

**Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554**

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

Via the ECFS

COMMENTS OF THE WI-FI ALLIANCE

The Wi-Fi Alliance, (“the Alliance”)¹ hereby respectfully submits its comments in the above-captioned Proceeding (“the NPRM”).²

The Alliance applauds and fully supports the underlying goals of the Commission in the instant Proceeding – to modernize and simplify regulatory paradigms and thereby make spectrum more accessible for both licensed and unlicensed uses.

New wireless technologies require more spectrum to be made available. In addition, these technologies are decentralizing the ownership of wireless systems. In this environment, a review of spectrum management policies and the evaluation of means to improve access to unused or underused spectrum is a logical and useful step.

The Alliance is an interested party in this Proceeding and appreciates the opportunity to offer these timely-filed Comments.

¹ The Wi-Fi Alliance, formerly known as the Wireless Ethernet Compatibility Alliance, is an international trade association formed in 1999 with the goal of promoting the adoption and commercialization of IEEE 802.11-compatible products. These products may be used to support Wireless Local Area Networks in the 5 GHz frequency band.

Membership in the Alliance is open to all companies that support the IEEE 802.11x standards. Current members include nearly every major radio manufacturer that produces wireless network equipment for the U.S. market. Alliance membership, with over 200 companies, continues to grow. A complete membership listing may be found on our website, <http://www.wi-fi.org>.

² *Facilitating Opportunities for Flexible, Efficient, and Reliable Spectrum Use Employing Cognitive Radio Technologies*, Notice of Proposed Rulemaking, ET Docket No. 03-108 (released Dec. 30, 2003).

INTRODUCTION

1. The Alliance supports the stated FCC goal of exploring “cognitive radio technologies to adapt a radio’s use of spectrum to the real time conditions of its operating environment to offer regulators, licensees, and the public the potential for more flexible, efficient, and comprehensive use of available spectrum while reducing the risk of harmful interference.
2. In the NPRM, the Commission seeks comment on all issues related to the application of cognitive radio technology, including the frequency bands and services that are most likely to benefit from this technology.³
3. We fully support the commission in considering the listed enabling technologies/functions. All of the listed cognitive techniques are valid, feasible, and as explained in the NPRM, already in use in one form or another in various licensed and unlicensed radio devices.

COGNITIVE TECHNIQUES USED UNDER EXISTING RULES

4. Continued use of cognitive techniques (those stated by the commission and those not yet invented) *under existing rules* should be allowed without additional requirements, when such techniques comply with Part 15 or other applicable parts of the Commission’s rules. Use of such techniques does not require new technical rules and will allow continued innovation and improved use of spectrum without need for Commission action.
5. We believe additional rules for the listed cognitive technologies should be developed and put into force *specifically to facilitate access to additional spectrum and/or higher power levels*. We believe broadly imposed rules for one or more cognitive radio features across bands or services are not necessary or beneficial. For instance, adaptive modulation techniques are being

³ See the NPRM at 31.

used within existing bands under existing rules. There is no need to create new rules for adaptive modulation techniques in this case.

COGNITIVE TECHNIQUES USED TO GAIN ACCESS TO ADDITIONAL BANDS OR EXISTING BANDS UNDER LESS RESTRICTIVE OPERATING CONSTRAINTS

6. New rules should be based on affording *an appropriate level of protection* rather than mandating which cognitive technique(s) must be used. It is hoped the Commission will strive for maximum flexibility when developing new rules to ensure continued innovation of radio technologies. Other methods or techniques that protect incumbents adequately should be allowed in addition to the cognitive radio techniques listed in the NPRM.

7. Therefore, the WiFi Alliance recommends a somewhat different approach than proposed in the NRPM:

- The Commission, with interested parties, should *first* identify bands and services where it is believed cognitive techniques have potential to be used to facilitate additional sharing of existing licensed or unlicensed bands or to permit higher TX Powers.
- Then, *with a specific opportunity for spectrum reuse or dynamic sharing identified*, new rules should be developed jointly with all interested parties. Conversely, there is no need for and no benefit to developing *general purpose rules* defining how a “cognitive radio” must operate. This is because the sharing scenario will vary from band to band depending upon the nature of the incumbent users.
- Finally, interested manufacturer’s can develop advantageous solutions using whichever cognitive techniques meet the agreed protection criteria and market needs.

8. In summary, different solutions will be required in different bands depending on the incumbents, and their characteristics. In some cases a quantified and agreed sharing analysis, may be required to validate the adequacy of various solutions. This approach could allow the Commission to avoid mandating a specific set of sharing techniques.

INCREASED POWER FOR UNLICENSED DEVICES

9. The Alliance commends the Commission for proposing use of increased transmit powers in the unlicensed bands where other users of the band are not in operation.⁴ We encourage the Commission to continue to seek opportunities to allow more effective use of the spectrum by location and believe the same solution(s) can and should be applied to sharing spectrum temporarily or permanently unused in time or geography.

10. The handling of the current proposal will certainly serve as an indicator of future, additional opportunities. Therefore, the Alliance offers the following guidance for how similar, new rules can be developed for the case of existing bands where operation is already occurring:

11. The Commission has proposed the specific cognitive techniques required in this case -- rather than define and justify the necessary and sufficient sharing criteria (beyond the footnoted analysis). If the protection criteria were provided by the Commission or agreed jointly between incumbent and interested manufacturers, then the Commission could avoid dictating specific technical solutions. Manufacturers could use a sharing study and/ or agreed protection criteria to justify the sharing techniques they wish to implement. Perhaps TPC need not be implemented at all, if more sensitive sensing is implemented. Perhaps sensing need not be implementing in the way dictated in the proposed rules, if maximum transmitter power is some amount lower than the additional 8dB allowed. A quantified and agreed sharing analysis would promote competition and innovation by suppliers and perhaps better achieve the goal of increased rural access in this case.

⁴ See the NPRM at 37.

PROPOSED CHANGES TO SDR RULES – MANDATORY VS. PERMISSIVE

12. The Commission asks if certain devices should be required to be certified under SDR rules so that security features are implemented to ensure authorized operation- specifically to ensure that only software that is part of an approved hardware/software combination can be loaded.⁵

13. The Alliance is concerned of the added burden on manufacturers and the Commission staff if mandatory SDR categorization is imposed on all WiFi devices comprising hundreds of Part 15 original and permissive change authorization submissions each year. The added burden of demonstrating “adequate security measures” to subjective measures of adequacy should be avoided. An alternative proposal is outlined in the related section below.

PROPOSED CHANGES TO SDR RULES - SECURITY FEATURES

14. The Commission seeks comment on whether any modifications are necessary to the security and authentication requirements in the current SDR rules. Specifically, on whether the current rules provide adequate safeguards against unauthorized modifications to SDRs.⁶ The WiFi Alliance believes the Commission should not impose blanket security rules across product types and instead focus on instances where there is evidence that interference is happening or is likely to occur.

15. It is possible that in practice there will be very few instances where devices are seen to be falling subject to tampering or modification and therefore at risk of causing interference to other users of the band or adjacent bands of operation.

16. We believe at this time it is sufficient for the Commission to require that manufacturers describe the specific provisions implemented related to security and protection in the technical description (or with the Software Flow Diagram if provided with the certification submission).

⁵ See the NPRM at 84.

This would allow the Commission to track what security features and levels of protection are being implemented for various technologies. Then in future, if complaints or other evidence of unauthorized operation of a category of devices is received, then implementation of mandatory measures appropriate to the specific type of unauthorized operation could be imposed.

17. The Alliance encourages the Commission to avoid broad new protection rules for devices that may fit in the SDR category. A number of proposed remedies (such as software validation/signature or location awareness) may be used in practice by various manufacturers, but would be onerous, costly and complex if mandated across the wide variety of Unlicensed wireless devices.

18. In summary, a more focused approach would a) seek to identify bands or services at actual risk of harm due to hacking or tampering of radio devices then b) development of protections specific to the product category in question. Generic, broad requirements for protections for SDRs are not justified.

**PROPOSED CHANGES TO SDR RULES - AUTOMATIC FREQUENCY SELECTION
IN PART 15 DEVICES – WORLD MODE DEVICES**

19. The Commission proposes to adopt a new Section 15.202 in its rules that would provide that certification may be obtained for a device that is capable of operating on frequencies not permitted by this part, provided the device incorporates DFS and operates on only United States frequencies when operated in the United States.⁷

20. We understand that the FCC defines “DFS” as a mechanism that dynamically detects signals from other radio frequency systems and avoids co-channel operation with those systems. However, The Alliance believes use of such sensing feature is not appropriate in the case of Part 15 devices with capability to operate on frequencies including those of the Mobile Satellite

⁶ *Id.* at 94.

⁷ *See* the NPRM at 95.

Service in 2.483-2.500GHz. Imposing a requirement for unlicensed devices to sense presence of MSS signals is not at all justified in the NPRM and not known to be technically feasible or necessary and may cause operational problems when such unlicensed devices are operated in other countries where the same MSS signals may be present. Such sensing feature would not serve the purpose suggested by the Commission – to ensure an appropriate operating frequency based on the country of operation.

21. One situation that originally prompted FCC attention is that of an Unlicensed Wi-Fi device with capability to operate outside of U.S. frequencies. The Alliance believes that the existing, industry initiated methods of ensuring authorized operation are sufficient in this case. The new proposed rules would be an unnecessary burden and disincentive from selling World-capable client devices which benefit U.S. and non-U.S. users alike. The Alliance requests the Commission to fully consider the existing standards based solution(s) available for ensuring authorized operation of devices with World Capabilities such as the 802.11TGd feature.

22. In this case, the Master/Controller scheme is used, similar to multiband mobile phones where beacons from the controller indicate to the client device the proper channels of operation. And in this one case, if the industry-provided scheme for ensuring operation only on U.S. frequencies is seen to be defeated, then the cause must be considered before imposing a remedy.

23. Review of existing rules for configuration of FCC certified Access Points may be all that is needed to ensure non-authorized operation does not occur to any significant degree.

24. The Alliance recommends the following related measure. While it may be possible to certify a WLAN Access Point device for use of channels 12 and 13 in the 2.4GHz band, it is not in the best interest of the consumer or industry to allow these certifications. By limiting the channel set to the industry norm of channels 1-11 for future authorizations, operation on authorized channels for all Wi-Fi devices in the field will be further ensured.

25. Other device types operating in various unlicensed bands may or may not require such protections. Therefore, imposing wide-sweeping, technology-specific protections go far beyond the perceived risk identified in this one instance. Finally, one cognitive feature that can be helpful in this instance is location awareness. However, this is not a general purpose solution appropriate for all Wi-Fi Devices and should not be mandated or favored by the Commission.

PROPOSED CHANGES TO SDR RULES - SOFTWARE FLOW DIAGRAM

26. The Commission proposes deleting the requirement for SDR authorization to submit source code to the Commission.⁸ The proposed alternative, to instead submit a flow diagram and description of the radio controlling software is certainly more reasonable than the original requirement. However, the Alliance requests that the commission go further by removing the original requirement for source code and not impose an alternate requirement for a software description and flowchart. We do not believe providing such description or flowchart will realistically assist the authorization branch or TCB's in judging if a device meets the applicable authorization requirements.

27. Instead, the test report demonstrating compliance with the applicable rules should suffice. And the commission and TCB's are free to request or require applicant's submit declarations, descriptions or other information before authorizing a product, in order to answer specific questions of compliance with the rules.

28. If a requirement for a flow diagram is created, then we believe it should be limited to explain the protection measures implemented to prevent unauthorized modification of the device's software, rather than an open-ended, comprehensive explanation of the device's software architecture.

⁸ See the NPRM at 86.

**PROPOSED NEW TERM FOR MECHANISM TO SELECT OPERATING
FREQUENCY**

29. The commission proposes using the Term DFS in the context of cognitive radio to more broadly refer to a mechanism that selects an appropriate operating frequency for a device based on some specific condition.⁹

30. We recommend the commission use a different term for the general mechanism for selecting appropriate operating frequency based on specific conditions. Unnecessary confusion will be prevented by leaving the term DFS as it is currently known domestically and especially globally as the specific interference mitigation functions agreed and defined in ITU-R M.1562 agreed at WRC-03.

**DEVICES OPERATING UNDER CONTROL OF ANOTHER DEVICE
(MASTER/CLIENT)**

31. The Commission seeks comment on whether devices operating under the control of a master controller should be exempt from complying with DFS or other requirements.¹⁰

32. The Alliance believes the correct answer is that “system” solutions for meeting such requirements should be generally accepted and even encouraged as long as appropriate conformance testing can be performed demonstrating that each separate device type comprising a system can be tested individually or in combination to demonstrate conformance with the rules. Reduced product cost and improved performance will result from continued regulatory flexibility for such Master/controller solutions.

⁹ See the NPRM at 24.

¹⁰ *Id.* at 40.

SUMMARY AND CONCLUSION

33. The Alliance respectfully offers these comments and again applauds the Commission's efforts to explore new ways of making more effective use of spectrum and, particularly, making more spectrum available for use by unlicensed devices.

Respectfully submitted,

/s/

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