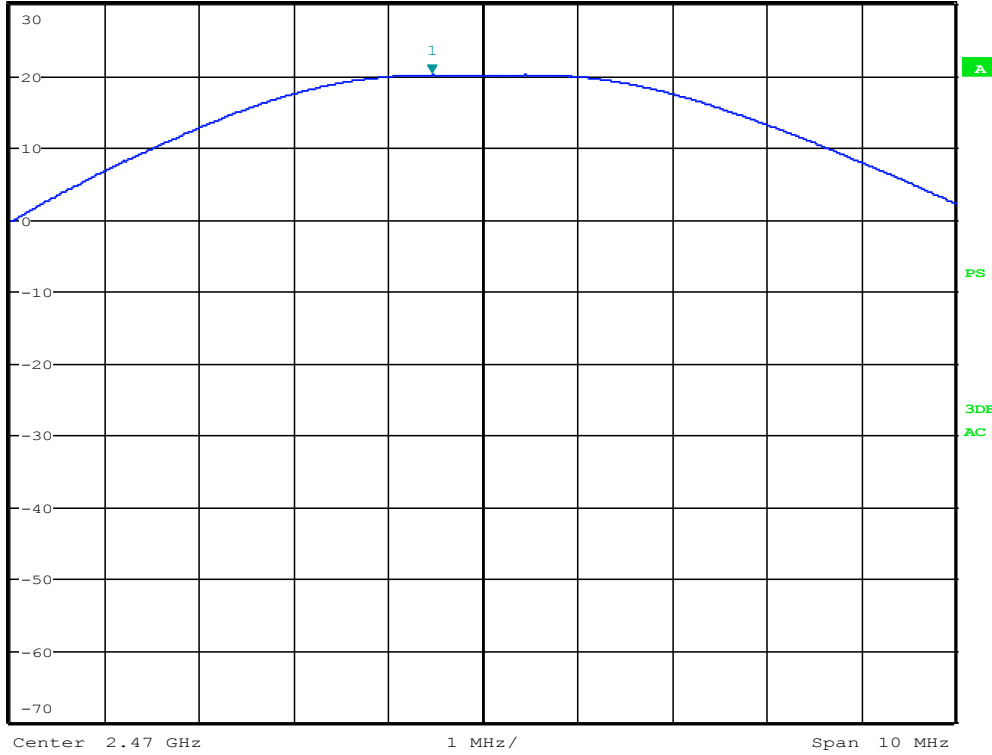


*RBW 3 MHz Marker 1 [T1]
 *VBW 10 MHz 20.13 dBm
 SWT 2.5 ms 2.469455128 GHz

Ref 30 dBm

*Att 50 dB

1 PK
VIEW



Date: 8.DEC.2015 17:36:54

Power Output, Channel 25: CEN-GWEXER (24VDC Mode)

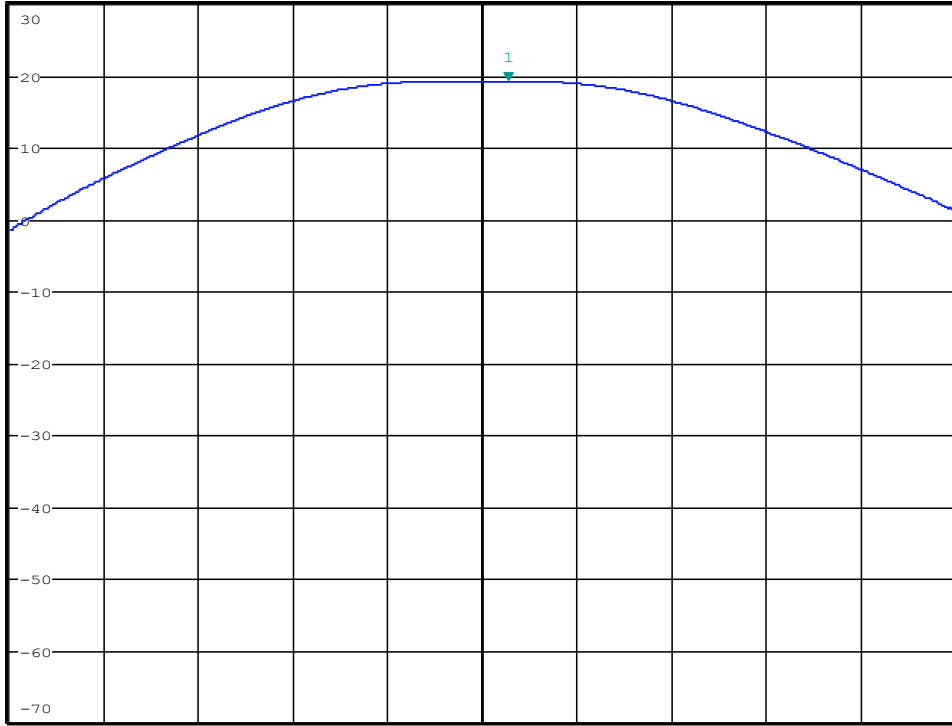


*RBW 3 MHz Marker 1 [T1]
 *VBW 10 MHz 19.22 dBm
 SWT 2.5 ms 2.475272436 GHz

Ref 30 dBm

*Att 50 dB

1 PK
VIEW



Center 2.475 GHz

1 MHz/

Span 10 MHz

Date: 8.DEC.2015 17:39:16

Power Output, Channel 26: CEN-GWEXER (24VDC Mode)

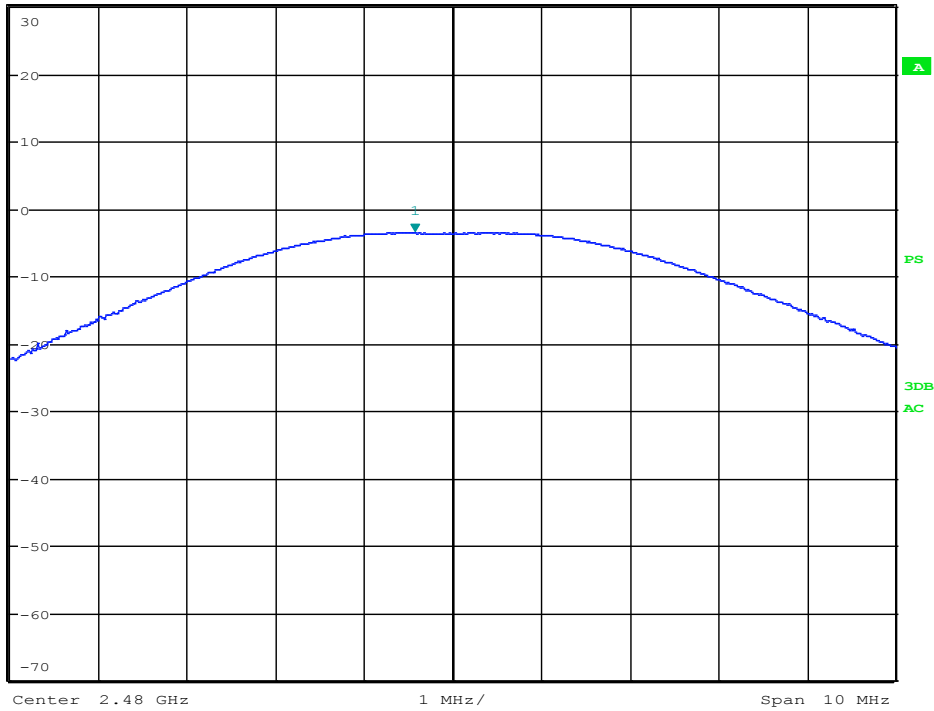


*RBW 3 MHz Marker 1 [T1]
 *VBW 10 MHz -3.51 dBm
 SWT 2.5 ms 2.479567308 GHz

Ref 30 dBm

*Att 50 dB

I PK
VIEW



Date: 8.DEC.2015 17:41:07



3.4 Band Edge Conducted

Criterion: In any 100 kHz bandwidth outside the frequency band, the RF power shall be at least 20 dB below that in the 100 kHz bandwidth within the band.

Test Procedure: Per 558074 D01 DTS Meas Guidance v03r02 § 11

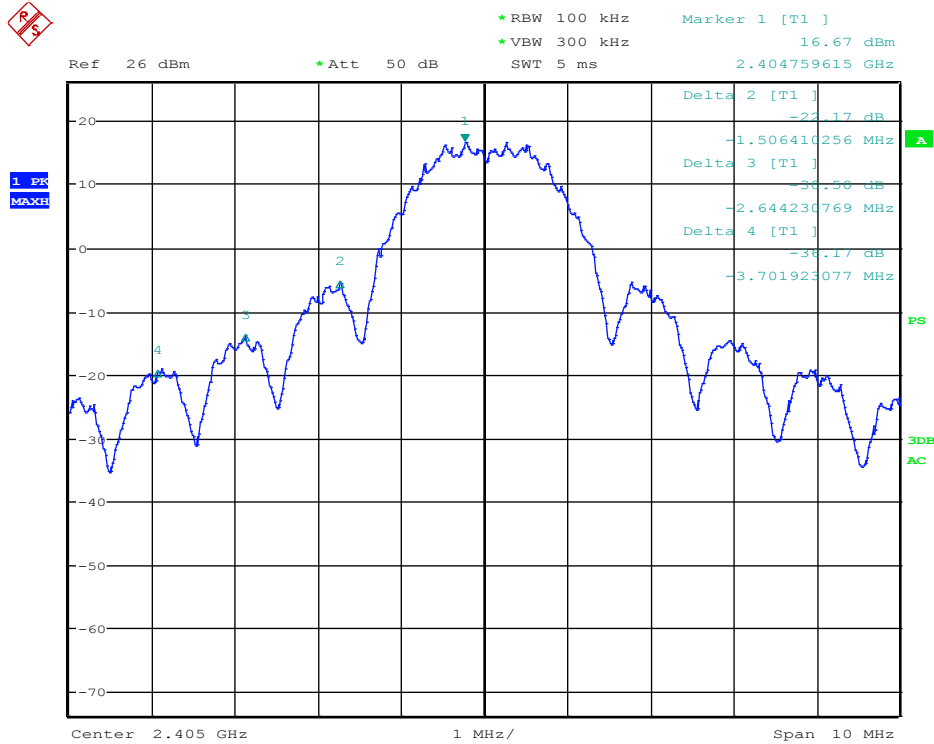
The DTS rules specify that in any 100 kHz bandwidth outside of the authorized frequency band, the power shall be attenuated according to the following conditions:

a) If the maximum peak conducted output power procedure was used to demonstrate compliance as described in 9.1, then the peak output power measured in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum in-band peak PSD level in 100 kHz (*i.e.*, 20 dBc).

b) If maximum conducted (average) output power was used to demonstrate compliance as described in 9.2, then the peak power in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 30 dB relative to the maximum in-band peak PSD level in 100 kHz (*i.e.*, 30 dBc).

c) In either case, attenuation to levels below the 15.209 general radiated emissions limits is not required.

Band Edge, Channel 11: CEN-GWEXER (24VDC Mode)



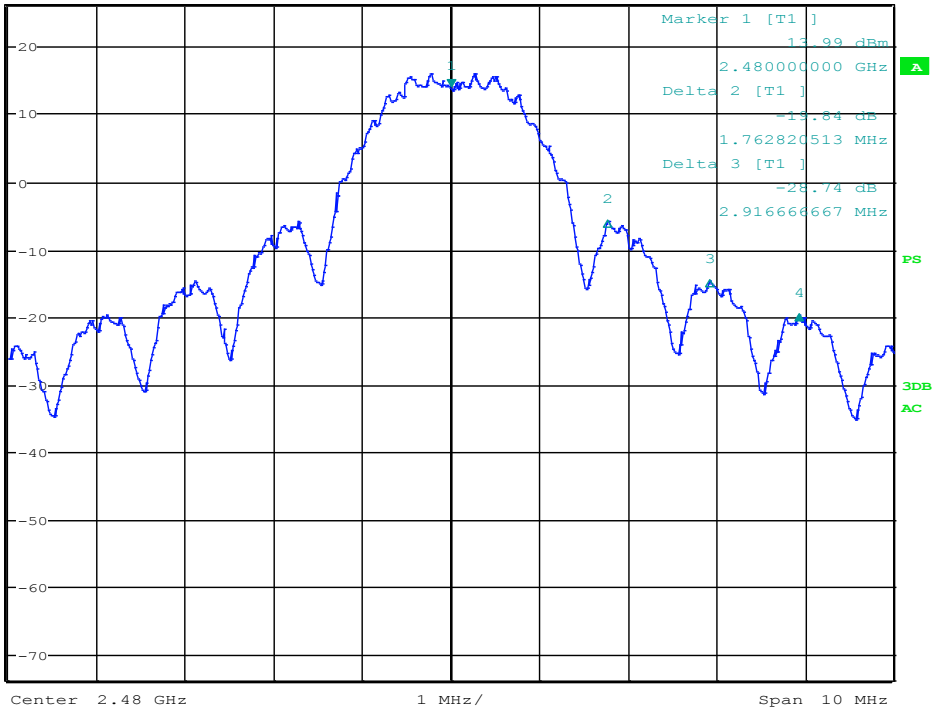
Date: 16.NOV.2015 17:47:23

Band Edge, Channel 26: CEN-GWEXER (24VDC Mode)



*RBW 100 kHz Delta 4 [T1]
 *VBW 300 kHz -33.76 dB
 Ref 26 dBm *Att 50 dB SWT 5 ms 3.926282051 MHz

1 PK
MAX



Date: 16.NOV.2015 17:42:26



3.5 Conducted Spurious Emissions

Criterion: In any 100 kHz bandwidth outside the frequency band, the RF power shall be at least 20 dB below that in the 100 kHz bandwidth within the band.

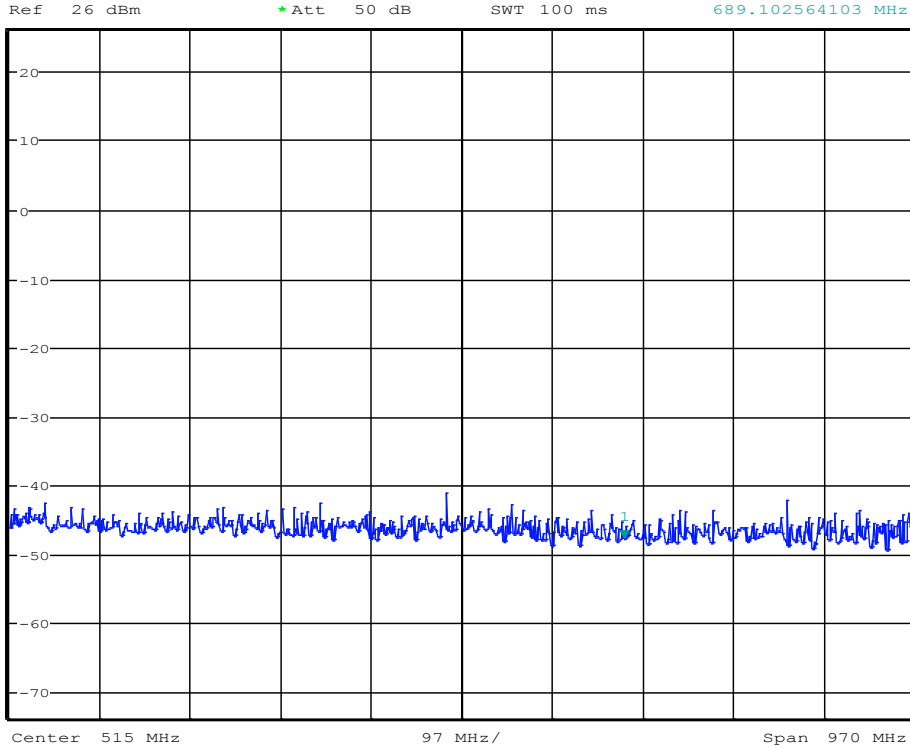
Test Procedure: Per 558074 D01 DTS Meas Guidance v03r02 § 11



Conducted Spurious Emission, 30MHz to 1GHz, Channel 11: CEN-GWEXER (24VDC Mode)



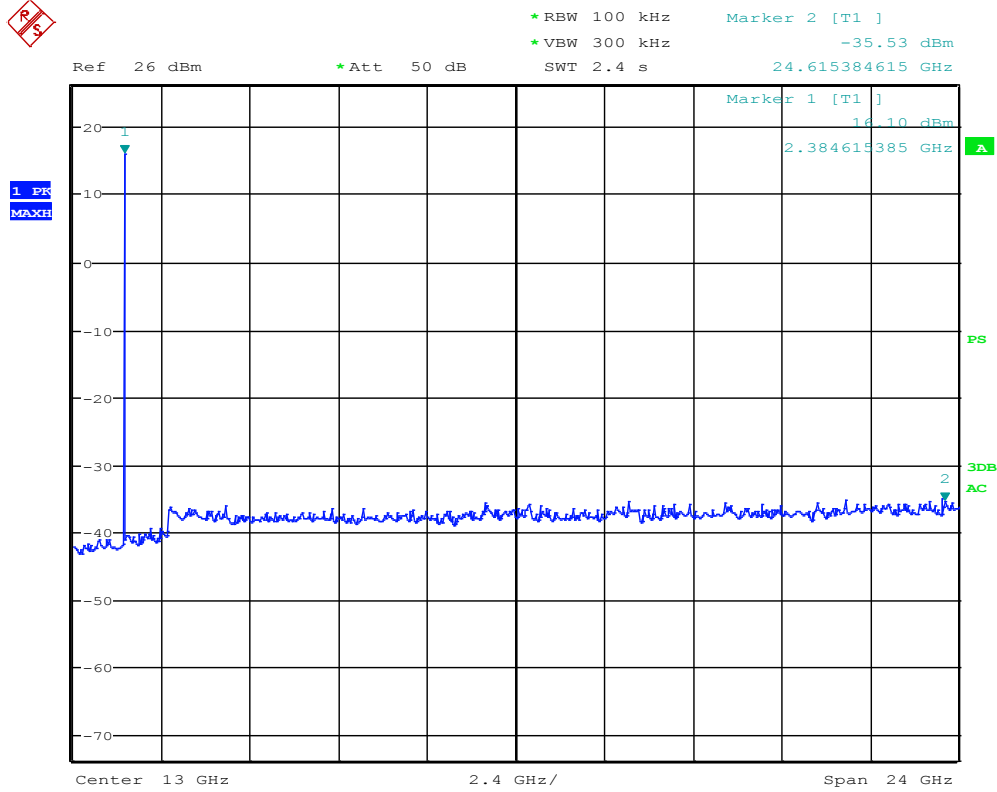
*RBW 100 kHz Marker 1 [T1]
*VBW 300 kHz -47.77 dBm
SWT 100 ms 689.102564103 MHz



Date: 16.NOV.2015 17:53:25



Conducted Spurious Emission, 1GHz to 25GHz, Channel 11: CEN-GWEXER (24VDC Mode)



Date: 16.NOV.2015 18:04:48



Conducted Spurious Emission, 30MHz to 1GHz, Channel 18: CEN-GWEXER (24VDC Mode)

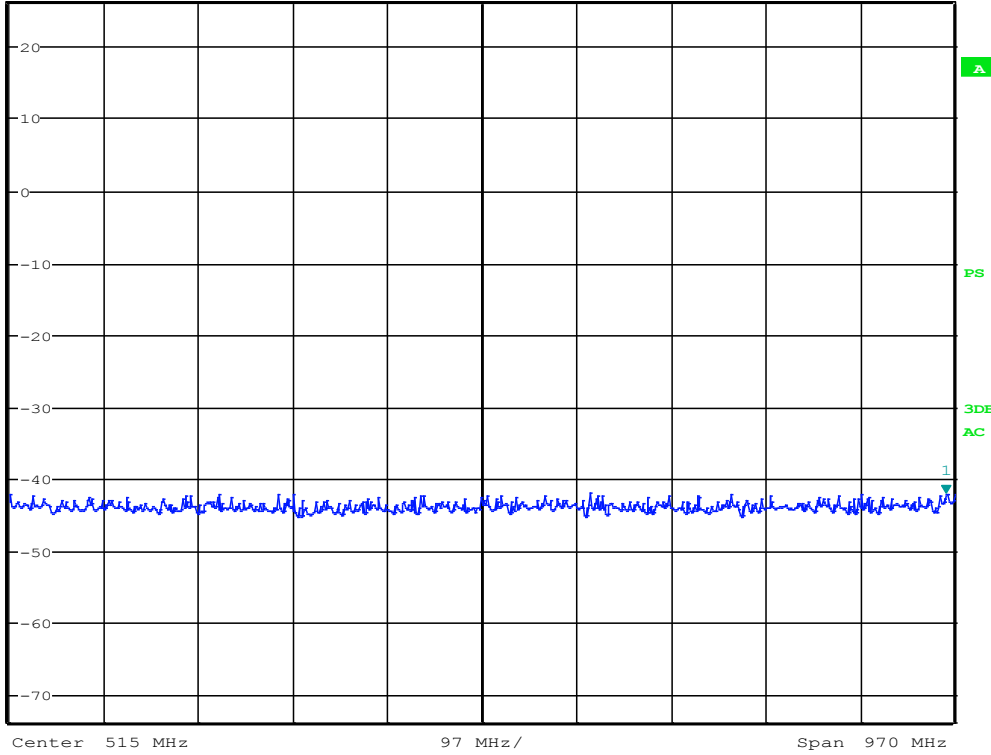


*RBW 100 kHz Marker 1 [T1]
*VBW 300 kHz -42.07 dBm
SWT 100 ms 990.673076923 MHz

Ref 26 dBm

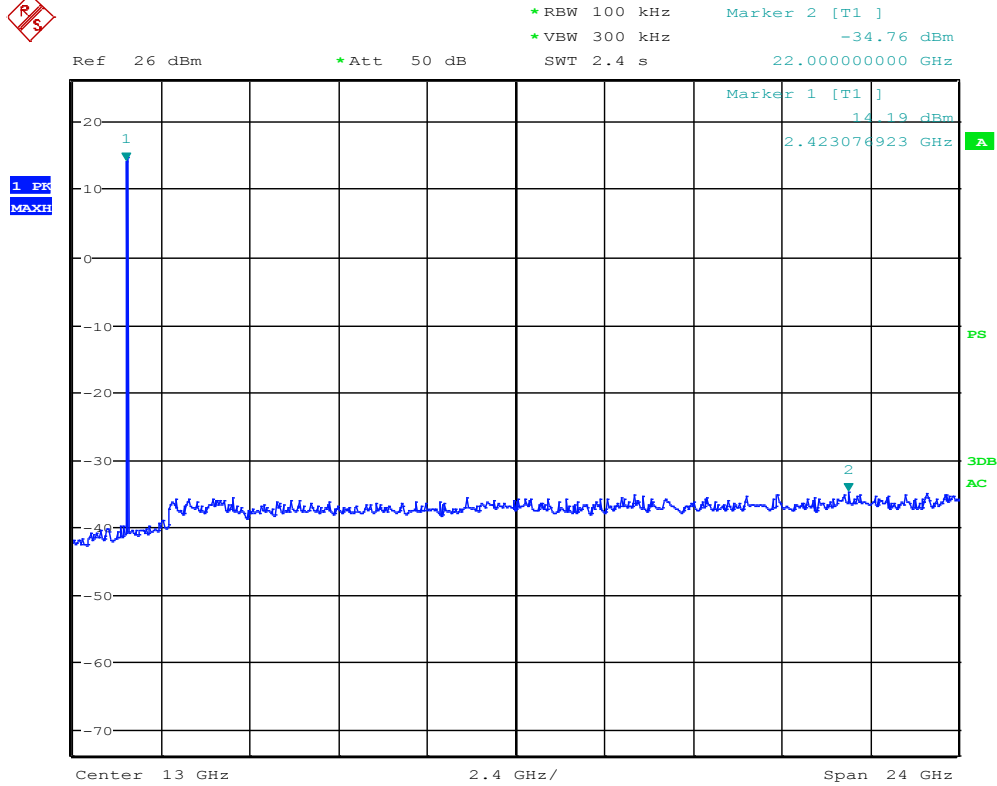
*Att 50 dB

1 PK
MAXH



Date: 16.NOV.2015 17:56:20

Conducted Spurious Emission, 1GHz to 25GHz, Channel 18: CEN-GWEXER (24VDC Mode)



Date: 16.NOV.2015 18:02:51



- b) Set the span to 1.5 times the *DTS bandwidth*.
- c) Set the RBW to: $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$.
- d) Set the VBW $\geq 3 \times \text{RBW}$.
- e) Detector = peak.
- f) Sweep time = auto couple.
- g) Trace mode = max hold.
- h) Allow trace to fully stabilize.
- i) Use the peak marker function to determine the maximum amplitude level within the RBW.
- j) If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.



CEN-GWEXER (24VDC Mode)

Channel	Frequency(MHz)	Power Spectral Density (dBm)
11	2405	4.66
18	2440	3.96
26	2480	4.50

Power Spectral Density, Channel 11: CEN-GWEXER (24VDC Mode)

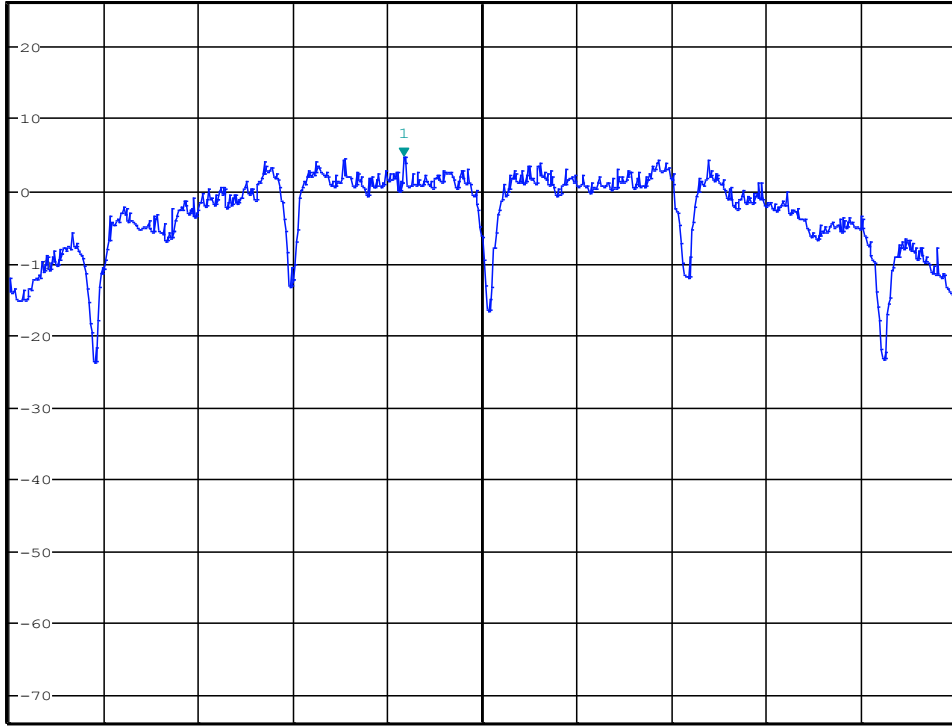


*RBW 3 kHz Marker 1 [T1]
*VBW 10 kHz 4.66 dBm
SWT 270 ms 2.40480000 GHz

Ref 26 dBm

*Att 50 dB

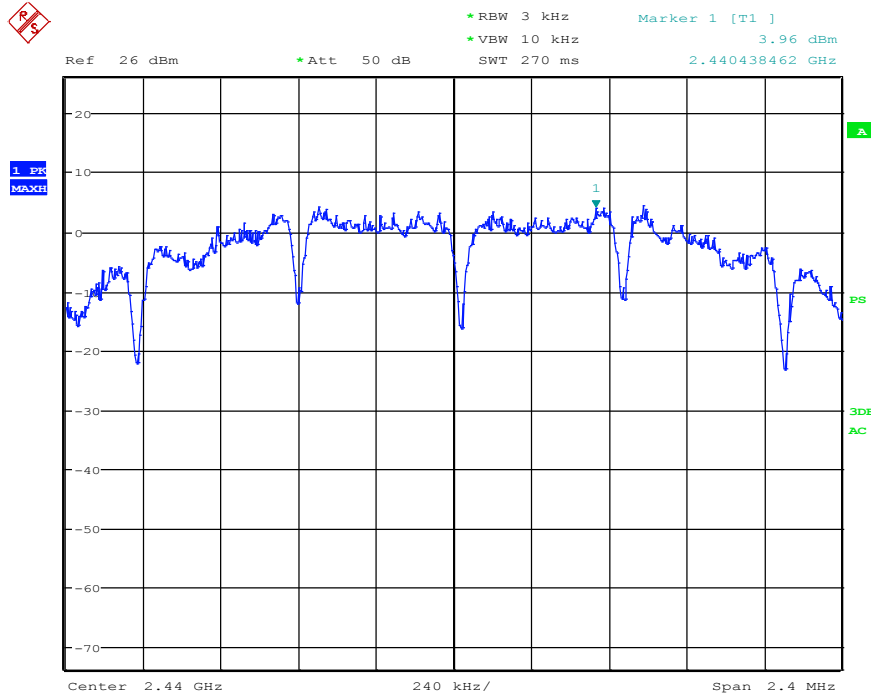
1 PK
MAXH



Date: 16.NOV.2015 16:56:48

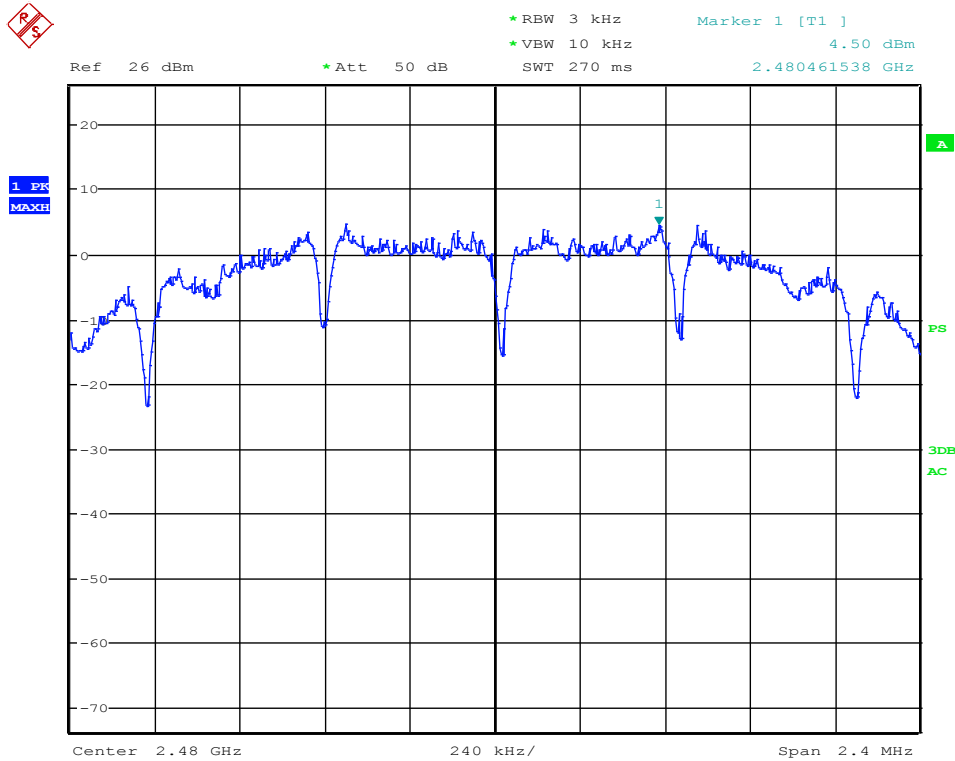


Power Spectral Density, Channel 18: CEN-GWEXER (24VDC Mode)



Date: 16.NOV.2015 16:54:58

Power Spectral Density, Channel 26: CEN-GWEXER (24VDC Mode)



Date: 16.NOV.2015 16:50:54

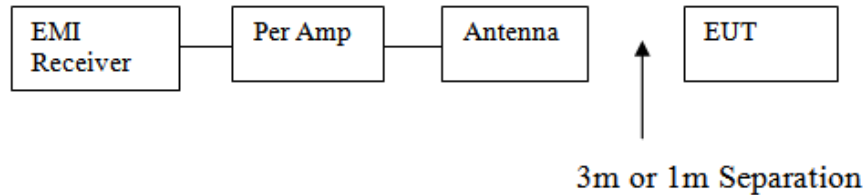
3.7 Radiated Spurious Emissions

Criteria: Radiated spurious emissions which fall in the restricted bands must comply with the radiated emission limits specified in FCC § 15.209(a) and Table 2 of IC RSS-Gen.

Test Procedure: Per 558074 D01 DTS Meas Guidance v03r02 § 11
 Radiated spurious emission was performed from 30 MHz to the tenth harmonics of the carrier. For each scan of radiated emission measurement, the procedures for maximizing emissions were followed. The EUT was rotated and antenna height was varied between 1meter (m) and 4m in order to maximize the observed levels. Measurements in both horizontal and vertical polarities were made and the data was recorded. All radiated emission measurements, up to 18 GHz, were performed at 3m distance between an antenna and the EUT (except where noted otherwise). All radiated emission measurements, above 18 GHz, were performed at 1m

distance between an antenna and the EUT.

Block Diagram:



The peak level of radiated emissions above 1 GHz was measured with a resolution bandwidth (RBW) of 1 MHz and a Video Band Width (VBW) of 3 MHz. Average level was measured with VBW of 10Hz, Duty Cycle Correction Factor (DCCF) was applied to the harmonics.

Over the 30MHz to 18GHz frequency range, each EUT was distanced 3 meters from the receive antenna (bilog or double ridge).

For all frequencies, the EUT was oriented as seen in the photograph below; the EUT antenna was always folded 90 degrees and pointing up, towards the ceiling of the lab.

CEN-GWEXER Fixed Orientation

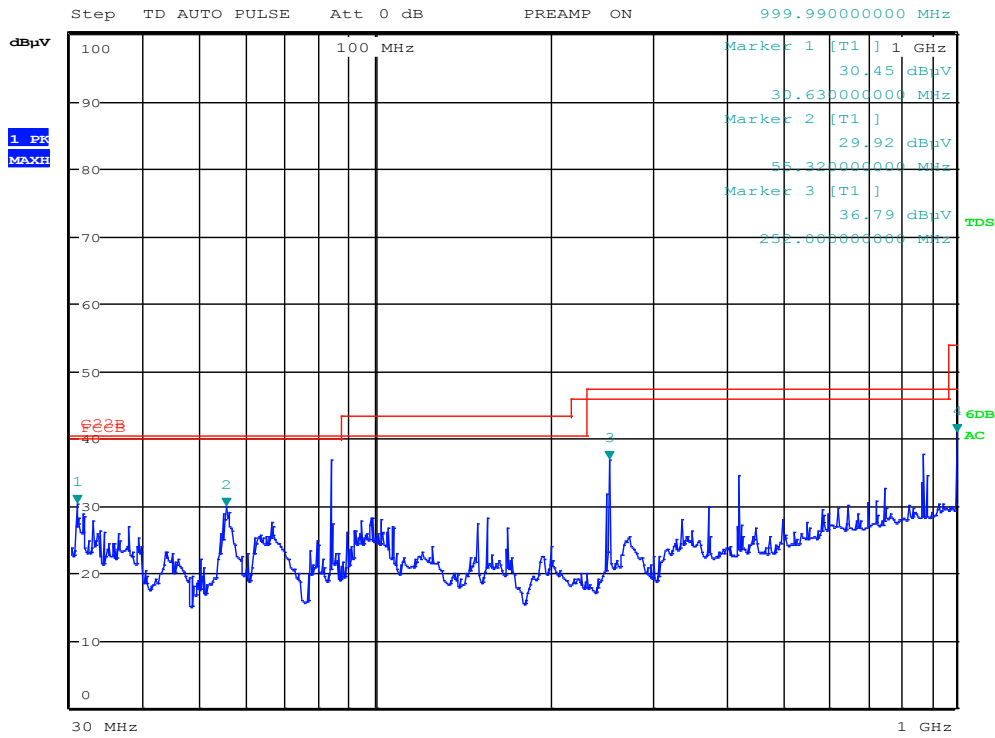


Sample Plots

30MHz-1GHz Vertical CEN-GWEXER (24VDC Mode):



RBW 120 kHz Marker 4 [T1]
 MT 100 ms 40.94 dBuV
 PREAMP ON 999.990000000 MHz



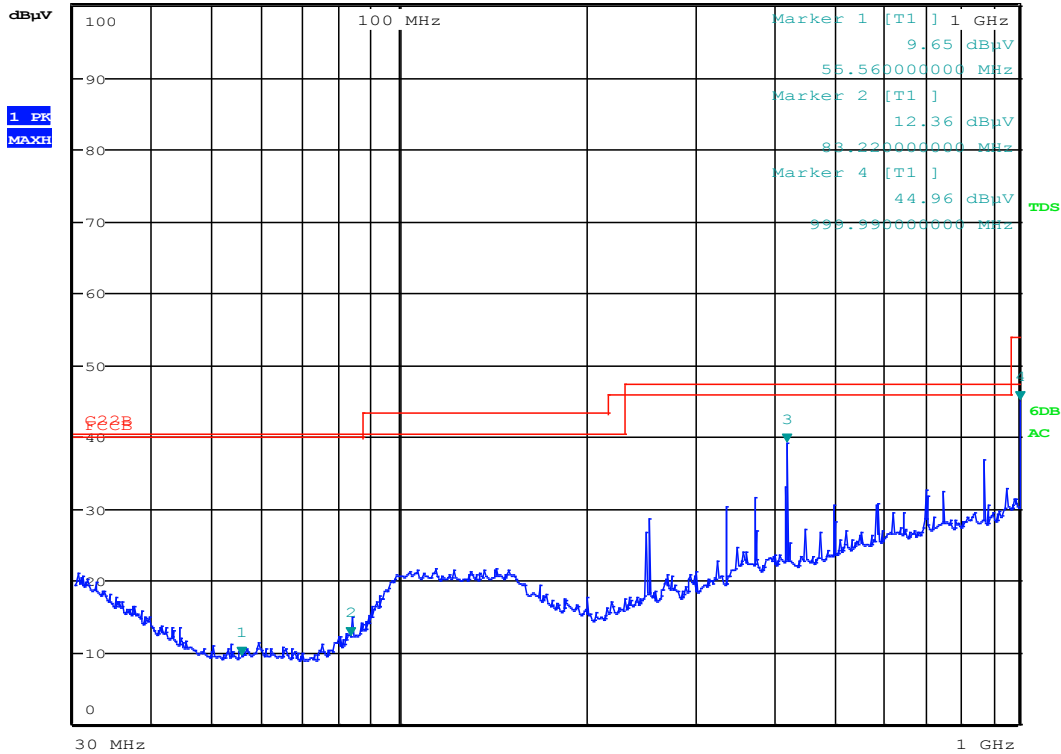
Date: 10.NOV.2015 16:09:15

30MHz-1GHz Horizontal CEN-GWEXER (24VDC Mode):



RBW 120 kHz Marker 3 [T1]
 MT 100 ms 39.26 dBuV
 PREAMP ON 420.06000000 MHz

Step TD AUTO PULSE Att 0 dB



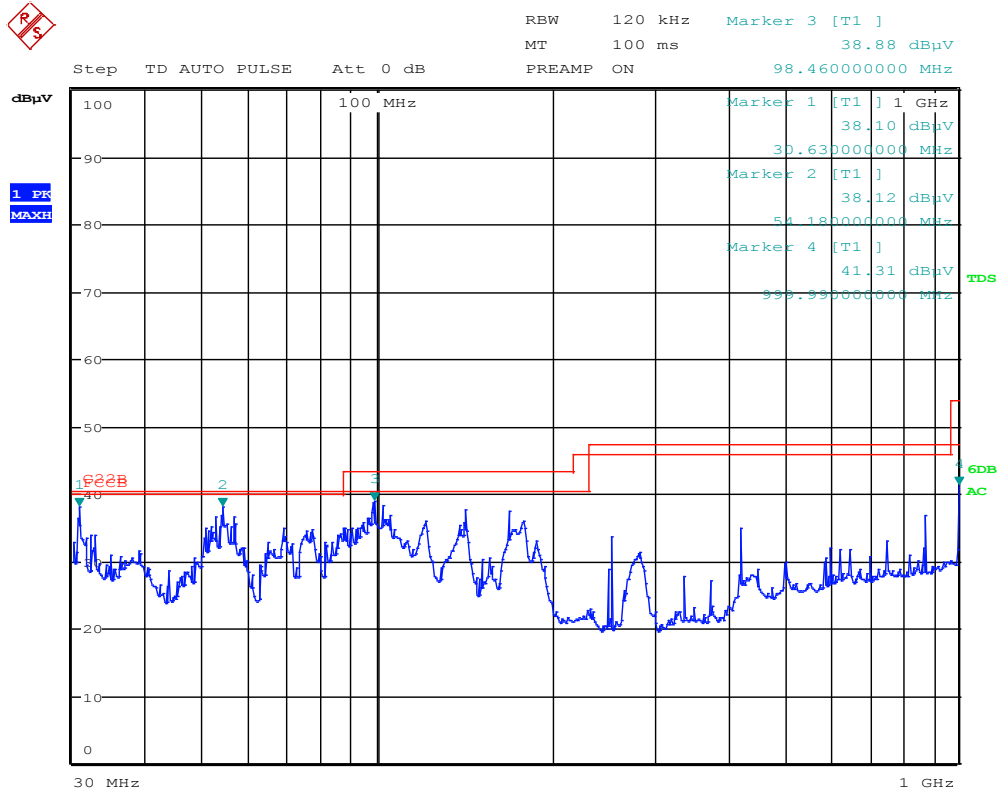
Date: 10.NOV.2015 16:19:58

CEN-GWEXER (24VDC Mode):

Antenna		Turntable Azimuth Angle (degrees)	Frequency (MHz)	Measured Level (dBuV/m)	FCC Class B		CISPR 22 Class B	
Orientation	Height (cm)				Limit (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Margin (dB)
V	90	219	30.63	29.2	40	10.8	40.5	11.3
V	89	165	55.89	25.5	40	14.5	40.5	15
V	125	180	84	36.6	40	3.4	40.5	3.9
V	88	99	252.03	36.8	46	9.2	47.5	10.7
H	94	252	419.97	38.5	46	7.5	47.5	9
H	132	318	874.98	38.8	46	7.2	47.5	8.7
H	118	330	1000	45.2	54	8.8	47.5	2.3

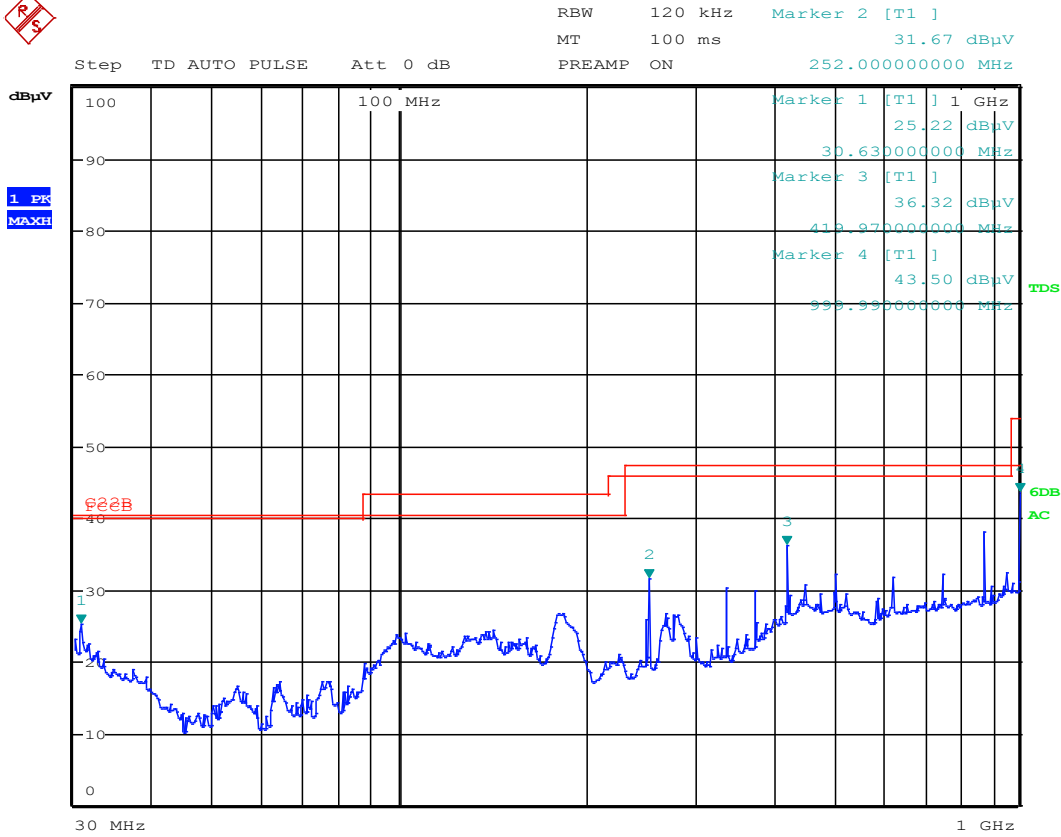
Sample Plots

30MHz-1GHz Vertical CEN-GWEXER (PoE Mode):



Date: 13.NOV.2015 10:47:21

30MHz-1GHz Horizontal CEN-GWEXER (PoE Mode):



Date: 13.NOV.2015 11:16:10



CEN-GWEXER (PoE Mode):

Antenna		Turntable Azimuth Angle (degrees)	Frequency (MHz)	Measured Level (dBuV/m)	FCC Class B		CISPR 22 Class B	
Polarity	Height (cm)				Limit (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Margin (dB)
V	91	176	30.63	37.3	40	2.7	40.5	3.2
V	88	192	54.18	35.5	40	4.5	40.5	5
V	108	194	69	31.9	40	8.1	40.5	8.6
V	107	282	98.46	35.2	43.5	8.3	40.5	5.3
V	106	98	141.18	34.8	43.5	8.7	40.5	5.7
V	100	212	168.03	34.5	43.5	9	40.5	6
V	88	306	251.94	32.8	46	13.2	47.5	14.7
H	94	263	420.06	35.6	46	10.4	47.5	11.9
H	120	126	875.01	38.7	46	7.3	47.5	8.8
H	119	313	999.99	45.7	54	8.3	47.5	1.8



Radiated EMI Data (1 – 25GHz): CEN-GWEXER

Ch #	Type	Freq (MHz)	Power Level Setting	A n t e n n a			Table Azimuth Angle (Deg)	Meas Level (dBuV/m)		DCCF (dB)[2]	Corr Level (dBuV/m)		FCC Limit (dBuV/m)		FCC Margin (dB)	
				Orient [1]	Dist (m)	Height (cm)		PK	AV		PK	AV	PK	AV	PK	AV
11	lbe	2390	256	v	3	157	127	64.5	59.1	-11.95	64.5	47.1	74	54	9.5	6.9
	f	2405	256	v	3	157	127	121.5	115.9				n/a	n/a		
	2f	4780	256	v	3	157	127	61.4	53.0	-11.95	61.4	41.0	74	54	12.6	13.0
	3f	7170	256	v	3	157	127	63.1	54.6	-11.95	63.1	42.7	74	54	10.9	11.3
18	f	2440	256	v	3	155	232	120.5	114.8				n/a	n/a		
	2f	4880	256	v	3	155	232	61.0	52.9	-11.95	61.0	41.0	74	54	13.0	13.0
	3f	7320	256	v	3	155	232	62.5	54.4	-11.95	62.5	42.4	74	54	11.5	11.6
25	f	2475	256	v	3	153	235	121.1	115.3				n/a	n/a		
	ube	2483	254	v	3	153	235	72.7	65.3	-11.95	72.7	53.4	74	54	1.3	0.6
	2f	4950	256	v	3	153	235	61.2	53.1	-11.95	61.2	41.2	74	54	12.8	12.8
	3f	7425	256	v	3	153	235	63.3	54.8	-11.95	63.3	42.8	74	54	10.7	11.2
26	f	2480	256	v	3	155	246	120.4	114.7				n/a	n/a		
	ube	2483	230	v	3	155	246	66.9	60.4	-11.95	66.9	48.4	74	54	7.1	5.6
	2f	4960	256	v	3	155	246	61.3	52.9	-11.95	61.3	41.0	74	54	12.7	13.0
	3f	7440	256	v	3	155	246	63.2	55.0	-11.95	63.2	43.0	74	54	10.8	11.0
[1] receiver antenna v (vertical) orientation produced largest levels																
[2] Measured Duty Cycle (see below) = -11.95																



Sample Calculation of the Electric Field Magnitude

The magnitude of the Electric field, E is calculated in $dB\mu V/m$ in terms of the measured antenna output voltage and three transducer factors as follows:

$$E (dB\mu V/m) = AOV(dB\mu V) + AF(dB/m) + CL(dB) - AG(dB)$$

where,

$AOV(dB\mu V)$ = Antenna Output Voltage in $dB(\mu V)$,

$AF(dB/m)$ = Antenna Factor in $dB(1/m)$,

$CL(dB)$ = Cable Loss in dB ,

$AG(dB)$ = Amplifier Gain in dB

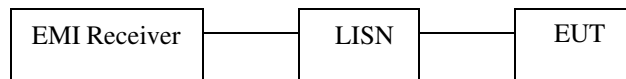
The three transducer factors AF , CL and AG are stored in the EMI Receiver, as functions of frequency, over corresponding frequency ranges.

3.8 Transmitter AC Power line Conducted Emissions

Performance Criterion: AC power line conducted emissions shall not exceed the limits specified in FCC § 15.207 and Table 4 of IC RSS-Gen.

Test Details: AC power line conducted emissions were performed from 150 kHz to 30 MHz and measured with a resolution bandwidth of 9 kHz. EUT was set in the receiving mode. Refers to the following screen captures (using a peak detector) and block diagram

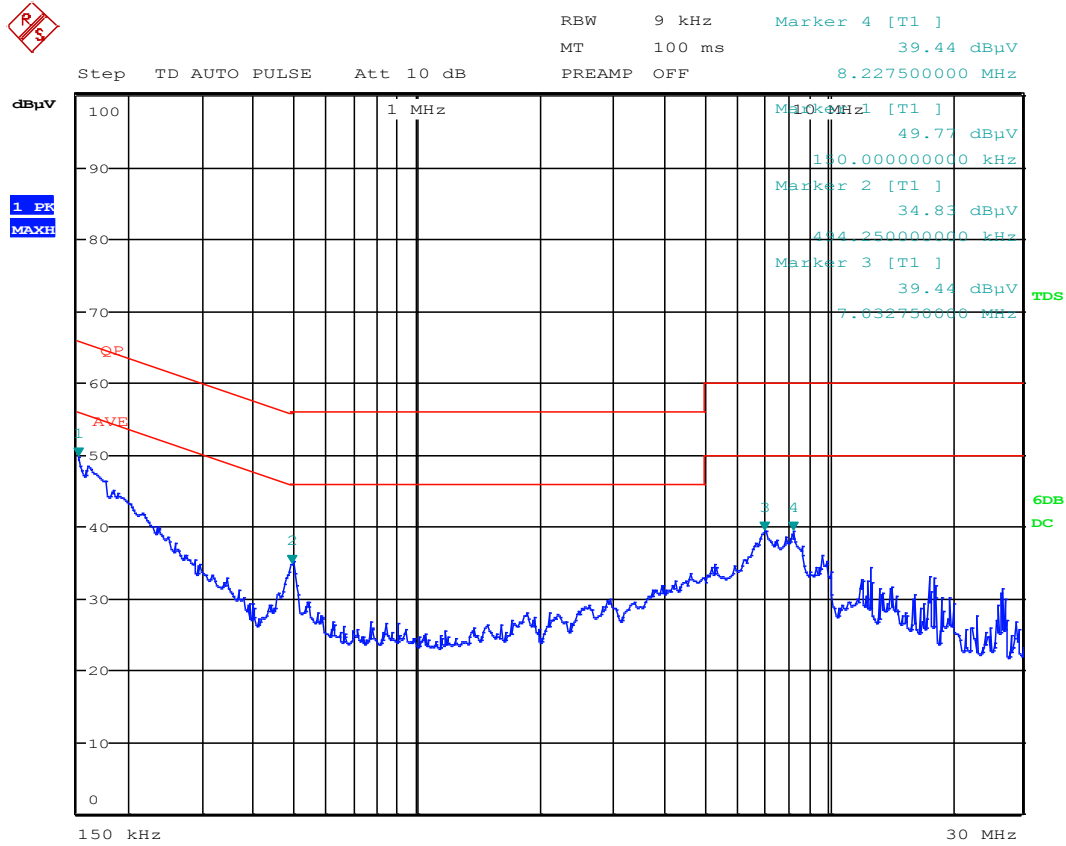
Block Diagram:



Note: AC side of AC-DC (support power supply) conducted emissions were measured.



Line 1: CEN-GWEXER (24VDC Mode)



Date: 10.NOV.2015 15:17:07

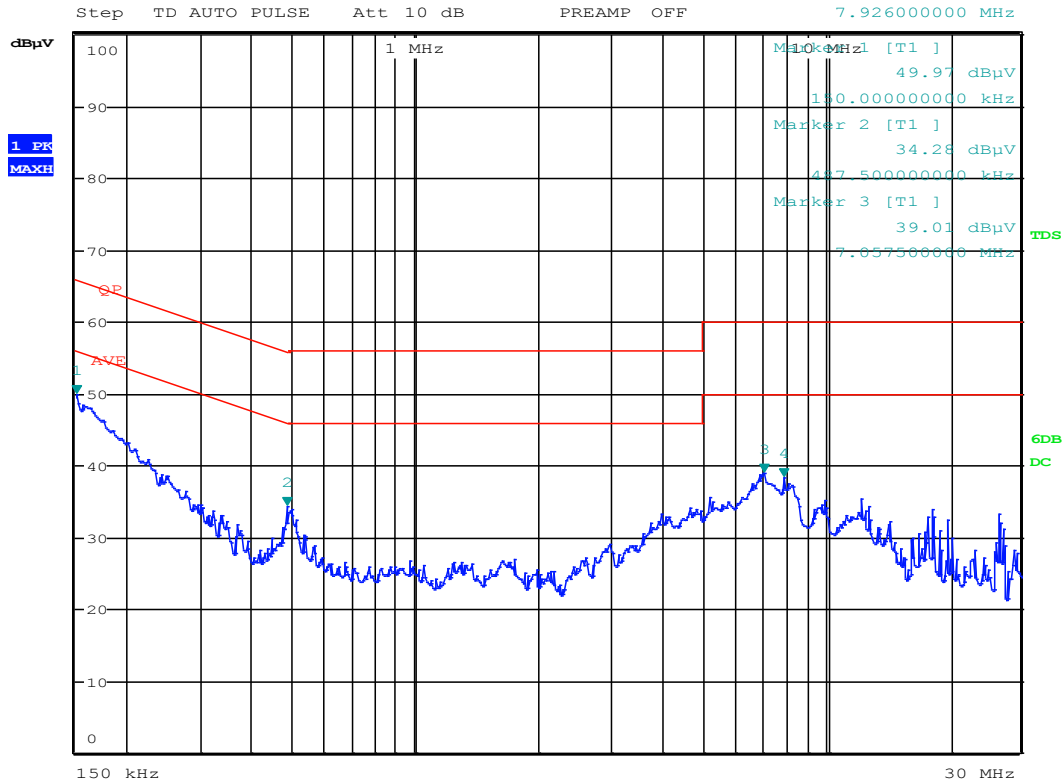
FDD ID: EROCENGWEXER
IC: 5683C-CENGWEXER
FCC Registration #412871

Industry Canada Site #5683C-1 VCCI#3551

Line 2: CEN-GWEXER (24VDC Mode)



RBW 9 kHz Marker 4 [T1] 38.38 dBμV
 MT 100 ms
 PREAMP OFF 7.926000000 MHz



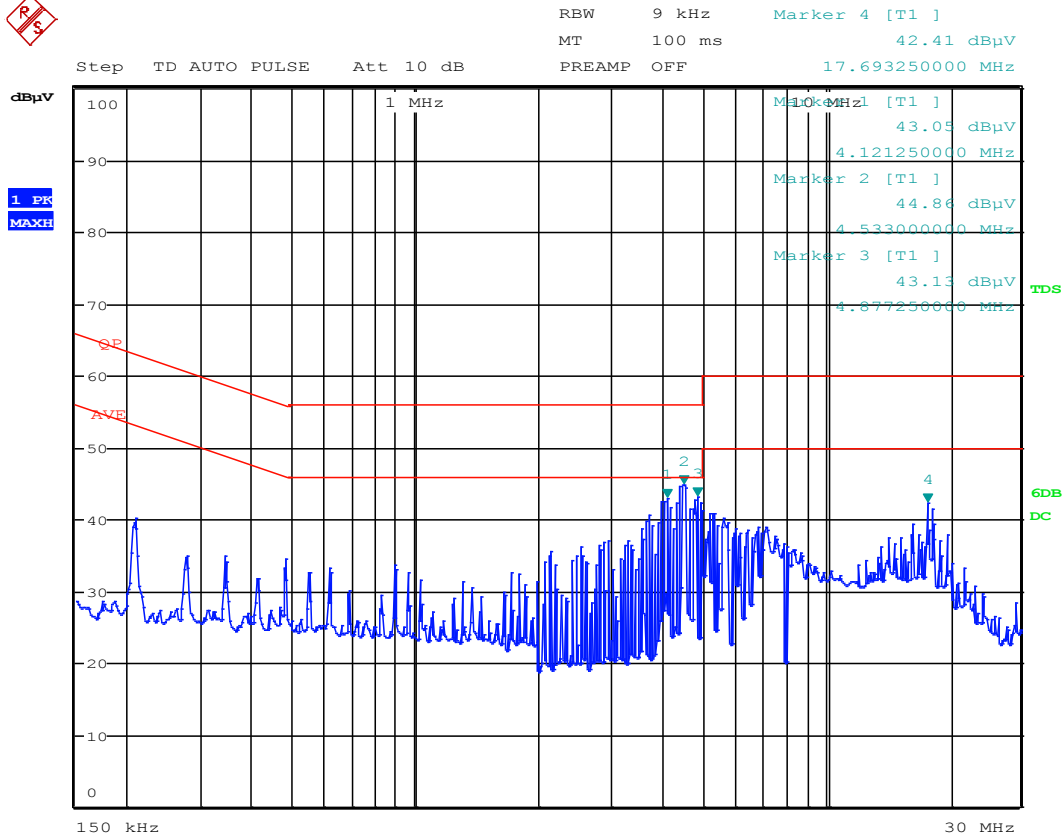
Date: 10.NOV.2015 15:27:38



CEN-GWEXER (24VDC Mode)

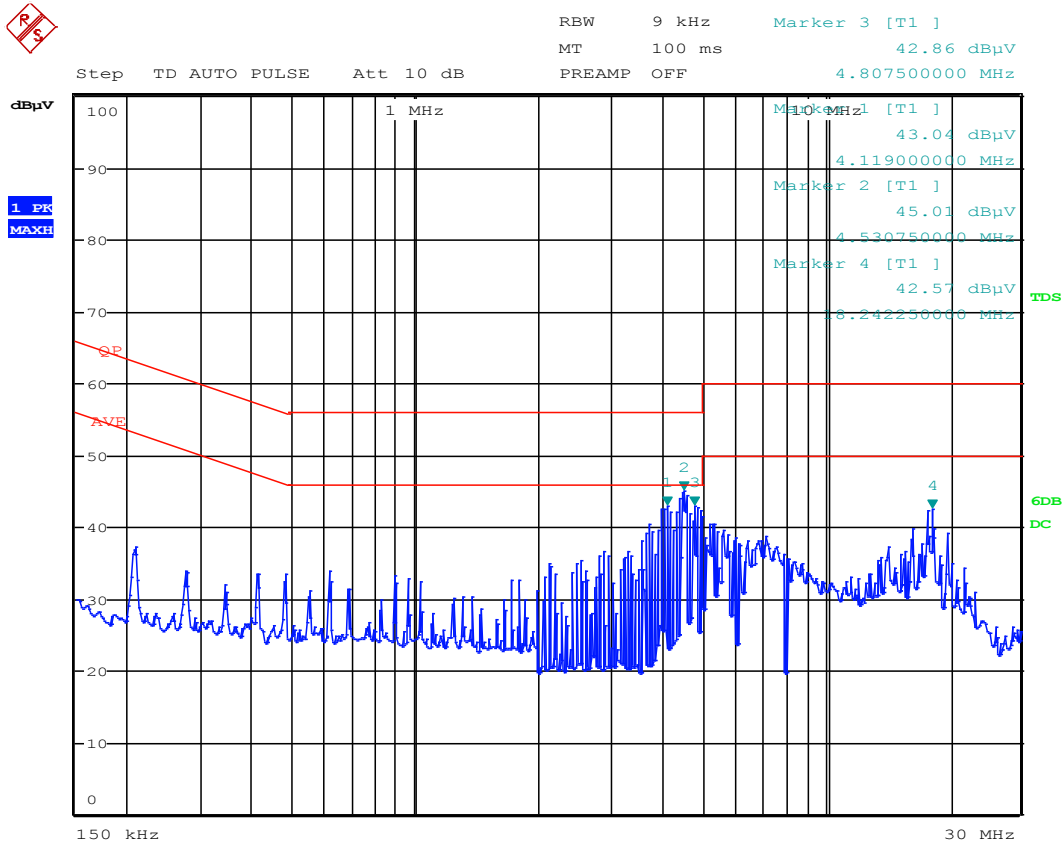
			FCC15 / CISPR22 Class B			
Frequency (MHz)	Measured Level (dBuV)		Limits (dBuV)		Margins (dB)	
	QP	AV	QP	AV	QP	AV
120V/L1						
0.15	46.3	27.2	66.0	56.0	19.7	28.8
0.49425	32.2	26.1	56.1	46.1	23.9	20.0
7.03275	35.4	27	60.0	50.0	24.6	23.0
8.2275	34.8	27	60.0	50.0	25.2	23.0
120V/L2						
0.15	46.3	27.1	66.0	56.0	19.7	28.9
0.4875	30.9	23.8	56.2	46.2	25.3	22.4
7.0575	35.3	27	60.0	50.0	24.7	23.0
7.926	32.9	26.5	60.0	50.0	27.1	23.5

Line 1: CEN-GWEXER (PoE Mode)



Date: 10.NOV.2015 10:21:46

Line 2: CEN-GWEXER (PoE Mode)



Date: 10.NOV.2015 10:47:01



CEN-GWEXER (PoE Mode)

			FCC15 / CISPR22 Class B			
Frequency (MHz)	Measured Level (dBuV)		Limits (dBuV)		Margins (dB)	
	QP	AV	QP	AV	QP	AV
120V/L1						
4.12125	41.8	40.9	56.0	46.0	14.2	5.1
4.533	43.8	42.9	56.0	46.0	12.2	3.1
4.87725	41.2	39.7	56.0	46.0	14.8	6.3
17.69325	39.8	35.5	60.0	50.0	20.2	14.5
120V/L2						
4.119	42.1	41.3	56.0	46.0	13.9	4.7
4.53075	44	43.2	56.0	46.0	12.0	2.8
4.8075	40.9	38.2	56.0	46.0	15.1	7.8
18.24225	40.5	37.3	60.0	50.0	19.5	12.7



$$DCCF(dB) = 20 \log_{10}(\{\text{sum of durations of pulses over a 100ms interval}\}/100\text{ms})$$

four long and three shorter pulses were observed over a 100 ms interval, as follows:

p1s1	4.577724		p2s1	2.318109
p1s2	4.577724		p2s2	2.313301
p1s3	4.577724		p2s3	2.313301
p1s4	4.588942			
p1-avg	4.5805285 ms		p2-avg	2.314903667 ms

Hence,

$$DCCF(\text{cen-gwexer}) = 20 \log_{10}(\{4(p1\text{-avg})+3(p2\text{-avg})\}/100) = -11.95\text{dB}$$