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Marlene H. Dortch
Secretary
Federal Communications Commission
445 12th Street, S.W.
Washington, DC 20554

January 06, 2014

Re: GN Docket No. 12-354 – Amendment of the Commission's Rules with Regard to Commercial Operations in the 3550-3650 MHz Band

Dear Ms. Dortch:

Please find attached Microsoft's response to the Commission's November 18, 2013, Public Notice seeking proposed papers for its January 14, 2014 Workshop on a proposed spectrum access system (SAS) for the 3.5 GHz band. For purposes of this submission, Microsoft has focused its responses on Focus Area D – Issues Related to the Initial Launch and Evolution of SAS and Band Planning.

We look forward to a productive workshop on January 14 to discuss and debate the various focus areas. Please do not hesitate to contact me at 202-641-7615 or paulgar@microsoft.com if you have any questions about this submission.

Sincerely,

Paul W. Garnett

Director, Technology Policy

Microsoft Corp.

Response to Focus Area D: Issues Related to Initial Launch and Evolution of SAS and Band Planning

Introduction

Microsoft appreciates the opportunity to participate in the FCC SAS Workshop on January 14, 2014. We are committed to helping the FCC in its evaluation of the regulatory and licensing structure for 3.5 GHz for the following broad use cases:

- Small-cell networking: Internet access and devices connectivity
- Last mile (backhaul access)

Just as Wi-Fi transformed access over the past decade, opportunistic and dynamic small-cell devices in the 3.5 GHz band can deliver speed, quality, and agility that consumers and businesses have never before seen. Dynamic access in the 3.5 GHz could also be used to narrow the gap for last mile access.

The 3.5 GHz plan should allocate a sufficiently large amount of continuous spectrum to unlicensed, opportunistic GAA devices. Opportunistic communications such as the Citizens Broadband Service will only flourish in the 3.5 GHz band if the Commission dedicates sufficient usable spectrum to GAA, which is available on a nationwide basis. Manufacturers and service providers are prepared to meet the demand for dynamic technology and deploy products and services for the 3.5 GHz band. But they are unlikely to significantly invest in new technology unless they are certain that sufficient bandwidth will be available. Manufacturers must have assurance that Incumbent and Priority Access users cannot occupy the entire band and that consumers will be able to use their products without significant interruption. Accordingly, the Commission should reserve a minimum amount of spectrum on the 3.5 GHz band for GAA use.

In the Public Notice, the Commission asked whether reserving 40 percent to 50 percent of non-incumbent 3.5 GHz spectrum for GAA users would be sufficient. The short answer is “no.” In areas with large amounts of federal use (such as San Diego and Seattle), much of the 3.5 GHz band is already occupied by incumbents. Forty-to-fifty percent of the small remaining amount of spectrum would not be sufficient for GAA, particularly if carriers reserve most of the Priority Access tier. Instead, the Commission should set aside at least 50 MHz on the 3.5 GHz band for GAA. Based on Microsoft’s experience with developing and deploying opportunistic and dynamic technology, 50 MHz of contiguous usable spectrum is the minimum amount that is necessary to bring a new technology to commercial viability.

As the success of Wi-Fi demonstrates, opportunistic devices function best when they are unencumbered by licensing requirements. GAA small-cell devices also should be unlicensed under the equipment authorization rules of Parts 2 and 15. This system provides a nascent technology with the flexibility and agility that it needs to meet consumer demands.

Focus Area D and Response

D.1. What functions should be required at launch? How should the SAS's capabilities evolve over time? What functions can be added later? How would such an evolution path anticipate backward compatibility of deployed equipment?

D.2. What are the key network deployment topologies the SAS should support at launch (e.g., low-power small cells, backhaul, higher-power rural uses)? Can the SAS be designed to support multiple wireless technologies? Please provide technical details to distinguish various use and technology cases as they might, in turn, generate different requirements for the SAS.

D.3. Should there be a phased approach to flexible partitioning of the band between different use cases (e.g., low power small cells vs. wireless backhaul or between PA and GAA)? What are the tradeoffs and how we can ensure backward compatibility of devices as the band plan evolves?

D.4. How can we ensure that the SAS and band plan evolution maximize flexibility to accommodate multiple spectrum uses / topologies going forward while maintaining backward compatibility?

D.5. How should the system be developed and deployed? To ensure a successful launch, what strategies could be employed to test the capabilities of the SAS?

D.6. What provisions need to be established to address the possibility of an SAS experiencing a service outage or permanently discontinuing service?

Microsoft supports using three coexistence mechanisms in the 3500-3650 band.

1. An identifying beacon
2. Listen before talk
3. Geolocation and database queries to protect Incumbents

In those spectrum bands in which they are authorized to operate, PA devices should make use of an identifying signal or beacon that transmits both a unique identification number for each device and as well as an indication the device is designated for PA. GAA devices should communicate similar information during a database query or through a MAC protocol.

When combined with listen-before-talk, being able to identify all PA device transmissions over the air will provide a number of benefits.

- Assuming that a GAA device is outside of Incumbent and PA exclusion zones, GAA devices should be able to use all available channels.
- Once the GAA device has heard a PA device beacon, it should be prohibited from using that channel in that location until it has not heard the beacon for a set period of time.
- If PA licensees are able to identify each other, they should be able to resolve these kind of conflicts between each other.

Listen before talk is also contemplated in the original 3.5 GHz NPRM, as part of a 5GHz like DFS mechanism that would require all stations to vacate the channel they are using if they are able to sense the signature of an incumbent user's radar.

At launch, the functionality of the SAS should be limited to protecting the contours of the shipboard radars and grandfathered satellite earth stations, and to provide a mechanism to communicate to a device that it must change channels because it is interfering with a user that has a higher priority.

In protecting the contour of the Incumbent users, the SAS should function in a similar manner to the existing TV White Space (TVWS) databases, with the notable exception that the SAS should tell a device at what power it can operate a given location. Specifying a reduced power level will allow a device to operate closer to a protected contour in order to maximize spectrum use while avoiding the production of harmful interference.

Low-power small cells, backhaul, and higher-power rural uses have been identified as the applications that should be supported at launch. Regulating coexistence between different network deployment topologies need not be a function of the SAS. Questions about how densely the various applications can be deployed co-channel are best answered through real world testing and industry standards.

While very small license areas might raise issues regarding interference between PA licensees, as posited, for example, by the Consumer Electronics Association (*see* http://apps.fcc.gov/ecfs/document/view?id=7520960838), co-channel and adjacent channel coexistence between differing technologies is best handled through industry standardization as well as vendor and licensee cooperation. The functionality of the SAS should be limited to protecting existing systems and to signal interferers that they need to change channels.

Decisions about compatibility of use cases are more contingent on cell size and allowable power levels than on SAS functionality. Compatibility between PA and GAA users does not need to rely on the SAS. In the event a GAA user is interfering with a PA device, the PA device would be able to report the identity of the interferer to the SAS, and, in turn, the SAS should signal the GAA device to vacate the channel. If there is a case where one PA licensee is interfering with another, the optimal solution would be for the party being harmed to change channels. If this is not possible, the interfered with PA licensee should be able to identify the interfering PA licensee and attempt to find an amicable resolution. This method appears to have been effective in resolving disputes between 3650-3700 MHz licensees.

If the core functionality of the SAS is to set the maximum power level of an individual device. A band plan of 15 10MHz channels should allow for sufficient flexibility to try a number of different spectrum uses / topologies going forward.

If there are a number of publicly available GAA SASes, devices should be able to connect to another SAS in the event of an outage. An example of such a mechanism can be found in the ETSI TVWS standard (EN 301 598). In the event that no GAA SASes are available, a device would have to stop transiting after a given period of time.