KDB 987594 D05 – AFC DUTHarness Testing

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Note: The views expressed in this presentation are those of the author and may not necessarily represent the views of the Federal Communications Commission.
47 CFR 15.407(k)

- Currently there are no real-world AFC (Automated Frequency Coordination) systems to test the requirements of 15.407(k)
- Wi-Fi Alliance (WFA) created an AFC test harness that mimics the functionality of an AFC to assist in the certification of 6SD and 6FC devices

6SD/6FC certification using AFC test harness:

- Test report demonstrating requirements of 47 CFR 15.407(k) are met along with required attestations.
- Testing must be done by an accredited and FCC recognized test laboratory to either the FCC scope for U-NII with DFS or the FCC scope for U-NII without DFS per KDB 974614.
- Approved PIA (Persistent Inquiry Approval) is required prior to certification
AFC Test Harness

Wi-Fi Alliance
- AFC DUT test harness
  • Includes .deb software package and user manual for install and GUI
- AFC Specifications and Test Plans
  • Compliance test plan includes detailed test cases and P/F criteria.

Devices that do not use the WiFi Alliance test harness must identify a specific AFC and demonstrate compliance using that AFC.
WFA AFC DUT Test Harness

TCB Workshop

October 25, 2023
WFA AFC DUT Test Harness

AFC DUT connection to AFC Test Harness

Network Element/Proxy managing AFC DUT(s) connection to AFC Test Harness

Figure 1. Standard Power Access Point Test Setup

Figure 2. Proxy representing one or more Standard Power Access Points Test Setup
When testing using a proxy, a detailed description of the proxy must be submitted with the filing (D05).

- Describe the communication network and protocol between the AFC DUT and proxy
- Can be submitted as an Operational Description exhibit and held confidential.
- Include security statement that no third party can control, authorize or allow a standard access point to radiate emissions in the 6 GHz band any other way than permitted by an AFC-registered session.
WFA AFC DUT Test Harness

2 ways for test harness to validate AFC DUT’s RF emissions

- Manual
  • RF measurements are done by test engineer and validated through UI popup messages in the test harness

- Auto (LitePoint IQxel-MW)
  • If test lab has LitePoint IQxel-MW tester, it can be connected on the same network as the test harness and RF measurements are done automatically using LitePoint RF test equipment

Both methods require plots to be included in test report
WFA AFC DUT Test Harness

Test Setup Configuration

- AFC DUT approved for LPI Operation
- AFC DUT needs to be supplied with mandatory registration information to formulate an Available Spectrum inquiry Request

AFC DUT Power Cycle Timeout (seconds): 90
Delay for AFC DUT applying follow on Inquiry Spectrum Response (seconds): 60

RF test equipment

- Operation Type: LitePoint_iQxel-MW
- Tester IP Address: LitePoint_iQxel-MW
- RF Ports: Manual

Notice: Please update the 'IQsniffer_path_loss.csv' file according to the attenuators used on your testbed.

IQsniffer_path_loss.csv can be found in the /usr/local/bin/WFA-QuickTrack-Tool/QuickTrack-Tool/Test-Services/AppData/IQsniffer folder.
5 tests involved in Wi-Fi Alliance AFC DUT Compliance Test Plan:

- **AFCD.RSA**: Successful registration and spectrum access request
  - RF plot required in test report
- **AFCD.USA**: Unsuccessful registration and spectrum access request
- **AFCD.SAU**: Successful spectrum access update
  - RF plot required in test report
- **AFCD.UAU**: Unsuccessful spectrum access update
- **AFCD.USV**: Unsuccessful server validation
For AFC D.RSA and AFC D.SAU:

- Available Spectrum Inquiry Request can be accomplished with channels, or frequency range, or both
  
  • Channels: AFC test harness returns list of available channels and associated MaxEIRP
  
  • Frequency Range: AFC test harness available frequency range and MaxPSD

- If AFC DUT supports both frequency range and channel requests, then test harness will repeat AFC D.RSA and AFC D.SAU to test both cases
For AFC D.RSA and AFC D.SAU Cont:

- Test reports **must** include plots showing frequency and power the AFC DUT is transmitting on after test harness sends Available Spectrum Inquiry Response.

- Test report must clearly explain EIRP value including any losses or antenna gains included.

AFC D.RSA

- Repeated for all supported channel widths of AFC DUT.

- Validates 2 separate spectrum access requests and responses to mimic the AFC DUT 24-hour refresh requirement.
WFA AFC DUT Test Harness

Output files from test harness required for certification

- Log File (For successful test cases)
  - DUT_Available_Spectrum_Inquiry_Request-Response.txt
    - Will list spectrum requests and responses from the AFC DUT and test harness

- Tool report
  - Tool-report_(date_timestamp).html
    - Will list test harness test cases and P/F validation results

Both files located at: /usr/local/bin/WFA-QuickTrack-Tool/Cloud-Reports/
# AFC DUT Compliance Test Report

## DUT Information

<table>
<thead>
<tr>
<th>DUT Information</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>AFC DUT System</td>
<td>Standard Power AP with Proxy</td>
</tr>
<tr>
<td>BUT Vendor Name</td>
<td>FCC</td>
</tr>
<tr>
<td>BUT Product Model</td>
<td>FCC</td>
</tr>
</tbody>
</table>

## Test Result

<table>
<thead>
<tr>
<th>FCC Requirements</th>
<th>Test Case Name</th>
<th>Test Result</th>
</tr>
</thead>
</table>

## Test Measurements

<table>
<thead>
<tr>
<th>Test Case Name</th>
<th>Description</th>
<th>Value</th>
<th>Validation Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>AFC_DUT_SP_OPERATION</td>
<td>AFC DUT transmit with standard power in the band before the Spectrum Inquiry Response</td>
<td>false</td>
<td>PASS</td>
</tr>
<tr>
<td>AFC_DUT_SEND_SPECTRUM_INQUIRYREQUEST_1</td>
<td>AFC DUT sends an Available Spectrum Inquiry Request</td>
<td>true</td>
<td>PASS</td>
</tr>
<tr>
<td>AFC_DUT_SPECTRUM_INQUIRYREQUEST_VALID_1</td>
<td>Valid mandatory registration information</td>
<td>true</td>
<td>PASS</td>
</tr>
<tr>
<td>AFC_DUT_CONFORM_SPECTRUM_INQUIRYRESPONSE_1</td>
<td>AFC DUT transmit power in the band is less than CEILING(LPJ limits (3 dBm/MHz PSD), SP limits (28.837/9340/33715 dBm EIRP) in Spectrum Response) on channel 23 bandwidth 20.</td>
<td>true</td>
<td>PASS</td>
</tr>
<tr>
<td>AFC_DUT_SEND_SPECTRUM_INQUIRYREQUEST_2</td>
<td>AFC DUT sends an Available Spectrum Inquiry Request</td>
<td>true</td>
<td>PASS</td>
</tr>
<tr>
<td>AFC_DUT_SPECTRUM_INQUIRYREQUEST_VALID_2</td>
<td>Valid mandatory registration information</td>
<td>true</td>
<td>PASS</td>
</tr>
<tr>
<td>AFC_DUT_CONFORM_SPECTRUM_INQUIRYRESPONSE_2</td>
<td>AFC DUT transmit power in the band is less than CEILING(LPJ limits (3 dBm/MHz PSD), SP limits (27.8447/5637/56932 dBm EIRP) in Spectrum Response) on channel 23 bandwidth 20.</td>
<td>true</td>
<td>PASS</td>
</tr>
</tbody>
</table>