

**BEFORE THE  
FEDERAL COMMUNICATIONS COMMISSION  
WASHINGTON, D.C. 20554**

In the Matter of	)	
	)	
Facilitating Opportunities for Flexible, Efficient, And Reliable Spectrum Use Employing Cognitive Radio Technologies	)	ET Docket No. 03-108
	)	
Authorization and Use of Software Defined Radios	)	ET Docket No. 00-47 (Terminated)
	)	

**COMMENTS OF THE  
TELECOMMUNICATIONS INDUSTRY ASSOCIATION**

The Telecommunications Industry Association (“TIA”) hereby submits comments in response to the Notice of Proposed Rulemaking and Order in the above-captioned proceeding.<sup>1</sup>

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<sup>1</sup> *Notice of Proposed Rulemaking and Order*, FCC 03-322 (released Dec. 30, 2003) (“NPRM”).

## I. INTRODUCTION

TIA is the leading trade association representing the communications and information technology industry, with 700 member companies that manufacture or supply the products and services used in global communications. Among their numerous lines of business, TIA member companies design, produce and deploy terrestrial and satellite wireless network and terminal equipment. As a result, TIA has substantial interest in current and future Federal Communications Commission (“FCC” or “Commission”) spectrum management decisions and activities.

In this NPRM, the Commission seeks comment on facilitating opportunities for flexible, efficient, and reliable spectrum use employing cognitive radio technologies. A cognitive radio is a radio that can change its transmitter parameters based on interaction with the environment in which it operates. Specifically, cognitive radios could determine their location, sense spectrum use by neighboring devices, change frequency, adjust output power, and alter transmission parameters and characteristics. The Commission highlights four scenarios in which cognitive radio technologies could be used to improve spectrum access and efficiency of spectrum use: i) a licensee could employ cognitive radio technologies internally within its own network to increase spectrum efficiency; ii) cognitive radio technologies could facilitate secondary markets in spectrum use, implemented by voluntary agreements between licensees and third parties; iii) cognitive radio technologies could facilitate automated frequency coordination among licensees of co-primary services; and iv) cognitive radio technologies could be used to enable non-voluntary third party access to spectrum, for example, unlicensed underlays in licensed bands.

TIA is pleased to assist the Commission, and its Spectrum Policy Task Force (“SPTF”), with its ongoing review of current FCC spectrum policies. TIA supports the Commission’s desire to promote more efficient use of spectrum and to possibly create opportunities for new and additional use of radio communications by the American public. TIA has long believed that sound spectrum management is critical to the future success of the communications industry.

TIA believes that cognitive radio technology can be a potentially powerful tool that will allow more intensive use of spectrum in the future. However, given the large base of embedded transmitters operating in the United States today, along with the carefully balanced spectrum sharing rules that apply to many bands, one of the first policy choices the Commission must confront is how to introduce cognitive functionality into an environment where virtually no cognitive functionality exists. In TIA’s view, the Commission would best advance cognitive radio by initially identifying new band allocations or new services where cognitive technology could be allowed right from the start. Not only will it be important to gain operational experience with cognitive functionality to demonstrate that it works as intended, but equipment for both unlicensed and licensed uses will need to be designed specifically to accommodate that functionality. In addition, the Commission will need to devise equipment authorization tests and measurements unique to cognitive functionality, a process which requires intensive effort, as the experience in introducing dynamic frequency selection in the 5 GHz band demonstrates.

Different bands will also raise different challenges. Spectrum sharing rules may still be required. Interference issues will need to be studied, depending on the amount of

flexibility in transmitter power that will be allowed. Some cognitive functionality may be beneficial in some bands, but unnecessary in others. In sum, cognitive radio technology itself must not be depended on as a substitute for sound spectrum management policy. Cognitive radio technologies can enhance spectrum efficiency only if the technology is carefully applied to specific bands and systems.

## II. DISCUSSION

As the Commission notes in the NPRM, there are a number of capabilities that could be incorporated into cognitive radios including dynamic frequency selection (“DFS”), adaptive modulation that can modify transmission characteristics and waveforms, transmit power control (“TPC”), power and frequency selection based on location sensing, automated frequency coordination between a licensee and a third party pursuant to a prior agreement, and real-time negotiation for spectrum on an ad hoc basis without a prior agreement. Many of these capabilities are used today in commercial networks, for example, in the Commercial Mobile Radio Service (“CMRS”). In particular, DFS and TPC features are used extensively in cellular and PCS networks to improve spectrum efficiency and serve these systems’ growing subscriber base. The Commission’s rules have not and should not hamper the development and commercial deployment of technically and economically feasible cognitive radio technologies.

### A. Rural Markets and Unlicensed Devices

Lower population density and greater distances between people can make it difficult for Wireless Internet Service Providers and wireless LANs to provide adequate

signal coverage in rural areas under the current Part 15 limits. The FCC proposes to allow higher power operation by unlicensed devices in any area that has limited spectrum use, provided the device has capabilities to determine whether it is in such an area. Specifically, the FCC is proposing to add a new rule section that applies to cognitive radio devices operating in the industrial, scientific and medical bands on frequencies identified in Sections 15.247 and 15.249 of the rules. This new rule would allow a transmitter power increase of up to six times higher than current limits. This proposal would increase the signal range by a factor of up to 2.5 and increase coverage area by a factor of 6 as compared to the current limits.

TIA believes that the goal of extending wireless internet services to rural areas is laudable. However, little technical work and testing has been conducted on this proposal and therefore it is difficult to estimate its impact. Because of their ubiquitous deployment, any increase in power of unlicensed devices operating in the 900 MHz and 2.4 GHz bands would likely result in significantly more interference. Moreover, the potential for lost coverage by CMRS networks resulting from interference received by higher powered unlicensed devices would be more extreme at the coverage edge of the mobile network, usually rural areas. Furthermore, defining a “rural area” could prove problematic as population centers and spectrum usage patterns are subject to changes over time.

#### B. Secondary Markets and Interruptible Spectrum Leasing

Voluntary spectrum leasing transactions between licensees and potential lessees are currently permitted for a significant number of non-public safety services. The

Commission believes that such arrangements are subject to potentially prohibitive transaction costs and that cognitive radio technology could possibly drive those transaction costs to a lower level by automating some or all of the process of negotiating the terms of a lease. TIA agrees that a wider array of spectrum leasing opportunities could potentially be made available through the use of emerging technologies such as cognitive radios. TIA encourages the Commission to continue to grant licensees greater flexibility in their use of licensed spectrum. Such flexibility would encourage licensees to participate in secondary leasing arrangements and accelerate innovation in all radio technologies.

The Commission seeks comment on possible approaches for use of cognitive radio technologies to enhance the efficient leased use of public safety spectrum. The Commission notes that public safety licensees would likely wish to condition leased use of their spectrum on retaining the right to “interrupt” or preempt a lessee’s use temporarily in order to satisfy their particular operational requirements for immediate access, reliability, or security. With respect to public safety applications, the Commission seeks comment on whether it should identify one or more specific technical approaches in its rules to be employed by lessees, either at the discretion of the public safety licensee or on a mandatory basis under FCC rules. Specifically, the FCC details a “beacon” approach that would ensure that public safety licensees would retain real-time access to their leased spectrum. In a beacon system, the lessee’s transmitter must have the ability to receive a control signal sent continuously by the licensee at times when transmissions by the lessee are permitted. If the lessee cannot hear the beacon signal, it must cease transmission thereby allowing the public safety licensee to commence

operations on the same channels. TIA welcomes Commission consideration of mechanisms that allow greater use of spectrum. However, we caution the Commission from encouraging the use of unproven technologies in the critically important public safety bands. Public safety licensees must have the flexibility to evaluate future advances in cognitive radio technologies before making such spectrum leasing arrangements. The Commission should not make changes to the rules for use of public safety spectrum until there is an extremely high level of confidence that interference will not occur. As stated above, TIA believes that it is best to deploy cognitive radios in new band allocations or in new services, allowing service providers to gain operational experience with cognitive functionality designed specifically for the new band or service.

Given the nascent state of the beacon approach envisioned by the Commission, implementing interruptible spectrum leasing along with the technical mechanisms required to achieve the necessary level of certainty in regaining spectrum access by the public safety licensee could raise the cost of public safety communications drastically. Considering the critical requirements for public safety, bands used for such services are not appropriate for testing the viability and reliability of the beacon approach. Moreover, interruptible spectrum leasing lacks the regulatory certainty necessary for lessees to develop business plans and suppliers to develop products.

### C. SDR and Cognitive Radio Equipment Authorization Rule Changes

Since 2001 the Commission's rules have permitted manufacturers the option to declare a device as a Software Defined Radio ("SDR") when seeking equipment certification. However, SDRs must incorporate security features to ensure that only

software that is part of an approved hardware/software combination can be loaded into the SDR. SDR manufacturers are also required to supply a copy of the software source code that controls the device's radio frequency operating parameters to the Commission upon request.

TIA supports the Commission's proposal to delete the requirement that grantees or applicants supply a copy of their radio software upon request and instead add the less burdensome requirement that applicants supply a description and flow diagram of the software that controls the radio operating parameters. This flow diagram should only be required to make a showing that the security features that ensure unauthorized changes to the radio parameters are in place. The Commission should institute appropriate safeguards to ensure that the flow diagrams are not made available to the general public.

TIA opposes any requirement that manufacturers/importers declare certain equipment as SDRs. Current rules provide adequate safeguards against unauthorized modifications to SDRs. A mandatory SDR filing requirement for some devices could be a disincentive to the deployment of SDRs and burden the industry by restricting the use of an efficient manufacturing technique.

Finally, TIA urges the Commission to establish effective enforcement mechanisms to ensure that cognitive radios deployed in networks are working properly and are removed from service if found to be causing unacceptable interference.

#### D. Rules Should Permit Manufacture of Transmitters That Can Be Sold Worldwide

The Notice proposes a rule that would allow Part 15 transmitters to be produced that are capable of operating on frequencies not permitted in the United States, provided

that the device incorporates dynamic frequency selection (DFS) and, when in use within the U.S., can only be operated on U.S. frequencies. The Notice expresses concern that end users should not be able to select an unauthorized frequency range or easily modify devices to operate in unauthorized frequency ranges. The Notice asks for comment on the means by which such misuse could be prevented.

TIA endorses the Commission's proposal to allow certification of frequency selectable wireless devices which could benefit consumers and manufacturers by reducing production costs and allowing production of devices that can be used in both the United States and other countries. TIA encourages the Commission to more broadly consider whether other types of radio transmitting devices should be similarly treated. TIA opposes the requirement that transmitters subject to this rule be equipped with DFS. DFS is simply a tool to select an open, or unused, frequency, and cannot determine the country in which the transmission is occurring. As such, DFS is unrelated to the issue the Commission is trying to address. Instead, TIA proposes that a system installer in an enterprise or service provider environment should be permitted, via a password controlled menu or similar security mechanism, to configure the transmitter for the country of deployment. TIA further agrees that consumers should not be able to select an unauthorized frequency range to operate in the United States, or tamper with the device to permit transmission over unauthorized frequencies. This rule would ensure that transmitters are correctly utilizing frequencies authorized for use in the United States and elsewhere.

### III. CONCLUSION

TIA applauds the Commission's ongoing efforts to promote more efficient use of spectrum. TIA has long believed that sound spectrum management is critical to the future success of the communications industry. While cognitive radio technology itself cannot be depended on as a substitute for sound spectrum management policy, these technologies could enhance spectrum efficiency if carefully applied to specific bands and systems.

TIA agrees that a wider array of spectrum leasing opportunities could potentially be made available through the use of emerging technologies such as cognitive radios and encourages the Commission to continue to grant licensees greater flexibility in their use of licensed spectrum. TIA welcomes Commission consideration of mechanisms that allow more efficient use of spectrum. In addition, TIA encourages the Commission to look into these new technologies once supported by solid, non-interfering test results and to implement them once an appropriate enforcement mechanism is in place to accommodate any unexpected problems.

TIA member companies design, develop and manufacture communications equipment, including systems that are subject to, and affected by, the Commission's regulatory oversight. TIA therefore has a direct and substantial interest in the spectrum management activities of the Commission and, more specifically, in the outcome of the issues addressed in this proceeding. TIA requests that the Commission take into consideration the views expressed above.

Respectfully submitted,

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