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FCC PART 15.Subpart H White Spaces System

Part 2 TEST REPORT

Fixed TVBD Device

Applicant	6HARMONICS, INC.
Address	21 CONCOURSE GATE SUITE 2 OTTAWA, ON K2E 7S4 CANADA
FCC ID	2AASTGWS-4006-17
Model Number	GWS-4006-17
Product Description	WHITE SPACE FIXED TVBD CPE EQUIPMENT
Date Sample Received	12/9/2015
Dates Tested	12/11 – 12/21/2015
Date of Report	12/21/2015
Tested By	Cory Leverett
Approved By	Sid Sanders
Test Results	<input checked="" type="checkbox"/> PASS <input type="checkbox"/> FAIL

Report Number	Version Number	Description	Issue Date
2592UT15TestReport	Rev1	Initial Issue	12/21/2015

THE ATTACHED REPORT SHALL NOT BE REPRODUCED EXCEPT IN FULL WITHOUT THE WRITTEN APPROVAL OF TIMCO ENGINEERING, INC.

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GENERAL REMARKS

The attached report shall not be reproduced except in full without the written permission of Timco Engineering Inc.

The test results relate only to the items tested.

Summary

The device under test does:



fulfill the general approval requirements as identified in this test report



not fulfill the general approval requirements as identified in this test report

Attestations

The scope of this document is to report the results of the Fixed TVBD Part 2 Database Interface Certification tests.

There are three (3) components of the White Spaces technology;

- **TV Band devices (Fixed TVBD for Certification).**
- **TV Bands Database (iConnectiv Certified White Space Database)**
- **TV Band System,** Made up of Fixed TVBD's database, and layer of interaction between the devices and the databases.

To the best of my knowledge and belief, these tests were performed using the measurement procedures described in this report.

All instrumentation and accessories used to test products for compliance to the indicated standards are calibrated regularly in accordance with ISO 17025: 2005 requirements.

I attest that the necessary measurements were made, under my supervision, at:

Timco Engineering Inc.
849 NW State Road 45
Newberry, FL 32669

Authorized Signatory Name:

Cory Leverett
Engineering Project Manager

Date: 12/21/2015



APPLICANT. 6HARMONICS, INC.
FCC ID: 2AASTGWS-4006-17
REPORT: 2592UT15TestReport_Rev1

GENERAL INFORMATION

EUT Specification:

Applicable Standard	Part 15 Subpart H TV Band White Space Fixed Device		
DUT Description	WHITE SPACE CPE EQUIPMENT		
FCC ID	2AASTGWS-4006-17		
Application:	High capacity, long range communication link		
Operating Frequency	473 - 695 MHz		
Number of channels	14 to 35 and 39 to 51 (473 to 599 MHz and 623 to 695 MHz)		
Transmit Power(dBm):	17		
EUT Power Source	<input checked="" type="checkbox"/> 110-240Vac DC Power adapter 55VDC 0.73 A PowerDsine, Model # 9001G-40/SP, Part # PD-9001G-40/SP-/AC <input type="checkbox"/> Battery Operated Exclusively		
Test Item	<input type="checkbox"/> Prototype	<input type="checkbox"/> Pre-Production	<input checked="" type="checkbox"/> Production
Type of Equipment	<input checked="" type="checkbox"/> Fixed - WGF	<input type="checkbox"/> Mobile – WG1	<input type="checkbox"/> Portable – WG2
	<input type="checkbox"/> Fixed - WSF	<input type="checkbox"/> Mobile – WS1	<input type="checkbox"/> Portable – WS2
Antenna Connector	50 ohm N-connector		
Antenna	N/A testing was conducted (see test setup figure)		
Network Port	RJ 45		

Test Facility	Timco Engineering Inc. 849 NW State Road 45 Newberry, FL 32669 USA.
Test Conditions	Temperature: 24.3°C Relative humidity: 41%
Test Exercise	The EUT was tested in normal operator mode.

Test Equipment List

Device	Manufacturer	Model	Serial Number	Cal/Char Date	Due Date
*EMI Test Receiver	Rhode & Schwarz	ESU 40	100320	03/11/14	03/11/17
Network Switch	Linksys	EG008W ver. 3	RDV30JC02743	NA	NA
RF Combiner	Edison Electric	M530	NS	05/18/2014	05/18/2016

*EMI RECEIVER SOFTWARE VERSION

The receiver firmware used was version 4.43 Service Pack 3

TEST PROCEDURES

Database Test: Certification Test Procedures for TV Band (White Spaces) Devices Authorized under Subpart H of the Part 15 Rules, 416721 DO1 White Space Test Procedures v02.

Version of the System Software Tested

CPE VERSION

```
GWS Cma > version
GWS HostFirmware-Beta-V0.1.17-FCC-A 6H-CPE Nov 27 2015 10:39:16-build
```

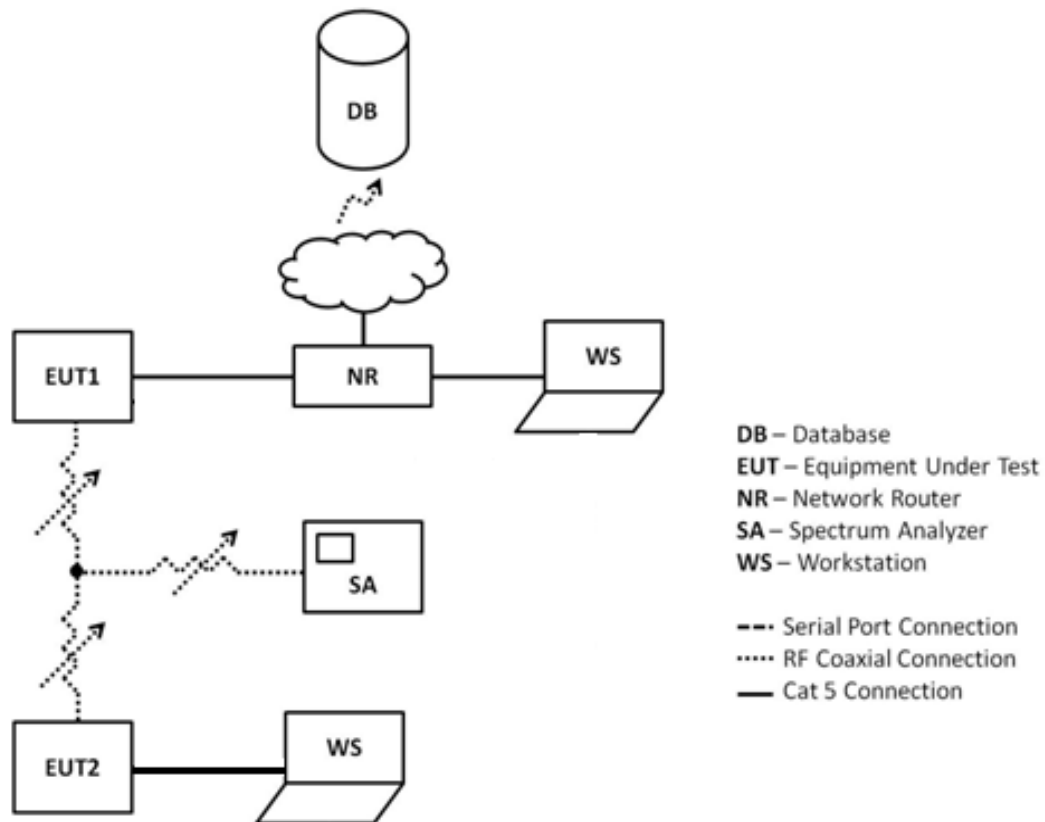
BTS VERSION

```
GWS Cma > version
GWS HostFirmware-Rel8-draft5 6H-Host Board Oct 14 2015 10:00:06-build
```


TEST CONFIGURATION:

TVBD / TV White Spaces Database System Test

1



Device and System Operation

The 6Harmonics Inc. GWS radios are a new class of radios designed for the global white space radio market. The GWS-4006-17 is designed to provide up to 20 dBm of transmit power, offer a sensitivity of up to -100 dBm, and provide 14.4 Mbps of UDP throughput in a 6 MHz television channel. The product can be used for Point to Point or Point to Multi-point operation.

Test Network Configuration

GWS-4006-17 transmits on a single pre-configured or preferred TV White Space channel in the UHF frequency band based on the available channels for the registered location. The bench test network configuration is shown in Figure 1 above. The elements of the test setup are:

- EUT1 –Base Station White Space Radio Serial
- EUT2 –CPE White Space Radio Serial
- NR – standard network router/switch
- WS – workstation (laptop computer) to access TVBD control GUI and record measurements
- SA – spectrum analyzer
- RF attenuators and cabling

The workstation is physically connected to one of the network router LAN ports via RJ45 and establishes a network connection to the EUT and the internet. The routers WAN port connection is required to be capable of providing Internet access.

EUT1 is physically connected to a network router LAN port via its RJ45 network port. EUT1 is called the Base station and has direct connection to the internet. EUT2 (the CPE) is connected to EUT1 via a Coax link. EUT2 has no direct connection to the internet. EUT2 can have access to the internet only when the EUT1-EUT2 RF link is operating. All of the device/database tests were executed in normal operational mode. Configuration of EUT is accomplished using command line Telnet and SSH sessions.

EUT1 is programmed with the 'personality' of a base station and EUT2 is programmed with a 'personality' of a subscriber or CPE.

As defined in the FCC's White Spaces Final Rules, the EUT only operates and is tested as Fixed TV Band Devices (TVBDs). The EUT is provisioned or enrolled prior to testing by a Spectrum Bridge representative. In addition, the EUT1 and EUT2 must be configured with registration information to register with Spectrum Bridge WSDB. The firmware loaded in the EUT includes the database interface agent that includes the Spectrum Bridge White Space services URL.

The EUT must be configured with complete registration information using the SSH command line interface and will not transmit until it registers and receives a valid channel list. When power is applied and the radio establishes an Internet connection; the Base Station EUT/TVBD sends the registration information to the database via the Internet. The WSDB verifies the TVBD's FCC ID and serial number and upon confirmation, registers the device. The device then requests a channel map for its location. Upon receiving a list of available channels from the database the TVBD will verify if the pre-configured or preferred channel is available before enabling transmission.

The following tests address the Radios functionality as a Fixed TVBD and compliance with the FCC's TV White Space Database Interface Certification Rules Part 2.

TEST Summary

This document provides test overviews and test results that apply specifically to Fixed TVBD's operating in TV White Spaces on an unlicensed secondary use basis.

Test Result Summary

Test Case	P/F/I
§15.713(f)(3) Fixed TVBD Registration(Successful Registration)	P
§15.713(f)(3) Fixed TVBD Registration(Restricted Co-ordinates)	P
§15.713(f)(3) Fixed TVBD Registration(Incomplete Contact Information)	P
§15.713(f)(3) Fixed TVBD Registration(HAAT)	P
§15.713(f)(3) Fixed TVBD Registration(Antenna Height AGL)	P
§15.713(f)(3) Fixed TVBD Registration(FCCID/Serial Number)	P
§15.707(a) Fixed TVBD Relocated	P
§15.711(b)(3)(iii) Fixed & Mode II TVDB Database Update	P
§15.711(b)(3)(i)(ii), §15.713(a)(1) 48 Hour Channel Scheduling	P
§15.707, §15.711(b)(3)(i)(ii)(iv),(c), §15.712 TVBD Channel Availability	P
§15.711(f) Security:	P

P-Pass

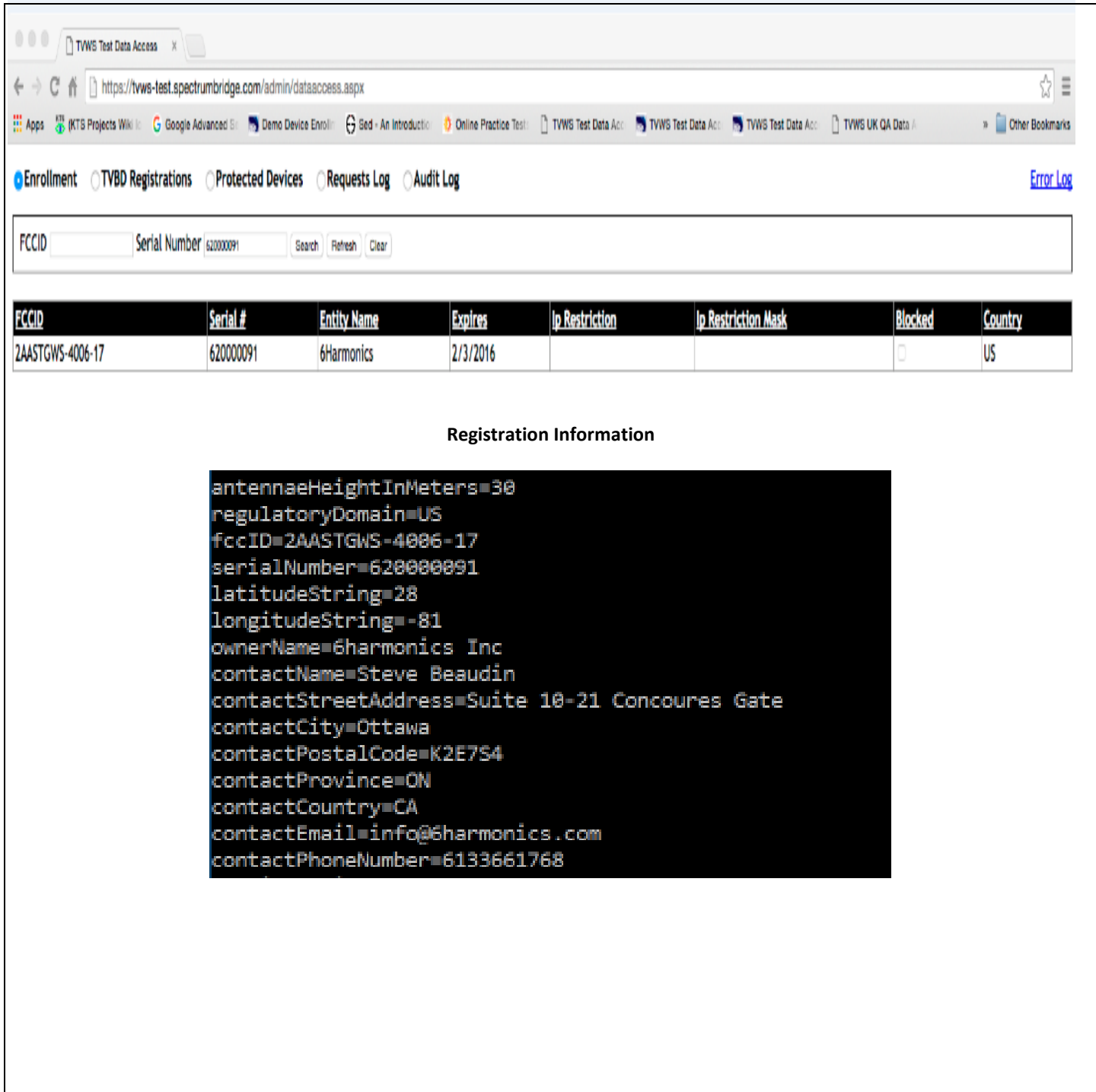
F-Fail

I-Inconclusive

N.A.-not applicable/not supported

Database Enrollment Information

The following screenshot of the log shows the TVBD enrolled in the iConnectiv whitespace database prior to the testing.



The screenshot shows a web browser window with the URL <https://tvws-test.spectrumbridge.com/admin/dataaccess.aspx>. The page has a navigation bar with links: Enrollment, TVBD Registrations, Protected Devices, Requests Log, and Audit Log. Below the navigation bar is a search form with fields for FCCID and Serial Number. The search results table shows one entry for FCCID 2AASTGWS-4006-17, Serial # 620000091, Entity Name 6Harmonics, Expires 2/3/2016, and Country US.

FCCID	Serial #	Entity Name	Expires	Ip Restriction	Ip Restriction Mask	Blocked	Country
2AASTGWS-4006-17	620000091	6Harmonics	2/3/2016			<input type="checkbox"/>	US

Below the table, there is a section titled "Registration Information" which contains a list of registration details in a monospace font:

```

antennaeHeightInMeters=30
regulatoryDomain=US
fccID=2AASTGWS-4006-17
serialNumber=620000091
latitudeString=28
longitudeString=-81
ownerName=6harmonics Inc
contactName=Steve Beaudin
contactStreetAddress=Suite 10-21 Concoures Gate
contactCity=Ottawa
contactPostalCode=K2E7S4
contactProvince=ON
contactCountry=CA
contactEmail=info@6harmonics.com
contactPhoneNumber=6133661768
  
```


Setup Photo



a) Successful Registration, 15.713(f)(3) – Fixed TVBD without a direct connection to the internet(Subscriber)

Test procedure:

Configure the base station with the required registration information. Verify that the required registration information is sent and stored in the white space data base.

Operating channel should be verified on the subscriber (radio without the internet connection) using the EUT GUI

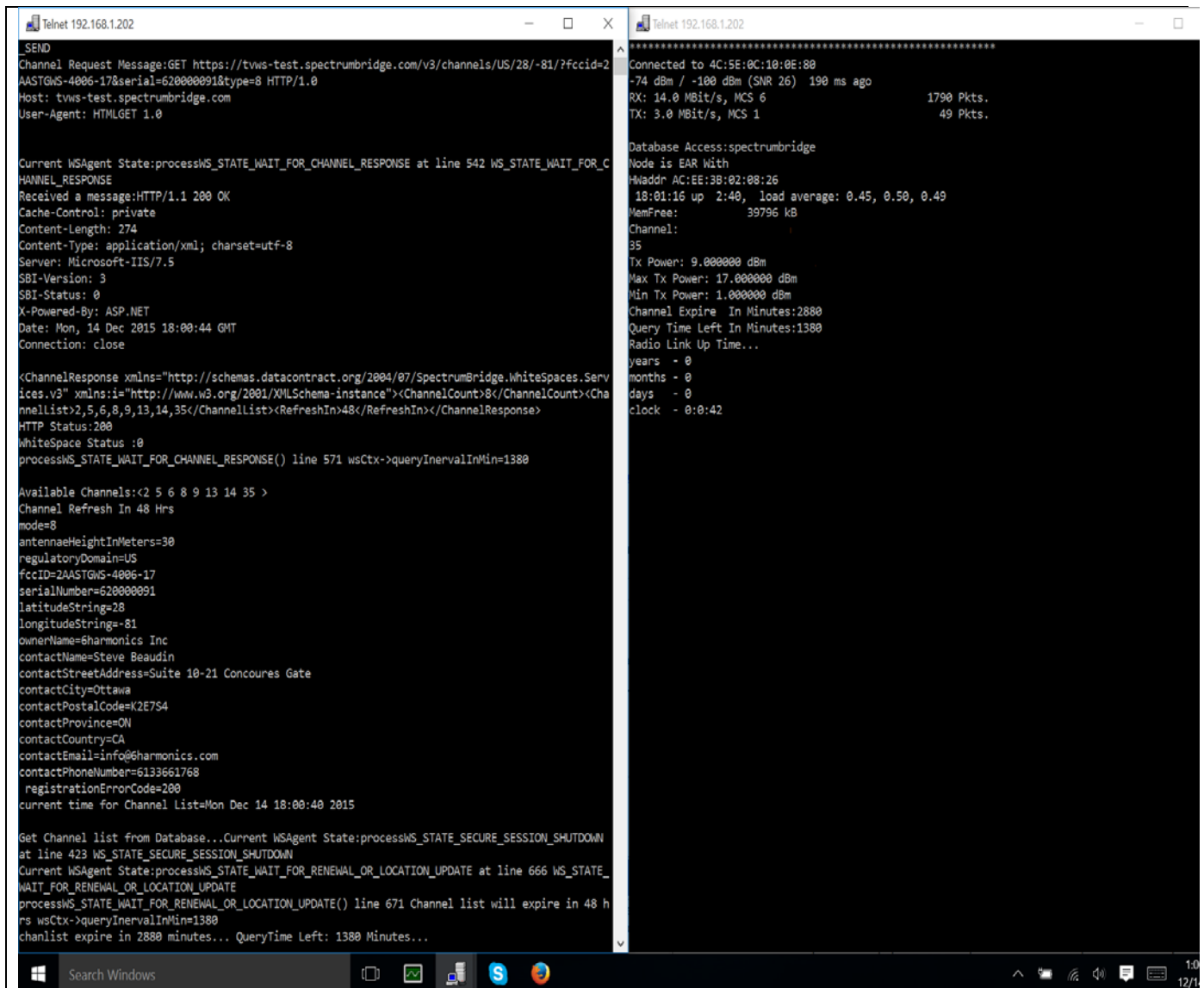
Test pre-conditions:

The Base station and subscriber (radio without the internet connection) TVBD were configured and the information submitted for registration to the WSDB.

Registration Information Entered into CPE

```
antennaeHeightInMeters=30
regulatoryDomain=US
fccID=2AASTGWS-4006-17
serialNumber=620000091
latitudeString=28
longitudeString=-81
ownerName=6harmonics Inc
contactName=Steve Beaudin
contactStreetAddress=Suite 10-21 Concours Gate
contactCity=Ottawa
contactPostalCode=K2E7S4
contactProvince=ON
contactCountry=CA
contactEmail=info@6harmonics.com
contactPhoneNumber=6133661768
```


The TVBD Registration status logs page shown below confirms the successful registration. Operating Channel is 35. (Greenwich Mean Time Zone)



```

Telnet 192.168.1.202
SEND
Channel Request Message:GET https://twvs-test.spectrumbridge.com/v3/channels/US/28/-81/?fccid=2
AASTGWS-4006-17&serial=620000091&type=8 HTTP/1.0
Host: twvs-test.spectrumbridge.com
User-Agent: HTMLGET 1.0

Current WSAgent State:processWS_STATE_WAIT_FOR_CHANNEL_RESPONSE at line 542 WS_STATE_WAIT_FOR_C
HANNEL_RESPONSE
Received a message:HTTP/1.1 200 OK
Cache-Control: private
Content-Length: 274
Content-Type: application/xml; charset=utf-8
Server: Microsoft-IIS/7.5
SBI-Version: 3
SBI-Status: 0
X-Powered-By: ASP.NET
Date: Mon, 14 Dec 2015 18:00:44 GMT
Connection: close

<ChannelResponse xmlns="http://schemas.datacontract.org/2004/07/SpectrumBridge.WhiteSpaces.Serv
ices.v3" xmlns:i="http://www.w3.org/2001/XMLSchema-instance"><ChannelCount>8</ChannelCount><Cha
nnellist>2,5,6,8,9,13,14,35</Channellist><RefreshIn>48</RefreshIn></ChannelResponse>
HTTP Status:200
WhiteSpace Status :0
processWS_STATE_WAIT_FOR_CHANNEL_RESPONSE() line 571 wsCtx->queryIntervalInMin=1380

Available Channels:<2 5 6 8 9 13 14 35 >
Channel Refresh In 48 Hrs
mode=8
antennaeHeightInMeters=30
regulatoryDomain=US
fccID=2AASTGWS-4006-17
serialNumber=620000091
latitudeString=28
longitudeString=-81
ownerName=6harmonics Inc
contactName=Steve Beaudin
contactStreetAddress=Suite 10-21 Concores Gate
contactCity=Ottawa
contactPostalCode=K2E7S4
contactProvince=ON
contactCountry=CA
contactEmail=info@6harmonics.com
contactPhoneNumber=6133661768
registrationErrorCode=200
current time for Channel List=Mon Dec 14 18:00:40 2015

Get Channel list from Database...Current WSAgent State:processWS_STATE_SECURE_SESSION_SHUTDOWN
at line 423 WS_STATE_SECURE_SESSION_SHUTDOWN
Current WSAgent State:processWS_STATE_WAIT_FOR_RENEWAL_OR_LOCATION_UPDATE at line 666 WS_STATE_
WAIT_FOR_RENEWAL_OR_LOCATION_UPDATE
processWS_STATE_WAIT_FOR_RENEWAL_OR_LOCATION_UPDATE() line 671 Channel list will expire in 48 h
rs wsCtx->queryIntervalInMin=1380
chanlist expire in 2880 minutes... QueryTime Left: 1380 Minutes...

Telnet 192.168.1.202
Connected to 4C:5E:0C:10:0E:80
-74 dBm / -100 dBm (SNR 26) 190 ms ago
RX: 14.0 MBit/s, MCS 6 1790 Pkts.
TX: 3.0 MBit/s, MCS 1 49 Pkts.

Database Access:spectrumbridge
Node is EAR With
HWaddr AC:EE:3B:02:08:26
18:01:16 up 2:40, load average: 0.45, 0.50, 0.40
MemFree: 39796 kB
Channel:
35
TX Power: 9.000000 dBm
Max Tx Power: 17.000000 dBm
Min Tx Power: 1.000000 dBm
Channel Expire In Minutes:2880
Query Time Left In Minutes:1380
Radio Link Up Time...
years - 0
months - 0
days - 0
clock - 0:0:42
  
```

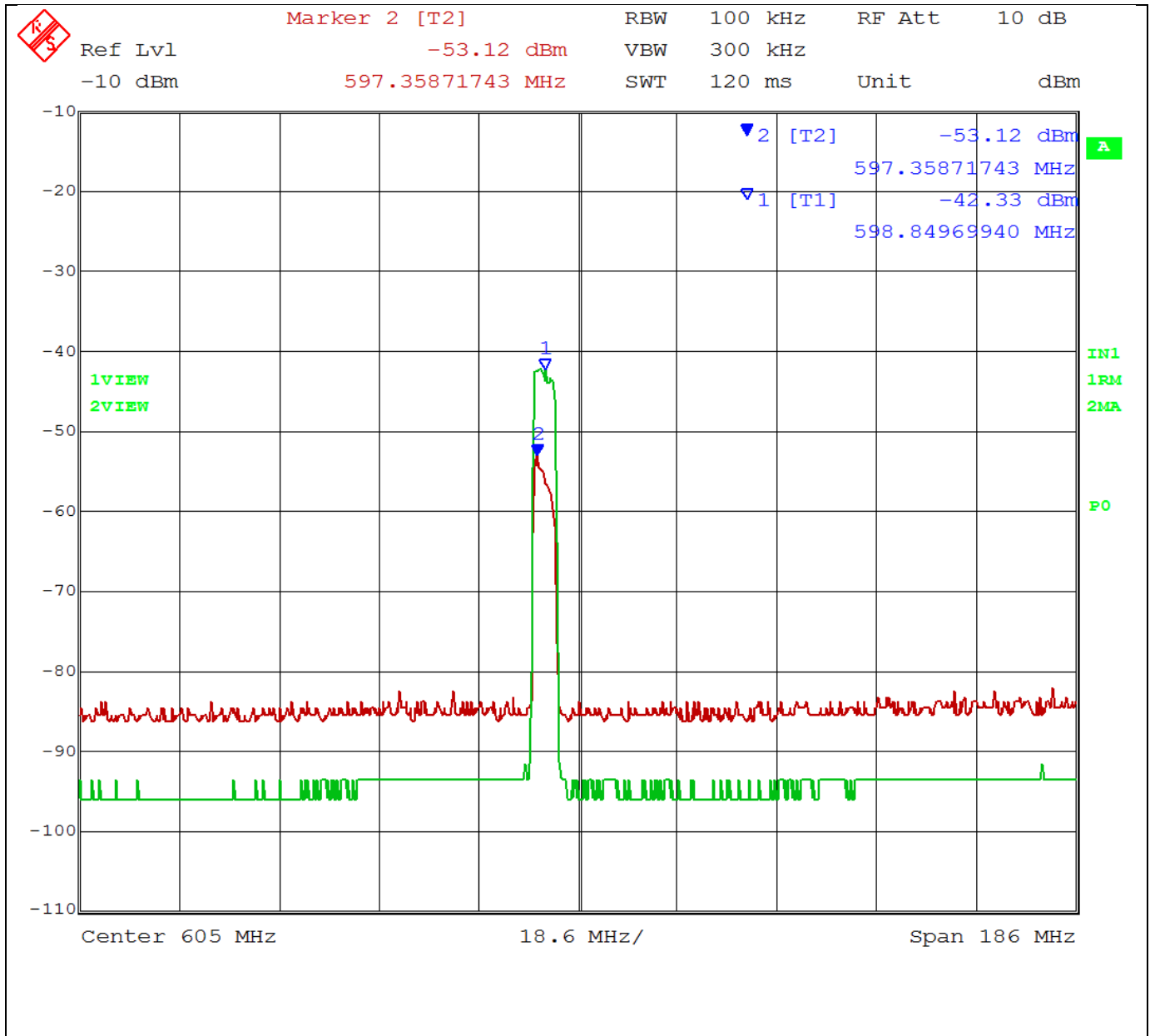

Spectrum Bridge Log

The following log shows the successful registration with the Database (Eastern Standard Time)

DateTime	RequestIp	Request Url	RequestData	Response Status	ResponseData
12/14/15 13:00	98.191.81.133	/v3/channels/ US/28/- 81/?fccid=2A ASTGWS- 4006- 17&serial=62 0000091&typ e=8	NULL	0	<?xml version="1.0" encoding="utf-16"?> <ChannelResponse xmlns:xsd="http://www.w3.org/2001/ XMLSchema" xmlns:xsi="http://www.w3.org/2001/X MLSchema-instance"> <ChannelCount>8</ChannelCount> <ChannelList>2,5,6,8,9,13,14,35</Cha nnelList> <RefreshIn>48</RefreshIn> </ChannelResponse>
12/14/15 11:47	98.191.81.133	/v3/devices/ US/2AASTGW S-4006- 17/6200009 1	version="1.0" encoding="utf- 16"?> <RegistrationReq uest xmlns:xsd="http:// www.w3.org/20 01/XMLSchema" xmlns:xsi="http:// www.w3.org/20 01/XMLSchema- instance"> <DeviceType>Fixe d</DeviceType> <Latitude>28</La titude> <Longitude>- 81</Longitude> <AntennaHeight> 30</AntennaHeig ht> <DeviceOwner>6 harmonics Inc </DeviceOwner> <ContactName>S teve Beaudin </ContactName> <ContactStreet>S uite 10-21 Concours	0	NULL

Test Results:

The CPE transmitter did not turn ON until the database exchange was successfully completed. The Green trace is the output of the CPE after registration, the Red Trace is the beacon of the BTS.



Result: PASS

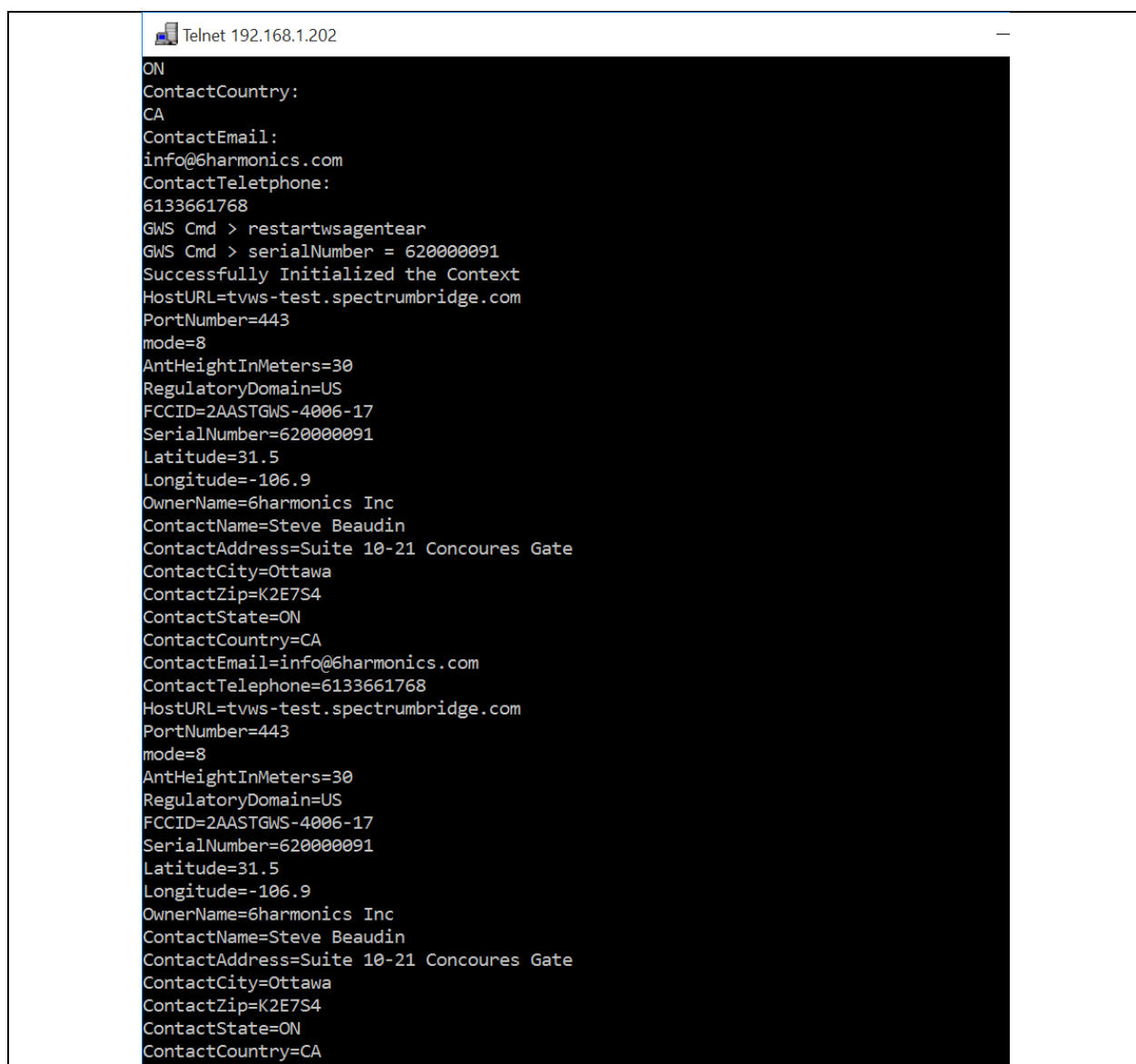
b) Unsuccessful Registration, 15.713(f)(3) – Restricted co-ordinates

Test Procedure:

Configure the EUT with restricted co-ordinates (Outside US Regulatory boundaries, example 31.5, -106.9).
Verify the required registration information is sent and stored in the white space data base.
Registration failure should be verified by accessing the WSDB registration interface and also the EUT GUI.

Test Pre-conditions:

A location outside US regulatory boundaries (31.5, -106.9) was entered into the radio and the information submitted for registration to the WSDB.

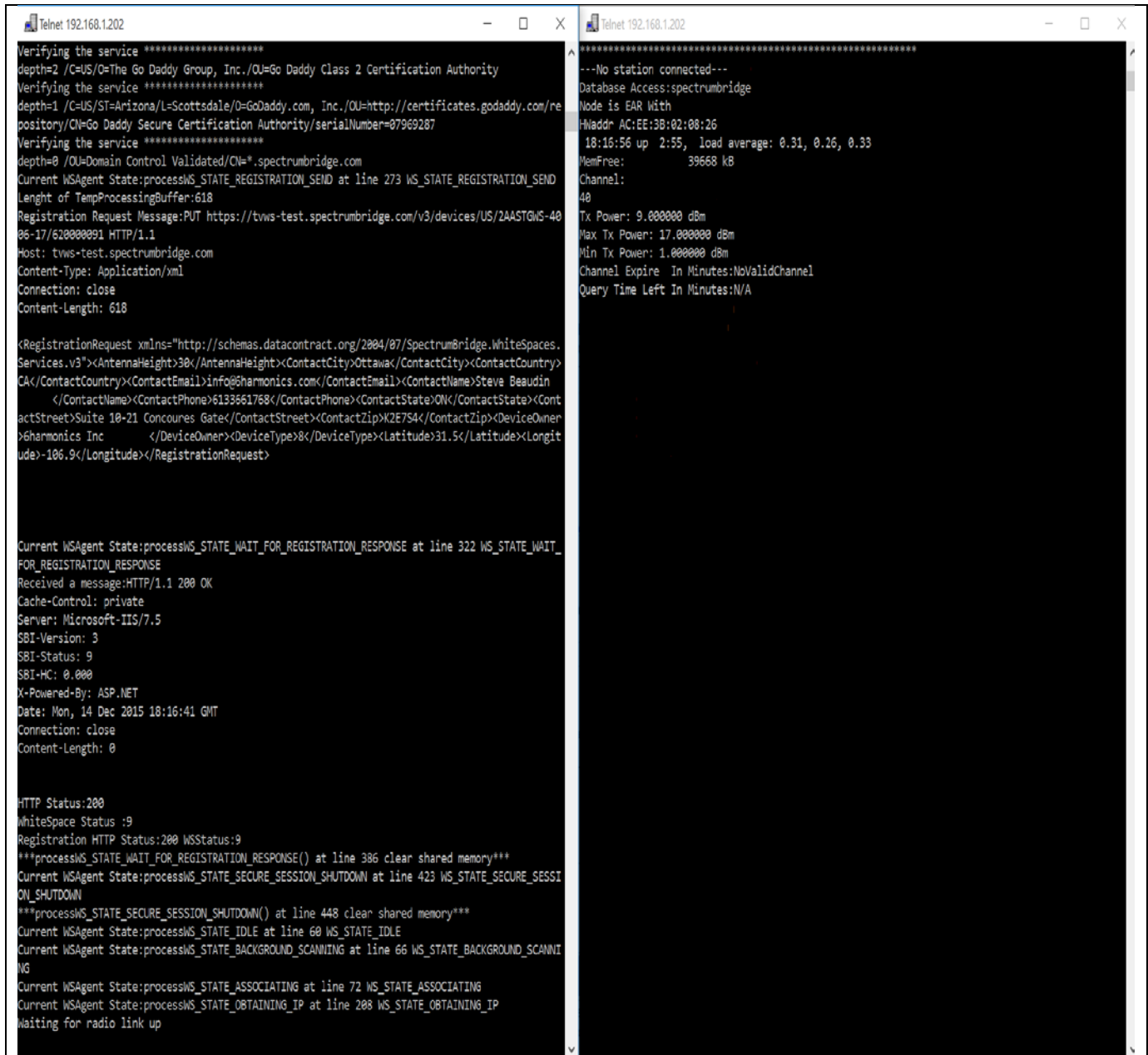


```

Telnet 192.168.1.202
ON
ContactCountry:
CA
ContactEmail:
info@6harmonics.com
ContactTelephone:
6133661768
GWS Cmd > restartwsagentear
GWS Cmd > serialNumber = 620000091
Successfully Initialized the Context
HostURL=tvws-test.spectrumbridge.com
PortNumber=443
mode=8
AntHeightInMeters=30
RegulatoryDomain=US
FCCID=2AASTGWS-4006-17
SerialNumber=620000091
Latitude=31.5
Longitude=-106.9
OwnerName=6harmonics Inc
ContactName=Steve Beaudin
ContactAddress=Suite 10-21 Concoures Gate
ContactCity=Ottawa
ContactZip=K2E7S4
ContactState=ON
ContactCountry=CA
ContactEmail=info@6harmonics.com
ContactTelephone=6133661768
HostURL=tvws-test.spectrumbridge.com
PortNumber=443
mode=8
AntHeightInMeters=30
RegulatoryDomain=US
FCCID=2AASTGWS-4006-17
SerialNumber=620000091
Latitude=31.5
Longitude=-106.9
OwnerName=6harmonics Inc
ContactName=Steve Beaudin
ContactAddress=Suite 10-21 Concoures Gate
ContactCity=Ottawa
ContactZip=K2E7S4
ContactState=ON
ContactCountry=CA
  
```


Test Results:

The screen shot of the TVBD Logs shown below confirms the failed registration. The transmitter did not turn ON. (Green)



```

Telnet 192.168.1.202
Verifying the service *****
depth=2 /C=US/O=The Go Daddy Group, Inc./OU=Go Daddy Class 2 Certification Authority
Verifying the service *****
depth=1 /C=US/ST=Arizona/L=Scottsdale/O=GoDaddy.com, Inc./OU=http://certificates.godaddy.com/repository/CN=Go Daddy Secure Certification Authority/serialNumber=07969287
Verifying the service *****
depth=0 /OU=Domain Control Validated/CN=*.spectrumbridge.com
Current WSAgent State:processWS_STATE_REGISTRATION_SEND at line 273 WS_STATE_REGISTRATION_SEND
Length of TempProcessingBuffer:618
Registration Request Message:PUT https://twvs-test.spectrumbridge.com/v3/devices/US/2AASTGWS-4006-17/620000091 HTTP/1.1
Host: twvs-test.spectrumbridge.com
Content-Type: Application/xml
Connection: close
Content-Length: 618

<RegistrationRequest xmlns="http://schemas.datacontract.org/2004/07/SpectrumBridge.WhiteSpaces.Services.v3"><AntennaHeight>30</AntennaHeight><ContactCity>Ottawa</ContactCity><ContactCountry>CA</ContactCountry><ContactEmail>info@6harmonics.com</ContactEmail><ContactName>Steve Beaudin</ContactName><ContactPhone>6133661758</ContactPhone><ContactState>ON</ContactState><ContactStreet>Suite 10-21 Concorde Gate</ContactStreet><ContactZip>K2E7S4</ContactZip><DeviceOwner>6harmonics Inc</DeviceOwner><DeviceType>8</DeviceType><Latitude>31.5</Latitude><Longitude>-106.9</Longitude></RegistrationRequest>

Current WSAgent State:processWS_STATE_WAIT_FOR_REGISTRATION_RESPONSE at line 322 WS_STATE_WAIT_FOR_REGISTRATION_RESPONSE
Received a message:HTTP/1.1 200 OK
Cache-Control: private
Server: Microsoft-IIS/7.5
SBI-Version: 3
SBI-Status: 9
SBI-HC: 0.000
X-Powered-By: ASP.NET
Date: Mon, 14 Dec 2015 18:16:41 GMT
Connection: close
Content-Length: 0

HTTP Status:200
WhiteSpace Status :9
Registration HTTP Status:200 WSStatus:9
***processWS_STATE_WAIT_FOR_REGISTRATION_RESPONSE() at line 386 clear shared memory***
Current WSAgent State:processWS_STATE_SECURE_SESSION_SHUTDOWN at line 423 WS_STATE_SECURE_SESSION_SHUTDOWN
***processWS_STATE_SECURE_SESSION_SHUTDOWN() at line 448 clear shared memory***
Current WSAgent State:processWS_STATE_IDLE at line 60 WS_STATE_IDLE
Current WSAgent State:processWS_STATE_BACKGROUND_SCANNING at line 66 WS_STATE_BACKGROUND_SCANNING
Current WSAgent State:processWS_STATE_ASSOCIATING at line 72 WS_STATE_ASSOCIATING
Current WSAgent State:processWS_STATE_OBTAINING_IP at line 208 WS_STATE_OBTAINING_IP
Waiting for radio link up

Telnet 192.168.1.202
---No station connected---
Database Access:spectrumbridge
Node is EAR With
Hiaddr AC:EE:38:02:08:26
18:16:56 up 2:55, load average: 0.31, 0.26, 0.33
MemFree: 39668 kB
Channel:
48
Tx Power: 9.000000 dBm
Max Tx Power: 17.000000 dBm
Min Tx Power: 1.000000 dBm
Channel Expire In Minutes:NoValidChannel
Query Time Left In Minutes:N/A
  
```

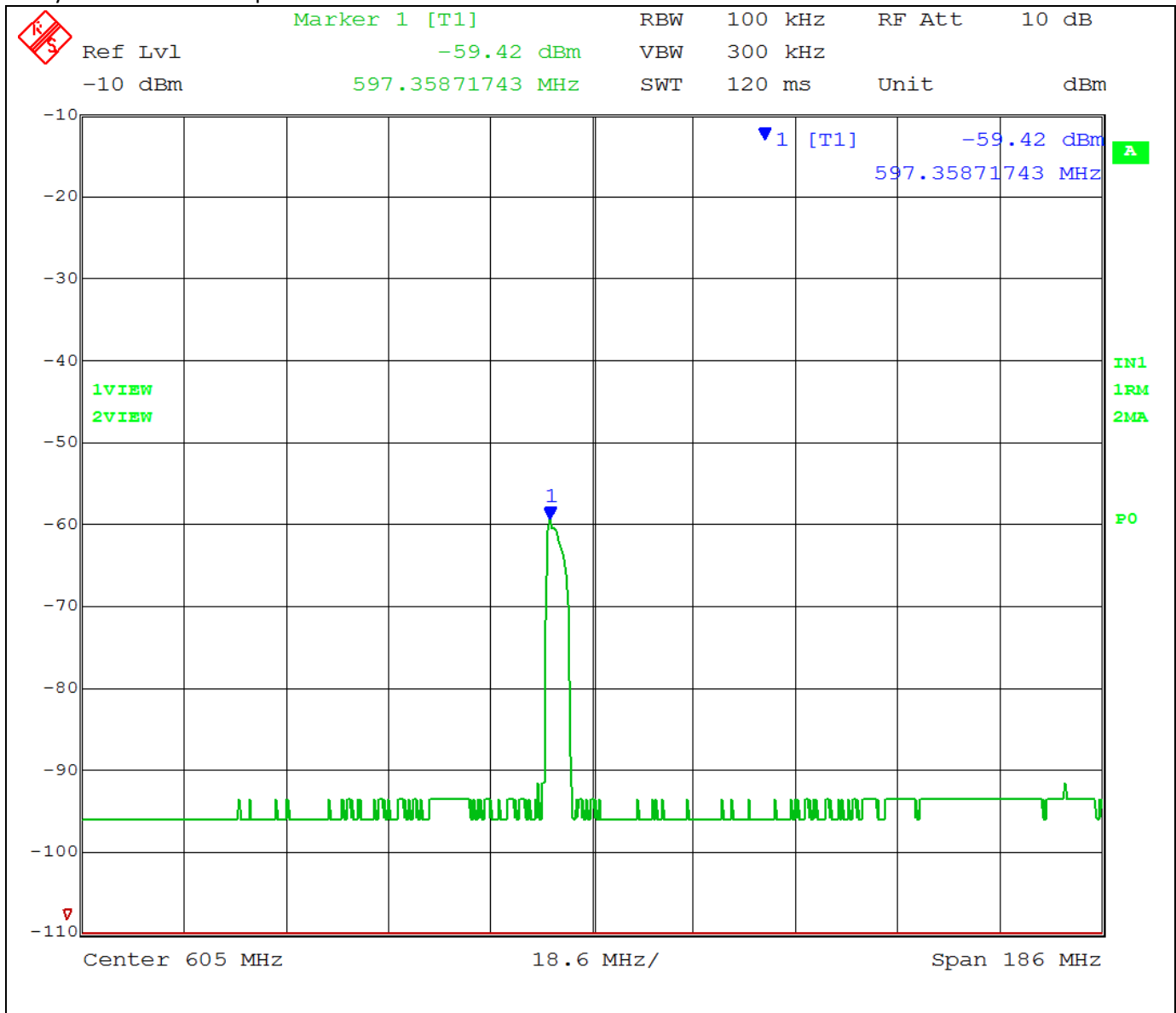

Spectrum Bridge Log

The following log shows the unsuccessful registration with the Database at 1:16 pm (est) on 12/14/2015 due to the registration info containing restricted coordinates outside the US boundaries

DateTime	RequestIp	Request Url	RequestData	Response Status	ResponseData
12/14/15 13:16	98.191.81.133	/v3/devices /US/2AAST GWS-4006-17/6200000 91	16"?> <RegistrationRequest xmlns:xsd="http://www.w3.org/2001/XMLSchema" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"> <DeviceType>Fixed</DeviceType> <Latitude>31.5</Latitude> <Longitude>-106.9</Longitude> <AntennaHeight>30</AntennaHeight> <DeviceOwner>6harmonics Inc </DeviceOwner>	9	NULL
12/14/15 13:16	98.191.81.133	/v3/devices /US/2AAST GWS-4006-17/6200000 91	<?xml version="1.0" encoding="utf-16"?> <RegistrationRequest xmlns:xsd="http://www.w3.org/2001/XMLSchema" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"> <DeviceType>Fixed</DeviceType> <Latitude>31.5</Latitude> <Longitude>-106.9</Longitude> <AntennaHeight>30</AntennaHeight> <DeviceOwner>6harmonics Inc </DeviceOwner> <ContactName>Steve Beaudin </ContactName> <ContactStreet>Suite 10-21 Concoures Gate</ContactStreet> <ContactCity>Ottawa</ContactCity> <ContactState>ON</ContactState> <ContactZip>K2E7S4</ContactZip> <ContactCountry>CA</ContactCountry> <ContactEmail>info@6harmonics.com</ContactEmail> <ContactPhone>6133661768</ContactPhone> </RegistrationRequest>	9	NULL

Spectrum Analyzer plot:

Only the BTS Beacon is present the CPE TX did not turn on



Unsuccessful Registration, no tx

Result: PASS

c) Unsuccessful Registration, 15.713(f)(3) – Incomplete Contact Information

Test Procedure:

Configure the EUT with Incomplete Information (e.g. Contact information). Verify the required registration information is sent and stored in the white space data base.

Registration failure should be verified by accessing the WSDB registration interface and also the EUT GUI.

Test Pre-conditions:

The 'Contact Name' Information field should be left blank. This shall be repeated for all information fields to complete the test

Test Results:

The system error message as shown on the following logs confirms the failed registration. No registration request was sent to the WSDB. All combinations of missing information were tried and the behavior verified. The TVBD GUI does not send a registration request to WSDB with missing contact information.

See screenshots of the log files on following pages

Test Results:

There was no attempted WSDB registration and the Base Station transmitter was off

Radio Record (Missing Owner)

```

Telnet 192.168.1.202
Suite 10-21 Concoures Gate
ContactCity:
Ottawa
ContactZipcode:
K2E7S4
ContactState:
ON
ContactCountry:
CA
ContactEmail:
info@6harmonics.com
ContactTelephone:
6133661768
GWS Cmd > setowner
GWS Cmd > showregistration
...Registration Info...
URL:
twis-test.spectrumbridge.com
DeviceNode:
DEV_FIXED
AntennaHeight:
30
AntennaType:
AGL
RegulatoryDomain:
US
Latitude:
28
Longitude:
-81
...Owner Info...
Owner:

Contactname:
Steve Beaudin
ContactAddress:
Suite 10-21 Concoures Gate
ContactCity:
Ottawa
ContactZipcode:
K2E7S4
ContactState:
ON
ContactCountry:
CA
ContactEmail:
info@6harmonics.com
ContactTelephone:
6133661768
GWS Cmd > restartwsagentear
killall: whitespaceagent: no process killed
GWS Cmd > serialNumber = 620000091
Contact info can not be empty. Please add OwnerName in registration
clearshm() at line 64 clear shared memory

*****
---No station connected---
Database Access:spectrumbridge
Node is EAR With
HWaddr AC:EE:38:02:08:26
01:02:35 up 9:41, load average: 0.55, 0.46, 0.43
MemFree: 39800 kB
Channel:
22
Tx Power: 9.000000 dBm
Max Tx Power: 17.000000 dBm
Min Tx Power: 1.000000 dBm
Channel Expire In Minutes:NoValidChannel
Query Time Left In Minutes:N/A

```


Radio Record (Missing Contact Name)

```

telnet 192.168.1.202
ContactEmail:
Info@6harmonics.com
ContactTelephone:
5133661768
BWS Cmd > restartwsagentear
killall: whitespaceagent: no process killed
BWS Cmd > serialNumber = 620000091
Contact info can not be empty. Please add OwnerName in registration
clearshm() at line 64 clear shared memory
BWS Cmd > setowner 6harmonics Inc
BWS Cmd > set contactname
Unknown cmd set contactname
Please type h or --help for supporting commands
BWS Cmd > setcontactname
BWS Cmd > showregistration
..Registration Info...
URL:
twis-test.spectrumbridge.com
DeviceMode:
DEV_FIXED
AntennaHeight:
30
AntennaType:
AGL
RegulatoryDomain:
US
Latitude:
28
Longitude:
-81
..Owner Info...
Owner:
6harmonics Inc
Contactname:

ContactAddress:
Suite 10-21 Concourses Gate
ContactCity:
Ottawa
ContactZipcode:
K2E7S4
ContactState:
ON
ContactCountry:
CA
ContactEmail:
Info@6harmonics.com
ContactTelephone:
5133661768
BWS Cmd > restartwsagentear
killall: whitespaceagent: no process killed
BWS Cmd > serialNumber = 620000091
Contact info can not be empty. Please add ContactName in registration info
clearshm() at line 64 clear shared memory

*****
---No station connected---
Database Access:spectrumbridge
Node is EAR With
Hwaddr AC:EE:3B:02:08:26
01:06:03 up 9:44, load average: 0.60, 0.48, 0.43
MemFree: 39748 kB
Channel:
49
TX Power: 9.000000 dBm
Max Tx Power: 17.000000 dBm
Min Tx Power: 1.000000 dBm
Channel Expire In Minutes:NoValidChannel
Query Time Left In Minutes:N/A

```


Radio Record (Missing Contact Address)

```

Telnet 192.168.1.202
username: admin
password:
GWS Cmd > showregistration
...Registration Info...
URL:
tvws-test.spectrumbridge.com
DeviceNode:
DEV_FIXED
AntennaHeight:
30
AntennaType:
AGL
RegulatoryDomain:
US
Latitude:
28
Longitude:
-81
...Owner Info...
Owner:
6harmonics Inc
Contactname:
Steve Beaudin
ContactAddress:

ContactCity:
Ottawa
ContactZipcode:
K2E7S4
ContactState:
ON
ContactCountry:
CA
ContactEmail:
info@6harmonics.com
ContactTelephone:
6133661768
GWS Cmd > restartwsagentear
killall: whitespaceagent: no process killed
GWS Cmd > serialNumber = 620000001
Contact info can not be empty. Please add ContactAddress in registration info
clearshm() at line 64 clear shared memory

Telnet 192.168.1.202
*****
---No station connected---
Database Access:spectrumbridge
Node is EAR With
Hwaddr AC:EE:3B:02:08:26
01:10:43 up 9:49, load average: 0.72, 0.64, 0.52
MemFree: 39844 kB
Channel:
49
Tx Power: 9.000000 dBm
Max Tx Power: 17.000000 dBm
Min Tx Power: 1.000000 dBm
Channel Expire In Minutes:NoValidChannel
Query Time Left In Minutes:N/A
  
```


Radio Record (Missing Contact State)

```

Telnet 192.168.1.202
Suite 10-21 Concoures Gate
ContactCity:
Ottawa
ContactZipcode:
K2E7S4
ContactState:
ON
ContactCountry:
CA
ContactEmail:
info@6harmonics.com
ContactTelephone:
6133661768
GWS Cmd > setcontactstate
GWS Cmd > showregistration
...Registration Info...
URL:
twvs-test.spectrumbridge.com
DeviceMode:
DEV_FIXED
AntennaHeight:
30
AntennaType:
AGL
RegulatoryDomain:
US
Latitude:
28
Longitude:
-81
...Owner Info...
Owner:
6harmonics Inc
Contactname:
Steve Beaudin
ContactAddress:
Suite 10-21 Concoures Gate
ContactCity:
Ottawa
ContactZipcode:
K2E7S4
ContactState:

ContactCountry:
CA
ContactEmail:
info@6harmonics.com
ContactTelephone:
6133661768
GWS Cmd > restartwsagentear
killall: whitespaceagent: no process killed
GWS Cmd > serialNumber = 620000091
Contact info can not be empty. Please add ContactState in registration info
clearshm() at line 64 clear shared memory

Telnet 192.168.1.202
*****
Connected to 4C:5E:0C:10:0E:80
-74 dBm / -100 dBm (SNR 26) 100 ms ago
RX: 14.0 MBit/s, MCS 6          1180 Pkts.
TX: 6.0 MBit/s, MCS 3          25 Pkts.

Database Access:spectrumbridge
Node is EAR With
Mladdr AC:EE:3B:02:08:26
01:14:01 up 9:52, load average: 0.45, 0.74, 0.60
MemFree:      39836 kB
Channel:
35
Tx Power: 9.000000 dBm
Max Tx Power: 17.000000 dBm
Min Tx Power: 1.000000 dBm
Channel Expire In Minutes:NoValidChannel
Query Time Left In Minutes:N/A
Radio Link Up Time...
years - 0
months - 0
days - 0
clock - 0:0:39

```


Radio Record (Missing Contact Zip Code)

```

Telnet 192.168.1.202
Suite 10-21 Concoures Gate
ContactCity:
Ottawa
ContactZipcode:
K2E7S4
ContactState:
ON
ContactCountry:
CA
ContactEmail:
info@6harmonics.com
ContactTelephone:
6133661768
GWS Cmd > setcontactzipcode
GWS Cmd > showregistration
...Registration Info...
URL:
twms-test.spectrumbridge.com
DeviceMode:
DEV_FIXED
AntennaHeight:
88
AntennaType:
AGL
RegulatoryDomain:
US
Latitude:
28
Longitude:
-81
...Owner Info...
Owner:
6harmonics Inc
Contactname:
Steve Beaudin
ContactAddress:
Suite 10-21 Concoures Gate
ContactCity:
Ottawa
ContactZipcode:

ContactState:
ON
ContactCountry:
CA
ContactEmail:
info@6harmonics.com
ContactTelephone:
6133661768
GWS Cmd > restartwsagentear
killall: whitespaceagent: no process killed
GWS Cmd > serialNumber = 620000091
Contact info can not be empty. Please add ContactZip in registration info
clearshm() at line 64 clear shared memory

*****
---No station connected---
Database Access:spectrumbridge
Node is EAR With
Hwaddr AC:EE:3B:02:08:26
01:15:28 up 9:54, load average: 0.14, 0.57, 0.55
MemFree: 39832 kB
Channel:
50
Tx Power: 9.000000 dBm
Max Tx Power: 17.000000 dBm
Min Tx Power: 1.000000 dBm
Channel Expire In Minutes:NoValidChannel
Query Time Left In Minutes:N/A

```


Radio Record (Missing City)

```

Telnet 192.168.1.202
Suite 10-21 Concoures Gate
ContactCity:
Ottawa
ContactZipcode:
K2E7S4
ContactState:
ON
ContactCountry:
CA
ContactEmail:
info@6harmonics.com
ContactTelephone:
6133661768
GWS Cmd > setcontactcity
GWS Cmd > showregistration
...Registration Info...
URL:
twws-test.spectrumbridge.com
DeviceNode:
DEV_FIXED
AntennaHeight:
30
AntennaType:
AGL
RegulatoryDomain:
US
Latitude:
28
Longitude:
-81
...Owner Info...
Owner:
6harmonics Inc
Contactname:
Steve Beaudin
ContactAddress:
Suite 10-21 Concoures Gate
ContactCity:

ContactZipcode:
K2E7S4
ContactState:
ON
ContactCountry:
CA
ContactEmail:
info@6harmonics.com
ContactTelephone:
6133661768
GWS Cmd > restartwsagentear
killall: whitespaceagent: no process killed
GWS Cmd > serialNumber = 620000091
Contact info can not be empty. Please add ContactCity in registration info
clearshm() at line 64 clear shared memory

Telnet 192.168.1.202
-----
---No station connected---
Database Access:spectrumbridge
Node is EAR With
Hwaddr AC:EE:38:02:08:26
  01:12:50 up  9:51,  load average: 1.13, 0.89, 0.63
MemFree:      39776 kB
Channel:
30
Tx Power: 9.000000 dBm
Max Tx Power: 17.000000 dBm
Min Tx Power: 1.000000 dBm
Channel Expire In Minutes:NoValidChannel
Query Time Left In Minutes:N/A
  
```


Radio Record (Missing Country)

```

telnet 192.168.1.202
Suite 10-21 Concoures Gate
ContactCity:
Ottawa
ContactZipcode:
K2E7S4
ContactState:
ON
ContactCountry:
CA
ContactEmail:
info@6harmonics.com
ContactTelephone:
6133661768
GWS Cmd > setcontactcountry
GWS Cmd > showregistration
...Registration Info...
URL:
twsw-test.spectrumbridge.com
DeviceNode:
DEV_FIXED
AntennaHeight:
30
AntennaType:
AGL
RegulatoryDomain:
US
Latitude:
28
Longitude:
-81
...Owner Info...
Owner:
6harmonics Inc
Contactname:
Steve Beaudin
ContactAddress:
Suite 10-21 Concoures Gate
ContactCity:
Ottawa
ContactZipcode:
K2E7S4
ContactState:
ON
ContactCountry:

ContactEmail:
info@6harmonics.com
ContactTelephone:
6133661768
GWS Cmd > restartwsagentear
killall: whitespaceagent: no process killed
GWS Cmd > serialNumber = 620000091
Contact info can not be empty. Please add ContactCountry in registration info
clearshm() at line 64 clear shared memory

telnet 192.168.1.202
*****
---No station connected---
Database Access:spectrumbridge
Node is EAR with
Hwaddr AC:EE:3B:02:08:26
01:16:35 up 9:55, load average: 0.04, 0.46, 0.51
MemFree: 39848 kB
Channel:
22
Tx Power: 9.000000 dBm
Max Tx Power: 17.000000 dBm
Min Tx Power: 1.000000 dBm
Channel Expire In Minutes:NoValidChannel
Query Time Left In Minutes:N/A

```


Radio Record (Missing Email)

```

Telnet 192.168.1.202
Suite 10-21 Concoures Gate
ContactCity:
Ottawa
ContactZipcode:
K2E7S4
ContactState:
ON
ContactCountry:
CA
ContactEmail:
info@6harmonics.com
ContactTelephone:
6133661768
GWS Cmd > setcontactemail
GWS Cmd > showregistration
...Registration Info...
URL:
tvws-test.spectrumbridge.com
DeviceNode:
DEV_FIXED
AntennaHeight:
30
AntennaType:
AGL
RegulatoryDomain:
US
Latitude:
28
Longitude:
-81
...Owner Info...
Owner:
6harmonics Inc
Contactname:
Steve Beaudin
ContactAddress:
Suite 10-21 Concoures Gate
ContactCity:
Ottawa
ContactZipcode:
K2E7S4
ContactState:
ON
ContactCountry:
CA
ContactEmail:
ContactTelephone:
6133661768
GWS Cmd > restartwsagentear
killall: whitespaceagent: no process killed
GWS Cmd > serialNumber = 620000091
Contact info can not be empty. Please add ContactEmail in registration info
clearshm() at line 64 clear shared memory

Telnet 192.168.1.202
-----
---No station connected---
Database Access:spectrumbridge
Node is EAR With
HWaddr AC:EE:3B:02:08:26
01:17:28 up 9:56, load average: 0.47, 0.48, 0.51
MemFree: 39688 kB
Channel:
30
Tx Power: 9.000000 dBm
Max Tx Power: 17.000000 dBm
Min Tx Power: 1.000000 dBm
Channel Expire In Minutes:NoValidChannel
Query Time Left In Minutes:N/A

```


Radio Record (Missing Telephone)

```

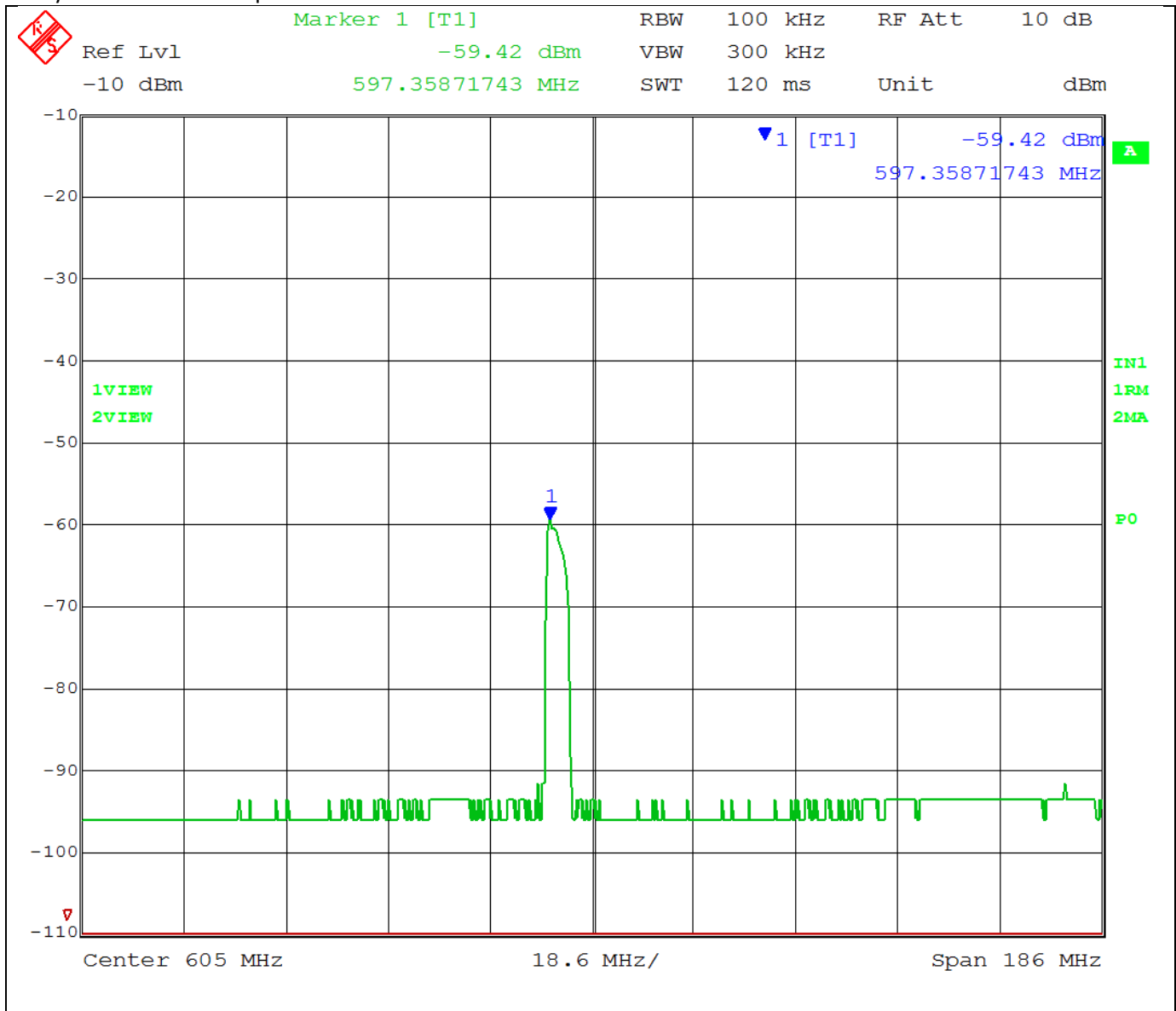
Telnet 192.160.1.202
setgateway xxx.xxx.xxx.xxx
getipaddress
getnetworkmask
getgateway
restartnetwork
config_ear
config_car
getgwsmode
version
reboot
GWS Cmd > setcontacttelephone
Unknow cmd setcontacttelephone
Please type h or --help for supporting commands
GWS Cmd > setcontacttelephone
GWS Cmd > showregistration
...Registration Info...
URL:
tvws-test.spectrumbridge.com
DeviceNode:
DEV_FIXED
AntennaHeight:
30
AntennaType:
AGL
RegulatoryDomain:
US
Latitude:
28
Longitude:
-81
...Owner Info...
Owner:
6harmonics Inc
Contactname:
Steve Beaudin
ContactAddress:
Suite 10-21 Concoures Gate
ContactCity:
Ottawa
ContactZipcode:
K2E7S4
ContactState:
ON
ContactCountry:
CA
ContactEmail:
info@6harmonics.com
ContactTelephone:

GWS Cmd > restartwsagentear
killall: whitespaceagent: no process killed
GWS Cmd > serialNumber = 620000091
Contact info can not be empty. Please add ContactTelephone in registration info
clearshm() at line 64 clear shared memory

*****
---No station connected---
Database Access:spectrumbridge
Node is EAR With
Hwaddr AC:EE:3B:02:08:26
01:20:46 up 9:59, load average: 0.40, 0.41, 0.48
MemFree: 39760 kB
Channel:
24
Tx Power: 9.000000 dBm
Max Tx Power: 17.000000 dBm
Min Tx Power: 1.000000 dBm
Channel Expire In Minutes:NoValidChannel
Query Time Left In Minutes:N/A

```


Only the BTS Beacon is present the CPE TX did not turn on



Incomplete Contact Information Unsuccessful Registration, no tx

Result: PASS

Unsuccessful Registration, 15.713(f)(3) – HAAT > 250m

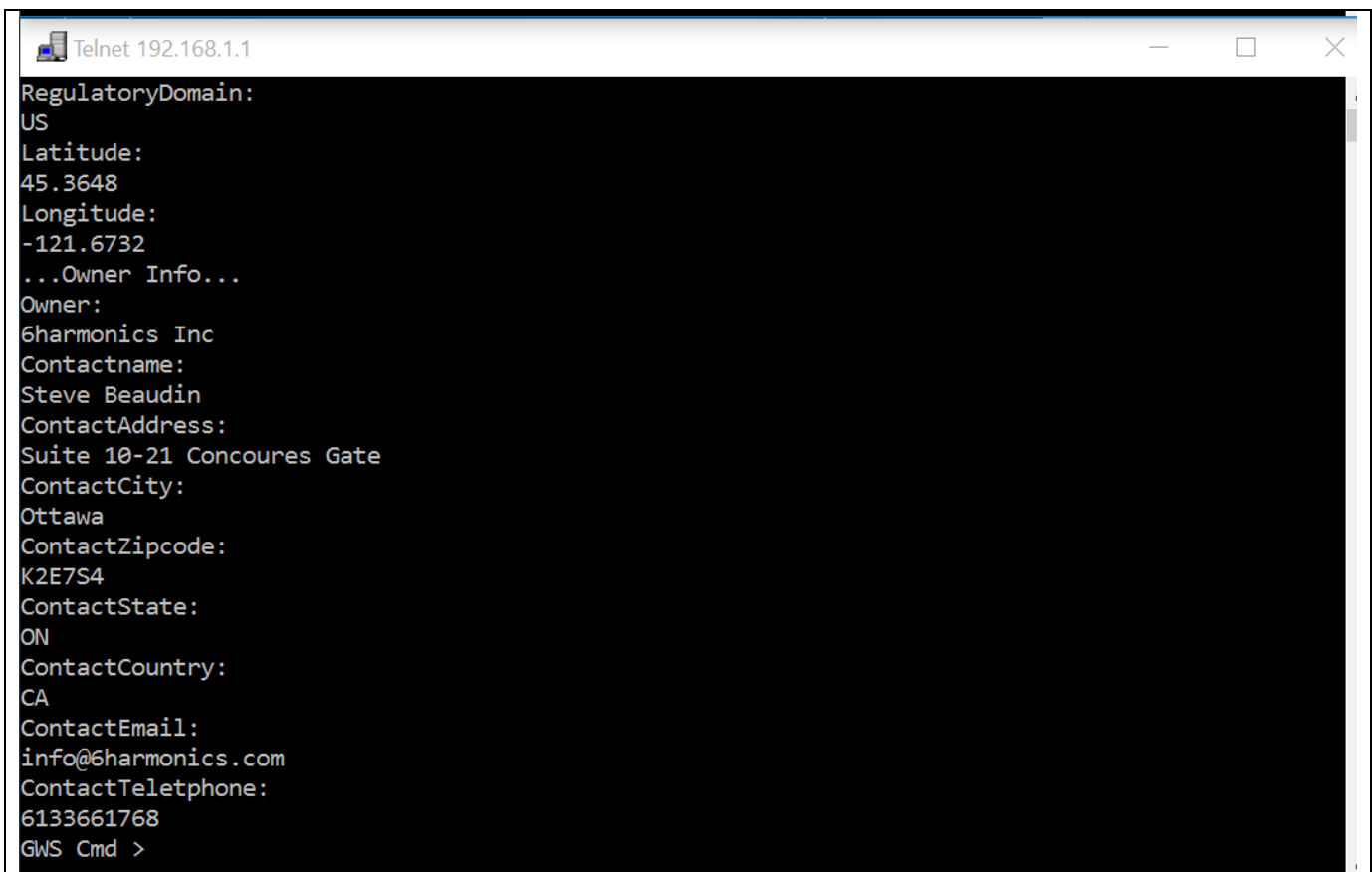
Test Procedure:

Configure the EUT with such that HAAT>250m. Verify the required registration information is sent and stored in the white space data base.

Registration failure should be verified by accessing the WSDB registration interface and also the EUT status web page.

Test Pre-conditions:

A location with a HAAT> 250 m (Derived from location, invalid HAAT example - Mt. Hood 45.3648, -121.6732) was entered into the radio and the information submitted for registration to the WSDB.



```
Telnet 192.168.1.1
RegulatoryDomain:
US
Latitude:
45.3648
Longitude:
-121.6732
...Owner Info...
Owner:
6harmonics Inc
Contactname:
Steve Beaudin
ContactAddress:
Suite 10-21 Concours Gate
ContactCity:
Ottawa
ContactZipcode:
K2E7S4
ContactState:
ON
ContactCountry:
CA
ContactEmail:
info@6harmonics.com
ContactTeletphone:
6133661768
GWS Cmd >
```

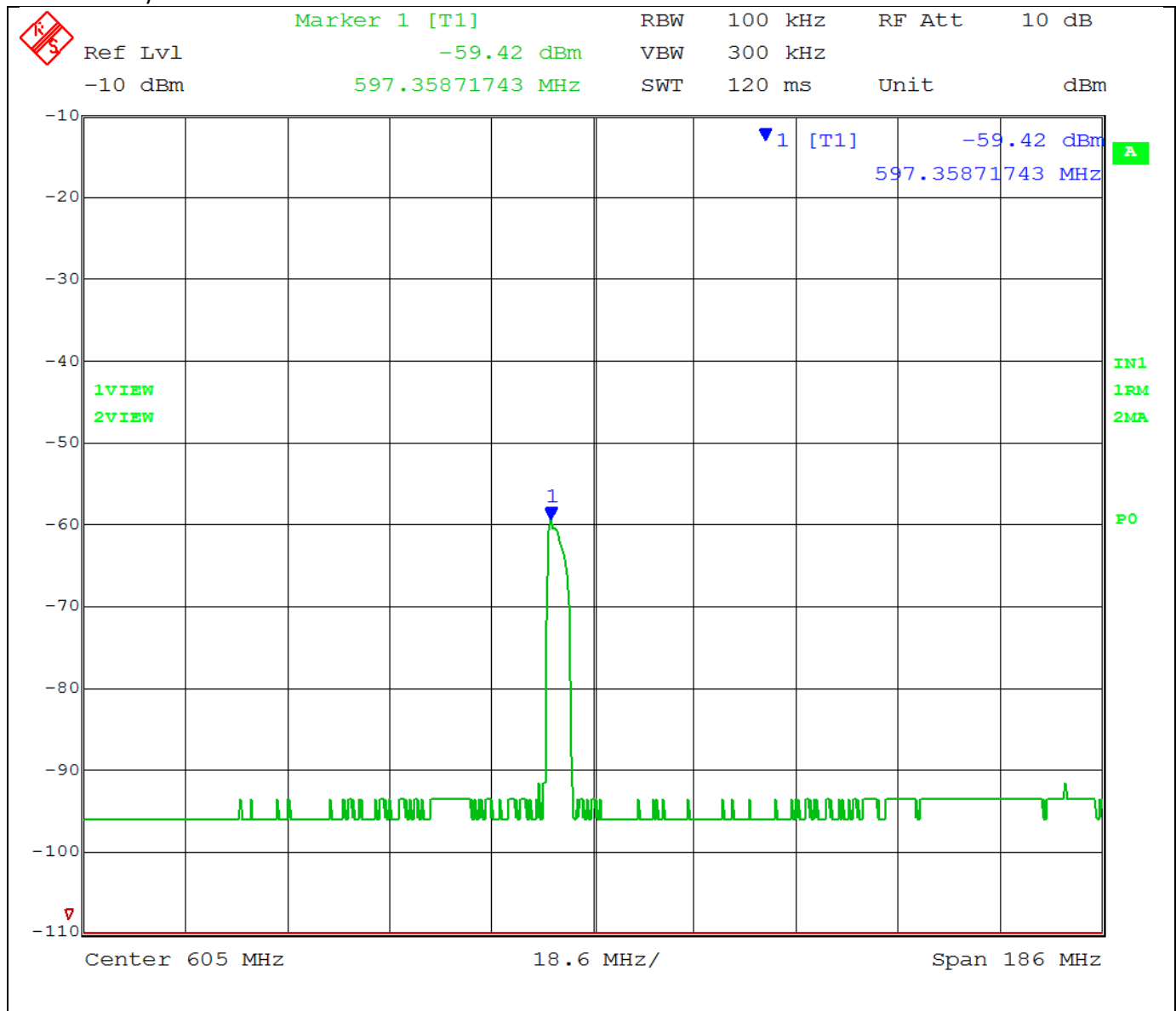

Spectrum Bridge Log

The following log shows the unsuccessful registration with the Database(Eastern Standard Time)

DateTime	RequestIp	Request Url	RequestData	Response Status	ResponseData
12/18/15 15:46	98.191.81.133	/v3/devices /US/2AAST GWS-4006- 17/6200000 91	<?xml version="1.0" encoding="utf-16"?> <RegistrationRequest xmlns:xsd="http://www.w3.org/2001/XMLSchema" a" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"> <DeviceType>Fixed</DeviceType> <Latitude>45.3648</Latitude> <Longitude>-121.6732</Longitude> <AntennaHeight>30</AntennaHeight> <DeviceOwner>6harmonics Inc </DeviceOwner> <ContactName>Steve Beaudin </ContactName> <ContactStreet>Suite 10-21 Concours Gate </ContactStreet> <ContactCity>Ottawa </ContactCity> <ContactState>ON</ContactState> <ContactZip>K2E7S4</ContactZip> <ContactCountry>CA</ContactCountry> <ContactEmail>info@6harmonics.com</ContactEmail> <ContactPhone>6133661768</ContactPhone> </RegistrationRequest>	11	NULL
12/18/15 15:45	98.191.81.133	/v3/devices /US/2AAST GWS-4006- 17/6200000 91	<?xml version="1.0" encoding="utf-16"?> <RegistrationRequest xmlns:xsd="http://www.w3.org/2001/XMLSchema" a" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"> <DeviceType>Fixed</DeviceType> <Latitude>45.3648</Latitude> <Longitude>-121.6732</Longitude> <AntennaHeight>30</AntennaHeight> <DeviceOwner>6harmonics Inc </DeviceOwner> <ContactName>Steve Beaudin </ContactName> <ContactStreet>Suite 10-21 Concours Gate </ContactStreet> <ContactCity>Ottawa </ContactCity> <ContactState>ON</ContactState> <ContactZip>K2E7S4</ContactZip> <ContactCountry>CA</ContactCountry> <ContactEmail>info@6harmonics.com</ContactEmail> <ContactPhone>6133661768</ContactPhone> </RegistrationRequest>	11	NULL

Test Results:

The transmitter did not turn ON. Only the Beacon from the BTS was present, Spectrum analyzer was used to verify no transmission form the CPE.



Result: PASS

d) Unsuccessful Registration, 15.713(f)(3) –Antenna Height AGL> 30m

Test Procedure:

Configure the EUT with such that AGL>30m. Verify the required registration information is sent and stored in the white space data base.

Registration failure should be verified by accessing the WSDB registration interface and also the EUT status web page.

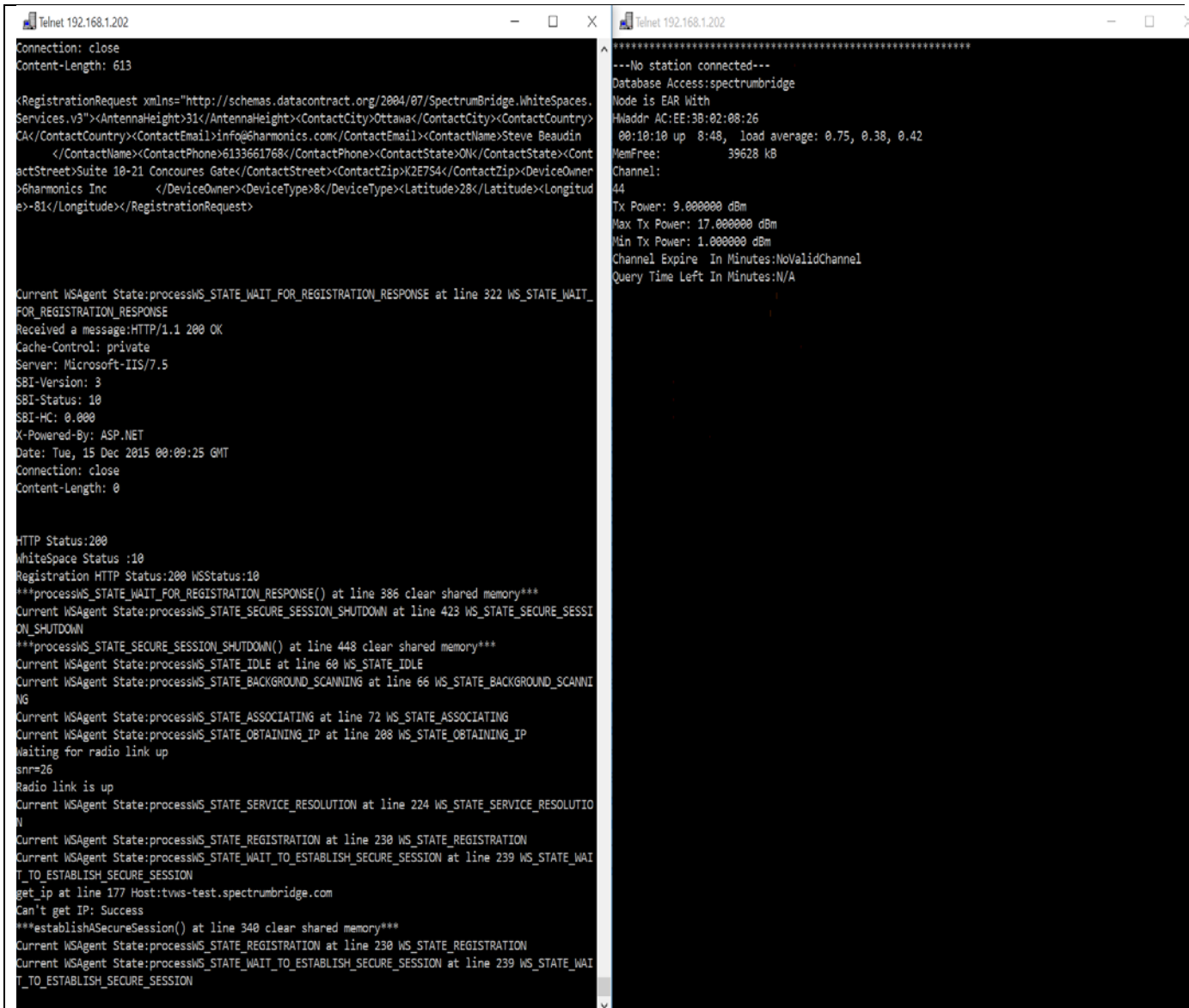
Test Pre-conditions:

Antenna height = 31 m was entered into the radio and the information submitted for registration to the WSDB.

```
GWS Cmd > show registration
...Registration Info...
URL:
tvws-test.spectrumbridge.com
DeviceMode:
DEV_FIXED
AntennaHeight:
31
AntennaType:
AGL
RegulatoryDomain:
US
Latitude:
28
Longitude:
-81
...Owner Info...
Owner:
6harmonics Inc
Contactname:
Steve Beaudin
ContactAddress:
Suite 10-21 Concours Gate
ContactCity:
Ottawa
ContactZipcode:
K2E7S4
ContactState:
ON
ContactCountry:
CA
ContactEmail:
info@6harmonics.com
ContactTelephone:
6133661768
GWS Cmd >
```


Test Results:

The following CPE screenshot shows the requested device registration did not yield any channels upon registering with database



```

Telnet 192.168.1.202
Connection: close
Content-Length: 613

<RegistrationRequest xmlns="http://schemas.datacontract.org/2004/07/SpectrumBridge.WhiteSpaces.
Services.v3"><AntennaHeight>31</AntennaHeight><ContactCity>Ottawa</ContactCity><ContactCountry>
CA</ContactCountry><ContactEmail>info@6harmonics.com</ContactEmail><ContactName>Steve Beaudin
</ContactName><ContactPhone>6133661768</ContactPhone><ContactState>ON</ContactState><Cont
actStreet>Suite 10-21 Concours Gate</ContactStreet><ContactZip>K2E7S4</ContactZip><DeviceOwner
>6harmonics Inc
</DeviceOwner><DeviceType>8</DeviceType><Latitude>28</Latitude><Longitud
e>-81</Longitude></RegistrationRequest>

Current WSAgent State:processWS_STATE_WAIT_FOR_REGISTRATION_RESPONSE at line 322 WS_STATE_WAIT_
FOR_REGISTRATION_RESPONSE
Received a message:HTTP/1.1 200 OK
Cache-Control: private
Server: Microsoft-IIS/7.5
SBI-Version: 3
SBI-Status: 10
SBI-HC: 0.000
X-Powered-By: ASP.NET
Date: Tue, 15 Dec 2015 00:09:25 GMT
Connection: close
Content-Length: 0

HTTP Status:200
WhiteSpace Status :10
Registration HTTP Status:200 WSStatus:10
***processWS_STATE_WAIT_FOR_REGISTRATION_RESPONSE() at line 386 clear shared memory***
Current WSAgent State:processWS_STATE_SECURE_SESSION_SHUTDOWN at line 423 WS_STATE_SECURE_SESSI
ON_SHUTDOWN
***processWS_STATE_SECURE_SESSION_SHUTDOWN() at line 448 clear shared memory***
Current WSAgent State:processWS_STATE_IDLE at line 60 WS_STATE_IDLE
Current WSAgent State:processWS_STATE_BACKGROUND_SCANNING at line 66 WS_STATE_BACKGROUND_SCANNI
NG
Current WSAgent State:processWS_STATE_ASSOCIATING at line 72 WS_STATE_ASSOCIATING
Current WSAgent State:processWS_STATE_OBTAINING_IP at line 208 WS_STATE_OBTAINING_IP
Waiting for radio link up
snr=26
Radio link is up
Current WSAgent State:processWS_STATE_SERVICE_RESOLUTION at line 224 WS_STATE_SERVICE_RESOLUTIO
N
Current WSAgent State:processWS_STATE_REGISTRATION at line 230 WS_STATE_REGISTRATION
Current WSAgent State:processWS_STATE_WAIT_TO_ESTABLISH_SECURE_SESSION at line 239 WS_STATE_WAI
T_TO_ESTABLISH_SECURE_SESSION
get_ip at line 177 Host:tvws-test.spectrumbridge.com
Can't get IP: Success
***establishASecureSession() at line 340 clear shared memory***
Current WSAgent State:processWS_STATE_REGISTRATION at line 230 WS_STATE_REGISTRATION
Current WSAgent State:processWS_STATE_WAIT_TO_ESTABLISH_SECURE_SESSION at line 239 WS_STATE_WAI
T_TO_ESTABLISH_SECURE_SESSION

Telnet 192.168.1.202
---No station connected---
Database Access:spectrumbridge
Node is EAR With
HWaddr AC:EE:3B:02:08:26
00:10:10 up 8:48, load average: 0.75, 0.38, 0.42
MemFree: 39628 kB
Channel:
44
Tx Power: 9.000000 dBm
Max Tx Power: 17.000000 dBm
Min Tx Power: 1.000000 dBm
Channel Expire In Minutes:NoValidChannel
Query Time Left In Minutes:N/A
  
```

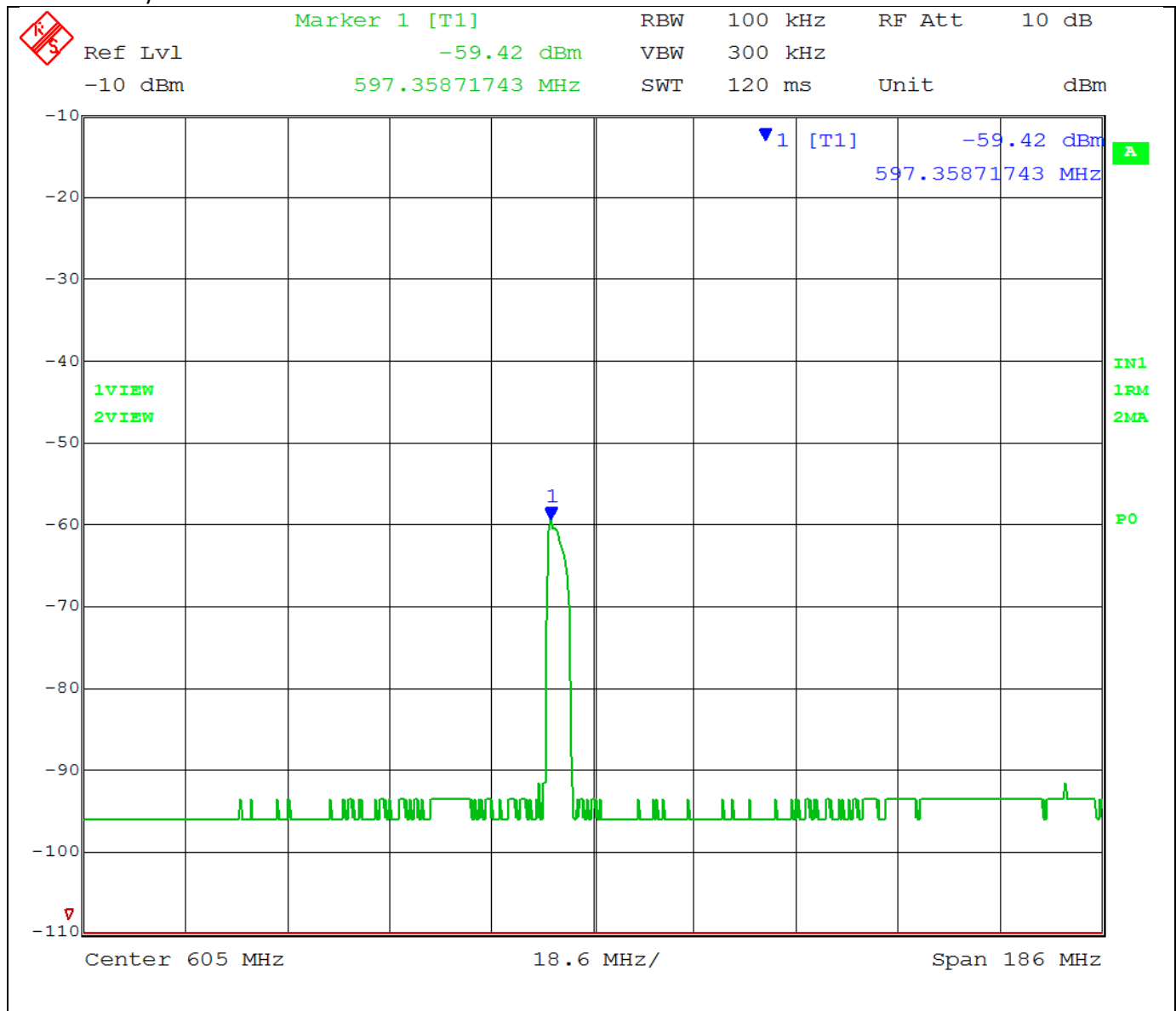

Spectrum Bridge Log

The following log shows the unsuccessful registration with the Database at 7:09 pm (est) due to the antenna height exceeding 30m

DateTime	RequestIp	Request Uri	RequestData	Response Status	ResponseData
12/14/15 19:09	98.191.81.133	/v3/devices/US/2AASTGWS-4006-17/620000091	<?xml version="1.0" encoding="utf-16"?> <RegistrationRequest xmlns:xsd="http://www.w3.org/2001/XMLSchema" instance="1"> xmlns:xsi="http://www.w3.org/2001/XMLSchema" instance="1"> <DeviceType>Fixed</DeviceType> <Latitude>28</Latitude> <Longitude>-81</Longitude> <AntennaHeight>31</AntennaHeight> <DeviceOwner>6harmonics Inc</DeviceOwner> <ContactName>Steve Beaudin</ContactName> <ContactStreet>Suite 10-21 Concours Gate</ContactStreet> <ContactCity>Ottawa</ContactCity> <ContactState>ON</ContactState> <ContactZip>K2E7S4</ContactZip> <ContactCountry>CA</ContactCountry> <ContactEmail>info@6harmonics.com</ContactEmail> <ContactPhone>6133661768</ContactPhone> </RegistrationRequest>	10	NULL
12/14/15 19:09	98.191.81.133	/v3/devices/US/2AASTGWS-4006-17/620000091	<?xml version="1.0" encoding="utf-16"?> <RegistrationRequest xmlns:xsd="http://www.w3.org/2001/XMLSchema" instance="1"> xmlns:xsi="http://www.w3.org/2001/XMLSchema" instance="1"> <DeviceType>Fixed</DeviceType> <Latitude>28</Latitude> <Longitude>-81</Longitude> <AntennaHeight>31</AntennaHeight> <DeviceOwner>6harmonics Inc</DeviceOwner> <ContactName>Steve Beaudin</ContactName> <ContactStreet>Suite 10-21 Concours Gate</ContactStreet> <ContactCity>Ottawa</ContactCity> <ContactState>ON</ContactState> <ContactZip>K2E7S4</ContactZip> <ContactCountry>CA</ContactCountry> <ContactEmail>info@6harmonics.com</ContactEmail> <ContactPhone>6133661768</ContactPhone> </RegistrationRequest>	10	NULL

Test Results:

The transmitter did not turn ON. Only the Beacon from the BTS was present, Spectrum analyzer was used to verify no transmission form the CPE.



Result: PASS

e) Unsuccessful Registration, 15.713(f)(3) – FCC ID, Serial Number

FCC ID and the Serial Number is a part of the TVBD firmware and cannot be changed.

The CPE registration interface does not contain a mechanism by which the serial number or the FCCID of the radio can be changed. The FCCID and serial are flashed during the manufacturing process and cannot be changed without being returned to the manufacturer.

Result: PASS

§15.707(a) Fixed TVBD Relocated

Confirm that the database will not provide a channel list for a Fixed TVBD at a location other than that registered.

Test Procedure:

- ✓ Configure the fixed device with a location that will yield an authorized channel list. Verify proper channel operation using a spectrum analyzer and the device management interface.
- ✓ Reconfigure (change) the configured location of the fixed device. Power cycle the device.
- ✓ Verify that the fixed device receives a channel map request exception, and does not transmit using white space frequencies using a spectrum analyzer and the device management interface.

Test Data:

The implementation of the location input prevents the radio from requesting channels from another location other than the last successful registration. It is not possible for the user to input location information into the radio that would result in a channel request from a different location other than the current registration location. In the event of a change in the input location information, a new registration and channel request are sent using the same entered registration location information.

Result: PASS

§15.711(b)(3)(iii) Fixed & Mode II TVDB Database Update

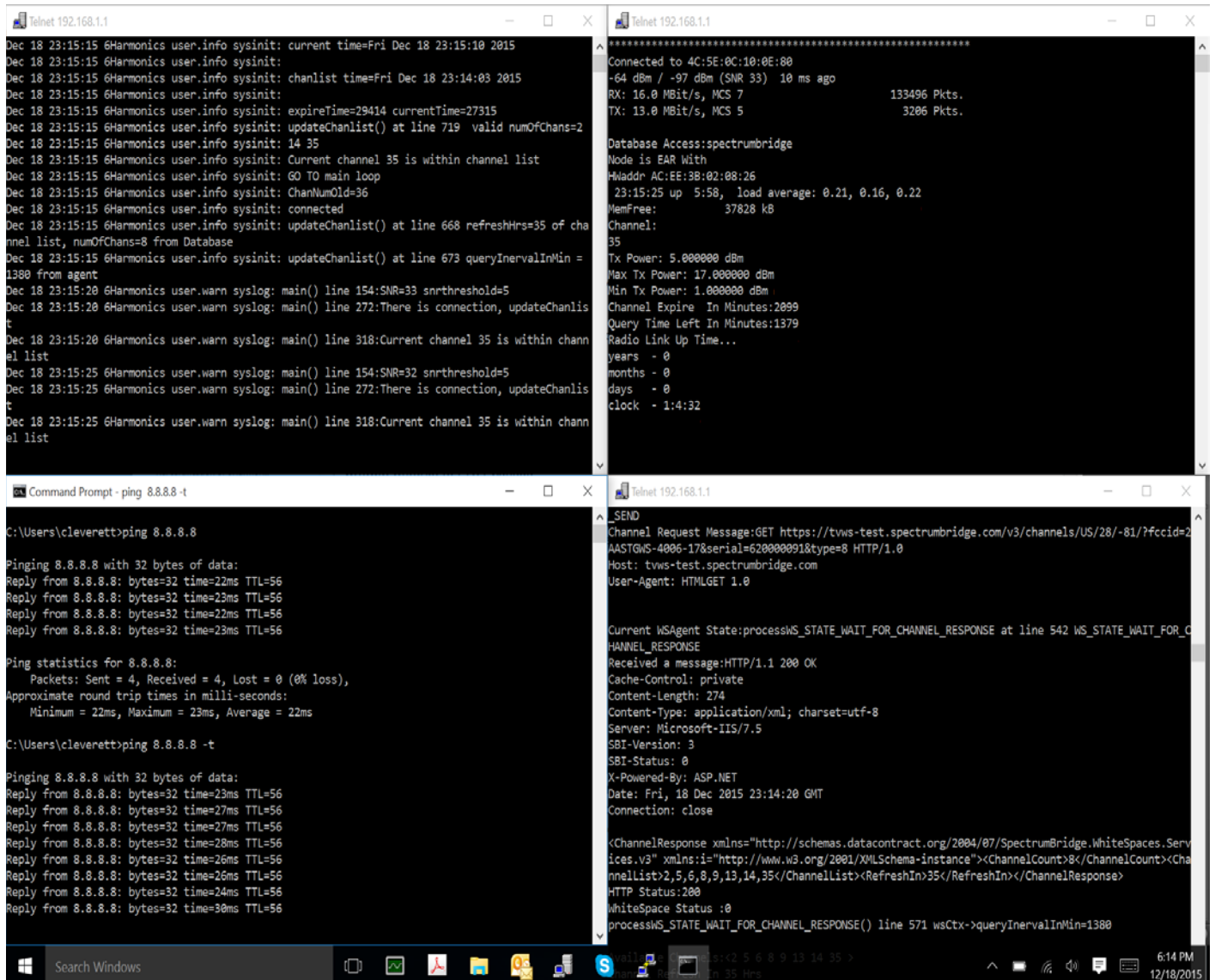
Test Procedures:

– The BS radio is blocked from accessing the WSDB URL by entering and enabling blocking on the network router firewall

Test Results:

1. The BS successfully registered and requested channels at 6:14 pm (EST) on 12-18-2015, as seen in the BS log below and was operating on channel 35
2. The channel allocation is valid for 24 hours and will expire 6:14 pm (EST) on 12-19-2015,
3. The network router was set up to block the iConectiv WSDB service
4. Please see The CPE radio screenshots, and the Spectrum Bridge Database logs on the following pages

The BS radio log shows that the channel location is only valid for 24 hours, the transmitter was turned off after this time.



The screenshot displays four windows from a Windows desktop:

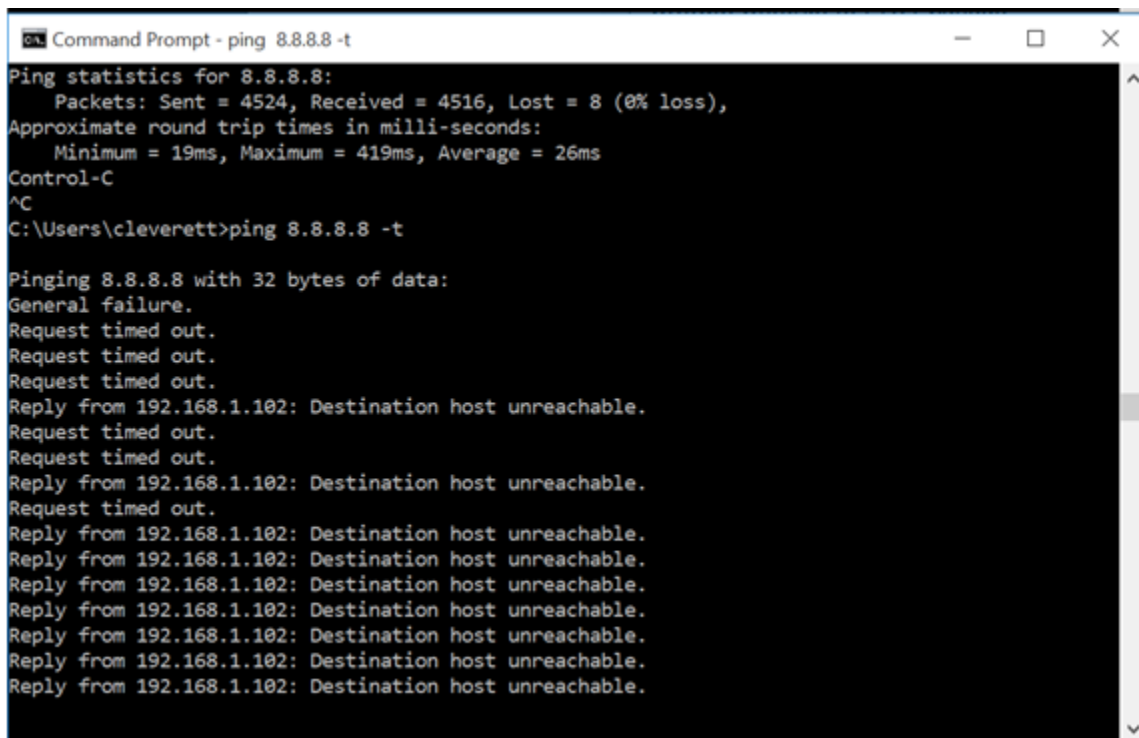
- Top Left (Telnet 192.168.1.1):** Shows a log of system events for 6Harmonics user.info sysinit. Key entries include:
 - Dec 18 23:15:15 6Harmonics user.info sysinit: current time=Fri Dec 18 23:15:10 2015
 - Dec 18 23:15:15 6Harmonics user.info sysinit: chanlist time=Fri Dec 18 23:14:03 2015
 - Dec 18 23:15:15 6Harmonics user.info sysinit: expireTime=29414 currentTime=27315
 - Dec 18 23:15:15 6Harmonics user.info sysinit: updateChanlist() at line 719 valid numOfChans=2
 - Dec 18 23:15:15 6Harmonics user.info sysinit: 14 35
 - Dec 18 23:15:15 6Harmonics user.info sysinit: Current channel 35 is within channel list
 - Dec 18 23:15:15 6Harmonics user.info sysinit: GO TO main loop
 - Dec 18 23:15:15 6Harmonics user.info sysinit: ChanNumOld=36
 - Dec 18 23:15:15 6Harmonics user.info sysinit: connected
 - Dec 18 23:15:15 6Harmonics user.info sysinit: updateChanlist() at line 668 refreshHrs=35 of channel list, numOfChans=8 from Database
 - Dec 18 23:15:15 6Harmonics user.info sysinit: updateChanlist() at line 673 queryIntervalInMin = 1380 from agent
 - Dec 18 23:15:20 6Harmonics user.warn syslog: main() line 154:SNR=33 snrthreshold=5
 - Dec 18 23:15:20 6Harmonics user.warn syslog: main() line 272:There is connection, updateChanlist
 - Dec 18 23:15:20 6Harmonics user.warn syslog: main() line 318:Current channel 35 is within channel list
 - Dec 18 23:15:25 6Harmonics user.warn syslog: main() line 154:SNR=32 snrthreshold=5
 - Dec 18 23:15:25 6Harmonics user.warn syslog: main() line 272:There is connection, updateChanlist
 - Dec 18 23:15:25 6Harmonics user.warn syslog: main() line 318:Current channel 35 is within channel list
- Top Right (Telnet 192.168.1.1):** Shows connection details and statistics:
 - Connected to 4C:5E:0C:10:0E:80
 - 64 dBm / -97 dBm (SNR 33) 10 ms ago
 - RX: 16.0 MBit/s, MCS 7 133496 Pkts.
 - TX: 13.0 MBit/s, MCS 5 3206 Pkts.
 - Database Access:spectrumbridge
 - Node is EAR With
 - HWaddr AC:EE:3B:02:08:26
 - 23:15:25 up 5:58, load average: 0.21, 0.16, 0.22
 - MemFree: 37828 kB
 - Channel: 35
 - Tx Power: 5.000000 dBm
 - Max Tx Power: 17.000000 dBm
 - Min Tx Power: 1.000000 dBm
 - Channel Expire In Minutes:2099
 - Query Time Left In Minutes:1379
 - Radio Link Up Time...
 - years - 0
 - months - 0
 - days - 0
 - clock - 1:4:32
- Bottom Left (Command Prompt - ping 8.8.8.8 -t):** Shows ping results to 8.8.8.8:
 - C:\Users\cleverett>ping 8.8.8.8
 - Pinging 8.8.8.8 with 32 bytes of data:
 - Reply from 8.8.8.8: bytes=32 time=22ms TTL=56
 - Reply from 8.8.8.8: bytes=32 time=23ms TTL=56
 - Reply from 8.8.8.8: bytes=32 time=22ms TTL=56
 - Reply from 8.8.8.8: bytes=32 time=23ms TTL=56
 - Ping statistics for 8.8.8.8:
 - Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
 - Approximate round trip times in milli-seconds:
 - Minimum = 22ms, Maximum = 23ms, Average = 22ms
 - C:\Users\cleverett>ping 8.8.8.8 -t
 - Pinging 8.8.8.8 with 32 bytes of data:
 - Reply from 8.8.8.8: bytes=32 time=23ms TTL=56
 - Reply from 8.8.8.8: bytes=32 time=27ms TTL=56
 - Reply from 8.8.8.8: bytes=32 time=27ms TTL=56
 - Reply from 8.8.8.8: bytes=32 time=28ms TTL=56
 - Reply from 8.8.8.8: bytes=32 time=26ms TTL=56
 - Reply from 8.8.8.8: bytes=32 time=26ms TTL=56
 - Reply from 8.8.8.8: bytes=32 time=24ms TTL=56
 - Reply from 8.8.8.8: bytes=32 time=30ms TTL=56
- Bottom Right (Telnet 192.168.1.1):** Shows an HTTP GET request and response:
 - _SEND
 - Channel Request Message:GET https://twvs-test.spectrumbridge.com/v3/channels/US/28/-81/?ccid=2AASTGWS-4006-17&serial=620000091&type=8 HTTP/1.0
 - Host: twvs-test.spectrumbridge.com
 - User-Agent: HTMLGET 1.0
 - Current WSAgent State:processWS_STATE_WAIT_FOR_CHANNEL_RESPONSE at line 542 WS_STATE_WAIT_FOR_CHANNEL_RESPONSE
 - Received a message:HTTP/1.1 200 OK
 - Cache-Control: private
 - Content-Length: 274
 - Content-Type: application/xml; charset=utf-8
 - Server: Microsoft-IIS/7.5
 - SBI-Version: 3
 - SBI-Status: 0
 - X-Powered-By: ASP.NET
 - Date: Fri, 18 Dec 2015 23:14:20 GMT
 - Connection: close
 - <ChannelResponse xmlns="http://schemas.datacontract.org/2004/07/SpectrumBridge.WhiteSpaces.Services.v3" xmlns:i="http://www.w3.org/2001/XMLSchema-instance"><ChannelCount>8</ChannelCount><ChannelList>2,5,6,8,9,13,14,35</ChannelList><RefreshIn>35</RefreshIn></ChannelResponse>
 - HTTP Status:200
 - WhiteSpace Status :0
 - processWS_STATE_WAIT_FOR_CHANNEL_RESPONSE() line 571 wsCtx->queryIntervalInMin=1380

Spectrum Bridge Log

The following log shows the successful registration with the Database (Eastern Standard Time)

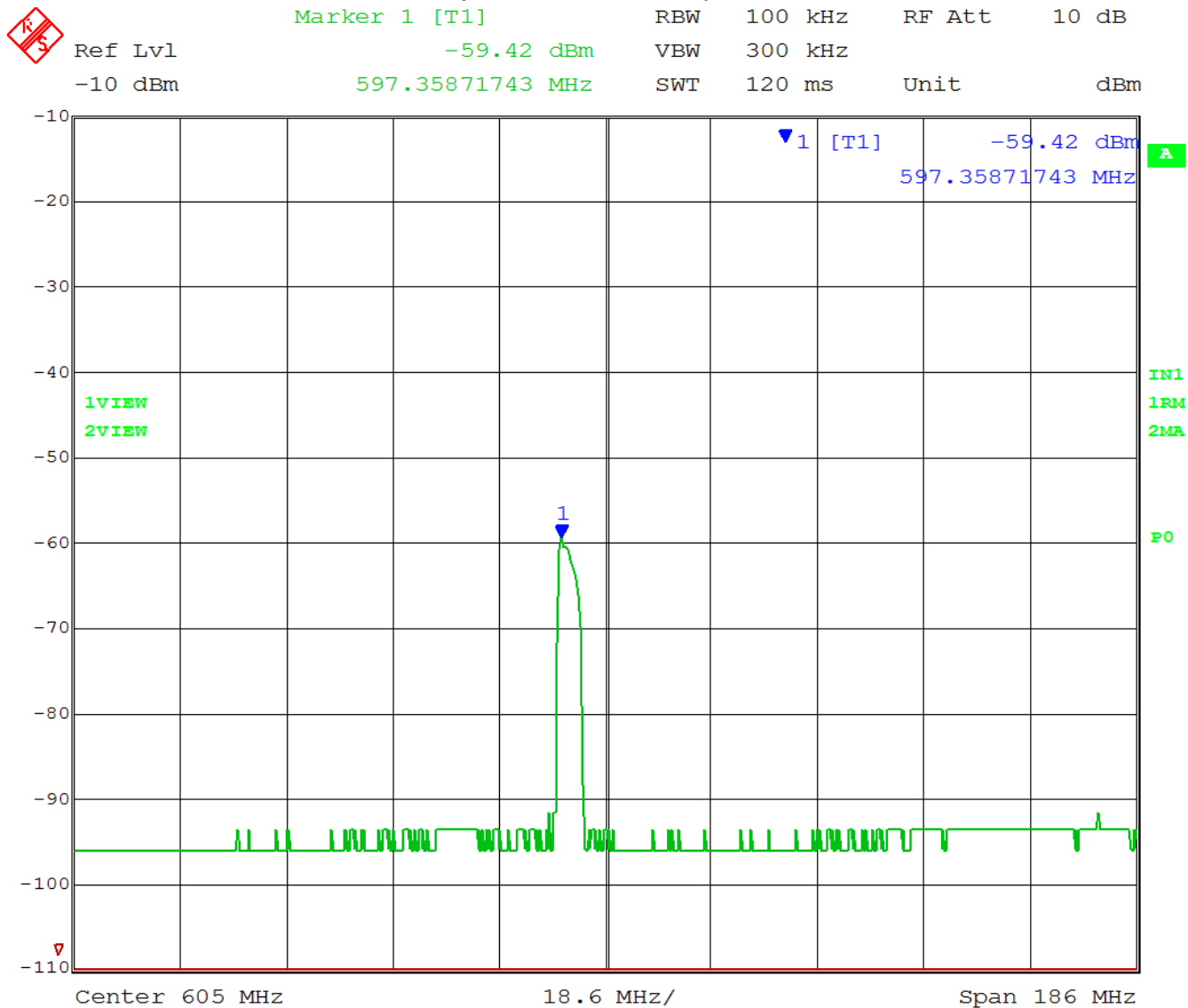
DateTime	RequestIp	Request Url	RequestData	Response Status	ResponseData
12/18/15 18:14	98.191.81.133	/v3/channels/US/28/-81/?fccid=2AASTGWS-4006-17&serial=620000091&type=8	NULL	0	16"?> <ChannelResponse xmlns:xsd="http://www.w3.org/2001/XMLSchema" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"> <ChannelCount>8</ChannelCount> <ChannelList>2,5,6,8,9,13,14,35</ChannelList> <RefreshIn>35</RefreshIn> </ChannelResponse>
12/18/15 18:14	98.191.81.133	/v3/devices/US/2AASTGWS-4006-17/620000091	version="1.0" encoding="utf-16"?> <RegistrationRequest xmlns:xsd="http://www.w3.org/2001/XMLSchema" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"> <DeviceType>Fixed</DeviceType> <Latitude>28</Latitude> <Longitude>-81</Longitude> <AntennaHeight>30</AntennaHeight> <DeviceOwner>6harmonics Inc</DeviceOwner>	0	NULL

BS radio is blocked from WSDB URL access, Client Radio is no longer online as a result of the Base Station not being able to access the Spectrum Bridge URL for a database query. At 6:13 pm (est) on 12/19/2015 the ping to googles DNS server failed through CPE's radio link to BS.

A screenshot of a Windows Command Prompt window titled "Command Prompt - ping 8.8.8.8 -t". The window has a black background with white text. The text shows the results of a ping command to 8.8.8.8. It starts with "Ping statistics for 8.8.8.8:" followed by "Packets: Sent = 4524, Received = 4516, Lost = 8 (0% loss)," and "Approximate round trip times in milli-seconds: Minimum = 19ms, Maximum = 419ms, Average = 26ms". Then, it shows "Control-C" and "^C". The command "C:\Users\cleverett>ping 8.8.8.8 -t" is entered. The output shows "Pinging 8.8.8.8 with 32 bytes of data:" followed by "General failure." and several "Request timed out." messages. There are also several "Reply from 192.168.1.102: Destination host unreachable." messages. The window has a standard Windows title bar with minimize, maximize, and close buttons.

The following spectrum analyzer plot was captured to make sure the transmission had stopped.

Only the BTS Beacon Was present



Result: PASS

§15.711(b)(3)(i)(ii), §15.713(a)(1) 48 Hour Channel Scheduling

Use the database protected entity interface to register protection for a low-power auxiliary device in the same location and channel on which the TVDB (EUT) has selected and is operating. The registered protection for the low-power auxiliary device should be scheduled for protection within the next 48 hour period.

Test Procedure:

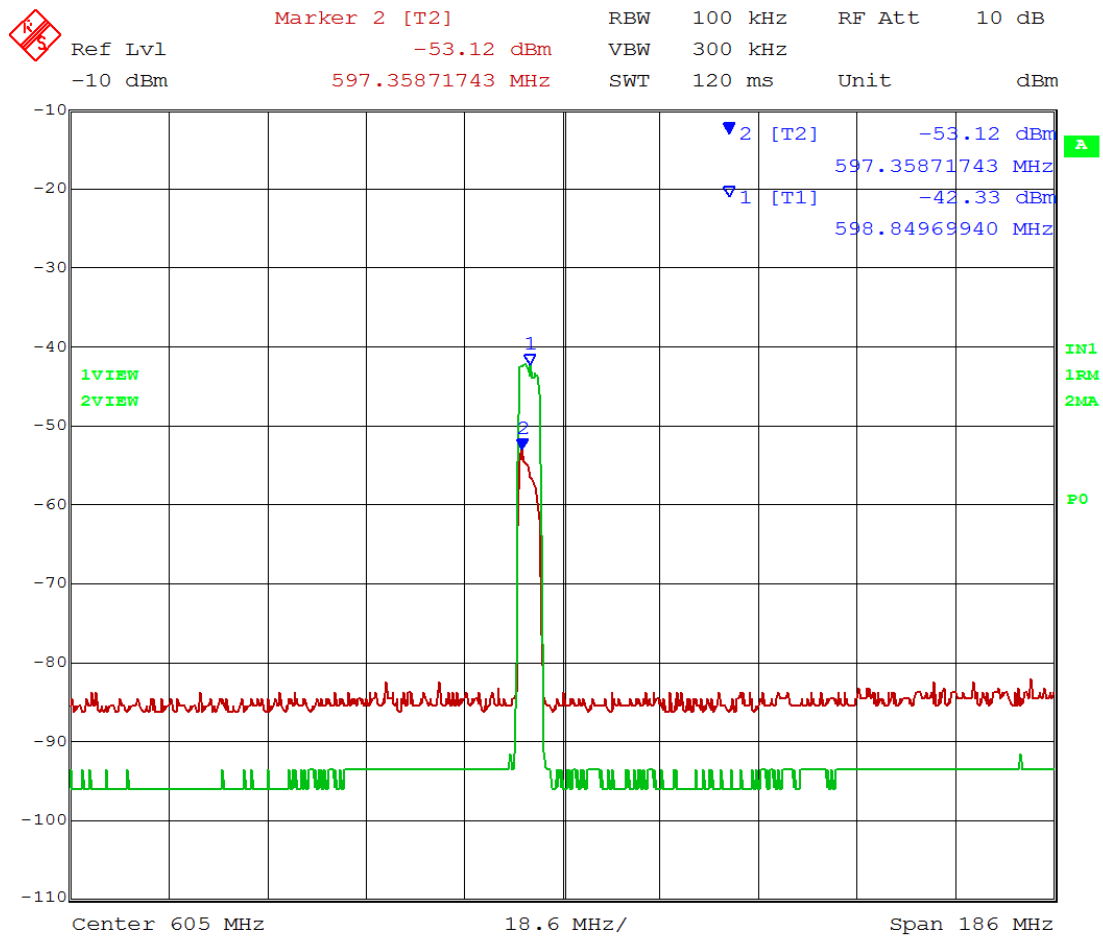
- ✓ Configure the TVBD (EUT) such that it can access the database.
- ✓ Verify that EUT requests and receives a valid channel list. Verify the EUT is using an authorized channel using a spectrum analyzer and the device management interface.
- ✓ Use the database interface to register protection for a low-power auxiliary device for the same location and channel on which the TVDB (EUT) has selected and is operating. The registered protection for the low-power auxiliary device should be scheduled for protection within the next 48 hour period.
- ✓ Verify that the EUT requests and receives a new channel list at the scheduled time of the registered low-power channel protection is to take effect.
- ✓ Verify the EUT is no longer operating on the channel that was previously used and subsequently reserved using a spectrum analyzer and the device management interface.

Test Data:

Pre-Protected Entity registration status Base Station and CPE are registered and operating on channel 35

The EUT was registered at 10:07 am (est) on 12/21/2015 and verified that a valid channel list was received. The device was transmitting on channel 35.

Pre-Protected Entity registration status Base Station and CPE are registered and operating on channel 35MHz



Using the database interface here <https://spectrum.iconectiv.com> a low-power auxiliary device was registered for the same location and channel on which the TVDB (EUT) has selected and is operating (CH19). The registered protection for the low-power auxiliary device was scheduled for 1:30 pm (est) on 12/21/2015 PM.

Entity Information

Entity Type	Low Power Auxiliary Stations
Channel Numbers	35
Transmitter Call Sign	LP001

Usage Schedule

Usage	One Time Event
Time Zone	(UTC-05:00) Eastern Time (US & Canada)
Event Starts	12/21/2015 11:30:00 AM
Event Ends	12/21/2015 1:30:00 PM

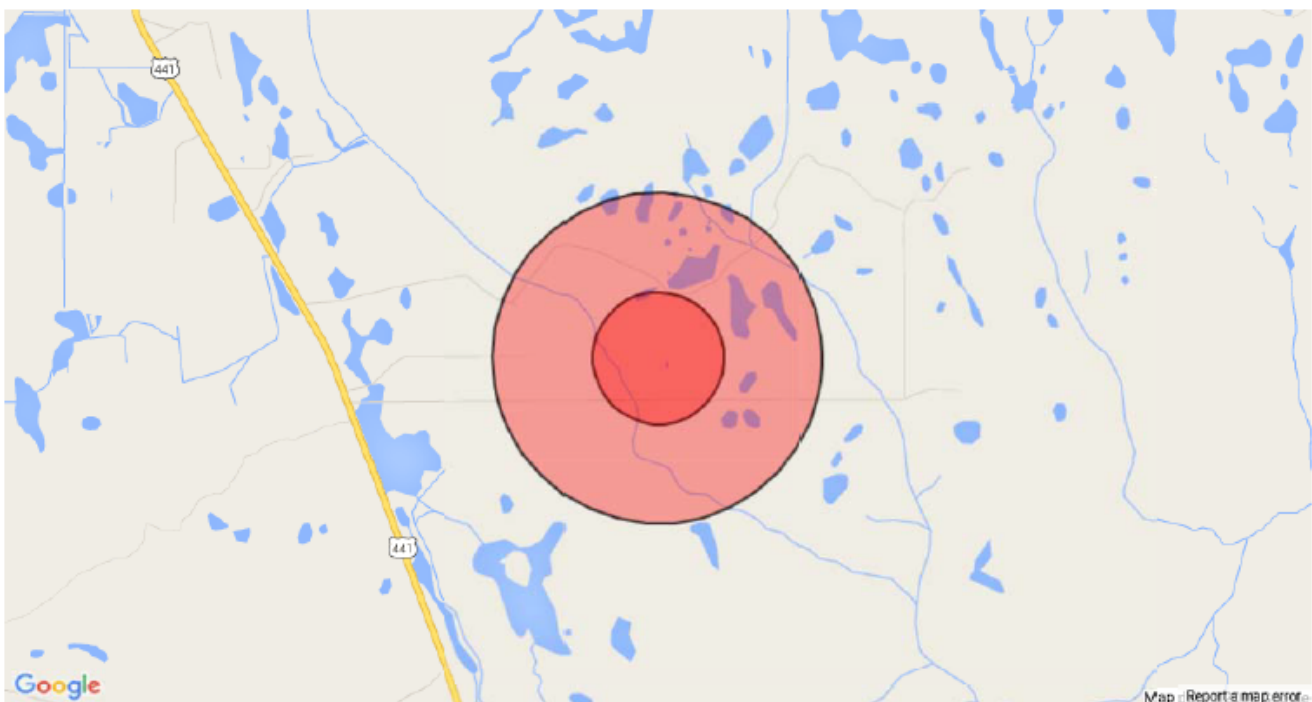
Contact Information

Name of Entity Owner	TIMCO
Contact Name	Cory Leverett
Country	US
Address	849 NW SR 45
City	Newberry
State	FL
Postal Code	32669
Contact Phone	352-472-5500
Contact Email	cory@timcoengr.com

Location(s)

Point: 28 -81

Map

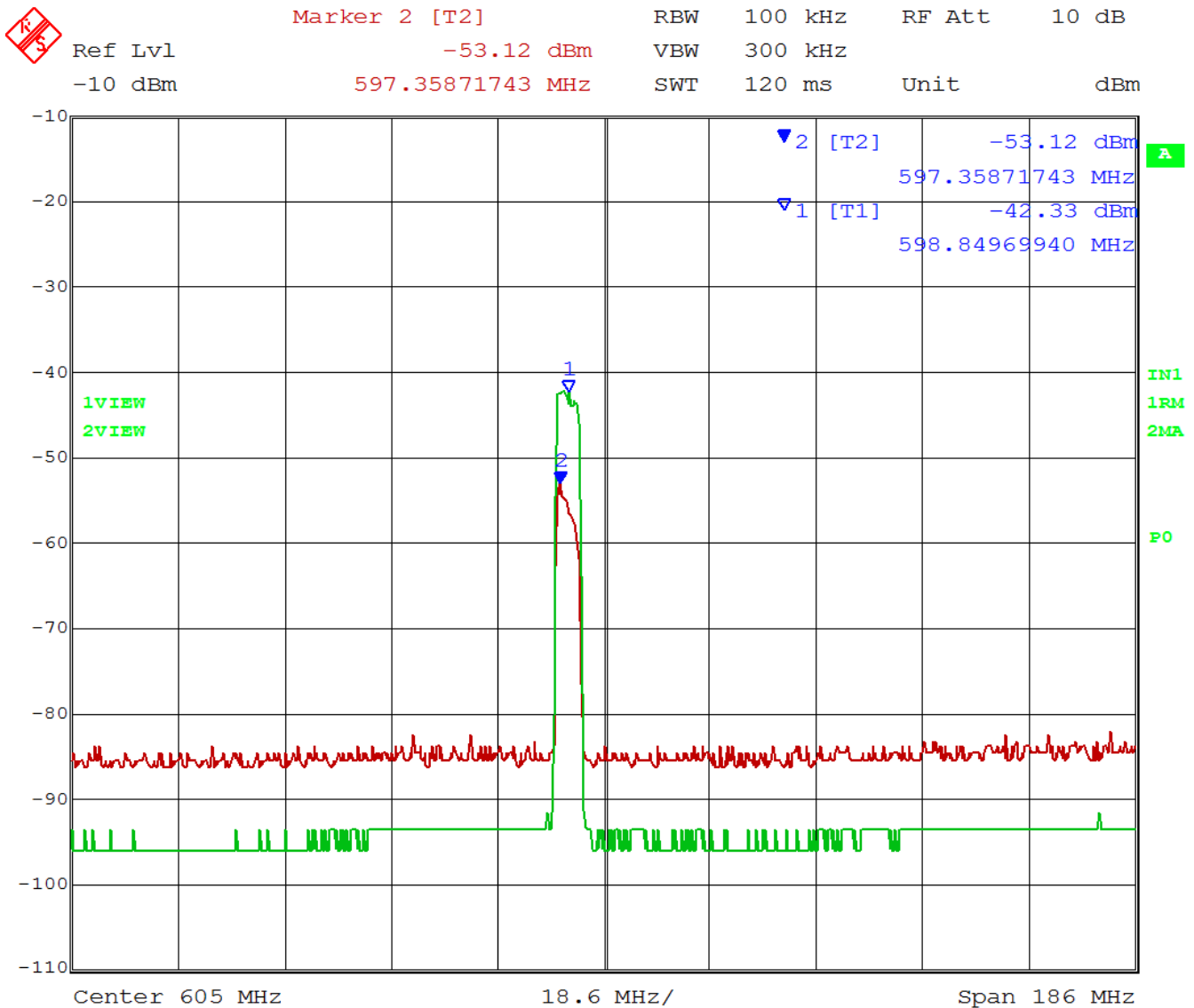


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Auxiliary Device Enrollment

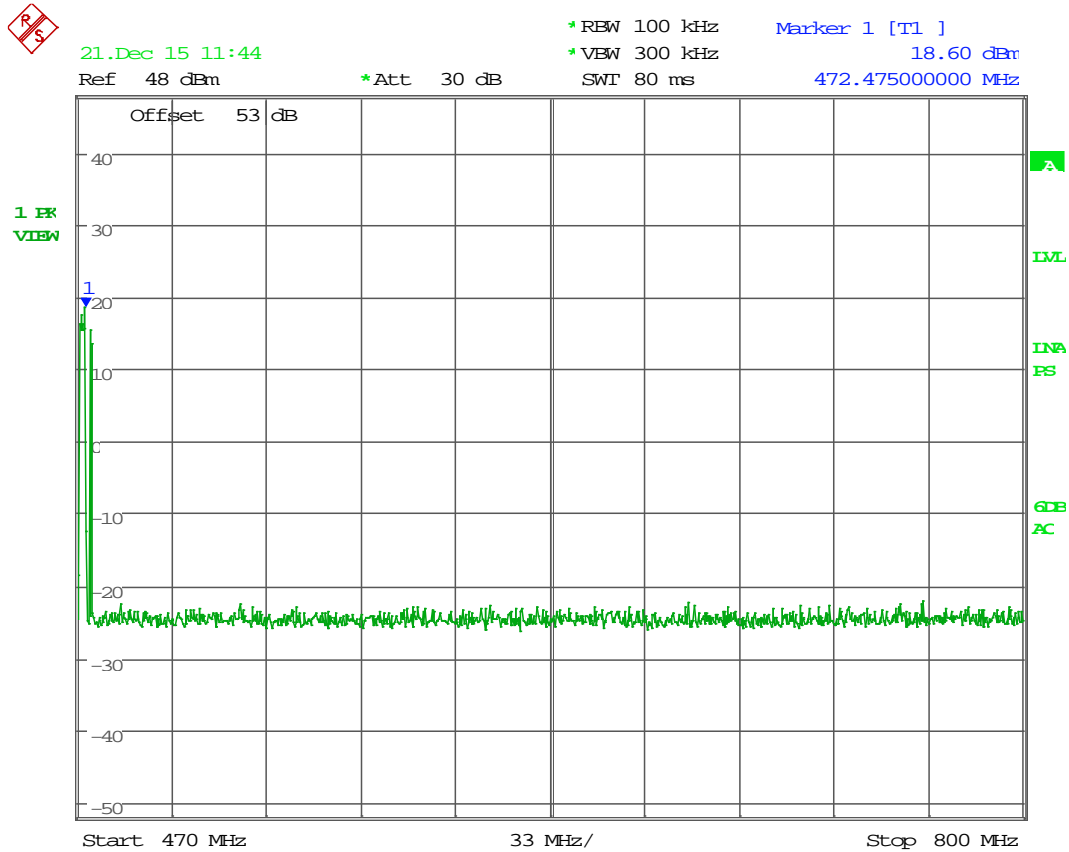
APPLICANT. 6HARMONICS, INC.
FCC ID: 2AASTGWS-4006-17
REPORT: 2592UT15TestReport_Rev1

After the auxiliary device has been registered, and a new TVBD registration has been initiated, the updated channel information is retrieved from the database and the EUT is still transmitting on channel 35:



Post-Protected Entity registration operating channel 14
The EUT vacated the protected channel prior to the scheduled time

Spectrum Analyzer plot to show that EUT has moved to CH 14



Date: 21.DEC.2015 11:44:25

Spectrum Bridge Log

The following log shows the successful registration with the Database before the event at 10:07 am (Eastern Standard Time) on 12/21/2015 with channel 35 in its channel list

DateTime	RequestIp	Request Url	RequestData	Response Status	ResponseData
12/21/15 10:07	98.191.81.133	/v3/channels/US/28/-81/?fccid=2AASTGWS-4006-17&serial=620000091&type=8	NULL	0	<?xml version="1.0" encoding="utf-16"?> <ChannelResponse xmlns:xsd="http://www.w3.org/2001/XMLSchema" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"> <ChannelCount>8</ChannelCount> <ChannelList>2,5,6,8,9,13,14,35</ChannelList> <RefreshIn>48</RefreshIn> </ChannelResponse>
12/21/15 10:07	98.191.81.133	/v3/devices/US/2AASTGWS-4006-17/620000091	<?xml version="1.0" encoding="utf-16"?> <RegistrationRequest xmlns:xsd="http://www.w3.org/2001/XMLSchema" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"> <DeviceType>Fixed</DeviceType> <Latitude>28</Latitude> <Longitude>-81</Longitude> <AntennaHeight>30</AntennaHeight> <DeviceOwner>6harmonics Inc</DeviceOwner> <ContactName>Steve Beaudin</ContactName> <ContactStreet>Suite 10-21 Concoures Gate</ContactStreet> <ContactCity>Ottawa</ContactCity> <ContactState>ON</ContactState> <ContactZip>K2E7S4</ContactZip> <ContactCountry>CA</ContactCountry> <ContactEmail>info@6harmonics.com</ContactEmail> <ContactPhone>6133661768</ContactPhone> </RegistrationRequest>	0	NULL

Spectrum Bridge Log

The following log shows the database query after the channel list expires after the event at 11:35 am(Eastern Standard Time) with the scheduled events channel 35 removed from the channel list

DateTime	RequestIp	Request Url	RequestData	Response Status	ResponseData
12/21/15 11:35	98.191.81.133	/v3/channels/US/28/-81/?fccid=2AASTGWS-4006-17&serial=620000091&type=8	NULL	0	<pre><?xml version="1.0" encoding="utf-16"?> <ChannelResponse xmlns:xsd="http://www.w3.org/2001/XMLSchema" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"> <ChannelCount>7</ChannelCount> <ChannelList>2,5,6,8,9,13,14</ChannelList> <RefreshIn>48</RefreshIn> </ChannelResponse></pre>
12/21/15 11:35	98.191.81.133	/v3/devices/US/2AASTGWS-4006-17/620000091	<pre><?xml version="1.0" encoding="utf-16"?> <RegistrationRequest xmlns:xsd="http://www.w3.org/2001/XMLSchema" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"> <DeviceType>Fixed</DeviceType> <Latitude>28</Latitude> <Longitude>-81</Longitude> <AntennaHeight>30</AntennaHeight> <DeviceOwner>6harmonics Inc</DeviceOwner> <ContactName>Steve Beaudin</ContactName> <ContactStreet>Suite 10-21 Concoures Gate</ContactStreet> <ContactCity>Ottawa</ContactCity> <ContactState>ON</ContactState> <ContactZip>K2E7S4</ContactZip> <ContactCountry>CA</ContactCountry> <ContactEmail>info@6harmonics.com</ContactEmail> <ContactPhone>6133661768</ContactPhone> </RegistrationRequest></pre>	0	NULL

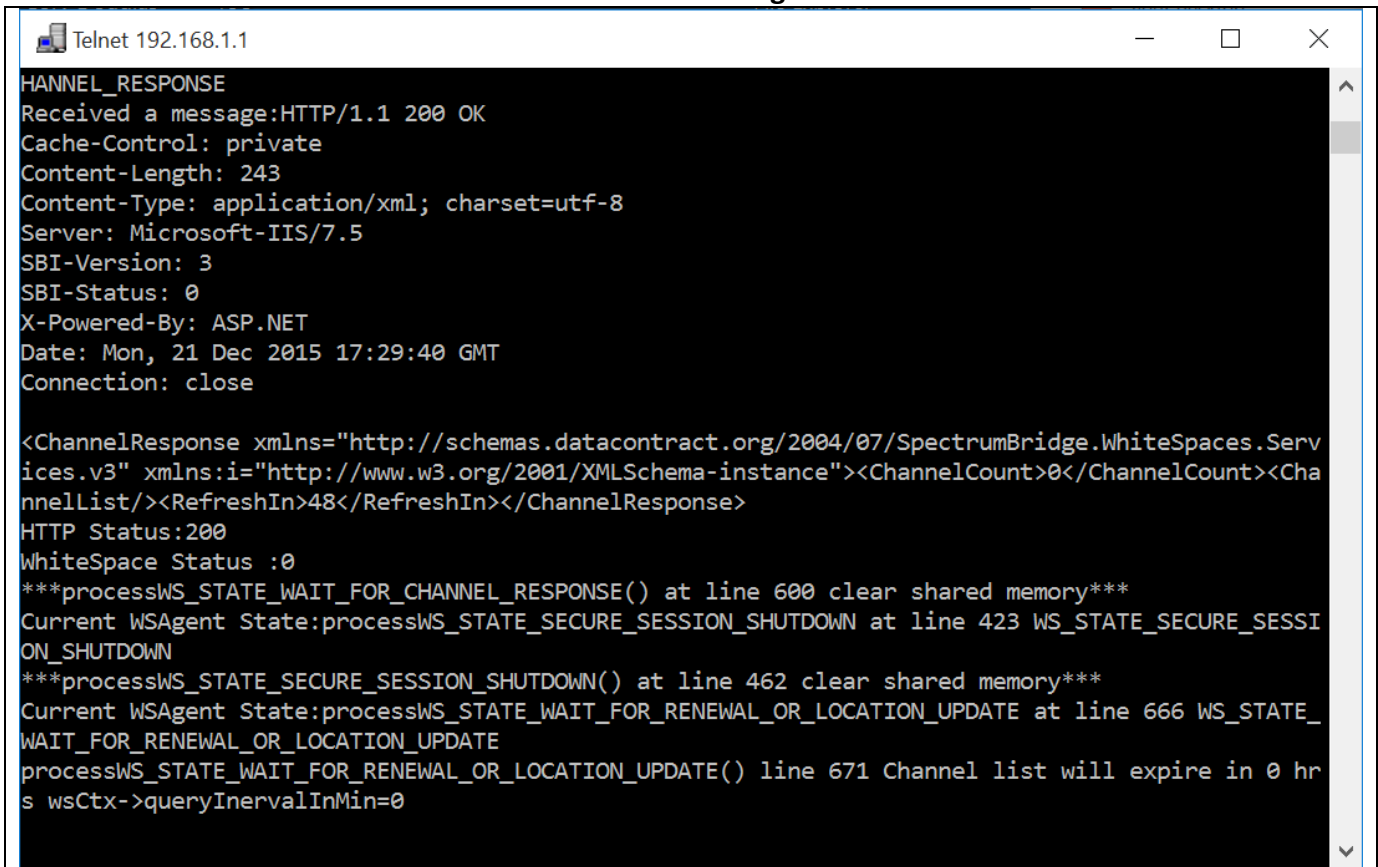
§15.707, §15.711(b)(3)(i)(ii)(iv),(c), §15.712 TVBD Channel Availability

Confirm that the channel list provided by the database conforms with those allowable to the class of TVBD under test. Confirm that the TVBD is operating on a channel from the list at authorized power and cannot be made to operate on an unauthorized channel.

Test Procedure:

- ✓ Configure and register the devices location (34.078611, -107.61805) such that the database returns a channel list that does not allow operation on any channel.
- ✓ Use a spectrum analyzer to verify that the EUT does not transmit on any white space channel.
- ✓ Verify that the EUT does not transmit on any channel until it successfully registers and receives a channel list

Test Results: There were no channels available for the registered location



```
Telnet 192.168.1.1
HANNEL_RESPONSE
Received a message:HTTP/1.1 200 OK
Cache-Control: private
Content-Length: 243
Content-Type: application/xml; charset=utf-8
Server: Microsoft-IIS/7.5
SBI-Version: 3
SBI-Status: 0
X-Powered-By: ASP.NET
Date: Mon, 21 Dec 2015 17:29:40 GMT
Connection: close

<ChannelResponse xmlns="http://schemas.datacontract.org/2004/07/SpectrumBridge.WhiteSpaces.Services.v3" xmlns:i="http://www.w3.org/2001/XMLSchema-instance"><ChannelCount>0</ChannelCount><ChannelList/><RefreshIn>48</RefreshIn></ChannelResponse>
HTTP Status:200
WhiteSpace Status :0
***processWS_STATE_WAIT_FOR_CHANNEL_RESPONSE() at line 600 clear shared memory***
Current WSAgent State:processWS_STATE_SECURE_SESSION_SHUTDOWN at line 423 WS_STATE_SECURE_SESSION_SHUTDOWN
***processWS_STATE_SECURE_SESSION_SHUTDOWN() at line 462 clear shared memory***
Current WSAgent State:processWS_STATE_WAIT_FOR_RENEWAL_OR_LOCATION_UPDATE at line 666 WS_STATE_WAIT_FOR_RENEWAL_OR_LOCATION_UPDATE
processWS_STATE_WAIT_FOR_RENEWAL_OR_LOCATION_UPDATE() line 671 Channel list will expire in 0 hrs
wsCtx->queryIntervalInMin=0
```

The radio did not/does not transmit until it receives a valid channel list. A valid channel list could not be obtained from the coordinates used to register fixed device.

Result: Pass

Spectrum Bridge Log

The following log shows the successful registration with the Database at 12:29 pm (est) on 12/21/2015 and that there are no channels provided in the channel list with the coordinates given during registration

DateTime	RequestIp	Request Url	RequestData	Response Status	ResponseData
12/21/15 12:29	98.191.81.133	/v3/channels/US/34.078611/-107.61805/?fccid=2AAS TGWS-4006-17&serial=620000091&type=8	NULL	0	<?xml version="1.0" encoding="utf-16"?> <ChannelResponse xmlns:xsd="http://www.w3.org/2001/XMLSchema" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"> <ChannelCount>0</ChannelCount> <ChannelList /> <RefreshIn>48</RefreshIn> > </ChannelResponse>
12/21/15 12:29	98.191.81.133	/v3/devices/US/2AAS TGWS-4006-17/620000091	<?xml version="1.0" encoding="utf-16"?> <RegistrationRequest xmlns:xsd="http://www.w3.org/2001/XMLSchema" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"> <DeviceType>Fixed</DeviceType> <Latitude>34.078611</Latitude> <Longitude>-107.61805</Longitude> <AntennaHeight>30</AntennaHeight> <DeviceOwner>6harmonics Inc</DeviceOwner> <ContactName>Steve Beaudin </ContactName> <ContactStreet>Suite 10-21 Concoures Gate </ContactStreet> <ContactCity>Ottawa </ContactCity> <ContactState>ON</ContactState> <ContactZip>K2E7S4</ContactZip> <ContactCountry>CA</ContactCountry> <ContactEmail>info@6harmonics.com</ContactEmail> <ContactPhone>6133661768</ContactPhone> </RegistrationRequest>	0	NULL

Result: Pass

APPLICANT. 6HARMONICS, INC.
FCC ID: 2AAS
REPORT: 2592UT15TestReport_Rev1

§15.711(f) Security:

Please see the attached document: 6H SBI Secure Communications Cert.pdf