



**FCC CFR47 PART 15 SUBPART H**  
**CLASS 2 PERMISSIVE CHANGE TEST REPORT**  
**DATABASE TEST REPORT**  
**FOR**  
**FIXED TV BAND DEVICE**  
**MODEL NUMBER: ACRS 2.0**  
**REPORT NUMBER: 14U16838-2**  
**FCC ID: A2UACRS20F**

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## 1. ATTESTATION OF TEST RESULTS

**COMPANY NAME:** Adaptrum  
25 E. Trimble Road  
San Jose, CA 95131

**EUT DESCRIPTION:** FIXED TV BAND DEVICE

**MODEL:** ACRS 2.0

**SERIAL NUMBER:** BASE: A2F0JA07  
CLIENT: A2F0JA10

**DATE TESTED:** FEBRUARY 7, 2014

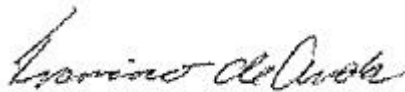
APPLICABLE STANDARDS	
SECTION	TEST RESULTS
DATABASE PORTIONS OF FCC PART 15 SUBPART H	Pass

UL Verification Services Inc. tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL Verification Services Inc. based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

**Note:** The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL Verification Services Inc. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Verification Services Inc. will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of any government.

Approved & Released For  
UL Verification Services Inc. By:

Tested By:



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PROJECT LEAD  
UL Verification Services Inc.



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## 2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with FCC CFR 47 Part 15 Subpart H and KDB 416271 D01 White Space Test Procedures v02.

## 3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 47173 Benicia Street, Fremont, California, USA.

UL Verification Services Inc. is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at <http://ts.nist.gov/standards/scopes/2000650.htm>.

## 4. CALIBRATION AND UNCERTAINTY

### 4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

### 4.2. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

$$\begin{aligned} \text{Field Strength (dBuV/m)} &= \text{Measured Voltage (dBuV)} + \text{Antenna Factor (dB/m)} + \\ &\text{Cable Loss (dB)} - \text{Preamp Gain (dB)} \\ 36.5 \text{ dBuV} + 18.7 \text{ dB/m} + 0.6 \text{ dB} - 26.9 \text{ dB} &= 28.9 \text{ dBuV/m} \end{aligned}$$

### 4.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

PARAMETER	UNCERTAINTY
Conducted Disturbance, 0.15 to 30 MHz	±3.52 dB
Radiated Disturbance, 30 to 1000 MHz	±4.94 dB

Uncertainty figures are valid to a confidence level of 95%.

## 5. EQUIPMENT UNDER TEST

### 5.1. DESCRIPTION OF EUT

The EUT are Adaptrum ACRS 2.0 base and client radios operating as Fixed TV Band Devices in compliance with Part 15 Subpart H of Title 47 of the Code of Federal Regulations. Adaptrum ACRS 2.0 radios are broadband wireless communication equipment operating in the UHF TV band with frequency range from 473 MHz to 695 MHz (Channels 14 – 51 excluding Channels 36 to 38) and modulation modes QPSK, 16QAM and 64QAM.

### 5.2. DESCRIPTION OF PERMISSIVE CHANGE

The change consists of adding the Telcordia TVWS Database hence referred to as the TVWS Database throughout this report.

### 5.3. SOFTWARE AND FIRMWARE

The software installed in the EUT during testing was version 3.5.0.1 firmware.

### 5.4. DETAILS OF TESTED SYSTEM

#### SUPPORT EQUIPMENT & PERIPHERALS

AC Adapter	Lenovo	LN-A0403A3C	36200411	DoC
Client PC	Lenovo ideaPad	20319	CB27158640	DoC
AC Adapter	Lenovo	LN-A0403A3C	36200411	DoC
Router	TP-Link	TL-R860	13880700236	DoC
AC Adapter	TP-Link	T090060-2B1	1335	DoC
Switch	D-Link	DGS-2208	F36J6A2006143	DoC
AC Adapter	D-Link	MT12-Y075100-A1	1006	N/A
POE	ITE Power Supply	PENB1030A4800F0X	N/A	N/A
POE	AC/DC Adapter	TP-POE-48WP	N/A	N/A

## **TEST SETUP**

As illustrated in the following setup diagram, the EUT are the Adaptrum ACRS 2.0 base and client radios connected through cable assembly with proper attenuation to form a broadband communications system allowing the client-side PC to connect to the Internet (on the base side) through the TV White Space connection between the client and base radios. The BASE PC and CLIENT PC are used to configure the radio devices and monitor the device-and-database interactions.

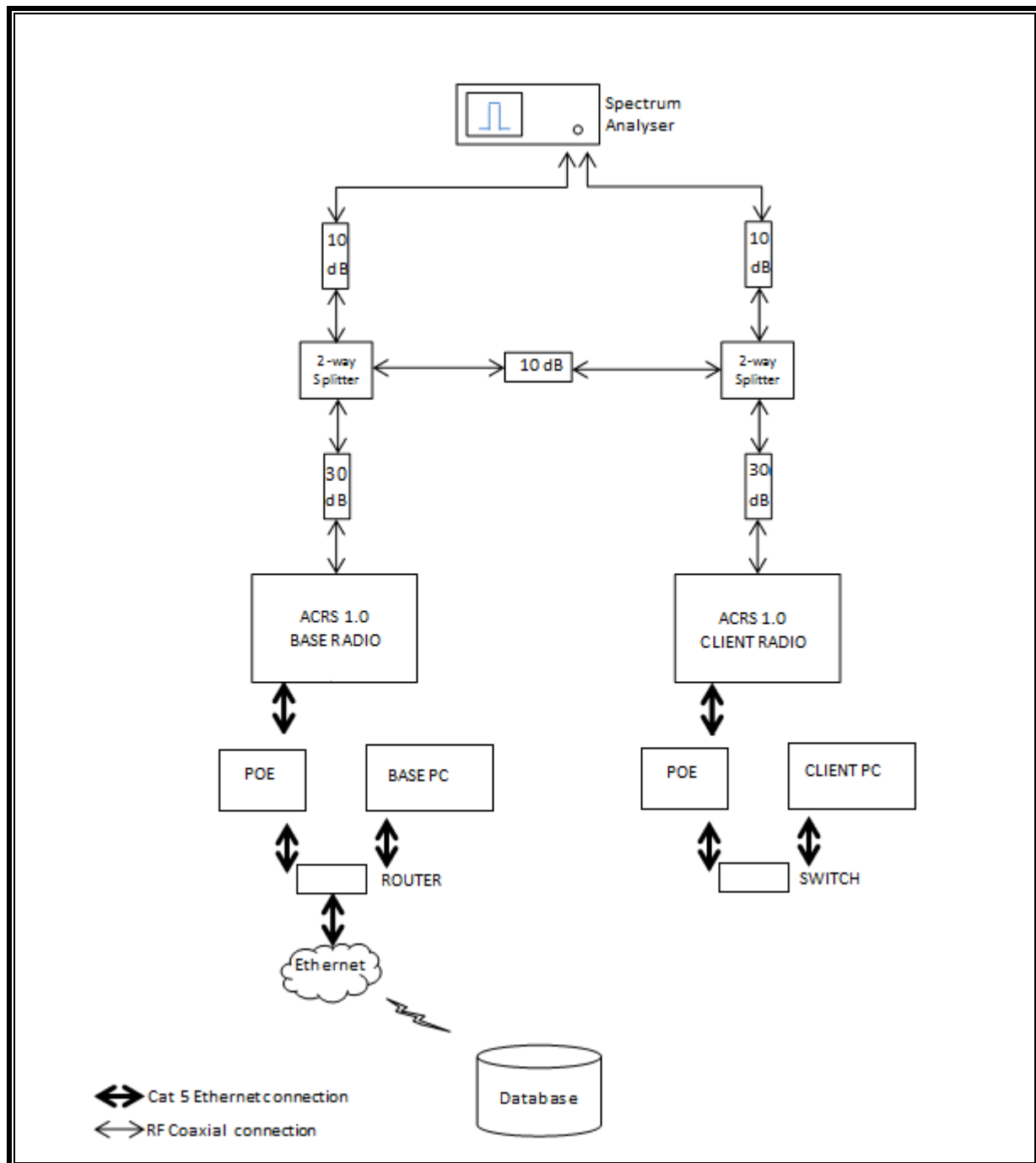
The ACRS 2.0 radios are Fixed TV Band Devices that require professional installation. The ACRS 2.0 radio software has a database module that communicates with the TVWS Database and controls the radio operation in accordance with FCC Part 15 Subpart H rules. The EUT radios have been provisioned in the TVWS Database prior to the testing. For the testing conducted in this report, the EUT software was configured in the installer mode to demonstrate the compliance to the Part 15 Subpart H database rules. Once the device registration and location information has been entered into the radio software by the professional installer, the devices will communicate with the TVWS Database to perform device registration and retrieve TVWS channel list. After the installation, the device registration information will be stored in the device firmware and used by the device to automatically perform device registration and channel list request upon power cycling.

As shown in the diagram, the base radio has a direct connection to the Internet and upon power cycling will automatically communicate with the TVWS Database to 1) perform device registration and 2) retrieve TVWS channel list using the device registration information including device type, serial number, location, contact information, etc. The base radio can only operate on a channel that is within the channel list returned from the TVWS Database. Upon power cycling, the client radio will first scan a specified set of channels to look for the base signal. Once the client detects the base signal on a channel, it will send a connection request to the base which contains the client serial number and location information. The base will contact the TVWS Database on behalf of the client to perform device registration and channel list request. Only when the device registration is successful and the returned channel list for the client device contains the channel that the base is currently operating on, the base will grant the connection request from the client.

During normal operation, the base radio will periodically contact the TVWS Database to retrieve the updated channel lists for itself and on behalf of the client radio. The client channel list will be sent over the air to the client. If either the base or the client discovers its current operating channel is no longer in its updated channel list, it will cease operation on the channel immediately.



## TEST SETUP DIAGRAM



## 6. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

TEST EQUIPMENT LIST				
Description	Manufacturer	Model	Asset	Cal Due
Spectrum Analyzer, 44 GHz	Agilent	E4446A	C01012	10/21/2014

## 7. DATABASE CERTIFICATION REQUIREMENTS

The following database related rules apply to TV White Space Systems under FCC CFR47 PART 15 SUBPART H for Fixed TVBD devices per KDB 416721 D01 White Space Test Procedures v02, Part 2:

§15.713(f)(3) Fixed TVBD Registration  
§15.707(a) Fixed TVBD Relocated  
§15.711(b)(3)(iii) Fixed & Mode II TVDB Database Update  
§15.711(b)(3)(i)(ii), §15.713(a)(1) 48 Hour Channel Scheduling  
§15.707, §15.711(b)(3)(i)(ii)(iv),(c), §15.712 TVBD Channel Availability  
§15.709(a)(2) 1st-Adjacent Power reduction  
§15.715(f) Security

## 8. BASE STATION DATABASE CERTIFICATION TEST RESULTS

### 8.1. §15.713(F)(3) FIXED TVBD REGISTRATION

#### REQUIREMENT

- The Fixed TVBD must be able to provide the required information to the TVWS database and obtain a successful registration:
- The database must indicate a failed device registration if any of the following data provided by the TVBD is invalid:
  - i. FCC ID
  - ii. Serial Number
  - iii. Restricted Coordinates
  - iv. HAAT > 250 m
  - v. Antenna Height AGL > 30 m
  - vi. Incomplete contact information
- For a fixed TVBD without a direct connection to the internet, confirm that registration through a registered fixed device takes place only on a channel available to that registered device.

### 8.1.1. SUCCESSFUL REGISTRATION

#### TEST PROCEDURE

- Configure the base EUT with correct registration information:
  - The FCC ID and serial number are permanently programmed to the device and cannot be modified.
  - Known acceptable geographic coordinates, antenna height AGL and contact information were entered into the EUT.
- The base EUT automatically contacts the TVWS Database to perform device registration.
- Upon successful registration, the base EUT automatically contacts the TVWS Database to retrieve device channel list.
- Selects a channel from the channel list returned from the TVWS Database and start normal radio operation on the selected channel.
- Verify base output signal on the selected channel on the spectrum analyzer.

#### RESULTS

The EUT successfully registered when correct registration information was submitted to the TVWS Database . The EUT transmission was observed on the spectrum analyzer on the selected TV channel (Channel 20) from the returned channel list from the TVWS Database.

Test Results	
Pass	Fail
<input checked="" type="checkbox"/>	<input type="checkbox"/>

**BASE SOFTWARE SHOWING SUCCESSFUL DEVICE REGISTRATION WITH THE TVWS DATABASE**

Adaptrum TVBD Control Panel :: Base

Log | Link | System Information | Diagnostics | Database | Installation

Registration

Device Information

DEV\_ID: A2UACRS20F  
DEV\_SN: A2FQJA07  
DEV\_MODE: F  
LAT: 41.40809  
LNG: -75.64332  
Height AGL: 10 meters

Contact

First Name: jin Last Name: sun  
Addr1: 25 E. Trimble Road  
Addr2:  
City: san jose State: CA  
Zip Code: 95131 Country: US  
Email: jin@adaptrum.com  
Work Phone: 408-850-0545 Mobile Phone: 408-850-0545

Registrant

First Name: jin Last Name: sun  
Addr1: 25 E. Trimble Road  
Addr2:  
City: san jose State: CA  
Zip Code: 95131 Country: US  
Email: jin@adaptrum.com  
Work Phone: 408-850-0545 Mobile Phone: 408-850-0545

Register Device

Channel Request

Device Information

DEV\_ID: A2UACRS20F  
DEV\_SN: A2FQJA07  
DEV\_MODE: F  
LAT: 41.40809  
LNG: -75.64332  
Height AGL: 10 meters

Other Information: Select From Available DB Channels

Update Interval:   
Select Cancel prism.telcordia.com/tvws/ddi/ddi

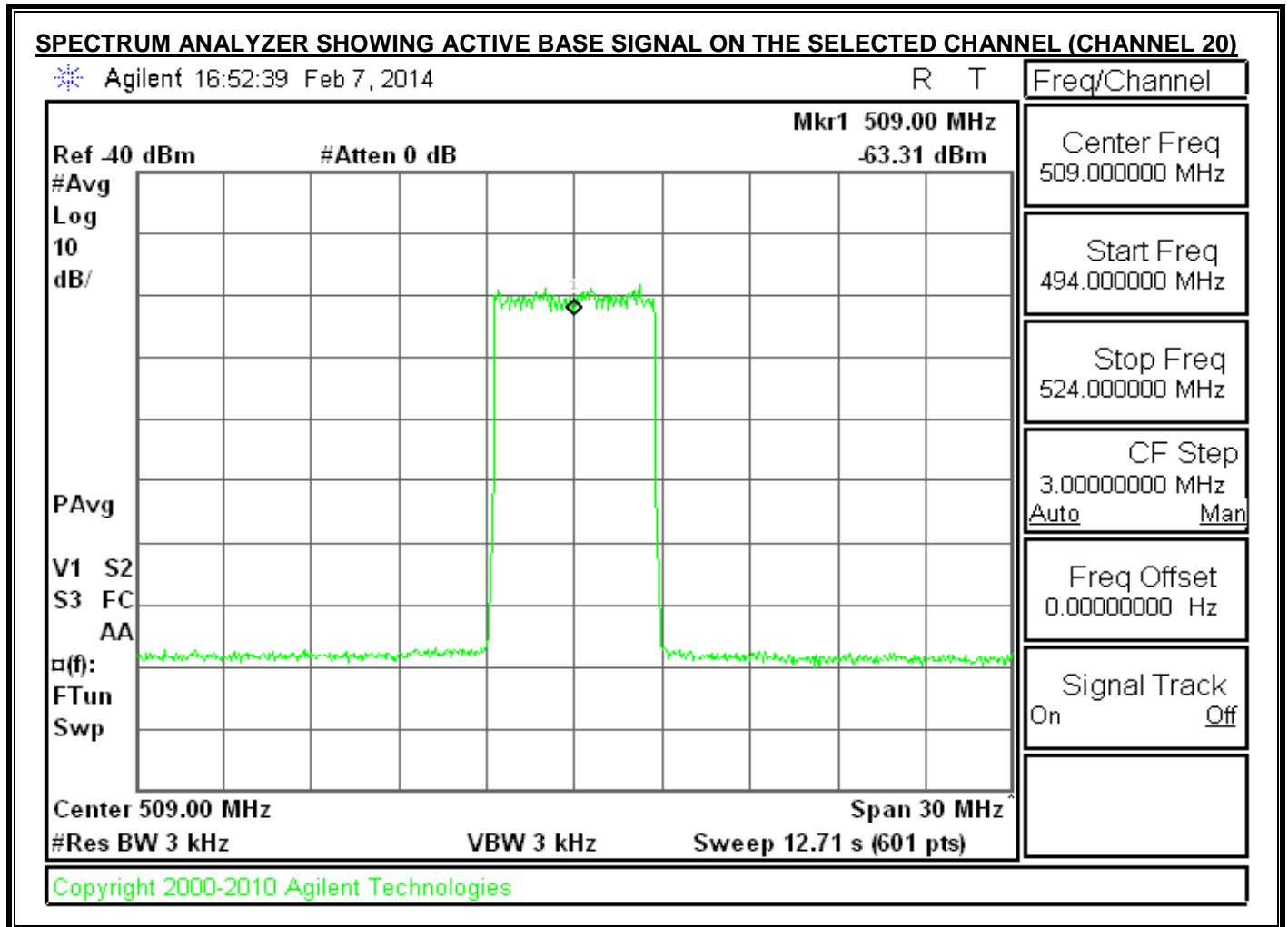
BASE MAC: FF:FF:FF:FF:FF:FF 2, 5, 6, 16, 17, 19, 20, 21, 26, 27, 29, 35, 39  
Client MAC:

Reset Channel Request

Device & Channel

Fixed PPI PPII Test 0 dB Full Power Broadcast Auto Channel CH 20 (509 MHz) Start/Stop Start Service Stop Service Status Update Status Auto Update

Expires in 23Hours 59Mins 59Secs.....16:13:01 02/07/2014  
✓ ff:ff:ff:ff:ff:ff Channel List Successful (13 Channels).....16:13:01 02/07/2014  
Base Device Registration .....16:13:20 02/07/2014  
✓ ff:ff:ff:ff:ff:ff Device Registration Successful.....16:13:20 02/07/2014



## 8.1.2. FAILED REGISTRATION – RESTRICTED COORDINATES

### TEST PROCEDURE

- Configure the EUT with restricted coordinates: (LAT= 41.882282, LNG= -131.628036) which is a location outside US regulatory boundaries
- Observe the base EUT registration failure indicated by the database message

### RESULT

The base EUT failed to register when restricted coordinates information were submitted to the TVWS Database.

Test Results	
Pass	Fail
<input checked="" type="checkbox"/>	<input type="checkbox"/>

**BASE SOFTWARE SHOWING FAILED DEVICE REGISTRATION DUE TO RESTRICTED COORDINATES**

Adaptrum TVBD Control Panel :: Base

Log | Link | System Information | Diagnostics | Database | Installation

Registration

Device Information

DEV\_ID: A2UACRS20F  
DEV\_SN: A2F0JA07  
DEV\_MODE: F  
LAT: 41.882282  
LNG: -131.628036  
Height AGL: 10 meters

Contact

First Name: lin Last Name: sun  
Addr1: 25 E. Trimble Road  
Addr2:  
City: san jose State: CA  
Zip Code: 95131 Country: US  
Email: lin@adaptrum.com  
Work Phone: 408-850-0545 Mobile Phone: 408-850-0545

Registrant

First Name: lin Last Name: sun  
Addr1: 25 E. Trimble Road  
Addr2:  
City: san jose State: CA  
Zip Code: 95131 Country: US  
Email: lin@adaptrum.com  
Work Phone: 408-850-0545 Mobile Phone: 408-850-0545

Register Device

Channel Request

Device Information

DEV\_ID: A2UACRS20F  
DEV\_SN: A2F0JA07  
DEV\_MODE: F  
LAT: 41.882282  
LNG: -131.628036  
Height AGL: 10 meters

Other Information: Select From Available DB Channels

Update Interval: [ ] Select Cancel

prism.telcordia.com/tvws/ddi/ddi

BASE MAC: FF:FF:FF:FF:FF:FF  
Client MAC:

Reset Channel Request

Device & Channel

Fixed PPI PPII Test 0 dB Full Power Broadcast Auto Channel CH 20 (509 MHz) Start/Stop Start Service Stop Service Status Update Status Auto Update

FF:ff:ff:ff:ff:ff Device Registration Failed.....11:39:59 02/07/2014  
Base Device Registration .....11:40:04 02/07/2014  
FF:ff:ff:ff:ff:ff Device Registration Failed.....11:40:04 02/07/2014



### 8.1.3. FAILED REGISTRATION – HAAT

#### TEST PROCEDURE

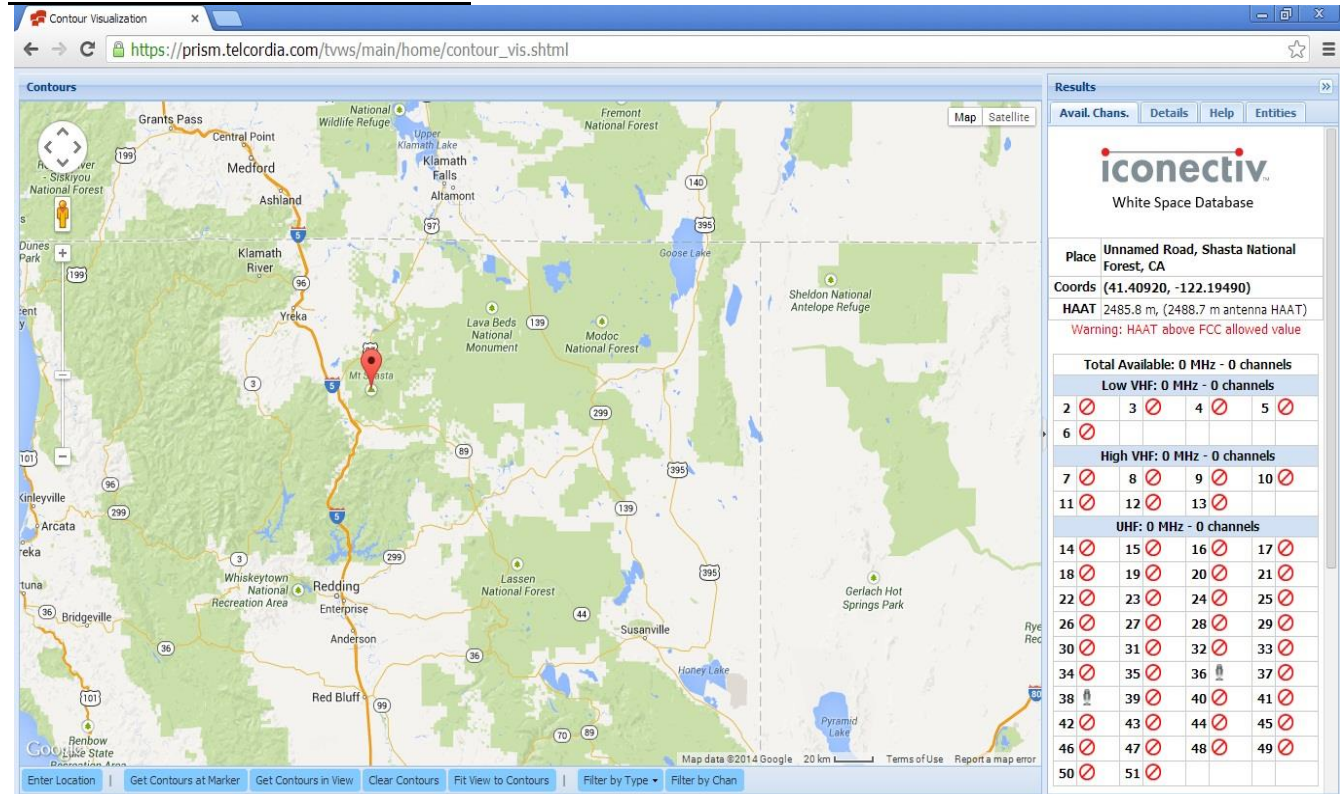
- Configure the EUT with Height Above Average Terrain(HAAT) > 250 m: the Mount Shasta coordinates (LAT=41.4092, LNG=-122.1949) were used.
- Observe the base registration failure indicated by the database message.

#### RESULTS

The base EUT failed to register when it is set to a location with HAAT above the limit.

Test Results	
Pass	Fail
<input checked="" type="checkbox"/>	<input type="checkbox"/>

# **MOUNT SHASTA HAS NO TVWS CHANNELS DUE TO HAAT LIMIT AS INDICATED BY THE TELCORDIA TVWS DATABASE WEB INTERFACE**



## BASE SOFTWARE SHOWING FAILED DEVICE REGISTRATION

Adaptrum TVBD Control Panel :: Base

Log | Link | System Information | Diagnostics | Database | Installation

Registration

Device Information:

DEV\_ID: A2UACRS20F  
DEV\_SN: A2F0JA01  
DEV\_MODE: F  
LAT: 41.4092  
LNG: -122.1949  
Height AGL: 10 meters

Contact:

First Name: lin Last Name: sun  
Addr1: 25 E. Trimble Road  
Addr2:  
City: san jose State: CA  
Zip Code: 95131 Country: US  
Email: lin@adaptrum.com  
Work Phone: 408-850-0545 Mobile Phone: 408-850-0545

Registrant:

First Name: lin Last Name: sun  
Addr1: 25 E. Trimble Road  
Addr2:  
City: san jose State: CA  
Zip Code: 95131 Country: US  
Email: lin@adaptrum.com  
Work Phone: 408-850-0545 Mobile Phone: 408-850-0545

Register Device

Channel Request

Device Information:

DEV\_ID: A2UACRS20F  
DEV\_SN: A2F0JA01  
DEV\_MODE: F  
LAT: 41.4092  
LNG: -122.1949  
Height AGL: 10 meters

Other Information:

Select From Available DB Channels

Update Interval:

BASE MAC: FF:FF:FF:FF:FF:FF  
CLIENT MAC: 00:26:B9:F5:FB:A3 16, 17, 19, 20, 39

Reset Channel Request

Device & Channel

Fixed PPI PPII Test 0 dB Full Power Broadcast Auto Channel CH 20 (509 MHz)

Start/Stop: Start Service Stop Service

Status: Update Status Auto Update

Base Device Channel List.....15:41:33 01/13/2014

✗ ff:ff:ff:ff:ff:ff Device Registration Failed.....15:41:33 01/13/2014

Base Device Channel List.....15:42:36 01/13/2014

✗ ff:ff:ff:ff:ff:ff Device Registration Failed.....15:42:36 01/13/2014

### 8.1.4. FAILED REGISTRATION – ANTENNA HEIGHT AGL

#### TEST PROCEDURE

- Configure the EUT with antenna height Above Ground Level (AGL) > 30 meters.
- Observe the base registration failure indicated by the database message.

#### RESULTS

The base EUT failed to register when it is set to a location with antenna AGL above the limit.

Test Results	
Pass	Fail
<input checked="" type="checkbox"/>	<input type="checkbox"/>

**BASE SOFTWARE SHOWING FAILED DEVICE REGISTRATION DUE TO AGL LIMIT**

The screenshot displays the 'Adaptrum TVBD Control Panel - Base' software interface. The 'Registration' tab is active, showing fields for Device Information (DEV\_ID: A2UACRS20F, DEV\_SN: A2FQJA07, DEV\_MODE: F, LAT: 41.40809, LNG: -75.64332, Height AGL: 31 meters), Contact (First Name: lin, Last Name: sun, Address: 25 E. Trimble Road, City: san jose, State: CA, Zip Code: 95131, Country: US, Email: lin@adaptrum.com, Work Phone: 408-850-0545, Mobile Phone: 408-850-0545), and Registrant (First Name: lin, Last Name: sun, Address: 25 E. Trimble Road, City: san jose, State: CA, Zip Code: 95131, Country: US, Email: lin@adaptrum.com, Work Phone: 408-850-0545, Mobile Phone: 408-850-0545). A 'Register Device' button is present. Below this, the 'Channel Request' tab is active, showing fields for Device Information, Other Information (Select From Available DB Channels), Update Interval, BASE MAC, and Client MAC. A 'Reset Channel Request' button is also visible. At the bottom, the 'Device & Channel' section shows a log of events, including a failed device registration due to AGL limit.

**Device Information:**  
DEV\_ID: A2UACRS20F  
DEV\_SN: A2FQJA07  
DEV\_MODE: F  
LAT: 41.40809  
LNG: -75.64332  
Height AGL: 31 meters

**Contact:**  
First Name: lin Last Name: sun  
Addr1: 25 E. Trimble Road  
Addr2:  
City: san jose State: CA  
Zip Code: 95131 Country: US  
Email: lin@adaptrum.com  
Work Phone: 408-850-0545 Mobile Phone: 408-850-0545

**Registrant:**  
First Name: lin Last Name: sun  
Addr1: 25 E. Trimble Road  
Addr2:  
City: san jose State: CA  
Zip Code: 95131 Country: US  
Email: lin@adaptrum.com  
Work Phone: 408-850-0545 Mobile Phone: 408-850-0545

**Channel Request:**  
Device Information: DEV\_ID: A2UACRS20F, DEV\_SN: A2FQJA07, DEV\_MODE: F, LAT: 41.40809, LNG: -75.64332, Height AGL: 31 meters  
Other Information: Select From Available DB Channels  
Update Interval:   
BASE MAC: FF:FF:FF:FF:FF:FF  
Client MAC:   
Reset Channel Request

**Device & Channel:**  
Fixed PPI PPII Test 0 dB Full Power Broadcast Auto Channel CH 20 (509 MHz) Start/Stop: Start Service Stop Service Status: Update Status Auto Update  
Log:  
✖ ff:ff:ff:ff:ff:ff Device Registration Failed.....11:57:28 02/07/2014  
Base Device Registration .....11:58:23 02/07/2014  
✖ ff:ff:ff:ff:ff:ff Device Registration Failed.....11:58:23 02/07/2014

## 8.1.5. FAILED REGISTRATION – INCOMPLETE CONTACT INFORMATION

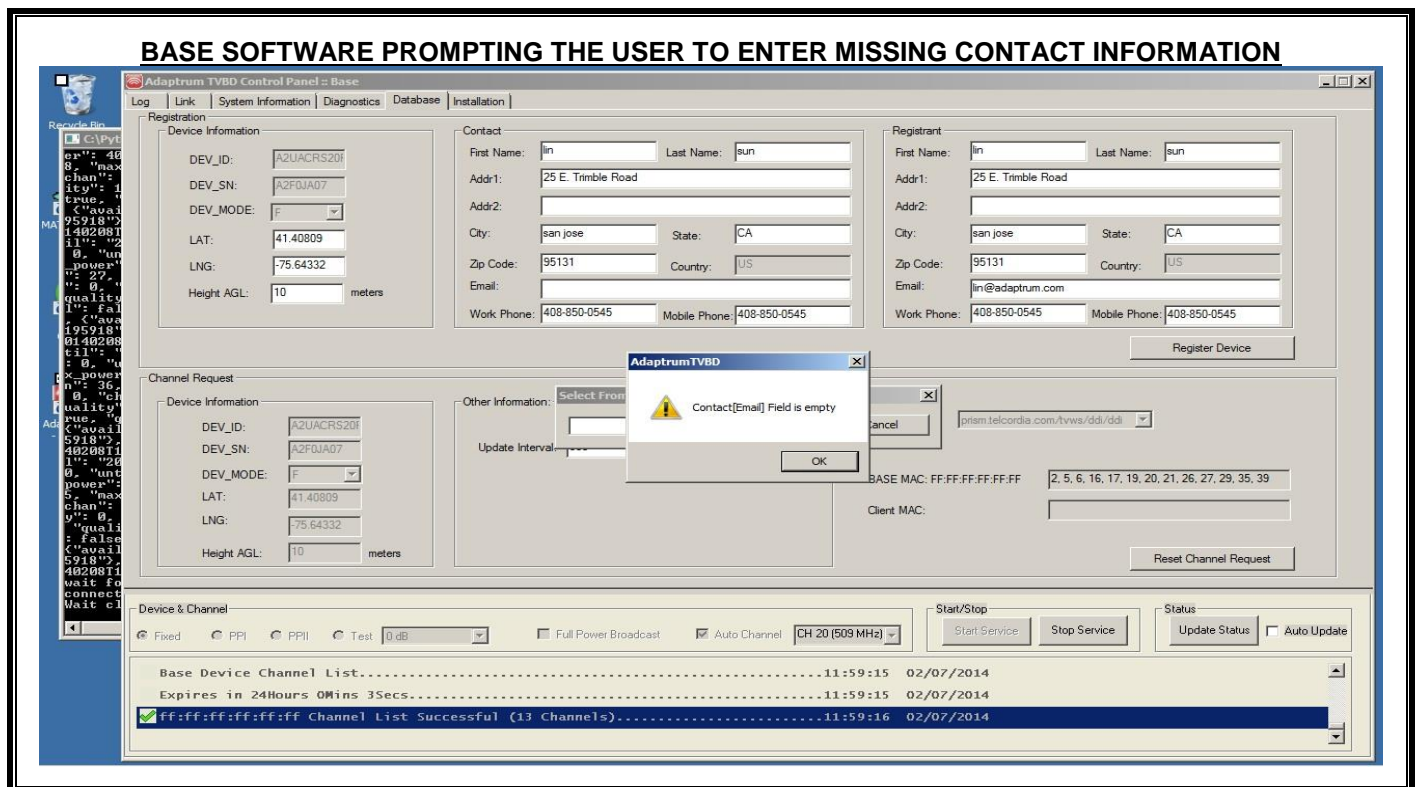
### TEST PROCEDURE

- Configure the base EUT with missing contact information, e.g. email.
- The device software cannot proceed with registration and prompts user to enter the missing information.

### RESULTS

Software didn't proceed with registration when contact information fields are missing.

Test Results	
Pass	Fail
<input checked="" type="checkbox"/>	<input type="checkbox"/>



## 8.2. §15.707(A) FIXED TVBD RELOCATED

### REQUIREMENT

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

### TEST PROCEDURE

- The base EUT geographic coordinates are entered at registration time and stored in the device. The device channel list request uses the same coordinates established at registration time. No separate coordinates can be entered for channel list request.
- The device requires professional installation and device registration information including device location will be entered by the professional installer.
- Once the registration is complete, upon power cycling the device will use the stored registration location for channel list request.

### RESULTS

The device only uses its registered location for channel list request. The device registered location will be established at installation time by a professional installer and cannot be altered after installation – see ACRS 2.0 Professional Installer Manual and ACRS 2.0 User Manual.

Test Results	
Pass	Fail
<input checked="" type="checkbox"/>	<input type="checkbox"/>

**BASE SOFTWARE ONLY ALLOWS DEVICE REGISTRATION LOCATION INFORMATION TO BE ENTERED DURING INSTALLATION AND THE SAME DEVICE LOCATION IS USED FOR CHANNEL LIST REQUEST**

The screenshot displays the 'Adaptrum TVBD Control Panel : Base' software interface. It features a menu bar with 'Log', 'Link', 'System Information', 'Diagnostics', 'Database', and 'Installation'. The 'Installation' tab is active, showing two main sections: 'Registration' and 'Channel Request'.

**Registration Section:**

- Device Information:** Fields for DEV\_ID (A2UACRS20F), DEV\_SN (A2FQJA07), DEV\_MODE (F), LAT (41.40809), LNG (-75.64332), and Height AGL (10 meters).
- Contact:** Fields for First Name (lin), Last Name (sun), Addr1 (25 E. Trimble Road), Addr2, City (san jose), State (CA), Zip Code (95131), Country (US), Email (lin@adaptrum.com), Work Phone (408-850-0545), and Mobile Phone (408-850-0545).
- Registrant:** Identical fields to the Contact section.
- A 'Register Device' button is located at the bottom right of this section.

**Channel Request Section:**

- Device Information:** Same as the registration section.
- Other Information:** Includes a 'Select From Available DB Channels' dialog box, a 'prism.telcordia.com/tvws/ddi/ddi' dropdown, and a 'BASE MAC' field with the value 'FF:FF:FF:FF:FF:FF'.
- Channel List:** A list showing 'Base Device Channel List' and 'Expires in 24Hours 0Mins 3Secs'. A green checkmark indicates 'ff:ff:ff:ff:ff Channel List Successful (13 Channels)'.
- A 'Reset Channel Request' button is at the bottom right.

**Device & Channel Section:**

- Includes a 'Start/Stop' section with 'Start Service' and 'Stop Service' buttons.
- A 'Status' section with 'Update Status' and 'Auto Update' checkboxes.
- A 'Full Power Broadcast' checkbox and an 'Auto Channel' checkbox.
- A 'CH 20 (509 MHz)' dropdown menu.



### 8.3. §15.711(B)(3)(III) FIXED & MODE II TVDB DATABASE UPDATE

#### REQUIREMENT

- §15.711(B)(3)(III) If a fixed or Mode II personal/portable TVBD fails to successfully contact the TV bands database during any given day, it may continue to operate until 11:59 p.m. of the following day at which time it must cease operations until it re-establishes contact with the TV bands database and re-verifies its list of available channels.

Block access to the database from the TVBD. All other radio functions, including internet connectivity should be maintained. Confirm that the TVBD shuts down by 11:59 PM on the following day. All other radio functions, including internet connectivity should be maintained.

#### TEST PROCEDURE

- Set the base EUT to normal operation mode:
  - Enter proper registration information on the base.
  - Base contacts the TVWS to perform registration.
  - Base contacts the TVWS to retrieve channel list.
  - Select an operating channel from returned channel list.
  - Enable base transmission.
- Observe the base EUT output signal on the spectrum analyzer.
- Use a programmable router to block the database URL.
- Observe that there is no output signal from the base after 11:59 PM on the following day.

#### RESULTS

During normal operation, the base and client channel lists are updated periodically by sending channel list requests to the TVWS Database . For test purposes this time period was set to 5 minutes. After the database access was blocked, the next channel list requests failed and the EUTs stopped transmission immediately.

Test Results	
Pass	Fail
<input checked="" type="checkbox"/>	<input type="checkbox"/>



## BASE SOFTWARE BEFORE DATABASE BLOCKING (BASE ON CHANNEL 20)

**Adaptrum TVBD Control Panel - Base**

Log | Link | System Information | Diagnostics | Database | Installation

**Registration**

**Device Information**

DEV\_ID: A2UACRS20F  
DEV\_SN: A2FBJA07  
DEV\_MODE: F  
LAT: 41.40809  
LNG: -75.64332  
Height AGL: 10 meters

**Contact**

First Name: lin Last Name: sun  
Addr1: 25 E. Trimble Road  
Addr2:  
City: san jose State: CA  
Zip Code: 95131 Country: US  
Email: lin@adaptrum.com  
Work Phone: 408-850-0545 Mobile Phone: 408-850-0545

**Registrant**

First Name: lin Last Name: sun  
Addr1: 25 E. Trimble Road  
Addr2:  
City: san jose State: CA  
Zip Code: 95131 Country: US  
Email: lin@adaptrum.com  
Work Phone: 408-850-0545 Mobile Phone: 408-850-0545

Register Device

**Channel Request**

**Device Information**

DEV\_ID: A2UACRS20F  
DEV\_SN: A2FBJA07  
DEV\_MODE: F  
LAT: 41.40809  
LNG: -75.64332  
Height AGL: 10 meters

**Other Information:** Select From Available DB Channels

Update Interval:  Select Cancel

prism.telcordia.com/tvws/ddi/ddi

BASE MAC: FF:FF:FF:FF:FF:FF 2, 5, 6, 16, 17, 19, 20, 21, 26, 27, 29, 35, 39  
CLIENT MAC: 20:1A:06:2D:18:72 2, 5, 6, 16, 17, 19, 20, 39

Reset Channel Request

**Device & Channel**

Fixed PPI PPII Test 0 dB Full Power Broadcast Auto Channel CH 20 (509 MHz) Start/Stop Status

Start Service Stop Service Update Status Auto Update

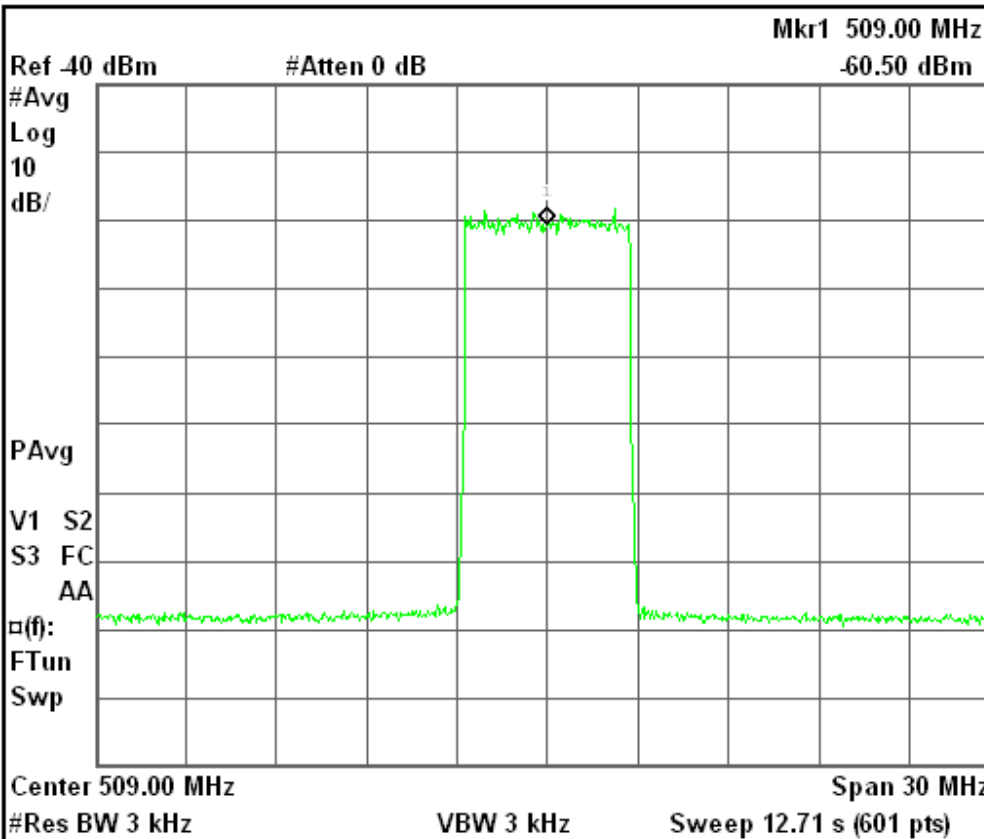
20:1a:06:2d:18:72 Device Channel List .....15:20:32 02/07/2014  
Expires in 24Hours 0Mins 0Secs.....15:20:32 02/07/2014  
20:1a:06:2d:18:72 Channel List Successful (8 Channels).....15:20:32 02/07/2014

# **BASE SIGNAL SPECTRUM BEFORE DATABASE BLOCKING**

Agilent 17:19:08 Feb 7, 2014

R T

Freq/Channel



Center Freq 509.000000 MHz
Start Freq 494.000000 MHz
Stop Freq 524.000000 MHz
CF Step 3.00000000 MHz Auto Man
Freq Offset 0.00000000 Hz
Signal Track On Off

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## BASE SOFTWARE 5 MINUTES AFTER DATABASE BLOCKING (BASE STOPPED)

Adaptrum TVBD Control Panel :: Base

Log | Link | System Information | Diagnostics | Database | Installation

Registration

Device Information

DEV\_ID: A2UACRS20F  
DEV\_SN: A2F0JA07  
DEV\_MODE: F  
LAT: 41.40809  
LNG: -75.64332  
Height AGL: 10 meters

Contact

First Name: lin Last Name: sun  
Addr1: 25 E. Trimble Road  
Addr2:  
City: san jose State: CA  
Zip Code: 95131 Country: US  
Email: lin@adaptrum.com  
Work Phone: 408-850-0545 Mobile Phone: 408-850-0545

Registrant

First Name: lin Last Name: sun  
Addr1: 25 E. Trimble Road  
Addr2:  
City: san jose State: CA  
Zip Code: 95131 Country: US  
Email: lin@adaptrum.com  
Work Phone: 408-850-0545 Mobile Phone: 408-850-0545

Register Device

Channel Request

Device Information

DEV\_ID: A2UACRS20F  
DEV\_SN: A2F0JA07  
DEV\_MODE: F  
LAT: 41.40809  
LNG: -75.64332  
Height AGL: 10 meters

Other Information:

Select From Available DB Channels

Update Interval:

prism.telcordia.com/tvws/ddi/ddi

BASE MAC: FF:FF:FF:FF:FF:FF  
CLIENT MAC: 20:1A:06:2D:18:72

Reset Channel Request

Device & Channel

Fixed PPI PPII Test 0 dB Full Power Broadcast Auto Channel CH 20 (509 MHz)

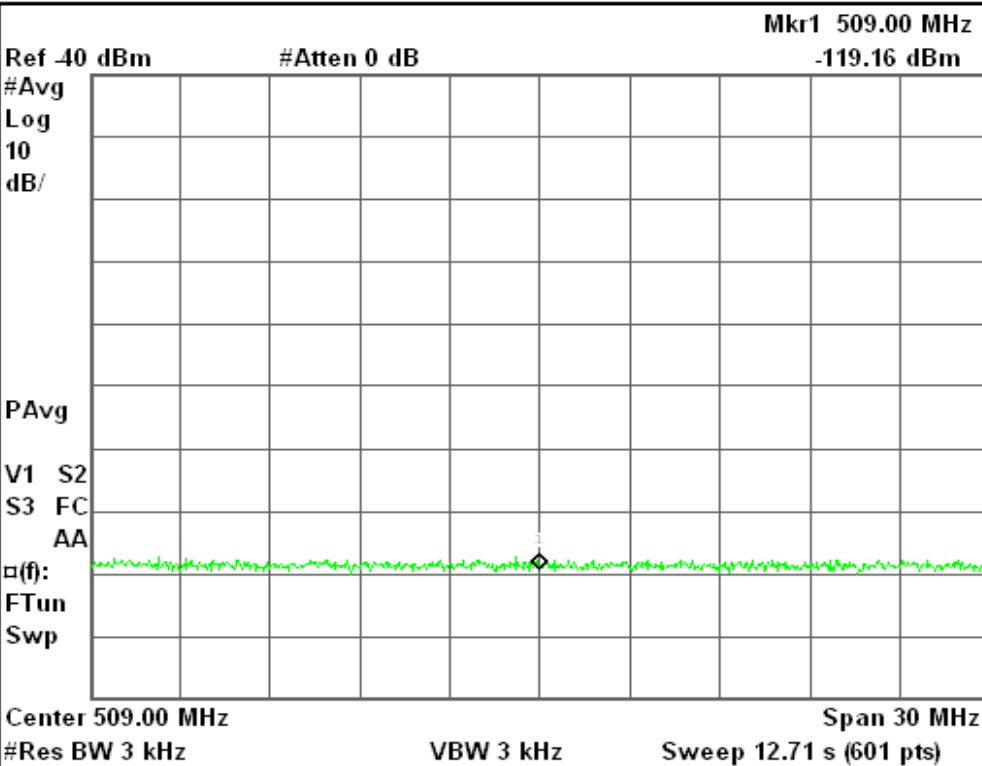
Start/Stop Start Service Stop Service Status Update Status Auto Update

ff:ff:ff:ff:ff:ff Channel List Failed (0 Channels).....15:25:00 02/07/2014  
20:1a:06:2d:18:72 Device Channel List .....15:25:27 02/07/2014  
20:1a:06:2d:18:72 Channel List Failed (0 Channels).....15:25:27 02/07/2014

# BASE SIGNAL SPECTRUM 5 MINUTES AFTER DATABASE BLOCKING

Agilent 17:25:31 Feb 7, 2014

R T



Freq/Channel

Center Freq  
509.000000 MHz

Start Freq  
494.000000 MHz

Stop Freq  
524.000000 MHz

CF Step  
3.00000000 MHz  
Auto Man

Freq Offset  
0.00000000 Hz

Signal Track  
On Off

Copyright 2000-2010 Agilent Technologies

## **8.4. §15.711(B)(3)(I)(II), §15.713(A)(1) 48 HOUR CHANNEL SCHEDULING**

### **REQUIREMENT**

- §15.711(B)(3)(I) Fixed devices must access a TV bands database over the Internet to determine the TV channels that are available at their geographic coordinates, taking into consideration the fixed device's antenna height, prior to their initial service transmission at a given location. Operation is permitted only on channels that are indicated in the database as being available for such TVBDs. Fixed TVBDs shall access the database at least once a day to verify that the operating channels continue to remain available. Operation on a channel must cease immediately if the database indicates that the channel is no longer available. Fixed TVBD must adjust their use of channels in accordance with channel availability schedule information provided by their database for the 48-hour period beginning at the time of the device last accessed the database for a list of available channels.

After receiving an available channel list, register a low-power auxiliary device on the TVBD operating channel. Repeat the available channel request after the update interval and confirm that the low-power device is accounted for in the schedule. Using the system management software, confirm that the device changes channels at the scheduled time.

### **TEST PROCEDURE**

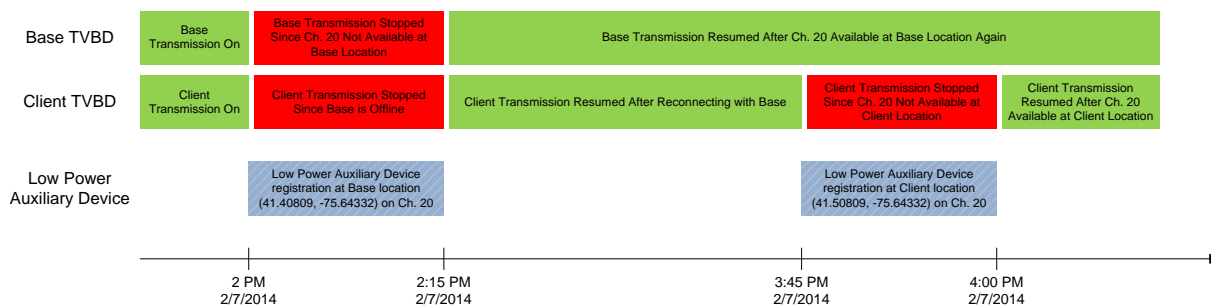
- Referring to the following testing timeline diagram. Low Power Auxiliary Devices are registered and scheduled for protection at both base and client locations, i.e. from 2 PM to 2:15 PM on 2/7/2014 at base location and from 3:45 PM to 4:00 PM on 2/7/2014 at client location.
- Allow the base and client EUT to enter normal operations prior to the base scheduling, i.e. on Channel 20 before 2 PM on 2/7/2014.
- Upon channel list request to the TVWS Database, the base EUT obtains the channel list expiration time (at 2 PM on 2/7/2014) reflecting the Low Power Auxiliary Device's registered protection period.
- The base EUT requests new channel list upon the channel list expiration time (2 PM on 2/7/2014) and the base EUT's current operating channel (Channel 20) is no longer in the returned channel list.
- The base EUT ceases transmission on Channel 20 immediately.
- The client EUT ceases operation on Channel 20 right after the base EUT since the client EUT won't transmit without receiving the base signal.
- The base EUT continues sending periodic channel list requests to the TVWS Database . The returned channel list expiration time (2:15 PM on 2/7/2014) reflecting the ending time of the registered protection period for the Low Power Auxiliary Device.
- The base EUT requests new channel list upon the channel list expiration time (2:15 PM on 2/7/2014) and Channel 20 becomes available again in the returned channel list from the TVWS Database . The base EUT will resume transmission on Channel 20.
- The client EUT will detect the base EUT signal on Channel 20 and reconnect with the base EUT.

## RESULTS

The base EUT correctly ceased transmission on the protected channel over the protection period of the Low Power Auxiliary Device registered at the same location.

Test Results	
Pass	Fail
<input checked="" type="checkbox"/>	<input type="checkbox"/>

### 48 HOUR CHANNEL SCHEDULING TESTING TIMELINE ILLUSTRATION



## 48 HOUR CHANNEL SCHEDULING LOW POWER AUXILIAR DEVICE REGISTRATION RECORD AT BASE LOCATION

The screenshot displays the Telcordia US TV White Space Registration Site. The browser address bar shows the URL: <https://prism.telcordia.com/tvws/dev/reg/lpad-reg/details?id=14495>. The page features the 'iconectiv' logo and a 'Telcordia' logo. A navigation menu on the left includes 'NAVIGATION' (Home, FAQ, Channel Availability) and 'REGISTRATION' (Registration Home, Licensed Mic, Unlicensed Mic, MVPD (Cable Headend), Temporary BAS Links, Supporting Objects, Contacts List, Owners List, Change Password, Sign Out). A green box highlights the 'Record Saved' message: 'You've successfully created the registration record.' Below this, the 'Details for LP-Aux Registration' are shown in a table format.

Details for LP-Aux Registration	
<a href="#">Edit</a>	<a href="#">Back</a> <a href="#">List All</a>
Global Record ID:	140207TELC0000007
Owner:	Adaptrum (San Jose, CA) 🔍
Contact:	Haiyun Tang 🔍
Operating mode:	Licensed
Region type:	Point
WKT Geometry:	GEOMETRYCOLLECTION (POINT (-75.64332 41.40809))
TV Channels:	20
Call Sign:	WABC-TV
Start:	2014-02-07 14:00 PT
Duration:	15 mins
Recurrence:	Once

## 48 HOUR CHANNEL SCHEDULING BASE SOFTWARE BEFORE PROTECTION PERIOD

**Adaptrum TVBD Control Panel :: Base**

Log | Link | System Information | Diagnostics | Database | Installation

**Registration**

**Device Information**

DEV\_ID: A2UACRS20F  
DEV\_SN: A2FQJA07  
DEV\_MODE: F  
LAT: 41.40809  
LNG: -75.64332  
Height AGL: 10 meters

**Contact**

First Name: lin Last Name: sun  
Addr1: 25 E. Trimble Road  
Addr2:  
City: san jose State: CA  
Zip Code: 95131 Country: US  
Email: lin@adaptrum.com  
Work Phone: 408-850-0545 Mobile Phone: 408-850-0545

**Registrant**

First Name: lin Last Name: sun  
Addr1: 25 E. Trimble Road  
Addr2:  
City: san jose State: CA  
Zip Code: 95131 Country: US  
Email: lin@adaptrum.com  
Work Phone: 408-850-0545 Mobile Phone: 408-850-0545

Register Device

**Channel Request**

**Device Information**

DEV\_ID: A2UACRS20F  
DEV\_SN: A2FQJA07  
DEV\_MODE: F  
LAT: 41.40809  
LNG: -75.64332  
Height AGL: 10 meters

**Other Information:** Select From Available DB Channels

Update Interval:  Select Cancel prism.telcordia.com/tvws/ddi/ddi

BASE MAC: FF:FF:FF:FF:FF:FF 2, 5, 6, 16, 17, 19, 20, 21, 26, 27, 29, 35, 39  
Client MAC:

Reset Channel Request

**Device & Channel**

Fixed PPI PPII Test 0 dB Full Power Broadcast Auto Channel CH 20 (509 MHz) Start/Stop Start Service Stop Service Status Update Status Auto Update

Base Device Channel List.....13:52:57 02/07/2014  
Expires in 0Hours 7Mins 3Secs.....13:52:57 02/07/2014  
✓ ff:ff:ff:ff:ff:ff Channel List Successful (13 Channels).....13:52:57 02/07/2014

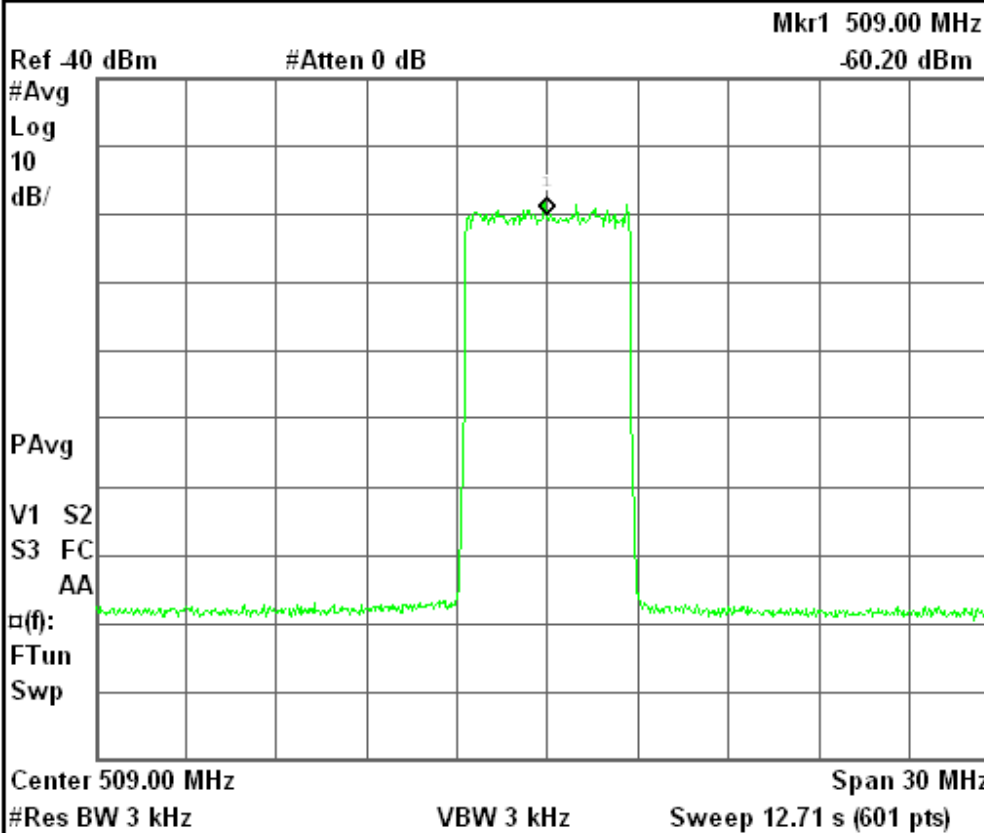


**48 HOUR CHANNEL SCHEDULING BASE SIGNAL SPECTRUM BEFORE PROTECTION PERIOD**

Agilent 19:10:30 Feb 7, 2014

R T

Freq/Channel



Center Freq  
509.000000 MHz

Start Freq  
494.000000 MHz

Stop Freq  
524.000000 MHz

CF Step  
3.00000000 MHz  
Auto Man

Freq Offset  
0.00000000 Hz

Signal Track  
On Off

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## 48 HOUR CHANNEL SCHEDULING BASE SOFTWARE DURING PROTECTION PERIOD (CHANNEL 20 UNAVAILABLE)

**Adaptrum TVBD Control Panel :: Base**

Log | Link | System Information | Diagnostics | Database | Installation |

**Registration**

**Device Information**

DEV\_ID: A2UACRS20F  
DEV\_SN: A2F0JA07  
DEV\_MODE: F  
LAT: 41.40809  
LNG: -75.64332  
Height AGL: 10 meters

**Contact**

First Name: lin Last Name: sun  
Addr1: 25 E. Trimble Road  
Addr2:  
City: san jose State: CA  
Zip Code: 95131 Country: US  
Email: lin@adaptrum.com  
Work Phone: 408-850-0545 Mobile Phone: 408-850-0545

**Registrant**

First Name: lin Last Name: sun  
Addr1: 25 E. Trimble Road  
Addr2:  
City: san jose State: CA  
Zip Code: 95131 Country: US  
Email: lin@adaptrum.com  
Work Phone: 408-850-0545 Mobile Phone: 408-850-0545

Register Device

**Channel Request**

**Device Information**

DEV\_ID: A2UACRS20F  
DEV\_SN: A2F0JA07  
DEV\_MODE: F  
LAT: 41.40809  
LNG: -75.64332  
Height AGL: 10 meters

**Other Information:**

Select From Available DB Channels  
Update Interval:  Select Cancel  
prism.telcordia.com/tvws/ddi/ddi

BASE MAC: FF:FF:FF:FF:FF:FF 2, 5, 6, 16, 17, 19, 21, 26, 27, 29, 35, 39  
Client MAC:

Reset Channel Request

**Device & Channel**

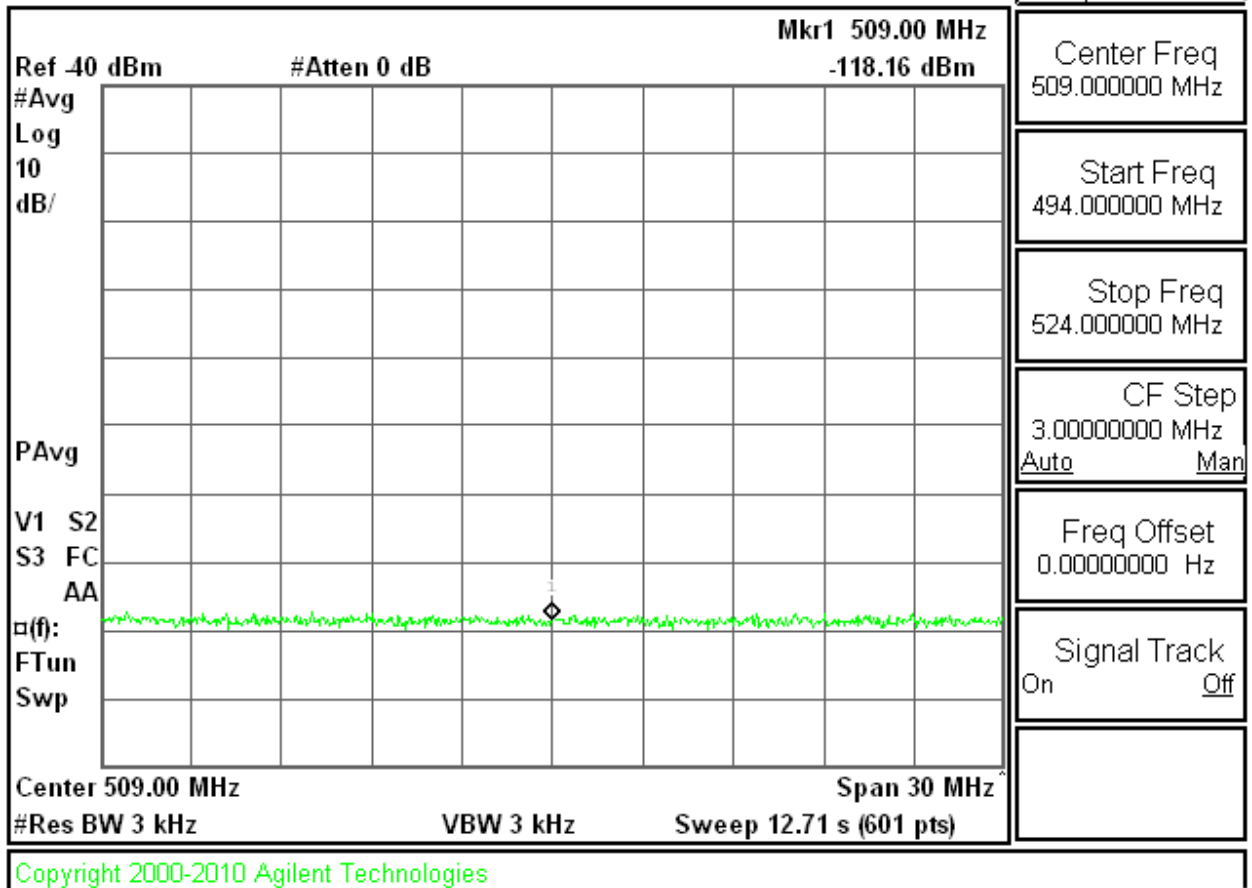
Fixed PPI PPII Test 0 dB Full Power Broadcast Auto Channel CH 20 (509 MHz) Start/Stop Start Service Stop Service Status Update Status Auto Update

Base Device Channel List.....14:00:40 02/07/2014  
Expires in 0Hours 14Mins 20Secs.....14:00:40 02/07/2014  
✓ff:ff:ff:ff:ff:ff Channel List Successful (12 Channels).....14:00:40 02/07/2014

**48 HOUR CHANNEL SCHEDULING BASE SIGNAL SPECTRUM DURING PROTECTION PERIOD  
(TRANSMISSION STOPPED)**

✱ Agilent 19:16:25 Feb 7, 2014

R T



### 48 HOUR CHANNEL SCHEDULING BASE RESUMES ON CHANNEL 20 AFTER PROTECTION PERIOD

**Adaptrum TVBD Control Panel - Base**

Log | Link | System Information | Diagnostics | Database | Installation

**Registration**

**Device Information**

DEV\_ID: A2UACRS20F  
DEV\_SN: A2FBJA07  
DEV\_MODE: F  
LAT: 41.40809  
LNG: -75.64332  
Height AGL: 10 meters

**Contact**

First Name: lin Last Name: sun  
Addr1: 25 E. Trimble Road  
Addr2:  
City: san jose State: CA  
Zip Code: 95131 Country: US  
Email: lin@adaptrum.com  
Work Phone: 408-850-0545 Mobile Phone: 408-850-0545

**Registrant**

First Name: lin Last Name: sun  
Addr1: 25 E. Trimble Road  
Addr2:  
City: san jose State: CA  
Zip Code: 95131 Country: US  
Email: lin@adaptrum.com  
Work Phone: 408-850-0545 Mobile Phone: 408-850-0545

Register Device

**Channel Request**

**Device Information**

DEV\_ID: A2UACRS20F  
DEV\_SN: A2FBJA07  
DEV\_MODE: F  
LAT: 41.40809  
LNG: -75.64332  
Height AGL: 10 meters

**Other Information:** Select From Available DB Channels

Update Interval: [ ] Select Cancel

prism.telcordia.com/tvws/ddi/ddi

BASE MAC: FF:FF:FF:FF:FF:FF 2, 5, 6, 16, 17, 19, 20, 21, 26, 27, 29, 35, 39  
Client MAC: [ ]

Reset Channel Request

**Device & Channel**

Fixed PPI PPII Test 0 dB Full Power Broadcast Auto Channel CH 20 (509 MHz)

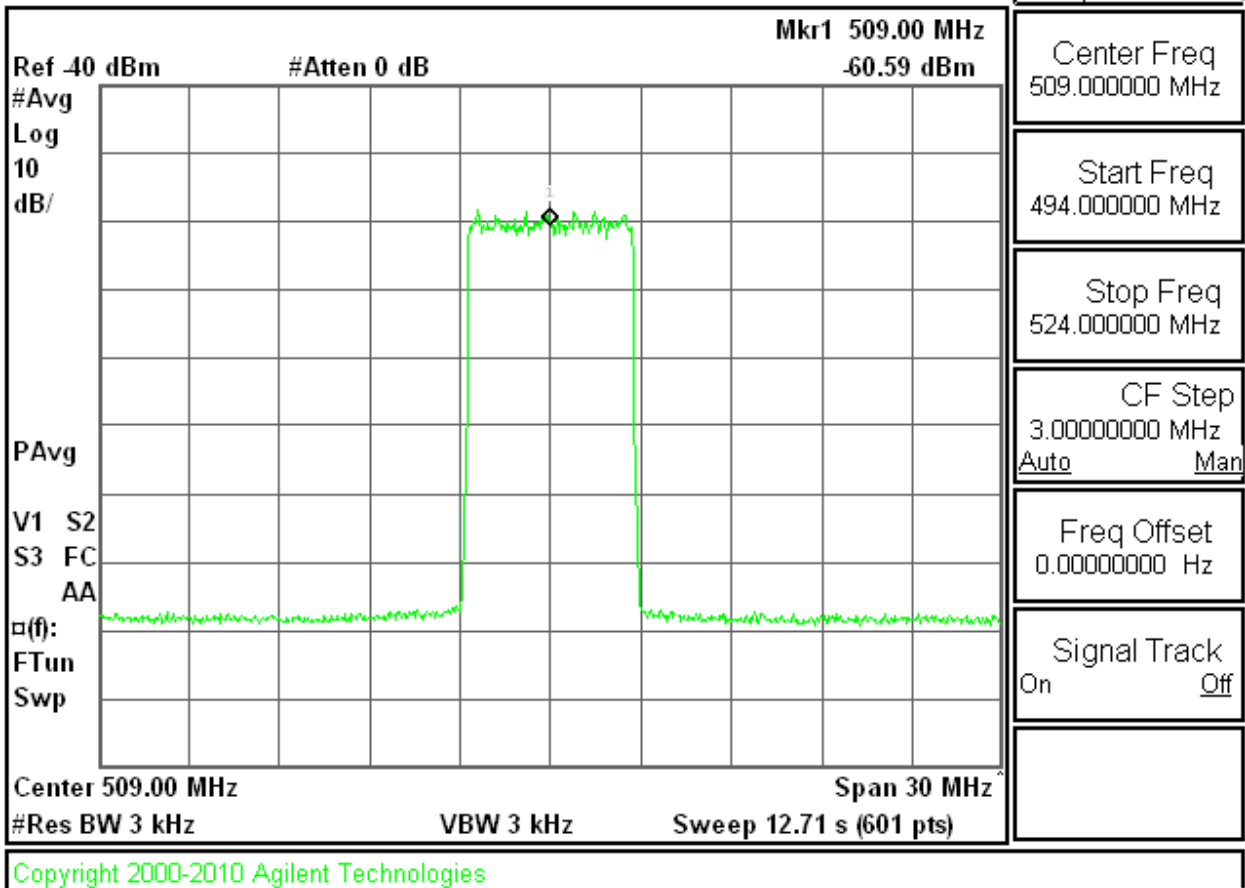
Start/Stop Start Service Stop Service Status Update Status Auto Update

Base Device Channel List.....14:15:37 02/07/2014  
Expires in 23Hours 59Mins 59Secs.....14:15:37 02/07/2014  
✓ ff:ff:ff:ff:ff:ff Channel List Successful (13 Channels).....14:15:37 02/07/2014

**48 HOUR CHANNEL SCHEDULING BASE RESUMES TRANSMISSION ON CHANNEL 20 AFTER PROTECTION PERIOD**

Agilent 19:31:40 Feb 7, 2014

R T



## **8.5. §15.707, §15.711(B)(3)(I)(II)(IV),(C), §15.712 TVBD CHANNEL AVAILABILITY**

### **REQUIREMENT**

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

### **TEST PROCEDURE**

- Configure the base EUT with correct registration information.
- The base EUT automatically contacts the TVWS Database to perform device registration.
- Upon successful registration, base automatically contacts the TVWS Database to retrieve device channels.
- The base EUT software only allows the user to select a channel from the channel list returned from the database (see base software screen capture below) which are within the device operating frequency range 470 – 698 MHz (Channels 14 – 51 excluding Channels 36 to 38) as approved by FCC for ACRS 2.0 Fixed TVBD.
- Test pre-condition: The device is configured to operate at a power level less than or equal to that which is authorized by the Grant.
- Upon successful registration the database returns the allowable power according to the device type, Fixed 36 dBm eirp in this example.
- Verify on the spectrum analyzer that the base EUT is operating on the selected channel, i.e. Channel 20.

## RESULTS

The EUT operates on a channel from the authorized channel list and at the authorized power level.

The EUT cannot select and operate on any channel other than those within the authorized channel list returned from the TVWS Database , which are within the device operating frequency range.

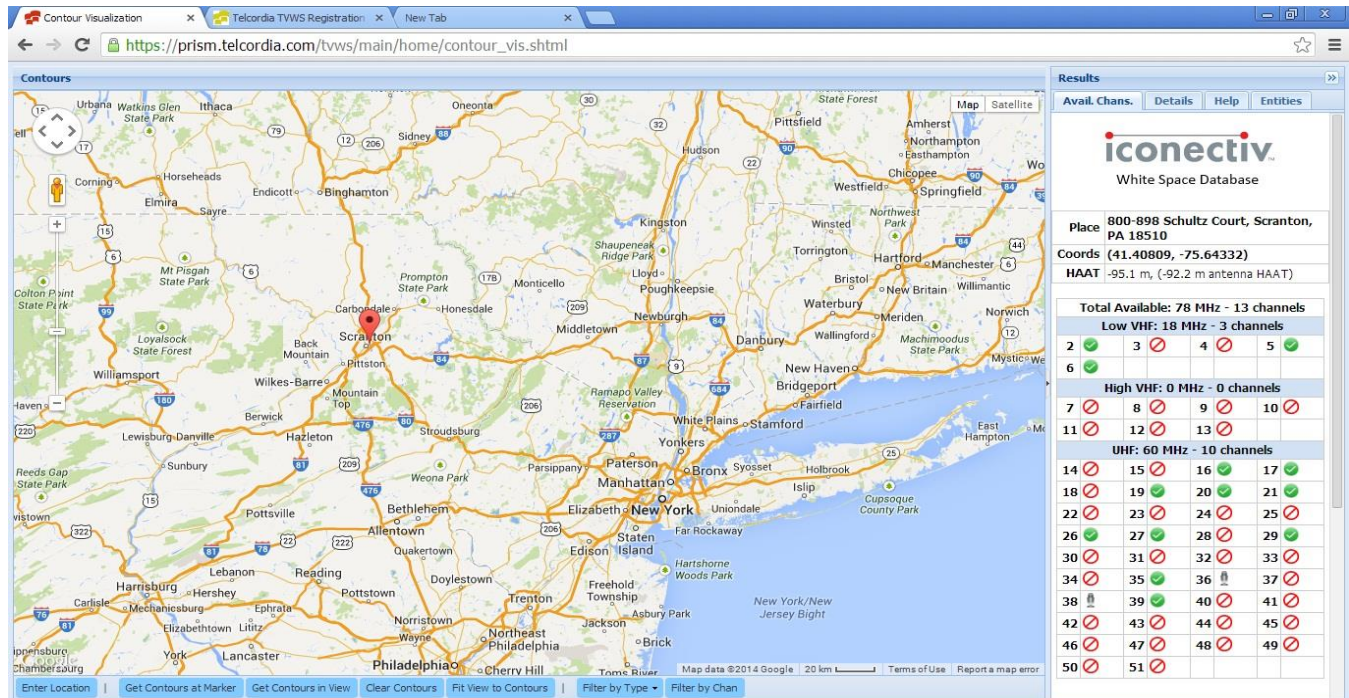
Test Results	
Pass	Fail
<input checked="" type="checkbox"/>	<input type="checkbox"/>

### **BASE SOFTWARE ONLY ALLOWS A CHANNEL FROM AUTHORIZED CHANNEL LISTS TO BE SELECTED FOR DEVICE OPERATION**

The screenshot displays the 'Adaptrum TVBD Control Panel - Base' software interface. The 'Registration' tab is active, showing fields for 'Device Information' (DEV\_ID: A2UACRS20F, DEV\_SN: A2F0JA07, DEV\_MODE: F, LAT: 41.40809, LNG: -75.64332, Height AGL: 10 meters) and 'Contact' details (First Name: lin, Last Name: sun, Address: 25 E. Trimble Road, City: san jose, State: CA, Zip Code: 95131, Country: US, Email: lin@adaptrum.com, Work Phone: 408-850-0545, Mobile Phone: 408-850-0545). A 'Register Device' button is present. Below this, the 'Channel Request' section shows a 'Select From Available DB Channels' dialog box with a list of channels (CH 16 to CH 39) and a 'Select' button. The 'Update Interval' is set to 16. The 'BASE MAC' is FF:FF:FF:FF:FF:FF and the 'Client MAC' is empty. A 'Reset Channel Request' button is also visible. At the bottom, the 'Device & Channel' section shows the current channel as 'CH 20 (509 MHz)' and a status bar indicating 'Base Device Channel List' expires in 23 hours 59 mins 59 secs, and 'Channel List Successful (13 Channels)'.



**TELCORDIA WEB INTERFACE SHOWING AUTHORIZED CHANNELS AT THE DEVICE LOCATION. NOTE ONLY A SUBSET (CHANNELS 16, 17, 19, 20, 21, 26, 27, 29, 35 AND 39) OF THE 13 AVAILABLE CHANNELS ARE WITHIN THE ACRS 2.0 TVBD BASE OPERATING FREQUENCY RANGE.**

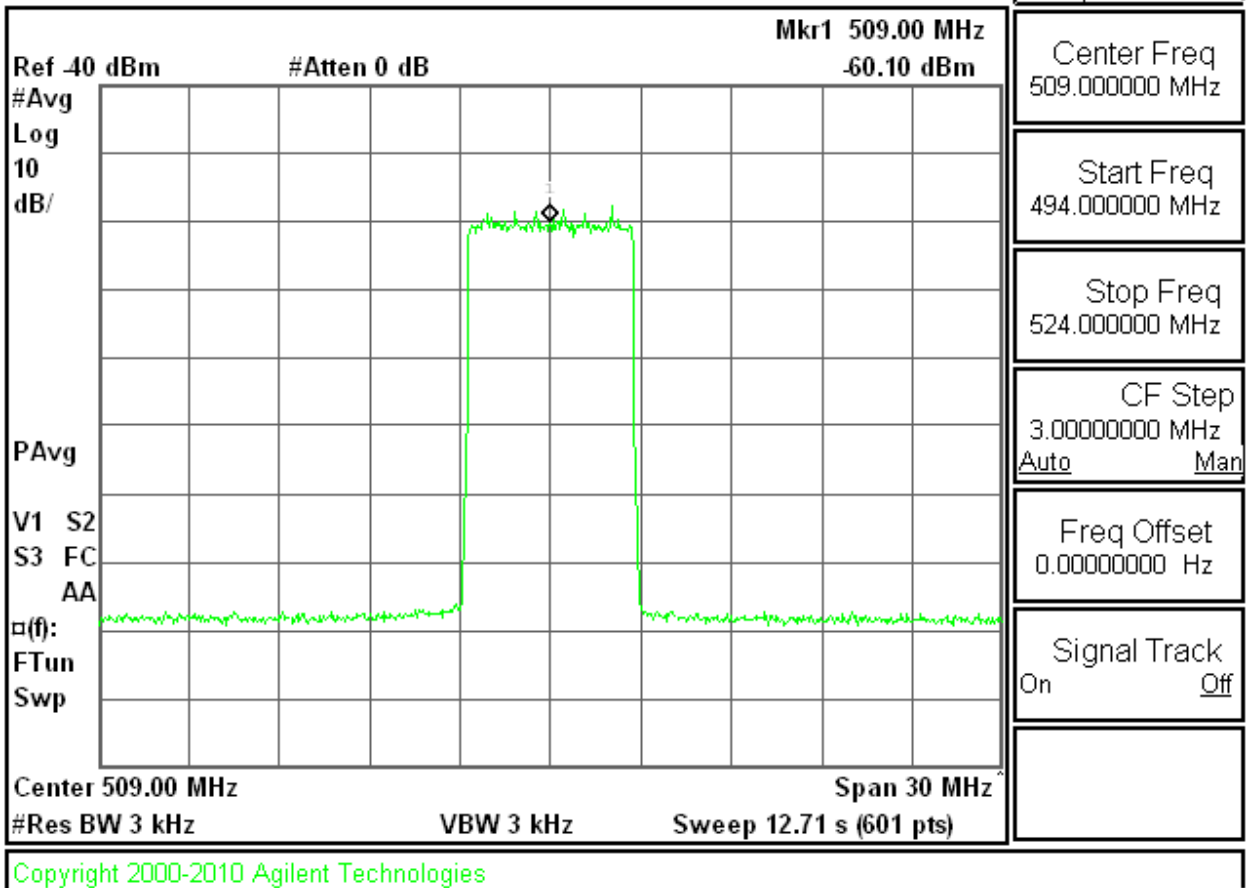




**BASE SIGNAL SPECTRUM ON THE AUTHORIZED CHANNEL**

\* Agilent 19:36:03 Feb 7, 2014

R T



## 8.6. §15.715(F) SECURITY

### REQUIREMENT

- The device operations procedures must include documentation with a detailed explanation of the following for each database the device is expected to work with:
  - i. What communication protocol is used between the database and the TVBD?
  - ii. How are communications initiated?
  - iii. How does the TVBD validate messages from the database?
  - iv. How does the device handle failure to communicate or authenticate the database?
  - v. How does the database validate messages from a TVBD?
  - vi. What encryption method is used?
  - vii. How does the database ensure secure registration of protected devices?

### ANSWERS

#### *i. What communication protocol is used between the database and the TVBD?*

The device uses a proprietary protocol, described in the “Telcordia TV Whitespace (TVWS) Solution Device-to-Database Protocol” document, built on top of JSON messages over HTTPS with public and shared key authentication.

#### *ii. How are communications initiated?*

To initiate the communication session, the device will contact the Database at a known URL and authenticate the Database using the public key mechanism where the Database’s public key is used to verify the digital certificate from the Database (i.e. signed by the Database’s private key). Once the database is authenticated, SSL/TLS handshaking will be performed where a session key will be securely shared between the device and Database (again using the public/private key mechanism). The session key will be used to encrypt further messages between the Database and the device using a SSL/TLS supported cipher suite. A secure HTTP session is then established.

#### *iii. How does the TVBD validate messages from the database?*

The Database is authenticated using the public key issued by a certificate authority. Communication sessions between the Database and the device are encrypted.

#### *iv. How does the device handle failure to communicate or authenticate the database?*

In the case that the device fails to authenticate the Database, the secure HTTP session will not be established and consequently no message exchange will occur between the device and the Database. In this case, a device registration will return as FAIL and device a channel list request will return with ZERO channels.

In the case that the Database fails to authenticate the device – i.e. device response to database authentication challenge is invalid, the Database will terminate the secure HTTP session with the device. In this case, a device registration will return as FAIL and a device channel list request will return with ZERO channels.

In the case that the device loses communication with the Database in the middle of an active session, a subsequent device registration request will time out and return as FAIL and a subsequent device channel list request will time out and return with ZERO channels.

*v. How does the database validate messages from a TVBD?*

The device is authenticated using a “share secret” key that is generated at manufacturing time based on the device serial number. Communication sessions between the Database and the device are encrypted.

*vi. What encryption method is used?*

The communication is secured using the HTTPS protocol, which employs X.509 certificates to exchange a symmetric key used for the data exchange.

*vii. How does the database ensure secure registration of protected devices?*

The Telcordia Database provides an HTTPS base web service to register the protected devices like wireless microphones. The web based registration verifies mandatory inputs, as well as matches any FCC-specific information, such as callsign, ULS file number, etc. Registered protected devices will be considered by the Database in the channel list computation.

The registration data is stored in secure storage areas protected from public access. The registration data is exchanged with peer databases through HTTPS/SFTP channels, both of which use TLS encryption and server authentication, as well as an additional layer of X.509 signatures for tamper prevention.

## 9. CLIENT STATION - DATABASE CERTIFICATION TESTS

### 9.1. §15.713(F)(3) FIXED TVBD REGISTRATION

#### REQUIREMENT

- The Fixed TVBD must be able to provide the required information to the TVWS database and obtain a successful registration:
- For a fixed TVBD without a direct connection to the internet, confirm that registration through a registered fixed device takes place only on a channel available to that registered device.

### 9.1.1. SUCCESSFUL REGISTRATION

#### TEST PROCEDURE

- Configure the client EUT with correct registration information:
  - The FCC ID and serial number are permanently programmed to the device and cannot be modified.
  - Known acceptable location coordinates, antenna height AGL were entered into the EUT software.
  - Client device uses the same contact information as the base device (both client device and base device are managed by the same operator).
- Proper scan channel set is entered on the client EUT which contains the base EUT's current operating channel.
- The client EUT makes the connection request to the base.
- The base EUT contact the TVWS Database to register the client device.
- Upon successful registration, the base retrieves channel list on behalf of the client device.
- Client connection request is granted if the base operating channel is within the returned client channel list from the TVWS Database . The base EUT also informs the client EUT about the retrieved client channel lists.
- The client EUT starts normal radio operation.
- Verify client output signal (on the same channel as the base EUT) on spectrum analyzer.

#### RESULTS

The client EUT was successfully registered with the TVWS Database with proper registration information through the base EUT. The client EUT entered normal operation on the same channel (Channel 20) as that of the base EUT which is within the returned client channel list.

The client EUT didn't have a direct connection to the Internet. It sent the registration request to the base EUT on the base EUT operating channel. The base EUT then sent the client registration request to the TVWS Database to register the client.

Test Results	
Pass	Fail
<input checked="" type="checkbox"/>	<input type="checkbox"/>

**CLIENT SOFTWARE WITH DEVICE LOCATION INFORMATION AND PROPER SCAN CHANNEL SET (THAT INCLUDES THE CURRENT BASE OPERATING CHANNEL – CHANNEL 20)**

The screenshot displays the 'Adaptrum TVBD Control Panel :: Client' window. The top menu bar includes 'Log', 'Link', 'System Information', 'Diagnostics', 'Database', and 'Installation'. The main area is divided into sections for 'Device Configuration' and 'Device & Channel'.

**Device Configuration:**

- Device Information:**
  - DEV\_ID: A2UACRS10
  - DEV\_SN: A2F0JA10
  - DEV\_MODE: F
  - LAT: 41.50809
  - LNG: -75.64332
  - Height AGL: 5 meters
- Scan Channel Set:** 20, 21 (with an 'Update Now' button)
- Set Device Info** button

**Device & Channel:**

- Buttons: Fixed, PPI, PPII, Test (0 dB)
- ☒ Auto Channel: CH 20 (509 MHz)
- Start/Stop** button
- Status:** Update Status, Auto Update
- Log:**
  - Channel Search Failed On Channel 22.....14:27:21 02/07/2014
  - Channel Search Started On Channel 20.....14:27:21 02/07/2014
  - Channel Search Success On Channel 20.....14:27:31 02/07/2014

## BASE SOFTWARE SHOWING SUCCESSFUL CLIENT REGISTRATION AND CHANNEL LIST REQUEST

**Adaptrum TVBD Control Panel :: Base**

Log | Link | System Information | Diagnostics | Database | Installation

**Registration**

**Device Information**

DEV\_ID: A2UACRS20F  
DEV\_SN: A2FQJA07  
DEV\_MODE: F  
LAT: 41.40809  
LNG: 75.64332  
Height AGL: 10 meters

**Contact**

First Name: lin Last Name: sun  
Addr1: 25 E. Trimble Road  
Addr2:  
City: san jose State: CA  
Zip Code: 95131 Country: US  
Email: lin@adaptrum.com  
Work Phone: 408-850-0545 Mobile Phone: 408-850-0545

**Registrant**

First Name: lin Last Name: sun  
Addr1: 25 E. Trimble Road  
Addr2:  
City: san jose State: CA  
Zip Code: 95131 Country: US  
Email: lin@adaptrum.com  
Work Phone: 408-850-0545 Mobile Phone: 408-850-0545

Register Device

**Channel Request**

**Device Information**

DEV\_ID: A2UACRS20F  
DEV\_SN: A2FQJA07  
DEV\_MODE: F  
LAT: 41.40809  
LNG: 75.64332  
Height AGL: 10 meters

**Other Information**

Select From Available DB Channels  
Update Interval:   
Select Cancel  
prism.telcordia.com/tvws/ddi/ddi

BASE MAC: FF:FF:FF:FF:FF:FF 2, 5, 6, 16, 17, 19, 20, 21, 26, 27, 29, 35, 39  
CLIENT MAC: 20:1A:06:2D:18:72 2, 5, 6, 16, 17, 19, 20, 39

Reset Channel Request

**Device & Channel**

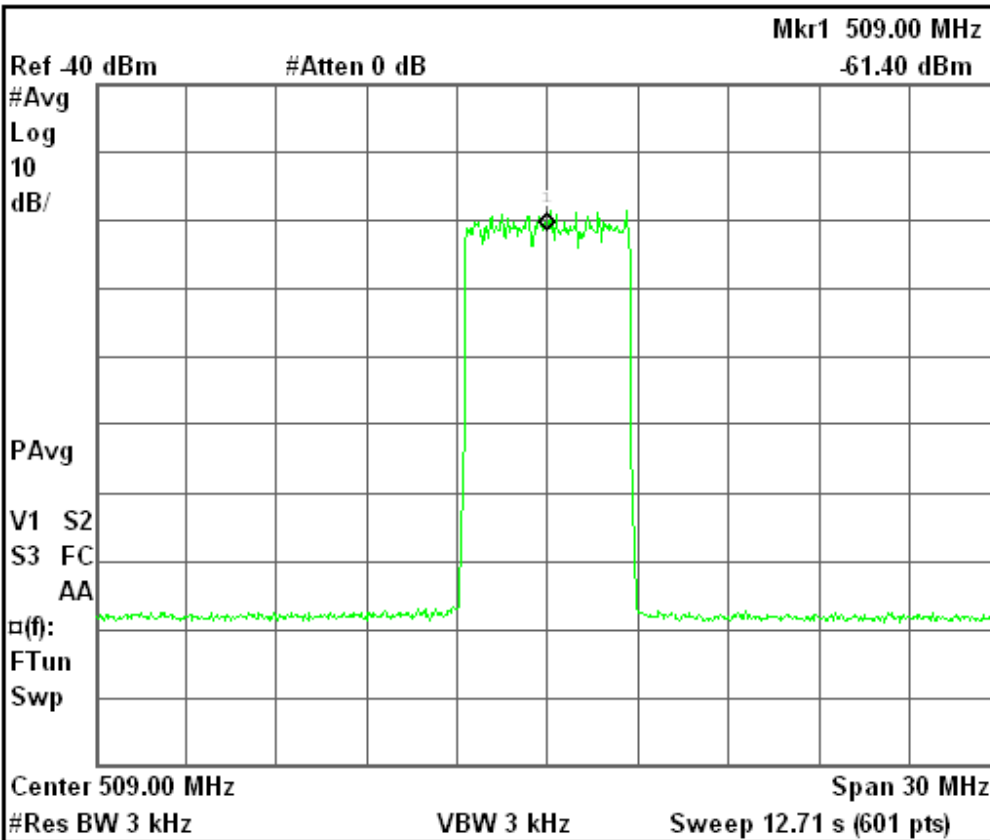
Fixed PPI PPII Test 0 dB Full Power Broadcast Auto Channel CH 20 (509 MHz) Start/Stop Start Service Stop Service Status Update Status Auto Update

Client 20:1a:06:2d:18:72 Created. Past Logins 0.....14:27:20 02/07/2014  
20:1a:06:2d:18:72 Device Registration .....14:27:23 02/07/2014  
ff:ff:ff:ff:ff:ff Channel List Successful (13 Channels).....14:27:23 02/07/2014  
20:1a:06:2d:18:72 Device Registration Successful.....14:27:23 02/07/2014

# ACTIVE CLIENT SIGNAL SPECTRUM ON CHANNEL 20

Agilent 21:24:28 Feb 7, 2014

R T



Freq/Channel
Center Freq 509.000000 MHz
Start Freq 494.000000 MHz
Stop Freq 524.000000 MHz
CF Step 3.00000000 MHz Auto Man
Freq Offset 0.00000000 Hz
Signal Track On Off

Copyright 2000-2010 Agilent Technologies



## 9.1.2. FAILED REGISTRATION – RESTRICTED COORDINATES

### TEST PROCEDURE

- Set the base EUT to normal operation (on Channel 20).
- Configure the client EUT with restricted coordinates:  
(LAT= 41.882282, LNG= -131.628036), which are outside US regulatory boundaries.
- Configure the client EUT scan channel set to include Channel 20.
- The client EUT sends connection request to the base EUT.
- The base EUT will contact the TVWS Database to register the client.
- Observe the client registration failure indicated by the database message.

### RESULTS

The client EUT failed to register when restricted coordinates information were submitted to the TVWS Database .

Test Results	
Pass	Fail
<input checked="" type="checkbox"/>	<input type="checkbox"/>

### CLIENT SOFTWARE WITH RESTRICTED COORDINATES

Adaptrum TVBD Control Panel :: Client

Log | Link | System Information | Diagnostics | Database | Installation

---

Device Configuration

Device Information

DEV\_ID: A2UACRS10  
DEV\_SN: A2F0JA10  
DEV\_MODE: F  
LAT: 41.882282  
LNG: -131.628036  
Height AGL: 5 meters

Scan Channel Set: 20, 21, 22 ... Update Now

Set Device Info

---

Device & Channel

Fixed PPI PPIL Test 0 dB Auto Channel CH 21 (515 MHz) Start/Stop Status

Update Status Auto Update

Channel Search Started On Channel 20.....14:41:54 02/07/2014  
✗ Channel Search Failed On Channel 20.....14:42:20 02/07/2014  
Channel Search Started On Channel 21.....14:42:20 02/07/2014

## BASE SOFTWARE SHOWING FAILED CLIENT REGISTRATION DUE TO RESTRICTED COORDINATES

**Adaptrum TVBD Control Panel :: Base**

Log | Link | System Information | Diagnostics | Database | Installation

**Registration**

**Device Information**

DEV\_ID: A2UACRS20F  
DEV\_SN: A2F0JA07  
DEV\_MODE: F  
LAT: 41.40809  
LNG: -75.64332  
Height AGL: 10 meters

**Contact**

First Name: lin Last Name: sun  
Addr1: 25 E. Trimble Road  
Addr2:  
City: san jose State: CA  
Zip Code: 95131 Country: US  
Email: lin@adaptrum.com  
Work Phone: 408-850-0545 Mobile Phone: 408-850-0545

**Registrant**

First Name: lin Last Name: sun  
Addr1: 25 E. Trimble Road  
Addr2:  
City: san jose State: CA  
Zip Code: 95131 Country: US  
Email: lin@adaptrum.com  
Work Phone: 408-850-0545 Mobile Phone: 408-850-0545

Register Device

**Channel Request**

**Device Information**

DEV\_ID: A2UACRS20F  
DEV\_SN: A2F0JA07  
DEV\_MODE: F  
LAT: 41.40809  
LNG: -75.64332  
Height AGL: 10 meters

**Other Information:** Select From Available DB Channels

Update Interval:  Select Cancel

ptsm.telcordia.com/tvws/ddi/ddi

BASE MAC: FF:FF:FF:FF:FF:FF 2, 5, 6, 16, 17, 19, 20, 21, 26, 27, 29, 35, 39  
CLIENT MAC: 20:1A:06:2D:18:72

Reset Channel Request

**Device & Channel**

Fixed PPI PPII Test 0 dB Full Power Broadcast Auto Channel CH 20 (509 MHz) Start/Stop Start Service Stop Service Status Update Status Auto Update

20:1a:06:2d:18:72 Device Registration .....14:39:33 02/07/2014  
✗ 20:1a:06:2d:18:72 Device Registration Failed.....14:39:33 02/07/2014  
Base Device Channel List.....14:40:30 02/07/2014  
Expires in 24Hours 0Mins 0Secs.....14:40:30 02/07/2014

### 9.1.3. FAILED REGISTRATION – HAAT

#### TEST PROCEDURE

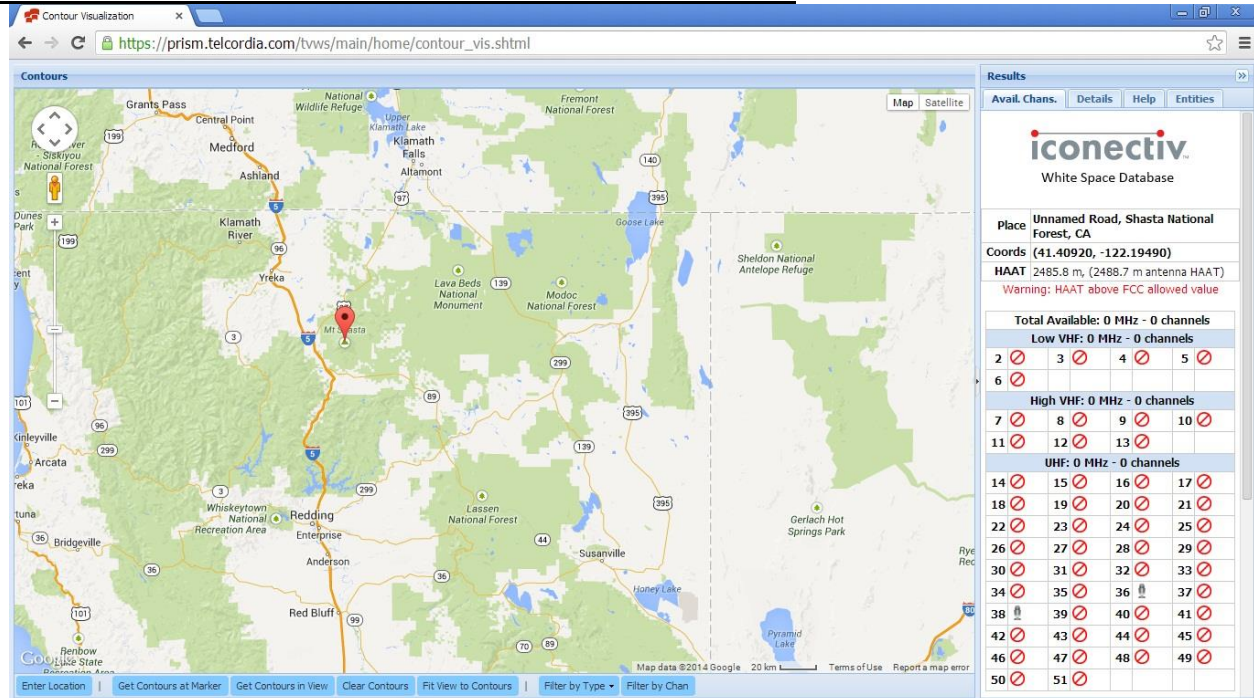
- Set the base EUT to normal operation (on Channel 20).
- Configure the client EUT with the Mount Shasta coordinates (LAT= 41.4092, LNG=-122.1949).
- Configure the client EUT scan channel set to include Channel 20.
- The client EUT sends connection request to the base EUT.
- The base EUT will contact the TVWS Database to register the client.
- Observe the client registration failure indicated by the database message.

#### RESULTS

The client EUTs failed to register when it is set to a location with HAAT above the limit.

Test Results	
Pass	Fail
<input checked="" type="checkbox"/>	<input type="checkbox"/>

## MOUNT SHASTA HAS NO TVWS CHANNELS DUE TO HAAT LIMIT



## CLIENT SOFTWARE CONFIGURED WITH MOUNT SHASTA COORDINATES

Adaptrum TVBD Control Panel :: Client

Log | Link | System Information | Diagnostics | Database | Installation

Device Configuration

Device Information

DEV\_ID: A2UACRS10 Scan Channel Set: 20, 21, 22 Update Now

DEV\_SN: A2F0JA10

DEV\_MODE: F

LAT: 41.4092

LNG: -122.1949

Height AGL: 5 meters Set Device Info

Device & Channel

Fixed PPI PPII Test 0 dB Auto Channel CH 20 (509 MHz) Start/Stop Status Update Status Auto Update

Channel Search Started On Channel 21.....14:48:44 02/07/2014

Channel Search Failed On Channel 21.....14:49:01 02/07/2014

Channel Search Started On Channel 20.....14:49:01 02/07/2014

## BASE SOFTWARE SHOWING FAILED CLIENT REGISTRATION DUE TO HAAT LIMIT

**Adaptrum TVBD Control Panel :: Base**

Log | Link | System Information | Diagnostics | Database | Installation

**Registration**

**Device Information**

DEV\_ID: A2UACRS20F  
DEV\_SN: A2FBJA07  
DEV\_MODE: F  
LAT: 41.40809  
LNG: -75.64332  
Height AGL: 10 meters

**Contact**

First Name: lin Last Name: sun  
Addr1: 25 E. Trimble Road  
Addr2:  
City: san jose State: CA  
Zip Code: 95131 Country: US  
Email: lin@adaptrum.com  
Work Phone: 408-850-0545 Mobile Phone: 408-850-0545

**Registrant**

First Name: lin Last Name: sun  
Addr1: 25 E. Trimble Road  
Addr2:  
City: san jose State: CA  
Zip Code: 95131 Country: US  
Email: lin@adaptrum.com  
Work Phone: 408-850-0545 Mobile Phone: 408-850-0545

Register Device

**Channel Request**

**Device Information**

DEV\_ID: A2UACRS20F  
DEV\_SN: A2FBJA07  
DEV\_MODE: F  
LAT: 41.40809  
LNG: -75.64332  
Height AGL: 10 meters

**Other Information:** Select From Available DB Channels

Update Interval:  Select Cancel

prim.telcordia.com/tvws/ddi/ddi

BASE MAC: FF:FF:FF:FF:FF:FF 2, 5, 6, 16, 17, 19, 20, 21, 26, 27, 29, 35, 39  
CLIENT MAC: 20:1A:06:2D:18:72

Reset Channel Request

**Device & Channel**

Fixed PPI PPII Test 0 dB Full Power Broadcast Auto Channel CH 20 (509 MHz)

Start/Stop Start Service Stop Service Status Update Status Auto Update

❌ Client 20:1a:06:2d:18:72 Deleted.....14:50:37 02/07/2014  
✅ Client 20:1a:06:2d:18:72 Created. Past Logins 0.....14:51:16 02/07/2014  
20:1a:06:2d:18:72 Device Registration .....14:51:19 02/07/2014  
❌ 20:1a:06:2d:18:72 Device Registration Failed.....14:51:19 02/07/2014

#### 9.1.4. FAILED REGISTRATION – ANTENNA HEIGHT AGL

##### TEST PROCEDURE

- Set the base EUT to normal operation (on Channel 20).
- Configure the client EUT with antenna height Above Ground Level (AGL) > 30 meters.
- Configure the client EUT scan channel set to include Channel 20.
- The client EUT sends connection request to the base EUT.
- The base EUT will contact the TVWS Database to register the client.
- Observe the client registration failure indicated by the database message.

##### RESULTS

The client EUT failed to register when it is set to a location with antenna height AGL above the limit.

Test Results	
Pass	Fail
<input checked="" type="checkbox"/>	<input type="checkbox"/>



### CLIENT SOFTWARE WITH AGL ABOVE LIMIT

### BASE SOFTWARE SHOWING FAILED CLIENT REGISTRATION DUE TO AGL LIMIT

**Adaptrum TVBD Control Panel :: Base**

Log | Link | System Information | Diagnostics | Database | Installation

**Registration**

**Device Information:**

DEV\_ID: A2UACRS20F  
DEV\_SN: A2F0JA07  
DEV\_MODE: F  
LAT: 41.40809  
LNG: -75.64332  
Height AGL: 10 meters

**Contact:**

First Name: lin Last Name: sun  
Addr1: 25 E. Trimble Road  
Addr2:  
City: san jose State: CA  
Zip Code: 95131 Country: US  
Email: lin@adaptrum.com  
Work Phone: 408-850-0545 Mobile Phone: 408-850-0545

**Registrant:**

First Name: lin Last Name: sun  
Addr1: 25 E. Trimble Road  
Addr2:  
City: san jose State: CA  
Zip Code: 95131 Country: US  
Email: lin@adaptrum.com  
Work Phone: 408-850-0545 Mobile Phone: 408-850-0545

Register Device

**Channel Request**

**Device Information:**

DEV\_ID: A2UACRS20F  
DEV\_SN: A2F0JA07  
DEV\_MODE: F  
LAT: 41.40809  
LNG: -75.64332  
Height AGL: 10 meters

**Other Information:**

Select From Available DB Channels  
Update Interval:   
Select Cancel  
prism.telcordia.com/tvws/ddi/ddi

BASE MAC: FF:FF:FF:FF:FF:FF 2, 5, 6, 16, 17, 19, 20, 21, 26, 27, 29, 35, 39  
CLIENT MAC: 20:1A:06:2D:18:72

Reset Channel Request

**Device & Channel**

Fixed PPI PPII Test 0 dB Full Power Broadcast Auto Channel CH 20 (509 MHz)

Start/Stop Start Service Stop Service Status Update Status Auto Update

Client 20:1a:06:2d:18:72 Created. Past Logins 0.....14:58:45 02/07/2014  
20:1a:06:2d:18:72 Device Registration .....14:58:47 02/07/2014  
20:1a:06:2d:18:72 Device Registration Failed.....14:58:47 02/07/2014

## 9.1.5. FAILED REGISTRATION – INCOMPLETE CONTACT INFORMATION

### TEST PROCEDURE

- The client EUT uses the same contact information as the base EUT as both the base and the client are managed by the same operator.

### RESULTS

Base software won't proceed with registration when contact information fields are missing.

Test Results	
Pass	Fail
<input checked="" type="checkbox"/>	<input type="checkbox"/>

### BASE SOFTWARE PROMPTING THE USER TO ENTER MISSING CONTACT INFORMATION

The screenshot shows the 'Adaptrum TVBD Control Panel - Base' application. The 'Registration' tab is selected, displaying fields for 'Device Information', 'Contact', and 'Registrant'. The 'Contact' section has a warning dialog box open, indicating that the 'Contact[Email] Field is empty'. The 'Channel Request' tab is also visible, showing 'Device Information' and 'Other Information' fields. The bottom status bar displays a message: 'Base Device Channel List... 11:59:15 02/07/2014 Expires in 24Hours 0Mins 3Secs... 11:59:15 02/07/2014 [ff:ff:ff:ff:ff:ff Channel List Successful (13 Channels)... 11:59:16 02/07/2014]'. The 'Device & Channel' section at the bottom shows 'Fixed' selected, 'Full Power Broadcast' checked, and 'Auto Channel' selected, with 'CH 20 (509 MHz)' displayed.

## 9.2. 15.707(A) FIXED TVBD RELOCATED

### REQUIREMENT

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

### TEST PROCEDURE

- The client EUT geographic coordinates are entered at registration time and stored in the device. The device channel list request uses the same coordinates established at registration time. No separate coordinates can be entered for channel list request.
- The device requires professional installation and device registration information including device location will be entered by the professional installer.
- Once the registration is complete, upon power cycling the device will use the stored registration location for channel list request.

### RESULTS

The device only uses its registered location for channel list request. The device registered location will be established at installation time by a professional installer and cannot be altered after installation – see ACRS 2.0 Professional Installer Manual and ACRS 2.0 User Manual.

Test Results	
Pass	Fail
<input checked="" type="checkbox"/>	<input type="checkbox"/>

**CLIENT SOFTWARE ONLY ALLOWS DEVICE REGISTRATION LOCATION INFORMATION TO BE ENTERED DURING INSTALLATION AND SAME DEVICE LOCATION IS USED FOR CHANNEL LIST REQUEST**

Adaptrum TVBD Control Panel :: Client

Log | Link | System Information | Diagnostics | Database | Installation

Device Configuration

Device Information

DEV\_ID: A2UACRS10

DEV\_SN: A2F0JA10

DEV\_MODE: F

LAT: 41.50809

LNG: -75.64332

Height AGL: 5 meters

Scan Channel Set: 20, 21

Update Now

Set Device Info

Device & Channel

Fixed PPI PPII Test 0 dB

Auto Channel CH 20 (509 MHz)

Start/Stop

Status

Update Status Auto Update

Channel Search Failed On Channel 21.....15:05:29 02/07/2014

Channel Search Started On Channel 20.....15:05:29 02/07/2014

Channel Search Success On Channel 20.....15:05:38 02/07/2014

**BASE SOFTWARE USE CLIENT REGISTRATION LOCATION INFORMATION TO RETRIEVE CHANNEL LIST ON BEHALF OF THE CLIENT**

**Adaptrum TVBD Control Panel :: Base**

Log | Link | System Information | Diagnostics | Database | Installation

Registration

Device Information

DEV\_ID: A2UACRS20F  
DEV\_SN: A2F0JA07  
DEV\_MODE: F  
LAT: 41.40809  
LNG: -75.64332  
Height AGL: 10 meters

Contact

First Name: jin Last Name: sun  
Addr1: 25 E. Trimble Road  
Addr2:  
City: san jose State: CA  
Zip Code: 95131 Country: US  
Email: jin@adaptrum.com  
Work Phone: 408-850-0545 Mobile Phone: 408-850-0545

Registrant

First Name: jin Last Name: sun  
Addr1: 25 E. Trimble Road  
Addr2:  
City: san jose State: CA  
Zip Code: 95131 Country: US  
Email: jin@adaptrum.com  
Work Phone: 408-850-0545 Mobile Phone: 408-850-0545

Register Device

Channel Request

Device Information

DEV\_ID: A2UACRS20F  
DEV\_SN: A2F0JA07  
DEV\_MODE: F  
LAT: 41.40809  
LNG: -75.64332  
Height AGL: 10 meters

Other Information: Select From Available DB Channels

Update Interval:  minutes

BASE MAC: FF:FF:FF:FF:FF:FF 2, 5, 6, 16, 17, 19, 20, 21, 26, 27, 29, 35, 39  
CLIENT MAC: 20:1A:06:2D:18:72 2, 5, 6, 16, 17, 19, 20, 39

Reset Channel Request

Device & Channel

Fixed PPI PPII Test 0 dB Full Power Broadcast Auto Channel CH 20 (509 MHz)

Start/Stop Start Service Stop Service

Status Update Status Auto Update

20:1a:06:2d:18:72 Device Channel List .....15:05:32 02/07/2014  
Expires in 23Hours 59Mins 59Secs.....15:05:32 02/07/2014  
✓ 20:1a:06:2d:18:72 Channel List Successful (8 Channels).....15:05:32 02/07/2014

### 9.3. §15.711(B)(3)(III) FIXED & MODE II TVDB DATABASE UPDATE

#### REQUIREMENT

- §15.711(B)(3)(III) If a fixed or Mode II personal/portable TVBD fails to successfully contact the TV bands database during any given day, it may continue to operate until 11:59 p.m. of the following day at which time it must cease operations until it re-establishes contact with the TV bands database and re-verifies its list of available channels.

Confirm that Block access to the database from the TVBD. All other radio functions, including internet connectivity should be maintained. Confirm that the TVBD shuts down by 11:59 PM on the following day.

#### TEST PROCEDURE

- Set the base EUT to normal operation mode.
- Set the client EUT to normal operation mode:
  - Enter proper registration information on the client.
  - Choose a proper set of scan channels on the client that includes the base operating channel.
  - The client sends connection request to the base.
  - The base performs registration and channel list request on behalf of the client.
  - The base verifies the current operating channel is in the returned client channel list and grants the client connection request and sends the client channel list to the client.
  - The client verifies its operating channel is in the client device channel list and enters normal operation.
- Observe output signal from the client EUT on the spectrum analyzer.
- Use a programmable router to block the database URL.
- Observe that there is no output signal from the client after 11:59 PM on the following day.

#### RESULTS

During normal operation, the base and client channel lists are updated periodically by sending channel list requests to the TVWS Database . Currently the period is set to 5 minutes. After the database access was blocked, the next channel list requests failed and the EUTs stopped transmission immediately.

Test Results	
Pass	Fail
<input checked="" type="checkbox"/>	<input type="checkbox"/>

### BASE SOFTWARE BEFORE DATABASE BLOCKING (CLIENT/BASE ON CHANNEL 20)

**Adaptrum TVBD Control Panel :: Base**

Log | Link | System Information | Diagnostics | Database | Installation

**Registration**

**Device Information:**

DEV\_ID: A2UACRS20F  
DEV\_SN: A2F0JA07  
DEV\_MODE: F  
LAT: 41.40809  
LNG: -75.64332  
Height AGL: 10 meters

**Contact:**

First Name: lin Last Name: sun  
Addr1: 25 E. Trimble Road  
Addr2:  
City: san jose State: CA  
Zip Code: 95131 Country: US  
Email: lin@adaptrum.com  
Work Phone: 408-850-0545 Mobile Phone: 408-850-0545

**Registrant:**

First Name: lin Last Name: sun  
Addr1: 25 E. Trimble Road  
Addr2:  
City: san jose State: CA  
Zip Code: 95131 Country: US  
Email: lin@adaptrum.com  
Work Phone: 408-850-0545 Mobile Phone: 408-850-0545

Register Device

**Channel Request**

**Device Information:**

DEV\_ID: A2UACRS20F  
DEV\_SN: A2F0JA07  
DEV\_MODE: F  
LAT: 41.40809  
LNG: -75.64332  
Height AGL: 10 meters

**Other Information:**

Select From Available DB Channels  
Update Interval:   
Select Cancel  
prism.telcordia.com/tvws/ddi/ddi

BASE MAC: FF:FF:FF:FF:FF:FF 2, 5, 6, 16, 17, 19, 20, 21, 26, 27, 29, 35, 39  
CLIENT MAC: 20:1A:06:2D:18:72 2, 5, 6, 16, 17, 19, 20, 39

Reset Channel Request

**Device & Channel**

Fixed PPI PPII Test 0 dB Full Power Broadcast Auto Channel CH 20 (509 MHz)

Start/Stop Start Service Stop Service Status Update Status Auto Update

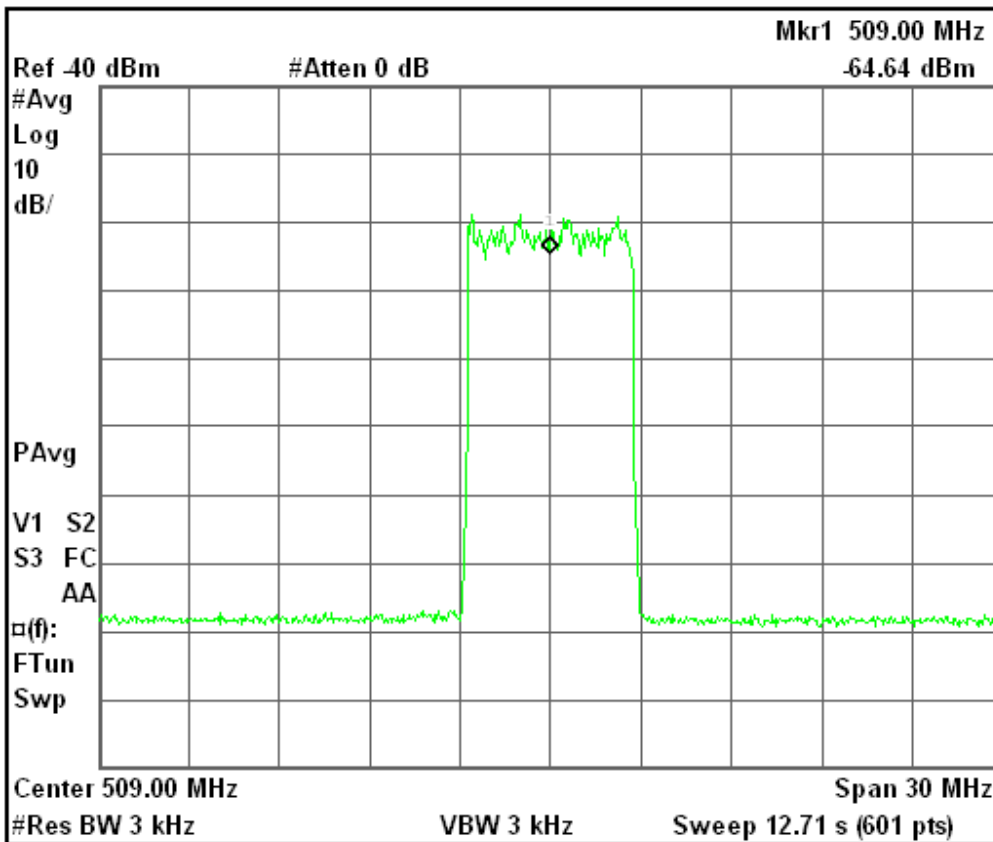
20:1a:06:2d:18:72 Device Channel List .....15:20:32 02/07/2014  
Expires in 24Hours 0Mins 0Secs.....15:20:32 02/07/2014  
✓ 20:1a:06:2d:18:72 Channel List Successful (8 Channels).....15:20:32 02/07/2014



# CLIENT SIGNAL SPECTRUM BEFORE DATABASE BLOCKING

Agilent 20:36:34 Feb 7, 2014

R T



Freq/Channel
Center Freq 509.000000 MHz
Start Freq 494.000000 MHz
Stop Freq 524.000000 MHz
CF Step 3.00000000 MHz Auto Man
Freq Offset 0.00000000 Hz
Signal Track On Off

Copyright 2000-2010 Agilent Technologies

### BASE SOFTWARE 5 MINUTES AFTER DATABASE BLOCKING (CLIENT STOPPED)

**Adaptrum TVBD Control Panel - Base**

Log | Link | System Information | Diagnostics | Database | Installation

**Registration**

Registration	Contact	Registrant
<b>Device Information</b> DEV_ID: A2UACRS20F DEV_SN: A2FQJA07 DEV_MODE: F LAT: 41.40809 LNG: -75.64332 Height AGL: 10 meters	<b>Contact</b> First Name: lin Last Name: sun Addr1: 25 E. Trimble Road Addr2: City: san jose State: CA Zip Code: 95131 Country: US Email: lin@adaptrum.com Work Phone: 408-850-0545 Mobile Phone: 408-850-0545	<b>Registrant</b> First Name: lin Last Name: sun Addr1: 25 E. Trimble Road Addr2: City: san jose State: CA Zip Code: 95131 Country: US Email: lin@adaptrum.com Work Phone: 408-850-0545 Mobile Phone: 408-850-0545

Register Device

**Channel Request**

Device Information	Other Information	Channel Request
<b>Device Information</b> DEV_ID: A2UACRS20F DEV_SN: A2FQJA07 DEV_MODE: F LAT: 41.40809 LNG: -75.64332 Height AGL: 10 meters	<b>Other Information</b> Select From Available DB Channels Update Interval: prism.telcordia.com/tyws/dd/ddi	<b>Channel Request</b> BASE MAC: FF:FF:FF:FF:FF:FF CLIENT MAC: 20:1A:06:2D:18:72 Reset Channel Request

**Device & Channel**

Fixed PPI PPIL Test 0 dB Full Power Broadcast Auto Channel CH 20 (509 MHz) Start/Stop Status

Start Service Stop Service Update Status Auto Update

ff:ff:ff:ff:ff:ff Channel List Failed (0 Channels).....15:25:00 02/07/2014

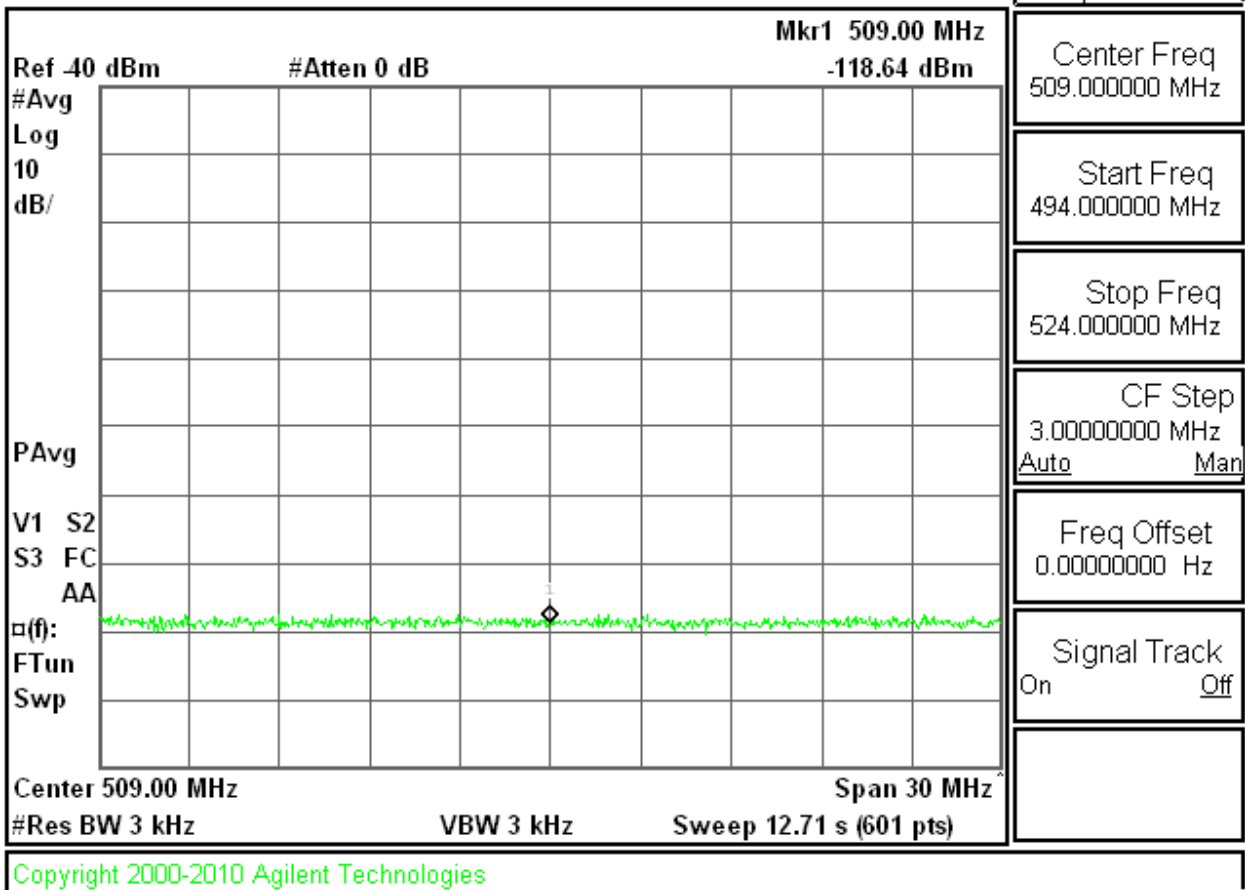
20:1a:06:2d:18:72 Device Channel List .....15:25:27 02/07/2014

20:1a:06:2d:18:72 Channel List Failed (0 Channels).....15:25:27 02/07/2014

# CLIENT SIGNAL SPECTRUM ~5 MINUTES AFTER DATABASE BLOCKING

Agilent 20:41:30 Feb 7, 2014

R T



#### **9.4. §15.711(B)(3)(I)(II), §15.713(A)(1) 48 HOUR CHANNEL SCHEDULING**

##### **REQUIREMENT**

- After receiving an available channel list, register a low-power auxiliary device on the TVBD operating channel. Repeat the available channel request after the update interval and confirm that the low-power device is accounted for in the schedule. Using the system management software, confirm that the device changes channels at the scheduled time.

##### **TEST PROCEDURE**

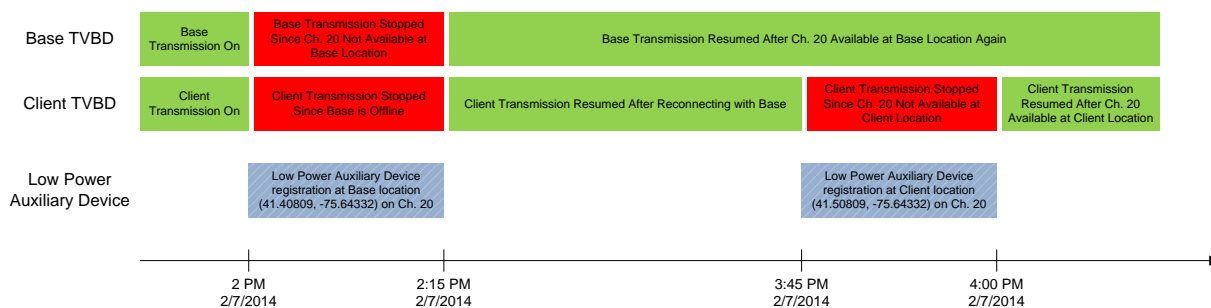
- Referring to the following testing timeline diagram. Low Power Auxiliary Devices are registered and scheduled for protection at both base and client locations, i.e. from 2 PM to 2:15 PM on 2/7/2014 at base location and from 3:45 PM to 4:00 PM on 2/7/2014 at client location.
- The base and client EUTs are in normal operation prior to the time when the Low Power Auxiliary Device protection period begins at the client location (3:45 PM on 2/7/2014).
- Upon channel list request to the TVWS Database , the base obtains the updated channel list expiration time for the client (at 3:45 PM on 2/7/2014) and sends the information to the client
- The base requests new client channel list upon the channel list expiration (3:45 PM on 2/7/2014) and the current operating channel (Channel 20) is no longer in the returned client channel list. The base sends the information to the client.
- The client ceases operation on Channel 20 immediately after receiving the updated channel list information from the base.
- The base continues sending periodic client channel list requests to the TVWS Database . The returned channel list expiration time (4:00 PM on 2/7/2014) reflecting the ending time of the registered protection period for the Low Power Auxiliary Device at the client location.
- The base requests new channel list for the client upon the channel list expiration (4:00 PM on 2/7/2014) and Channel 20 becomes available again. The base send the updated client channel list to the client.
- The client reconnects with the base and starts normal operation on Channel 20 after receiving the updated channel list that includes Channel 20.

## RESULTS

The client EUT correctly ceased transmission on the protected channel over the protection period of the Low Power Auxiliary Device at the same location.

Test Results	
Pass	Fail
<input checked="" type="checkbox"/>	<input type="checkbox"/>

### 48 HOUR CHANNEL SCHEDULING TESTING TIMELINE ILLUSTRATION



## 48 HOUR CHANNEL SCHEDULING LOW POWER AUXILIAR DEVICE REGISTRATION RECORD AT CLIENT LOCATION

Contour Visualization x Telcordia TVWS Registration x New Tab x

← → × <https://prism.telcordia.com/tvws/dev/reg/lpad-reg/details?id=14496> ☆ ☰

**iconectiv**  
experience  
performance  
results

**NAVIGATION**  
Home  
FAQ  
Channel Availability

**REGISTRATION**  
Registration Home  
• Licensed Mic  
• Unlicensed Mic  
• MVPD (Cable Headend)  
• Temporary BAS Links  
Supporting Objects  
• Contacts List  
• Owners List  
Change Password  
Sign Out

**Telcordia**

Note: You're reached the NEW TRUNK RegSite running on the host WS01DV01 .  
Configuration work is IN PROGRESS.

**Telcordia US TV White Space Registration Site**

Record Saved  
You've successfully created the registration record.

Details for LP-Aux Registration

[Edit](#) [Back](#) [List All](#)

Global Record ID:	140207TELC0000008
Owner:	Adaptrum (San Jose, CA) 🔍
Contact:	Haiyun Tang 🔍
Operating mode:	Licensed
Region type:	Point
WKT Geometry:	GEOMETRYCOLLECTION (POINT (-75.64332 41.50809))
TV Channels:	20
Call Sign:	WABC-TV
Start:	2014-02-07 15:45 PT
Duration:	15 mins
Recurrence:	Once

Waiting for prism.telcordia.com....

## 48 HOUR CHANNEL SCHEDULING BASE SOFTWARE BEFORE PROTECTION PERIOD FOR THE CLIENT LOCATION

**Adaptrum TVBD Control Panel :: Base**

Log | Link | System Information | Diagnostics | Database | Installation

**Registration**

**Device Information**

DEV\_ID: A2UACRS20F  
DEV\_SN: A2FBJA07  
DEV\_MODE: F  
LAT: 41.40809  
LNG: -75.64332  
Height AGL: 10 meters

**Contact**

First Name: jin Last Name: sun  
Addr1: 25 E. Trimble Road  
Addr2:  
City: san jose State: CA  
Zip Code: 95131 Country: US  
Email: jin@adaptrum.com  
Work Phone: 408-850-0545 Mobile Phone: 408-850-0545

**Registrant**

First Name: jin Last Name: sun  
Addr1: 25 E. Trimble Road  
Addr2:  
City: san jose State: CA  
Zip Code: 95131 Country: US  
Email: jin@adaptrum.com  
Work Phone: 408-850-0545 Mobile Phone: 408-850-0545

Register Device

**Channel Request**

**Device Information**

DEV\_ID: A2UACRS20F  
DEV\_SN: A2FBJA07  
DEV\_MODE: F  
LAT: 41.40809  
LNG: -75.64332  
Height AGL: 10 meters

**Other Information:** Select From Available DB Channels  
Update Interval:   
prism.telcordia.com/tvws/ddi/ddi

BASE MAC: FF:FF:FF:FF:FF:FF 2, 5, 6, 16, 17, 19, 20, 21, 26, 27, 29, 35, 39  
CLIENT MAC: 20:1A:06:2D:18:72 2, 5, 6, 16, 17, 19, 20, 39

Reset Channel Request

**Device & Channel**

Fixed PPI PPII Test 0 dB Full Power Broadcast Auto Channel CH 20 (509 MHz)

Start/Stop Start Service Stop Service

Status Update Status Auto Update

✓ ff:ff:ff:ff:ff:ff Channel List Successful (13 Channels).....15:33:02 02/07/2014  
20:1a:06:2d:18:72 Device Channel List .....15:38:34 02/07/2014  
Expires in 0Hours 6Mins 26Secs.....15:38:34 02/07/2014  
✓ 20:1a:06:2d:18:72 Channel List Successful (8 Channels).....15:38:35 02/07/2014

## **48 HOUR CHANNEL SCHEDULING CLIENT SOFTWARE BEFORE PROTECTION PERIOD FOR THE CLIENT LOCATION**

Adaptrum TVBD Control Panel :: Client

Log | Link | System Information | Diagnostics | Database | Installation

Device Configuration

Device Information

DEV\_ID: A2UACRS10

DEV\_SN: A2FQJA10

DEV\_MODE: F

LAT: 41.50809

LNG: -75.64332

Height AGL: 5 meters

Scan Channel Set: 20, 21, 22

Update Now

Set Device Info

Device & Channel

Fixed PPI PPII Test 0 dB

Auto Channel CH 20 (509 MHz)

Start/Stop

Status

Update Status Auto Update

Channel Search Failed On Channel 22.....15:28:56 02/07/2014

Channel Search Started On Channel 20.....15:28:56 02/07/2014

Channel Search Success On Channel 20.....15:29:09 02/07/2014

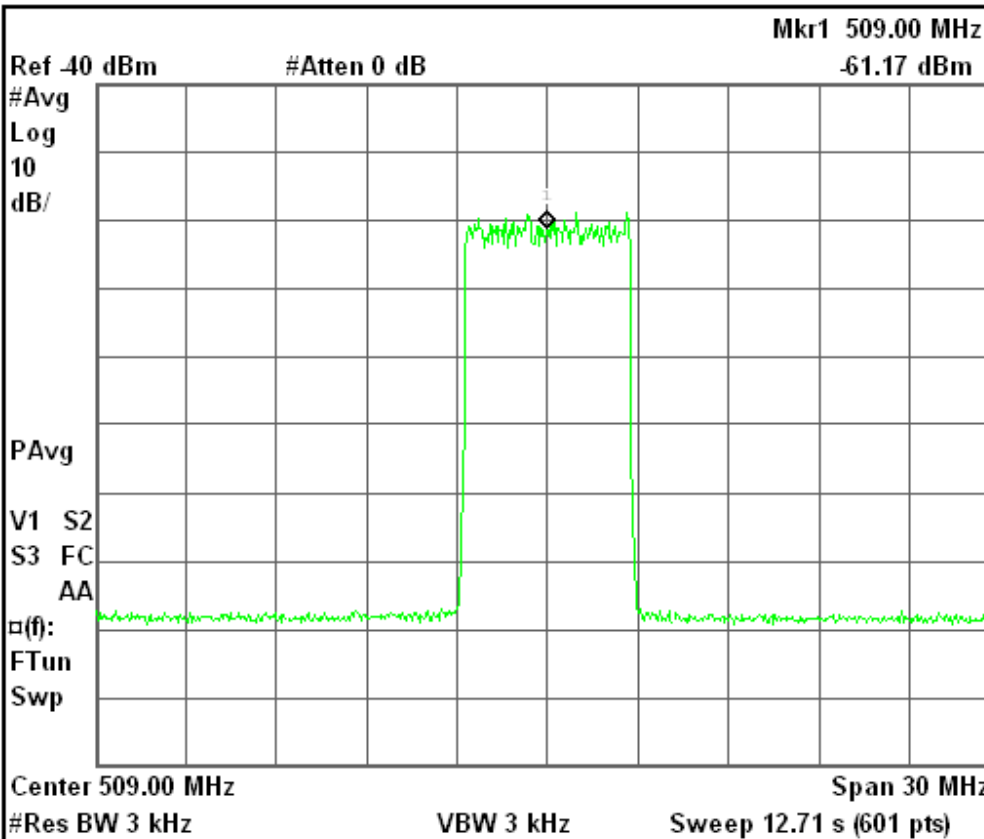


**48 HOUR CHANNEL SCHEDULING ACTIVE CLIENT SIGNAL SPECTRUM PRIOR TO PROTECTION PERIOD**

Agilent 20:45:06 Feb 7, 2014

R T

Freq/Channel



Center Freq  
509.000000 MHz

Start Freq  
494.000000 MHz

Stop Freq  
524.000000 MHz

CF Step  
3.00000000 MHz  
Auto Man

Freq Offset  
0.00000000 Hz

Signal Track  
On Off

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**48 HOUR CHANNEL SCHEDULING BASE SOFTWARE DURING PROTECTION PERIOD FOR THE CLIENT LOCATION (CHANNEL 20 NOT AVAILABLE AT THE CLIENT LOCATION)**

**Adaptrum TVBD Control Panel :: Base**

Log | Link | System Information | Diagnostics | Database | Installation

**Registration**

**Device Information**

DEV\_ID: A2UACRS20F  
DEV\_SN: A2FBJA07  
DEV\_MODE: F  
LAT: 41.40809  
LNG: -75.64332  
Height AGL: 10 meters

**Contact**

First Name: lin Last Name: sun  
Addr1: 25 E. Trimble Road  
Addr2:  
City: san jose State: CA  
Zip Code: 95131 Country: US  
Email: lin@adaptrum.com  
Work Phone: 408-850-0545 Mobile Phone: 408-850-0545

**Registrant**

First Name: lin Last Name: sun  
Addr1: 25 E. Trimble Road  
Addr2:  
City: san jose State: CA  
Zip Code: 95131 Country: US  
Email: lin@adaptrum.com  
Work Phone: 408-850-0545 Mobile Phone: 408-850-0545

Register Device

**Channel Request**

**Device Information**

DEV\_ID: A2UACRS20F  
DEV\_SN: A2FBJA07  
DEV\_MODE: F  
LAT: 41.40809  
LNG: -75.64332  
Height AGL: 10 meters

**Other Information:** Select From Available DB Channels  
Update Interval:   
prism.telcordia.com/tvws/ddi/ddi

BASE MAC: FF:FF:FF:FF:FF:FF 2, 5, 6, 16, 17, 19, 20, 21, 26, 27, 29, 35, 39  
CLIENT MAC: 20:1A:06:2D:18:72 2, 5, 6, 16, 17, 19, 39

Reset Channel Request

**Device & Channel**

Fixed PPI PPII Test 0 dB Full Power Broadcast Auto Channel CH 20 (509 MHz)

Start/Stop Start Service Stop Service

Status Update Status Auto Update

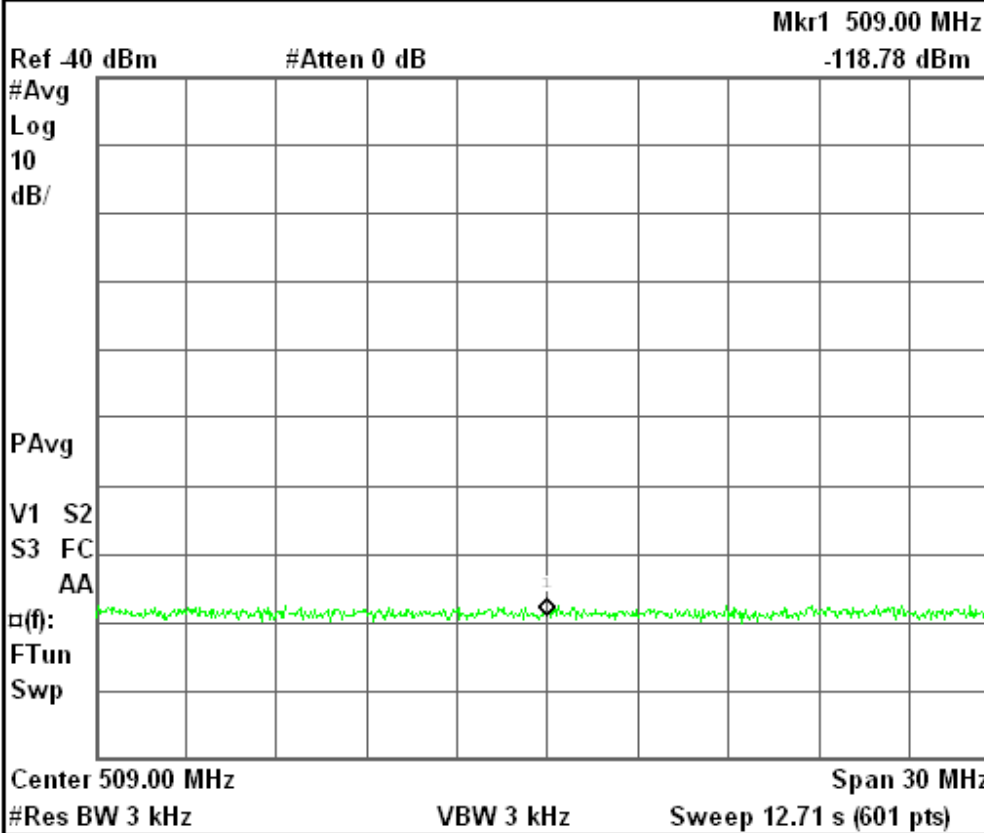
20:1a:06:2d:18:72 Device Channel List .....15:45:38 02/07/2014  
Expires in 0Hours 14Mins 22Secs.....15:45:38 02/07/2014  
✓ 20:1a:06:2d:18:72 Channel List Successful (7 Channels).....15:45:38 02/07/2014

**48 HOUR CHANNEL SCHEDULING CLIENT SIGNAL NOT ACTIVE DURING THE PROTECTION PERIOD**

Agilent 21:03:22 Feb 7, 2014

R T

Freq/Channel



Center Freq  
509.000000 MHz

Start Freq  
494.000000 MHz

Stop Freq  
524.000000 MHz

CF Step  
3.00000000 MHz  
Auto Man

Freq Offset  
0.00000000 Hz

Signal Track  
On Off

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**48 HOUR CHANNEL SCHEDULING BASE SOFTWARE AFTER PROTECTION PERIOD FOR THE CLIENT LOCATION (CHANNEL 20 AVAILABLE AGAIN)**

**Adaptrum TVBD Control Panel :: Base**

Log | Link | System Information | Diagnostics | Database | Installation

**Registration**

**Device Information**

DEV\_ID: A2UACRS20F  
DEV\_SN: A2FBJA07  
DEV\_MODE: F  
LAT: 41.40809  
LNG: -75.64332  
Height AGL: 10 meters

**Contact**

First Name: jin Last Name: sun  
Addr1: 25 E. Trimble Road  
Addr2:  
City: san jose State: CA  
Zip Code: 95131 Country: US  
Email: jin@adaptrum.com  
Work Phone: 408-850-0545 Mobile Phone: 408-850-0545

**Registrant**

First Name: jin Last Name: sun  
Addr1: 25 E. Trimble Road  
Addr2:  
City: san jose State: CA  
Zip Code: 95131 Country: US  
Email: jin@adaptrum.com  
Work Phone: 408-850-0545 Mobile Phone: 408-850-0545

Register Device

**Channel Request**

**Device Information**

DEV\_ID: A2UACRS20F  
DEV\_SN: A2FBJA07  
DEV\_MODE: F  
LAT: 41.40809  
LNG: -75.64332  
Height AGL: 10 meters

**Other Information:** Select From Available DB Channels  
Update Interval:   
prism.telcordia.com/tvws/ddi/ddi

BASE MAC: FF:FF:FF:FF:FF:FF 2, 5, 6, 16, 17, 19, 20, 21, 26, 27, 29, 35, 39  
CLIENT MAC: 20:1A:06:2D:18:72 2, 5, 6, 16, 17, 19, 20, 39

Reset Channel Request

**Device & Channel**

Fixed PPI PPII Test 0 dB Full Power Broadcast Auto Channel CH 20 (509 MHz)

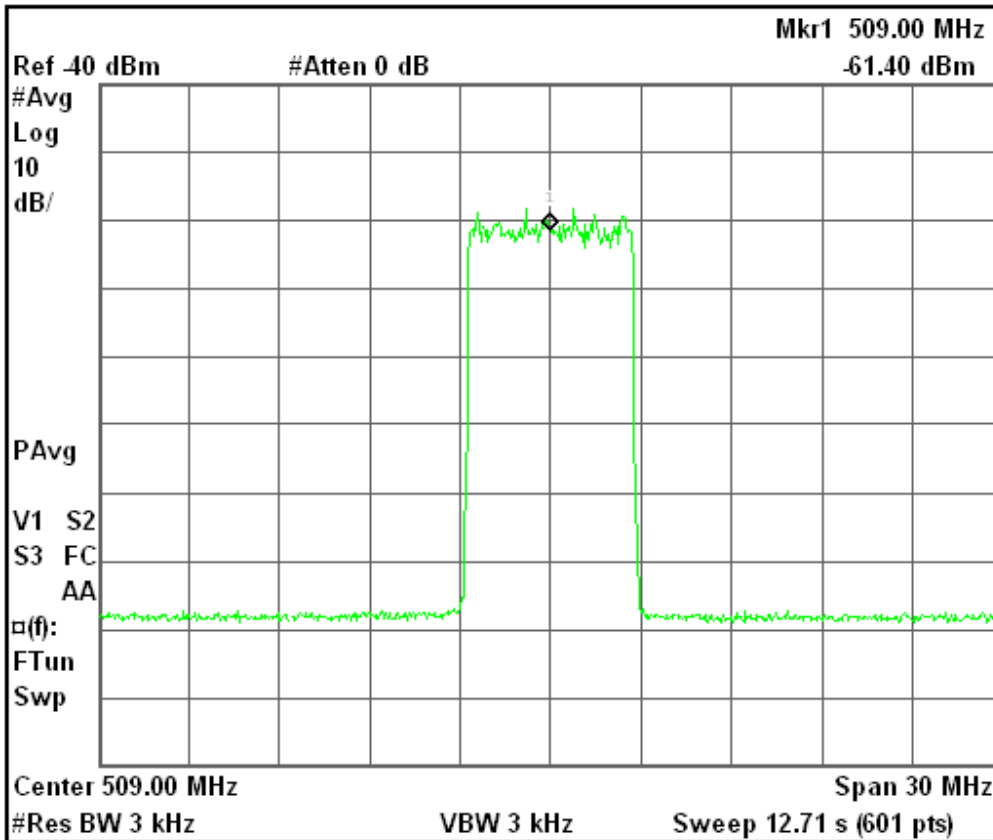
Start/Stop Start Service Stop Service Status Update Status Auto Update

20:1a:06:2d:18:72 Device Channel List .....16:00:11 02/07/2014  
Expires in 23Hours 59Mins 59Secs.....16:00:11 02/07/2014  
✓ 20:1a:06:2d:18:72 Channel List Successful (8 Channels).....16:00:11 02/07/2014

**48 HOUR CHANNEL SCHEDULING CLIENT SIGNAL RESUMED AFTER THE PROTECTION PERIOD**

Agilent 21:16:28 Feb 7, 2014

R T



Freq/Channel
Center Freq 509.000000 MHz
Start Freq 494.000000 MHz
Stop Freq 524.000000 MHz
CF Step 3.00000000 MHz Auto Man
Freq Offset 0.00000000 Hz
Signal Track On Off

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## 9.5. §15.707, §15.711(B)(3)(I)(II)(IV),(C), §15.712 TVBD CHANNEL AVAILABILITY

### REQUIREMENT

- 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

- Set the base EUT to normal operation (on Channel 20).
- Configure the client EUT with correct registration information.
- Configure the client with proper scan channel set that includes the base EUT operating channel. The client will issue connection request to the base.
- Observe the base performing device registration and channel list request on behalf of the client. The base operating channel is within the returned channel list for the client.
- The base grants connection request from the client and the client starts normal operation on the channel (Channel 20).
- The client EUT can only operate on a channel if all of the following are true:
  - The channel is within the authorized channel list for the base
  - The channel is the current operating channel of the base EUT
  - The channel is within the authorized channel list for the client
  - The channel is within the client device operating frequency range, i.e. 470 – 698 MHz (Channels 14 – 51 excluding Channels 36 to 38) as approved by FCC for ACRS 2.0 Fixed TVBD.
- Test pre-condition: The device is configured to operate at a power level less than or equal to that which is authorized by the Grant.
- Upon successful registration the database returns the allowable power according to the device type, Fixed 36 dBm eirp in this example.
- Verify the client transmission on the spectrum analyzer.

### RESULTS

The EUT operates on a channel from the authorized channel list and at the authorized power level.

Refer to the testing in Section 0, when the base EUT operating channel (Channel 20) was no longer in the channel list authorized for the client, the client ceased operation on the channel immediately. The testing verifies that the client EUT cannot operate on any channel other than those within the authorized channel list for the client returned from the TVWS Database .

Test Results	
Pass	Fail
<input checked="" type="checkbox"/>	<input type="checkbox"/>

**CLIENT SOFTWARE SHOWING CLIENT SCANNING AND MAKING CONNECTION WITH THE BASE ON CHANNEL 20**

The screenshot displays the 'Adaptrum TVBD Control Panel :: Client' window. The top menu bar includes 'Log', 'Link', 'System Information', 'Diagnostics', 'Database', and 'Installation'. The main area is divided into two sections. The 'Device Configuration' section contains a 'Device Information' panel with fields for DEV\_ID (A2UACRS10), DEV\_SN (A2F0JA10), DEV\_MODE (F), LAT (41.50809), LNG (-75.64332), and Height AGL (5 meters). To the right, the 'Scan Channel Set' is configured to '20, 21, 22' with an 'Update Now' button. The 'Device & Channel' section at the bottom features a 'Fixed' radio button, a 'PPI' radio button, a 'Test' radio button, a '0 dB' dropdown, an 'Auto Channel' checkbox, a 'CH 20 (509 MHz)' dropdown, a 'Start/Stop' button, and a 'Status' panel with 'Update Status' and 'Auto Update' options. A log window at the bottom shows three entries: 'Channel Search Started On Channel 20' at 15:59:06 on 02/07/2014, 'Channel Search Success On Channel 20' at 16:00:17 on 02/07/2014, and 'Channel Search Success On Channel 20' at 16:04:44 on 02/07/2014. The last two entries are marked with green checkmarks and are highlighted in blue.

Channel Search	Time	Date
Channel Search Started On Channel 20	15:59:06	02/07/2014
Channel Search Success On Channel 20	16:00:17	02/07/2014
Channel Search Success On Channel 20	16:04:44	02/07/2014

## BASE SOFTWARE SHOWING SUCCESSFUL CLIENT CHANNEL LIST REQUEST

**Adaptrum TVBD Control Panel - Base**

Log | Link | System Information | Diagnostics | Database | Installation

**Registration**

**Device Information**

DEV\_ID: A2UACRS20F  
DEV\_SN: A2FBJA07  
DEV\_MODE: F  
LAT: 41.40809  
LNG: -75.64332  
Height AGL: 10 meters

**Contact**

First Name: lin Last Name: sun  
Addr1: 25 E. Trimble Road  
Addr2:  
City: san jose State: CA  
Zip Code: 95131 Country: US  
Email: lin@adaptrum.com  
Work Phone: 408-850-0545 Mobile Phone: 408-850-0545

**Registrant**

First Name: lin Last Name: sun  
Addr1: 25 E. Trimble Road  
Addr2:  
City: san jose State: CA  
Zip Code: 95131 Country: US  
Email: lin@adaptrum.com  
Work Phone: 408-850-0545 Mobile Phone: 408-850-0545

Register Device

**Channel Request**

**Device Information**

DEV\_ID: A2UACRS20F  
DEV\_SN: A2FBJA07  
DEV\_MODE: F  
LAT: 41.40809  
LNG: -75.64332  
Height AGL: 10 meters

**Other Information:** Select From Available DB Channels

Update Interval: [ ] Select Cancel

prism.telcordia.com/tvws/ddi/ddi

BASE MAC: FF:FF:FF:FF:FF:FF 2, 5, 6, 16, 17, 19, 20, 21, 26, 27, 29, 35, 39  
CLIENT MAC: 20:1A:06:2D:18:72 2, 5, 6, 16, 17, 19, 20, 39

Reset Channel Request

**Device & Channel**

Fixed PPI PPII Test 0 dB Full Power Broadcast Auto Channel CH 20 (509 MHz)

Start/Stop Start Service Stop Service Status Update Status Auto Update

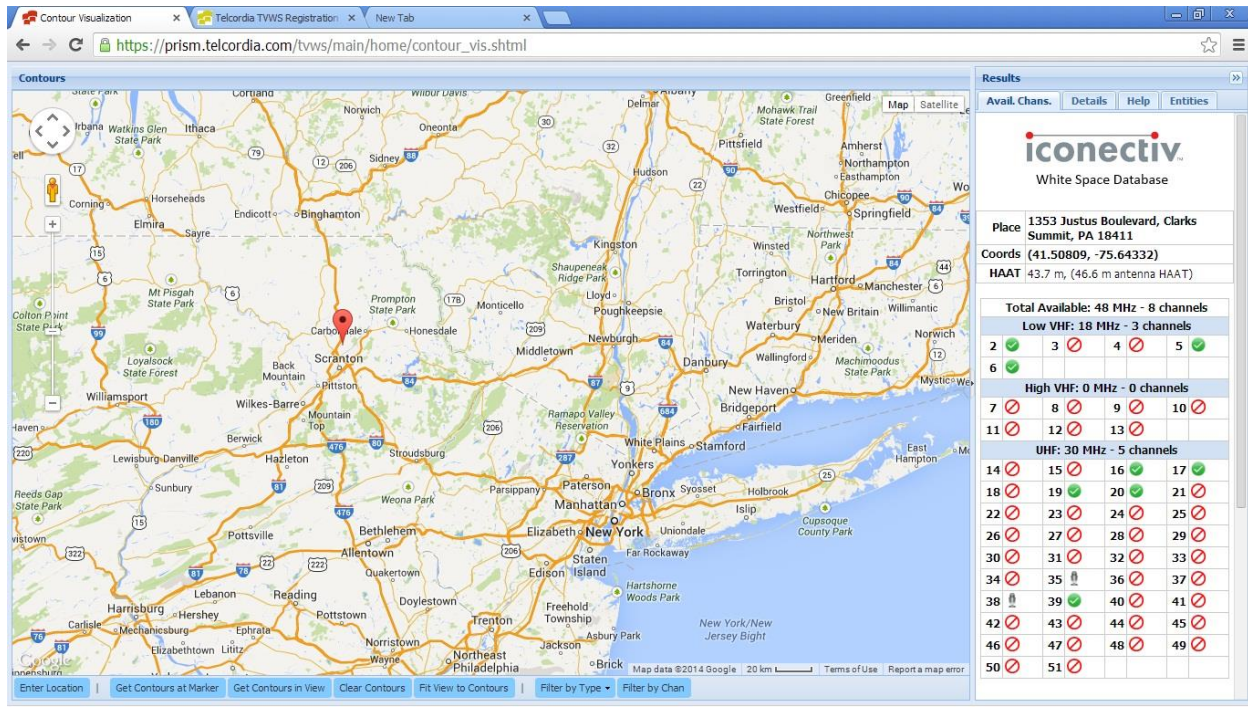
Expires in 23Hours 59Mins 59Secs.....16:04:38 02/07/2014

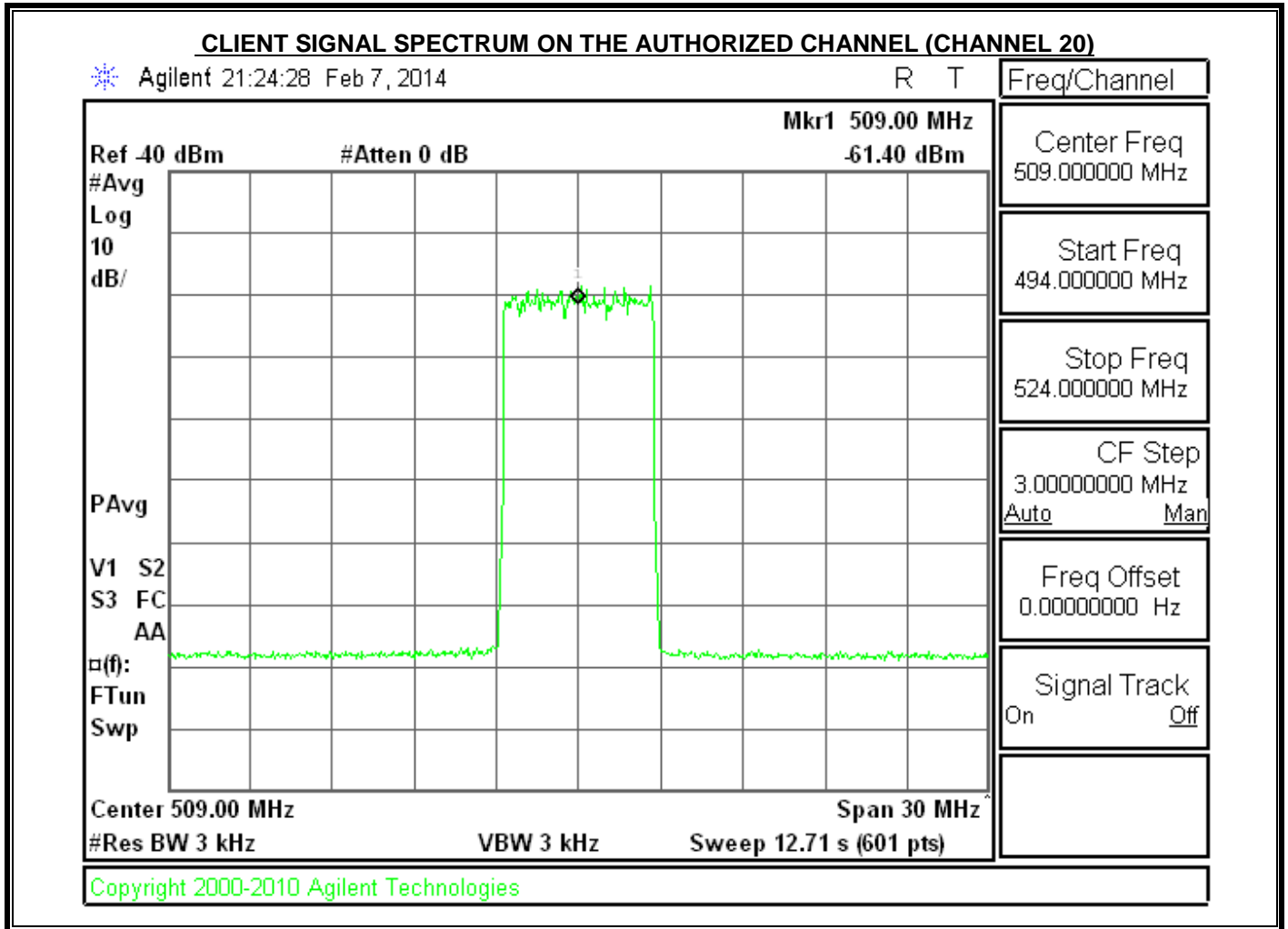
✓ ff:ff:ff:ff:ff:ff Channel List Successful (13 Channels).....16:04:38 02/07/2014

✓ 20:1a:06:2d:18:72 Channel List Successful (8 Channels).....16:04:38 02/07/2014



**TELCORDIA WEB INTERFACE SHOWING AUTHORIZED CHANNELS AT THE DEVICE LOCATION. NOTE ONLY A SUBSET (CHANNELS 16, 17, 19, 20 AND 39) OF THE 8 AVAILABLE CHANNELS ARE WITHIN THE ACRS 2.0 TVBD CLIENT OPERATING FREQUENCY RANGE.**





## **9.6. §15.715(F) SECURITY**

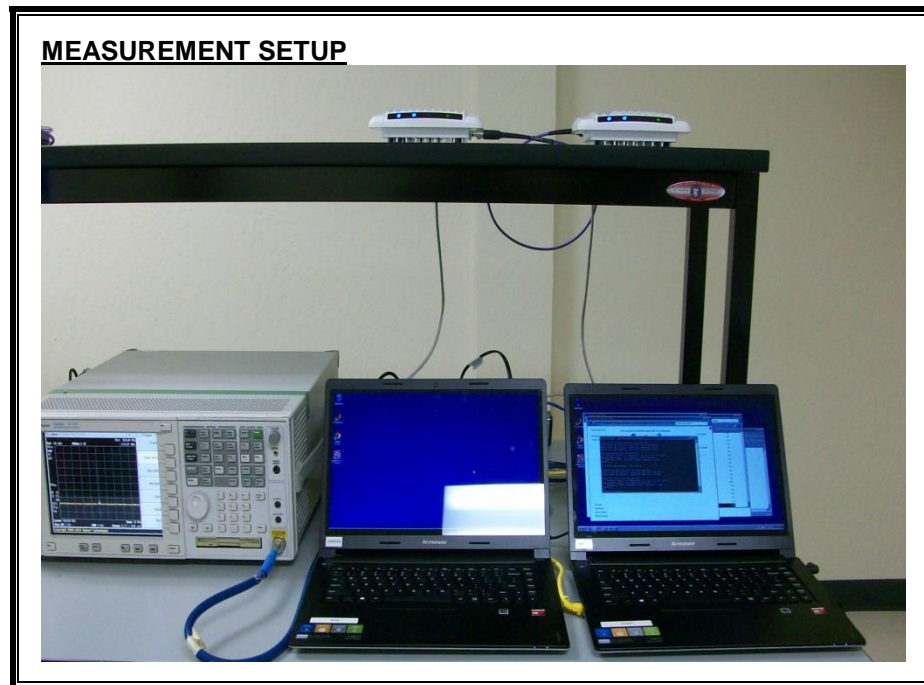
### **REQUIREMENT**

- The device operations procedures must include documentation with a detailed explanation of the following for each database the device is expected to work with:
  - i. What communication protocol is used between the database and the TVBD?
  - ii. How are communications initiated?
  - iii. How does the TVBD validate messages from the database?
  - iv. How does the device handle failure to communicate or authenticate the database?
  - v. How does the database validate messages from a TVBD?
  - vi. What encryption method is used?
  - vii. How does the database ensure secure registration of protected devices?

### **ANSWERS**

See answers in Section 8.6. Applicable to BASE and Client stations.

## 10. SETUP PHOTOS



**BASE STATION**



**CLIENT STATION**



**END OF REPORT**