



**Wireless Innovation Forum's Comments to  
the FCC regarding the Notice of Proposed  
Rulemaking and Order on Enabling  
Innovative Small Cell Use in the 3.5GHz  
Band Adopted December 12, 2012**

Document WINNF-13-R-0002

Version V1.0.0  
19 February 2013

# TERMS, CONDITIONS & NOTICES

This document has been prepared by the Regulatory Committee to assist The Software Defined Radio Forum Inc. (or its successors or assigns, hereafter “the Forum”). It may be amended or withdrawn at a later time and it is not binding on any member of the Forum or of the Regulatory Committee.

Contributors to this document that have submitted copyrighted materials (the Submission) to the Forum for use in this document retain copyright ownership of their original work, while at the same time granting the Forum a non-exclusive, irrevocable, worldwide, perpetual, royalty-free license under the Submitter’s copyrights in the Submission to reproduce, distribute, publish, display, perform, and create derivative works of the Submission based on that original work for the purpose of developing this document under the Forum's own copyright.

Permission is granted to the Forum’s participants to copy any portion of this document for legitimate purposes of the Forum. Copying for monetary gain or for other non-Forum related purposes is prohibited.

THIS DOCUMENT IS BEING OFFERED WITHOUT ANY WARRANTY WHATSOEVER, AND IN PARTICULAR, ANY WARRANTY OF NON-INFRINGEMENT IS EXPRESSLY DISCLAIMED. ANY USE OF THIS SPECIFICATION SHALL BE MADE ENTIRELY AT THE IMPLEMENTER'S OWN RISK, AND NEITHER THE FORUM, NOR ANY OF ITS MEMBERS OR SUBMITTERS, SHALL HAVE ANY LIABILITY WHATSOEVER TO ANY IMPLEMENTER OR THIRD PARTY FOR ANY DAMAGES OF ANY NATURE WHATSOEVER, DIRECTLY OR INDIRECTLY, ARISING FROM THE USE OF THIS DOCUMENT.

Recipients of this document are requested to submit, with their comments, notification of any relevant patent claims or other intellectual property rights of which they may be aware that might be infringed by any implementation of the specification set forth in this document, and to provide supporting documentation.

This document was developed following the Forum's policy on restricted or controlled information (Policy 009) to ensure that that the document can be shared openly with other member organizations around the world. Additional Information on this policy can be found here: [http://www.wirelessinnovation.org/page/Policies\\_and\\_Procedures](http://www.wirelessinnovation.org/page/Policies_and_Procedures)

Although this document contains no restricted or controlled information, the specific implementation of concepts contain herein may be controlled under the laws of the country of origin for that implementation. Readers are encouraged, therefore, to consult with a cognizant authority prior to any further development.

Wireless Innovation Forum <sup>TM</sup> and SDR Forum <sup>TM</sup> are trademarks of the Software Defined Radio Forum Inc.

**Before the**  
**Federal Communications Commission**  
**Washington, D.C. 20554**

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

**COMMENTS OF THE WIRELESS INNOVATION FORUM ON THE FCC NOTICE OF PROPOSED RULEMAKING AND ORDER ON ENABLING INNOVATIVE SMALL CELL USE IN THE 3.5GHZ BAND ADOPTED DECEMBER 12, 2012**

The Wireless Innovation Forum is a non-profit organization driving technology innovation in commercial, civil, and defense communications around the world. Forum members bring a broad base of experience in Software Defined Radio (SDR), Cognitive Radio (CR) and Dynamic Spectrum Access (DSA) technologies in diverse markets and at all levels of the wireless value chain to address emerging wireless communications requirements through enhanced value, reduced total life cost of ownership, and accelerated deployment of standardized families of products, technologies, and services.

In this response, the Forum offers comments regarding the NPRM on enabling innovative small cell use in the 3.5GHz band.

**1. USE OF SMALL CELL TECHNOLOGY**

The Forum supports the use of small cells; in particular, the deployment of small cells in the 3.5GHz band to offer significantly enhanced capacity and more effective use of spectrum. The reduced signal propagation range characteristics of this band are suited to services that operate only over small areas e.g. tens to hundreds of meters. The use of smaller cells also

increases the frequency reuse ability and therefore the density of small cells and number of geographically separated services. The combination of these two factors increases capacity available to users. The adoption of a small cell approach would also facilitate the broader deployment of self-optimizing networks. Small cells can be installed, powered, and managed by consumers.

## **2. SPECTRUM SHARING**

The Forum supports the use of spectrum sharing. Spectrum sharing results in better utilization of scarce frequency spectrum and standards based on this approach have been completed or are under development e.g. IEEE 802.11y, IEEE 802.11af, 802.16h, and 802.22<sup>1</sup>. The Forum advocates a regulatory model that includes combinations of licensed and unlicensed, sharing and hierarchical, cooperative and co-existent domains for the optimal utilization of spectrum<sup>2</sup>.

The Forum believes that clearing and reallocating Federal Spectrum is not a sustainable basis for spectrum policy due to high cost, length of time to implement and disruption to Federal mission. The Forum recommends the use of new technologies, and paradigms such as spectrum sharing and small cells that address the emerging spectrum crisis<sup>3</sup>. These recommendations have been supported by the work of the Forum, its members and its partners over the past several years including work by the Forum's Cognitive Radio Work Group on quantifying the benefits of cognitive radio technologies including spectrum sharing<sup>4</sup>. Spectrum sharing was explored in

---

<sup>1</sup> Wireless Innovation Forum, "Quantifying the Benefits of Cognitive Radio",  
<http://groups.winnforum.org/d/do/3839>

<sup>2</sup> Wireless Innovation Forum Draft Advocacy Agenda -Multiple Licensing Models (To Be Published)

<sup>3</sup> Wireless Innovation Forum, "WinnForum Position on PCAST Report on Spectrum Sharing",  
<http://groups.winnforum.org/d/do/5895>

<sup>4</sup> Wireless Innovation Forum, "Quantifying the Benefits of Cognitive Radio",  
<http://groups.winnforum.org/d/do/3839>

the use cases developed by the Forum's Public Safety Special Interest Group for cognitive radio<sup>5,6</sup>. A separate report by the Public Safety Special Interest Group identified advanced radio technologies as key to realizing innovative partnerships that would allow public safety to benefit from more efficient spectrum utilization<sup>7</sup>. These reports acknowledge spectrum sharing as an important component of future public safety communications capabilities, given the unique incident-based spectrum and capacity requirements of the public safety community.

The Forum supports the proposal to manage shared spectrum access via networked databases, as this would allow regulations and services to adapt over time and vary by band while protecting incumbent users. In doing so, the Forum believes that spectrum sensing technologies may also play a role in augmenting these database systems to better enable cooperative, opportunistic access and as such the Forum recommends that advances in these technologies not be discounted in future planning.

### **3. EXCLUSION ZONES**

The Forum believes that the technical and service characteristics for small cell deployments in the 3.5 GHz band have the potential to significantly reduce or eliminate the need for the geographic exclusion zones identified in the Fast Assessment and in the Ten Year Plan and Timetable published by the NTIA in October of 2010<sup>8,9</sup>. Furthermore, current trials have

---

<sup>5</sup> Wireless Innovation Forum, "Use Cases for Cognitive Applications in Public Safety Communications Systems Volume 2: Chemical Plant Explosion Scenario", <http://groups.winnforum.org/d/do/2325>

<sup>6</sup> Wireless Innovation Forum, "Use Cases for Cognitive Applications in Public Safety Communications Systems Volume 1: Review of the 7 July Bombing of the London Underground", <http://groups.winnforum.org/d/do/1565>

<sup>7</sup> Wireless Innovation Forum, "Considerations and Recommendations for Software Defined Radio Technologies for the 700 MHz Public/Private Partnership", <http://groups.winnforum.org/d/do/1579>

<sup>8</sup> National Telecommunications and Information Administration, "Plan and Timetable to make available 500MHz of Spectrum for Wireless Broadband", [http://www.ntia.doc.gov/files/ntia/publications/tenyearplan\\_11152010.pdf](http://www.ntia.doc.gov/files/ntia/publications/tenyearplan_11152010.pdf)

shown that the use of networked and synchronized databases accessed with device location information can be a critical technology in maximizing incumbent protection by enabling and managing real time access to this spectrum by secondary users on a geographic and temporal basis<sup>10,11,12</sup>. Basing management and policy decisions in networked and synchronized databases allow regulations and services to adapt over time and vary by band while protecting incumbent users. Networked databases provide access to information beyond what is immediately observable by a radio, thereby mitigating hidden node problems in spectrum sharing scenarios. They provide a simpler mechanism for managing upgrades to spectrum management / access schemes by updating rules in a small set of databases rather than in millions of individual radios. The Forum recommends that the NTIA, FCC and impacted federal agencies re-evaluate the requirements for exclusion zones in light of these technologies.

#### **4. TIERED LICENSING MODEL**

The Forum believes that a priority access tier should be implemented<sup>13</sup>. In addition, if critical safety-of-life applications are to be permitted in this tier, then they should be given priority access.

---

<sup>9</sup> National Telecommunications and Information Administration, “An Assessment of the Near-Term Viability of Accommodating Wireless Broadband Systems in the 1675-1710 MHz, 1755-1780 MHz, 3500-3650 MHz, and 4200-4220 MHz, 4380-4400 MHz Bands (President's Spectrum Plan Report)”, <http://www.ntia.doc.gov/report/2010/assessment-near-term-viability-accommodating-wireless-broadband-systems-1675-1710-mhz-17>

<sup>10</sup> Cambridge White Space Consortium, “Cambridge TV White Spaces Trial A Summary of the Technical Findings”, <http://www.cambridgewireless.co.uk/docs/Cambridge%20White%20Spaces%20Trial%20-%20technical%20findings-with%20higher%20res%20pics.pdf>

<sup>11</sup> News release, “Fairspectrum Provides TV White Space Database for Europe’s First Geolocation Radio License”, <http://www.fairspectrum.com/propagating-thoughts/pressreleasefairspectrumprovidestvwhitespacedatabaseforeurope%E2%80%99sfirstgeolocationradiolicense>

<sup>12</sup> Spectrum Bridge, “White Space Overview”, <http://spectrumbridge.com/ProductsServices/WhiteSpacesSolutions/WhiteSpaceOverview.aspx>

<sup>13</sup> In response to the question regarding the tiered licensing structure - should a Priority Access tier be implemented

The Forum believes that Essential and Critical Communication (E&CC) systems require security measures commensurate with meeting mission goals and deterring identified threats.

International and domestic terrorist organizations, especially those supported by rogue nations, have access to resources that can enable damaging and potentially crippling attacks on our nation's E&CC systems. The possible threats range from overt attacks on the physical components to insider attempts to subvert the operational software controlling the components of the systems. These threats may be present during the design and development, manufacturing or operational phases of a system.

The Wireless Innovation Forum has published a report outlining a process which identifies potential threats and vulnerabilities and leads to the development of security policies at the organizational, system and individual platform level<sup>14</sup>. These security policies specify the criteria and measures needed for protection and mitigation of designated threats throughout the entire lifetime of a system and its component elements.

The process includes identification of assets which require protection. These include but are not limited to information, security operating parameters and data, embedded software, hardware components and virtually any infrastructure component including dispatch centers, servers, routers relays, base stations and individual radio platforms. Threat and vulnerability analyses must tailor for each asset in addition to risk assessments estimating the probability that any given threat/vulnerability may be realized. With this process completed, then specific security measures and mitigation methods can be developed which can be applied to the design, manufacture and operation of the system and its various component elements. These security measures, methods and design requirements then form the basis of the various Organizational,

---

<sup>14</sup> Wireless Innovation Forum, "Securing Software Reconfigurable Communications Devices", <http://groups.winnforum.org/d/do/3014>

System and Platform security policies which govern the design, manufacturing, operation and maintenance and decommissioning of the system and its components<sup>15</sup>. Additional work is underway to profile these recommendations for Public Safety communications with the potential to extend these to other segments of the market as appropriate<sup>16</sup>.

The Forum reiterates its recommendation to the FCC that they place less emphasis on confidentiality of security methods and instead focus on development and application of policies and standards that enable communication systems and platforms to protect all sensitive information and data.<sup>17</sup>

The Forum supports the proposal to register GAA devices in the spectrum access system. Shared access to this band should be managed via networked databases as this would allow regulations and services to adapt over time and vary by band while protecting incumbent users<sup>18</sup>.

## **5. INDUSTRY STANDARDS**

The Forum further recommends that existing and emerging standards should be leveraged to the greatest extent possible. This includes database work that has been done within the Forum, along with the work of other standards bodies including the IEEE DySPAN Standards Committee, IEEE 802.19.1, and IETF PAWS. The Forum believes that alternative implementation of database concepts and architectures should be explored through test beds and trials that stress performance under different scenarios as a way to validate and prove viability<sup>19</sup>.

---

<sup>15</sup> Regarding the security measures which could be implemented to prevent unauthorized users from obtaining Priority Access use of the 3.5 GHz Band

<sup>16</sup> Wireless Innovation Forum, "Current Projects", [http://www.wirelessinnovation.org/Current\\_Projects](http://www.wirelessinnovation.org/Current_Projects)

<sup>17</sup> Wireless Innovation Forum Draft Advocacy Agenda -Multiple Licensing Models (To Be Published)

<sup>18</sup> Regarding the consideration to register GAA devices in the spectrum access system (SAS)

<sup>19</sup> Wireless Innovation Forum, "WinnForum Position on PCAST Report on Spectrum Sharing", <http://groups.winnforum.org/d/do/5895>



In addition, standards based on spectrum sharing approaches have been completed or are under development e.g. IEEE 802.11y, IEEE 802.11af, 802.16h, and 802.22.<sup>20, 21</sup>

## **6. MANAGEMENT OF THE 3.5GHZ BAND**

The members of the Forum believe that the FCC's decision on whether the 3.5GHz band should be divided into channels should preserve technology and service neutrality<sup>22</sup>. If a channelized approach is adopted, this should be designed to support channel aggregation for broadband access<sup>23</sup>. The Forum believes that all channels should be available for all Citizens Broadband Service users in all geographic areas but specific channel availability at any location and/or time should be dictated through a geolocation database approach<sup>24</sup>. The Forum supports the adoption of dynamic channel assignment combined with a geolocation database approach<sup>25</sup>. The entire 3.5GHz band should be made available in this alternative way<sup>26</sup> and the entire band should be available on a nationwide basis to support the widest possible range of potential use cases and to maximise the appeal of this band to the market<sup>27</sup>.

## **7. INCLUSION OF 3650-3700MHZ**

The allocation of a contiguous 150MHz block of spectrum for shared commercial broadband deployment in the 3650-3700MHz band would help facilitate additional capacity expansion and support new services and increased consumer demand under the same flexible

---

<sup>20</sup> Wireless Innovation Forum, "Quantifying the benefits of cognitive radio", <http://groups.winforum.org/d/do/3839>

<sup>21</sup> In response to a question regarding the adoption of an industry standards approach to facilitate sharing between Citizens Broadband Service devices operating in the same service tier.

<sup>22</sup> On whether the 3.5 GHz Band be divided into channels

<sup>23</sup> In response to the question regarding the channel size

<sup>24</sup> On whether all channels be available for all Citizens Broadband Service users in all geographic areas

<sup>25</sup> On whether some form of static or dynamic channel assignment be implemented as part of the SAS

<sup>26</sup> On whether the entire band should be licensed in this alternative way, or just a portion

<sup>27</sup> On whether the whole band be licensed on a nationwide basis, or should it be subdivided into discrete spectrum blocks and/or geographic license areas

licensing structure<sup>28</sup>. The Forum recommends that the NTIA, FCC, and the impacted federal agencies should evaluate the 3650-3700 MHz band with a view to expanding the same licensing mechanism across this band.

## **8. PROMOTION OF SERVICE AND TECHNOLOGY NEUTRALITY**

While supporting the regulatory framework to support dedicated, licensed spectrum, the Forum believes that increased neutrality with respect to the specific uses of licensed spectrum will have a significant benefit in terms of increased innovation in wireless applications. For example, technology restrictions impact continued use of second generation commercial wireless technology. In some jurisdictions, regulations still require that commercial wireless operators use Global System for Mobile Communication (GSM) in certain bands. However, no reason exists today for precluding operators from using other air interfaces within these bands<sup>29</sup>. SDR base station technology is currently being deployed by all major operators globally<sup>30,31</sup>. This approach supports multiple air-interface technologies using the same hardware, while dynamically assigning channels in a manner that avoids any interference between them.

Respectfully submitted,

By: \_\_\_\_\_

Keith Nolan  
Chief Regulatory Officer  
Wireless Innovation Forum

Dated: 25 August 2014

---

<sup>28</sup> Regarding the potential inclusion of the 3650-3700 MHz band into the proposed regulatory regime and whether the allocation of a contiguous 150 megahertz block of spectrum for shared commercial broadband deployment in this manner would be in the public interest.

<sup>29</sup> such as LTE, 802.11af or proprietary air interfaces

<sup>30</sup> Wireless Innovation Forum, "SDR Market Study Task 1: Market Segmentation and Sizing", <http://groups.winnforum.org/p/do/sd/sid=3161&type=0>

<sup>31</sup> Wireless Innovation Forum, "SDR Market Study Task 2: The Cellular Industry- Terminals and Infrastructure", <http://groups.winnforum.org/p/do/sd/sid=3162&type=0>