

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of)	
)	
Facilitating Opportunities for Flexible,)	
Efficient, and Reliable Spectrum Use)	ET Docket No. 03-108
Employing Cognitive Ration Technologies)	
)	

COMMENTS OF ITRON, INC.

Itron, Inc. (“Itron”), by its attorneys, respectfully submits these Comments on the Notice of Proposed Rulemaking (“NPRM”) issued in the above-captioned proceeding.¹ Itron commends the Commission for exploring cognitive radio technology as an innovative solution to spectrum management. While Itron believes that cognitive radios may work to improve spectrum efficiency in some contexts, the Commission’s proposal to permit high power cognitive radio operations does not take into account the diversity of unlicensed devices already in operation and the distinct RF environments of the 902-928 MHz, 2.4 GHz and 5.8 GHz unlicensed bands.

Itron, therefore, asks the Commission to limit high-power cognitive radio operations to the 2.4 GHz and 5.8 GHz bands in order to preserve the 902-928 MHz band for low-power and low duty cycle unlicensed systems. Alternatively, Itron requests that the Commission establish a duty cycle limit for cognitive radios operating in the 902-928 MHz band to protect “invisible” low-power, low duty cycle devices operating in the same band.

¹ See *In re Facilitating Opportunities for Flexible, Efficient, and Reliable Spectrum Use Employing Cognitive Radio Technologies*, Notice of Proposed Rulemaking, 18 FCC Rcd 26859 (2003) (“NPRM”).

Itron is the nation's leading manufacturer and supplier of Automatic Meter Reading ("AMR") technologies using unlicensed Part 15 devices that operate in the 902-928 MHz band. Itron supplies its RF-based AMR systems to electric, gas, and water utility companies nationwide. Itron's AMR systems enable a utility to monitor business and residential meters from a remote location using a hybrid architecture that employs both licensed and unlicensed frequencies. On the unlicensed side, utility consumption and other critical information is transmitted from meter modules via unlicensed Part 15 devices operating in the 902-928 MHz band. To date, Itron has shipped more than 24 million meter modules to over 850 utility companies providing service in both rural and urban areas. Collectively Itron's utility customers have invested over \$1 billion in their AMR networks and tens of millions of AMR devices already are deployed and operating in the unlicensed 902-928 MHz band.

In the present *NPRM*, the Commission proposes to authorize high-power cognitive radio devices to operate in the unlicensed bands, provided such devices have the capability of monitoring the band prior to transmitting. Specifically, when usage is not detected, cognitive radios will be permitted to increase their power level up to six times (approximately 8 dB) greater than the maximum power level permitted under Section 15.247.² Similarly, cognitive radios operating pursuant to Section 15.249 will be permitted to operate with a field strength level 2.5 times higher than the maximum presently permitted.

Given the nature of unlicensed devices in operation and the general RF environment of the 902-928 MHz band, a "listen before transmit" requirement for cognitive radios does not provide adequate assurance that essential, low-power communications will not suffer destructive interference.

² *NPRM* at ¶ 38. "Limited spectrum use" is defined as the authorized band of operation, *e.g.*, the 902-928 MHz band, having a certain percentage of spectrum unused. "Unused spectrum," in turn, is defined as spectrum with an aggregate noise plus interference power no greater than 30 dB above the calculated thermal noise floor within a measurement bandwidth of 1.25 MHz. *Id.* at ¶ 44.

I. HIGH-POWER COGNITIVE RADIOS SHOULD NOT BE PERMITTED IN THE 902-928 MHz BAND.

Notwithstanding their spectrum monitoring features, cognitive radios pose a very real threat of causing harmful interference to undetected, or ignored, unlicensed devices operating at low power levels or with low duty cycles. For example, if an AMR reader is situated between a cognitive radio and an AMR meter device, both transmitting concurrently, depending on the separations, the AMR reader may only hear the higher power cognitive radio and not the meter device. At the same time, the cognitive radio will not be able to detect the low power AMR meter attempting to access the same spectrum.

Indeed, a 1 mW unlicensed device operating pursuant to Section 15.249 will not be detected by a cognitive radio if the distance between the devices is greater than 206 feet but can suffer harmful interference from a high-power cognitive radio at that distance. Likewise, a 6 Watt cognitive radio will cause interference to a -110 dBm receiver at a distance of 8575 feet.³ Thus, the possibility of harmful interference remains a very real risk to low-power, low duty cycle devices that are difficult to detect, ultimately resulting in lost data.

As the Commission itself recognizes in the *NPRM*, “allowing some devices in a band to operate with higher power could block the use of lower power devices, resulting in a situation where certain devices would not be able to operate.”⁴ This is particularly true in the 902-928 MHz band. The RF environment in the 902-928 MHz band is very different from RF environments in the 2.4 GHz and 5.8 GHz bands, which increasingly are being used by high-power devices with long duty cycles, such as wireless Internet devices. In contrast, the 902-928 MHz band is populated primarily by

³ These calculations were made using the equation:

$$PathLoss(dB) = 10 \log \left[\frac{\lambda^2}{(4\pi)^2 d_{breakpoint}^2} \right] + 10n \log \left[\frac{d}{d_{breakpoint}} \right] \text{ where } n=4.$$

⁴ *NPRM* at ¶ 46.

low power devices with short duty cycles, which are more likely to be adversely affected by the introduction of new high power cognitive radio technologies. The impact of deploying new high power devices in the 902-928 MHz band would be devastating to the low power AMR systems and other unlicensed devices operating in that band.

For these reasons, Itron asks the Commission to limit high power cognitive radio operations to the 2.4 GHz and 5.8 GHz bands in order to preserve the 902-928 MHz band for low-power, low duty cycle unlicensed systems.⁵ Recognizing these differences in the ISM bands will encourage continued investment in 902-928 MHz band technologies and facilitate the continued success and coexistence of AMR and other low power unlicensed systems operating in the 902-928 MHz band, while promoting innovative, higher-power technologies in the 2.4 GHz and 5.8 GHz bands.

II. ALTERNATIVELY, THE COMMISSION SHOULD IMPOSE A DUTY CYCLE LIMIT ON HIGH-POWER COGNITIVE RADIOS OPERATING IN THE 902-928 MHz BAND.

In the alternative, should the Commission choose to allow high-power cognitive radio technologies to be used in the 902-928 MHz band, Itron requests that the Commission establish a limit on the transmit duty cycle of cognitive radio technologies similar to the channel occupancy limit imposed on frequency hopping devices authorized under Section 15.247.⁶

⁵ In this regard, rather than permitting the introduction of high power cognitive radios in heavily used unlicensed bands, the EU recently allocated spectrum at 868 MHz for cognitive radio technologies.

⁶ See 47 C.F.R. § 15.247(a)(1)(i) (allowing frequency hopping systems operating in the 902-928 MHz band to occupy any frequency no longer than 0.4 seconds within any 10 second interval). Itron is not proposing a similar duty cycle limit for devices operating in the 2.4 GHz and 5.8 GHz bands.

As the Commission has recognized, longer duty cycles, like higher power, translate into greater interference potential.⁷ Unlicensed devices in the 902-928 MHz band traditionally have managed to coexist because they operate at low power with short duty cycles. A typical AMR data transmission is repeated multiple times on different channels to ensure successful reception. Yet even with this redundant messaging protocol, some data will be lost if low power AMR transmissions are not detected by cognitive radios that are not required to shut off or switch channels at periodic intervals.

As a possible solution to this problem, Itron proposes that cognitive radios operating in the 902-928 MHz band be permitted to transmit up to 0.4 seconds on a particular frequency, and then must cease transmitting on that frequency for at least 10 seconds. In the 10-second interval, the cognitive radio can wait to recommence transmission on the same frequency or jump to a different frequency. In turn, the AMR transmitters which were not detected by the cognitive radio would have the opportunity to access the spectrum.

CONCLUSION

Itron commends the Commission for updating its Part 15 rules to accommodate spectrally efficient and innovative technologies in the unlicensed bands. The Commission should take care, however, to limit the scope of new rules that are intended to promote the development of high power, high duty cycle technologies such as cognitive radios. Any such new rules should be limited to devices operating in the

⁷ See, e.g., *In re Review of Part 15 and other Parts of the Commission's Rules*, Second Report and Order and Memorandum Opinion and Order, 18 FCC Rcd 14741, ¶ 13 (2003) (declining to permit higher duty cycles for unlicensed devices because the requested change "effectively allows higher signal strength which could result in increased interference potential of devices").

2.4 GHz and 5.8 GHz band. Extending these rules to the 902-928 MHz band could pose a serious risk of harmful interference to the tens of millions of low power, low duty cycle devices already operating in the heavily used band.

Respectfully submitted,

ITRON, INC.

A handwritten signature in black ink that reads "Henry Goldberg". The signature is written in a cursive style with a large, prominent "H" and "G".

By: _____

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May 3, 2004