

test report

304460-2TRFWL

Date of issue: June 13, 2016

Applicant:

6harmonics Inc.

Product:

Television Band Device (TVBD)

Model:

GWS-4006-23

FCC ID:

2AASTGWS-4006-23

Specifications:

FCC 47 CFR Part 15 Subpart H

White Space Devices

Test location

Company name	Nemko Canada Inc.
Address	303 River Road
City	Ottawa
Province	Ontario
Postal code	K1V 1H2
Country	Canada
Telephone	+1 613 737 9680
Facsimile	+1 613 737 9691
Toll free	+1 800 563 6336
Website	www.nemko.com
Site number	FCC: 176392; IC: 2040A-4 (3 m semi anechoic chamber)

Tested by	Andrey Adelberg, Senior Wireless/EMC Specialist
Reviewed by	Kevin Rose, Wireless/EMC Specialist
Date	June 13, 2016
Signature of reviewer	

Limits of responsibility

Note that the results contained in this report relate only to the items tested and were obtained in the period between the date of initial receipt of samples and the date of issue of the report.

This test report has been completed in accordance with the requirements of ISO/IEC 17025. All results contain in this report are within Nemko Canada's ISO/IEC 17025 accreditation.

Copyright notification

Nemko Canada Inc. authorizes the applicant to reproduce this report provided it is reproduced in its entirety and for use by the company's employees only. Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties.

Nemko Canada Inc. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

© Nemko Canada Inc.

Table of contents

Table of contents	3
Section 1. Report summary	4
1.1 Applicant and manufacturer	4
1.2 Test specifications	4
1.3 Statement of compliance	4
1.4 Exclusions	4
1.5 Test report revision history	4
Section 2. Summary of test results	5
2.1 FCC Part 15 Subpart H test results	5
Section 3. Equipment under test (EUT) details	6
3.1 Sample information	6
3.2 EUT information	6
3.3 Technical information	6
3.4 Product description and theory of operation	6
3.5 Test configuration	6
3.6 Setup photo	7
Section 4. Engineering considerations	8
4.1 Modifications incorporated in the EUT	8
4.2 Technical judgment	8
4.3 Deviations from laboratory tests procedures	8
Section 5. Test conditions	9
5.1 Atmospheric conditions	9
5.2 Power supply range	9
Section 6. Measurement uncertainty	10
6.1 Uncertainty of measurement	10
Section 7. Test equipment	11
7.1 Test equipment list	11
Section 8. Testing data	12
8.1 FCC 15.713(g) Fixed white space device registration	12
8.2 FCC15.713(g)(3)(iii) Unsuccessful registration – restricted coordinates	16
8.3 FCC15.713(g)(3)(v) Unsuccessful registration due to incomplete information – missing owner	20
8.4 FCC15.713(g)(3)(vi) Unsuccessful registration due to incomplete information – contact name	24
8.5 FCC15.713(g)(3)(vii) Unsuccessful registration due to incomplete information – contact address	28
8.6 FCC15.713(g)(3)(vii) Unsuccessful registration due to incomplete information – contact state (province)	33
8.7 FCC15.713(g)(3)(vii) Unsuccessful registration due to incomplete information – contact zip code	38
8.8 FCC15.713(g)(3)(vii) Unsuccessful registration due to incomplete information – contact city	43
8.9 FCC15.713(g)(3)(vii) Unsuccessful registration due to incomplete information – contact country	48
8.10 FCC15.713(g)(3)(viii) Unsuccessful registration due to incomplete information – contact email	53
8.11 FCC15.713(g)(3)(ix) Unsuccessful registration due to incomplete information – contact telephone	58
8.12 FCC15.713(e)(6) Unsuccessful registration due to HAAT >250 m	62
8.13 FCC15.713(e)(6) Unsuccessful registration due to antenna height that exceeds 30 m	67
8.14 FCC15.713(g)(3)(i) and (ii) Unsuccessful registration due to incomplete information – FCC ID and Serial number	72
8.15 FCC15.713(a)(3) Relocation of fixed TVBD	73
8.16 FCC15.711(c)(2)(iii) Fixed & Mode II TVDB database update	74
8.17 FCC15.711(c)(2)(iii) Low-power auxiliary device protection	78
8.18 FCC15.711(j) Security	81
Section 9. Block diagrams of test set-ups	82
9.1 Master test setup diagram	82
9.2 Slave test setup diagram	83



Section 1. Report summary

1.1 Applicant and manufacturer

Company name	6harmonics Inc.
Address	Suite 10 - 21 Concourse Gate
City	Ottawa
Province/State	ON
Postal/Zip code	K2E 7S4
Country	Canada

1.2 Test specifications

FCC 47 CFR Part 15, Subpart H	White Space Devices
-------------------------------	---------------------

1.3 Statement of compliance

In the configuration tested, the EUT was found compliant.

Testing was completed against all relevant requirements of the test standard. Results obtained indicate that the product under test complies in full with the requirements tested. The test results relate only to the items tested.

See “Summary of test results” for full details.

1.4 Exclusions

None

1.5 Test report revision history

Revision #	Details of changes made to test report
TRF	Original report issued

Section 2. Summary of test results

2.1 FCC Part 15 Subpart H test results

Part	Test description	Verdict
§15.713(g)(3)	Fixed white space device registration	Pass
§15.713(g)(3)(iii)	Unsuccessful registration – restricted coordinates	Pass
§15.713(g)(3)(v)	Unsuccessful registration due to incomplete information – missing owner	Pass
§15.713(g)(3)(vi)	Unsuccessful registration due to incomplete information – contact name	Pass
§15.713(g)(3)(vii)	Unsuccessful registration due to incomplete information – contact address	Pass
§15.713(g)(3)(vii)	Unsuccessful registration due to incomplete information – contact state (province)	Pass
§15.713(g)(3)(vii)	Unsuccessful registration due to incomplete information – contact zip code	Pass
§15.713(g)(3)(vii)	Unsuccessful registration due to incomplete information – contact city	Pass
§15.713(g)(3)(vii)	Unsuccessful registration due to incomplete information – contact country	Pass
§15.713(g)(3)(viii)	Unsuccessful registration due to incomplete information – contact email	Pass
§15.713(g)(3)(ix)	Unsuccessful registration due to incomplete information – contact telephone	Pass
§15.713(e)(6)	Unsuccessful registration due to HAAT > 250 m	Pass
§15.713(e)(6)	Unsuccessful registration due to antenna height that exceeds 30 m	Pass
§15.713(g)(3)(i) and (ii)	Unsuccessful registration due to incomplete information – FCC ID and Serial number	Pass
§15.713(a)(3)	Relocation of fixed TVBD	Pass
§15.711(c)(2)(i)	Database access	Pass
§15.711(c)(2)(iii)	Low-power auxiliary device protection	Pass
§15.711(j)	Security	Pass

Section 3. Equipment under test (EUT) details

3.1 Sample information

Receipt date	February 29, 2016
Nemko sample ID number	None

3.2 EUT information

Product name	Television Band Device (TVBD)
Model	GWS-4006-23
Serial number	620000096 (master or slave)

3.3 Technical information

Frequency band	470–698 MHz
Channel BW	6 MHz
Type of modulation	BPSK, QPSK, 16-QAM, and 64-QAM
Power requirements	120 VAC 60 Hz or 48 V _{DC} via PoE

3.4 Product description and theory of operation

The 6Harmonics Inc. GWS radios are a new class of radios designed for the global white space radio market. The GWS-4006-23 is designed to provide up to 23 dBm of transmit power, offer a sensitivity of up to –100 dBm, and provide 16.5 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.

3.5 Test configuration

The work station laptop was connected to network router and established a network connection to the internet and the EUT. Two separate samples of GWS-4006-23 were used in the setup. One sample was configured as Master and the second sample was configured as Slave. Master device was connected to a network router with direct access to the internet. Slave device was connected to master device using RF cables, attenuators and RF splitter. Slave device doesn't have direct internet access. It was able to access the internet only during master-slave coax link. All EUT's were controlled and monitored by a work station using Terminal sessions.

3.6 Setup photo

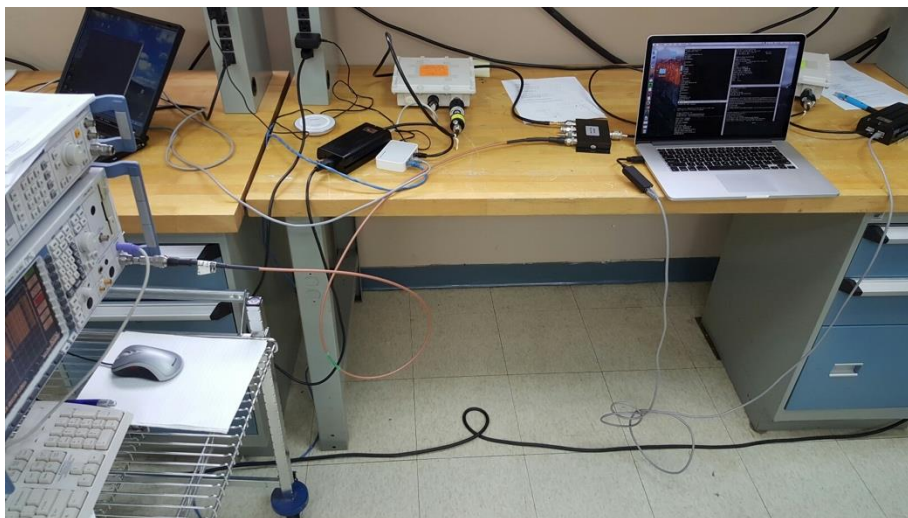


Figure3.6-1: Setup photo



Section 4. Engineering considerations

4.1 Modifications incorporated in the EUT

There were no modifications performed to the EUT during this assessment.

4.2 Technical judgment

None

4.3 Deviations from laboratory tests procedures

No deviations were made from laboratory procedures.

Section 5. Test conditions

5.1 Atmospheric conditions

Temperature	15–30 °C
Relative humidity	20–75 %
Air pressure	860–1060mbar

When it is impracticable to carry out tests under these conditions, a note to this effect stating the ambient temperature and relative humidity during the tests shall be recorded and stated.

5.2 Power supply range

The normal test voltage for equipment to be connected to the mains shall be the nominal mains voltage. For the purpose of the present document, the nominal voltage shall be the declared voltage, or any of the declared voltages $\pm 5\%$, for which the equipment was designed.

Section 6. Measurement uncertainty

6.1 Uncertainty of measurement

Nemko Canada Inc. has calculated measurement uncertainty and is documented in EMC/MUC/001 "Uncertainty in EMC measurements." Measurement uncertainty was calculated using the methods described in CISPR 16-4 Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC measurements; as well as described in UKAS LAB34: The expression of Uncertainty in EMC Testing. Measurement uncertainty calculations assume a coverage factor of $K=2$ with 95% certainty.



Section 7. Test equipment

7.1 Test equipment list

Table 7.1-1: Equipment list

Equipment	Manufacturer	Model no.	Asset no.	Cal cycle	Next cal.
Spectrum analyzer	Rohde & Schwarz	FSU	FA001877	1 year	Mar. 27/16

Note: NCR - no calibration required, VOU - verify on use

Section 8. Testing data

8.1 FCC 15.713(g) Fixed white space device registration

8.1.1 Definitions and limits

Prior to operating for the first time or after changing location, a fixed white space device must register with the white space database by providing the information listed in paragraph (g)(3) of §15.713.

8.1.2 Test summary

Test date	February 29, 2016	Temperature	22 °C
Test engineer	Andrey Adelberg	Air pressure	1004 mbar
Verdict	Pass	Relative humidity	32 %

8.1.3 Observations, settings and special notes

EUT was configured with the with proper registration information. Successful registration was verified with spectrum analyzer and by accessing WSDb registration interface and showing on the EUT status information page.

8.1.4 Test data

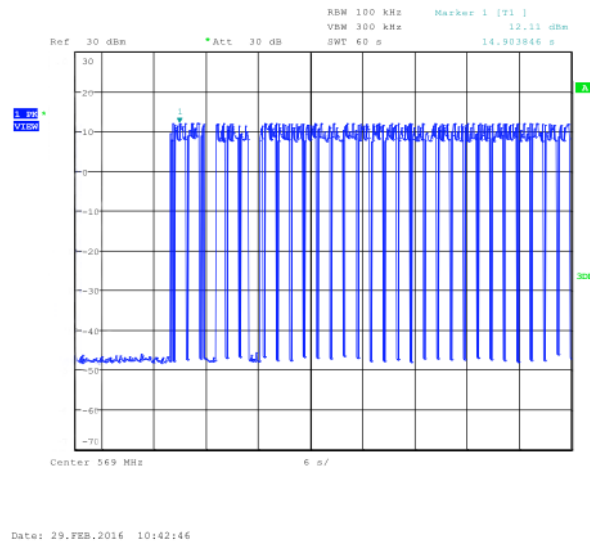


Figure 8.1-1: Successful registration of master device. Spectrum plot shows that prior to the registration of the EUT there is no transmission and the transmission started right after the successful registration.

Note: there were no emissions from the Master Device detected, on any channels, until it has successfully registered.

```
tvws-test.spectrumbridge.com
DeviceMode:
DEV_FIXED
AntennaHeight:
2
AntennaType:
AGL
RegulatoryDomain:
US
Latitude:
44.429534
Longitude:
-75.15075
...Owner Info...
Owner:
GH
Contactname:
info
ContactAddress:
Suite 10-21 Concoures Gate
ContactCity:
Ottawa
ContactZipcode:
K2E7S4
ContactState:
ON
ContactCountry:
CA
ContactEmail:
info@6harmonics.com
ContactTelephone:
6133661768
GWS Cmd >

-----
---No station connected---
Database Access:spectrumbridge
Node is CAR With Ethernet MAC:
HWaddr AC:EE:3B:02:00:87
10:05:10 up 14 min, load average: 0.25, 0.16, 0.08
MemFree: 39796 kB
Channel:
30
Tx Power: 17.000000 dBm
Max Tx Power: 23.000000 dBm
Min Tx Power: 7.000000 dBm
GWS_Ready
Channel Expire In 2879 Minutes
Query Time Left In 1379 Minutes
█
```

Figure8.1-2: Data log of successful registration of master device

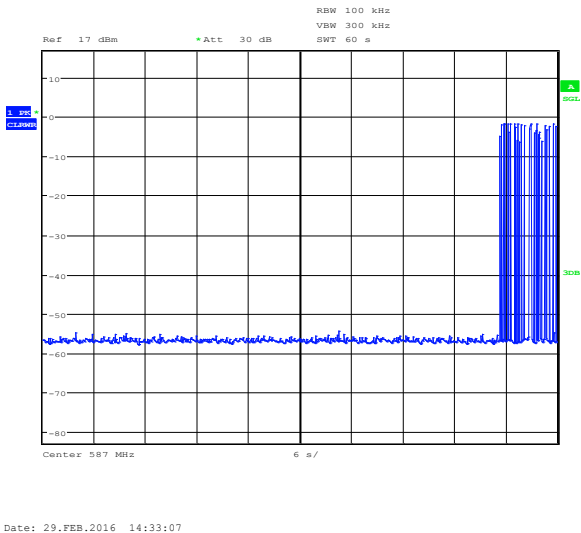


Figure 8.1-3: Successful registration of slave device. Spectrum plot shows that prior to the registration of the EUT there is no transmission and the transmission started right after the successful registration.

Note: Prior to registration, Slave Device did not transmit on any channels except for the channel where it saw a beacon from the Master Device. Only the Slave device is permitted to transmit prior to registration for the purposes of registering only on a channel where it sees a beacon from a Master Device. To achieve this, the SLAVE must perform a passive scan.

```
steven — telnet 192.168.3.202 — 80x36
GWS Cmd > showregistration
...Registration Info...
URL:
tvws-test.spectrumbridge.com
DeviceMode:
DEV_FIXED
AntennaHeight:
2
AntennaType:
AGL
RegulatoryDomain:
US
Latitude:
44.429534
Longitude:
-75.15075
...Owner Info...
Owner:
GH
Contactname:
info
ContactAddress:
Suite 10-21 Concourses Gate
ContactCity:
Ottawa
ContactZipcode:
K2E7S4
ContactState:
ON
ContactCountry:
CA
ContactEmail:
info@gharmonics.com
ContactTelephone:
6133661768
GWS Cmd >

steven — telnet 192.168.3.202 — 80x24
Connected to ac:ee:3b:02:08:87
-78 dBm / -98 dBm (SNR 20) 170 ms ago
RX: 18.0 MBit/s, MCS 7, short GI          999 Pkts.
TX: 16.0 MBit/s, MCS 7                    11 Pkts.

Database Access:spectrumbridge
Node is EAR With
HWaddr AC:EE:3B:02:08:9E
14:07:23 up 8 min, Load average: 0.56, 0.48, 0.26
MemFree: 39180 kB
Channel:
33
Tx Power: 17.000000 dBm
Max Tx Power: 23.000000 dBm
Min Tx Power: 7.000000 dBm
Channel Expire In 2878 Minutes
Query Time Left In 1378 Minutes
Radio Link Up Time...
years - 0
months - 0
days - 0
clock - 0:0:31

steven — telnet 192.168.3.202 — 80x33
Host: tvws-test.spectrumbridge.com
User-Agent: HTMLGET 1.0

Current WSAgent State: WS_STATE_WAIT_FOR_CHANNEL_RESPONSE
Received a message:HTTP/1.1 200 OK
Cache-Control: private
Content-Length: 348
Content-Type: application/xml; charset=utf-8
Server: Microsoft-IIS/8.5
SBI-Version: 3
SBI-Status: 0
X-Powered-By: ASP.NET
Date: Mon, 29 Feb 2016 19:05:22 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>32</ChannelCount><ChannelList>2,5,6,9,10,11,12,13,14,15,16,25,26,27,28,29,30,31,32,33,34,35,39,43,44,45,46,47,48,49,50,51</ChannelList><RefreshIn>48</RefreshIn></ChannelResponse>
HTTP Status:200
WhiteSpace Status :0
processWS_STATE_WAIT_FOR_CHANNEL_RESPONSE() line 649 wsCtx->queryIntervalInMin=1380

Available Channels:<2 5 6 9 10 11 12 13 14 15 16 25 26 27 28 29 30 31 32 33 34 35 39 43 44 45 46 47 48 49 50 51 >
Channel Refresh In 48 Hrs
Get Channel list from Database...
Current WSAgent State: WS_STATE_SECURE_SESSION_SHUTDOWN
Current WSAgent State: WS_STATE_WAIT_FOR_RENEWAL_OR_LOCATION_UPDATE
chanlist expire in 2878 minutes... QueryTime Left: 1378 Minutes...

setchan 29
Setting frequency to 563 MHz
```

Figure8.1-4: Data log of successful registration of slave device

8.2 FCC15.713(g)(3)(iii) Unsuccessful registration – restricted coordinates

8.2.1 Definitions and limits

(3) The white space device registration database shall contain the following information for fixed white space devices:
(iii) Device's geographic coordinates (latitude and longitude (NAD 83));

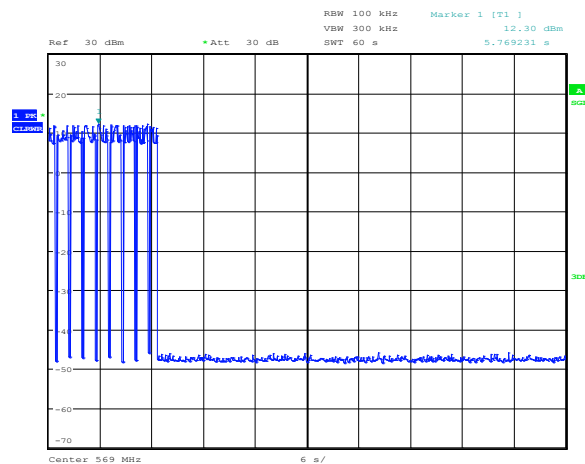
8.2.2 Test summary

Test date	February 29, 2016	Temperature	22 °C
Test engineer	Andrey Adelberg	Air pressure	1004 mbar
Verdict	Pass	Relative humidity	32 %

8.2.3 Observations, settings and special notes

The device was initially configured with a valid registration such that the device will begin to transmit on a given channel. Once the device was transmitting and the link was established, the registration data was modified to incorporate restricted coordinates. EUT was configured with restricted coordinated: outside US regulatory boundaries with latitude: 31.5 and longitude: –106.9. The registration process was re-initiated with the invalid coordinates. After database rejection, the EUT stopped the transmission as can be seen in figure 8.2-1. Conversely, if the device was initially configured with invalide coordinates, the device will not transmit since the registration will be rejected. The test was repeated for a Master Device Fig 8.2-1 and a Slave Device Fig 8.2-3.

8.2.4 Test data



Date: 29.FEB.2016 10:44:15

Figure 8.2-1: Unsuccessful registration with restricted coordinates of master device. Spectrum plot shows that prior to the unsuccessful registration the EUT was transmitting and the transmission stopped right after the EUT detected missing information in the registration form.


```
steven — telnet 192.168.3.202 — 80x37
Host: twws-test.spectrumbridge.com
Content-Type: Application/xml
Connection: close
Content-Length: 580

<RegistrationRequest xmlns="http://schemas.datacontract.org/2004/07/SpectrumBridge.WhiteSpaces.Services.v3"><AntennaHeight>2</AntennaHeight><ContactCity>Ottawa</ContactCity><ContactCountry>CA</ContactCountry><ContactEmail>info@6harmonics.com</ContactEmail><ContactName>info</ContactName><ContactPhone>6133661768</ContactPhone><ContactState>ON</ContactState><ContactStreet>Suite 10-21 Concours Gate</ContactStreet><ContactZip>K2E7S4</ContactZip><DeviceOwner>6H</DeviceOwner><DeviceType>8</DeviceType><Latitude>31.5</Latitude><Longitude>-106.9</Longitude></RegistrationRequest>

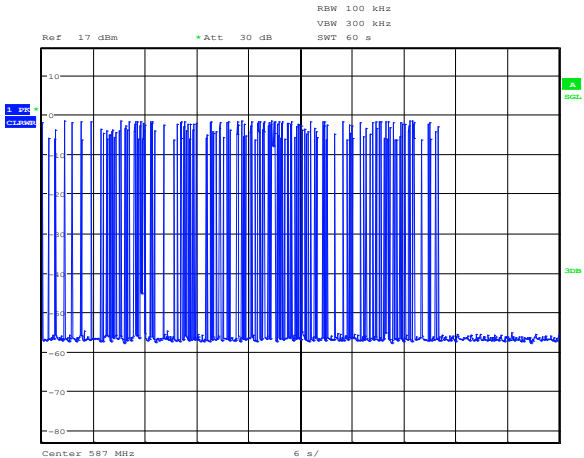
Current WSAgent State: WS_STATE_WAIT_FOR_REGISTRATION_RESPONSE
Received a message:HTTP/1.1 200 OK
Cache-Control: private
Server: Microsoft-IIS/8.5
SBI-Version: 3
SBI-Status: 9
SBI-HC: 0.000
X-Powered-By: ASP.NET
Date: Mon, 29 Feb 2016 15:10:32 GMT
Connection: close
Content-Length: 0

HTTP Status:200
WhiteSpace Status :9
Registration Failed
Registration HTTP Status:200 WS Error code:9
Error: LOCATION OUTSIDE REG DOMAIN
Current WSAgent State: WS_STATE_SECURE_SESSION_SHUTDOWN
```

```
steven — telnet 192.168.3.202 — 80x24
---No station connected---
Database Access:spectrumbridge
Node is CAR With Ethernet MAC:
HWaddr AC:EE:3B:02:00:9E
10:10:30 up 19 min, load average: 0.45, 0.28, 0.18
MemFree: 39196 KB
Channel: 30
Tx Power: 17.000000 dBm
Max Tx Power: 23.000000 dBm
Min Tx Power: 7.000000 dBm
TX Down

logread -f
Feb 29 10:10:14 6Harmonics kern.info kernel: [ 1144.910000] device wlan0 left promiscuous mode
Feb 29 10:10:14 6Harmonics kern.info kernel: [ 1144.910000] br-lan: port 2(wlan0) entered disabled state
Feb 29 10:10:15 6Harmonics user.warn syslog: Registration HTTP Status:200 WS Error code:9
Feb 29 10:10:15 6Harmonics user.warn syslog: ***processWS_STATE_WAIT_FOR_REGISTRATION_RESPONSE() at line 471 clear shared memory***
Feb 29 10:10:30 6Harmonics user.warn syslog: ***processWS_STATE_SECURE_SESSION_SHUTDOWN() at line 542 clear shared memory***
Feb 29 10:10:31 6Harmonics user.warn syslog: Registration HTTP Status:200 WS Error code:9
Feb 29 10:10:31 6Harmonics user.warn syslog: ***processWS_STATE_WAIT_FOR_REGISTRATION_RESPONSE() at line 471 clear shared memory***
```

Figure8.2-2: Data log of unsuccessful registration with restricted coordinates of master device



Date: 29.FEB.2016 14:35:38

Figure8.2-3: Unsuccessful registration with restricted coordinates of slave device. Spectrum plot shows that prior to the unsuccessful registration the EUT was transmitting and the transmission stopped right after the EUT detected missing information in the registration form.

```
steven — telnet 192.168.3.202 — 80x36
GWS Cmd > showregistration
...Registration Info...
URL:
tvws-test.spectrumbridge.com
DeviceMode:
DEV_FIXED
AntennaHeight:
2
AntennaType:
AGL
RegulatoryDomain:
US
Latitude:
31.5
Longitude:
-106.9
...Owner Info...
Owner:
6H
Contactname:
info
ContactAddress:
Suite 10-21 Concourses Gate
ContactCity:
Ottawa
ContactZipcode:
K2E7S4
ContactState:
ON
ContactCountry:
CA
ContactEmail:
info@6harmonics.com
ContactTelephone:
6133661768
GWS Cmd >

PING 8.8.8.8 (8.8.8.8): 56 data bytes
64 bytes from 8.8.8.8: seq=0 ttl=55 time=14.226 ms
64 bytes from 8.8.8.8: seq=1 ttl=55 time=13.920 ms
64 bytes from 8.8.8.8: seq=2 ttl=55 time=13.842 ms
64 bytes from 8.8.8.8: seq=3 ttl=55 time=13.705 ms
^C
--- 8.8.8.8 ping statistics ---
4 packets transmitted, 4 packets received, 0% packet loss
round-trip min/avg/max = 13.705/13.923/14.226 ms

setlatitude 31.5
setlongitude -106.9

steven — telnet 192.168.3.202 — 80x24
---No station connected---
Database Access:spectrumbridge
Node is EAR With
HWaddr AC:EE:38:02:08:9E
14:09:36 up 10 min, load average: 0.46, 0.41, 0.26
MemFree: 39168 kB
Channel:
39
Tx Power: 17.000000 dBm
Max Tx Power: 23.000000 dBm
Min Tx Power: 7.000000 dBm
Channel Expire In NoValidChannel Minutes
Query Time Left In NoV Minutes

steven — telnet 192.168.3.202 — 80x33
8</ContactPhone><ContactState>ON</ContactState><ContactStreet>Suite 10-21 Concou
rses Gate </ContactStreet><ContactZip>K2E7S4</ContactZip><DeviceOwner>6H
</DeviceOwner><DeviceType>8</DeviceType><Latitude>31.5</Latitude><Longitud
e>-106.9</Longitude></RegistrationRequest>

Current WSAgent State: WS_STATE_WAIT_FOR_REGISTRATION_RESPONSE
Received a message:HTTP/1.1 200 OK
Cache-Control: private
Server: Microsoft-IIS/8.5
SBI-Version: 3
SBI-Status: 9
SBI-HC: 0.000
X-Powered-By: ASP.NET
Date: Mon, 29 Feb 2016 19:09:18 GMT
Connection: close
Content-Length: 0

HTTP Status:200
WhiteSpace Status :9
Registration Failed
Registration HTTP Status:200 WS Error code:9
Error: LOCATION OUTSIDE REG DOMAIN
Current WSAgent State: WS_STATE_SECURE_SESSION_SHUTDOWN
Current WSAgent State: WS_STATE_IDLE
Current WSAgent State: WS_STATE_BACKGROUND_SCANNING
Current WSAgent State: WS_STATE_ASSOCIATING
Current WSAgent State: WS_STATE_OBTAINING_IP
Waiting for radio link up
```

Figure8.2-4: Data log of unsuccessful registration with restricted coordinates of slave device

8.3 FCC15.713(g)(3)(v) Unsuccessful registration due to incomplete information – missing owner

8.3.1 Definitions and limits

- (3) The white space device registration database shall contain the following information for fixed white space devices:
(v) Name of the individual or business that owns the device

8.3.2 Test summary

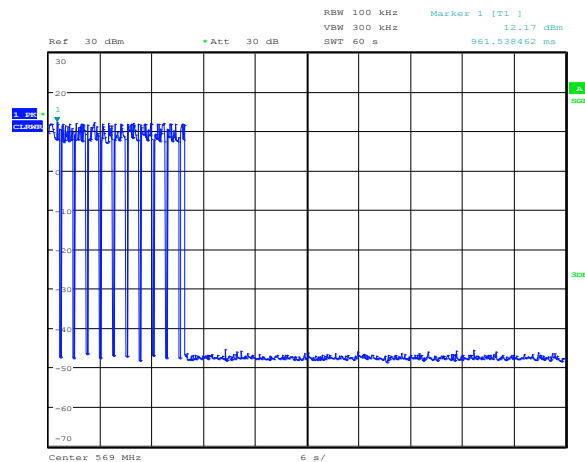
Test date	February 29, 2016	Temperature	22 °C
Test engineer	Andrey Adelberg	Air pressure	1004 mbar
Verdict	Pass	Relative humidity	32 %

8.3.3 Observations, settings and special notes

EUT was configured with incomplete information: owner field was left intentionally blank (instead of 6H). It was verified, that after detecting missing contact information, EUT did not send any form request to database, the EUT stopped the transmission.

The device was initially configured with a valid registration such that the device will begin to transmit on a given channel. Once the device was transmitting and the link was established, the registration data was modified such that the contact information was missing. The registration process was re-initiated with the missing contact information. The device Software detected the incomplete registration information and did not send a request to the database, but rather ceased to transmit as can be seen in Fig 8.3-1. Conversely, if the device was initially configured with invalid contact information, the device will not transmit or attempt to register. The test was repeated for a Master Device Fig 8.3-1 and a Slave Device Fig 8.3-3.

8.3.4 Test data



Date: 29.FEB.2016 10:54:05

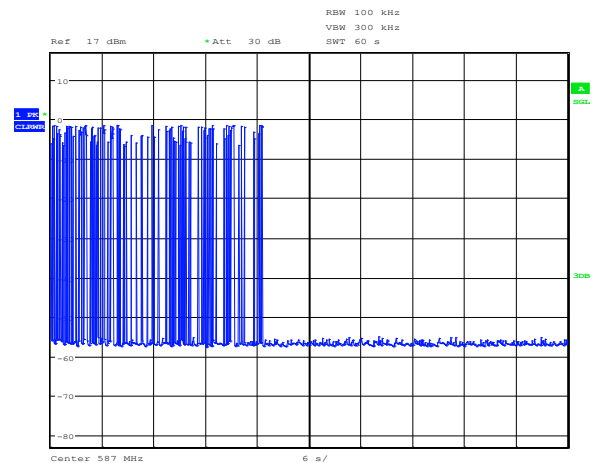
Figure 8.3-1: Unsuccessful registration with missing owner of master device. Spectrum plot shows that prior to the unsuccessful registration the EUT was transmitting and the transmission stopped right after the EUT detected missing information in the registration form.

```
steven — telnet 192.168.3.202 — 81x36
GWS Cmd > showregistration
...Registration Info...
URL:
twsw-test.spectrumbridge.com
DeviceMode: Unsuccessful
DEV_FIXED missing info
AntennaHeight:
2
AntennaType:
AGL
RegulatoryDomain:
US
Latitude:
44.429534
Longitude:
-75.15075
Owner:
Contactname:
info
ContactAddress:
Suite 10-21 Concoures Gate
ContactCity:
Ottawa
ContactZipcode:
K2E7S4
ContactState:
ON
ContactCountry:
CA
ContactEmail:
info@6harmonics.com
ContactTelephone:
6133661768
GWS Cmd >

steven — telnet 192.168.3.202 — 80x24
---No station connected---
Database Access:spectrumbridge
Node is CAR With Ethernet MAC:
HWaddr AC:EE:3B:02:00:9E
10:27:07 up 35 min, load average: 0.51, 0.35, 0.27
MemFree: 39252 kB
Channel:
30
Tx Power: 17.000000 dBm
Max Tx Power: 23.000000 dBm
Min Tx Power: 7.000000 dBm
TX Down

steven — telnet 192.168.3.202 — 93x37
chanbw == SSINGLE CHAN
14 15 16 25 26 27 28 29 30 31 32 33 34 35 39 43 44 45 46 47 48 49 50 51
valid FCC number Of Chans=24
TX State=TX Down
Get channel List,Turn Tx On
Write Chanlist to file with number of channel = 24:
14 15 16 25 26 27 28 29 30 31 32 33 34 35 39 43 44 45 46 47 48 49 50 51
getchanbw in ConfigBTS is 5
Setting frequency to 569 MHz
configBTS() at line 412 ***current chan=30
configBTS line 432 current channel=30 within chanlist
Tx is on
[GWS Cmd > restartwsagentcar
main() at line 110 numOfChans=0
main() at line 113 numOfChans=0 from Database
main() at line 116 refreshHrs=0 of database
main() at line 121 queryIntervalInMin = 0 from agent
current time=Mon Feb 29 10:26:49 2016
chanlist time=Sun Jan 0 00:00:00 1900
expire time=0 current time=42386
Channel List Will expire in -42386 Minutes
Channel List Expired
numOfChans=0 from Database
<Channels>
GWS Cmd > read getchanbw is 5
chanbw == SSINGLE CHAN
valid FCC number Of Chans=0
Turn Tx Off
retval = 1 serialNumber = 620000096
Contact info can not be empty. Please add OwnerName in registration
txoff() at line 64 clear shared memory
Delay 30 sec
```

Figure8.3-2: Data log of unsuccessful registration with missing owner information of master device



Date: 29.FEB.2016 14:38:03

Figure8.3-3: Unsuccessful registration with missing owner of slave device. Spectrum plot shows that prior to the unsuccessful registration the EUT had been configured with valid information and was transmitting. Subsequently when a registration request was initiated with invalid data the transmission stopped right after the EUT detected missing information in the registration form.


```

GWS Cmd > showregistration
...Registration Info...
URL:
twms-test.spectrumbridge.com
DeviceMode:
DEV_FIXED
AntennaHeight:
2
AntennaType:
AGL
RegulatoryDomain:
US
Latitude:
44.429534
Longitude:
-75.15075
...Owner Info...
Owner:
ContactName:
info
ContactAddress:
Suite 10-21 Concourses Gate
ContactCity:
Ottawa
ContactZipcode:
K2E7S4
ContactState:
ON
ContactCountry:
CA
ContactEmail:
info@6harmonics.com
ContactTelephone:
6133661768
GWS Cmd >

64 bytes from 8.8.8.8: seq=0 ttl=55 time=14.226 ms
64 bytes from 8.8.8.8: seq=1 ttl=55 time=13.920 ms
64 bytes from 8.8.8.8: seq=2 ttl=55 time=13.842 ms
64 bytes from 8.8.8.8: seq=3 ttl=55 time=13.705 ms
AC
--- 8.8.8.8 ping statistics ---
4 packets transmitted, 4 packets received, 0% packet loss
round-trip min/avg/max = 13.705/13.923/14.226 ms

setlatitude 31.5
setlongitude -106.9
setlatitude 44.429534
setlongitude -75.15075
setchan 33
Setting frequency to 587 MHz
setowner

Current WSAgent State: WS_STATE_WAIT_FOR_CHANNEL_RESPONSE
Received a message: HTTP/1.1 200 OK
Cache-Control: private
Content-Length: 348
Content-Type: application/xml; charset=utf-8
Server: Microsoft-IIS/8.5
SBI-Version: 3
SBI-Status: 0
X-Powered-By: ASP.NET
Date: Mon, 29 Feb 2016 19:10:38 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>32</ChannelCount><Channellist>2,5,6,9,10,11,12,13,14,15,16,25,26,27,28,29,30,31,32,33,34,35,39,43,44,45,46,47,48,49,50,51</Channellist><RefreshIn>48</RefreshIn></ChannelResponse>
HTTP Status:200
WhiteSpace Status :0
processWS_STATE_WAIT_FOR_CHANNEL_RESPONSE() line 649 wsCtx->queryIntervalInMin=1380

Available Channels:<2 5 6 9 10 11 12 13 14 15 16 25 26 27 28 29 30 31 32 33 34 35 39 43 44 45 46 47 48 49 50 51 >
Channel Refresh In 48 Hrs
Get Channel list from Database...
Current WSAgent State: WS_STATE_SECURE_SESSION_SHUTDOWN
Current WSAgent State: WS_STATE_WAIT_FOR_RENEWAL_OR_LOCATION_UPDATE
GWS Cmd > restartwsagentear
GWS Cmd > serialNumber = 6200000096
Contact info can not be empty. Please add OwnerName in registration clearshm() at line 64 clear shared memory

```

Figure8.3-4: Data log of unsuccessful registration with missing owner information of slave device

8.4 FCC15.713(g)(3)(vi) Unsuccessful registration due to incomplete information – contact name

8.4.1 Definitions and limits

(3) The white space device registration database shall contain the following information for fixed white space devices:
(vi) Name of a contact person responsible for the device's operation

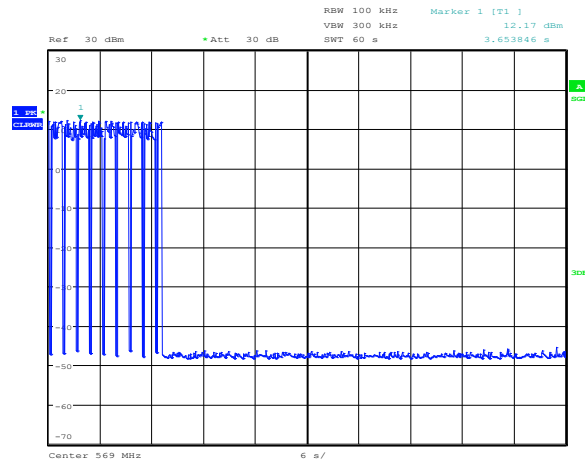
8.4.2 Test summary

Test date	February 29, 2016	Temperature	22 °C
Test engineer	Andrey Adelberg	Air pressure	1004 mbar
Verdict	Pass	Relative humidity	32 %

8.4.3 Observations, settings and special notes

EUT was configured with incomplete information: contact name field was left intentionally blank (instead of *info*). It was verified, that after detecting missing contact information, EUT did not send any form request to database, the EUT stopped the transmission. To test this feature the device was initially configured with valid information and allowed to transmit on the channel. The registration information was then modified to render it invalid and a registration request was re-initiated. Once the device detects an invalid registration field, the device ceased to transmit and flagged the error in the GUI. The test was repeated when the device is configured as a Master as well as a Slave.

8.4.4 Test data



Date: 29.FEB.2016 10:56:26

Figure8.4-1: Unsuccessful registration with missing contact name of master device. Spectrum plot shows that prior to the unsuccessful registration the EUT had been configured with valid information and was transmitting. Subsequently when a registration request was initiated with invalid data the transmission stopped right after the EUT detected missing information in the registration form. If the EUT detects a missing contact name during initial power up, the device will not attempt to register with the database, will not transmit and will flag the error to the user.


```
GWS Cmd > showregistration
...Registration Info...
URL:
twsw-test.spectrumbridge.com
DeviceMode:
DEV_FIXED
AntennaHeight:
2
AntennaType:
AGL
RegulatoryDomain:
US
Latitude:
44.429534
Longitude:
-75.15075
...Owner Info...
Owner:
6H
Contactname:
ContactAddress:
Suite 10-21 Concores Gate
ContactCity:
Ottawa
ContactZipcode:
K2E7S4
ContactState:
ON
ContactCountry:
CA
ContactEmail:
info@6harmonics.com
ContactTelephone:
6133661768
GWS Cmd >

***No station connected***
Database Access:spectrumbridge
Node is CAR With Ethernet MAC:
HWaddr AC:EE:3B:02:00:9E
10:29:41 up 38 min, load average: 0.45, 0.38, 0.29
MemFree: 39204 kB
Channel:
30
Tx Power: 17.000000 dBm
Max Tx Power: 23.000000 dBm
Min Tx Power: 7.000000 dBm
TX Down

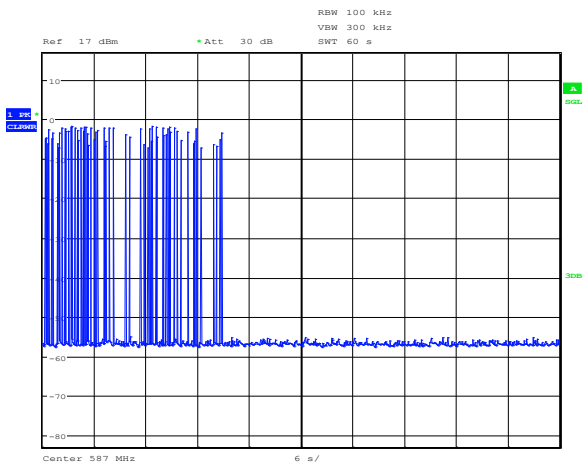
chanbw == SSINGLE CHAN
14 15 16 25 26 27 28 29 30 31 32 33 34 35 39 43 44 45 46 47 48 49 50 51
valid FCC number Of Chans=24
TX State=TX Down
Get channel List,Turn Tx On
Write Chanlist to file with number of channel = 24:
14 15 16 25 26 27 28 29 30 31 32 33 34 35 39 43 44 45 46 47 48 49 50 51
getchanbw in ConfigBTS is 5
Setting frequency to 569 Mhz
configBTS() at line 412 ***current chan=30
configBTS line 432 current channel=30 within chanlist
Tx is on
GWS Cmd > restartwsagentcar
main() at line 110 numOfChans=0
main() at line 113 numOfChans=0 from Database
main() at line 116 refreshHrs=0 of database
main() at line 121 queryIntervalInMin = 0 from agent
current time=Mon Feb 29 10:29:28 2016

chanlist time=Sun Jan 0 00:00:00 1900

expire time=0 current time=42389
Channel List Will expire in -42389 Minutes
Channel List Expired
numOfChans=0 from Database
<Channels>
GWS Cmd > read getchanbw is 5
chanbw == SSINGLE CHAN

valid FCC number Of Chans=0
Turn Tx Off
setval = 1 serialNumber = 670000006
Contact info can not be empty. Please add ContactName in registration info
txoff() at line 64 clear shared memory
Delay 30 sec
```

Figure8.4-2: Data log of unsuccessful registration with missing contact name of master device



Date: 29.FEB.2016 14:40:14

Figure8.4-3: Unsuccessful registration with missing contact name of slave device. Spectrum plot shows that prior to the unsuccessful registration the EUT had been configured with valid information and was transmitting. Subsequently when a registration request was initiated with invalid data the transmission stopped right after the EUT detected missing information in the registration form. If the EUT detects a missing contact name during the initial power up, the device will not attempt to register with the database, will not transmit and will flag3 the error to the user.

```

GWS Cmd > showregistration
...Registration Info...
URL:
  tvws-test.spectrumbridge.com
DeviceMode:
  DEV_FIXED
AntennaHeight:
  2
AntennaType:
  AGL
RegulatoryDomain:
  US
Latitude:
  44.429534
Longitude:
  -75.15075
...Owner Info...
Owner:
  GH
Contactname:
ContactAddress:
  Suite 10-21 Concourses Gate
ContactCity:
  Ottawa
ContactZipcode:
  K2E7S4
ContactState:
  ON
ContactCountry:
  CA
ContactEmail:
  info@6harmonics.com
ContactTelephone:
  6133661768
GWS Cmd >

^C
--- 8.8.8.8 ping statistics ---
4 packets transmitted, 4 packets received, 0% packet loss
round-trip min/avg/max = 13.705/13.923/14.226 ms

setlatitude 31.5
setlongitude -106.9
setlatitude 44.429534
setlongitude -75.15075
setchan 33
Setting frequency to 587 MHz
setowner
setowner GH
setcontactname
setchan 33
Setting frequency to 587 MHz

-----
---No station connected---
Database Access:spectrumbridge
Node is EAR With
HWaddr AC:EE:3B:02:08:9E
14:14:28 up 15 min, load average: 0.91, 0.59, 0.36
MemFree: 39512 kB
Channel:
  17
Tx Power: 17.000000 dBm
Max Tx Power: 23.000000 dBm
Min Tx Power: 7.000000 dBm
Channel Expire In NoValidChannel Minutes
Query Time Left In N/A Minutes

Server: Microsoft-IIS/8.5
SBI-Version: 3
SBI-Status: 0
X-Powered-By: ASP.NET
Date: Mon, 29 Feb 2016 19:10:38 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>32</ChannelCount><ChannelList>2,5,6,9,10,11,12,13,14,15,16,25,26,27,28,29,30,31,32,33,34,35,39,43,44,45,46,47,48,49,50,51</ChannelList><RefreshIn>48</RefreshIn></ChannelResponse>
HTTP Status:200
WhiteSpace Status :0
processWS_STATE_WAIT_FOR_CHANNEL_RESPONSE() line 649 wsCtx->queryIntervalInMin=1380
Available Channels:<2 5 6 9 10 11 12 13 14 15 16 25 26 27 28 29 30 31 32 33 34 35 39 43 44 45 46 47 48 49 50 51 >
Channel Refresh In 48 Hrs
Get Channel list from Database...
Current WSAgent State: WS_STATE_SECURE_SESSION_SHUTDOWN
Current WSAgent State: WS_STATE_WAIT_FOR_RENEWAL_OR_LOCATION_UPDATE
GWS Cmd > restartwsagentear
GWS Cmd > serialNumber = 6200000096
Contact info can not be empty. Please add OwnerName in registration
clearshm() at line 64 clear shared memory
GWS Cmd > restartwsagentear
killall: whitespaceagent: no process killed
GWS Cmd > serialNumber = 6200000096
Contact info can not be empty. Please add ContactName in registration info
clearshm() at line 64 clear shared memory

```

Figure8.4-4: Data log of unsuccessful registration with missing contact name of slave device

8.5 FCC15.713(g)(3)(vii) Unsuccessful registration due to incomplete information – contact address

8.5.1 Definitions and limits

- (3) The white space device registration database shall contain the following information for fixed white space devices:
(vii) Address for the contact person

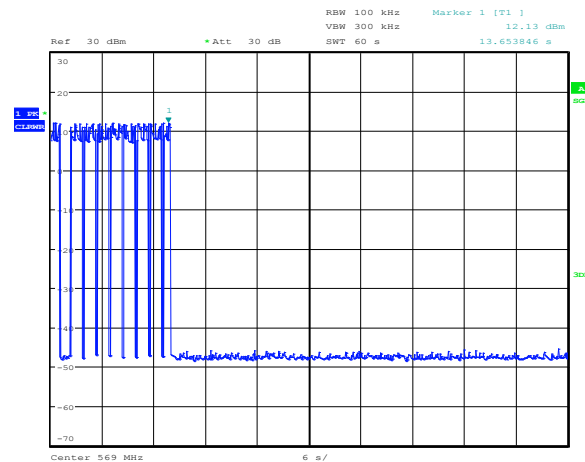
8.5.2 Test summary

Test date	February 29, 2016	Temperature	22 °C
Test engineer	Andrey Adelberg	Air pressure	1004 mbar
Verdict	Pass	Relative humidity	32 %

8.5.3 Observations, settings and special notes

EUT was configured with incomplete information: contact address field was left intentionally blank (instead of *Suit 10-21 Concourse Gate*). It was verified, that after detecting missing contact information, EUT did not send any form request to database, the EUT stopped the transmission. To test this feature the device was initially configured with valid information and allowed to transmit on the channel. The registration information was then modified to render it invalid and a registration request was re-initiated. Once the device detects an invalid registration field, the device ceased to transmit and flagged the error in the GUI. The test was repeated when the device is configured as a Master as well as a Slave. If incomplete registration information is detected during the initial power up the device will not attempt to register and will flag the error to the user.

8.5.4 Test data



Date: 29.FEB.2016 10:58:04

Figure8.5-1: Unsuccessful registration with missing contact address of master device. Spectrum plot shows that prior to the unsuccessful registration the EUT had been configured with valid information and was transmitting. Subsequently when a registration request was initiated with invalid data the transmission stopped right after the EUT detected missing information in the registration form. If the EUT detects a missing contact name during the initial power up, the device will not attempt to register with the database, will not transmit and will flag the error to the user.

The figure consists of three screenshots from telnet sessions to 192.168.3.202. The first screenshot (81x36) shows the 'showregistration' command output, where 'ContactAddress:' is highlighted with a red box. The second screenshot (80x24) shows the device status, including 'TX Down' highlighted with a red box. The third screenshot (93x38) shows the 'getchanbw' command output, where the error message 'Contact info can not be empty. Please add ContactAddress in registration info' is highlighted with a red box.

```
[GWS Cmd > showregistration
...Registration Info...
URL:
twsw-test.spectrumbridge.com
DeviceMode:
DEV_FIXED:
AntennaHeight:
2
AntennaType:
AGL
RegulatoryDomain:
US
Latitude:
44.429534
Longitude:
-75.15075
...Owner Info...
Owner:
GH
Contactname:
Info
ContactAddress:
ContactCity:
Ottawa
ContactZipcode:
K2E7S4
ContactState:
ON
ContactCountry:
CA
ContactEmail:
info@harmonics.com
ContactTelephone:
6133661768
GWS Cmd > ]

Suite 10-21 Concours Gate
setcontactaddress

[

steven — telnet 192.168.3.202 — 81x36

steven — telnet 192.168.3.202 — 80x24
-----No station connected-----
Database Access:spectrumbridge
Node is CAR With Ethernet MAC:
HWaddr AC:EE:38:02:00:9E
10:31:54 up 40 min, load average: 0.51, 0.38, 0.31
MemFree: 39160 kB
Channel:
30
Tx Power: 17.000000 dBm
Max Tx Power: 23.000000 dBm
Min Tx Power: 7.000000 dBm
TX Down
[

steven — telnet 192.168.3.202 — 93x38
read getchanbw is 5
chanbw == SSINGLE CHAN
14 15 16 25 26 27 28 29 30 31 32 33 34 35 39 43 44 45 46 47 48 49 50 51
valid FCC number Of Chans=24
TX State=TX Down
Get channel List,Turn Tx On
Write Chanlist to file with number of channel = 24:
14 15 16 25 26 27 28 29 30 31 32 33 34 35 39 43 44 45 46 47 48 49 50 51
getchanbw in ConfigBTS is 5
Setting frequency to 560 MHz
configBTS() at line 412 ***current chan=30
configBTS line 432 current channel=30 within chanlist
Tx is on
[GWS Cmd > restartwsagentcar
main() at line 110 numOfChans=0
main() at line 113 numOfChans=0 from Database
main() at line 116 refreshHrs=0 of database
main() at line 121 queryIntervalInMin = 0 from agent
current time=Mon Feb 29 10:31:33 2016

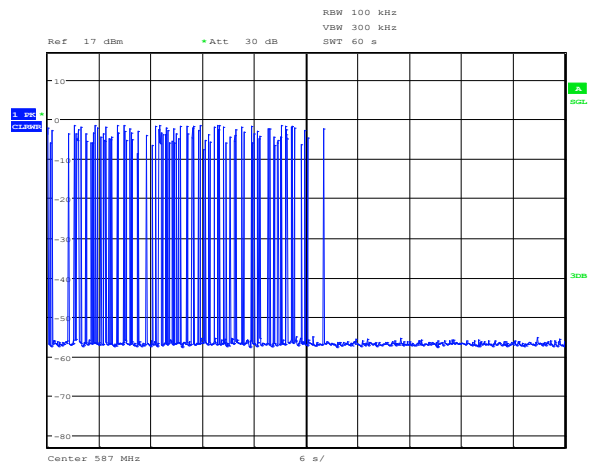
chanlist time=Sun Jan 0 00:00:00 1900

expire time=0 current time=42391
Channel List Will expire in -42391 Minutes
Channel List Expired
numOfChans=0 from Database
<Channels:>
read getchanbw is 5
chanbw == SSINGLE CHAN

valid FCC number Of Chans=0
Turn Tx Off
[GWS Cmd > netval = 1 serialNumber = 620000096
Contact info can not be empty. Please add ContactAddress in registration info
txoff() at line 64 clear shared memory

Delay 30 sec
```

Figure8.5-2: Data log of unsuccessful registration with missing contact address of master device



Date: 29.FEB.2016 14:44:16

Figure8.5-3: Unsuccessful registration with missing contact address of slave device. Spectrum plot shows that prior to the unsuccessful registration the EUT had been configured with valid information and was transmitting. Subsequently when a registration request was initiated with invalid data the transmission stopped right after the EUT detected missing information in the registration form. If the EUT detects a missing contact name during initial power up, the device will not attempt to register with the database, will not transmit and will flag the error to the user.

```
steven — telnet 192.168.3.202 — 80x36
[GWS Cmd > showregistration
...Registration Info...
URL:
tvws-test.spectrumbridge.com
DeviceMode:
DEV_FIXED
AntennaHeight:
2
AntennaType:
AGL
RegulatoryDomain:
US
Latitude:
44.429534
Longitude:
-75.15075
...Owner Info...
Owner:
6H
Contactname:
info
ContactAddress:
ContactCity:
Ottawa
ContactZipcode:
K2E7S4
ContactState:
ON
ContactCountry:
CA
ContactEmail:
info@6harmonics.com
ContactTelephone:
6133661768
GWS Cmd >]

steven — telnet 192.168.3.202 — 80x24
---No station connected---
Database Access:spectrumbridge
Node is EAR With
HWAddr AC:EE:38:02:08:9E
14:18:27 up 19 min, load average: 0.87, 0.65, 0.44
MemFree: 39452 kB
Channel:
40
Tx Power: 17.000000 dBm
Max Tx Power: 23.000000 dBm
Min Tx Power: 7.000000 dBm
Channel Expire In NoValidChannel Minutes
Query Time Left In N/A Minutes

steven — telnet 192.168.3.202 — 80x33
Connection: close
<ChannelResponse xmlns="http://schemas.datacontract.org/2004/07/SpectrumBridge.WhiteSpaces.Services.v3" xmlns:i="http://www.w3.org/2001/XMLSchema-instance"><ChannelCount>32</ChannelCount><ChannelList>2,5,6,9,10,11,12,13,14,15,16,25,26,27,28,29,30,31,32,33,34,35,39,43,44,45,46,47,48,49,50,51</ChannelList><RefreshIn>48</RefreshIn></ChannelResponse>
HTTP Status:200
WhiteSpace Status :0
processWS_STATE_WAIT_FOR_CHANNEL_RESPONSE() line 649 wsCtx->queryIntervalInMin=13
80

Available Channels:<2 5 6 9 10 11 12 13 14 15 16 25 26 27 28 29 30 31 32 33 34 3
5 39 43 44 45 46 47 48 49 50 51 >
Channel Refresh In 48 Hrs
Get Channel list from Database...
Current WSAgent State: WS_STATE_SECURE_SESSION_SHUTDOWN
Current WSAgent State: WS_STATE_WAIT_FOR_RENEWAL_OR_LOCATION_UPDATE
GWS Cmd > restartwsagentear
GWS Cmd > serialNumber = 620000096
Contact info can not be empty. Please add OwnerName in registration
clearshm() at line 64 clear shared memory
GWS Cmd > restartwsagentear
killall: whitespaceagent: no process killed
GWS Cmd > serialNumber = 620000096
Contact info can not be empty. Please add ContactName in registration info
clearshm() at line 64 clear shared memory
GWS Cmd > restartwsagentear
killall: whitespaceagent: no process killed
GWS Cmd > serialNumber = 620000096
Contact info can not be empty. Please add ContactAddress in registration info
clearshm() at line 64 clear shared memory
GWS Cmd >]

Setting frequency to 587 MHz
setowner
setowner 6H
setcontactname
setchan 33
Setting frequency to 587 MHz
setcontactname info
setchan 33
Setting frequency to 587 MHz
setcontactaddress
setchan 33
```

Figure8.5-4: Data log of unsuccessful registration with missing contact address of slave device

8.6 FCC15.713(g)(3)(vii) Unsuccessful registration due to incomplete information – contact state (province)

8.6.1 Definitions and limits

(3) The white space device registration database shall contain the following information for fixed white space devices:
(vii) Address for the contact person

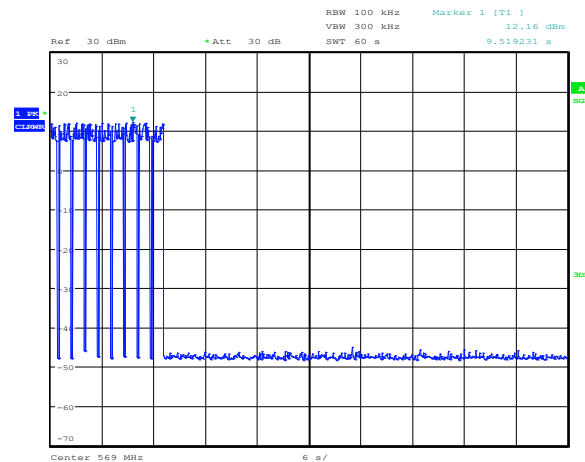
8.6.2 Test summary

Test date	February 29, 2016	Temperature	22 °C
Test engineer	Andrey Adelberg	Air pressure	1004 mbar
Verdict	Pass	Relative humidity	32 %

8.6.3 Observations, settings and special notes

EUT was configured with incomplete information: contact state field was left intentionally blank (instead of *ON*). It was verified, that after detecting missing contact information, EUT did not send any form request to database, the EUT stopped the transmission. To test this feature the device was initially configured with valid information and allowed to transmit on the channel. The registration information was then modified to render it invalid and a registration request was re-initiated. Once the device detects an invalid registration field, the device ceased to transmit and flagged the error in the GUI. The test was repeated when the device is configured as a Master as well as a Slave. If incomplete registration information is detected during the initial power up the device will not attempt to register and will flag the error to the user.

8.6.4 Test data



Date: 29.FEB.2016 10:59:55

Figure 8.6-1: Unsuccessful registration with missing contact contact (state) of master device. Spectrum plot shows that prior to the unsuccessful registration the EUT had been configured with valid information and was transmitting. Subsequently when a registration request was initiated with invalid data the transmission stopped right after the EUT detected missing information in the registration form. If the EUT detects a missing contact name during initial power up, the device will not attempt to register with the database, will not transmit and will flag the error to the user.

```

(GWS Cmd > showregistration
...Registration Info...
URL:
twsw-test.spectrumbridge.com
DeviceMode:
DEV_FIXED
AntennaHeight:
2
AntennaType:
AGL
RegulatoryDomain:
US
Latitude:
44.429534
Longitude:
-75.15075
...Owner Info...
Owner:
6H
Contactname:
info
ContactAddress:
Suite 10-21 Concourses Gate
ContactCity:
Ottawa
ContactZipcode:
K2E7S4
ContactState:
ContactCountry:
CA
ContactEmail:
info@6harmonics.com
ContactTelephone:
6133661768
GWS Cmd >

Feb 29 10:14:33 6Harmonics user.warn syslog: ***processWS_STATE_WAIT_FOR_REGISTER
ATION_RESPONSE() at line 471 clear shared memory***
setlatitude 44.429534
setlongitude -75.15075
setlatitude 31.5
setlongitude -106.9
setlatitude 44.429534
setlongitude -75.15075
setowner
setowner 6H
setowner
setowner 6H
setcontactname
setcontactname info
getcontactaddress
Suite 10-21 Concourses Gate
setcontactaddress
setcontactaddress Suite 10-21 Concourses Gate
setcontactstate

---No station connected---
Database Access:spectrumbridge
Node is CAR With Ethernet MAC:
HWaddr AC:EE:38:02:00:9E
10:33:50 up 42 min, load average: 0.29, 0.34, 0.31
MemFree: 39056 kB
Channel:
30
Tx Power: 17.000000 dBm
Max Tx Power: 23.000000 dBm
Min Tx Power: 7.000000 dBm
TX Down

read getchanbw is 5
chanbw == SSINGLE CHAN
14 15 16 25 26 27 28 29 30 31 32 33 34 35 39 43 44 45 46 47 48 49 50 51
valid FCC number Of Chans=24
TX State=TX Down
Get channel List,Turn Tx On
Write Chanlist to file with number of channel = 24:
14 15 16 25 26 27 28 29 30 31 32 33 34 35 39 43 44 45 46 47 48 49 50 51
getchanbw in ConfigBTS is 5
Setting frequency to 569 MHz
configBTS() at line 412 ***current chan=30
configBTS line 432 current channel=30 within chanlist
Tx is on
(GWS Cmd > restartwsagentcar
main() at line 110 numOfChans=0
main() at line 113 numOfChans=0 from Database
main() at line 116 refreshHrs=0 of database
main() at line 121 queryIntervalInMin = 0 from agent
current time=Mon Feb 29 10:33:32 2016

chanlist time=Sun Jan 0 00:00:00 1900

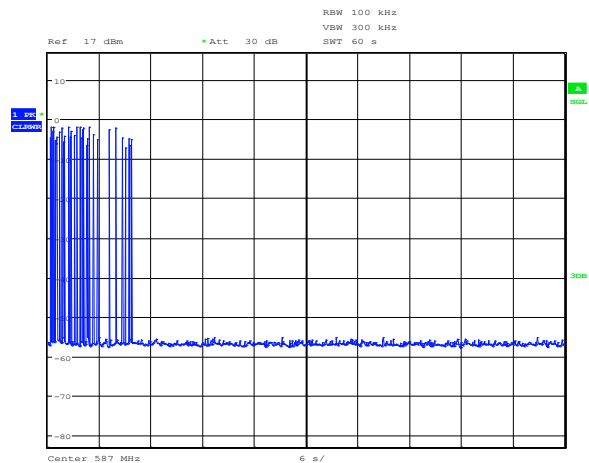
expire time=0 current time=42393
Channel List Will expire in -42393 Minutes
Channel List Expired
numOfChans=0 from Database
<Channels:>
read getchanbw is 5
chanbw == SSINGLE CHAN

valid FCC number Of Chans=0
Turn Tx Off
GWS Cmd > reset = 1 serialNumber = 6200000006
Contact info can not be empty. Please add ContactState in registration info
txoff() at line 64 clear shared memory

Delay 30 sec

```

Figure8.6-2: Data log of unsuccessful registration with missing contact state of master device



Date: 29.FEB.2016 14:46:21

Figure8.6-3: Unsuccessful registration with missing contact contact state (province) of slave device. Spectrum plot shows that prior to the unsuccessful registration the EUT had been configured with valid information and was transmitting. Subsequently when a registration request was initiated with invalid data the transmission stopped right after the EUT detected missing information in the registration form. If the EUT detects a missing contact name during initial power up, the device will not attempt to register with the database, will not transmit and will flag the error to the user.

```
steven — telnet 192.168.3.202 — 80x36
GWS Cmd > showregistration
...Registration Info...
URL:
tvws-test.spectrumbridge.com
DeviceMode:
DEV_FIXED
AntennaHeight:
2
AntennaType:
AGL
RegulatoryDomain:
US
Latitude:
44.429534
Longitude:
-75.15075
...Owner Info...
Owner:
6H
Contactname:
info
ContactAddress:
Suite 10-21 Concourses Gate
ContactCity:
Ottawa
ContactZipcode:
K2E7S4
ContactState:
Contactcountry:
CA
ContactEmail:
info@6harmonics.com
ContactTelephone:
6133661768
GWS Cmd >

steven — telnet 192.168.3.202 — 80x24
---No station connected---
Database Access:spectrumbridge
Node is EAR With
HWaddr AC:EE:38:02:08:9E
14:20:15 up 20 min, load average: 0.61, 0.57, 0.43
MemFree: 39452 kB
Channel:
40
Tx Power: 17.000000 dBm
Max Tx Power: 23.000000 dBm
Min Tx Power: 7.000000 dBm
Channel Expire In NoValidChannel Minutes
Query Time Left In N/A Minutes

steven — telnet 192.168.3.202 — 80x33
Current WSAgent State: WS_STATE_WAIT_FOR_CHANNEL_RESPONSE
Received a message:HTTP/1.1 200 OK
Cache-Control: private
Content-Length: 348
Content-Type: application/xml; charset=utf-8
Server: Microsoft-IIS/8.5
SBI-Version: 3
SBI-Status: 0
X-Powered-By: ASP.NET
Date: Mon, 29 Feb 2016 19:18:56 GMT
Connection: close

<ChannelResponse xmlns="http://schemas.datacontract.org/2004/07/SpectrumBridge.W
hiteSpaces.Services.v3" xmlns:i="http://www.w3.org/2001/XMLSchema-instance"><Cha
nnelCount>32</ChannelCount><Channellist>2,5,6,9,10,11,12,13,14,15,16,25,26,27,28
,29,30,31,32,33,34,35,39,43,44,45,46,47,48,49,50,51</Channellist><RefreshIn>48</
RefreshIn></ChannelResponse>
HTTP Status:200
WhiteSpace Status :0
processWS_STATE_WAIT_FOR_CHANNEL_RESPONSE() line 649 wsCtx->queryIntervalInMin=13
80
Available Channels:<2 5 6 9 10 11 12 13 14 15 16 25 26 27 28 29 30 31 32 33 34 3
5 39 43 44 45 46 47 48 49 50 51 >
Channel Refresh In 48 Hrs
Get Channel list from Database...
Current WSAgent State: WS_STATE_SECURE_SESSION_SHUTDOWN
Current WSAgent State: WS_STATE_WAIT_FOR_RENEWAL_OR_LOCATION_UPDATE
GWS Cmd > serialNumber = 6200000006
Contact info can not be empty. Please add ContactState in registration info
clearshm() at line 64 clear shared memory
```

Figure8.6-4: Data log of unsuccessful registration with missing contact state of slave device

8.7 FCC15.713(g)(3)(vii) Unsuccessful registration due to incomplete information – contact zip code

8.7.1 Definitions and limits

(3) The white space device registration database shall contain the following information for fixed white space devices:
(vii) Address for the contact person

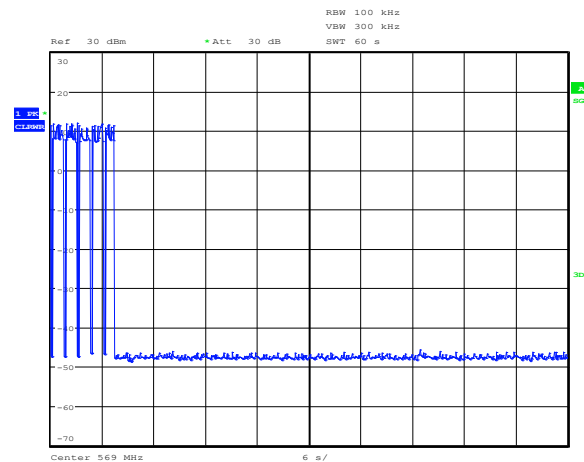
8.7.2 Test summary

Test date	February 29, 2016	Temperature	22 °C
Test engineer	Andrey Adelberg	Air pressure	1004 mbar
Verdict	Pass	Relative humidity	32 %

8.7.3 Observations, settings and special notes

EUT was configured with incomplete information: contact zip code field was left intentionally blank (instead of *K2E7S4*). It was verified, that after detecting missing contact information, EUT did not send any form request to database, the EUT stopped the transmission. To test this feature the device was initially configured with valid information and allowed to transmit on the channel. The registration information was then modified to render it invalid and a registration request was re-initiated. Once the device detects an invalid registration field, the device ceased to transmit and flagged the error in the GUI. The test was repeated when the device is configured as a Master as well as a Slave. If incomplete registration information is detected during the initial power up the device will not attempt to register and will flag the error to the user.

8.7.4 Test data



Date: 29.FEB.2016 11:01:54

Figure8.7-1: Unsuccessful registration with missing contact zip code of master device. Spectrum plot shows that prior to the unsuccessful registration the EUT had been configured with valid information and was transmitting. Subsequently when a registration request was initiated with invalid data the transmission stopped right after the EUT detected missing information in the registration form. If the EUT detects a missing contact zip code during initial power up, the device will not attempt to register with the database, will not transmit and will flag the error to the user.


```
GWS Cmd > showregistration
...Registration Info...
URL:
twins-test.spectrumbridge.com
DeviceMode:
DEV_FIXED
AntennaHeight:
2
AntennaType:
AGL
RegulatoryDomain:
US
Latitude:
44.429534
Longitude:
-75.15075
...Owner Info...
Owner:
GH
Contactname:
info
ContactAddress:
Suite 10-21 Concourses Gate
ContactCity:
Ottawa
ContactZipcode:
ContactState:
ON
ContactCountry:
CA
ContactEmail:
info@harmonics.com
ContactTelephone:
6133661768
GWS Cmd >

setlatitude 44.429534
setlongitude -75.15075
setlatitude 31.5
setlongitude -106.9
setlatitude 44.429534
setlongitude -75.15075
setowner
setowner GH
setowner GH
setcontactname
setcontactname info
getcontactaddress
Suite 10-21 Concourses Gate
setcontactaddress
setcontactaddress Suite 10-21 Concourses Gate
setcontactstate
setcontactstate ON
setcontactzipcode

---No station connected---
Database Access:spectrumbridge
Node is CAR With Ethernet MAC:
HWaddr AC:EE:3B:02:00:9E
10:36:02 up 44 min, load average: 0.33, 0.35, 0.31
MemFree: 39072 kB
Channel:
30
Tx Power: 17.000000 dBm
Max Tx Power: 23.000000 dBm
Min Tx Power: 7.000000 dBm
TX Down

read getchanbw is 5
chanbw == SSINGLE CHAN
14 15 16 25 26 27 28 29 30 31 32 33 34 35 39 43 44 45 46 47 48 49 50 51
valid FCC number Of Chans=24
TX State=TX Down
Get channel List,Turn Tx On
Write Chanlist to file with number of channel = 24:
14 15 16 25 26 27 28 29 30 31 32 33 34 35 39 43 44 45 46 47 48 49 50 51
getchanbw in ConfigBTS is 5
Setting frequency to 569 MHz
configBTS() at line 412 ***current chan=30
configBTS line 432 current channel=30 within chanlist
Tx is on
GWS Cmd > restartwsagentcar
main() at line 110 numOfChans=0
main() at line 113 numOfChans=0 from Database
main() at line 116 refreshHrs=0 of database
main() at line 121 queryIntervalInMin = 0 from agent
current time=Mon Feb 29 10:35:34 2016

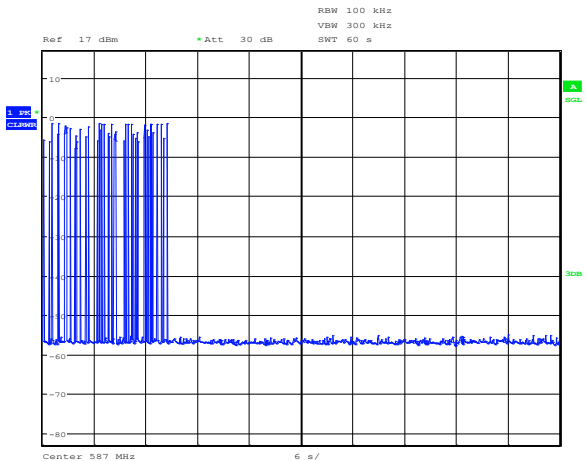
chanlist time=Sun Jan 0 00:00:00 1900

expire time=0 current time=42395
Channel List Will expire in -42395 Minutes
Channel List Expired
numOfChans=0 from Database
<Channels:>
read getchanbw is 5
chanbw == SSINGLE CHAN

valid FCC number Of Chans=0
Turn Tx Off
GWS Cmd > resetval = 1 serialNumber = 620000006
Contact info can not be empty. Please add ContactZip in registration info
txoff() at line 64 clear shared memory

Delay 30 sec
```

Figure8.7-2: Data log of unsuccessful registration with missing contact zip code of master device



Date: 29.FEB.2016 14:47:41

Figure8.7-3: Unsuccessful registration with missing contact zip code of slave device. Spectrum plot shows that prior to the unsuccessful registration the EUT had been configured with valid information and was transmitting. Subsequently when a registration request was initiated with invalid data the transmission stopped right after the EUT detected missing information in the registration form. If the EUT detects a missing contact zip code during initial power up, the device will not attempt to register with the database, will not transmit and will flag the error to the user.

```
steven — telnet 192.168.3.202 — 80x36
GWS Cmd > showregistration
...Registration Info...
URL:
tvws-test.spectrumbridge.com
DeviceMode:
DEV_FIXED
AntennaHeight:
2
AntennaType:
AGL
RegulatoryDomain:
US
Latitude:
44.429534
Longitude:
-75.15075
...Owner Info...
Owner:
GH
Contactname:
info
ContactAddress:
Suite 10-21 Concourses Gate
ContactCity:
Ottawa
ContactZipcode:
ContactState:
ON
ContactCountry:
CA
ContactEmail:
info@gharmonics.com
ContactTelephone:
6133661768
GWS Cmd >

setowner
setowner GH
setcontactname
setchan 33
Setting frequency to 587 MHz
setcontactname info
setchan 33
Setting frequency to 587 MHz
setcontactaddress
setchan 33
Setting frequency to 587 MHz
setcontactaddress Suite 10-21 Concourses Gate
setcontactaddress Suite 10-21 Concourses Gate
setchan 33
Setting frequency to 587 MHz
setcontactstate
setcontactstate ON
setchan 33
Setting frequency to 587 MHz
setcontactzipcode

steven — telnet 192.168.3.202 — 80x24
---No station connected---
Database Access:spectrumbridge
Node is EAR With
HWaddr AC:EE:38:02:08:9E
14:21:45 up 22 min, load average: 0.45, 0.56, 0.44
MemFree: 39360 kB
Channel:
35
Tx Power: 17.000000 dBm
Max Tx Power: 23.000000 dBm
Min Tx Power: 7.000000 dBm
Channel Expire In NoValidChannel Minutes
Query Time Left In N/A Minutes

steven — telnet 192.168.3.202 — 80x33
Current WSAgent State: WS_STATE_WAIT_FOR_CHANNEL_RESPONSE
Received a message:HTTP/1.1 200 OK
Cache-Control: private
Content-Length: 348
Content-Type: application/xml; charset=utf-8
Server: Microsoft-IIS/8.5
SBI-Version: 3
SBI-Status: 0
X-Powered-By: ASP.NET
Date: Mon, 29 Feb 2016 19:20:50 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>32</ChannelCount><ChannelList>2,5,6,9,10,11,12,13,14,15,16,25,26,27,28,29,30,31,32,33,34,35,39,43,44,45,46,47,48,49,50,51</ChannelList><RefreshIn>48</RefreshIn></ChannelResponse>
HTTP Status:200
WhiteSpace Status :0
processWS_STATE_WAIT_FOR_CHANNEL_RESPONSE() line 649 wsCtx->queryIntervalInMin=1380
Available Channels:<2 5 6 9 10 11 12 13 14 15 16 25 26 27 28 29 30 31 32 33 34 35 39 43 44 45 46 47 48 49 50 51 >
Channel Refresh In 48 Hrs
Get Channel list from Database...
Current WSAgent State: WS_STATE_SECURE_SESSION_SHUTDOWN
Current WSAgent State: WS_STATE_WAIT_FOR_RENEWAL_OR_LOCATION_UPDATE
GWS Cmd > restartwsagentear
GWS Cmd > serialNumber = 620000096
Contact info can not be empty. Please add ContactZip in registration info
clearshm() at line 64 clear shared memory
```

Figure8.7-4: Data log of unsuccessful registration with missing contact zip code of slave device