Federal Communications Commission
Washington, D.C. 20554

March 31, 2014

Marlene Dortch
Secretary
Federal Communications Commission
445 12th Street, SW
Washington, DC 20554

Re: 3.5 GHz Online Discussion Forum, WTB Docket No. 12-354

Dear Ms. Dortch:

The Wireless Telecommunications Bureau (Bureau) and the Office of Engineering and Technology (OET) hosted a workshop in the Commission Meeting Room on January 14, 2014, to discuss the development and adoption of a dynamic Spectrum Access System to govern interactions between and among devices in the 3.5 GHz band.[1] Following the conclusion of the workshop, the Bureau and OET commenced an online discussion forum (forum) to facilitate dialogue between interested parties on topics discussed in the workshop.[2] The forum was divided into the workshop's four focus areas and an additional supplemental area on a radar interference studies presentation given the day of the workshop.[3] The forum was closed on January 28, 2014 at 5:00 P.M. EST. Parties submitted a total of six comments (four initial comments and two reply comments to an initial comment). With this letter we submit into the record the attached "3.5 GHz Spectrum Access System Workshop Online Discussion Forum Comments Posted as of January 28, 2014 at 5:00 P.M. EST."

Respectfully Submitted,

_____/s/_____

Brian Regan
Legal Advisor
Office of the Bureau Chief
Wireless Telecommunications Bureau
Federal Communications Commission

Attachment

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[1] 3.5 GHz Spectrum Access System Workshop, http://www.fcc.gov/events/35-ghz-spectrum-access-system-workshop.

[2] *FCC Wireless Telecommunications Bureau and Office of Engineering and Technology Announce Agenda for Workshop to Discuss the Creation of a Spectrum Access System in the 3.5 GHz Band*, Public Notice, 29 FCC Rcd. 174 (WTB/OET 2014).

[3] 3.5 GHz Spectrum Access System Workshop Online Discussion Forums, http://spectrumworkshop.uservoice.com/.

3.5 GHz Spectrum Access System Workshop Online Discussion Forum Comments Posted as of January 28, 2014 at 5:00 P.M. EST

Focus Area C: SAS Monitoring and Management of Spectrum Use

Comment # 1

- **Providers should not be starved for capacity or have necessary capacity cut without warning**

Submitted by Anonymous · January 15, 2014

One of the biggest potential problems with an SAS is that broadband providers -- especially WISPs -- who have committed to provide customers with a certain amount of bandwidth may no longer be able to do so when a new spectrum user enters the arena. Any SAS should ensure that no user is starved of bandwidth or denied spectrum in such a way as to cause him to be unable to fulfill reasonable service commitments. The system should also ensure that spectrum is not reserved and then left unused -- either due to simply wasteful behavior or as an anticompetitive tactic.

Reply to Comment # 1

Submitted by Brett Glass · January 19, 2014 12:55 AM

Unfortunately, as I read the current NPRM, WISPs are never eligible for priority access (though, IMHO, they should be; they serve a vital function). They shouldn't be edged out, or their service compromised, because the local municipality doesn't want to use other frequencies available to it (e.g. 4.9 GHz) or a hospital administrator wants to set up wireless access so he can telecommute.

Reply to Comment # 1

Submitted by Johanna Dwyer, Federated Wireless · January 17, 2014 10:44 AM

Priority access is designed to ensure that a provider, whether a WISP or an MNO or a private network provider, has priority access to the spectrum that they have secured a priority license for. The regional SAS has a role of managing coexistence between systems, and the reuse factor that is achievable by any given SAS implementation will depend on how effectively the SAS can do this. Tier 1 or incumbent use will always take precedence even over priority access licensees, however an effective SAS will also have a good idea of what the typical spectrum requirements of the incumbents are, including temporally, and the approved priority applications need to reflect a certain reliability of being able to continuously provide the spectrum necessary to meet the totality of the priority application requirements.
Separating the priority application process from the access authorization process, and making the access authorization period sufficiently short, permits the SAS to assign unused spectrum, whether part of a priority access license or not, to a user that will actually make use of it for the given access authorization period. This fulfills the Commission's "use it or lose it" requirement, however still protects the priority access licensees that are making productive use of their spectrum. For more information, please see
http://apps.fcc.gov/ecfs/document/view?id=7520960539

Comment # 2

- **SAS management of diverse system spectrum use**

Submitted by Johanna Dwyer, Federated Wireless · January 17, 2014

SAS management of the use of federal shared spectrum is required to protect incumbents, however additionally requiring the SAS to manage the coexistence of diverse systems within the band will make more productive use of the spectrum and enable a much higher degree of frequency reuse.

The SAS is uniquely aware of all the users of a portion of the frequency band at a given location and time, and is therefore positioned to make short duration frequency access authorizations which respect exclusion zones and maximize the spectrum utilization across a heterogeneous system population.

Comment # 3

- **GAA tier coexistence concepts**

Submitted by Anonymous · January 22, 2014

GAA spectrum coexistence and sharing is the key element that needs resolution as GAA is lowest priority tier and coexistence strategy of this tier will drive most complex requirements on devices and SAS.

There are two types of coexistence: uncoordinated similar to WiFi that starts to show its limitations as spectrum becomes crowded. As a principle this concept doesn't really scale in multitier world as higher priority tier devices must be identified and protected. As opposed to DFS that allows identification of several specific patterns, in present case (PA multi-technology tier) such undertake will drive excessive requirements on all devices.
In coordinated coexistence case, SAS will coordinate in one or all dimensions: geography, frequency, time .

Coordination can start with course granularity and refine as spectrum users proliferate.
Talking about small cells, basic geographic coordination requires micro-targeted coexistence especially on GAA tier. GAA devices should have capability to respond and comply to SAS coordination in any of the three dimensions.

Assuming GAA usage will be governed by fair access to spectrum, as usage will increase, sharing requirements will become more restrictive.
In such case, SAS will become more like a HetNet SON tool over a certain geography, just to cover GAA coexistence needs.

Next question is how SAS business case and ownership is defined, as this becomes more of a local entity in a distributed architecture.

Elements like PA policy and incumbents protection will come naturally to piggy back on GAA framework especially similar models have been implemented already.
One simple way, for fast spectrum availability is enabling temporary (light) PA licenses with incumbents protection rules (at least similar to 3.65 GHz) , so deployments can happen at a geography coordinated level.

Once GAA framework is ready to deploy, and GAA devices start to become available, parts of PA spectrum will become GAA, increasing up to envisioned boundaries.

In worst case former PA users with expired and not renewed license, will become GAA users needing to comply to GAA usage and SAS micromanagement as opposed to protected PA umbrella.

Comment # 4

- **Need for better than ITU analysis for large system 3.5-3.7GHz deployments**

Submitted by Jim Veeder · January 23, 2014

Thank you FCC Wireless and Technology for this 3.5 GHz SAS workshop. As noted by Chairman Tom Wheeler in his introduction the audience is large and the interest is great. The moderators and panelists were excellent and I was happy to meet and share cards with many of them.

For incumbents doing Life and Safety services, services delivering critical real time combat support, moving real time rocket in-launch correction data, FAA air traffic control correction data, emergency communications and the like it is a challenge to educate newly created entrepreneurial RF environment neighbors. Years of experience, data collection and sophisticated analysis are lost to those who think interference considerations are a simple matter. It can become rocket science when it matters.

Often ITU analysis is used where it should not be. While mountains are most often considered as a source of signal blockage, which is true for the engineer attempting to close the link on a terrestrial path, for the matter of interference though, the mountains are most often a type of complex grating which give an opportunity of alternative paths to the photons of interest and show that their time spurious distributions, while averging about an ITU derived number for low lapse rates, have peak values as much as nearly 30 dB above average for about a millisecond of every second, and with lapse rates in of about 100 U/km can even overwhelm the ITU calculated averages by showing 40 to 50 dB peaks above ITU analysis averages for the same amount of time. Above 100 U/km, much worse

Also the largely accepted antennae discrimination angles valued for their mitigation of interference is no long valid in most non-line-of-sight (NLOS) situations. Intereference does not drop off as the sidelobe pattern of the antennae, but as a linear function of angles, say something like 1dB per degree, depending on terrain. Also background reflection from away-looking hills can back scatter interfering signals significantly more than 20 dB above the most direct NLOS path.

WiMax services even outside of the earth station's exclusion zones have been seen to have at times strong interference potential.

Using mathematical techniques associated with QED (quantum electrodynamics) these effects can be predicted. The new tools of the future for complicated geography and weather must start to incorporate the vocabulary of Born approximations modeling thunderheads and the like, generalized functions modeling steep high river gorges and moisture basins, Fermat's principle, all possible paths integration, Lagrangian mechanics and calculus of variations as a minimum. The physics is kept at first principles, embracing all Newton's and Maxwell's equations which

can all be derived from QED and in this way only the weather is approximated and terrain modeled most simply until it fits test data.

We invite discussion and interest from all parties who want to improve the opportunity to better share RF spectrum. So far we have found that frequency coordinators for WiMax operators will not discuss anything but ITU analysis and will only input the most benign weather and terrain parameters into their analysis. Life and Safety must be better than that.

I recommend an "open mouth" FCC workshop so that the audience is free to share and challenge in the heat of the presentations. Often the value of a very pertinent question or statement is lost outside the context of those precise matters of the immediate presentation. In our experience we know there are very strong opinions in these matters and most often people do not want to learn new methods of difficult analysis unless the analysis is their primary focus.

We are willing to meet, share analysis development, and show data that will open eyes to the need for a different approach. Wave equations, Poynting vectors, diffraction calculations... are inadequate except for very simple terrain geography and weather. With tens of very low gain antennae base stations and hundreds of similar customer stations, all radiating at 10 Watts over 10 MHz, we no longer have a simple point to point high gain microwave problem, the problem becomes ubiquitous in the environment. We have spent months taking data and proving analysis. Discrimination angles melt away as any source of hope. We wish share this and invite discussion, critical or otherwise, especially critical.

I hope enough has been written here to have at least stirred interest. You are welcome to contact jimveeder@usei-teleport.com or call 206 910 4614 cell, 509 689 6000 office.

Jim Veeder
US Electrodynamics Science Chief