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

To: The Commission

COMMENTS OF NEXTEL PARTNERS, INC.

Nextel Partners, Inc. ("Nextel Partners"), by its attorneys, hereby submits its initial Comments in response to the Commission's Notice of Proposed Rulemaking and Order in the above-captioned proceeding.[1] As set forth in greater detail below, Nextel Partners generally supports the Commission's efforts to examine existing spectrum policies and investigate innovative possibilities for maximizing spectrum efficiency. However, Nextel Partners believes that any use of cognitive radio ("CR") and/or software defined radio ("SDR") technology in existing or future CMRS bands should be strictly limited to voluntary uses by existing spectrum licensees.

I. INTRODUCTION

Nextel Partners is a wireless telecommunications carrier whose primary focus is to provide digital wireless mobile communication services in mid-sized and smaller markets, including historically underserved, rural and insular markets throughout the United States. Nextel Partners has grown from its inception in 1999,

[1] *In the Matter of Facilitating Opportunities for Flexible, Efficient, and Reliable Spectrum Use Employing Cognitive Radio Technologies; Authorization and Use of Software Defined Radios*, Notice of Proposed Rulemaking and Order, ET Docket Nos. 03-108 and 00-47 (released December 30, 2003) ("*NPRM*"), 69 Fed. Reg. 7397 (February 17, 2004) (initial comments due on or before May 3, 2004).

when Nextel Partners served fewer than 50,000 customers in a small number of markets, and today serves over one million customers in 31 states. Nextel Partners operates more than 3,300 cell sites and its system covers more than 37,000,000 POPs. Through its cooperative arrangements with Nextel Communications, Inc. ("Nextel"), Nextel Partners brings to its customers in high cost rural areas, insular and smaller markets the same national network and the same fully integrated four-in-one bundle of services available from Nextel in urban areas. These services include (i) digital cellular, (ii) text/numeric messaging, (iii) Nextel Wireless Web services and (iv) Nextel Direct Connect® digital two-way radio in a single phone. Nextel Partners provides these advanced digital wireless communications services over an industry-leading 2.5G nationwide network. In addition to serving the residents of rural, insular and secondary market areas, Nextel Partners provides mobile services to travelers in corridors along interstate and state highways.

Nextel Partners agrees that the Commission should not regulate CR and SDR technology in a way that might unduly limit their potential.[2] Nevertheless, it is of paramount importance that the Commission not permit these new technologies to be implemented in a manner that allows them to cause interference and disruption to existing licensees.

II. DISCUSSION

In the *NPRM,* the Commission explores the possibilities for facilitating more efficient use of spectrum by the introduction of CR technology that enables

[2] *See NPRM* at ¶ 18.

opportunistic radiofrequency devices flexibility in their use of "unused" spectrum in certain defined situations. The Commission defines a CR device as:

> . . . a radio that can change its transmitter parameters based on interaction with the environment in which it operates. This interaction may involve active negotiation or communications with other spectrum users and/or passive sensing and decision-making within the radio.[3]

The *NPRM* considers that there are four principal possibilities for the implementation of CR technology: (i) employment of CR technology by existing spectrum licensees internally within their own networks to increase the efficiency of spectrum use; (ii) facilitating secondary markets in spectrum implemented by means of voluntary agreements between existing licensees and third parties; (iii) enabling automated frequency coordination between licensees of co-primary services; and (iv) enabling non-voluntary third party access to licensed spectrum, by permitting an unlicensed device to operate at times or in locations where it appears that licensed spectrum is not in use.[4]

Nextel Partners applauds the Commission's investigation into methods for improving the efficient utilization of spectrum, and generally supports the Commission's attempts to encourage the use of increasingly sophisticated approaches such as CR and/or SDR[5] technology. However, Nextel Partners urges the Commission to restrict the implementation of this technology in present and future CMRS spectrum bands to purely *voluntary* uses by *existing spectrum licensees*.

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[3] *NPRM* at ¶ 10.

[4] *Id.* at ¶ 3.

[5] The Commission defines a SDR as "a device in which the operating parameters are controlled by software, allowing the radio to be programmed to transmit and receive on a variety of frequencies and/or to use one or more different transmission formats supported by its hardware design." *Id.* at ¶ 9.

Existing licensees could use this developing technology to increase system efficiencies, to create innovative spectrum leasing opportunities,[6] or to assist in coordination with co-channel users (where applicable). On the other hand, allowing opportunistic CR and/or SDR devices to identify "unused" spectrum within a licensed CMRS spectrum band and utilize that identified "unused" spectrum for radiofrequency transmissions is likely to unduly complicate a CMRS licensee's spectrum management tasks, and may result in harmful interference. Likewise, allowing unlicensed devices to operate at high power levels in rural areas on the theory that spectrum is "unused" is subject to many potential regulatory and technical problems, and should not be permitted in or near present or future CMRS bands.

A. The Commission Should Restrict Use of CR and SDR Technology in Present and Future CMRS Bands to Voluntary Uses by Existing Licensees

The development of CR and SDR technology holds a great deal of potential for the efficient use of spectrum. However, as CTIA cautions in its January 27, 2003 Comments on the Spectrum Policy Task Force Report:[7]

> . . . the Task Force places a great deal of emphasis on the future ability of new technologies, such as software-defined radios, to monitor their local RF environment and operate more dynamically than traditional technologies in responding to unwanted interference. CTIA's members fully expect to utilize these types of radios when they have been proven in real-world scenarios; however, such "smart" technologies are still currently in the developmental stages, and at the present time have not been proven either technically or economically viable. Until these systems have significant additional development

[6] *See NPRM* at ¶ 49 (CR technology has the potential of facilitating the creation of new spectrum leasing opportunities where none would otherwise exist).

[7] *See* Comments of the Cellular Telecommunications & Internet Association ("CTIA") in ET Docket No. 02-135 (filed January 27, 2003).

> and evolve to the point of commercialization, and the efficacy of the interference avoidance techniques are measured in the real world, software-defined radio should not be positioned as a spectrum management *panacea.*[8]

Concomitant with the opportunities for better spectrum management that implementation of these new technologies may represent, there are also significant risks to existing systems and users. The Commission explicitly recognizes that "cognitive radio could raise new interference issues that will need to be considered."[9] Accordingly, the Commission must ensure that it has adequately safeguarded the operations of existing licensees and the interests of consumers that use existing wireless services prior to introducing new approaches that are potentially disruptive.

In general, CMRS bands are heavily utilized by incumbent users, and contain little "white space" or unused spectrum. CMRS providers use sophisticated techniques to manage their licensed spectrum, and the introduction of opportunistic devices on a non-voluntary basis is likely to cause disruption, make system growth problematic, and result in increased levels of interference.[10] The Commission

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[8] *Id.* at 12 (emphasis in original).

[9] *Id.*

[10] *See, e.g.,* Comments of V-COMM, LLC in ET Docket Nos. 03-237 and 03-108 at 42-43 (filed April 5, 2004) ("VCOMM Comments"). As stated by V-COMM, in practical engineering terms and in real world circumstances, the Commission's present concepts for the introduction of cognitive radio technologies may increase interference and make spectrum management for existing licensees difficult due in part to incorrect assessments of spectrum availability by the new devices. These problems arise for a variety of reasons, including, but not limited to: (i) disparities between the cognitive radio device's assessment of the spectrum use in its immediate location, and the spectrum use situation extant at the differing location of its intended receiver; (ii) a cognitive radio device's incorrect assessment of spectrum availability due to its distance from a co-channel base station signal, or obstructions in the signal path; (iii) problems arising due to disparities between conditions extant

should make it clear in any rules promulgated to facilitate introduction of CR and SDR that they may not operate in bands dedicated to CMRS licensees, except when utilized by, or with the express advance written permission of, the existing licensee.

The difficulty in accommodating "opportunistic," unlicensed users is only compounded by the growth of a CMRS system, which increases the density of users and correlative demand for spectrum. Strictly reserving CR and SDR technologies in the CMRS bands to voluntary use by existing licensees will allow the CMRS service provider to control and prevent harmful interference to the network as the system develops and grows.[11]

Consistent with the foregoing, Nextel Partners is interested in exploring the *voluntary* use of these new technologies as part of its overall management of its licensed spectrum, and would welcome rules that facilitate the incorporation of CR and SDR technology in present and future CMRS bands under the strict control of CMRS licensees. Such use may allow for better system management, planning and growth, and may facilitate voluntary spectrum leasing transactions with third parties that would not be possible without the use of advanced technologies.[12]

B. Non-Voluntary "Opportunistic" Uses of CR and SDR Technology Present the Additional Risk of Abuse and Non-Compliant Activities

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in the cell site forward-link versus reverse-link bands that might cause a cognitive device to operate when it should not; and (iv) the inability of an opportunistic device to sense a change in conditions once it has commenced operations, the "sensing while transmitting" problem. *See* V-COMM Comments at 47-50.

[11] *See* VCOMM Comments at 41.

[12] *See NPRM* at ¶ 49.

As the Commission points out in the *NPRM*, there are concerns that the innovative new technologies also present "the possibility of new types of abuse."[13] The inherent ability of CR and SDR devices to be intentionally configured to circumvent existing spectrum use restrictions is an additional reason why they should not be deployed in CMRS bands, except by the licensees themselves. The Commission must take great care in implementing rules that prevent the opportunistic use of licensed frequencies by devices that are so sophisticated and agile that they can impede the orderly growth of CMRS systems, but nevertheless avoid detection by reconfiguring their parameters. Nextel Partners believes that the only acceptable way to accomplish this is to restrict the use of CR and SDR devices in present and future CMRS bands to the CMRS licensees themselves.

C. The Commission Should Not Permit Higher Power Operations of Unlicensed Devices in Rural Areas Where CMRS Operations Could be Adversely Affected

As a CMRS provider that focuses primarily on smaller, rural and insular markets, Nextel Partners is in favor of technological improvements that allow better and more economical service alternatives to consumers in underserved markets. Nevertheless, Nextel Partners is concerned about the Commission's proposal to allow higher power for unlicensed devices in rural areas or other areas of less-intense spectrum use.[14] To the extent that these geographic areas fall within the licensed territory of an existing CMRS provider, the Commission should not permit unlicensed devices to operate on frequencies or in a manner that could complicate the CMRS carriers' spectrum management, curtail potential growth or result in an

[13] *Id.* at ¶ 30.

[14] *See NPRM* at ¶¶ 5-6.

increase in harmful interference.

One of the principal objectives of the Universal Service program is to reach out to consumers in rural, insular and high-cost areas with services that are comparable in quality, variety and cost to those enjoyed by residents in urban and densely populated areas. Underserved areas have been the focus of a great deal of private and government funding and future planning. The Commission should be careful not to undercut these efforts by creating a situation in which licensed CMRS providers are undermined by "opportunistic" devices that can present interference problems. Permitting interference from "opportunistic" devices that do not offer the same range and quality of service to consumers that CMRS systems currently provide will only harm the public interest.

D. The Commission Should Implement Safeguards to Ensure Proper Use of Developing Technologies

In addition to restricting the use of CR and SDR technologies to existing licensees in the context of the present and future licensed CMRS bands, Nextel Partners believes that the Commission should impose careful safeguards over type certification for this technology. For example, SDR manufacturers should be required to identify their technology as such, and should not be permitted to avoid Commission-imposed requirements by mischaracterizing or failing to fully declare the capabilities of their devices.[15] Failure to impose strict type certification standards on these new technologies could compound interference problems and the potential for non-compliant use.

[15] *See NPRM* at 87-88.

CONCLUSION

In view of the foregoing, Nextel Partners respectfully requests that the Commission take action consistent with the views expressed herein.

Respectfully submitted,

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