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RADIO TEST REPORT

Report ID:

REP107975

Project number

PRJ0079248

Applicant:

Emergent Solutions Inc.

Product type:

Television Band Device (TVBD)

Model:

EBR100MODX

FCC identifier:

FCC ID: 2BOHX-EBR100MODX

ISED Certification Number:

IC: 33834-EBR100MODX

Specifications:

- ◆ FCC 47 CFR Part 15 Subpart H, §15.713
- ◆ RSS-222, Issue 4, November 2024

Date of issue: September 3, 2025

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Test location

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Site number	FCC: CA2040; (3 m semi anechoic chamber)		

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.

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Section 1. Report summary

1.1 Applicant and manufacturer

Company name	Emergent Solutions Inc.
Address	1801 Woodward Drive
City	Ottawa
Province/State	ON
Postal/Zip code	K2C 0R3
Country	Canada

1.2 Test specifications

FCC 47 CFR Part 15, Subpart H RSS-222, Issue 4 November 2024	White Space Devices White Space Devices (WSDs)
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1.3 Test methods

KDB 416721 D01 v03	White Space Test Procedures
DBS-01, Issue 3, October 4, 2021	White Space Database Specifications

1.4 Statement of compliance

In the configuration tested, the EUT was found compliant.

Testing was performed against all relevant requirements of the test standard except as noted in section 1.5 below. Results obtained indicate that the product under test complies in full with the requirements tested. The test results relate only to the items tested.

This White Space Device incorporates geolocation capability with a confidence level of 95% that conforms to the requirements specified in RSS-222, Section 12 (Geolocation requirements for fixed WSDs). The manufacturer takes full responsibility for the conformity of the geolocation capability to RSS-222 requirements and commits to maintaining this conformity throughout the product's lifecycle.

See "Summary of test results" for full details.

1.5 Exclusions

None

1.6 Test report revision history

Revision #	Date of issue	Details of changes made to test report
REP107975	September 3, 2025	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 (postal) 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)(1)	48-hour channel scheduling	Pass
§15.713(a)(3)	Relocation of fixed TVBD	Pass
§15.711(c)(2)(i)	Fixed & Mode II TVDB database update	Pass
§15.711(c)(2)(iii)	Low-power auxiliary device protection	Pass
§15.712	Interference protection requirements (Fixed and personal/portable)	Pass
§15.711(c)(2)(ii)	Fixed and Mode II Power level reduction	Pass
§15.711(j)	Security	Pass

Notes: FCC §15.711(g) – Identifying Information:

Compliance with §15.711(g) has been demonstrated through the registration tests documented in the table above §15.713(g)(3).

The EBR100MODX transmits the required identifying information, including device identification and geographic coordinates, as verified by the FCC test data.

All tests have passed, confirming compliance with FCC §15.711(g).

2.2 RSS-222 test results

Part	Test description	Verdict
13.2.1	Fixed WSDs: Initialization	Pass
13.2.2	Fixed WSDs: WSDB update	Pass
13.2.3	Fixed WSDs: Failure to contact the WSDB	Pass
13.2.4	Fixed WSDs: No direct connection to the Internet	Not applicable ¹
13.2.5	Fixed WSDs: Power loss	Not applicable ²
DBS-01 11.2	Registration of licensed LPAs	Pass
DBS-01 14.4	Height limits	Pass

Notes: ¹ DUT requires direct WSDB connection; relay mode not supported.

² As per manufacturer, power off test was not performed as the device requires manual start after power restoration.

RSS-222 Annex A Confirmation:

The EBR100MODX has been evaluated as a Fixed White Space Device (WSD). In accordance with RSS-222 Annex A, the device complies with the applicable requirements for this WSD type.

The device incorporates database access, transmit power control, and geolocation features, and operates only within the parameters authorized by the White Space Database (WSDB). As a fixed device, it does not operate in personal/portable Mode I or Mode II configurations.

This statement confirms compliance with the confirmation requirements of RSS-222 Annex A.

Section 3. Equipment under test (EUT) details

3.1 Sample information

Receipt date	June 24, 2025
Nemko sample ID number	PRJ00792480001

3.2 EUT information

Product name	EBR100 Platform
Model	EBR100MODX
Serial number	SCU as 317VL25260001 and the SSU as 317VL25260002

3.3 Technical information

Frequency band	470–602 MHz (channels 14–35)
Channel BW	6, 12, 24 MHz
Type of modulation	OFDM (BPSK to 64QAM)
Power requirements	120 VAC 60 Hz or 48 V _{DC} via PoE
WSD Class	Class A and B
WSD Type:	Fixed
Narrowband device	N/A
Implementation of TPC	Yes
Determination of geographic coordinates	Via GPS with 95% confidence level
Antenna gains	9 dBi, 12 dBi
Cable loss	1 dB

3.4 Product description and theory of operation

The EBR100MODX is a 2x2 MIMO broadband radio that provides high capacity, long range communications links. Operating across 470-602MHz band, the EBR100MODX is configured via firmware options and electronic feature and region secure certificates. The EBR100MODX is a Fixed WSD that supports PAWS Protocol to Access White Space Database. It operates with RED database provider which is both FCC and ISED approved. Has embedded GNSS module for geo-location. Has dual-PoE GbE ports and 2 RF ports. Also supports 12VDC input.

The EBR100MODX fully complies with WSDB channel availability and EIRP information that includes scheduled changes in channel availability.

3.5 Database information

Nominet White Space Data Base and Data base sandbox were used for devices registration and testing.

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	860–1060 mbar

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

UKAS Lab 34 and TIA-603-B have been used as guidance for measurement uncertainty reasonable estimations with regards to previous experience and validation of data. Nemko Canada, Inc. follows these test methods in order to satisfy ISO/IEC 17025 requirements for estimation of uncertainty of measurement for wireless products.

Measurement uncertainty budgets for the tests are detailed below. Measurement uncertainty calculations assume a coverage factor of $K = 2$ with 95% certainty.

Table 6.1-1: Measurement uncertainty

Test name	Measurement uncertainty, dB
All antenna port measurements	0.55

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	FSV 40	FA002731	1 year	March 25, 2026

Section 8. Testing data

8.1 FCC 15.711(a)(b)(c), FCC 15.713(g)(3) 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 and §15.711(a), (b), (c). Testing in accordance with KDB 416721 D01, III (2)(a) and Table A8

KDB 416721 D01 Section III.2

a) §15.713(g)(3) Fixed White Space device registration The Fixed White Space device must provide the required information to the database and obtain a successful registration. The management software must be able to collect the data listed below. Confirm that the DUT will not operate unless a list of available channels is received from the database.

1. FCC ID
2. Serial Number
3. Contact information (Device owner and device contact)
4. Location Coordinates
5. Location uncertainty with 95% accuracy

Table 8.1-1: Compliance with KDB 416721 D01 Table A8 Requirements

§15.711 Reference	Requirement (per Table A8)
(a)	Channel operation relies on geo-location and authorization by a White Space Database
(b)(1)	Accuracy: Fixed WSDs with geo-location must demonstrate uncertainty \leq 95% confidence
(b)(2)	Must reference North American Datum of 1983 (NAD83)
(c)(1)	General requirement: fixed device info must be ascertained, stored, and transmitted to WSDB
(c)(1)(i)	Geo-location and height info stored in device memory
(c)(1)(ii)	Registration with a White Space Database
(c)(1)(iii)	Use of external geo-location source is permitted
(c)(1)(iv)	Must demonstrate accuracy

8.1.2 Test summary

Test date July 7, 2025

8.1.3 Observations, settings and special notes

EUT was configured with the with proper registration information. Successful registration with all required fields and as a Fixed device type was verified by showing on the PuTTY output window page.

There were no emissions detected, on any channels, until it has successfully registered

8.1.4 Test data

```
WsdbClient::prettyPrintJsonMessage() AVAIL_SPECTRUM_REQ:
{
  "jsonrpc": "2.0",
  "method": "spectrum.paws.getSpectrum",
  "id": "2",
  "params": {
    "type": "AVAIL_SPECTRUM_REQ",
    "version": "1.0",
    "deviceDesc": {
      "serialNumber": "317VL25260001",
      "manufacturerId": "Emergent Solutions Inc",
      "modelId": "EBR100MODX",
      "rulesetIds": [
        "FccTvBandWhiteSpace-2010"
      ],
      "fccId": "2B0HX-EBR100MODX",
      "fccTvbdDeviceType": "FIXED"
    },
    "location": {
      "point": {
        "center": {
          "latitude": 47.0349903,
          "longitude": -102.7780131
        },
        "semiMajorAxis": 0.0,
        "semiMinorAxis": 0.0,
        "orientation": 0.0
      },
      "confidence": 95
    }
  }
},
```

Figure 8.1-1: Successful registration and identification as Fixed Device Type device

```
Available Spectrum Response OK(start)
Channel Bandwidth = 6.000000
Max TxPower = 40.000000
Corrected TxPower = 9.000000
Freq at max = 473.000000
freq(602 - 608) is out of range
Available Channels: (14);(15);(16);(17);(18);(19);(20);(21);(22);(23);(24);(25);(26);(27);(28);(29);(30);(31);(32);(33);(34);(35);
gain set to 31.000000
```

Figure 8.1-2: Successful registration with received list of available 6-MHz channels

```
Available Spectrum Response OK
Channel Bandwidth = 12.000000
Max TxPower = 40.000000
Corrected TxPower = 9.000000
Freq at max = 476.000000
Available Channels: (14,15);
(16,17);
(18,19);
(20,21);
(22,23);
(24,25);
(26,27);
(28,29);
(30,31);
(32,33);
(34,35);
(36,0);

31.000000
gain set to 31.000000
```

Figure 8.1-3: Successful registration with received list of available 12-MHz channels

```
Available Spectrum Response OK
Channel Bandwidth = 24.000000
Max TxPower = 40.000000
Corrected TxPower = 9.000000
Freq at max = 482.000000
Available Channels: (14,15,16,17);
(18,19,20,21);
(22,23,24,25);
(26,27,28,29);
(30,31,32,33);
(34,35,36,0);

31.000000
gain set to 31.000000
```

Figure 8.1-4: Successful registration with received list of available 24-MHz channels

8.2 FCC 15.713(a)(1), FCC 15.711(c)(2)(iii) 48-hour channel scheduling

8.2.1 Definitions and limits

After receiving an available channel list, register a low-power auxiliary device on the WSD operating channel to operate on an available channel and in an upcoming time period when the device will be tested. Repeat the available channel request after the update interval and in the time period when the low-power auxiliary device is scheduled to operate 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. Testing in accordance with KDB 416721 D01, III (2)(h)

8.2.2 Test summary

Test date July 7, 2025

8.2.3 Observations, settings and special notes

EUT implements a refresh time of 1200 seconds instead of 48-hour push notification wait. Information is sent to database more than 4 times an hour.

8.2.4 Test data

```
"maxContiguousBwHz": 100000000.0,  
"maxTotalBwHz": 100000000.0,  
"needsSpectrumReport": true,  
"rulesetInfo": {  
  "authority": "us",  
  "maxLocationChange": 100.0,  
  "maxPollingSecs": 1200,  
  "rulesetId": "FCCtvBandWhiteSpace-2010"
```

Figure 8.2-1: Refresh time (T-Update) instead of 48-hour push notification wait

8.3 FCC 15.713(g)(3)(iii) Unsuccessful registration – restricted coordinates

8.3.1 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));

8.3.2 Test summary

Test date July 7, 2025

8.3.3 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 transmitted and the link was established, the registration data was modified to incorporate restricted coordinates. EUT was configured with restricted coordinates: outside US regulatory boundaries and the registration process was re-initiated with the invalid coordinates. After the database rejection, the EUT stopped the transmission.

8.3.4 Test data

```
{
  "jsonrpc": "2.0",
  "method": "spectrum.paws.getSpectrum",
  "id": "3",
  "params": {
    "type": "AVAIL_SPECTRUM_REQ",
    "version": "1.0",
    "deviceDesc": {
      "serialNumber": "317VL25260001",
      "manufacturerId": "Emergent Solutions Inc",
      "modelId": "EBR100MODX",
      "rulesetIds": [
        "FccTvBandWhiteSpace-2010"
      ],
      "fccId": "2B0HX-EBR100MODX",
      "fccTvbdDeviceType": "FIXED"
    },
    "location": {
      "point": {
        "center": {
          "latitude": 30.635,
          "longitude": 103.944722
        }
      }
    }
  }
}
```

Figure 8.3-1: Unsuccessful registration with restricted coordinates

```
{
  "error": {
    "code": -104,
    "data": "",
    "message": "location is outside coverage area"
  },
  "id": "3",
  "jsonrpc": "2.0"
}
```

Figure 8.3-2: Unsuccessful registration with restricted coordinates

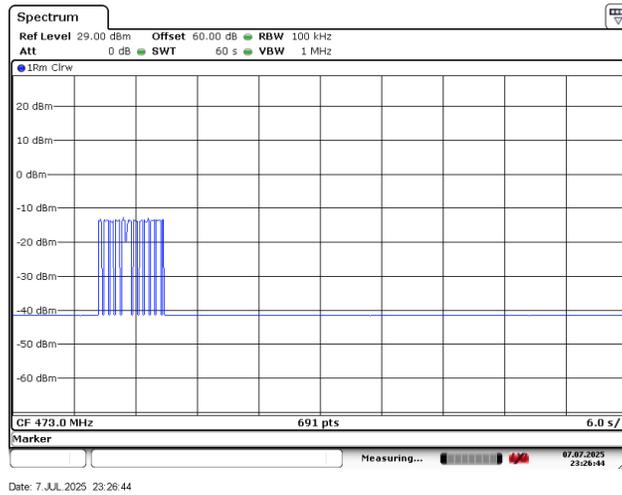


Figure 8.3-3: Unsuccessful registration and transmission stops from Base station unit

8.4 FCC 15.713(g)(3)(v) Unsuccessful registration due to incomplete information – missing owner

8.4.1 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

8.4.2 Test summary

Test date August 13, 2025

8.4.3 Observations, settings and special notes

EUT was configured with incomplete information: owner name 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.
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 not re-initiated. Once the device detects an invalid registration field, the device flagged the error.

8.4.4 Test data

```
>>: set owner name ""  
Error: empty argument, not allowed, please provide valid entry
```

Figure 8.4-1: Unsuccessful registration with missing owner name information

8.5 FCC 15.713(g)(3)(vi) Unsuccessful registration due to incomplete information – contact name

8.5.1 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

8.5.2 Test summary

Test date August 13, 2025

8.5.3 Observations, settings and special notes

EUT was configured with incomplete information: contact name field was left intentionally blank (instead of *Smith*). It was verified, that after detecting missing contact information, EUT did not send any form request to database.
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 not re-initiated. Once the device detects an invalid registration field, the device flagged the error.

8.5.4 Test data

```
>>: set operator name ""  
Error: empty argument, not allowed, please provide valid entry
```

Figure 8.5-1: Unsuccessful registration with missing contact name

8.6 FCC 15.713(g)(3)(vii) Unsuccessful registration due to incomplete information – contact address

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 August 13, 2025

8.6.3 Observations, settings and special notes

EUT was configured with incomplete information: owner/operator contact address field was left intentionally blank. It was verified, that after detecting missing contact information, EUT did not send any form request to database.
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 not re-initiated. Once the device detects an invalid registration field, the device flagged the error.

8.6.4 Test data

```
>>: set owner address1 ""  
Error: empty argument, not allowed, please provide valid entry
```

Figure 8.6-1: Unsuccessful registration with missing owner contact address line 1

```
>>: set owner address2 ""  
Error: empty argument, not allowed, please provide valid entry
```

Figure 8.6-2: Unsuccessful registration with missing owner contact address line 2

```
>>: set operator address1 ""  
Error: empty argument, not allowed, please provide valid entry
```

Figure 8.6-3: Unsuccessful registration with missing operator contact address line 1

```
>>: set operator address2 ""  
Error: empty argument, not allowed, please provide valid entry
```

Figure 8.6-4: Unsuccessful registration with missing operator contact address line 2

8.7 FCC 15.713(g)(3)(vii) Unsuccessful registration due to incomplete information – contact state (region)

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 August 13, 2025

8.7.3 Observations, settings and special notes

EUT was configured with incomplete information: owner/operator 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.
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 not re-initiated. Once the device detects an invalid registration field, the device flagged the error.

8.7.4 Test data

```
>>: set owner prov ""  
Error: empty argument, not allowed, please provide valid entry
```

Figure 8.7-1: Unsuccessful registration with missing owner contact state

```
>>: set operator prov ""  
Error: empty argument, not allowed, please provide valid entry
```

Figure 8.7-2: Unsuccessful registration with missing operator contact state

8.8 FCC 15.713(g)(3)(vii) Unsuccessful registration due to incomplete information – contact zip (postal) code

8.8.1 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

8.8.2 Test summary

Test date August 13, 2025

8.8.3 Observations, settings and special notes

EUT was configured with incomplete information: owner/operator contact zip (postal) 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 not re-initiated. Once the device detects an invalid registration field, the device flagged the error.

8.8.4 Test data

```
>>: set owner postal ""  
Error: empty argument, not allowed, please provide valid entry
```

Figure 8.8-1: Unsuccessful registration with missing owner contact zip (postal) code

```
>>: set operator postal ""  
Error: empty argument, not allowed, please provide valid entry
```

Figure 8.8-2: Data log of unsuccessful registration with missing operator contact zip (postal) code

8.9 FCC 15.713(g)(3)(vii) Unsuccessful registration due to incomplete information – contact city

8.9.1 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

8.9.2 Test summary

Test date August 13, 2025

8.9.3 Observations, settings and special notes

EUT was configured with incomplete information: owner/operator contact city field was left intentionally blank (instead of *Ottawa*). It was verified, that after detecting missing contact information, EUT did not send any form request to database.

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 not re-initiated. Once the device detects an invalid registration field, the device flagged the error.

8.9.4 Test data

```
>>: set owner city ""  
Error: empty argument, not allowed, please provide valid entry
```

Figure 8.9-1: Unsuccessful registration with missing owner contact city

```
>>: set operator city ""  
Error: empty argument, not allowed, please provide valid entry
```

Figure 8.9-2: Unsuccessful registration with missing operator contact city

8.10 FCC 15.713(g)(3)(vii) Unsuccessful registration due to incomplete information – contact country

8.10.1 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

8.10.2 Test summary

Test date August 13, 2025

8.10.3 Observations, settings and special notes

EUT was configured with incomplete information: owner/operator contact country field was left intentionally blank (instead of CA). It was verified, that after detecting missing contact information, EUT did not send any form request to database.
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 not re-initiated. Once the device detects an invalid registration field, the device flagged the error.

8.10.4 Test data

```
>>: set owner country ""  
Error: empty argument, not allowed, please provide valid entry
```

Figure 8.10-1: Unsuccessful registration with missing owner contact country

```
>>: set operator country ""  
Error: empty argument, not allowed, please provide valid entry
```

Figure 8.10-2: Unsuccessful registration with missing operator contact country

8.11 FCC 15.713(g)(3)(viii) Unsuccessful registration due to incomplete information – contact email

8.11.1 Definitions and limits

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

8.11.2 Test summary

Test date August 13, 2025

8.11.3 Observations, settings and special notes

EUT was configured with incomplete information: owner/operator contact email field was left intentionally blank (instead of *info@6harmonics.com*). It was verified, that after detecting missing contact information, EUT did not send any form request to database. 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 not re-initiated. Once the device detects an invalid registration field, the device flagged the error.

8.11.4 Test data

```
>>: set owner email ""  
Error: empty argument, not allowed, please provide valid entry
```

Figure 8.11-1: Unsuccessful registration with missing owner contact email

```
>>: set operator email ""  
Error: empty argument, not allowed, please provide valid entry
```

Figure 8.11-2: Unsuccessful registration with missing operator contact email

8.12 FCC 15.713(g)(3)(ix) Unsuccessful registration due to incomplete information – contact telephone

8.12.1 Definitions and limits

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

8.12.2 Test summary

Test date August 13, 2025

8.12.3 Observations, settings and special notes

EUT was configured with incomplete information: owner/operator contact telephone field was left intentionally blank (instead of +16133661768). It was verified, that after detecting missing contact information, EUT did not send any form request to database. 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 not re-initiated. Once the device detects an invalid registration field, the device flagged the error.

8.12.4 Test data

```
>>: set owner tel ""  
Error: empty argument, not allowed, please provide valid entry
```

Figure 8.12-1: Unsuccessful registration with missing owner contact telephone

```
>>: set operator tel ""  
Error: empty argument, not allowed, please provide valid entry
```

Figure 8.12-2: Unsuccessful registration with missing operator contact telephone

8.13 FCC 15.713(e)(6) Unsuccessful registration due to HAAT > 250 m

8.13.1 Definitions and limits

A fixed device with an antenna height above ground that exceeds 30 meters or an antenna height above average terrain (HAAT) that exceeds 250 meters shall not be provided a list of available channels.

KDB 416721 D01 Section III.2

a) §15.713(g)(3) Fixed White Space device registration The Fixed White Space device must provide the required information to the database and obtain a successful registration. The management software must be able to collect the data listed below. Confirm that the DUT will not operate unless a list of available channels is received from the database.

6. Antenna Height AGL (must not be > 30 m) Confirm that antenna HAAT exceeding 250 m generally, or 500 m in less congested areas receives no list of available channels

8.13.2 Test summary

Test date July 7, 2025

8.13.3 Observations, settings and special notes

EUT was configured with information that included a location with HAAT of more than 250 m. It was verified, that after database rejection, the EUT didn't start the transmission.

To test this feature the device was configured with invalid information and requested to transmit on the channel. Once the database responded with an empty channel list as a result of the antenna height above ground, or excessive HAAT, the EUT didn't start to transmit. Subscriber unit was waiting for the information from Base station and didn't start transmission as well.

8.13.4 Test data

```
WsdbClient::prettyPrintJsonMessage() INIT_REQ:
{
  "jsonrpc": "2.0",
  "method": "spectrum.paws.init",
  "id": "1",
  "params": {
    "type": "INIT_REQ",
    "version": "1.0",
    "deviceDesc": {
      "serialNumber": "317VL25260001",
      "manufacturerId": "Emergent Solutions Inc",
      "modelId": "EBR100MODX",
      "rulesetIds": [
        "FccTvBandWhiteSpace-2010"
      ],
      "fccId": "2B0HX-EBR100MODX",
      "fccTvbdDeviceType": "FIXED"
    },
    "location": {
      "point": {
        "center": {
          "latitude": 37.9,
          "longitude": -114.6
        }
      }
    }
  }
}
```

Figure 8.13-1: Unsuccessful registration with restricted HAAT location

```
availSpectrumResponse.error.code= -202  
availSpectrumResponse.error.data=  
availSpectrumResponse.error.message= Fixed devices must not have height AAT above 250m, found 590.7m  
rm: can't remove '/var/run/son.conf': No such file or directory  
wifi disabled
```

Figure 8.13-2: Unsuccessful registration with restricted HAAT location

8.14 FCC 15.713(e)(6) Unsuccessful registration due to antenna height that exceeds 30 m

8.14.1 Definitions and limits

A fixed device with an antenna height above ground that exceeds 30 meters or an antenna height above average terrain (HAAT) that exceeds 250 meters shall not be provided a list of available channels.

KDB 416721 D01 Section III.2

a) §15.713(g)(3) Fixed White Space device registration The Fixed White Space device must provide the required information to the database and obtain a successful registration. The management software must be able to collect the data listed below. Confirm that the DUT will not operate unless a list of available channels is received from the database.

6. Antenna Height AGL (must not be > 30 m) Confirm that antenna HAAT exceeding 250 m generally, or 500 m in less congested areas receives no list of available channels

8.14.2 Test summary

Test date July 7, 2025

8.14.3 Observations, settings and special notes

EUT was configured with information that included an antenna height that exceeded 30 m limit in congested areas (at latitude 47.6062° N and longitude 122.3321° W). and 100 m in less congested areas (the limit is set by the database). It was verified, that after database rejection, 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 database responded with an empty channel list as a result of the antenna height above ground, the EUT stopped to transmit. For the Base station device, during the initial power up and registration, if the database returns an empty channel list, it will not turn on the transmitter. For the Subscriber device, the EUT will perform a passive scan and will attempt to connect to a Base station device on a channel where it detects a beacon. If the database responds with an empty channel list, or the device is unable to connect to the database, it will cease to transmit on the channel.

8.14.4 Test data

```
availSpectrumResponse.error.code= -202
availSpectrumResponse.error.data=
availSpectrumResponse.error.message= Fixed devices must not have height AGL above 100m, found 101.0m
/sbin/wifi: eval: line 3133: : Permission denied
/sbin/wifi: eval: line 3133: : Permission denied
```

Figure 8.14-1: Unsuccessful registration with restricted antenna height in the less congested area

```
Available Spectrum Response OK
Channel Bandwidth = 6.000000
Max TxPower = 16.000000
Corrected TxPower = -15.000000
Freq at max = 497.000000
Available Channels: (18);(19);(28);
```

Figure 8.14-2: Example of congested area location with available channels for antenna height of 5 m

```
"antenna": {  
  "height": 5.0,  
  "heightUncertainty": 0.0,  
  "heightType": "AGL"  
}
```

Figure 8.14-3: System location settings

```
"location": {  
  "point": {  
    "center": {  
      "latitude": 35.347074,  
      "longitude": -81.991132  
    },  
    "semiMajorAxis": 0.0,  
    "semiMinorAxis": 0.0,  
    "orientation": 0.0  
  },  
}
```

Figure 8.14-4: System location settings

```
"antenna": {  
  "height": 20.0,  
  "heightUncertainty": 0.0,  
  "heightType": "AGL"  
}
```

Figure 8.14-5: Antenna height adjusted to the specific height.

```
WsdBAgentCtlObserver::notify() [label="wsdbAgent" event="agentState"]  
WsdBAgentCtlObserver::notify() [label="wsdbAgent" event="availSpectrumResponse"]  
.  
Available Spectrum Response OK  
No Spectrum available, unable to set power.
```

Figure 8.14-6: Example of congested area location with no available channels for antenna height of 20 m

```
"antenna": {  
  "height": 40.0,  
  "heightUncertainty": 0.0,  
  "heightType": "AGL"  
}
```

Figure 8.14-7: Antenna height adjusted to the specific height.

```
WsdBAgentCtlObserver::notify() [label="wsdbAgent" event="agentState"]  
WsdBAgentCtlObserver::notify() [label="wsdbAgent" event="availSpectrumResponse"]  
.  
Available Spectrum Response OK  
No Spectrum available, unable to set power.
```

Figure 8.14-8: Example of congested area location with no available channels for antenna height of 40 m

8.15 FCC 15.713(g)(3)(i) and (ii) Unsuccessful registration due to incomplete information – FCC ID and Serial number

8.15.1 Definitions and limits

- (3) The white space device registration database shall contain the following information for fixed white space devices:
- (i) FCC identifier (FCC ID) of the device;
 - (ii) Manufacturer's serial number of the device

8.15.2 Test summary

Test date July 7, 2025

8.15.3 Observations, settings and special notes

The registration interface does not contain a mechanism by which the serial number or the FCC ID of the radio can be changed. The FCC ID and serial number are flash-programmed during the manufacturing process and could not be changed without being returned to the manufacturer.

8.15.1 Test data

```
"location": {  
  "point": {  
    "center": {  
      "latitude": 47.50602,  
      "longitude": -100.17317  
    },  
  },  
}
```

Figure 8.15-1: System settings [USA]

```
availSpectrumResponse.error.code= -202  
availSpectrumResponse.error.data=  
availSpectrumResponse.error.message= FCC ID is not known
```

Figure 8.15-2: Unsuccessful registration with wrong FCC ID

```
WsdBAgentCtlObserver::notify() [label="WsdBAgent" event="agentState"]  
WsdBAgentCtlObserver::notify() [label="WsdBAgent" event="availSpectrumResponse"]  
.  
Agent Error: Unauthorized Access to server, please check token validity(401).  
/sbin/wifi: eval: line 3133: : Permission denied  
/sbin/wifi: eval: line 3133: : Permission denied
```

Figure 8.15-3: Unsuccessful registration with wrong serial number [USA]

8.16 FCC 15.713(a)(3) Relocation of fixed TVBD

8.16.1 Definitions and limits

The white space database serves the following function:

- (3) To register the identification information and location of fixed white space devices and unlicensed wireless microphone users.
The Data base will not provide a channel list for a fixed TVBD at a location other than that registered.

8.16.2 Test summary

Test date July 7, 2025

8.16.3 Observations, settings and special notes

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

8.17 FCC 15.711(c)(2)(i) Fixed & Mode II TVDB database update

8.17.1 Definitions and limits

Each fixed white space device must access a white space database over the Internet to determine the available channels and the corresponding maximum permitted power for each available channel that is available at its geographic coordinates, taking into consideration the fixed device's antenna height above ground level and geo-location uncertainty, prior to its initial service transmission at a given location. Testing in accordance with KDB 416721 D01, III (2)(e)

8.17.2 Test summary

Test date July 7, 2025

8.17.3 Observations, settings and special notes

EUT was configured with proper registration information and the successful registration was verified. Database URL was modified from *paws-usa.wavedb.com* to *paws-ind.wavedb.com*. After the time of channel allocation has passed it was verified that without the proper database access the EUT received an empty channel list and stopped the transmission. Then the URL was changed back to and it was verified that with the proper database access the EUT received a channel list and started the transmission. Testing was repeated with Base station disconnected from the internet and it was verified, that after refresh time both EUTs ceased transmission.

8.17.4 Test data

```
>>: get url
wsdb url:https://paws-usa.wavedb.com
>>: set url https://paws-ind.wavedb.com
>>: WsdbAgentCtlObserver::notify() [label="wsdbAgent" event="agentState"]
start
```

Figure 8.17-1: Wrong database URL setting

```
Error: unable to connect to server.
/sbin/wifi: eval: line 3133: : Permission denied
/sbin/wifi: eval: line 3133: : Permission denied
sh: out of range
sh: out of range
/sbin/wifi: eval: line 2747: /etc/init.d/rsrsmgr: not found
sh: 0: unknown operand
/sbin/wifi: eval: line 3133: : Permission denied
uci: Entry not found
awk: /tmp/apvap_ssids.txt: No such file or directory
rm: can't remove '/var/run/son.conf': No such file or directory
0
wifi disabled
```

Figure 8.17-2: Unsuccessful registration due to incorrect token.

```
WsdBAgentCtlObserver::notify() [label="wsdbAgent" event="agentState"]  
WsdBAgentCtlObserver::notify() [label="wsdbAgent" event="initError"]  
WsdBAgentCtlObserver::notify() [label="wsdbAgent" event="spectrumError"]  
.  
Error, No Response, or failed to send, Check internet connectivity.  
/sbin/wifi: eval: line 3133: : Permission denied  
/sbin/wifi: eval: line 3133: : Permission denied
```

Figure 8.17-3: Wrong database URL setting

```
>>: get token  
wsdb token:d-a6663e1d-be32-4432-8d73-826c570865b8  
>>: set token iawdnjwnd-123njnd  
>>: WsdBAgentCtlObserver::notify() [label="wsdbAgent" event="agentState"]  
start
```

Figure 8.17-4: Database parameter: token was incorrect

```
2025-07-07T20:19:56.588580050Z wsdb/agent (TRACE_WARN) WsdBAgent::activeState()  
.  
Agent Error: Unauthorized Access to server, please check token validity(401).  
/sbin/wifi: eval: line 3133: : Permission denied  
/sbin/wifi: eval: line 3133: : Permission denied
```

Figure 8.17-5: Unsuccessful registration due to incorrect token.

8.18 FCC 15.711(h) Database re-check requirement

8.18.1 Definitions and limits

Fixed WSDs shall access the WSDB at least once every 24 hours to verify that the operating channels remain available. If the WSDB indicates that the channel is no longer available at the current operating level, the fixed WSD shall immediately stop operating on the channel or reduce its power to a permissible level, as determined by the WSDB. Fixed WSDs shall update their use of channels in accordance with the channel availability schedule provided by their WSDB. The channel availability schedule shall be updated daily and shall cover a period of 48 hours from the time that the WSD last accessed the WSDB

8.18.2 Test summary

Test date July 7, 2025

8.18.3 Observations, settings and special notes

For compliance demonstration, the EUT was configured at a shortened WSDB refresh interval of 1200 seconds (20 minutes). This allowed database re-check operation to be verified within the test period. The test logs (Figures 8.18-1 through 8.18-3) show periodic queries and successful refreshes during the evaluation.

In normal deployment, the device complies with FCC §15.711(h), which requires that a powered-on device access the WSDB at least once every 60 minutes and cease operation no later than 120 minutes after the last successful contact. In addition, per KDB 416721 D01 Section III.2.f, if WSDB contact is lost, the device ceases operation by 11:59 PM of the following day unless database access is restored.

This behavior is further supported by the manufacturer's documentation (EBR100MODX Operational Description, rev0p3, Section 10), which explicitly states that the device complies with FCC Part 15 Subpart H (§15.711, §15.713, §15.715) requirements for WSDB communication and operation.

8.18.4 Test data

```
"maxContiguousBwHz": 100000000.0,  
"maxTotalBwHz": 100000000.0,  
"needsSpectrumReport": true,  
"rulesetInfo": {  
  "authority": "us",  
  "maxLocationChange": 100.0,  
  "maxPollingSecs": 1200,  
  "rulesetId": "FCCtvBandWhiteSpace-2010"
```

Figure 8.18-1: Refresh time (T-Update) instead of 48-hour push notification wait

```
  },  
  ],  
  "timestamp": "2025-08-11T16:54:44.726Z",  
  "type": "AVAIL_SPECTRUM_RESP",  
  "version": "1.0"  
}
```

Figure 8.18-2: Initialization

```
    }  
  ],  
  "timestamp": "2025-08-11T17:09:45.745Z",  
  "type": "AVAIL_SPECTRUM_RESP",  
  "version": "1.0"  
}  
} }  
FccTesterObserver::notify() [label="fccTester" event="agentState"]  
FccTesterObserver::notify() [label="fccTester" event="availSpectrumResponse"]  
Check spectrum response called(check)  
Found freq no changes
```

Figure 8.18-3: After 20 minutes refresh time

8.19 FCC 15.711(c)(2)(iii) Low-power auxiliary device protection

8.19.1 Definitions and limits

Each fixed white space devices shall access the database at least once a day to verify that the operating channels continue to remain available. Each fixed white space device must adjust its use of channels in accordance with channel availability schedule information provided by its database for the 48-hour period beginning at the time the device last accessed the database for a list of available channels.

Use of database protected entity interface to register protection for a low-power auxiliary device in the same location and channel which EUT has selected and operating. The registered protection for the low-power auxiliary device should be scheduled within the next 48-hour period. Testing in accordance with KDB 416721 D01, III (2)(I).

8.19.2 Test summary

Test date July 7, 2025

8.19.3 Observations, settings and special notes

EUT was configured with proper registration information and the successful registration was verified. The channel expiration time for testing purposes was reduced to 5 minutes. Meantime it was scheduled with WSDB that channel 14 would be registered for low-power device. After the time of channel allocation of the EUT has passed it was verified that the EUT stopped the transmission on the temporary restricted and removed from the channel list. EUT is not waiting 48 hours for the push notification but rather following refresh rate of 20 minutes.

8.19.4 Test data

```
Available Spectrum Response OK(start)
Channel Bandwidth = 6.000000
Max TxPower = 40.000000
Corrected TxPower = 9.000000
Freq at max = 473.000000
Freq(502 - 502) is out of range
Available Channels: (14) (15); (16); (17); (18); (19); (20); (21); (22); (23); (24); (25); (26); (27); (28); (29); (30); (31); (32); (33); (34); (35)
```

Figure 8.19-1: Successful registration before the registration of LP device on channel 14

RED WAVE DB

Channel Search USA Protected Entity Registration

Channel Number(s)* 14 Callsign* BLN00751

+ Add

Location Point Polygon

Location (NAD83) Decimal DMS

Latitude* 47.50602

Longitude* -100.17317

Duration

Start Time (UTC)* Aug

End Time (UTC)* Aug

Contact Details

Contact Name* Dhara

Street Address* 221 Farabee Drive

City* Lafayette

State* Indiana

Country* United States

ZIP Code 47905

Phone Number* +17654472172

Figure 8.19-2: Registration of LP device on channel 14 at the same location

```
Check spectrum response called(check)
Channel Bandwidth = 6.000000
Max TxPower = 40.000000
Corrected TxPower = 9.000000
Freq at max = 479.000000
freq(602 - 608) is out of range
Available Channels: (15); (16); (17); (18); (19); (20); (21); (22); (23); (24); (25); (26); (27); (28); (29); (30); (31); (32); (33); (34); (35)
```

Figure 8.19-3: Unsuccessful registration after the registration of LP device on channel 14

8.20 FCC 15.712 Interference protection requirements (Fixed and personal/portable)

8.20.1 Definitions and limits

Using system management software or database, provide different location (coordinates) so that compliance with operating channel and power level is shown under each of the scenarios outlined in §15.712. Include a sample scan showing the total channel power and adjacent channel emission settings for test coordinates.

8.20.2 Test summary

Test date June 27, 2019

8.20.3 Observations, settings and special notes

EUT was configured with proper registration information and the successful registration was verified. The coordinates then were changed in accordance with FCC 15.712 test scenarios. Updated channel list with unavailable channels was verified. Once the device gets updated channel list, the device flagged the error in the GUI when trying to set the restricted channel.

Test scenarios were as follows:

- (a) Digital television stations, and digital and analog Class A TV, low power TV, TV translator and TV booster stations.
- (b) TV translator, Low Power TV (including Class A) and Multi-Channel Video Programming Distributor (MVPD) receive sites.
- (c) Fixed Broadcast Auxiliary Service (BAS) links.
- (d) PLMRS/CMRS operations.
- (e) Offshore Radiotelephone Service.
- (f) Low power auxiliary services, including wireless microphones - Duplicate of earlier tests
- (g) Border areas near Canada and Mexico.
- (h) Radio astronomy services.
- (i) 600 MHz service band.
- (j) Wireless Medical Telemetry Service. - No existing examples
- (k) 488-494 MHz band in Hawaii.

8.20.4 Test data

```
WsdClient::prettyPrintJsonMessage() AVAIL_SPECTRUM_REQ:
{
  "jsonrpc": "2.0",
  "method": "spectrum.paws.getSpectrum",
  "id": "4",
  "params": {
    "type": "AVAIL_SPECTRUM_REQ",
    "version": "1.0",
    "deviceDesc": {
      "serialNumber": "317VL25260001",
      "manufacturerId": "Emergent Solutions Inc",
      "modelId": "EBR100MODX",
      "rulesetIds": [
        "FccTvBandWhiteSpace-2010"
      ],
      "fccId": "2B0HX-EBR100MODX",
      "fccTvbdDeviceType": "FIXED"
    },
    "location": {
      "point": {
        "center": {
          "latitude": 35.775,
          "longitude": -106.24555
        }
      }
    }
  }
}
```

Figure 8.20-1: System location settings for coordinates in scenario (a)

```
WsdAgentCtlObserver::notify() [label="wsdbAgent" event="agentState"]
WsdAgentCtlObserver::notify() [label="wsdbAgent" event="availSpectrumResponse"]
.
Available Spectrum Response OK
No Spectrum available, unable to set power.
```

Figure 8.20-2: No channels available for coordinates set in scenarios (a)

```
WsdClient::prettyPrintJsonMessage() AVAIL_SPECTRUM_REQ:
{
  "jsonrpc": "2.0",
  "method": "spectrum.paws.getSpectrum",
  "id": "6",
  "params": {
    "type": "AVAIL_SPECTRUM_REQ",
    "version": "1.0",
    "deviceDesc": {
      "serialNumber": "317VL25260001",
      "manufacturerId": "Emergent Solutions Inc",
      "modelId": "EBR100MODX",
      "rulesetIds": [
        "FccTvBandWhiteSpace-2010"
      ],
      "fccId": "2B0HX-EBR100MODX",
      "fccTvbdDeviceType": "FIXED"
    },
    "location": {
      "point": {
        "center": {
          "latitude": 43.80102,
          "longitude": -111.778
        }
      }
    }
  }
}
```

Figure 8.20-3: System location settings for coordinates in scenario (b)

```
Available Spectrum Response OK
Channel Bandwidth = 6.000000
Max TxPower = 40.000000
Corrected TxPower = 9.000000
Freq at max = 473.000000
Available Channels: (14);(15);(28);(30);(31);(33);(34);
```

Figure 8.20-4: Received channel list for coordinates set in scenarios (b) – no transmission allowed on channel 23

```
WsdbClient::prettyPrintJsonMessage() AVAIL_SPECTRUM_REQ:
{
  "jsonrpc": "2.0",
  "method": "spectrum.paws.getSpectrum",
  "id": "8",
  "params": {
    "type": "AVAIL_SPECTRUM_REQ",
    "version": "1.0",
    "deviceDesc": {
      "serialNumber": "317VL25260001",
      "manufacturerId": "Emergent Solutions Inc",
      "modelId": "EBR100MODX",
      "rulesetIds": [
        "FccTvBandWhiteSpace-2010"
      ],
      "fccId": "2B0HX-EBR100MODX",
      "fccTvbdDeviceType": "FIXED"
    },
    "location": {
      "point": {
        "center": {
          "latitude": 41.890417,
          "longitude": -87.623694
        }
      }
    }
  }
}
```

Figure 8.20-5: System location settings for coordinates in scenario (c)

```
Available Spectrum Response OK
Channel Bandwidth = 6.000000
Max TxPower = 36.000000
Corrected TxPower = 5.000000
Freq at max = 647.000000
freq(692 - 698) is out of range
Available Channels: 43;
```

Figure 8.20-6: Received channel list for coordinates set in scenarios (c) – no transmission allowed on channel 28

```
WsdbClient::prettyPrintJsonMessage() AVAIL_SPECTRUM_REQ:
{
  "jsonrpc": "2.0",
  "method": "spectrum.paws.getSpectrum",
  "id": "4",
  "params": {
    "type": "AVAIL_SPECTRUM_REQ",
    "version": "1.0",
    "deviceDesc": {
      "serialNumber": "317VL25260001",
      "manufacturerId": "Emergent Solutions Inc",
      "modelId": "EBR100MODX",
      "rulesetIds": [
        "FccTvBandWhiteSpace-2010"
      ],
      "fccId": "2B0HX-EBR100MODX",
      "fccTvbdDeviceType": "FIXED"
    },
    "location": {
      "point": {
        "center": {
          "latitude": 18.954722,
          "longitude": -77.004722
        }
      }
    }
  }
}
```

Figure 8.20-7: System location settings for coordinates in scenario (d) and (e)

```
Available Spectrum Response OK
Channel Bandwidth = 6.000000
Max TxPower = 36.000000
Corrected TxPower = 5.000000
Freq at max = 647.000000
freq(692 - 698) is out of range
Available Channels: (43);
```

Figure 8.20-8: Received channel list for coordinates set in scenarios (d) and (e) – no transmission allowed on channel 17 and 18

```
WsdbClient::prettyPrintJsonMessage() AVAIL_SPECTRUM_REQ:
{
  "jsonrpc": "2.0",
  "method": "spectrum.paws.getSpectrum",
  "id": "6",
  "params": {
    "type": "AVAIL_SPECTRUM_REQ",
    "version": "1.0",
    "deviceDesc": {
      "serialNumber": "317VL25260001",
      "manufacturerId": "Emergent Solutions Inc",
      "modelId": "EBR100MODX",
      "rulesetIds": [
        "FccTvBandWhiteSpace-2010"
      ],
      "fccId": "2B0HX-EBR100MODX",
      "fccTvbdDeviceType": "FIXED"
    },
    "location": {
      "point": {
        "center": {
          "latitude": 32.608179,
          "longitude": -116.969585
        }
      }
    }
  }
}
```

Figure 8.20-9: System location settings for coordinates in scenario (g)

```
Available Spectrum Response OK
Channel Bandwidth = 6.000000
Max TxPower = 40.000000
Corrected TxPower = 9.000000
Freq at max = 473.000000
Available Channels: (14);(22);(28);(29);(33);
```

Figure 8.20-10: Received channel list for coordinates set in scenarios (g) – no transmission allowed on channel 6 and 32

```
WsdClient::prettyPrintJsonMessage() AVAIL_SPECTRUM_REQ:
{
  "jsonrpc": "2.0",
  "method": "spectrum.paws.getSpectrum",
  "id": "3",
  "params": {
    "type": "AVAIL_SPECTRUM_REQ",
    "version": "1.0",
    "deviceDesc": {
      "serialNumber": "317VL25260001",
      "manufacturerId": "Emergent Solutions Inc",
      "modelId": "EBR100MODX",
      "rulesetIds": [
        "FccTvBandWhiteSpace-2010"
      ],
      "fccId": "2B0HX-EBR100MODX",
      "fccTvbdDeviceType": "FIXED"
    },
    "location": {
      "point": {
        "center": {
          "latitude": 35.775,
          "longitude": -106.24555
        }
      }
    }
  }
},
```

Figure 8.20-11: System location settings for coordinates in scenario (h)

```
WsdAgentCtlObserver::notify() [label="wsdbAgent" event="agentState"]
WsdAgentCtlObserver::notify() [label="wsdbAgent" event="availSpectrumResponse"]
.
Available Spectrum Response OK
!o Spectrum available, unable to set power.
>>: set location latitude 40.78698 longitude -119.206486
```

Figure 8.20-12: No channels available for coordinates set in scenarios (h)

```
WsdClient::prettyPrintJsonMessage() AVAIL_SPECTRUM_REQ:
{
  "jsonrpc": "2.0",
  "method": "spectrum.paws.getSpectrum",
  "id": "6",
  "params": {
    "type": "AVAIL_SPECTRUM_REQ",
    "version": "1.0",
    "deviceDesc": {
      "serialNumber": "317VL25260001",
      "manufacturerId": "Emergent Solutions Inc",
      "modelId": "EBR100MODX",
      "rulesetIds": [
        "FccTvBandWhiteSpace-2010"
      ],
      "fccId": "2B0HX-EBR100MODX",
      "fccTvbdDeviceType": "FIXED"
    },
    "location": {
      "point": {
        "center": {
          "latitude": 40.78698,
          "longitude": -119.206486
        }
      }
    }
  }
}
```

Figure 8.20-13: System location settings for coordinates in scenario (i)

```
Available Spectrum Response OK
Channel Bandwidth = 6.000000
Max TxPower = 40.000000
Corrected TxPower = 9.000000
Freq at max = 473.000000
Available Channels: (14);(15);(16);(17);(18);(19);(20);(21);(22);(23);(24);(25);
(26);(27);(28);(29);(30);(31);(32);(33);(34);(35);(36);
```

Figure 8.20-14: No channels available for coordinates set in scenarios (i) – no transmission allowed on channel 37 and 38

```
WsdbClient::prettyPrintJsonMessage() AVAIL_SPECTRUM_REQ:
{
  "jsonrpc": "2.0",
  "method": "spectrum.paws.getSpectrum",
  "id": "8",
  "params": {
    "type": "AVAIL_SPECTRUM_REQ",
    "version": "1.0",
    "deviceDesc": {
      "serialNumber": "317VL25260001",
      "manufacturerId": "Emergent Solutions Inc",
      "modelId": "EBR100MODX",
      "rulesetIds": [
        "FccTvBandWhiteSpace-2010"
      ],
      "fccId": "2B0HX-EBR100MODX",
      "fccTvbdDeviceType": "FIXED"
    },
    "location": {
      "point": {
        "center": {
          "latitude": 20.88,
          "longitude": -156.678611
        }
      }
    }
  }
}
```

Figure 8.20-15: System location settings for coordinates in scenario (k)

```
Available Spectrum Response OK
Channel Bandwidth = 6.000000
Max TxPower = 40.000000
Corrected TxPower = 9.000000
Freq at max = 473.000000
Available Channels: (14);(18);(19);(26);(30);(31);(32);(33);(34);(35);(36);
```

Figure 8.20-16: No channels available for coordinates set in scenarios (k) – no transmission allowed on channel 17

8.21 FCC 15.711(c)(2)(ii), (d)(3), 15.715(e) Fixed and Mode II Power level reduction

8.21.1 Definitions and limits

Using system management software, make a channel availability request to the database. Using the spectrum analyzer, confirm that the WSD operates at no more than the maximum power level indicated by the database and that the power level cannot be set to a higher level than indicated by the database at that specific location. If the device cannot reduce power, it must cease operation. Testing in accordance with KDB 416721 D01, III (2)(o).

8.21.2 Test summary

Test date June 27, 2019

8.21.3 Observations, settings and special notes

EUT was configured with proper registration information and the successful registration was verified. After receiving channel EIRP limit, EUT Tx power and Antenna gain were modified to exceed the limit. It was verified that the output power was automatically reduced to comply with EIRP restriction for the operation channel used.

8.21.4 Test data

```
Available Spectrum Response OK(start)
Channel Bandwidth = 24.000000
Max TxPower = 40.000000
Corrected TxPower = 4.000000
Freq at max = 482.000000
freq(602 - 608) is out of range
Available Channels: (14,15,16,17);
(15,16,17,18);
(16,17,18,19);
(17,18,19,20);
(18,19,20,21);
(19,20,21,22);
(20,21,22,23);
(21,22,23,24);
(22,23,24,25);
(23,24,25,26);
(24,25,26,27);
(25,26,27,28);
(26,27,28,29);
(27,28,29,30);
(28,29,30,31);
(29,30,31,32);
(30,31,32,33);
(31,32,33,34);
(32,33,34,35);
(33,34,35,0);
```

Figure 8.21-1: Available channel list

```
}  
{  
  "dbm": 40.0,  
  "hz": 476000000.0  
}  
}  
{  
  "dbm": 40.0,  
  "hz": 482000000.0  
}
```

Figure 8.21-2: Attempt 1 (antenna gain 8 dBi) Database provided an EIRP limitation of 40 dBm

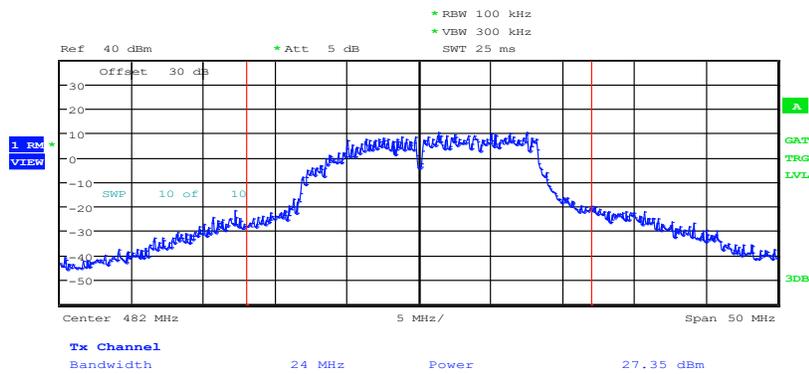


Figure 8.21-3: Output power measurement after registration and reception max EIRP limit (antenna gain 8 dBi)

```
},  
{  
  "dbm": 40.0,  
  "hz": 566000000.0  
},  
{  
  "dbm": 40.0,  
  "hz": 572000000.0  
},  
}
```

Figure 8.21-4: Attempt 1 (antenna gain 12 dBi) Database provided an EIRP limitation of 40 dBm

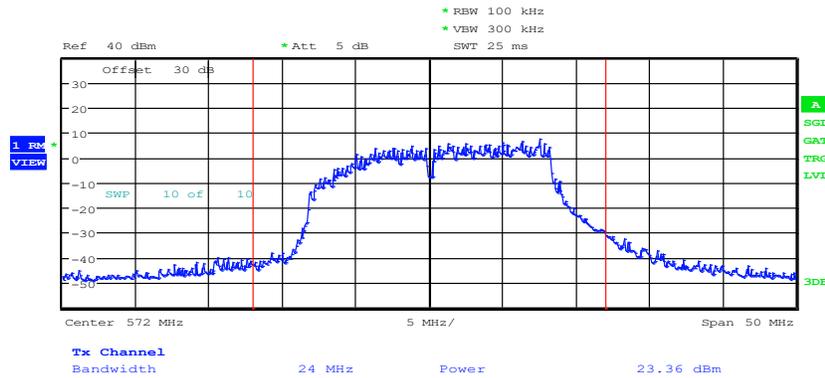


Figure 8.21-5: Output power measurement after registration and reception max EIRP limit (antenna gain 12 dBi)

8.22 FCC 15.711(j) Security

8.22.1 Definitions and limits

White space devices shall incorporate adequate security measures to ensure that they are capable of communicating for purposes of obtaining lists of available channels only with databases operated by administrators authorized by the Commission, and to ensure that communications between white space devices and databases are secure to prevent corruption or unauthorized interception of data. This requirement applies to communications of channel availability and other spectrum access information between the databases and fixed and Mode II devices (it is not necessary for white space devices to apply security coding to channel availability and channel access information where they are not the originating or terminating device and that they simply pass through).

8.22.2 Test summary

Test date July 7, 2025

8.22.3 Observations, settings and special notes

Information provided by the manufacturer

8.22.4 Test data

- i. What communication protocol is used between the database and the WSD?
The Fixed WSD (WSD) connects to the Nominet database using HTTPS over SSL/TLS. The Nominet database is certified by FCC which includes the protocol of how WSD interact with the database.
- ii. How are communications initiated?
When the WSD boots up the WSD first ensures a connection to the internet with a valid DNS and gateway. Then the radio accesses the URL of the database and undergoes a TLS v1.2 handshake before exchanging data. This ensures a secure exchange. The WSD initiates communication with the Nominet database by initially sending an INIT_REQ message which includes the WSD Descriptor.
The WSD Descriptor contains;
 - the device serial number
 - manufacturer ID
 - model ID
 - FCC ID
- iii. How does the WSD validate messages from the database?
The identity of the Nominet database is validated through verification of the Nominet SSL/TLS certificate through standard third-party certificate authority mechanisms, ensuring communications are secure and authenticated between the WSD and the database.
- iv. How does the device handle failure to communicate or authenticate the database?
If the WSD does not successfully communicate with an authenticated database (as above), it will not allow operations to begin. If the device fails to communicate with the database, it will re-try every 30 seconds.
- v. How does the database validate messages from a WSD?
A unique database token installed in the radio during manufacture is required to validate the exchange. Only devices that have a valid database token can receive communications from the database. The database validates the token against the provided serial number, manufacturer name, model ID and FCC ID.
The list of valid serial numbers is generated by the device manufacturer. Using the Nominet database web interface authorized users can generate tokens for specific devices with specific serial numbers. Users are authorized by Nominet via an account name and password, which is only available to persons authorized by the device manufacturer.
- vi. What encryption method is used?
SSL/TLS1.2 encryption is used to encrypt packets sent between the WSD and the database.
- vii. How does the database ensure secure registration of protected devices?
Protected devices are entities authorized by the rules for protection from WSD transmissions. Nominet provides a public interface to register protected devices in the database web tool using a valid account, valid username and valid password.

8.23 13.2.1 Fixed WSDs: Initialization

8.23.1 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 13.2.1 of RSS-222

8.23.2 Test summary

Test date July 7, 2025

8.23.3 Observations, settings and special notes

EUT was configured with the with proper registration information. Successful registration with all required fields and as a Fixed device type was verified by showing on the PuTTY output window page.

There were no emissions detected, on any channels, until it has successfully registered

8.23.4 Test data

```
WsdbClient::prettyPrintJsonMessage() INIT_REQ:
{
  "jsonrpc": "2.0",
  "method": "spectrum.paws.init",
  "id": "1",
  "params": {
    "type": "INIT_REQ",
    "version": "1.0",
    "deviceDesc": {
      "serialNumber": "317VL25260001",
      "manufacturerId": "Emergent Solutions Inc.",
      "modelId": "EBR100MODX",
      "rulesetIds": [
        "Canada-TVWS-2020"
      ],
      "isedId": "33834-EBR100MODX",
      "isedWsdDeviceType": "FIXED"
    },
    "location": {
      "point": {
        "center": {
          "latitude": 51.186011,
          "longitude": -81.693177
        },
        "semiMajorAxis": 0.0,
        "semiMinorAxis": 0.0,
        "orientation": 0.0
      },
      "confidence": 95
    }
  }
}
```

Figure 8.23-1: Successful registration and identification as Fixed Device Type device

```
    },  
    "antenna": {  
      "height": 20.0,  
      "heightUncertainty": 0.0,  
      "heightType": "AGL"  
    }  
  }  
}
```

Figure 8.23-2: Antenna height specification (AGL) as part of successful Fixed Device-Type identification

```
Available Spectrum Response OK(start)  
Channel Bandwidth = 6.000000  
Max TxPower = 40.000000  
Corrected TxPower = 9.000000  
Freq at max = 473.000000  
freq(602 - 608) is out of range  
Available Channels: (14); (15); (16); (17); (18); (19); (20); (21); (22); (23); (24); (25); (26); (27); (28); (29); (30); (31); (32); (33); (34); (35)
```

Figure 8.23-3: Successful registration with received list of available 6-MHz channels

8.24 13.2.2 Fixed WSDs: WSDB update

8.24.1 Definitions and limits

Fixed WSDs shall access the WSDB at least once every 24 hours to verify that the operating channels remain available. If the WSDB indicates that the channel is no longer available at the current operating level, the fixed WSD shall immediately stop operating on the channel or reduce its power to a permissible level, as determined by the WSDB. Fixed WSDs shall update their use of channels in accordance with the channel availability schedule provided by their WSDB. The channel availability schedule shall be updated daily and shall cover a period of 48 hours from the time that the WSD last accessed the WSDB.

8.24.2 Test summary

Test date July 7, 2025

8.24.3 Observations, settings and special notes

EUT implements a refresh time of 900 seconds instead of 48-hour push notification wait. Information is sent to database more than 4 times an hour.

8.24.4 Test data

```
.WsdbClient::prettyPrintJsonMessage() INIT_RESP:
{
  "id": "1",
  "jsonrpc": "2.0",
  "result": {
    "databaseChange": null,
    "rulesetInfos": [
      {
        "authority": "can",
        "maxLocationChange": 100.0,
        "maxPollingSecs": 900,
        "rulesetId": "Canada-TVWS-2020"
      }
    ]
  }
}
```

Figure 8.24-1: Refresh time (T-Update) instead of 48-hour push notification wait

8.25 13.2.3 Fixed WSDs: Failure to Contact WSDB

8.25.1 Definitions and limits

If a fixed WSD fails to successfully contact a WSDB during any given day, it may continue to operate until 11:59 p.m. (local time) of the following day, at which time it shall cease operations until it re-establishes contact with an approved WSDB and re-verifies the list of available channels.

8.25.2 Test summary

Test date July 7, 2025

8.25.3 Observations, settings and special notes

For testing purposes, the ISED ID was deliberately set to an invalid value to simulate failure to contact/validate with the WSDB. The WSDB responded with error code -202 ("ISED ID is not known"), after which the WSD ceased operation by disabling Wi-Fi. This demonstrates compliance with DBS-01 §10.2 and RSS-222 §13.2.3, which require a fixed WSD to stop operation if it cannot successfully contact the WSDB

8.25.4 Test data

```
>>: set device isedId 1234-GWS1235
set isedId 1234-GWS1235
>>: get device
Serial Number: 317VL25260001
ManufacturerId: Emergent Solutions Inc.
ModelId: EBR100MODX
rulesetIds: Canada-TVWS-2020
isedId: 1234-GWS1235
isedWsdDeviceType: FIXED
>>: start
```

Figure 8.25-1: Device settings

```
WsdbClient::prettyPrintJsonMessage() AVAIL_SPECTRUM_REQ:
{
  "jsonrpc": "2.0",
  "method": "spectrum.paws.getSpectrum",
  "id": "4",
  "params": {
    "type": "AVAIL_SPECTRUM_REQ",
    "version": "1.0",
    "deviceDesc": {
      "serialNumber": "317VL25260001",
      "manufacturerId": "Emergent Solutions Inc.",
      "modelId": "EBR100MODX",
      "rulesetIds": [
        "Canada-TVWS-2020"
      ],
      "isedId": "1234-GWS1235",
      "isedWsdDeviceType": "FIXED"
    },
    "location": {
      "point": {
        "center": {
          "latitude": 51.186011,
          "longitude": -81.693177
        }
      }
    }
  }
}
```

Figure 8.25-2: System settings

```
WsdbClient::prettyPrintJsonMessage() AVAIL_SPECTRUM_RESP:
{
  "error": {
    "code": -202,
    "message": "ISED ID is not known"
  },
  "id": "4",
  "jsonrpc": "2.0"
}
FccTesterObserver::notify() [label="fccTester" event="agentState"]
FccTesterObserver::notify() [label="fccTester" event="availSpectrumResponse"]
availSpectrumResponse.error.code= -202
availSpectrumResponse.error.data=
availSpectrumResponse.error.message= ISED ID is not known
m: can't remove '/var/run/son.conf': No such file or directory
wifi disabled
```

Figure 8.25-3: Failure to Contact WSDB – Device Ceases Operation

8.26 11.2 Registration of licensed LPAs

8.26.1 Definitions and limits

Per DBS-01 Section 11.2, the WSDB shall protect licensed Low Power Auxiliary (LPA) devices by not assigning channels in use by LPA operations within the protected contour. For fixed WSD testing, WSDB queries were made at [latitude 45.496 and longitude -73.5693] and the resulting channel list was verified to exclude any channels reserved for LPA use.

8.26.2 Test summary

Test date August 13, 2025

8.26.3 Observations, settings and special notes

EUT was configured with proper registration information and the successful registration was verified. The channel expiration time for testing purposes was reduced to 5 minutes. Meantime it was scheduled with WSDB that channel 23 would be registered for low-power device. After the time of channel allocation of the EUT has passed it was verified that the EUT stopped the transmission on the temporary restricted and removed from the channel list. EUT is not waiting 48 hours for the push notification but rather following refresh rate of 20 minutes.

8.26.4 Test data

```
WsdbClient::prettyPrintJsonMessage() INIT_REQ:
{
  "jsonrpc": "2.0",
  "method": "spectrum.paws.init",
  "id": "2",
  "params": {
    "type": "INIT_REQ",
    "version": "1.0",
    "deviceDesc": {
      "serialNumber": "317VL25260001",
      "manufacturerId": "Emergent Solutions Inc.",
      "modelId": "EBR100MODX",
      "rulesetIds": [
        "Canada-TVWS-2020"
      ],
      "isedId": "33834-EBR100MODX",
      "isedWsdDeviceType": "FIXED"
    },
    "location": {
      "point": {
        "center": {
          "latitude": 45.4960,
          "longitude": -73.5693
        }
      }
    }
  }
}
```

Figure 8.26-1: System location settings

```
Available Spectrum Response OK(start)
Channel Bandwidth = 6.000000
Max TxPower = 40.000000
Corrected TxPower = 9.000000
Freq at max = 527.000000
freq(602 - 608) is out of range
Available Channels: (14);(16);(18);(20);(22);(23);(24);(25);(27);(28);(30);(32);(33);(34);
```

Figure 8.26-2: Successful registration before the registration of LP device on channel 14

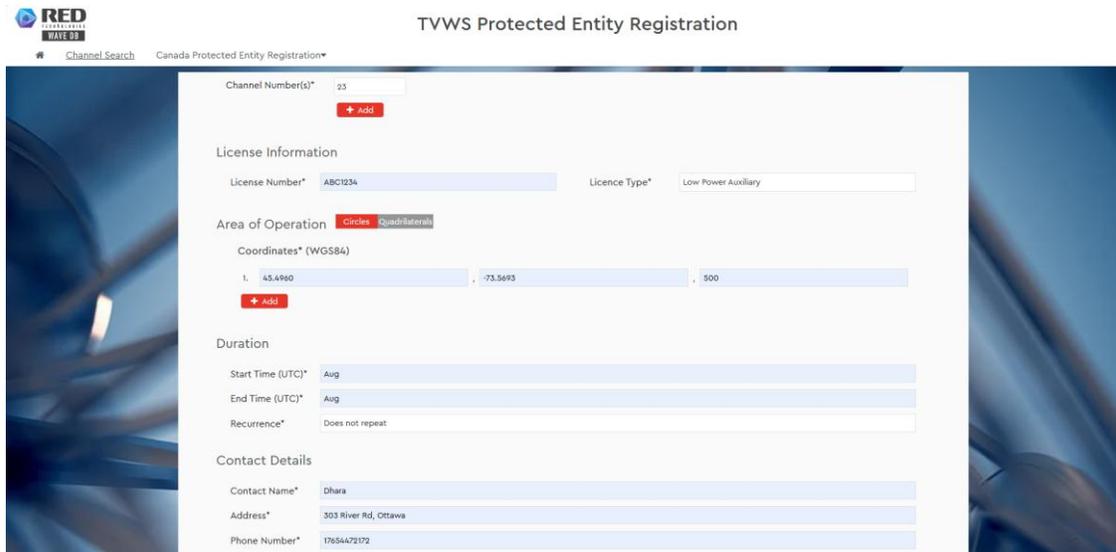


Figure 8.26-3: Registration of LP device on channel 23 at same location

```
Check spectrum response called(check)
Channel Bandwidth = 6.000000
Max TxPower = 40.000000
Corrected TxPower = 9.000000
Freq at max = 533.000000
freq(602 - 608) is out of range
Available Channels: (14);(16);(18);(20);(22);(24);(25);(27);(28);(30);(32);(33);(34);
```

Figure 8.26-4: Unsuccessful registration after the registration of LP device on channel 23

8.27 14.4 Height limits

8.27.1 Definitions and limits

For fixed WSDs with an effective height above average terrain (EHAAT) exceeding 500 m or optionally 700 m, the WSDB shall not provide any list of available channels.

8.27.2 Test summary

Test date August 11, 2025

8.27.3 Observations, settings and special notes

EUT was configured with information that included a location with HAAT of more than 700 m. It was verified, that after database rejection, the EUT didn't start the transmission.

To test this feature the device was configured with invalid information and requested to transmit on the channel. Once the database responded with an empty channel list as a result of the antenna height above ground, or excessive HAAT, the EUT didn't start to transmit. Subscriber unit was waiting for the information from Base station and didn't start transmission as well.

8.27.4 Test data

```
WsdClient::prettyPrintJsonMessage() INIT_REQ:
{
  "jsonrpc": "2.0",
  "method": "spectrum.paws.init",
  "id": "2",
  "params": {
    "type": "INIT_REQ",
    "version": "1.0",
    "deviceDesc": {
      "serialNumber": "317VL25260001",
      "manufacturerId": "Emergent Solutions Inc.",
      "modelId": "EBR100MODX",
      "rulesetIds": [
        "Canada-TVWS-2020"
      ],
      "isedId": "33834-EBR100MODX",
      "isedWsdDeviceType": "FIXED"
    },
    "location": {
      "point": {
        "center": {
          "latitude": 53.5444,
          "longitude": -113.4909
        }
      }
    }
  }
}
```

Figure 8.27-1: System location settings

```
availSpectrumResponse.error.code= -202
availSpectrumResponse.error.data=
availSpectrumResponse.error.message= Fixed devices must not have height AAT above 700m, found 990.7m
rm: can't remove '/var/run/son.conf': No such file or directory
wifi disabled
```

Figure 8.27-2: Unsuccessful registration with restricted EHAAT location

Section 9. Block diagrams of test set-ups

9.1 Test setup diagram

