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**FCC PART 15. Subpart H White Spaces System**  
**Part 2 TEST REPORT**  
**Fixed TVBD Device**

<b>Applicant</b>	6HARMONICS, INC.	
<b>Address</b>	21 CONCOURSE GATE SUITE 10 OTTAWA ON K2E 7S4	
<b>FCC ID</b>	2AAST GWS-3000	
<b>Model Number</b>	GWS 3000	
<b>Product Description</b>	WHITE SPACE TVBD DEVICE	
<b>Date Sample Received</b>	August/05/2013	
<b>Date Tested</b>	August/05 – 09/2013	
<b>Tested By</b>	Mario de Aranzeta	
<b>Approved By</b>	Mario de Aranzeta	
<b>Report Number</b>	1379UT13TestReport.docx	
<b>Test Results</b>	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL

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



Testing Certificate # 0955-01

## TABLE OF CONTENTS

<b>TABLE OF CONTENTS .....</b>	<b>2</b>
<b>GENERAL INFORMATION .....</b>	<b>4</b>
<b>EMC EQUIPMENT LIST .....</b>	<b>5</b>
<b>TEST PROCEDURES.....</b>	<b>6</b>
<b>TEST CONFIGURATIONS: .....</b>	<b>7</b>
<b>DEVICE AND SYSTEM OPERATION.....</b>	<b>8</b>
<b>TEST NETWORK CONFIGURATION.....</b>	<b>8</b>
<b>TEST SUMMARY.....</b>	<b>9</b>
<b>TEST RESULT SUMMARY .....</b>	<b>9</b>
<b>DATABASE ENROLLMENT INFORMATION .....</b>	<b>10</b>
<b>SETUP PHOTO .....</b>	<b>11</b>
<b>§15.713(F)(3) FIXED TVBD REGISTRATION .....</b>	<b>12</b>
A)    SUCCESSFUL REGISTRATION, 15.713(F)(3) – FIXED TVBD WITH DIRECT CONNECTION TO INTERNET (BASE STATION) .....	12
B)    SUCCESSFUL REGISTRATION, 15.713(F)(3) – FIXED TVBD WITHOUT A DIRECT CONNECTION TO THE INTERNET(SUBSCRIBER) .....	14
C)    UNSUCCESSFUL REGISTRATION, 15.713(F)(3) – RESTRICTED CO-ORDINATES.....	16
D)    UNSUCCESSFUL REGISTRATION, 15.713(F)(3) – INCOMPLETE CONTACT INFORMATION .....	19
E)    UNSUCCESSFUL REGISTRATION, 15.713(F)(3) – HAAT > 250M .....	22
F)    UNSUCCESSFUL REGISTRATION, 15.713(F)(3) –ANTENNA HEIGHT AGL> 30M .....	24
G)    UNSUCCESSFUL REGISTRATION, 15.713(F)(3) – FCC ID, SERIAL NUMBER .....	26
<b>§15.707(A) FIXED TVBD RELOCATED .....</b>	<b>27</b>
<b>§15.711(B)(3)(III) FIXED &amp; MODE II TVDB DATABASE UPDATE .....</b>	<b>29</b>
<b>§15.707, §15.711(B)(3)(I)(II)(IV),(C), §15.712 TVBD CHANNEL AVAILABILITY.....</b>	<b>39</b>
<b>§15.711(F) SECURITY: .....</b>	<b>44</b>

APPLICANT: 6HARMONICS, INC.

FCC ID: 2AAST GWS-3000

REPORT: 6\6HARMONICS\1379UT13\1379UT13TestReport.docx

## 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 (Spectrum Bridge 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.



Testing Certificate # 0955-01

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:



Compliance Engineer

Date: August 09, 2013

APPLICANT: 6HARMONICS, INC.

FCC ID: 2AAST GWS-3000

REPORT: 6\6HARMONICS\1379UT13\1379UT13TestReport.docx

## GENERAL INFORMATION

### EUT Description

General:

Need 6Harmonics EUT description here, it has been requested.

### EUT Specification:

<b>Applicable Standard</b>	Part 15 Subpart H TV Band White Space Fixed Device		
<b>EUT Description</b>	Transceiver – Single preferred channel		
<b>FCC ID</b>	2AAST GWS-3000		
<b>Application:</b>	High capacity, long range communications links		
<b>Operating Frequency</b>	473-695 MHz		
<b>Number of channels</b>	TV Channels 14 -35 and 39-51 (473MHz-599MHz and 623MHz-695MHz)		
<b>Transmit Power(dBm):</b>	+20dBm maximum per RF channel		
<b>EUT Power Source</b>	<input type="checkbox"/> 110–120Vac/50– 60Hz <input checked="" type="checkbox"/> DC <input type="checkbox"/> Battery Operated Exclusively		
<b>Test Item</b>	<input type="checkbox"/> Prototype	<input type="checkbox"/> Pre-Production	<input checked="" type="checkbox"/> Production
<b>Type of Equipment</b>	<input checked="" type="checkbox"/> Fixed - WGF <input type="checkbox"/> Fixed - WSF	<input type="checkbox"/> Mobile – WG1 <input type="checkbox"/> Mobile – WS1	<input type="checkbox"/> Portable – WG2 <input type="checkbox"/> Portable – WS2
<b>Antenna Connector</b>	50 ohm N- connector		
<b>Antenna model</b>			
<b>Network Port</b>	RJ 45		
<b>Indicators</b>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>		

<b>Test Facility</b>	Timco Engineering Inc. 849 NW State Road 45 Newberry, FL 32669 USA.
<b>Test Conditions</b>	Temperature: 26°C Relative humidity: 50%
<b>Test Exercise</b>	The EUT was tested in normal operator mode.

APPLICANT: 6HARMONICS, INC.

FCC ID: 2AAST GWS-3000

REPORT: 6\6HARMONICS\1379UT13\1379UT13TestReport.docx



## EMC EQUIPMENT LIST

Device	Manufacturer	Model	Serial Number	Cal/Char Date	Due Date
Digital Multimeter	Fluke	8000A	520258	02/25/13	02/25/15
Digital Multimeter	Fluke	77	43850817	02/22/12	02/22/14
Spectrum Analyzer	R & S	ESU40	5000-309011540	3/21/2013	3/21/2015

APPLICANT: 6HARMONICS, INC.

FCC ID: 2AAST GWS-3000

REPORT: 6\6HARMONICS\1379UT13\1379UT13TestReport.docx

## 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.

### **Firmware Version Tested (base station)**

```
192.168.3.5:1440 - Tera Term VT
File Edit Setup Control Window Help
root@6HarmonicsBTS:~#
root@6HarmonicsBTS:~#
root@6HarmonicsBTS:~#
root@6HarmonicsBTS:~# cd /etc/config
root@6HarmonicsBTS:/etc/config# ls -al
drwxr-xr-x  1 root      root          2048 Jan  1  1970 .
drwxr-xr-x  1 root      root          2048 Jan  1  1970 ..
-rw-r--r--  1 root      root          37 Jul 17 14:26 6H-HotSpotConfig.cfg
-rw-r--r--  1 root      root          14 Jul 17 14:26 aircardusb.cfg
-rw-r--r--  1 root      root          12 Jul 17 14:26 btsip.cfg
-rw-r--r--  1 root      root          9 Aug  9 19:19 chanlist
-rw-r--r--  1 root      root          583 Jan  1  1970 dhcp
-rw-r--r--  1 root      root          86 Jul 17 14:26 dropbear
-rw-r--r--  1 root      root          3863 Jul 17 15:23 firewall
-rw-r--r--  1 root      root          109 Jul 17 14:26 fullchanlist
-rw-r--r--  1 root      root          191 Jul 17 15:21 lldpd
-rw-r--r--  1 root      root          353 Jul 19 20:23 network
-rw-r--r--  1 root      root          1773 Jul 17 14:26 qos
-rw-r--r--  1 root      root          182 Aug  9 19:19 registration
-rw-r--r--  1 root      root          275 Jan  1  1970 system
-rw-r--r--  1 root      root          365 Jan  1  1970 wireless
root@6HarmonicsBTS:/etc/config# version
6HGWS-Host-Firmware-v1.0.0-Beta2-July-17-2013-build
root@6HarmonicsBTS:/etc/config#
```

(CPE)

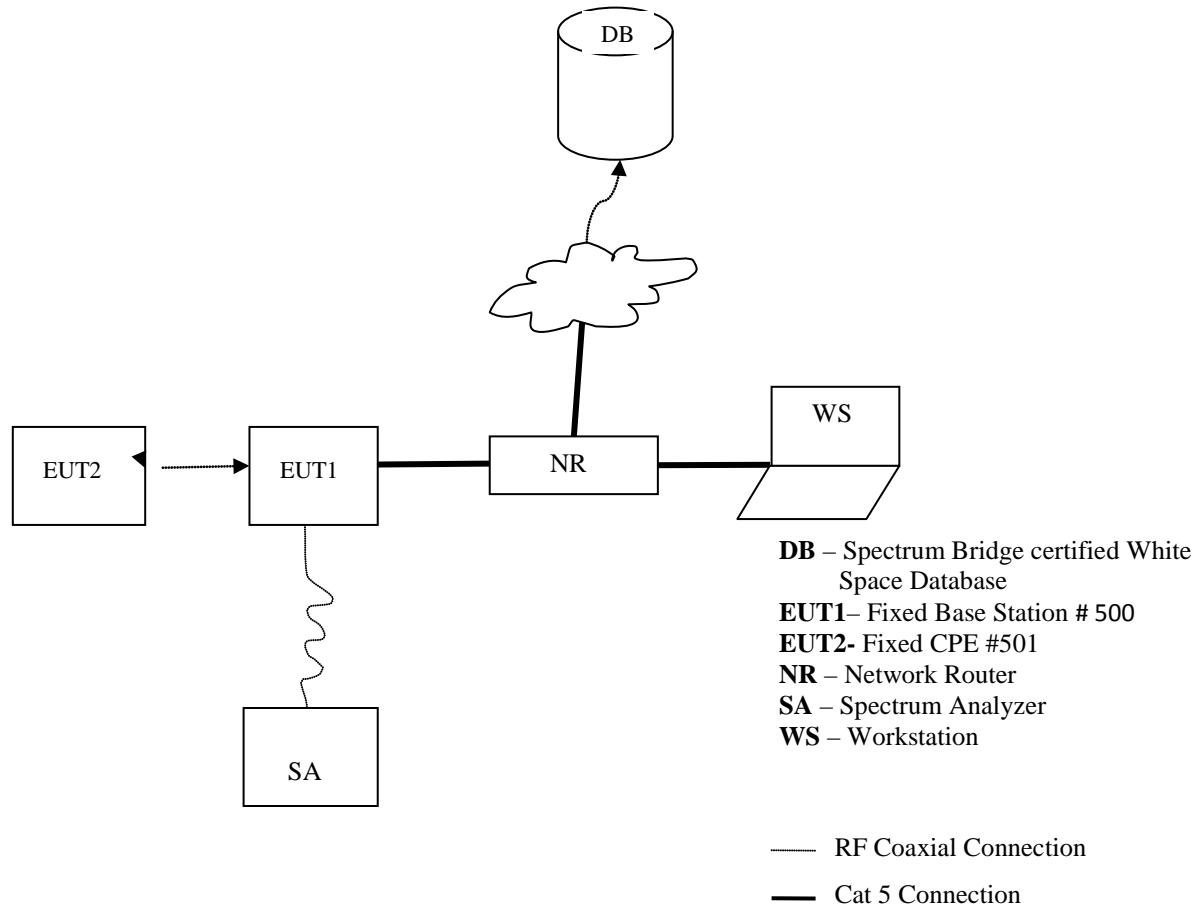
```
192.168.3.5:1440 - Tera Term VT
File Edit Setup Control Window Help
<ON>
<CA>
<Yu.Zhou@6Harmonics.com>
<6132524992>
$ ~ ~ ~ ~ ~
root@6HarmonicsBTS:/etc/config#
root@6HarmonicsBTS:/etc/config#
root@6HarmonicsBTS:/etc/config#
root@6HarmonicsBTS:/etc/config# opkg info wsbtsgagent
Package: wsbtsgagent
Version: 1.0.0-1
Depends: libc, libopenssl, libpthread, librt
Provides:
Status: install user installed
Architecture: ar71xx
Installed-Time: 1376068658
root@6HarmonicsBTS:/etc/config#
```

APPLICANT. 6HARMONICS, INC.

FCC ID: 2AAST GWS-3000

REPORT: 6\6HARMONICS\1379UT13\1379UT13TestReport.docx

**TEST CONFIGURATIONS:**



**Figure 1 TVBD Configuration**

## 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-3000 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

The GWS 3000 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 #500
- EUT2 –CPE White Space Radio Serial #501
- 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.

APPLICANT: 6HARMONICS, INC.

FCC ID: 2AAST GWS-3000

REPORT: 6\6HARMONICS\1379UT13\1379UT13TestReport.docx

## 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

APPLICANT: 6HARMONICS, INC.

FCC ID: 2AAST GWS-3000

REPORT: 6\6HARMONICS\1379UT13\1379UT13TestReport.docx

## Database Enrollment Information

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

<b>FCCID</b>	<b>Serial #</b>	<b>Entity Name</b>	<b>Expires</b>
6Harmonics	500	6Harmonics Inc.	12/31/2013
6Harmonics	501	6Harmonics Inc.	12/31/2013

## Radio Registration Input File

## Radio Registration Input

192.168.3.5:1440 - Tera Term VT

File Edit Setup Control Window Help

```
root@6HarmonicsBTS:~# wsagentbts
Security Cert File:cafile.cert
HostURL=tws-test.spectrumbridge.com
PortNumber=443
mode=8
AntHeightInMeters=30
RegulatoryDomain=US
FCCID=6HARMONICS
SerialNumber=500
Latitude=-28.0
Longitude=-81.0
OwnerName=Robert Wu
ContactName=Yu Zhou
ContactAddress=Suite 10-21 Concources Gate
ContactCity=Maitland
ContactZip=K2E7S4
ContactState=ON
ContactCountry=CA
ContactEmail=yu.zhou@6harmonics.com
ContactTelephone=6132524992
comPortNumber=443 wsCtx->comPortNumber=443
Successfully Initialized the Context
Current WSAgent State:WS_STATE_IDLE
Current WSagent State:WS_STATE_BACKGROUND_SCANNING
```

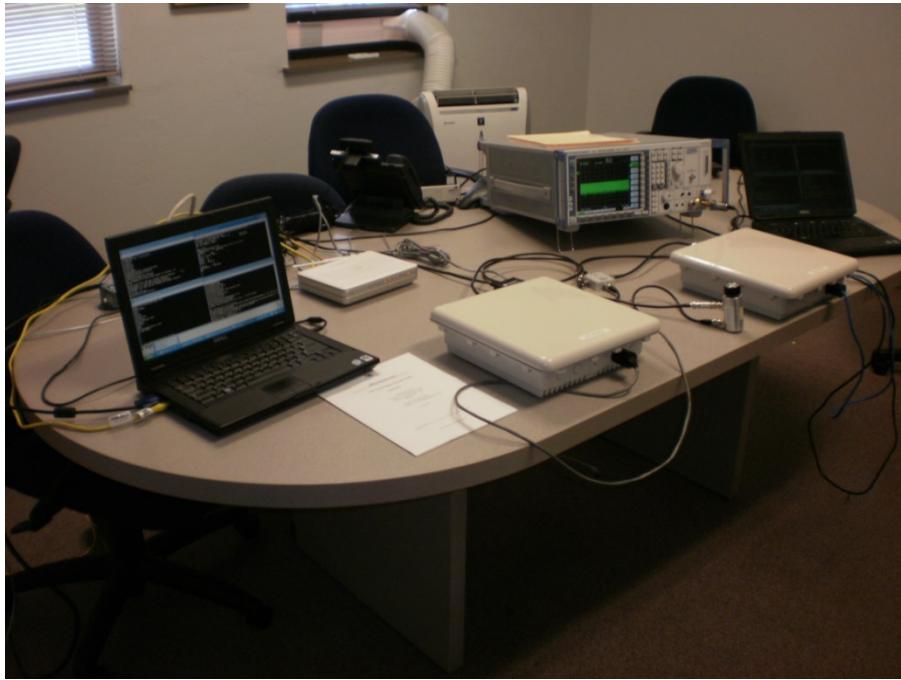
## WSDB Record

Date	Ip	Url	Status	RT (ms)	Data
8/8/2013 5:17:21 PM	71.43.255.210	/v3/channels/US/28.0/-81.0/?fccid=6HARMONICS&serial=500&type=8	Success (0)	826	Response
8/8/2013 5:17:20 PM	71.43.255.210	/v3/devices/US/6HARMONICS/500	Success (0)	313	Request

**Entity Name:** 6HARMONICS, INC.  
**Serial No:** Base unit: 500, CPE: 501  
**FCC ID:** 2AAST GWS-3000

APPLICANT: 6HARMONICS, INC.  
FCC ID: 2AAST GWS-3000  
REPORT: 6\6HARMONICS\1379UT13\1379UT13TestReport.docx

**Setup Photo**



APPLICANT: 6HARMONICS, INC.

FCC ID: 2AAST GWS-3000

REPORT: 6\6HARMONICS\1379UT13\1379UT13TestReport.docx

## §15.713(f)(3) Fixed TVBD Registration

### a) Successful Registration, 15.713(f)(3) – Fixed TVBD with direct connection to Internet (Base Station)

#### Test procedure:

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

Successful registration should be verified by accessing the WSDB registration interface and also the EUT status information page.

#### Test pre-conditions:

The FCC ID and the serial # of the radio are programmed in the firmware of the radio and cannot be modified with the EUT configuration web tool. A known acceptable location was put into the TVBD. The TVBD was configured as follows and the information submitted for registration to the WSDB.

#### Radio Registration Input File

```
192.168.3.5:1440 - Tera Term VT
File Edit Setup Control Window Help
[tcvws-test.spectrumbridge.com]
<443>
<DEV_FIXED>
<30>
<US>
<28.0>
<-81.0>
<Robert Wu>
<Yu Zhou>
<Suite 10-21 Concours Gate>
<Maitland>
<K2E7S4>
<ON>
<CA>
<yu.zhou@6harmonics.com>
<6132524992>
$
```

#### Radio Registration Input

```
192.168.3.5:1440 - Tera Term VT
File Edit Setup Control Window Help
root@6HarmonicsBTS:~# wsagentbts
Security Cert File:cafile.cert
HostURL=tcvws-test.spectrumbridge.com
PortNumber=443
mode=8
AntHeightInMeters=30
RegulatoryDomain=US
FCCID=6HARMONICS
SerialNumber=500
Latitude=28.0
Longitude=-81.0
OwnerName=Robert Wu
ContactName=Yu Zhou
ContactAddress=Suite 10-21 Concours Gate
ContactCity=Maitland
ContactZip=K2E7S4
ContactState=ON
ContactCountry=CA
ContactEmail=yu.zhou@6harmonics.com
ContactTelephone=6132524992
comPortNumber=443 wsCtx->comPortNumber=443
Successfully Initialized the Context
Current WSAgent State:WS_STATE_IDLE
Current WSAgent State:WS_STATE_BACKGROUND_SCANNING
```

APPLICANT: 6HARMONICS, INC.

FCC ID: 2AAST GWS-3000

REPORT: 6\6HARMONICS\1379UT13\1379UT13TestReport.docx

**Test Results:**

The registration request and the response for the successful registration can be seen on the WSDB log below.

Date	Ip	Url	Status	RT (ms)	Data
8/8/2013 5:17:21 PM	71.43.255.210	/v3/channels/US/28.0/-81.0/?fccid=6HARMONICS&serial=500&type=8	Success (0)	826	<a href="#">Response</a>
8/8/2013 5:17:20 PM	71.43.255.210	/v3/devices/US/6HARMONICS/500	Success (0)	313	<a href="#">Request</a>

```

<?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>28.0</Latitude>
  <Longitude>-81.0</Longitude>
  <AntennaHeight>15</AntennaHeight>
  <DeviceOwner>Robert Wu</DeviceOwner>
  <ContactName>Yu Zhou</ContactName>
  <ContactStreet>1021 Westgate Rd</ContactStreet>
  <ContactCity>Maitland</ContactCity>
  <ContactState>ON</ContactState>
  <ContactZip />
  <ContactCountry>CA</ContactCountry>
  <ContactEmail>Yu.Zhou@6Harmonics.com</ContactEmail>
  <ContactPhone>6132524992</ContactPhone>
</RegistrationRequest>
  
```

Successful Registration
**Result:** PASS

**b) 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.

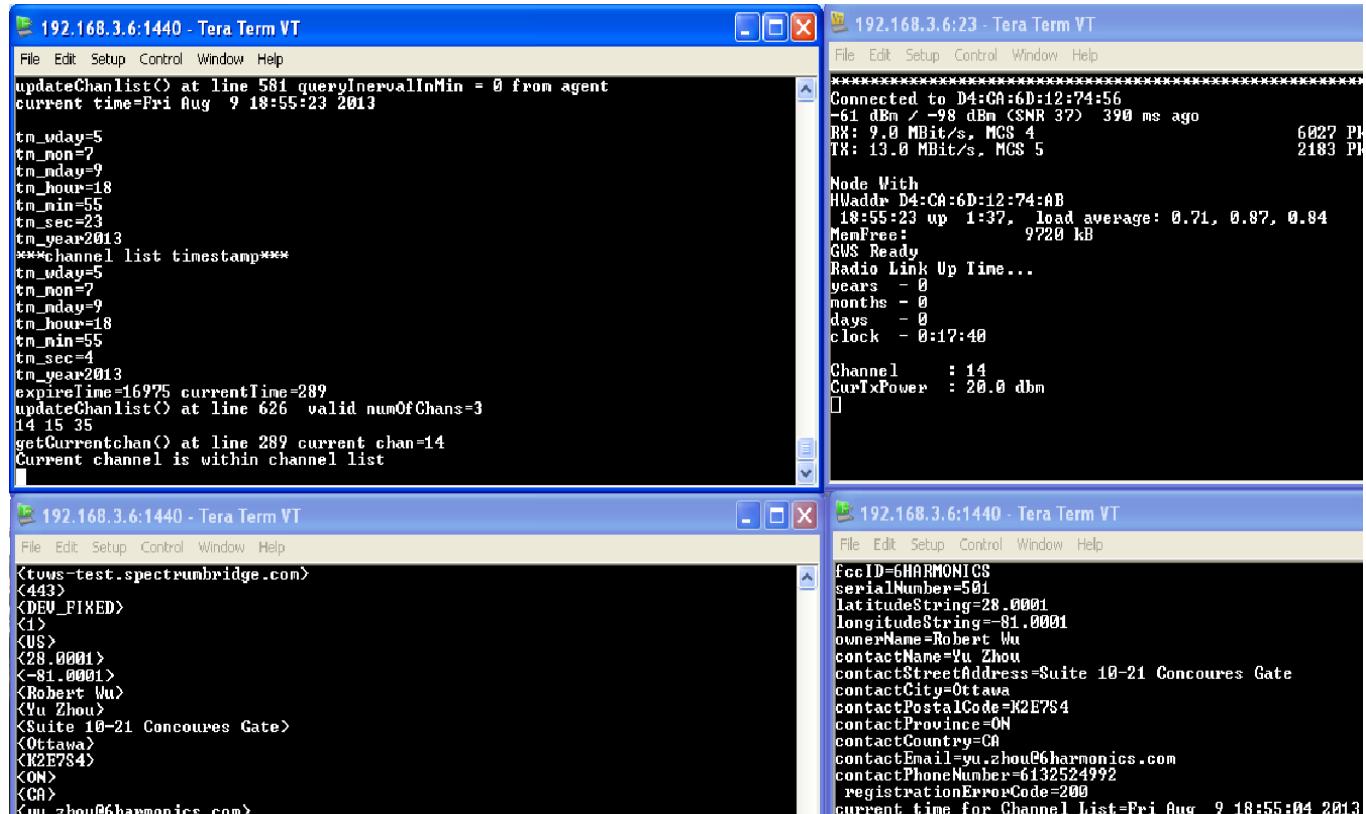
Operating channel should be verified on the subscriber (radio without the internet connection) using the EUT GUI

**Test pre-conditions:**

The Base station TVBD was configured and the information submitted for registration to the WSDB.

The subscriber operating channel was verified with the GUI.

**Radio Record**



192.168.3.6:1440 - Tera Term VT

```
File Edit Setup Control Window Help
updateChanlist() at line 581 queryIntervalInMin = 0 from agent
current time=Fri Aug 9 18:55:23 2013
tm_wday=5
tm_nmon=7
tm_nday=9
tm_hours=18
tm_min=55
tm_sec=23
tm_year=2013
***channel list timestamp***
tm_wdays=5
tm_nmon=7
tm_nday=9
tm_hours=18
tm_min=55
tm_sec=4
tm_year=2013
expireTime=16975 currentTime=289
updateChanlist() at line 626 valid numOfChans=3
14 15 35
getCurrentchan() at line 289 current chan=14
Current channel is within channel list
```

192.168.3.6:23 - Tera Term VT

```
File Edit Setup Control Window Help
*****
Connected to D4:CA:6D:12:74:56
-61 dBm / -98 dBm (SNR 37) 390 ms ago
RX: 9.0 MBit/s, MCS 4 6827 PB
TX: 13.0 MBit/s, MCS 5 2183 PB

Node With
HwAddr D4:CA:6D:12:74:56
18:55:23 up 1:37, load average: 0.71, 0.87, 0.84
MemFree: 9720 kB
GWS Ready
Radio Link Up Time...
years - 0
months - 0
days - 0
clock - 0:17:40

Channel : 14
CurTxPower : 20.0 dBm
```

192.168.3.6:1440 - Tera Term VT

```
File Edit Setup Control Window Help
<tuws-test.spectrumbridge.com>
<443>
<DEV_FIXED>
<1>
<US>
<28.0001>
<-81.0001>
<Robert Wu>
<Yu Zhou>
<Suite 10-21 Concourses Gate>
<Ottawa>
<K2E7S4>
<ON>
<CA>
<yu.zhou@6harmonics.com>
```

192.168.3.6:1440 - Tera Term VT

```
File Edit Setup Control Window Help
fccID=6HARMONICS
serialNumber=501
latitudeString=28.0001
longitudeString=-81.0001
ownerName=Robert Wu
contactName=Yu Zhou
contactStreetAddress=Suite 10-21 Concourses Gate
contactCity=Ottawa
contactPostalCode=K2E7S4
contactProvince=ON
contactCountry=CA
contactEmail=yu.zhou@6harmonics.com
contactPhoneNumber=6132524992
registrationErrorCode=200
current time for Channel List=Fri Aug 9 18:55:04 2013
```

APPLICANT: 6HARMONICS, INC.

FCC ID: 2AAST GWS-3000

REPORT: 6\6HARMONICS\1379UT13\1379UT13TestReport.docx

**Test Results:**

The registration request and the response for the successful registration can be seen on the WSDB log below for the subscriber.

Date	Ip	Url	Status	RT (ms)	Data
8/9/2013 2:38:08 PM	98.191.81.133	/v3/channels/US/28.0001/-81.0001/?fccid=6HARMONICS&serial=501&type=8	Success (0)	860	<a href="#">Response</a>
8/9/2013 2:38:07 PM	98.191.81.133	/v3/devices/US/6HARMONICS/501	Success (0)	296	<a href="#">Request</a>

The WSDB log shown below confirms the successful registration of the subscriber. Operating Channel is 14. The transmitter did not turn ON until the database exchange was successfully completed.

```

<?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>28.0001</Latitude>
  <Longitude>-81.0001</Longitude>
  <AntennaHeight>1</AntennaHeight>
  <DeviceOwner>Robert Wu</DeviceOwner>
  <ContactName>Yu Zhou</ContactName>
  <ContactStreet>Suite 10-21 Concourses Gate</ContactStreet>
  <ContactCity>Ottawa</ContactCity>
  <ContactState>ON</ContactState>
  <ContactZip>K2E7S4</ContactZip>
  <ContactCountry>CA</ContactCountry>
  <ContactEmail>yu.zhou@6harmonics.com</ContactEmail>
  <ContactPhone>6132524992</ContactPhone>
</RegistrationRequest>
<?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>10</ChannelCount>
  <ChannelList>2,5,6,7,8,9,13,14,15,35</ChannelList>
  <RefreshIn>48</RefreshIn>
</ChannelResponse>

```

**Result:** PASS

APPLICANT: 6HARMONICS, INC.

FCC ID: 2AAST GWS-3000

REPORT: 6\6HARMONICS\1379UT13\1379UT13TestReport.docx

### c) 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.

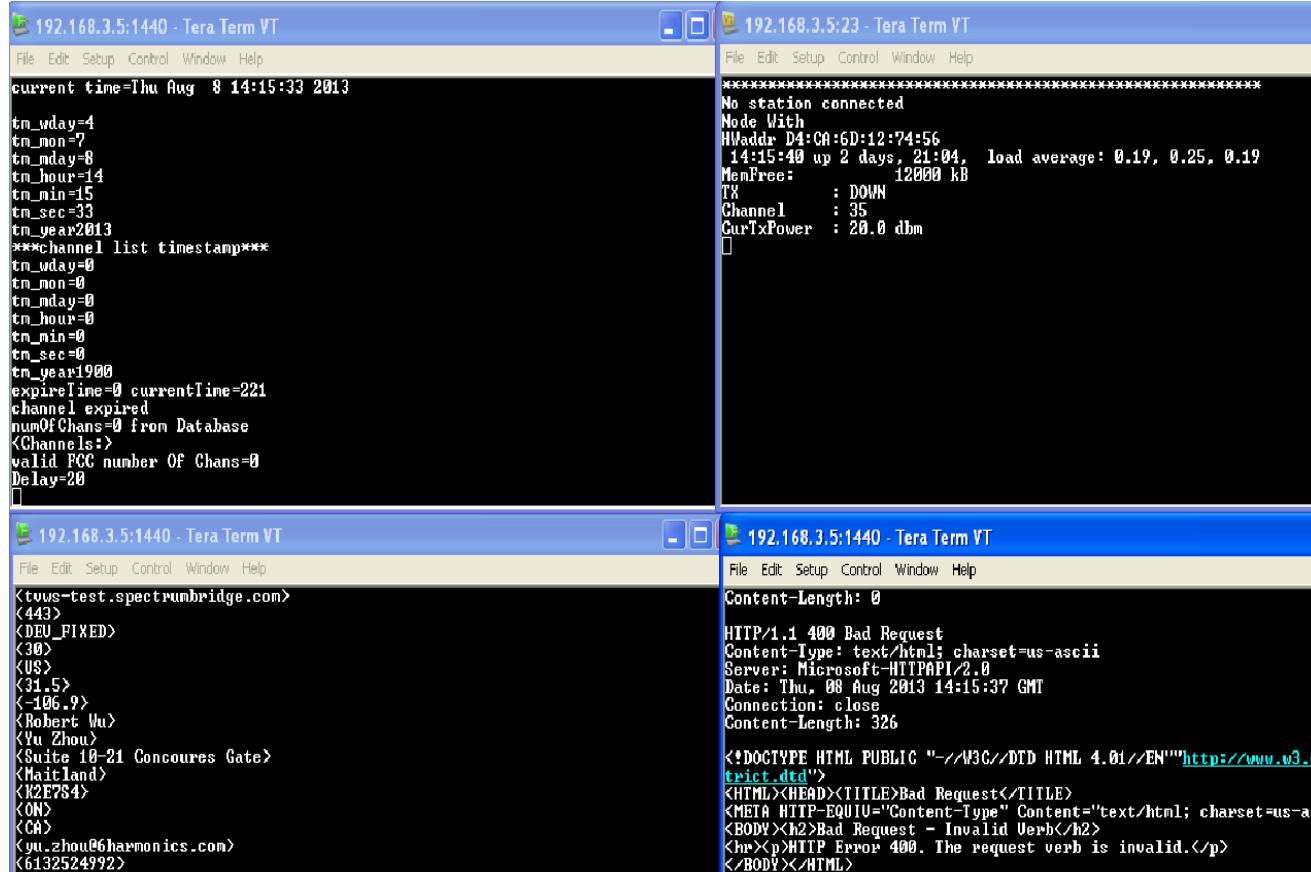
Registration failure should be verified by accessing the WSDB registration interface and also the EUT GUI.

#### 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.

#### Radio Record

**TX does not turn on or shuts down after 1 minute if previously on.**



The image shows three Tera Term VT windows. The top-left window (192.168.3.5:1440) displays radio configuration parameters: tm\_wday=4, tm\_mon=7, tm\_mday=8, tm\_hour=14, tm\_min=15, tm\_sec=33, tm\_year=2013. It also shows a timestamp: current time=Thu Aug 8 14:15:33 2013. The top-right window (192.168.3.5:23) shows system status: No station connected, Node With, HWaddr D4:0A:6D:12:74:56, 14:15:40 up 2 days, 21:04, load average: 0.19, 0.25, 0.19. The bottom-left window (192.168.3.5:1440) shows a failed HTTP request to <http://www.w3.org/strict.dtd>. The response is: Content-Length: 0, HTTP/1.1 400 Bad Request, Content-Type: text/html; charset=us-ascii, Server: Microsoft-HTTPAPI/2.0, Date: Thu, 08 Aug 2013 14:15:37 GMT, Connection: close, Content-Length: 326. The body of the response includes HTML code for a bad request error page.

APPLICANT: 6HARMONICS, INC.

FCC ID: 2AAST GWS-3000

REPORT: 6\6HARMONICS\1379UT13\1379UT13TestReport.docx

**Test Results:**

The failed registration with the reason for failure can be seen on the WSDB log below.

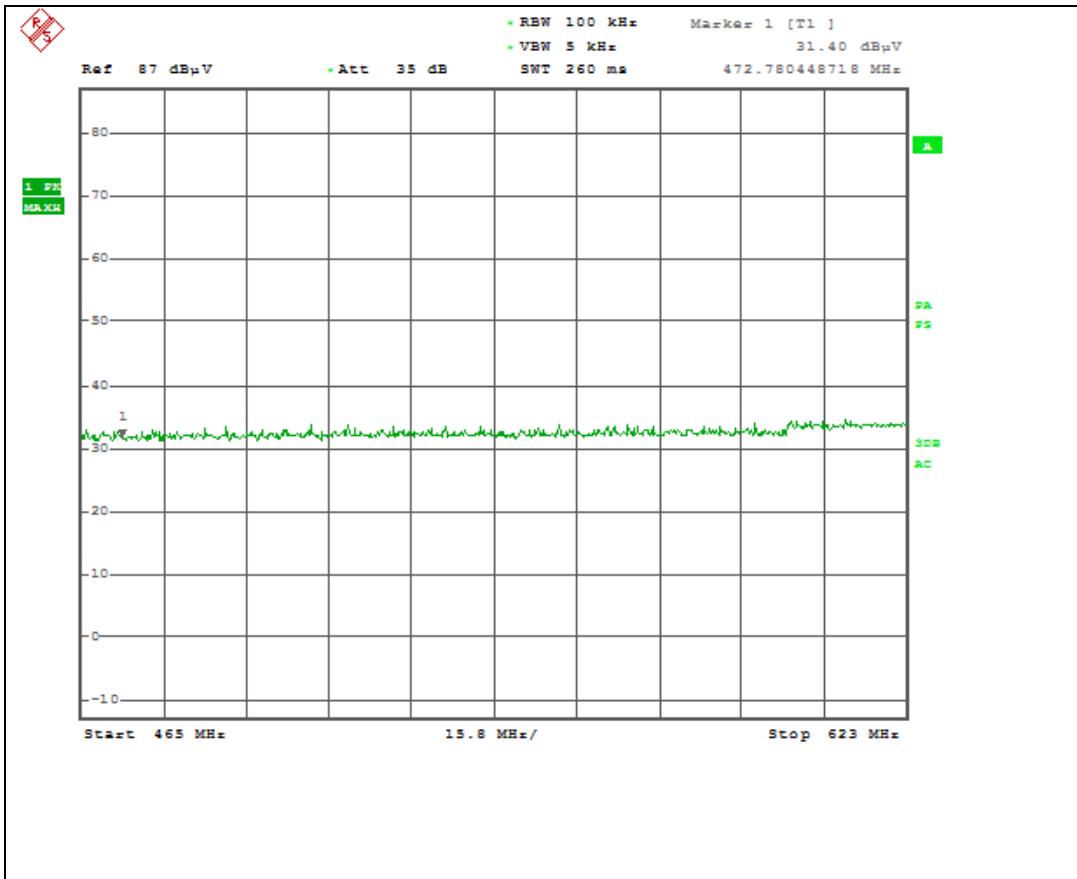
Date	Ip	Url	Status	RT (ms)	Data
8/8/2013 10:04:44 AM	71.43.255.210	/v3/devices/US/6HARMONICS/500	LocatedOutsideRegulatoryDomain (9)	156	<a href="#">Request</a>

```

<?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>Robert Wu</DeviceOwner>
  <ContactName>Yu Zhou</ContactName>
  <ContactStreet>Suite 10-21 Concourses Gate</ContactStreet>
  <ContactCity>Maitland</ContactCity>
  <ContactState>ON</ContactState>
  <ContactZip>K2E7S4</ContactZip>
  <ContactCountry>CA</ContactCountry>
  <ContactEmail>yu.zhou@6harmonics.com</ContactEmail>
  <ContactPhone>6132524992</ContactPhone>
</RegistrationRequest>

```

Spectrum Analyzer plot:



Unsuccessful Registration, no tx

**Result:** PASS

APPLICANT: 6HARMONICS, INC.  
 FCC ID: 2AAST GWS-3000  
 REPORT: 6\6HARMONICS\1379UT13\1379UT13TestReport.docx

**d) 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.

## Test Pre-conditions:

The 'Contact Name' Information field should be left blank.

## Test Results:

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

### Radio Record (contact name)

The figure displays four terminal windows (Tera Term VT) showing the configuration and file transfer process on a Harmonics BTS device (IP: 192.168.3.5).

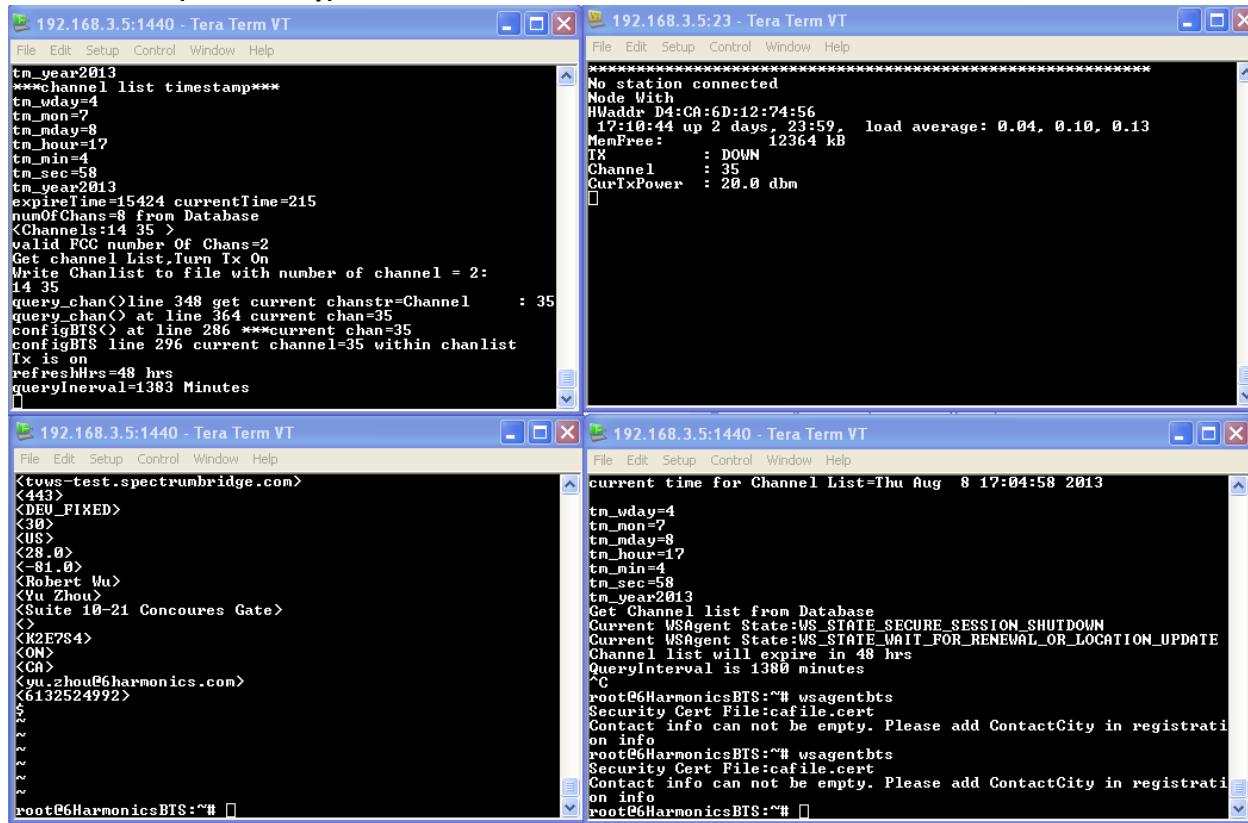
- Top Left Window:** Shows configuration commands for setting the current channel to 35. The commands include: tm\_year2013, tm\_wday=4, tm\_mon=7, tm\_mday=8, tm\_hour=17, tm\_min=4, tm\_sec=59, tm\_year2013, expireTime=15424, numOfChans=8, valid FCC number of Chans=2, Get channel List, Turn Tx On, Write Chanlist to file with number of channel = 2: 14 35, query\_chan() line 348, query\_chan() at line 364, configBTS() at line 286, configBTS line 296, Ix is on, refreshHrs=48 hrs, queryInterval=1383 Minutes.
- Top Right Window:** Shows the device status. It indicates "No station connected", "Node With HWaddr D4:CA:6D:12:74:56", "18:38:12 up 3 days, 1:27, load average: 0.07, 0.13, 0.14", "MemFree: 12292 kB", "TX : DOWN", "Channel : 35", and "CurTxPower : 20.0 dbm".
- Bottom Left Window:** Shows the contents of the file <tuws-test.spectrumbridge.com> which includes various contact details and a phone number (6132524992).
- Bottom Right Window:** Shows the process of installing the wsbtagent package via wget and opkg. It also shows an error message where opkg fails to install wsbtagent because it is already provided by whitespaceagent, and a note that whitespaceagent is not installed.

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FCC ID: 2AAST GWS-3000

REPORT: 6\6HARMONICS\1379UT13\1379UT13TestReport.docx

## Radio Record (contact city)



```

192.168.3.5:1440 - Tera Term VT
tm_usax2013
***channel list timestamp***
tm_wday=4
tm_mon=7
tm_mday=8
tm_hour=17
tm_min=4
tm_sec=58
tm_year2013
expireTime=15424 currentTime=215
numOfChans=8 from Database
<Channels:14 35>
valid FCC number Of Chans=2
Get channel List.Turn Tx On
Write Chanlist to file with number of channel = 2:
14 35
query_chan() at line 348 get current chanstr=Channel      : 35
query_chan() at line 364 current chan=35
configBTS() at line 286 ***current chan=35
configBTS line 296 current channel=35 within chanlist
Tx is on
refreshhrs=48 hrs
queryInterval=1383 Minutes
[]

192.168.3.5:23 - Tera Term VT
File Edit Setup Control Window Help
*****
No station connected
Node With
Hwaddr D4:CA:6D:12:74:56
17:10:44 up 2 days, 23:59,  load average: 0.04, 0.10, 0.13
MemFree: 12364 kB
TX      : DOWN
Channel : 35
CurTxPower : 20.0 dbm
[]

192.168.3.5:1440 - Tera Term VT
File Edit Setup Control Window Help
<twss-test.spectrumbridge.com>
<443>
<DEU_FIXED>
<20>
<US>
<28_0>
<-81_0>
<Robert Wu>
<U_Zhou>
<Suite 10-21 Concours Gate>
<K2E784>
<ON>
<CH>
<yu.zhou@6harmonics.com>
<6132524992>
<~>
<~>
<~>
<~>
<~>
<~>
root@6HarmonicsBTS:~# 

192.168.3.5:1440 - Tera Term VT
File Edit Setup Control Window Help
current time for Channel List=Thu Aug  8 17:04:58 2013
tm_wday=4
tm_mon=7
tm_mday=8
tm_hour=17
tm_min=4
tm_sec=58
tm_year2013
Get Channel list from Database
Current WSagent State:WS_STATE_SECURE_SESSION_SHUTDOWN
Current WSagent State:WS_STATE_WAIT_FOR_RENEWAL_OR_LOCATION_UPDATE
Channel list will expire in 48 hrs
QueryInterval is 1380 minutes
^C
root@6HarmonicsBTS:~# wsagentbts
Security Cert File:cafile.cert
Contact info can not be empty. Please add ContactCity in registration
on info
root@6HarmonicsBTS:~# wsagentbts
Security Cert File:cafile.cert
Contact info can not be empty. Please add ContactCity in registration
on info
root@6HarmonicsBTS:~# 
[]

192.168.3.5:1440 - Tera Term VT
File Edit Setup Control Window Help

```

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FCC ID: 2AAST GWS-3000

REPORT: 6\6HARMONICS\1379UT13\1379UT13TestReport.docx

## Radio Record (contact email)

The figure displays four terminal windows from the Tera Term VT application, each showing a different stage of configuration and system management for a device.

- Top Left Window:** Shows configuration commands for channel lists and timestamps. It includes commands like `tm_year=2013`, `tm_wday=4`, and `tm_min=4`. It also shows the creation of a chanlist with 35 channels and the configuration of an FCC ID.
- Top Right Window:** Shows system status and configuration. It includes the command `Get channel List.Turn Tx On` and displays the current channel configuration with `tx : DOWN`, `channel : 35`, and `curTxPower : 20.0 dbm`.
- Bottom Left Window:** Shows a session with the host `tvws-test.spectrumbridge.com`. It lists various network interfaces and their details, such as `Robert Wu` and `<Yu Zhou>`.
- Bottom Right Window:** Shows the root shell of a device running the `HarmonicsBTS` distribution. It details the installation of the `wsbtsagent` package, which failed due to a clash with the `cafile.cert` file. It also shows the configuration of the `wsbtsagent` service and a warning about empty contact information.

## Test Results:

The TVBD shown above 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 does not send a registration request to WSDB with missing contact information.

The transmitter did not turn ON. Spectrum analyzer was used to verify no transmission.

## Result: PASS

APPLICANT: 6HARMONICS, INC.

FCC ID: 2AAST GWS-3000

REPORT: 6\6HARMONICS\1379UT13\1379UT13TestReport.docx

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

**Test Procedure:**

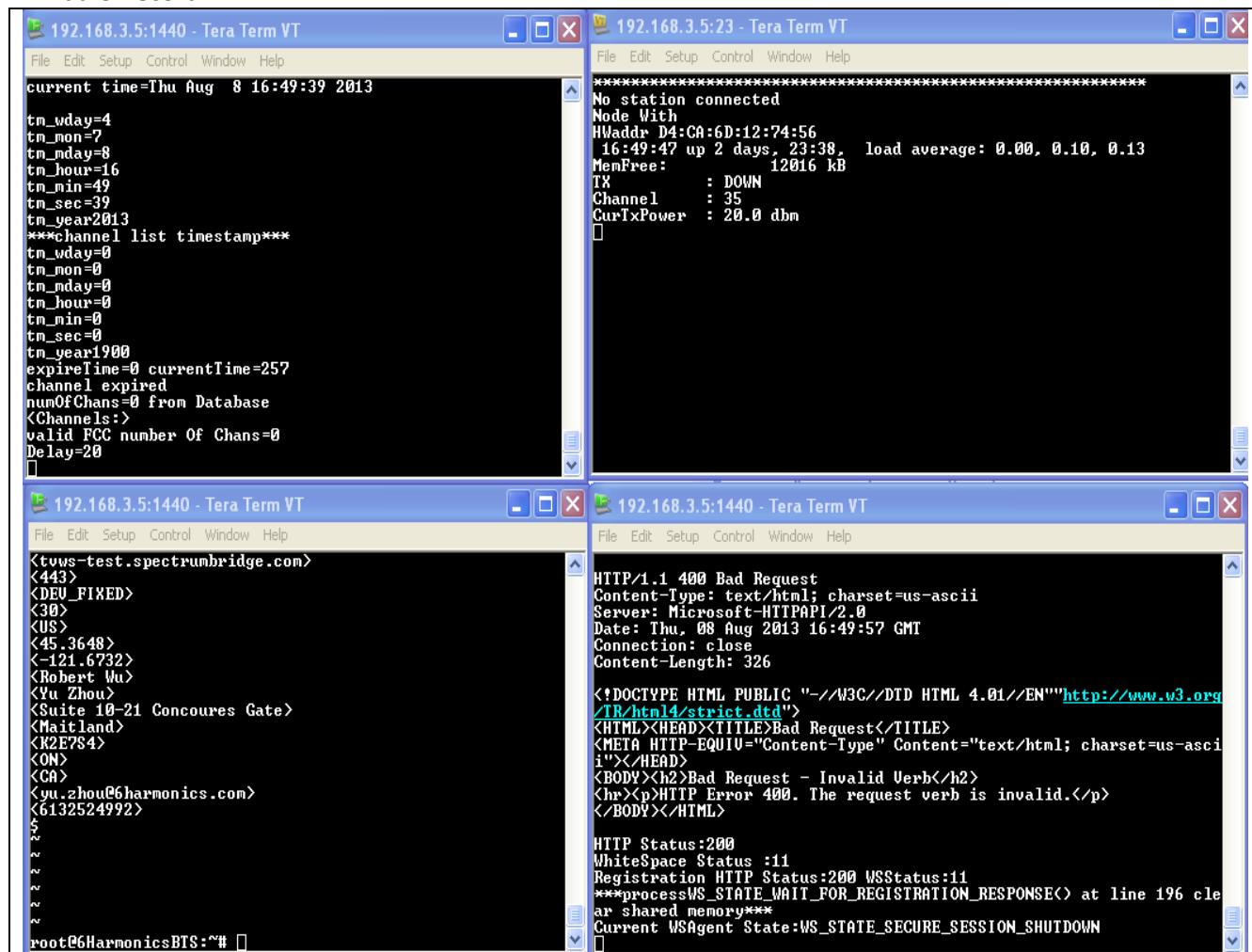
Configure the EUT with such that HAAT>250m. Verify the required registration information is sent and stored in the white space data base.

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.

**Radio Record**



The image shows four Tera Term VT windows arranged in a 2x2 grid, illustrating the test procedure for an unsuccessful registration attempt due to HAAT > 250m.

- Top Left Window (192.168.3.5:1440):** Displays the radio configuration for a location with coordinates 45.3648, -121.6732. The configuration includes:
  - current time=Thu Aug 8 16:49:39 2013
  - tm\_wday=4
  - tm\_mon=7
  - tm\_mday=8
  - tm\_hour=16
  - tm\_min=49
  - tm\_sec=39
  - tm\_year2013
- Top Right Window (192.168.3.5:23):** Shows the status of the radio interface:
  - No station connected
  - Node With
  - Hwaddr D4:CA:6D:12:74:56
  - 16:49:47 up 2 days, 23:38. load average: 0.00, 0.10, 0.13
  - MemFree: 12016 kB
  - TX : DOWN
  - Channel : 35
  - CurTxPower : 20.0 dbm
- Bottom Left Window (192.168.3.5:1440):** Displays the configuration of the radio interface:
  - File Edit Setup Control Window Help
  - tvws-test.spectrumbridge.com
  - 443
  - DEU\_FIXED
  - 30
  - US
  - 45.3648
  - 121.6732
  - Robert Yu
  - Yu Zhou
  - Suite 10-21 Concourses Gate
  - Maitland
  - K2E7S4
  - ON
  - CA
  - yu.zhou@6harmonics.com
  - 6132524992
- Bottom Right Window (192.168.3.5:1440):** Shows the registration attempt to the WSDB:
  - HTTP/1.1 400 Bad Request
  - Content-Type: text/html; charset=us-ascii
  - Server: Microsoft-HTTPAPI/2.0
  - Date: Thu, 08 Aug 2013 16:49:57 GMT
  - Connection: close
  - Content-Length: 326
  - HTTP Status:200
  - WhiteSpace Status :11
  - Registration HTTP Status:200 WSStatus:11
  - \*\*\*processWS\_STATE\_WAIT\_FOR\_REGISTRATION\_RESPONSE() at line 196 clear shared memory\*\*\*
  - Current WSAgent State:WS\_STATE\_SECURE\_SESSION\_SHUTDOWN

APPLICANT: 6HARMONICS, INC.

FCC ID: 2AAST GWS-3000

REPORT: 6\6HARMONICS\1379UT13\1379UT13TestReport.docx

**Test Results:**

The failed registration with the reason for failure can be seen on the WSDB log below.

Date	Ip	Url	Status	RT (ms)
8/8/2013 12:49:41 PM	71.43.255.210	/v3/devices/US/6HARMONICS/500	HaatAbove250m (11)	406

```

<?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>45.3648</Latitude>
  <Longitude>-121.6732</Longitude>
  <AntennaHeight>30</AntennaHeight>
  <DeviceOwner>Robert Wu</DeviceOwner>
  <ContactName>Yu Zhou</ContactName>
  <ContactStreet>Suite 10-21 Concours Gate</ContactStreet>
  <ContactCity>Maitland</ContactCity>
  <ContactState>ON</ContactState>
  <ContactZip>K2E7S4</ContactZip>
  <ContactCountry>CA</ContactCountry>
  <ContactEmail>yu.zhou@6harmonics.com</ContactEmail>
  <ContactPhone>6132524992</ContactPhone>
</RegistrationRequest>

```

The transmitter did not turn ON. Spectrum analyzer was used to verify no transmission.

**Result:** PASS

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

**Test Procedure:**

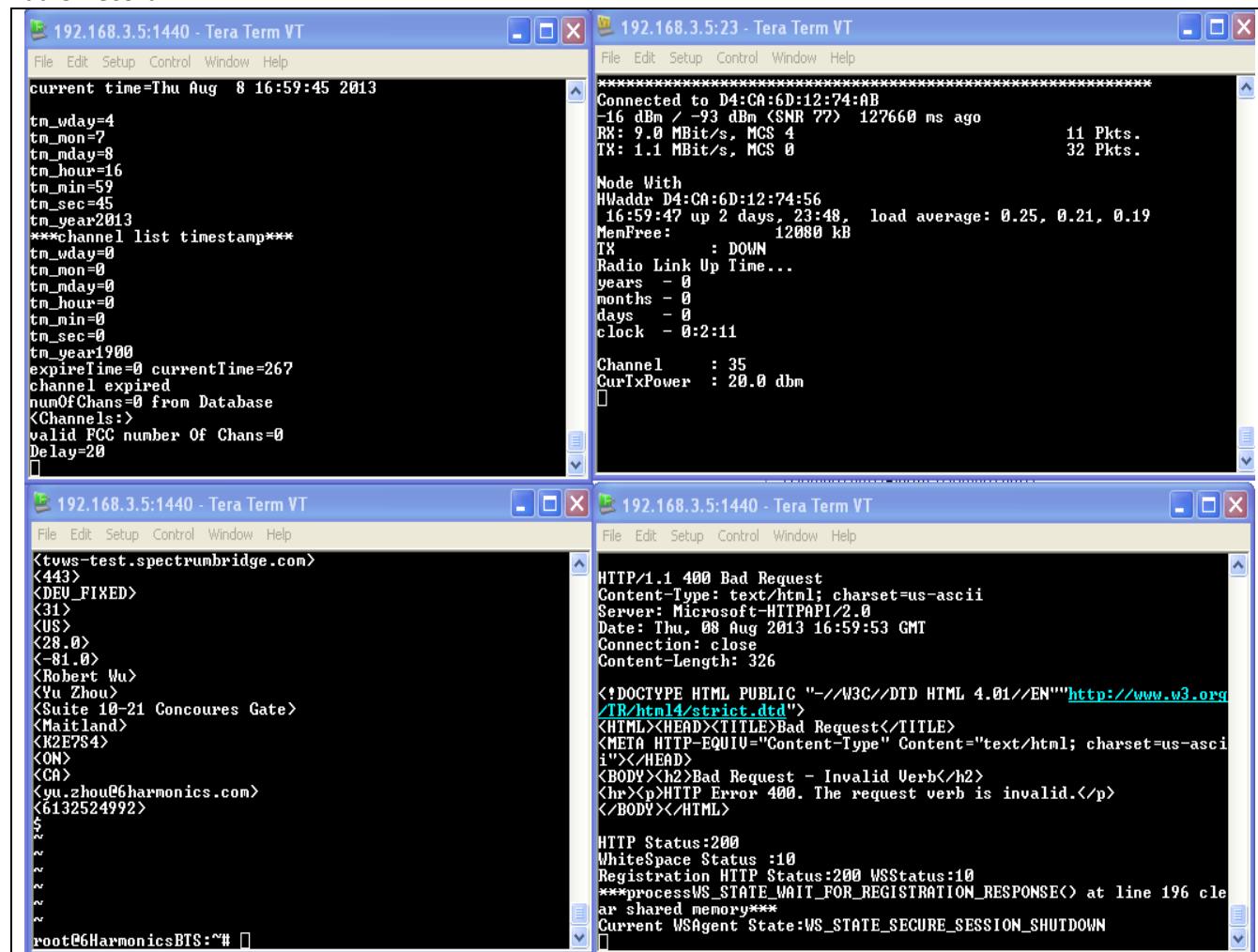
Configure the EUT with such that AGL>30m. Verify the required registration information is sent and stored in the white space data base.

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.

**Radio Record**



Four terminal windows are displayed, showing the following content:

- Top Left:** Tera Term VT window showing radio configuration. It includes variables like tm\_wday=4, tm\_mon=? (likely a typo for tm\_mon=7), tm\_mday=8, tm\_hour=16, tm\_min=59, tm\_sec=45, tm\_year=2013, and tm\_year=1900. It also shows a timestamp of current time=Thu Aug 8 16:59:45 2013 and a channel list timestamp.
- Top Right:** Tera Term VT window showing radio status. It includes a connection summary: Connected to D4:CA:6D:12:74:AB, RX: 9.0 MBit/s, MCS 4, TX: 1.1 MBit/s, MCS 0. It also shows a node summary: Node With Hladdr D4:CA:6D:12:74:56, 16:59:47 up 2 days, 23:48, load average: 0.25, 0.21, 0.19. MemFree: 12080 kB. TX: DOWN. Radio Link Up Time... years - 0, months - 0, days - 0, clock - 0:2:11. Channel 35, CurTxPower 20.0 dbm.
- Bottom Left:** Tera Term VT window showing a log from <twss-test.spectrumbridge.com>. It lists several names and locations: <443>, <DEU\_FIXED>, <31>, <US>, <28.0>, <-81.0>, <Robert Wu>, <Yu Zhou>, <Suite 10-21 Concources Gate>, <Maitland>, <X2E7S4>, <ON>, <CA>, <yu.zhou@6harmonics.com>, <6132524992>. It ends with a prompt: root@6HarmonicsBTS:~#
- Bottom Right:** Tera Term VT window showing an HTTP 400 Bad Request response. The response header includes Content-Type: text/html; charset=us-ascii, Server: Microsoft-HTTPAPI/2.0, Date: Thu, 08 Aug 2013 16:59:53 GMT, Connection: close, and Content-Length: 326. The body of the response shows an HTML document with a title "Bad Request", a meta tag with content-type="text/html; charset=us-ascii", and a body containing an h2 tag "Bad Request - Invalid Verb" and a p tag "HTTP Error 400. The request verb is invalid." It also shows a status line "HTTP Status:200" and a registration status "Registration HTTP Status:200 WSStatus:10".

APPLICANT: 6HARMONICS, INC.

FCC ID: 2AAST GWS-3000

REPORT: 6\6HARMONICS\1379UT13\1379UT13TestReport.docx

**Test Results:**

The failed registration with the reason for failure can be seen on the WSDB log below.

Date	Ip	Url	Status	RT (ms)	Data
8/8/2013 12:58:52 PM	71.43.255.210	/v3/devices/US/6HARMONICS/500	AntennaHeightAbove30m (10)	0	<a href="#">Request</a>

```

<?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>28.0</Latitude>
<Longitude>-81.0</Longitude>
<AntennaHeight>31</AntennaHeight>
<DeviceOwner>Robert Wu</DeviceOwner>
<ContactName>Yu Zhou</ContactName>
<ContactStreet>Suite 10-21 Concourses Gate</ContactStreet>
<ContactCity>Maitland</ContactCity>
<ContactState>ON</ContactState>
<ContactZip>K2E7S4</ContactZip>
<ContactCountry>CA</ContactCountry>
<ContactEmail>yu.zhou@6harmonics.com</ContactEmail>
<ContactPhone>6132524992</ContactPhone>
</RegistrationRequest>

```

The transmitter did not turn ON. Spectrum analyzer was used to verify no transmission.

**Result:** PASS

APPLICANT: 6HARMONICS, INC.

FCC ID: 2AAST GWS-3000

REPORT: 6\6HARMONICS\1379UT13\1379UT13TestReport.docx



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

The registration interface does not contain a mechanism by which the FCC ID of the radio can be changed. The FCC ID is flash programmed during the manufacturing process and cannot be changed without being returned to the manufacturer.

The registration interface does not contain a mechanism by which the serial number of the radio can be changed. The serial number is flash programmed during the manufacturing process and cannot be changed without being returned to the manufacturer.

APPLICANT: 6HARMONICS, INC.

FCC ID: 2AAST GWS-3000

REPORT: 6\6HARMONICS\1379UT13\1379UT13TestReport.docx

### §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.

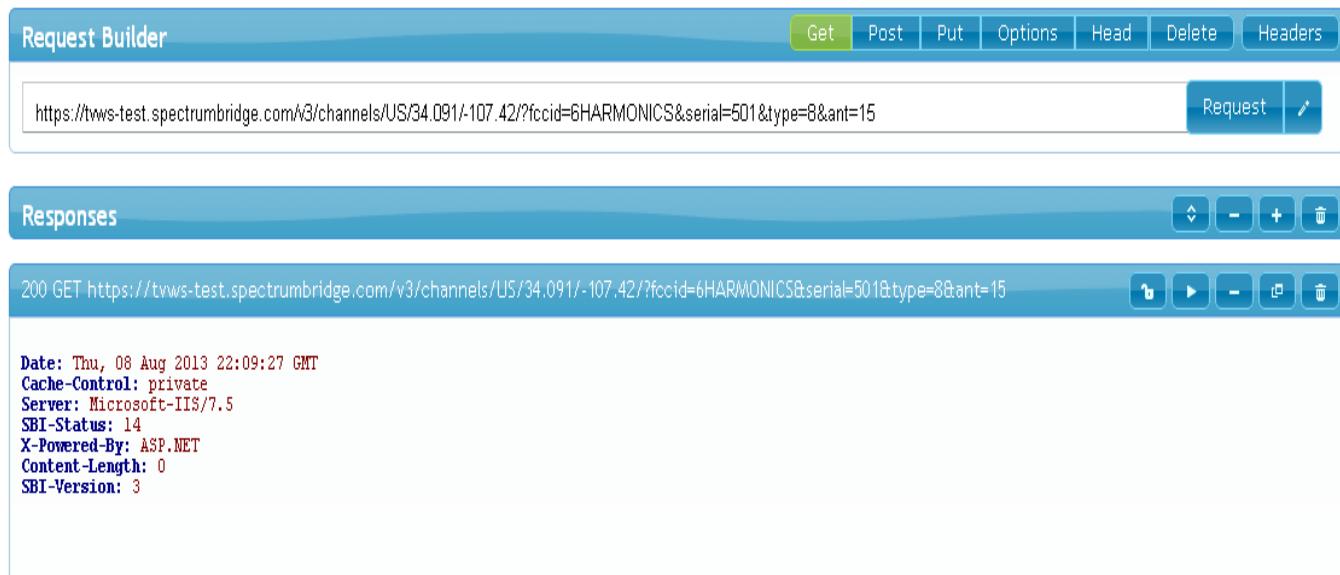
#### Test Procedure:

- ✓ 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:

WSDB Log for successful registration of the EUT:

Simulator requesting a channel list on a location different from where it was registered:



Request Builder

Get Post Put Options Head Delete Headers

https://twss-test.spectrumbridge.com/v3/channels/US/34.091/-107.42?fccid=6HARMONICS&serial=501&type=8&ant=15 Request ↻

Responses

200 GET https://twss-test.spectrumbridge.com/v3/channels/US/34.091/-107.42?fccid=6HARMONICS&serial=501&type=8&ant=15 ↻ ▶ - ↻ ↻ ↻ ↻

```

Date: Thu, 08 Aug 2013 22:09:27 GMT
Cache-Control: private
Server: Microsoft-IIS/7.5
SBI-Status: 14
X-Powered-By: ASP.NET
Content-Length: 0
SBI-Version: 3

```

APPLICANT: 6HARMONICS, INC.

FCC ID: 2AAST GWS-3000

REPORT: 6\6HARMONICS\1379UT13\1379UT13TestReport.docx

WSDB Log for the response to the TVBD relocated channel request:

<u>Date</u>	<u>Ip</u>	<u>Url</u>	<u>Status</u>	<u>RT (ms)</u>	<u>Data</u>
8/8/2013 6:09:27 PM	71.43.255.210	/v3/channels/US/34.091/-107.42/?fccid=6HARMONICS&serial=501&type=8&ant=15	RequestDoesNotMatchRegistration (14)	210	

**Result:** PASS

APPLICANT: 6HARMONICS, INC.  
FCC ID: 2AAST GWS-3000  
REPORT: 6\6HARMONICS\1379UT13\1379UT13TestReport.docx

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

#### **Test Procedure:**

Using a programmable router or similar network device, block the access to the database URL or IP address from the TVBD. Confirm that the TVBD shuts down by 11:59 PM on the following day.

- ✓ Configure the fixed or Mode II device with a location that will yield an authorized channel list. Verify proper channel operation using a spectrum analyzer and the device management interface.
- ✓ Restrict the access to the database.
- ✓ Verify that the device does not transmit using white space frequencies after 23:59 hrs. Verify using a spectrum analyzer and the device management interface.

#### **Test Results:**

**8/05/2013 4:11pm – Last successful base station channel request.**

8/5/2013 4:11:55 PM	71.43.255.210	/v3/channels/US/28.0/-81.0/?fccid=6HARMONICS&serial=500&type=8&ant=30	Success (0)	830	<a href="#">Response</a>
8/5/2013 4:11:54 PM	71.43.255.210	/v3/devices/US/6HARMONICS/500	Success (0)	250	<a href="#">Request</a>

**8/05/2013 4:21pm – A laptop is connected to the terminal radio and a ping is started to the WSDB across the WS radio link to the base station and out to the internet through the commercial router.**

**8/5/2013 4:23pm – The WAN connection between the Internet and the commercial router in the test set up is disconnected/blocked**

**8/5/2013 4:23pm – The base station transmitter stays on, the ping to the commercial router gateway across the wireless link continues successfully and is stored in a log.**

**Pinging 192.168.3.1 with 32 bytes of data:**

**Reply from 192.168.3.1: bytes=32 time=8ms TTL=64**

**Ping statistics for 192.168.3.1:**

**Packets: Sent = 1, Received = 1, Lost = 0 (0% loss),**

**Approximate round trip times in milliseconds:**

**Minimum = 8ms, Maximum = 8ms, Average = 8ms**

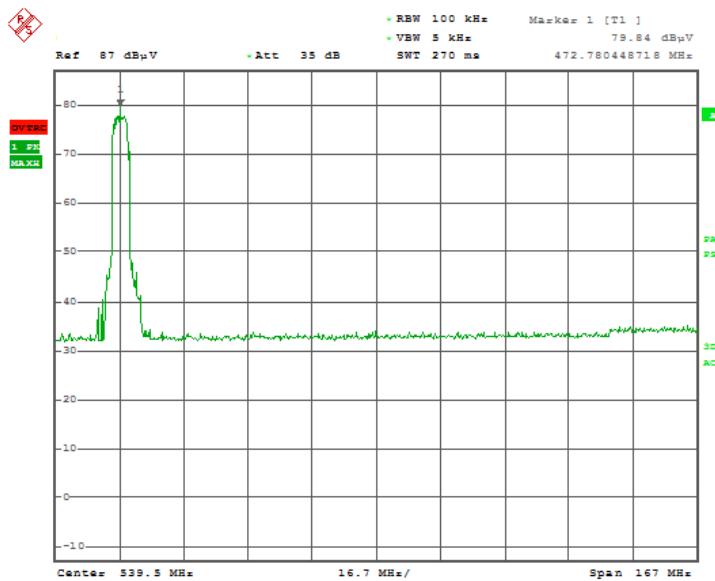
**Mon 08/05/2013 at 16:23:55.11**

APPLICANT: 6HARMONICS, INC.

FCC ID: 2AAST GWS-3000

REPORT: 6\6HARMONICS\1379UT13\1379UT13TestReport.docx

The device was initially powered up and it successfully registered with the database at approximately 4:10 PM. The device received a channel list and started transmitting on channel 14. The connection to the database was then blocked, while maintaining regular access to the internet.



#### Device transmitting on CH 14

**8/6/2013 11:17am - The base station transmitter turns off and the wireless link goes down, Ping to the WSDB across the wireless link fails approximately 23 hours and 2 minutes after the last successful channel request.**

#### Transmitter On

##### Ping statistics for 192.168.3.1:

**Packets: Sent = 1, Received = 1, Lost = 0 (0% loss),**

**Approximate round trip times in milli-seconds:**

**Minimum = 7ms, Maximum = 7ms, Average = 7ms**

**Tue 08/06/2013 at 15:12:55.11**

#### Transmitter OFF

**Pinging 192.168.3.1 with 32 bytes of data:**

**Reply from 192.168.3.40: Destination host unreachable.**

##### Ping statistics for 192.168.3.1 :

**Packets: Sent = 1, Received = 0, Lost = 1 (100% loss),**

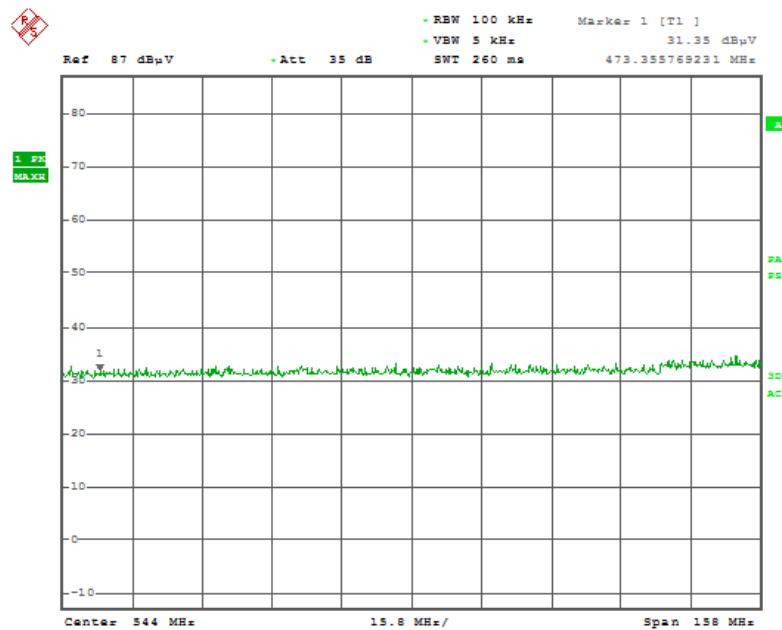
**Tue 08/06/2013 at 15:13:55.20**

APPLICANT. 6HARMONICS, INC.

FCC ID: 2AAST GWS-3000

REPORT: 6\6HARMONICS\1379UT13\1379UT13TestReport.docx

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



**Result: PASS**

APPLICANT: 6HARMONICS, INC.

FCC ID: 2AAST GWS-3000

REPORT: 6\6HARMONICS\1379UT13\1379UT13TestReport.docx

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

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.

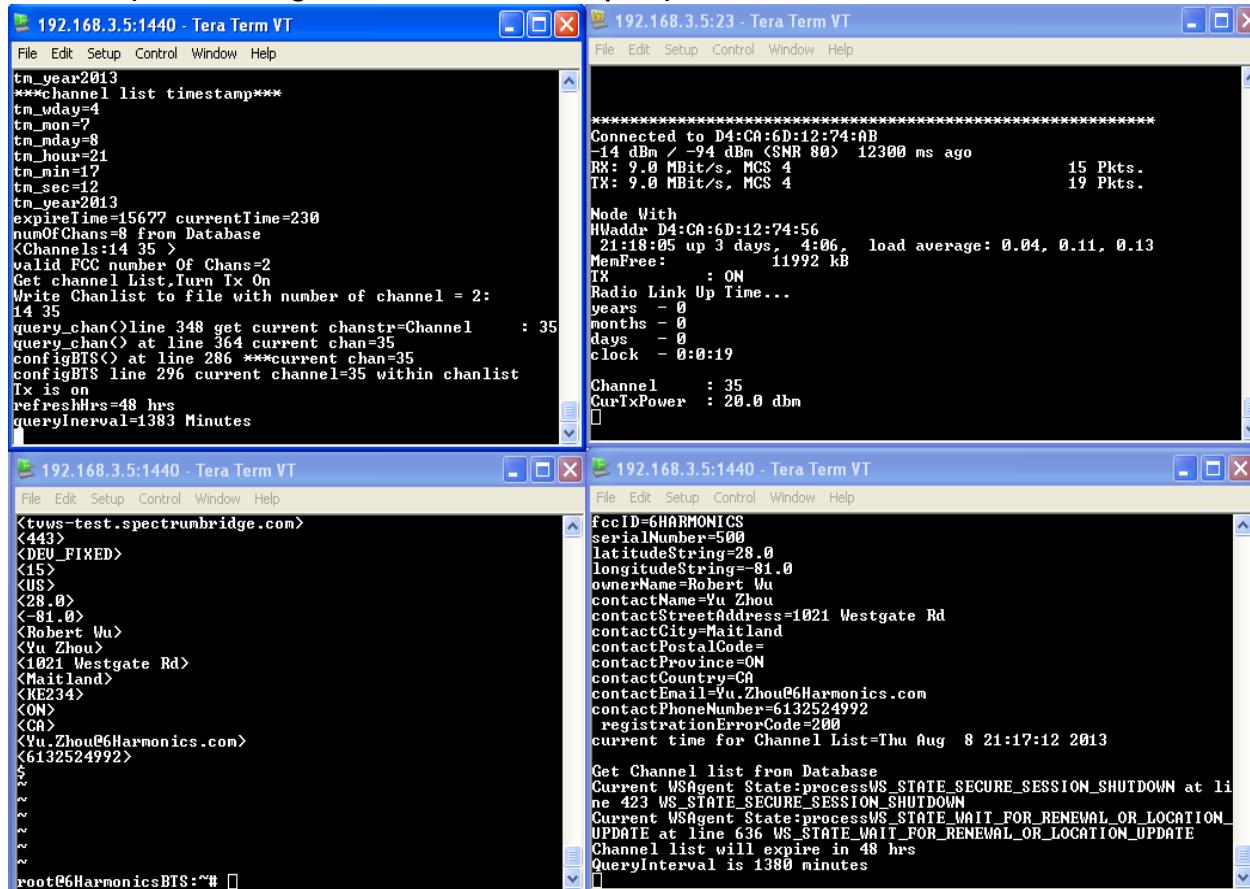
#### **Test Procedure:**

- ✓ 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 new channel map does not contain the channel previously protected when the low-power auxiliary device was registered.
- ✓ Verify the EUT is operating on a different channel from what was previously used and subsequently reserved using a spectrum analyzer and the device management interface.

APPLICANT: 6HARMONICS, INC.

FCC ID: 2AAST GWS-3000

REPORT: 6\6HARMONICS\1379UT13\1379UT13TestReport.docx

**Test Data:**
**Radio Record (successful registration and channel request)**


```

192.168.3.5:1440 - Tera Term VT
File Edit Setup Control Window Help
tm_year2013
***channel list timestamp***
tm_wday=4
tm_mon=7
tm_mday=8
tm_hour=21
tm_min=17
tm_sec=12
tm_year2013
expireTime=15677 currentTime=230
numOfChans=8 from Database
<Channels:14 35 >
valid FCC number Of Chans=2
Get channel List.Turn Tx On
Write Chanlist to file with number of channel = 2:
14 35
query_chan() at line 348 get current chanstr=Channel : 35
query_chan() at line 364 current chan=35
configBTS() at line 286 ***current chan=35
configBTS line 296 current channel=35 within chanlist
Tx is on
refreshHrs=48 hrs
queryInerval=1383 Minutes

192.168.3.5:23 - Tera Term VT
File Edit Setup Control Window Help
*****
Connected to D4:CA:6D:12:74:AB
-14 dBm / -94 dBm (SNR 80) 12300 ms ago
Rx: 9.0 MBit/s, MCS 4 15 Pkts.
Tx: 9.0 MBit/s, MCS 4 19 Pkts.

Node With
HWaddr D4:CA:6D:12:74:AB
21:18:05 up 3 days, 4:06, load average: 0.04, 0.11, 0.13
MemFree: 11992 kB
TX : ON
Radio Link Up Time...
years - 0
months - 0
days - 0
clock - 0:0:19

Channel : 35
CurTxPower : 20.0 dbm

192.168.3.5:1440 - Tera Term VT
File Edit Setup Control Window Help
<twss-test.spectrumbridge.com>
<443>
<DEV_FIXED>
<15>
<US>
<28.0>
<-81.0>
<Robert Wu>
<Yu Zhou>
<1021 Westgate Rd>
<Maitland>
<KE234>
<ON>
<CA>
<Yu.Zhou@6Harmonics.com>
<6132524992>
~
~
~
~
~
~
~
root@6HarmonicsBTS:~# 

192.168.3.5:1440 - Tera Term VT
File Edit Setup Control Window Help
fccID=6HARMONICS
serialNumber=500
latitudeString=-28.0
longitudeString=-81.0
ownerName=Robert Wu
contactName=Yu Zhou
contactStreetAddress=1021 Westgate Rd
contactCity=Maitland
contactPostalCode=
contactProvince=ON
contactCountry=CA
contactEmail=Yu.Zhou@6Harmonics.com
contactPhoneNumber=6132524992
registrationErrorCode=200
current time for Channel List=Thu Aug 8 21:17:12 2013

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 636 WS_STATE_WAIT_FOR_RENEWAL_OR_LOCATION_UPDATE
Channel list will expire in 48 hrs
QueryInterval is 1380 minutes

```

Operating Channel before an auxiliary device is registered.

The EUT was registered (at 5:17 PM) and verified that a valid channel list was received. The device was transmitting on channel 35.

**WSDB Log:**

Date	Ip	Url	Status	RT (ms)	Data
8/8/2013 5:17:21 PM	71.43.255.210	/v3/channels/US/28.0/-81.0/?fccid=6HARMONICS&serial=500&type=8	Success (0)	826	<a href="#">Response</a>
8/8/2013 5:17:20 PM	71.43.255.210	/v3/devices/US/6HARMONICS/500	Success (0)	313	<a href="#">Request</a>

The refresh time was verified by clicking on 'response' hyperlink on the WSDB website. The channel list refresh time is indicated to be 48 Hours.

APPLICANT: 6HARMONICS, INC.

FCC ID: 2AAST GWS-3000

REPORT: 6\6HARMONICS\1379UT13\1379UT13TestReport.docx

```
<?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>28.0</Latitude>
  <Longitude>-81.0</Longitude>
  <AntennaHeight>15</AntennaHeight>
  <DeviceOwner>Robert Wu</DeviceOwner>
  <ContactName>Yu Zhou</ContactName>
  <ContactStreet>1021 Westgate Rd</ContactStreet>
  <ContactCity>Maitland</ContactCity>
  <ContactState>ON</ContactState>
  <ContactZip />
  <ContactCountry>CA</ContactCountry>
  <ContactEmail>Yu.Zhou@6Harmonics.com</ContactEmail>
  <ContactPhone>6132524992</ContactPhone>
</RegistrationRequest>
```

---

```
<?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>
```

APPLICANT: 6HARMONICS, INC.

FCC ID: 2AAST GWS-3000

REPORT: 6\6HARMONICS\1379UT13\1379UT13TestReport.docx



Using the database interface here <http://whitespaces-test.spectrumbridge.com> a low-power auxiliary device was registered for the same location and channel on which the TVDB (EUT) has selected and is operating (CH35). The registered protection for the low-power auxiliary device was scheduled for 4 PM.

<b>Entity Information</b>	
Entity Type	Low Power Auxiliary Stations
Channel Numbers	35
Transmitter Call Sign	LP001
<b>Usage Schedule</b>	
Usage	One Time Event
Time Zone	(UTC-05:00) Eastern Time (US & Canada)
Event Starts	8/8/2013 6:00:00 PM
Event Ends	8/8/2013 7:00:00 PM
<b>Contact Information</b>	
Name of Entity Owner	Jim Lancaster
Contact Name	Jim Lancaster
Country	US
Address	1064 Greenwood Blvd
City	Lake Mary
State	FL
Postal Code	32746
Contact Phone	3522427119
Contact Email	j.lancaster@spectrumbridge.com
<b>Location(s)</b>	
Point: 28 -81	

#### Auxiliary Device Enrollment

APPLICANT: 6HARMONICS, INC.

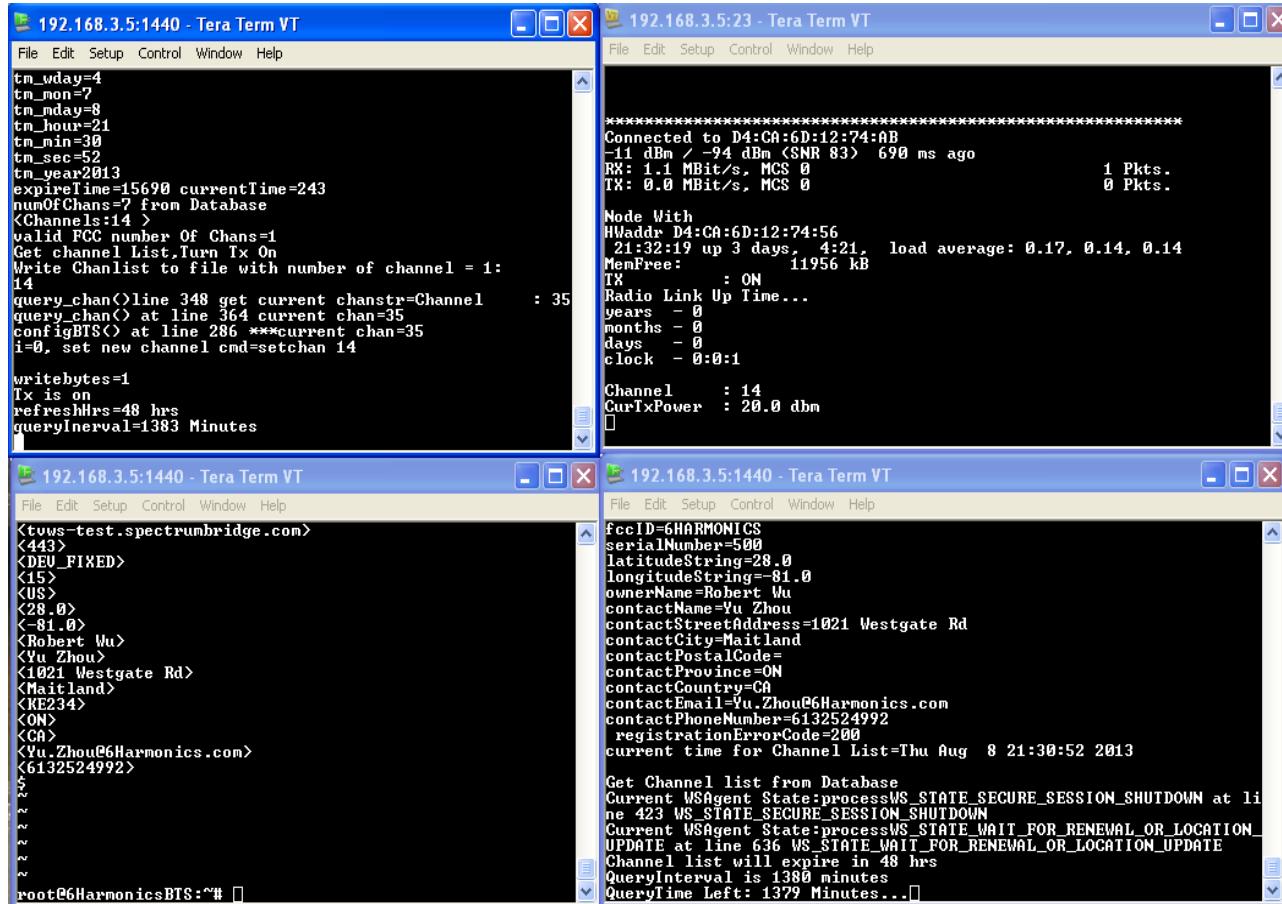
FCC ID: 2AAST GWS-3000

REPORT: 6\6HARMONICS\1379UT13\1379UT13TestReport.docx

## Channel Availability after registration of Low Power Auxiliary Device

With the next channel request, the TVBD receives the updated channel list which excludes CH35 and the Transmitter changes channel to 14.

### Radio Record



Four Tera Term windows showing radio configuration and channel list:

- Top Left:** Configuration of a low power auxiliary device. It shows variables like tm\_wday=4, tm\_mon=7, tm\_mday=8, tm\_hour=21, tm\_min=30, tm\_sec=52, tm\_year=2013, and a query to the database for channels. It also shows a command to write a channel list to a file.
- Top Right:** A connection status message. It shows the device is connected to D4:CA:6D:12:74:AB with 11 dBm / -94 dBm (SNR 83) 690 ms ago. RX: 1.1 MBit/s, MCS 0, 1 Pkts. TX: 0.0 MBit/s, MCS 0, 0 Pkts.
- Bottom Left:** A configuration message for a device at 192.168.3.5. It shows the device is on, has a refresh interval of 48 hrs, and a query interval of 1383 Minutes.
- Bottom Right:** A configuration message for a device at 192.168.3.5. It shows the device is on, has a refresh interval of 48 hrs, and a query interval of 1383 Minutes. It also shows a registration error code of 200.

### WSDB Record

Date	Ip	Url	Status	RT (ms)	Data
8/8/2013 5:49:04 PM	71.43.255.210	/v3/channels/US/33.62070/-100.3228/?fccid=6HARMONICS&serial=500&type=8	Success (0)	546	<a href="#">Response</a>
8/8/2013 5:49:02 PM	71.43.255.210	/v3/devices/US/6HARMONICS/500	Success (0)	1203	<a href="#">Request</a>

APPLICANT: 6HARMONICS, INC.

FCC ID: 2AAST GWS-3000

REPORT: 6\6HARMONICS\1379UT13\1379UT13TestReport.docx

**Channel list response :**

```
<?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>33.62070</Latitude>
  <Longitude>-100.3228</Longitude>
  <AntennaHeight>15</AntennaHeight>
  <DeviceOwner>Robert Wu</DeviceOwner>
  <ContactName>Yu Zhou</ContactName>
  <ContactStreet>1021 Westgate Rd</ContactStreet>
  <ContactCity>Maitland</ContactCity>
  <ContactState>ON</ContactState>
  <ContactZip />
  <ContactCountry>CA</ContactCountry>
  <ContactEmail>Yu.Zhou@6Harmonics.com</ContactEmail>
  <ContactPhone>6132524992</ContactPhone>
</RegistrationRequest>

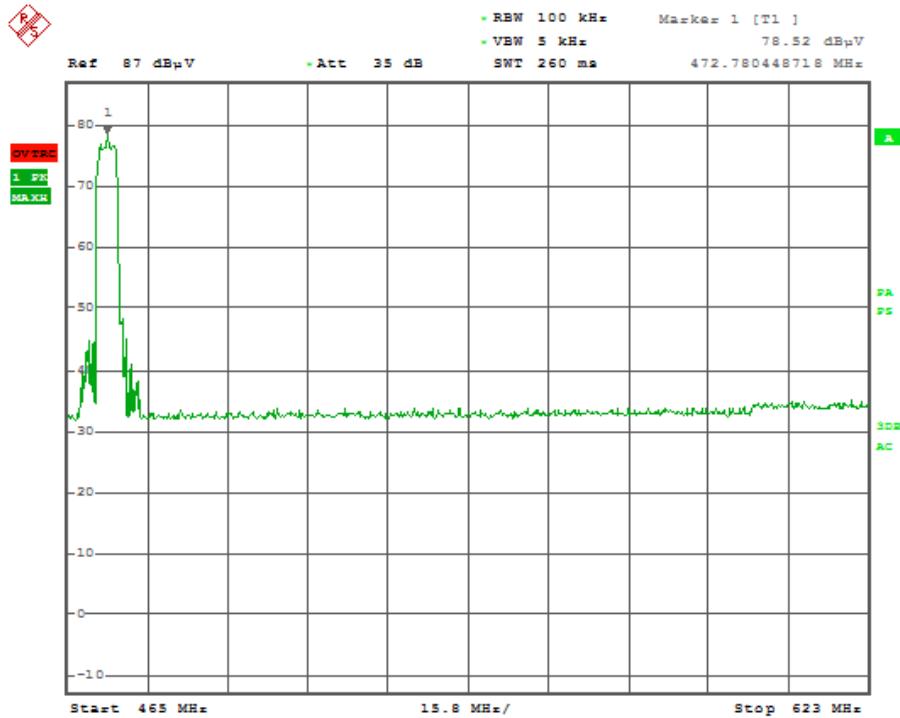
<?xml version="1.0" encoding="utf-16"?>
<ChannelResponse xmlns:xsd="http://www.w3.org/2001/XMLSchema"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
  <ChannelCount>45</ChannelCount>

  <ChannelList>2,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,30
    <RefreshIn>48</RefreshIn>
</ChannelResponse>
```

APPLICANT: 6HARMONICS, INC.

FCC ID: 2AAST GWS-3000

REPORT: 6\6HARMONICS\1379UT13\1379UT13TestReport.docx

**Spectrum Plot: (CH 14 TX)**

**Results:**

After receiving the updated channel listing the EUT changes channel to 14. This was verified by observing the spectrum analyzer.

APPLICANT: 6HARMONICS, INC.

FCC ID: 2AAST GWS-3000

REPORT: 6\6HARMONICS\1379UT13\1379UT13TestReport.docx

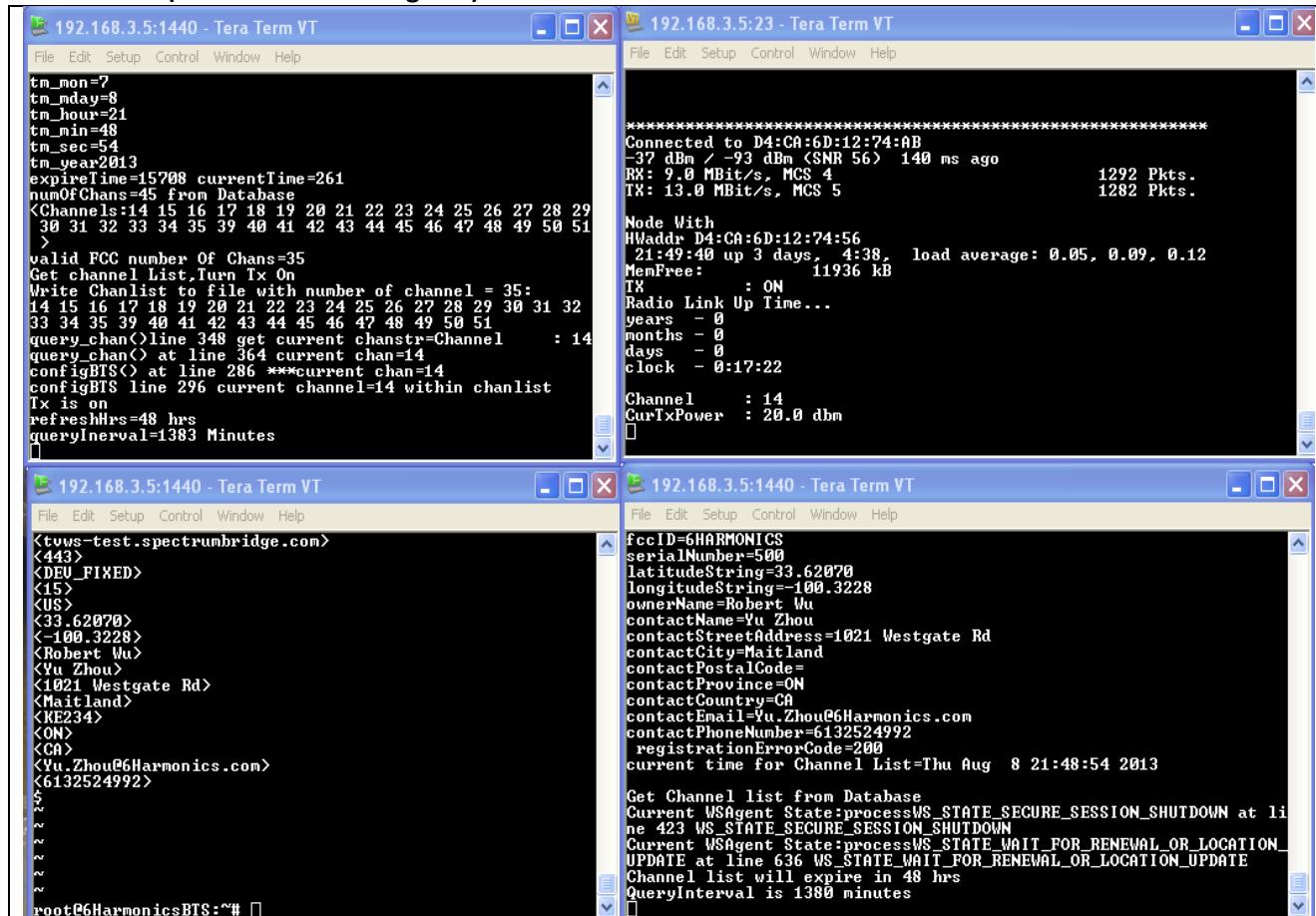
## §15.707, §15.711(b)(3)(i)(ii)(iv),(c), §15.712 TVBD Channel Availability

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:

- 1) Register the TVBD with valid location information.  
Verify that the channel list provided by the WSDB conforms to the device type of the TVBD under test.
- 2) All Device types
  - ✓ Configure and register the devices location (33.62070 N, -100.3228 W) 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

### Radio Record (successful channel grant)



The image shows four terminal windows (Tera Term VT) on a computer screen, illustrating the configuration and operation of a TVBD. The windows are arranged in a 2x2 grid.

- Top Left Window:** Displays configuration parameters for a channel list. It shows variables like tm\_mon=7, tm\_mday=8, tm\_hour=21, tm\_min=48, tm\_sec=54, tm\_year=2013, expireTime=15708, currentTIme=261, numOfChans=45, and a list of channels from 14 to 51. It also shows a valid FCC number of Chans=35 and a channel list with channels 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51.
- Top Right Window:** Shows a successful channel grant. It displays connection details (Connected to D4:CA:6D:12:74:0B), signal strength (Rx: 9.0 MBit/s, MCS 4), and transmission parameters (Tx: 13.0 MBit/s, MCS 5). It also shows statistics for 1292 Pkts. Rx and 1282 Pkts. Tx.
- Bottom Left Window:** Displays the configuration of a spectrum bridge. It shows the device ID (fccID=6HARMONICS), serial number (serialNumber=500), location (latitudeString=33.62070, longitudeString=-100.3228), owner name (ownerName=Robert Vu), contact name (contactName=Yu Zhou), contact address (contactStreetAddress=1021 Westgate Rd), and contact email (contactEmail=Yu.Zhou@6Harmonics.com). It also shows the contact phone number (contactPhoneNumber=6132524992) and registration error code (registrationErrorCode=200).
- Bottom Right Window:** Shows the current time for the channel list (Thu Aug 8 21:48:54 2013) and a log of database operations. It includes commands like '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 636 WS\_STATE\_WAIT\_FOR\_RENEWAL\_OR\_LOCATION\_UPDATE', and 'Channel list will expire in 48 hrs'. It also shows the query interval (QueryInterval is 1380 minutes).

APPLICANT: 6HARMONICS, INC.

FCC ID: 2AAST GWS-3000

REPORT: 6\6HARMONICS\1379UT13\1379UT13TestReport.docx

**Test Result 1:**

Date	Ip	Url	Status	RT (ms)	Data
8/8/2013 5:49:04 PM	71.43.255.210	/v3/channels/US/33.62070/-100.3228/?fccid=6HARMONICS&serial=500&type=8	Success (0)	546	<a href="#">Response</a>
8/8/2013 5:49:02 PM	71.43.255.210	/v3/devices/US/6HARMONICS/500	Success (0)	1203	<a href="#">Request</a>

```

<?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>33.62070</Latitude>
  <Longitude>-100.3228</Longitude>
  <AntennaHeight>15</AntennaHeight>
  <DeviceOwner>Robert Wu</DeviceOwner>
  <ContactName>Yu Zhou</ContactName>
  <ContactStreet>1021 Westgate Rd</ContactStreet>
  <ContactCity>Maitland</ContactCity>
  <ContactState>ON</ContactState>
  <ContactZip />
  <ContactCountry>CA</ContactCountry>
  <ContactEmail>Yu.Zhou@6Harmonics.com</ContactEmail>
  <ContactPhone>6132524992</ContactPhone>
</RegistrationRequest>

<?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>45</ChannelCount>

  <ChannelList>2,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,30
  <RefreshIn>48</RefreshIn>
</ChannelResponse>

```

**Test Result 1:**

**The database identifies the device type correctly and the channel list provided is correct for the device type.**

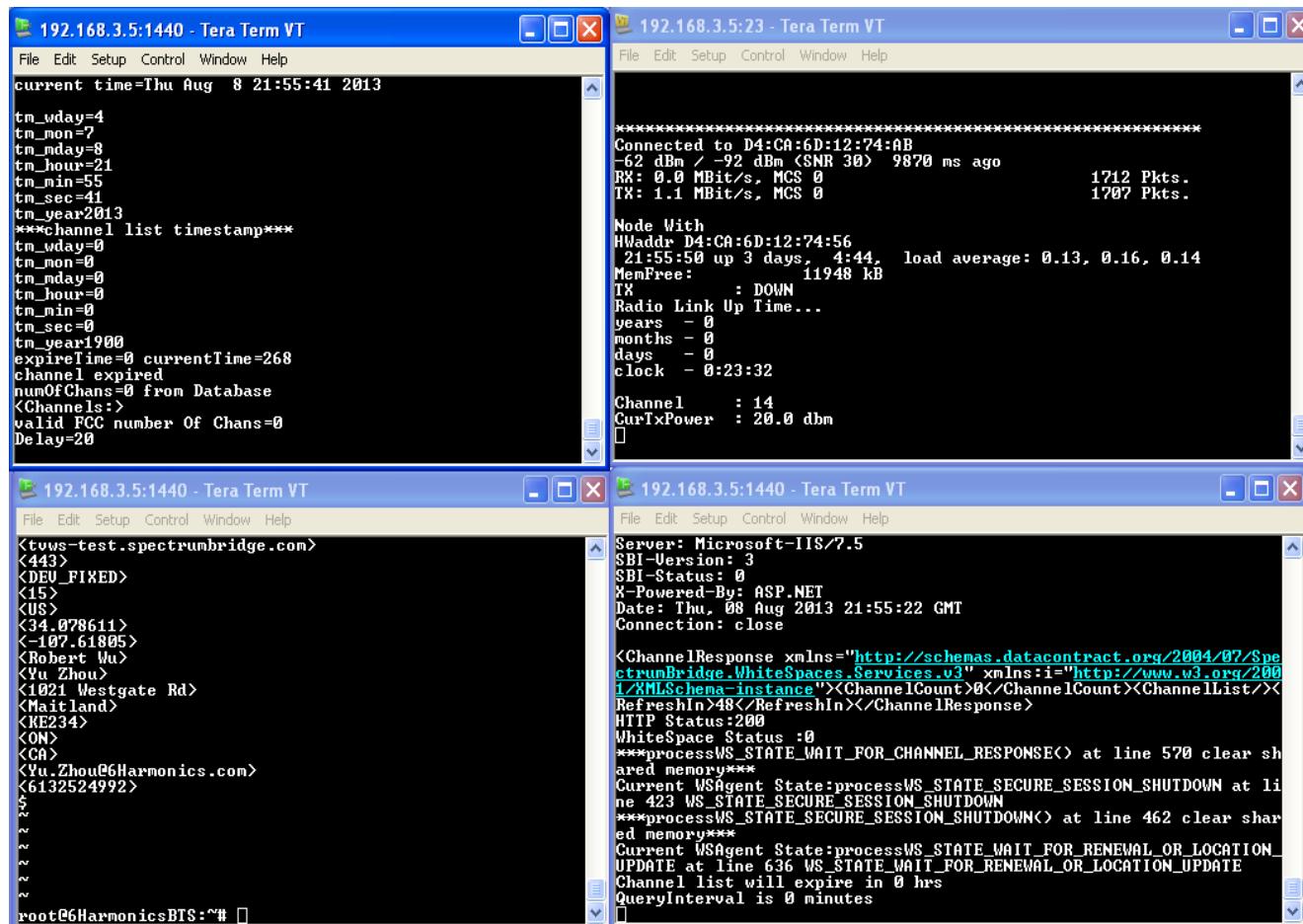
APPLICANT: 6HARMONICS, INC.

FCC ID: 2AAST GWS-3000

REPORT: 6\6HARMONICS\1379UT13\1379UT13TestReport.docx

**Test Precondition :**

A Registration request is sent for a location with no known available channels. Eg: (34.078611, -107.61805)

**Radio Record**


```

192.168.3.5:1440 - Tera Term VT
File Edit Setup Control Window Help
current time=Thu Aug  8 21:55:41 2013
tm_wday=4
tm_mon=7
tm_mday=8
tm_hour=21
tm_min=55
tm_sec=41
tm_year2013
***Channel list timestamp***
tm_wday=0
tm_mon=0
tm_mday=0
tm_hour=0
tm_min=0
tm_sec=0
tm_year1900
expireTime=0 currentTime=268
channel expired
numOfChans=0 from Database
<Channels:>
valid FCC number Of Chans=0
Delay=20

192.168.3.5:23 - Tera Term VT
File Edit Setup Control Window Help
*****
Connected to D4:CA:6D:12:74:AB
-62 dBm / -92 dBm (SNR 30) 9870 ms ago
RX: 0.0 MBit/s, MCS 0 1712 Pkts.
TX: 1.1 MBit/s, MCS 0 1707 Pkts.

Node With
HWaddr D4:CA:6D:12:74:56
21:55:50 up 3 days, 4:44, load average: 0.13, 0.16, 0.14
MemFree: 11948 kB
TX : DOWN
Radio Link Up Time...
years - 0
months - 0
days - 0
clock - 0:23:32
Channel : 14
CurTxPower : 20.0 dbm

```

```

192.168.3.5:1440 - Tera Term VT
File Edit Setup Control Window Help
<tws-test.spectrumbridge.com>
<443>
<DEV_FIXED>
<15>
<US>
<34.078611>
<-107.61805>
<Robert Wu>
<Yu Zhou>
<1021 Westgate Rd>
<Maitland>
<KE234>
<ON>
<CA>
<Yu.Zhou@6Harmonics.com>
<6132524992>
§
~
~
```

```

192.168.3.5:1440 - Tera Term VT
File Edit Setup Control Window Help
Server: Microsoft-IIS/7.5
SBI-Version: 3
SBI-Status: 0
X-Powered-By: ASP.NET
Date: Thu, 08 Aug 2013 21:55:22 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></ChannelList><Channel1Response><RefreshIn>48</RefreshIn></Channel1Response>
HTTP Status:200
WhiteSpace Status :0
***processWS_STATE_WAIT_FOR_CHANNEL_RESPONSE() at line 570 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 636 WS_STATE_WAIT_FOR_RENEWAL_OR_LOCATION_UPDATE
Channel list will expire in 0 hrs
QueryInterval is 0 minutes

```

APPLICANT: 6HARMONICS, INC.

FCC ID: 2AAST GWS-3000

REPORT: 6\6HARMONICS\1379UT13\1379UT13TestReport.docx

**Test Result 2:**

An empty channel list is received and the transmitter turned off immediately.

Date	Ip	Url	Status	RT (ms)	Data
8/8/2013 5:57:23 PM	71.43.255.210	/v3/channels/US/34.078611/-107.61805/?fccid=6HARMONICS&serial=500&type=8	Success (0)	360	<a href="#">Response</a>
8/8/2013 5:56:22 PM	71.43.255.210	/v3/channels/US/34.078611/-107.61805/?fccid=6HARMONICS&serial=500&type=8	Success (0)	296	<a href="#">Response</a>
8/8/2013 5:55:22 PM	71.43.255.210	/v3/channels/US/34.078611/-107.61805/?fccid=6HARMONICS&serial=500&type=8	Success (0)	313	<a href="#">Response</a>
8/8/2013 5:54:21 PM	71.43.255.210	/v3/channels/US/34.078611/-107.61805/?fccid=6HARMONICS&serial=500&type=8	Success (0)	406	<a href="#">Response</a>
8/8/2013 5:54:15 PM	71.43.255.210	/v3/devices/US/6HARMONICS/500	Success (0)	6123	<a href="#">Request</a>

```

<?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>15</AntennaHeight>
  <DeviceOwner>Robert Wu</DeviceOwner>
  <ContactName>Yu Zhou</ContactName>
  <ContactStreet>1021 Westgate Rd</ContactStreet>
  <ContactCity>Maitland</ContactCity>
  <ContactState>ON</ContactState>
  <ContactZip />
  <ContactCountry>CA</ContactCountry>
  <ContactEmail>Yu.Zhou@6Harmonics.com</ContactEmail>
  <ContactPhone>6132524992</ContactPhone>
</RegistrationRequest>

<?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>

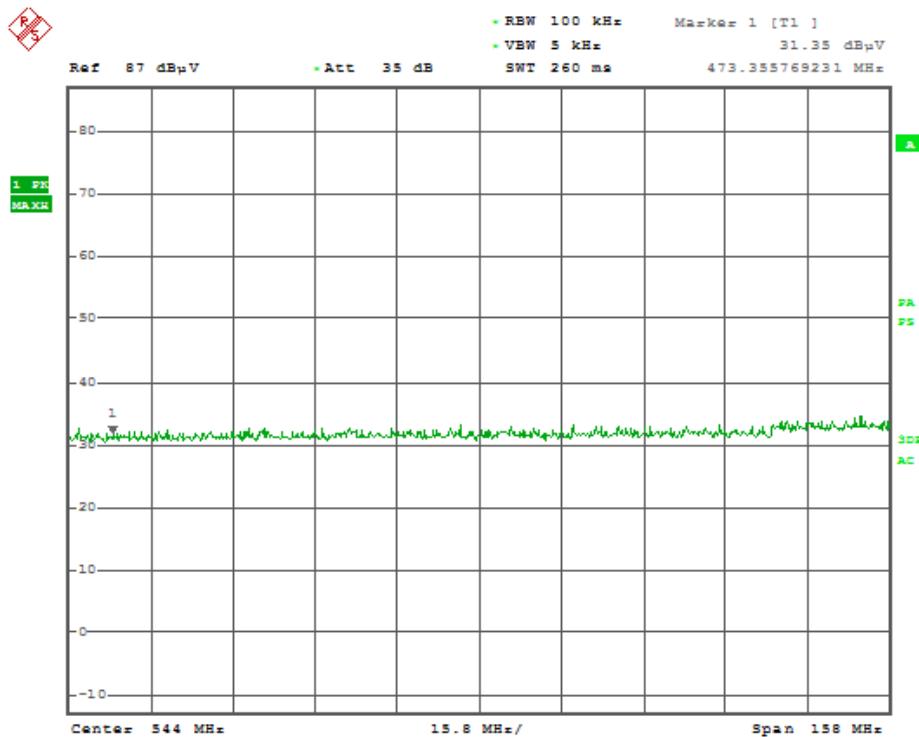
```

APPLICANT: 6HARMONICS, INC.

FCC ID: 2AAST GWS-3000

REPORT: 6\6HARMONICS\1379UT13\1379UT13TestReport.docx

Spectrum Analyzer screenshot:



**Results: The radio did not/does not transmit until it receives a valid channel list.**

APPLICANT: 6HARMONICS, INC.

FCC ID: 2AAST GWS-3000

REPORT: 6\6HARMONICS\1379UT13\1379UT13TestReport.docx



**§15.711(f) Security:**

**Please see the attached document, TVBD Secure Communications.pdf**

APPLICANT: 6HARMONICS, INC.

FCC ID: 2AAST GWS-3000

REPORT: 6\6HARMONICS\1379UT13\1379UT13TestReport.docx