



The AFC & Considerations for a Multistakeholder Group

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Automated Frequency Coordination (AFC)

From the FCC's 6 GHz Notice of Proposed Rulemaking:

“To determine whether an individual unlicensed device can transmit at a particular location on a given frequency, we propose that standard-power access points be required to obtain a list of permissible frequencies from an AFC system prior to transmitting or a list of prohibited frequencies in which it cannot transmit. We envision the AFC system to be a simple database that is easy to implement.”

k) *Automated frequency coordination (AFC).*

(1) Access points operating in the 5.925-6.425 GHz and 6.525-6.875 GHz bands shall access an AFC system to determine the available frequencies at their geographic coordinates prior to transmitting. Access points may transmit only on frequencies indicated as being available by an AFC system.

(2) An AFC system shall obtain information on protected services within the 5.925-6.425 GHz and 6.525-6.875 GHz bands from Commission databases and use that information to determine frequency availability for access points based on protection criteria specified by the Commission.

(3) An AFC system operator will be designated for a five-year term which can be renewed by the Commission based on the operator's performance during the term. If an AFC system ceases operation, it must provide at least 30-days' notice to the Commission and transfer any registration data to another AFC system operator.

(4) An AFC system operator may charge fees for providing registration and channel availability functions.

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Key issues to address:

- Device registration
- Centralized (e.g., cloud based) versus de-centralized AFC architecture
- Determining and updating frequency availability (i.e., incumbent protection requirements)
- Security requirements
- Data retention and user privacy
- AFC test and certification
- Interference resolution
- Other AFC system operator requirements

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The treatment of interference to fixed point-to-point services is an important threshold matter:

- Aggregation of interference effects arguably provides more precise incumbent protection and is more spectrally efficient for shared access
- However, treatment of interference on an aggregate basis substantially increases AFC complexity and thereby the effort to specify, develop, test, certify and operate an AFC
- Further, the benefits of interference aggregation may not be realized as conservatism will likely be introduced elsewhere in AFC operation (e.g., propagation models, use of statistical IPC, etc.)

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Single User protection based AFC is substantially less complex and provides flexibility for different AFC implementations

AFCs with Aggregate Interference protection methods:

- Must (re-)compute interference impact with each new device registration (spectrum request)
- Should produce substantially similar results
- Peer with other AFCs
- Maintain the state of each managed device (e.g., active/inactive)

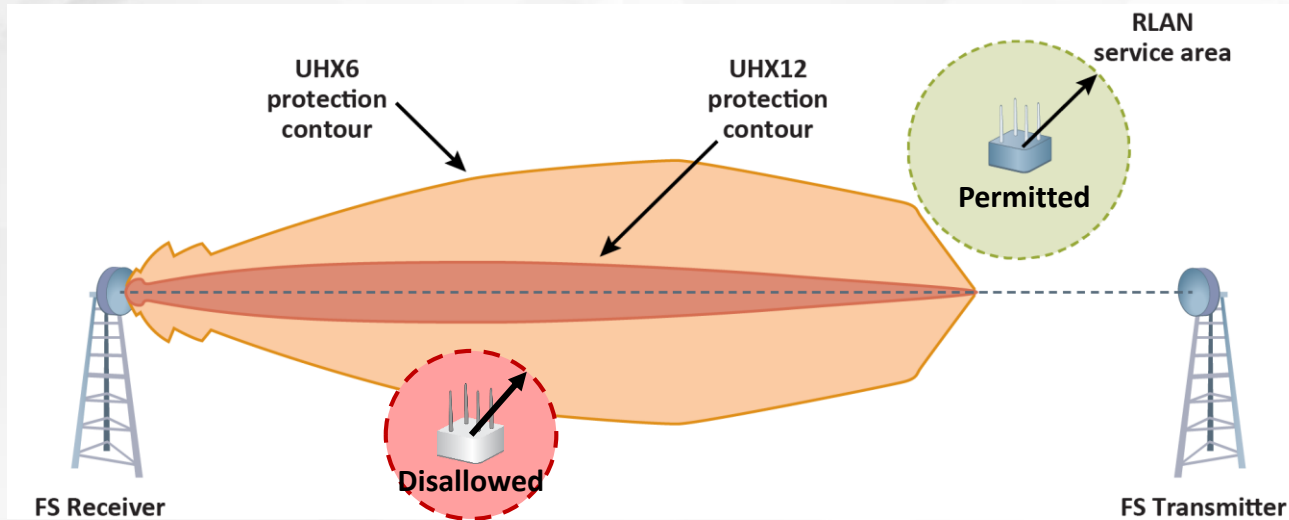
AFCs with Single User protection methods:

- Compute interference impact only once at time of initial registration (spectrum request)
- Can produce different results so long as they are within defined bounds
- Do not need to peer with other AFCs
- Do not need to maintain the state of each managed device

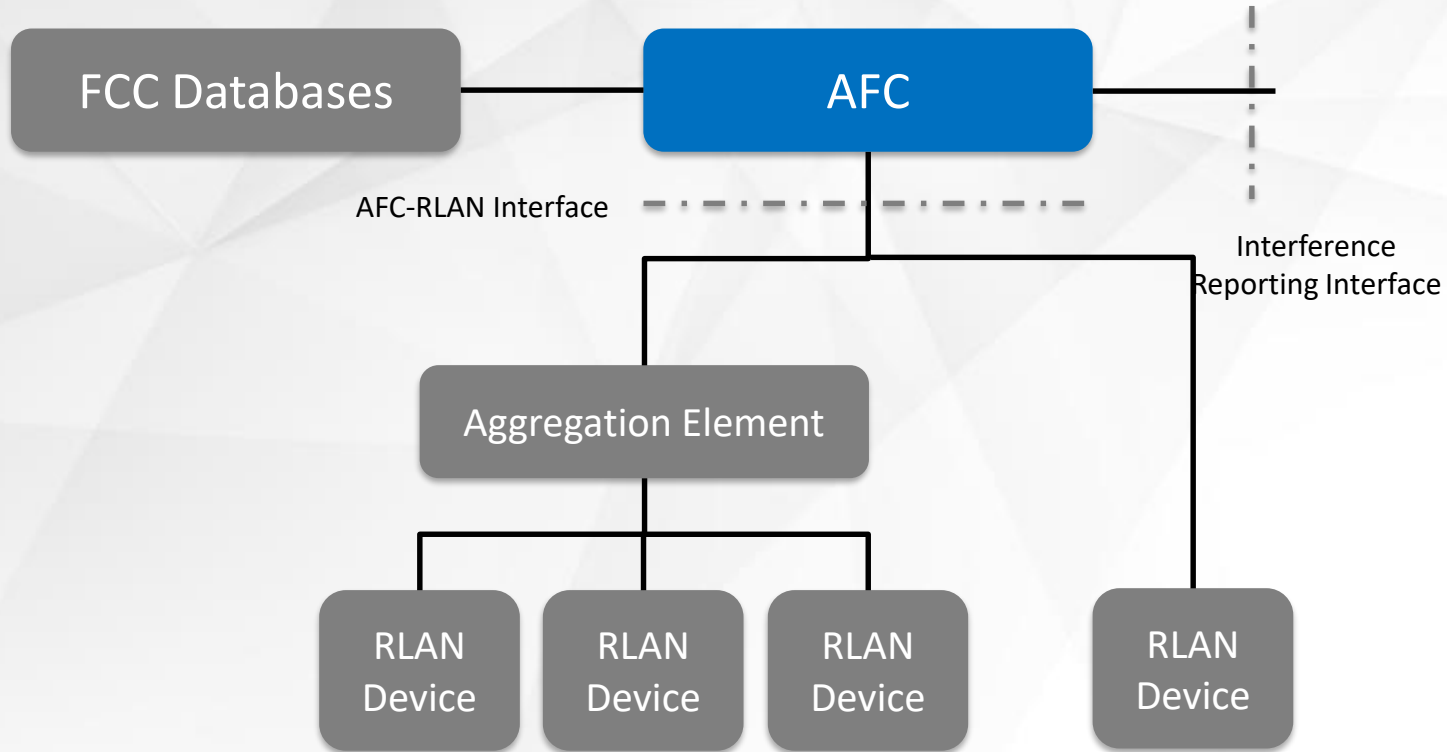
Proposed AFC Theory of Operations

Single User protection based AFC

- AFC systems calculate a protection area around every FS receiver based on licensee data in the FCC's Universal Licensing System (ULS) and RLAN operating data including its 3D position and effective EIRP
- The AFC protects against interference from clients of an RLAN by calculating an RLAN service area (RSA)
- Permissible RLAN operating frequencies are those where the RSA does not collide with any FS contour



Centralized AFC Functional Architecture



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Potential role/function for a multistakeholder group to specify, test, and certify Single User protection based AFC

AFC Requirement	Multistakeholder Group Function
Device registration	Specify contents of device registration. Set high level requirements for position determination, heartbeat/re-registration process, permitting different implementations.
Centralized (e.g., cloud based) versus decentralized AFC architecture	Set high level requirements for each architecture type. Merit of specifying single AFC-RLAN API versus multiple options should be carefully considered.
Determining and updating frequency availability (i.e., incumbent protection requirements)	Specify propagation model, loss factors, incumbent protection methodology including protection area and criteria, RLAN service area definition, etc.
Security requirements	Set high level requirements
Data retention and user privacy	Set high level requirements
AFC test and certification	Specify behavioral test framework that can be executed by third-party commercial laboratories (consistent with FCC OET equipment authorization)
Interference resolution	Set high level requirements
Other AFC system operator requirements	N/A



Thank you

Kurt Schaubach
Chief Technology Officer
kurt@federatedwireless.com


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