



# The Committee on Energy and Commerce

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## Memorandum

September 27, 2013

To: Members, Subcommittee on Communications and Technology

From: Majority Committee Staff

Subject: Hearing on “Challenges and Opportunities in the 5 GHz Spectrum Band”

### I. Overview

The Subcommittee on Communications and Technology will hold a hearing Tuesday, October 1, 2013, at 10:30 a.m. in 2123 Rayburn House Office Building on “Challenges and Opportunities in the 5 GHz Spectrum Band.” One panel of witnesses will testify:

1. Bob Friday, Vice President and Chief Technology Officer, Cisco
2. Julius Knapp, Chief, Office of Engineering and Technology, U.S. Federal Communications Commission
3. John Kenney, Principal Research Manager, Toyota Info Technology Center
4. Tom Nagel, Senior Vice President, Business Development, Comcast

As part of the Middle Class Tax Relief and Job Creation Act of 2012, Congress instructed the Federal Communications Commission (FCC) and the National Telecommunications and Information Administration (NTIA) to investigate the potential for increased unlicensed use of the spectrum in the 5 GHz band. As demand for wireless data continues to grow, the 5 GHz band holds great potential for the expansion of Wi-Fi and other unlicensed data services and implementation of the IEEE 802.11ac “Gigabit Wi-Fi” standard. However, in order to do so, unlicensed advocates must find ways to protect incumbent government systems, as well as the nascent Intelligent Transportation System.

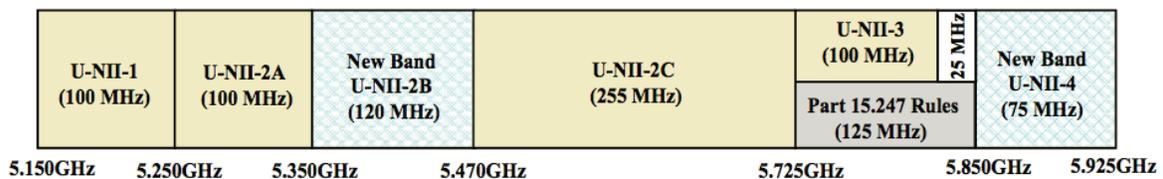
### II. Background

Demand for wireless data seemingly is unbounded. According to Cisco, global mobile data increased 70% annually from 2011 to 2012. In 2012, mobile devices consumed more than 885 petabytes of data (nearly one billion gigabytes) per month. As the number of wireless connected devices continues to grow, this number is expected to continue to grow as well, taxing the ability of mobile wireless broadband networks to keep pace with demand.

Increasingly, mobile wireless companies and users are turning to short-range wireless technologies like Wi-Fi to “offload” data from the mobile networks and to increase their data speeds when relatively stationary. For example, the U.S. House of Representatives has both a licensed distributed antenna system as well as unlicensed Wi-Fi systems.

The 5 GHz band is not, however, one single band of spectrum that simply can be reallocated for unlicensed. Rather, the band is a series of sub-bands that are already in use by various government and commercial incumbents and existing unlicensed operations. The spectrum in the 5 GHz band is part of the “Unlicensed National Information Infrastructure” (U-NII) that the FCC began allocating in 1997. The bands, now known as U-NII-1, U-NII-2A, U-NII-2C, and U-NII-3 are subject to an array of rules regarding permissible locations, acceptable power levels, and the use of spectrum sensing technologies that are designed to allow unlicensed use without harming licensed users in the band.

Recognizing the complimentary and valuable roles that the licensed mobile wireless networks and unlicensed Wi-Fi services play in our wireless data ecosystem, Congress adopted section 6406 of the Middle Class Tax Relief and Job Creation Act of 2012, instructing the FCC and NTIA to examine the spectrum in the 5 GHz band and to determine its suitability for increased unlicensed wireless use. These new bands of spectrum, now called U-NII-2B and U-NII-4, could permit greatly increased data speeds if service rules can be harmonized between the bands and incumbent operations. The chart below shows what the U-NII bands would look like if the new unlicensed bands were implemented.



Unlicensed advocates note that in order for the U-NII bands to be put to their highest use, the technical rules, including power levels, the use of dynamic frequency selection (DFS) spectrum sensing technologies, and outdoor-use restrictions should be harmonized across adjacent U-NII bands to facilitate the next generation of Wi-Fi, known as IEEE 802.11ac or simply “Gigabit Wi-Fi.”

### III. Discussion

While the 5 GHz band holds great potential to increase unlicensed data use for both the Wi-Fi and Wireless Internet Service Provider (WISP) community, there are challenges.

#### A. Existing Disparities Between U-NII Bands

Because U-NII devices operate under the FCC’s Part 15 unlicensed rules, U-NII devices are not afforded protection from interference and cannot interfere with existing licensed operations. As such, each of the U-NII bands is subject to differing rules designed to ensure they remain non-interfering.

For example, U-NII-1, which is the 5150 MHz to 5250 MHz band, is primarily allocated for radio navigation services and satellite services. In order to avoid interference to these systems, the FCC adopted a restriction that prohibits outdoor use of U-NII-1 devices and limits their power to one-twentieth the power permitted in U-NII-3. Generally, the higher the permitted

power level, the larger the area a base station can cover and the more resilient a signal is to interference.

Similarly, the U-NII bands have different requirements with respect to the use of DFS, a spectrum sensing technology that listens to the spectrum band for the presence of licensed radar systems before transmitting. The U-NII-2A and U-NII-2C bands are subject to this requirement, but the other U-NII bands are not. As a result, it is difficult to aggregate these spectrum bands to create the wide bands needed to accommodate the latest generation of Wi-Fi technology.

Consistent with the mandates of the Middle Class Tax Relief and Job Creation Act, the FCC and NTIA are in the process of determining if and how these rules can be harmonized and whether expansion into the U-NII-2B and U-NII-4 bands can be achieved without harming incumbents. Among the questions that are being asked are: What are the challenges associated with raising the power limits across these bands? How do the existing disparities impact Wi-Fi systems? What is the practical impact of DFS on Wi-Fi, and can it be eliminated without impacting government systems?

*B. Incumbent Licensees and Operations in the Proposed U-NII-2B and U-NII-4 Bands*

The spectrum provisions of the Middle Class Tax Relief and Job Creation Act of 2012 sought to expand the use of unlicensed spectrum in the 5 GHz band. However, because there are existing licensed incumbents in the band, the provisions instructed the FCC and the NTIA to examine whether and how to make these systems work together without harmful interference.

The U-NII-2B band is currently populated by numerous Federal and non-Federal radar systems, as well as satellite, radio navigation, and unmanned aerial systems. The U-NII-4 band currently is licensed to the Intelligent Transportation Service (ITS). ITS was allocated in 1999 to be used for systems to make the nation's highways and vehicles safer through various technologies including vehicle-to-vehicle and vehicle-to-infrastructure communications. Since that time, the Department of Transportation and the automobile industry have invested significant time and money in developing dedicated short range communications systems (DSRC). These systems require high levels of reliability and extremely short time delays in order to be effective. To date, the DSRC service has not been mass deployed; however, the Department of Transportation and the University of Michigan Transportation Research Institute currently are operating a "Connected Vehicle Test Bed" to continue developing this technology.

Among the questions witnesses may address are: Can these systems co-exist without compromising their integrity? What are the unique challenges to address when considering a system as extensive as that planned for ITS? Are there opportunities to rethink the configuration of the ITS band at this early stage in its deployment? What considerations will unlicensed device manufacturers have to consider when developing next generation unlicensed equipment?

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