



July 9, 2015

Via Electronic Filing

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

Re: Notice of Ex Parte Communication: Amendment of Part 15 of the Commission's Rules for Unlicensed Operations in the Television Bands, Repurposed 600 MHz Band, 600 MHz Guard Bands and Duplex Gap, and Channel 37, Amendment of Part 74 of the Commission's Rules for Low Power Auxiliary Stations in the Repurposed 600 MHz Band and 600 MHz Duplex Gap, ET Docket No. 14-165; Expanding the Economic and Innovation Opportunities of Spectrum Through Incentive Auctions, GN Docket No. 12-268

Dear Ms. Dortch:

On July 8, 2015, Donald Breslin, Andy Lee, Alan Norman, Austin Schlick, and I of Google Inc. met via teleconference with Ira Keltz, Geraldine Matise, Paul Murray, and Hugh Van Tuyl of the Commission's Office of Engineering and Technology. On July 9, Austin Schlick spoke by telephone with Roger Sherman of the Wireless Competition Bureau and Howard Symons of the Incentive Auction Task Force.

In each of these conversations, we discussed the importance of making three usable channels available for unlicensed use in the broadcast bands and repurposed 600 MHz band. In particular, we discussed the need to establish conservative but reasonable protection areas for wireless medical telemetry users, without allowing protection contours for atypical sites to serve as the default for all sites. We emphasized that unlicensed access to TV Channel 37, wherever achievable without harmful interference to protected WMTS and radio astronomy locations, is critical to reaching the three-channel minimum requirement nationwide.

We also discussed the benefits of allowing unlicensed devices to report their location capabilities, rather than mandating that devices meet a particular location-accuracy standard.¹ Under such a framework, if a device is able to determine its

¹ See 47 C.F.R. § 15.711(b); see also *Amendment of Part 15 of the Commission's Rules for Unlicensed Operations in the Television Bands, Repurposed 600 MHz Band, 600 MHz Guard Bands and Duplex Gap, and Channel 37, Amendment of Part 74 of the Commission's Rules for*

location accuracy, the device would share that location-accuracy information with a television white space (TVWS) database.² The database would use this accuracy parameter as an input for calculating available spectrum in the vicinity of the device. Thus, a device with poorer location-accuracy capabilities may have access to fewer channels than one that meets the Commission's current 50-meter requirement, while a device with more precise location-accuracy capabilities could gain access to additional channels. Ofcom recently adopted a similar rule for unlicensed devices operating in its television band,³ and the Internet Engineering Task Force's Protocol to Access White Space Databases, which establishes the protocol for communications between databases and unlicensed devices in the broadcast bands and repurposed 600 MHz band, already accommodates device location accuracy as a parameter.⁴

Making this change to the Commission's rules would enable a new set of use cases that are difficult to implement under the current rules. As the use of in-home Wi-Fi extends from providing connectivity for laptops, smartphones, tablets, and TVs to a broader range of home devices such as printers, thermostats, remote cameras, motion sensors, smoke detectors, and door locks, the need to provide more robust and reliable coverage throughout the home is paramount. Unlicensed signals must reach not only the living room, bedroom, and kitchen, but also the garage, utility room, basement, and attic. The favorable propagation characteristics of sub-1 GHz TVWS spectrum make the spectrum ideal for connecting all kinds of devices across the home. Wi-Fi access points, operating as Mode II TVWS devices, can serve as a hub for this kind of connectivity. Individual remote terminals—whether thermostats, smoke detectors, or other devices—could operate as Mode I devices.

Because GPS signals often are not reliable indoors, these devices will need to use location determination technologies other than GPS. For example, Google's Android operating system uses a method of crowdsourcing to determine an Android device's location.⁵ Today, the system provides a location and accuracy radius based on information about cell towers and Wi-Fi nodes visible to the Android device, and this same system could be used in Mode II access points. The accuracy of each location estimate is a

Low Power Auxiliary Stations in the Repurposed 600 MHz Band and 600 MHz Duplex Gap, ET Docket No. 14-165; *Expanding the Economic and Innovation Opportunities of Spectrum Through Incentive Auctions*, GN Docket No. 12-354, Notice of Proposed Rulemaking, 29 FCC Rcd 12248 ¶¶ 76-77 (2014) (considering whether to amend this rule).

² Devices would also retain the option of merely complying with today's 50-meter accuracy requirement.

³ Ofcom, *Implementing TV White Spaces*, Statement, § 5.14, Feb. 12, 2015, available at <http://stakeholders.ofcom.org.uk/binaries/consultations/white-space-coexistence/statement/tvws-statement.pdf>.

⁴ Internet Engineering Task Force, Protocol to Access White-Space (PAWS) Databases, RFC 7545, available at <https://datatracker.ietf.org/doc/rfc7545/>.

⁵ See Google Maps Geolocation API, <https://developers.google.com/maps/documentation/geolocation/>.

function of the number, type, and quality of the available location reference signals (e.g., cell towers and Wi-Fi nodes). For each of the input signals, factors such as signal strength, noise levels, coverage range, and data consistency are considered in computing an accuracy radius. This radius is a graphical representation of the measure of confidence regarding the estimated location. When there is a rich set of input signals, this radius can be small, but if the number or quality of the input signals goes down, it will increase. Because the number and quality of inputs vary from location to location, technologies such as this, while effective indoors, may not meet the 50-meter requirement at all times.

While alternative location determination technologies may not always meet the 50-meter requirement, they can adequately protect licensed operations and enable access to spectrum for a variety of devices in the connected home as long as their capabilities are known and taken into account by a TVWS database. For this reason, the Commission should replace its inflexible geolocation-accuracy mandate with a rule that permits devices to report their location accuracy capabilities as an input for calculating available spectrum.

Pursuant to the Commission's rules, this notice is being filed in the above-referenced docket for inclusion in the public record. Please contact me should you have any questions.

Respectfully submitted,

A handwritten signature in blue ink that reads "Aparna Sridhar".

Aparna Sridhar
Counsel
Google Inc.

cc: *Via electronic mail*
Roger Sherman
Howard Symons
Ira Keltz
Geraldine Matisse
Paul Murray
Hugh Van Tuyl