Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of	)	
	)	
Amendment of the Commission's Rules Regarding Dedicated Short-Range Communication Services in the 5.850-5.925 GHz Band (5.9 GHz Band)	)	WT Docket No. 01-90
	)	
Amendment of Parts 2 and 90 of the Commission's Rules to Allocate the 5.850-5.925 GHz Band to the Mobile Service for Dedicated Short Range Communications of Intelligent Transportation Services	)	ET Docket No. 98-95 RM-9096

***EX PARTE* SUBMISSION OF**
ARINC INCORPORATED

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SUMMARY

ARINC Incorporated ("ARINC") hereby provides this *ex parte* submission to further explain and refresh the public record regarding the need for and benefits of a proposed Site Registration Manager to oversee the site registration process for the Dedicated Short Range Communications ("DSRC") service in the 5.850-5.925 GHz Band. ARINC proposed such a third party entity in its previously filed Petition for Reconsideration and/or Clarification ("Petition"). Since the filing of the Petition, there has also been new Commission precedent that is relevant to ARINC's proposals.

DSRC holds the promise of providing critical safety-of-life and public safety services to the traveling public, but needs to have a reliable and suitable RF environment if these services are to be delivered successfully and initial problems with deploying DSRC will affect public acceptance. The need for such a Site Registration Manager is based on the belief that the message access priority framework for DSRC is not sufficient by itself to create the most appropriate RF environment for DSRC. This priority framework addresses only infrastructure sharing, not frequency sharing. While the adopted ASTM DSRC Standard's "listen-before-send" protocol does address frequency sharing issues, it cannot adequately ensure the most appropriate RF environment for DSRC. Many DSRC systems will be deployed in close proximity to one another, such as at intersections. These capabilities do not address channel access and other elements that are needed to prevent interference under these conditions. A Site Registration Manager should be enabled to provide "channel load balancing" among multiple DSRC systems to minimize the risk of interference in a given spectrum environment. Four "active" spectrum management functions are proposed for such an entity as part of the DSRC site registration process.

ARINC believes that these proposals, if adopted, will go far to ensure that DSRC licensees will have access to sufficient and reliable spectrum to meet their needs, particularly to meet the requirements of public safety licensees in the band.

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To: The Commission

***EX PARTE* SUBMISSION OF**
ARINC INCORPORATED

Pursuant to Section 1.1206(a) of the Commission's rules, 47 C.F.R. § 1.1206(a), ARINC Incorporated ("ARINC"), by its counsel, respectfully provides this *ex parte* submission further describing its proposed revisions to the licensing and services rules for the Dedicated Short Range Communications Service ("DSRCS ") in the Intelligent Transportation Systems ("ITS") Radio Service in the 5.850-5.925 ("5.9 GHz Band'), which were adopted in the *Report and Order* released February 10, 2004 in the above-captioned proceedings.[1]

[1] *Amendment of the Commission's Rules Regarding Dedicated Short-Range Communication Services in the 5.850-5.925 GHz Band (5.9 GHz Band); Amendment of Parts 2 and 90 of the Commission's Rules to Allocate the 5.950-5.925 GHz Band for Dedicated Short Range Communications of Intelligent Transportation Services*, WT Docket No. 01-90, ET Docket No. 98-95, RM-9096, Report and Order, 19 FCC Rcd 2458 (2004) ("*Report and Order*").

I. INTRODUCTION

Use of the 5.850-5.925 GHz Band ("5.9 GHz Band") for Dedicated Short Range Communications ("DSRC") holds the promise of providing nationwide, wireless access for the traveling public to a wide variety of services and information, generally termed Intelligent Transportation Systems ("ITS"). On February 10, 2004, the Commission adopted licensing and service rules for DSRC devices and systems operating in the 5.9 GHz Band.[2] These rules became effective on October 4, 2004.[3]

Most significant, the rules include the adoption of a single transmission standard ("ASTM DSRC Standard")[4] to ensure nationwide interoperability of DSRC services, operations and devices, as well as shared access to the full 5.9 GHz Band for both public safety and non public safety licensees. All operations and DSRC equipment must comply with the ASTM DSRC Standard. The rules also include a band channelization plan, licensing criteria and procedures, and technical rules for DSRC equipment (Roadside Units ("RSUs") and On-Board Units ("OBUs")), which will enable public safety and non public safety licensees to share access to the band.

On September 2, 2004, ARINC submitted a Petition for Reconsideration and/or Clarification ("ARINC Petition") requesting certain important refinements to the DSRC

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[2] *See generally Report and Order.*

[3] 69 Federal Register 46438 (August 3, 2004).

[4] *See* American Society of Testing and Materials (ASTM), Standard Specification for Telecommunications and Information Exchange and Information Exchange Between Roadside and Vehicle Systems – 5 GHz Band Dedicated Short Range Communications (DSRC) Medium Access Control (MAC) and Physical Layer (PHY) Specifications, Designation: E 2213-03 (published September 2003) ("ASTM DSRC Standard"). *See also* 47 C.F.R. § 90.379 (adopting ASTM DSRC Standard).

licensing rules.[5] The instant *ex parte* submission is provided to inform the public record regarding additional developments concerning the functions of the proposed third party "Site Registration Manager" for DSRC. The submission also discusses the import of recent Commission precedent since the filing of the ARINC Petition.

II. ARINC

ARINC is a world leader in the development and operation of communications and information processing systems, providing systems engineering and integration solutions to the government and transportation industries. Founded in 1929 to provide reliable and efficient radio communications for airlines, ARINC is headquartered in Annapolis, Maryland, and has over 80 locations worldwide. Since 1997, ARINC has participated in the DSRC standards development process under the auspices of the American Society for Testing and Materials ("ASTM") and the Institute of Electrical and Electronics Engineers ("IEEE") and pursuant to a support contract from the U.S. Department of Transportation. In this role, ARINC chairs the ASTM E17.51 DSRC Standards Writing Group, which developed the ASTM DSRC Standard.

The instant *ex parte* submission is being provided to the Commission pursuant to ARINC's role as a primary coordinator of the DSRC standards development process.

III. ARINC'S PETITION FOR RECONSIDERATION

ARINC's Petition requested that the Commission make certain refinements to the DSRC licensing rules to ensure that the rules result in the most suitable RF environment for the robust deployment of DSRC services in the 5.9 GHz Band. ARINC proposed that several "active" spectrum management techniques be introduced, including a software-based advance site review

[5] Petition for Reconsideration and/or Clarification of ARINC Incorporated, WT Docket No. 01-90 (filed Sept. 2, 2004) ("ARINC Petition").

analysis to identify potential interference problems before a new DSRC station is registered for a specific site.[6] Successful site registration in Universal Licensing System ("ULS") (or any other database) would not occur until the proposed station sites are cleared of any potential interference problems. It was also requested that licensees be required to register for specific Service Channels appropriate for their use application rather than for all channels in the band.[7] ARINC further suggested that the Commission consider having one or more third parties to manage and maintain the registration database rather than house this function in ULS.[8]

Additional proposed rule refinements included revisions to the station construction deadline and notice requirements.[9] ARINC proposed that licensees be required to initiate operations on at least one site within 12 months of the license grant and construct each registered site within 12 months after successful registration. Moreover, licensees should provide notice of when they have constructed and begin operations on their registered sites. A failure to meet these deadlines and provide the required notice would result, respectively, in the loss of the license or the site being purged from the registration database. The priority rights for interference protection should attach not at the time of site registration, but when the notice of construction is provided to the registration database.

Since the submission of ARINC's Petition, ARINC and the DSRC community have further developed the need for, functions and characteristics of the proposed third party Site

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[6] ARINC Petition at 8-9.

[7] *Id*. at 10.

[8] *Id.* at 11.

[9] Amended rules implementing these proposed changes are included in Appendix A to the Petition.

Registration Manager to oversee the recommended "active" spectrum management functions. These further proposals are based, in part, on rule modifications recently adopted for the "Millimeter Wave" service in the 71-76 GHz, 81-86 GHz and 92-95 GHz bands ("Above 70 GHz Service").[10]

IV. SITE REGISTRATION MANAGER

ARINC suggests there are four reasons why the proposed Site Registration Manager is needed for DSRC. In the *Report and Order*, the Commission found that, given the "lower power of RSUs and other interference mitigation provisions in the ASTM-DSRC Standard, interference disputes between DSRC operations should be rare."[11] Thus, according to the Commission, "'priority' is largely a matter of how messages are ranked and sent under the Control Channel protocol" for channel access.[12] The Commission further noted, however, that upper layers of the ASTM DSRC Standard, although still under development, will establish one or more levels of priority access for public safety messages.[13] The Commission therefore established a priority framework to govern how messages are ranked for transmission on the Control Channel: higher priority messages (safety-of-life first followed by public safety) will precede lower priority or

[10] *See Allocations and Service Rules for the 71-76 GHz, 81-86 GHz and 92-95 GHz Bands*, WT Docket No. 02-146, Memorandum Opinion and Order, 20 FCC Rcd 4889 (2005) ("*Above 70 GHz MO&O*").

[11] *Report and Order*, 19 FCC Rcd at 2474-75.

[12] *Id.* at 2475.

[13] *Id.*

non priority messages.[14] This priority access framework, moreover, would "ensure[] that non-public safety use of the band does not degrade public safety communications."[15]

The priority access framework will not adequately address RF concerns. Access prioritization is a software-defined code that will be implemented when operating software is loaded into DSRC radio equipment. Proposed revision of the ASTM DSRC Standard will add operational priorities at the data packet transmission level that are consistent with the Commission's priority framework. In other words, each packet will be assigned a priority based on the priority of the DSRC application: very high priorities for safety-of-life applications and low priority for non safety applications. The priorities identified in the proposed revision of ASTM DSRC Standard do not pertain to particular repeaters, but are instead associated with each type of DSRC application. This means that a repeater operated by a public safety licensee transmitting a high priority safety-of-life message would not inherently cause other repeaters operating on the same channel to stop sending their message. Consequently, the Commission's priority access framework should adequately address sharing of the DSRC infrastructure (namely, message access to a single DSRC repeater), but it does not adequately address frequency sharing issues, especially in a multiple-repeater environment. ARINC contends that there needs to be another mechanism to "balance" the priority access requirements for DSRC. The proposed Site Registration Manager would be able to perform this function.

Second, the "listen-before-send" protocol in the ASTM DSRC Standard also fails to address potential interference problems. The standard includes the Carrier Sense Multiple Access ("CSMA") "listen-before-send" operational protocol for transmitting data packets to

[14] *Id.*

[15] *Id.*

prevent packet "collisions." According to this protocol (which is expected to be fully implemented in proposed revisions to the ASTM DSRC Standard), when a high priority packet is ready to be transmitted the repeater first listens for any other transmission, and then sends the packets only if no other transmissions are detected. If, however, other transmissions are detected, the repeater waits for a specified period (the "back-off" time), and then repeats the listen-before-send routine.

There is a strong possibility, however, that multiple adjacent repeaters may all be seeking to use the same Service Channel and transmit messages with the same priority designation, especially where the repeaters are licensed to public safety entities. The listen-before-send protocol can become overwhelmed under these conditions: messages with the same priority designations would potentially interfere with one another, thus causing unnecessary delays in getting messages out. There is also a potential that high priority messages will receive interference from low priority messages in these conditions. Safety of life and public safety messages will need very low latency (*i.e.*, minimal wait before transmission). Any unnecessary delay could have an adverse impact on providing public safety services. A Site Registration Manager can effectively balance the load on channels ("channel load balancing") to minimize this risk of interference as part of the site registration process. Proposed revisions to the ASTM DSRC Standard contemplate that each RSU would be authorized to operate on the Control Channel and only one Service Channel,[16] which implicates a greater need for a mechanism to balance the load on individual Service Channels.

[16] Anticipating this development, ARINC proposed in its Petition that licensees not be granted authority to operate on all Service Channels. ARINC Petition at 10. Rather, applicants should be required to specify the appropriate Service Channel(s) when they seek to register an RSU at a

Third, ARINC believes that there needs to be a mechanism by which potential interference problems can be identified and resolved before systems are deployed. As further discussed below, the DSRC rules do not include any procedure during the initial stages of the licensing or registration process to identify where a potential RSU site and operations might cause interference to incumbent operations or might suffer interference. Interference problems are only identified after they occur. Resolving interference between deployed systems is much more costly and time consuming, and creates the risk that systems will potentially suffer downtime either because of the interference or during the time it takes to relocate or modify their operations. A Site Registration Manager can implement an upfront interference analysis that would identify potential interference problems before a proposed system is deployed.

Finally, there needs to be sufficient flexibility in channel selection to maximize reliable access to sufficient spectrum for low latency (*i.e.*, safety-of-life and public safety) communications. The DSRC service is perhaps unique in that public safety and non-public safety licensees share access to the band. A Site Registration Manager conducting this channel load balancing will help realize sufficient flexibility in channel selection to provide access to reliable and sufficient spectrum for public safety and prevent interference to their systems from non public safety operations.

V. "ACTIVE" SPECTRUM MANAGEMENT FUNCTIONS

Four "active" spectrum management functions are proposed for the Site Registration Manager: (1) advance site review interference analysis; (2) identification of RSU sites requiring coordination with Federal Government radar sites; (3) management of the site registration

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particular site. A Site Registration Manager, however, should have flexibility to modify these channel requests in a given RF environment.

database; and (4) interference dispute resolution. Carrying out these functions can be performed primarily through automated, software-based procedures, which will reduce costs and improve efficiencies.[17] These functions will give the Site Registration Manager the ability to consider the proposed use and technical design of proposed RSUs – considering factors, among others, site location, transmission power, Service Channels, emission masks and filters, and antenna height and directionality – to facilitate the intelligent placement of RSUs that maximizes available spectrum for all users while ensuring the reliable and effective delivery of higher priority safety communications.

A. Advance Site Review Interference Analysis

ARINC noted in its Petition that the DSRC licensing rules do not include a mechanism to assess how a proposed RSU site would impact the RF environment, particularly for the RSU to cause or suffer harmful interference.[18] ARINC therefore proposed that the Commission consider implementing some form of interference analysis at the outset of the registration process.[19] This process, termed "Advance Site Review Interference Analysis," is intended to identify problem RSU sites before they are deployed and can cause or suffer interference. It is also intended to minimize the likelihood that interference problems will occur after systems are deployed, when they are more costly and time consuming to resolve.[20] The Commission very recently revised its

[17] The software can also be written to ensure that intended uses are consistent with the DSRC definition (*see* 47 C.F.R. § 90.7) and the ASTM DSRC Standard.

[18] ARINC Petition at 5-6.

[19] *Id.* at 8-9.

[20] It is also the case that the lack of prior frequency review will impede effective sharing of the 5.9 GHz Band between the DSRC and Fixed Satellite Services ("FSS"), which are co-primary in the band with DSRC. DSRC and FSS industry groups are currently meeting to develop a spectrum sharing protocol for their operations in the 5.9 GHz Band. *See Ex Parte* Notice of the

rules for the Above 70 GHz Service requiring such an interference analysis as part of the "link" registration process. The Above 70 GHz Service precedent and its potential application to DSRC are discussed below.

1. Precedent: Above 70 GHz Service

When it adopted licensing and service rules for the Above 70 GHz Service in 2003, the Commission concluded that, given the technical characteristics of the "millimeter wave" technology, systems could transmit from closely adjacent sites without use of the traditional microwave coordination procedures.[21] It further concluded that if any instances of interference do result, they should be few in number and can be cleared after-the-fact.[22] As a last alternative, licensees could access the Commission's complaint process to resolve interference problems.[23]

A Petition for Reconsideration from an industry trade group, the Wireless Communications Association International ("WCAI"), requested that the Commission reconsider several of its licensing rules for the Above 70 GHz Service.[24] WCAI expressed its concern that using *post-hoc* (*i.e.*, after systems are deployed and operating) resolution of interference would

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Intelligent Transportation Society of America, America Association of State Highway and Transportation Officials and Satellite Industry Association, WT Docket No. 01-90 (filed May 20, 2005).

[21] *Allocations and Service Rules for the 71-76 GHz, 81-86 GHz and 92-95 GHz Bands*, WT Docket No. 02-146, Report and Order, 18 FCC Rcd 23318, 23338 (2003) ("*Above 70 GHz Report and Order*").

[22] *Id*.

[23] *Id*. at 23343.

[24] Wireless Communications Association International, Petition for Reconsideration in the 70/80 GHz Bands, WT Docket No. 02-146 (filed Feb. 23, 2004) ("WCAI Petition").

be too expensive and time consuming.[25] Such *post-hoc* interference resolution, moreover, would be all the more difficult given the long delay between the registration of a link and the detection of an interference problem, thus making it harder to identify the source of the interference and resolve the problem.[26] In addition, incumbent investment in their systems and services would not be adequately protected if there is a significant risk of potential interference.[27] According to WCAI, the likelihood of "catastrophic" system outage due to interference can be significantly reduced by using current technology that permits real-time, automated analysis to ascertain the potential interference implications before a system is deployed.[28] Moreover, the cost of this prevention is "negligible" as compared to the cost to modify systems after they are deployed to resolve interference problems.[29] WCIA requested that the Commission require each new licensee of the 70 and 80 GHz bands to verify at the beginning of the licensing process that its proposed links would not cause harmful interference to an existing link.[30]

Consistent with WCAI's Petition, the Commission adopted the requested Advance Site Review Interference Analysis as part of the license process for the Above 70 GHz Service.[31] Significantly, the Commission agreed with the contention that *post-hoc* resolution of interference problems would cause such uncertainty and delay in the service that would threaten the

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[25] *Id.* at 4-7.

[26] *Id.* at 5.

[27] *Id*. at 4-7.

[28] *Id.* at 4.

[29] *Id.*

[30] *Id.* at 3-4.

[31] *See Above 70 GHz MO&O*, 20 FCC Rcd at 4895.

economic viability of using these bands for new broadband services.[32] The Commission also concluded that the costs associated with conducting the upfront interference analysis are low as compared to the potential benefits of preventing harmful interference to incumbent systems.[33] The Commission revised its rules to require that licensees applying to register a link must submit an analysis to a registration database manager that the proposed link will neither cause nor receive harmful interference from previously registered links.[34]

2. Advance Site Review Interference Analysis for DSRC

Consistent with the procedures adopted for the Above 70 GHz Service, ARINC proposes that a similar Advance Site Review Interference Analysis be a required step in the site registration process for DSRC. Prior to registering a proposed RSU site, a licensee would have

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[32] *Id.* at 4895.

[33] *Id.*

[34] *Id.* at 4895-96. The required analysis is based on establish interference protection criteria already found in the Commission's rules. *See* 47 C.F.R. § 101.105(a)(5), App. B. The revised rule reads in relevant part:

> The licensee or applicant shall … (2) provide an electronic copy of an interference analysis to the third-party database manager which demonstrates that the potential for harmful interference to or from all previously registered non-government links has been analyzed according to the standards of section 101.105 and generally accepted good engineering practice, and that the proposed non-government link will neither cause harmful interference to, nor receive harmful interference from, any previously registered non-government link; and (3) provide upon request any information related to the interference analysis and the corresponding link. The third-party database manager shall receive and retain the interference analyses electronically and make them available to the public.

47 C.F.R. § 101.1523(b) (as amended). The Commission further noted that should interference occur after systems are deployed, it retained its rule that first-in-time registered links would receive interference protection from later-registered links, which must either discontinue or modify their systems to resolve the problem interference. *Above 70 GHz MO&O*, 20 FCC Rcd at 4896. The Commission's complaint process would also be available if the problem remains unresolved. *Id.*

conducted an interference analysis of the potential for each proposed site to cause interference or receive interference from incumbent systems in the 5.9 GHz Band, including both incumbent DSRC systems and incumbent FSS systems. This analysis would be conducted based on established interference protection criteria.[35] The licensee would then present the results of the interference analysis to the Site Registration Manager as part of the application to register its proposed site(s).[36] The determination that the proposed RSU site will not cause interference or suffer harmful interference would be conducted prior to and as a condition of registering a site in the DSRC site registration database.

ARINC believes that using an advance site review interference analysis will provide similar or, perhaps, greater benefits for DSRC as are expected for the Above 70 GHz Service. All Commission licensees, regardless of service and frequency bands, want to avoid any risk that operation of their deployed system may need to be suspended and altered if it is involved in a case of harmful interference, especially if they are the victim. Prevention through the proposed Advance Site Review Interference Analysis should reduce this risk considerably.

The appropriateness of using such an interference analysis is more compelling for DSRC than for the Above 70 GHz service. The DSRC service will include many public safety entities and others that will be transmitting and receiving safety of life and public safety communications. Public safety systems should not be put at risk of possible disruption or suspended operations because later-deployed systems start causing interference. It is also the case that public safety

[35] The relevant interference protection criteria would need to be developed.

[36] The Site Registration Manager should have the discretion to modify, for example, output power and other technical characteristics and channel selection (*e.g.*, the previously discussed "channel load balancing") to ensure a sound spectrum environment.

entities have very limited financial resources to deploy radio systems in the first place, let alone to alter operating systems after they are deployed.

In the Above 70 GHz Service, the Commission recognized that current technology can enable virtually "real-time" electronic interference analysis.[37] ARINC believes that a similar automated review process can also be used for DSRC.[38] Industry discussions are already underway examining the possible implementation models and associated costs to write and implement the necessary software and review procedures.

B. Identification of RSU Sites Requiring Coordination with Federal Government Radar Sites

Also operating in the 5.9 GHz Band are approximately 60 high-power radars used by the U.S. Department of Defense. The Commission's Rules specify that DSRC operations will not receive interference protection from incumbent radar sites.[39] In addition, DSRC stations located within 75 kilometers of the identified radars (a so-called "Exclusion Zone") must be coordinated through the federal government's frequency coordination process administered by the National Telecommunications and Information Administration ("NTIA") of the U.S. Department of Commerce.[40] The Commission specified that ULS would be configured to identify and refer

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[37] *Above 70 GHz MO&O,* 20 FCC Rcd at 4895.

[38] To implement this process, however, additional technical and operational information would be needed from licensees regarding proposed RSU sites beyond what is currently provided on FCC Form 601 and its Schedule M. Recommendations regarding what additional information is needed on Schedule M are provided in Appendix A.

[39] 47 C.F.R. § 90.371(b).

[40] *Id.* Sixty radar sites are identified (including their locations by coordinates) in the rule. *Id.* This federal government coordination process is called the Interdepartment Radio Advisory Committee ("IRAC"). NTIA has indicated that it would process the DSRC coordination requests within 14 days of receipt. *Report and Order*, 19 FCC Rcd at 2491.

such sites for NTIA coordination.[41] If the site registration process is managed outside of ULS, there may be operating efficiencies in having a Site Registration Manager identify these potential sites (likely via an automated software review) and refer them to the Commission.[42] Coordination with NTIA could be done in parallel with the other site registration processes.

C. Management of Site Registration Database

The current DSRC rules provide that license and site registration data be provided to and retained in the Commission's ULS database.[43] Another proposed function of the Site Registration Manager is to manage a separate registration database. Under this proposal, the ULS database would continue to be used for license applications and to hold basic licensee information, as it does for other wireless services.[44] There are advantages to be gained, however, from having one or more site registration databases separate from ULS. While ULS is a beneficial tool, and is constantly improving, it is simply not structured to implement the several proposed functions for the Site Registration Manager, in particular the Advanced Site Review Interference Analysis. Moreover, the administrative burdens on Commission resources to

[41] *Report and Order*, 19 FCC Rcd at 2491.

[42] According to the *Report and Order*, NTIA has indicated that it will provide a public website for the DSRC coordination process, which would indicate the coordination applications NTIA has received from the Commission, the date received, the date action is complete and status. *Id.* at 2491 n. 249. For the Above 70 GHz Service, the NTIA agreed to set up a website-based coordination process, and which is now operational. *See* http://freqcoord.ntia.doc.gov/. It also may be possible to use a similar "green light/yellow light" procedure for coordination of potential RSU sites for DSRC. *See Above 70 GHz Report and Order*, 18 FCC Rcd at 23341-42.

[43] FCC Form 601 has already been revised to accept DSRC license applications.

[44] It is also the case that additional technical and operational information that is not currently available from FCC Form 601 and Schedule M would be needed by a Site Registration Manager. This additional information is described in Appendix A.

implement and manage these proposed functions would be considerable and are beyond the scope of ULS.

Similar to the requirements for the third party database managers established for the Above 70 GHz Service,[45] a DSRC Site Registration Manager would develop its own database, or possibly share a database if more than one manager is named. Its services would be available to all parties in the order requested and on a non-discriminatory basis. The manager should also be permitted to offer optional services for additional cost. The manager could also provide updated site information to ULS and NTIA on a periodic basis, or otherwise permit access to the database by the agencies as requested.

D. Interference Dispute Resolution

The final proposed function of a Site Registration Manager would be to establish and manage an interference dispute resolution ("IDR") process to resolve instances of harmful interference between systems. Although the Advance Site Review Interference Analysis should greatly reduce the likelihood of actual interference occurring, this risk cannot be eliminated completely. A *post-hoc* IDR process could be used as a resource to resolve problems quickly if they occur. (It also may be possible for automated, software-based techniques to be developed that could offer a first-line interference analysis and resolution techniques at relatively low cost to the parties.) The Commission's complaint process would still be available if resolution cannot be reached through such an IDR program.

VI. SITE REGISTRATION PROCESS FLOW

Attached as Appendix B is a White Paper developed for ARINC, entitled "A Licensing and Site Registration Process for 5.9 GHz Roadside Units Incorporating 'Active' Spectrum

[45] *See generally Above 70 GHz Report and Order*, 18 FCC at 23340-41.

Management Functions." This White Paper describes, in both a narrative format and as a logical flow diagram, how the DSRC site registration process incorporating the active spectrum management functions overseen by a Site Registration Manager would proceed.

VII. NUMBER/TYPE OF MANAGERS

ARINC in its Petition suggested that there might be advantages to naming one or more third party entities to serve as the manager of the site registration process and database rather than house it in ULS.[46] Commission precedent and the advantages and disadvantages of naming a single or multiple managers and types of entities are further discussed below.

A. Single Manager

There are several advantages to designating only a single entity to serve as the DSRC Site Registration Manager. Licensees would have a single point of contact for submitting site registration applications and the accompanying interference analyses. This would likely be administratively easier for both licensees and the manager. The use of only one site registration database maintained by a single entity would also reduce the likelihood of potential discrepancies between multiple databases and eliminates the need for coordination among multiple managers. A single manager is also more likely to be able to ensure that it consistently applies the DSRC licensing procedures.

On the other hand, naming only a single Site Registration Manager would limit competition in the provision of these services. There would be no competitive pressures to check potential increases in any charged fees or to differentiate service offerings. There may thus be a need for periodic Commission review and approval of any charged fees. If there are significant

[46] ARINC Petition at 11. In the *Report and Order*, the Commission noted that there might be administrative advantages to having the registration process maintained by a third party rather than the Commission. 19 FCC Rcd at 2486.

numbers of site registration applications, it may be difficult for a single manager to process them in a timely and accurate manner. In addition, the costs of developing the registration and interference analysis software may be too costly for a single entity to bear, which would create pressure to charge higher fees to recover these costs.

In 2001, the Wireless Telecommunications Bureau ("Bureau") designated a single entity to serve as the nationwide coordinator for the Wireless Medical Telemetry Service ("WMTS"), the American Society for Health Care Engineering of the American Hospital Association ("AHA").[47] Although the Bureau acknowledged the benefits of competition for coordination services generally, it decided that a single coordinator model would work best for WMTS. A single entity would make the coordination process simpler, reduce costs and expedite the deployment of the service.[48] In addition, the Bureau concluded that multiple coordinators for WMTS would not necessarily result in cost savings as each coordinator would have to spread out its costs across fewer users, thus potentially raising fees.[49] Most importantly, the Bureau noted its concern that any lapse of communication among multiple coordinators could result in harmful interference to WMTS operations, thus putting patient care potentially at risk.[50] The Bureau chose AHA as the single designated, nationwide coordinator given that its members included the WMTA user community as well as it had unique experience with the service and equipment.[51]

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[47] *See Amendment of Parts 2 and 95 of the Commission's Rules to Create a Wireless Medical Telemetry Service*, ET Docket No. 99-255, Order, 16 FCC Rcd 4543 (2001) ("*WMTS Order*").

[48] *Id.* at 4549.

[49] *Id.*

[50] *Id.*

[51] *Id*. at 4550.

B. Multiple Managers

Another option would be to designate more than one Site Registration Manager. Each entity would maintain and operate its own site registration database. A licensee could apply to any one manager, but need apply only to one. It would be the responsibility of each manager to exchange site registration data, coordinate their databases and take the necessary steps to ensure that each database is complete, accurate and consistent with the others. Each manager would be authorized to clear proposed sites with the other managers and provide updated data to each other (and to the Commission's ULS database.)

Designating multiple managers would also introduce competition into the market for DSRC site registration services, thus putting downward pressure on fees and creating incentives to provide better quality of service. Licensees would have a choice of different managers. A licensee may find that one manager is more convenient or more responsive to its needs. Multiple managers would also be better able to handle significant numbers of applications at the same time than a single screener.

However, using multiple Site Registration Managers presents certain disadvantages. A failure by the managers to coordinate their databases could result in one or more entities having incomplete and/or inaccurate data regarding site registrations. Thus, a licensee that is seeking to register a site may find that its analysis of where to locate a proposed site may be based on erroneous data, thus causing delay in the registration process and the possible selection of a different site that may not be as desirable for technical or operational reasons. Coordinating the multiple databases may introduce delay in the registration process. There may also be inconsistent application of the DSRC licensee rules and procedures among the managers.

In addition, designating multiple Site Registration Managers implicates issues associated with the development of the registration and interference analysis software. Each manager may

decide to develop its own proprietary software, which could complicate database coordination and result in inconsistent analyses. Developing multiple software systems is duplicative, and would put pressure on each manager to charge sufficient fees to recover their own development costs; fees that would have to be spread across a smaller group of users for each manager than if there were only a single manager.

The Commission designated multiple database managers for the Above 70 GHz Service. Citing the benefits to be gained from introducing market forces into the frequency coordination process, the Commission decided to name multiple entities for the service.[52] It stated that "competition among coordinators promotes cost-based pricing and provides incentives for enhancing customer service…."[53] The Commission also found it unnecessary to establish fee limits, thus allowing the database managers to set fees to recoup costs.[54] The Commission subsequently designated three entities to serve as the service's database managers.[55]

C. Types of Managers

Precedents from the WTMS and Above 70 GHz Service suggest the types of entities that may be appropriate as the Site Registration Database for DSRC. Where a single manager is designated, it may be most appropriate that it be a non-profit or governmental entity. The WMTS manager is sponsored by a single, non-profit industry association. This precedent

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[52] *Above 70 GHz Report and Order*, 18 FCC Rcd at 23340.

[53] *Id.*

[54] *Id.* at 23341.

[55] *Allocations and Services Rules for the 71-76 GHz, 81-86 GHz and 92-95 GHz Bands*, WT Docket No. 02-146, Order, 19 FCC Rcd 20524 (2004). It should be noted that the Above 70 GHz Service is allocated for commercial, point-to-point fixed microwave services, and does not contemplate public safety communications.

suggests that where competitive concerns are less important than public safety interests, a single, non-profit entity may be the most appropriate type of manager. This is not to suggest that a governmental entity, or a partnership between a governmental entity and a private, non-profit association could not also serve as the manager. Where public safety concerns are less prevalent or do not exist, it may be more appropriate to name more than one manager to take advantage of the benefits resulting from competition. The three entities named as the database managers for the Above 70 GHz Serve are each private, for-profit entities.

To more fully ascertain the potential benefits and downsides of using one or more third party managers, ARINC suggests that the Commission solicit bids from interested parties. The Commission used a similar procedure to conclude that a single, third-party coordinator was most appropriate for WMTS.[56] Interested parties should be asked to explain the benefits of exclusivity (one manager) versus competition (multiple managers), and proposed services and their cost. Based on this information, the Commission would be better able to make an informed decision as to whether to name one or more managers, or decide to keep this function within ULS.

[56] *See WMTS Order*, 16 FCC Rcd at 4544-45.

VIII. CONCLUSION

ARINC believes that its proposed changes to the DSRC licensing rules will ensure that the most appropriate RF environment is created for supporting a DSRC service that is robust, comprehensive and interoperable for all users.

Respectfully submitted,

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August 5, 2005

APPENDIX A

Recommended Additional DSRC Technical and Operational Characteristics for RSU Site Registration Process

The present site registration process requires the licensee to submit data to the Commission's ULS database for each DSRC RSU geographic site. The data is submitted using FCC Form 601 (Main Form) and Schedule M. The main form provides data to establish the identity, eligibility and qualifications of the filer, determine the nature of the proposed service, and classify the filing. In Schedule M the licensee provides technical characteristics described by site data, antenna data, and equipment data. The licensee also must determine and acknowledge in Schedule M if the geographic location of the RSU requires international coordination, causes an environmental impact, is located in a Quiet Zone, or is a location that requires coordination with NTIA. The authority to operate the RSU begins after the Wireless Telecommunications Bureau screens the filing data and posts the registration on the ULS. The accuracy and completeness of the data submitted to the Commission's ULS database is critical to the screening process.

The site data requested in Items 3 to 12 of Schedule M meets the requirements of the Commission's Part 90 Rules (47 C.F.R. Part 90), and the DSRC Standard Specification, ATSM E 2213-03 for ITS radio service. While the site data is satisfactory it is important to emphasize the importance of defining the site latitude and longitude to the tenth degree (DD-MM-SS.S). It is required that a DSRC RSU operate within a DSRC communications zone that may coexist with multiple overlapping DSRC communications zones. Tenth degree, site location accuracy may be required to identify and mitigate interference when co-located RSU operation is planned. It is recommended that Schedule M be changed to include the specific Public Safety or Private DSRC ITS Application and communication zone (15, 100, 400, or 1000 meters) to be implemented at each geographic site. [57]

Antenna data is requested in Items 13 to 27 of Schedule M. While the transmit antenna data requested in Items 13 to 19 is satisfactory, polarization (Item 20) is not currently required for DSRC antennas. It is recommended that Schedule M be changed to include DSRC antenna polarization. The DSRC Standard, ATSM E 2213-03, specifies polarization may be either Vertical or Right-hand Circular. It is also recommended that Schedule M be changed to include DSRC antenna beam and sidelobe gain directed toward the horizon and at elevation angles of 5 to 40 degrees.

Receive antenna data, Items 21 to 27 of Schedule M is not currently required for DSRC antennas. Although the typical deployment of DSRC RSUs will transmit and receive on the same antenna, some co-located configurations may use separate transmit and receive antennas to mitigate interference. It is recommended that the Schedule M Instructions be modified to reflect the special case need for DSRC receive antenna characteristics in Items 21 to 27. It is also recommended that the polarization and beam/sidelobe gain be added to the receive antenna data.

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[57] *See* 47 C.F.R. §§ 90.375(c), 90.377(a).

Equipment data is requested in Items 28 to 43 of Schedule M. It is recommended that Schedule M be changed to include the DSRC Transmit Mask; Class A. B, C, or D. Of particular concern is the omission of receiver data, Items 40 to 43. It is also recommended that the Schedule M Instructions be modified to include the receiver data. It is further recommended that Schedule M be changed to include the two categories of DSRC receiver adjacent channel rejection Category 1 and Category 2.

APPENDIX B

White Paper:

A Licensing and Registration Process for 5.9 GHz DSRC Roadside Units Incorporating "Active" Spectrum Management Functions

(follows)

WHITE PAPER:

A LICENSING AND SITE REGISTRATION PROCESS FOR 5.9 GHz DSRC ROADSIDE UNITS INCORPORATING "ACTIVE" SPECTRUM MANAGEMENT FUNCTIONS

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Introduction

This white paper was developed in support of ARINC in developing FCC rules and rule modification submissions for use of the allocated 5.9 GHz DSRC spectrum. ARINC's Petition for Reconsideration to the FCC, requested that certain "active" spectrum management functions be used early in the DSRC licensing process to identify – and hopefully resolve – potential interference problems. This white paper was developed to support an anticipated *ex parte* filing to the FCC regarding these proposed spectrum management functions.

In particular, this paper presents a potential licensing and site registration process for 5.9 GHz DSRC Road Side Units (RSUs) that incorporates frequency screening. The incorporation of these features in the described licensing and site registration process addresses several factors that still need to be established for deployment of 5.9 GHz DSRC to proceed effectively.

5.9 GHz DSRC Site Registration Process Scenario

A 5.9 GHz DSRC site registration process scenario was developed to illustrate how one or more third-party site registration managers could help accomplish the objectives of usage eligibility and frequency screening in conjunction with the existing FCC ULS licensing process. The flow chart shown in Figure 1 (a, b & c) illustrates how the required process flow might be accomplished.

The initial step in making an application to operate an RSU in the 5.9 GHz DSRC spectrum is the licensing application through the ULS system. This step is shown in the first light yellow box in Figure 1a, and is identical to the currently employed ULS licensing process. As soon as the FCC grants the DSRC license to the applicant, the FCC license data becomes available on the ULS system. One or more third-party site registration managers would monitor the ULS license data, and update their own databases using the updates from the ULS licensing database.

As soon as the FCC grants the DSRC license to the applicant, the applicant applies for registration of each specific RSU site that is being proposed. If more than one third-party site registration manager is available, the applicant would be able to select a preferred site registration manager with which to make the registration application. If multiple site registration managers were available, these different organizations would be expected to compete for registration applications by providing competitive choices through price, features, added value and process time, for example.

It is envisioned that each third-party site registration manager would develop an automated, computerized system to accomplish the process steps shown within the blue boxes (Site Registration Manager (SRM) Role (typical), SRM Role (cont) and SRM Role (cont2) shown in Figures 1a, 1b and 1c, respectively).

The first decision gate in the process is: “Can Proposed RSU Site Successfully Share Band with DSRC Incumbents and Pending Stations?” (shown near the bottom of the page in Figure 1a). In this step, frequency screening is conducted to determine if the proposed site is able to successfully share the band with DSRC incumbents and pending DSRC RSU registrants. This process step would verify that the operation of the proposed RSU would not cause interference or receive interference to/from in-band incumbents or pending registrants through the application of interference criteria in an automated, computerized system. The interference criteria will need to be developed prior to the deployment of this registration process.

If this frequency screening process determines that interference issues exist, then the applicant is advised that they must undertake steps to mitigate the potential for causing or suffering interference, or else quit the registration process. The applicant may be advised to seek the services of a frequency coordinator in order to ensure the necessary mitigation steps are taken. Third-party site registration managers might decide to provide mitigation support with engineering resources, either using automated systems, or through human interaction in a similar manner to the possibilities for resolving ineligible registrations

that were previously discussed. This mitigation support may proceed through progressive steps, as required. For example, if the automated resources are not able to adequately supply mitigation steps, then the process might be escalated to a human intervention approach. This approach might be used in conjunction with the frequency coordinator requirement by exhausting the simpler steps through the progressive process described above before requiring the use of a frequency coordinator. If mitigation steps are taken, then the applicant can reapply to the beginning of the "Can Proposed RSU Site Successfully Share Band with DSRC Incumbents and Pending Stations?" process step.

If the "Can Proposed RSU Site Successfully Share Band with DSRC Incumbents and Pending Stations?" frequency screening process step determines that no interference issues exist, either directly or after mitigation steps have been taken, the applicant is advised of the successful completion of this step through the interactive, online-type registration process system. Immediately after this notice of success, the applicant can proceed to the next decision gate in the registration process.

The next decision gate in the process (shown near the bottom of the page in Figure 1a) considers potential interference issues with Fixed Satellite Service (FSS) stations, and is labeled: "Can Proposed RSU Site Successfully Share Band with FSS Incumbents and Pending Stations?" Frequency screening is conducted in this step based on interference criteria that will need to be established prior to deployment of the registration process. The screening in this step will determine if the proposed site is able to successfully share the band with FSS incumbents and pending registrants. This automated, computerized process step will use the interference protection criteria to verify that the operation of the proposed RSU will not cause interference or receive interference to/from FSS incumbents or pending registrants.

If the determination is made in this step of the frequency screening process that interference issues exist, then the applicant is advised that they must undertake steps to mitigate the potential for causing or suffering interference, or else quit the registration process. As in the previous step, the applicant may be advised to seek the services of a frequency coordinator in order to ensure the necessary mitigation steps are taken. The third-party site registration managers may be able to provide automated, or live, engineering support for mitigation. This mitigation support may also proceed through progressive steps, as in the previous step. If the mitigation steps are taken, the applicant can then reapply to the beginning of the "Can Proposed RSU Site Successfully Share Band with DSRC Incumbents and Pending Stations?" The recirculation through the "Can Proposed RSU Site Successfully Share Band with DSRC Incumbents and Pending Stations?" process step will determine if the mitigation steps taken in resolving "Can Proposed RSU Site Successfully Share Band with FSS Incumbents and Pending Stations?" issues have altered the situation in the earlier step. If there are now new interference issues in the "Can Proposed RSU Site Successfully Share Band with DSRC Incumbents and Pending Stations?" analysis, additional mitigation steps must be undertaken through a progressive process, as described earlier in the discussion. Once such issues are resolved, the "Can Proposed RSU Site Successfully Share Band with FSS Incumbents and Pending Stations?" process step must be repeated to determine if the prior step mitigation steps have altered the interference situation for FSS stations.

Assuming that effective mitigation steps can be implemented to successfully address all identified interference issues in these steps, the applicant can then proceed to the next decision gate in the registration process.

Alternately, if the "Can Proposed RSU Site Successfully Share Band with DSRC Incumbents and Pending Stations?" frequency screening process step determines on the first pass that no interference issues exist, the applicant is advised of the successful completion of this step and can immediately proceed to the next decision gate in the registration process.

The next decision gate is labeled: "Is Proposed RSU Site Located within an NTIA "Exclusion Zone"?", and can be seen near the top of Figure 1b. As noted in Figure 1b (Note 3), FCC Rule 90.371(b) states that DSRC sites within 75 kilometers of identified DOD radar sites must be coordinated through NTIA/IRAC procedures. The automated registration process can readily determine if the proposed RSU site is within the 75 kilometer exclusion zone and provide this information to the FCC. (It also may be possible to utilize a similar "green light / yellow light" coordination process for DSRC as has been implemented for the Above 70 GHZ "Millimeter Wave" Service.)

The next step in the registration process is for the third-party site registration manager to assign a date and time stamp to this RSU registration application. The next activity is for the site registration manager to notify the applicant that the registration was successful. At this point, the site registration manager adds this RSU registration data to its own registration database, notifies the FCC ULS system of the addition of this RSU registration to the site registration manager database, and provides the necessary registration data to the ULS system (as shown at the bottom of page in Figure 1c).

The site registration manager must then coordinate its registration database with the other third-party site registration managers' databases. It is expected that this coordination between site registration manager databases will be accomplished through the utilization of an automated, computerized system, so that very few resources are required on an ongoing basis to ensure accurate coordination of the various site registration manager databases.

Based upon the date and time stamp on a successful RSU registration, an automated timer in the site registration manager's system is set for one year. The next decision gate in the registration process depends upon the timer to establish "Did Applicant Provide Notice to SRM that Station was Constructed and Operating within 1 year?" (as shown near the bottom of the page in Figure 1b). Intermediate timers could also be used by the site registration manager, for example, to provide timely, periodic reminders to the applicant that the RSU must be installed and operating before the expiration of the one year requirement.

If the site registration manager is not provided with notice that the RSU station is up and operating before the expiration of the one year period, then the site registration manager deletes this RSU registration from its registration database. The site registration manager also notifies the applicant that they did not meet the one year requirement and that their

RSU registration has been deleted from the registration database. In addition, the site registration manager notifies the FCC ULS system of the deletion of this RSU registration from the site registration manager database (as shown near the bottom of the page in Figure 1c), and provides the reason for the deletion.

If the site registration manager is provided with notice that the RSU station is up and operating before the expiration of the one year period, then the site registration manager sets the appropriate operational date for this RSU registration in its registration database. The site registration manager also notifies the FCC ULS system of the operational date of this RSU in its registration database (as shown in the bottom third of Figure 1c). The operational date is then used to establish priority rights for interference protection for this RSU.

Any interference issues that arise after the deployment and operation of the RSU would trigger an "Interference Dispute Resolution" (IDR) process within the site registration manager role. This IDR process is envisioned as a series of progressive steps. Initial steps may use automated systems to suggest resolution solutions. For example, a number of stock responses could be provided by a computerized system based upon the relative operational dates for the two RSUs under contention, in conjunction with interactive entry of the interference issue details. As the next progressive step, if the initial automated step was not able to resolve the interference issue, human intervention with the requisite technical resources might be offered as part of the IDR process.

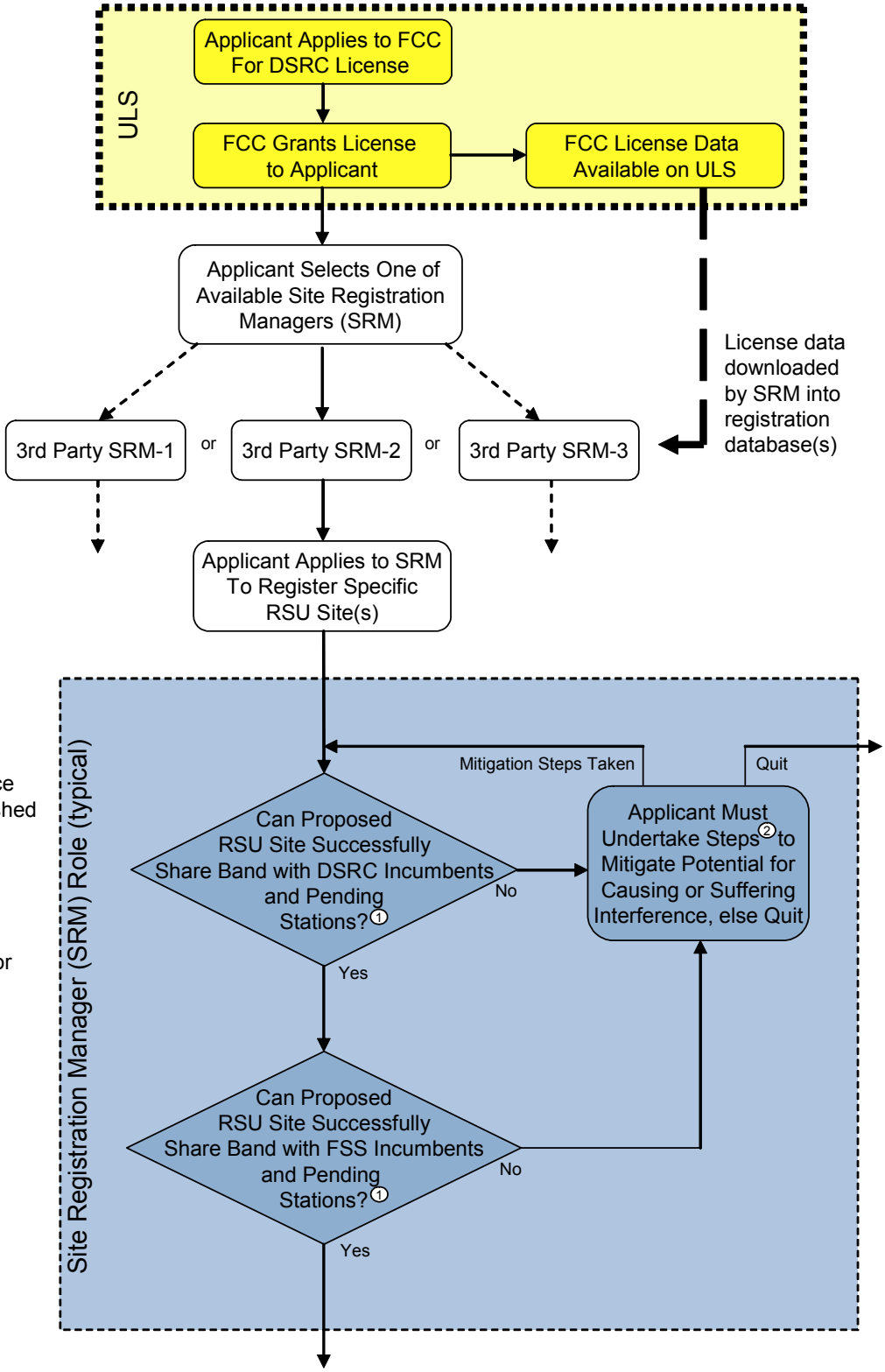
After the IDR process is used, another decision gate is reached: "Was Interference Issue Resolved by IDR Process?" If the IDR process was not able to resolve the interference issue, the site registration manager notifies the FCC that the IDR process was not successful (as shown at the top of the "FCC – Post-Licensing Functions" box in the lower half of Figure 1c). The established FCC complaint process would be available at this point to be used to resolve the interference issue. If the IDR process was able to resolve the interference issue, any changes to the registration data would be noted by the site registration manager in its database.

On an ongoing basis, each third-party site registration manager would be responsible for coordinating any updates to its registration database with the databases of the other third-party site registration managers. As previously discussed, it is envisioned that this ongoing coordination between site registration manager databases will be performed on a near real time basis through the effective use of an automated, computerized system. The successful completion of the described site registration manager processes leads to the desired outcome of "Successful DSRC RSU Licensing, Registration and Operation" (shown near the middle of Figure 1c).

Conclusion

This white paper has presented a potential licensing and site registration scenario for 5.9 GHz DSRC RSUs that incorporates usage eligibility and frequency screening. The incorporation of these features in the site registration scenario described in this paper effectively addresses frequency harmonization between DSRC RSUs that are installed near the same geographic location to help ensure the proper operation of safety-related applications. The incorporation of these factors into 5.9 GHz DSRC licensing and registration processes is viewed as critical for the deployment of 5.9 GHz DSRC to proceed effectively. The scenario described in this paper illustrates the process steps and logical flows between process steps that could be used to provide "active" spectrum management functions early in the DSRC licensing process as requested in ARINC's Petition for Reconsideration.

Figure 1a – 5.9 GHz Site Registration Scenario



NOTE 1:
Based on interference criteria to be established

NOTE 2:
Applicant may be required to seek the services of a frequency coordinator

Figure 1b – 5.9 GHz Site Registration Scenario (cont)

NOTE 3:
Per Rule 90.371(b), DSRC sites within 75 kilometers of identified DOD radar sites must be coordinated through NTIA/IRAC procedures

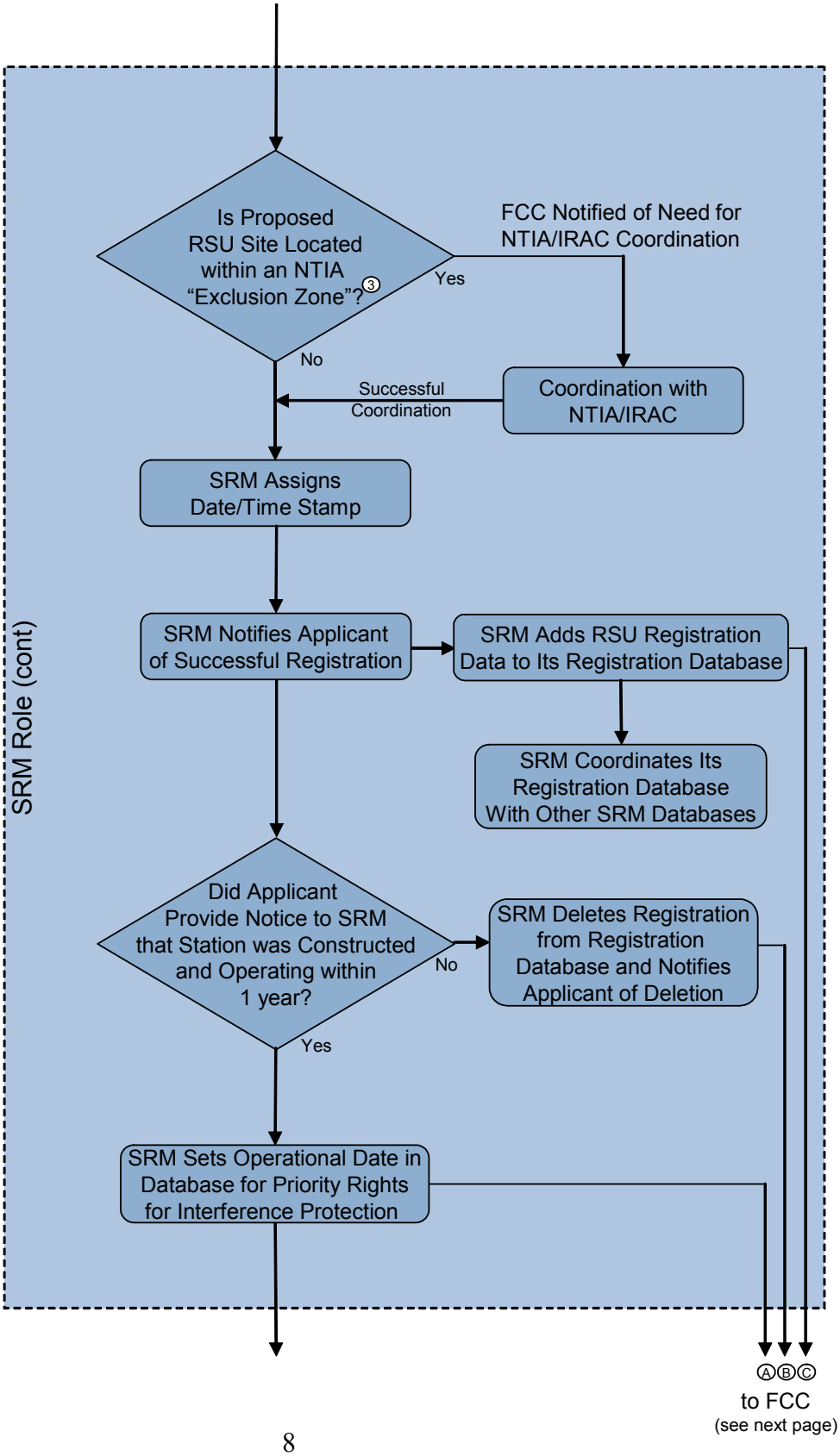


Figure 1c – 5.9 GHz Site Registration Scenario (cont2)