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Before the
Federal Communications Commission
Washington, D.C. 20554

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In the matter of	)	
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Petitions for Reconsideration of the Second Memorandum Opinion and Order, Service Rules for the 746-764 and 776-794 MHz Bands and Revisions to Part 27 of the Commission's Rules	)	WT Docket No. 99-168

Third Memorandum Opinion and Order

Adopted: July 2, 2002 **Released: July 12, 2002**

By the Commission:

I. INTRODUCTION

1. The Commission recently has taken measures to expedite the availability of additional public safety spectrum resources,[1] and has initiated other efforts to improve the capabilities and responsiveness of both public safety and commercial wireless services in emergency situations.[2] In this Memorandum Opinion and Order we also respond to public safety concerns, in resolving two petitions for

[1] *See, e.g.*, The 4.9 GHz Band Transferred from Federal Government Use, WT Docket No. 00-32, *Second Report and Order and Notice of Proposed Rulemaking*, FCC 02-47 (Feb. 27, 2002), 2002 WL 272026; New Public Safety Applications and Broadband Internet Uses Envisioned by FCC Authorization of Ultra-Wideband Technology, *First Report and Order*, FCC 02-48 (Apr. 22, 2002); Service Rules for the 746-764 and 776-794 MHz Bands, and Revisions to Part 27 of the Commission's Rules, WT Docket No. 99-168, Carriage of the Transmissions of Digital Television Broadcast Stations, CS Docket No. 98-120, Review of the Commission's Rules and Policies Affecting the Conversion to Digital Television, MM Docket No. 00-39, *Order on Reconsideration of the Third Report and Order*, 16 FCC Rcd 21633 at 21647-21649 paras. 26-29 (expedited processing of regulatory requests involving band clearing that would enable provision of public safety services), and Separate Statement of Commissioner Kathleen Abernathy at 2; *Upper 700 MHz MO&O and FNPRM*, 15 FCC Rcd at 20870-71 para. 61 (establishing presumption that band clearing arrangements that enable public safety services and do not entail specified detriments serve the public interest).

[2] *See, e.g.*, Improving Public Safety Communications in the 800 MHz Band, Consolidating the 900 MHz Industrial/Land Transportation and Business Pool Channels, WT Docket No. 02-55, *Notice of Proposed Rule Making*, FCC 02-81, 2002 WL 407564 (Mar. 15, 2002) (*800 MHz Consolidation NPRM*). The Commission has granted a waiver to Voicestream to enable it to provide priority access service to the National Communications System, and is reviewing Verizon's proposal for priority access service. Voicestream Wireless Corporation, Petition for Waiver of Section 64.402 of the Commission's Rules, WT Docket No. 01-333, *Memorandum Opinion and Order*, FCC 02-84, 2002 WL 493003 (Apr. 3, 2002).

reconsideration of the *Upper 700 MHz Second MO&O* in this proceeding,[3] filed by the National Public Safety Telecommunications Council (NPSTC) and the Public Safety Wireless Network (PSWN).[4] Specifically, after carefully examining the public safety-related arguments, we establish "mandatory coordination zones" near public safety base stations, within which commercial base station operators will be required to coordinate their operations with public safety licensees. This will establish an anticipatory, rather than reactive, process for controlling interference to public safety operators in the Upper 700 MHz band. We also note our interest in exploring measures that would approach the other side of the interference issue—providing for more robust public safety signals rather than simply constraining CMRS signals.

2. The steps we take today supplement the interference protection measures already adopted in the Upper 700 MHz context that are substantially more stringent standards than those adopted for other spectrum bands, including the 800 and 900 MHz bands.[5] For example, the out-of-band emission (OOBE) standards adopted in the *Upper 700 MHz First Report and Order,* and affirmed in the *Upper 700 MHz First MO&O,* reflect the Commission's carefully considered development of interference protection measures that encourage both public safety and commercial uses[6] and reflect the statutory mandate to reallocate spectrum for both types of uses.[7] We determine that other changes to the Part 27 rules for this

[3] Service Rules for the 746-764 and 776-794 MHz Bands, and Revisions to Part 27 of the Commission's Rules, WT Docket No. 99-168, *Second Memorandum Opinion and Order*, 16 FCC Rcd 1239 (2001) (*Upper 700 MHz Second MO&O*).

[4] The NPSTC Petition was submitted March 7 and the PSWN Petition March 8. NPSTC appends to its petition a technical report prepared by the Private Radio Section of the Telecommunications Industry Association (TIA) (the "*TIA Report*"), which was originally submitted to the Public Safety National Coordinating Committee in February, 2001. TIA supplemented this report by an *ex parte* submission filed November 6, 2001 ("*TIA Supplement*" or "*Supplement*"), in response to an oral request by Commission staff in a meeting held August 15, 2001. *See* Letter from Derek R. Khlopin, Director, Law and Public Policy, Telecommunications Industry Association, to Magalie Roman Salas, Secretary, Federal Communications Commission, WT Docket No. 99-168 (Aug. 17, 2001).

Comments were filed by: Com-Net Ericsson Critical Radio Systems, Inc. (Ericsson); Motorola, Inc. (Motorola); Nextel Communications, Inc. (Nextel); and by Private Radio Section of the Wireless Communications Division, Telecommunications Industry Association (TIA). Reply comments were filed by Access Spectrum, L.L.C. In addition, AT&T Wireless (AWS) and Cingular Wireless LLC (Cingular) submitted *ex parte* presentations responding to the November 6, 2001 *TIA Supplement,* and numerous public safety entities submitted letters endorsing the concerns raised by NPSTC and PSWN. These letters did not include additional technical data.

[5] In this context, the term 'Upper 700 MHz band' refers to the spectrum at 746-806 MHz, reallocated by the Commission for public safety and commercial uses pursuant to Section 337 of the Communications Act, 47 U.S.C. § 337. It includes the public safety spectrum blocks (at 764-776 and 794-806 MHz) as well as the commercial spectrum blocks (at 746-764 and 776-794 MHz). *See* In re Reallocation of Television Channels 60-69, the 746-806 MHz Band, ET Docket No. 97-157, *Report and Order*, 12 FCC Rcd 22953 (1997); Service Rules for the 746-764 and 776-794 MHz Bands, and Revisions to Part 27 of the Commission's Rules, WT Docket No. 99-168, Carriage of the Transmissions of Digital Broadcast Stations, CS Docket No. 98-120, Review of the Commission's Rules and Policies Affecting the Conversion to Digital Television, MM Docket No. 00-39, *Memorandum Opinion and Order and Further Notice of Proposed Rulemaking*, 15 FCC Rcd 20845 (2000) (*Upper 700 MHz MO&O and FNPRM*); Service Rules for the 746-764 and 776-794 MHz Bands, and Revisions to Part 27 of the Commission's Rules, WT Docket No. 99-168, Carriage of the Transmissions of Digital Broadcast Stations, CS Docket No. 98-120, Review of the Commission's Rules and Policies Affecting the Conversion to Digital Television, MM Docket No. 00-39, *First Report and Order*, 15 FCC Rcd 476 (2000) (*Upper 700 MHz First Report and Order*).

[6] More stringent OOBE standards are one of the measures being considered in the proceeding focussed on interference problems in the 800 MHz band. *See 800 MHz Consolidation NPRM, supra* n. [2].

[7] The Commission stated in the *700 MHz First Report and Order*:

(continued....)

band are not warranted. The nation faces new and serious challenges, but petitioners have not substantiated their broad assertions that other provisions of these rules will compromise the ability of public safety services to respond to those challenges.

II. BACKGROUND

3. In the *Upper 700 MHz First Report and Order*, the Commission established paired 15 megahertz bands for commercial wireless services, and divided each contiguous 15 megahertz band into five and ten megahertz blocks for auction purposes. Recognizing the statutory directives to protect public safety operations on the re-allocated spectrum from interference while enabling viable commercial development of re-allocated spectrum, the Commission established guard bands between the commercial and public safety blocks. To protect public safety systems from interference caused by out-of-band emissions (OOBE),[8] the service rules establish a 76 + 10log P dB attenuation requirement for Upper 700 MHz commercial base stations, compared to the 43 + 10log P dB requirement previously established for, *e.g.*, the 800 and 900 MHz bands. The substantially more stringent Upper 700 MHz OOBE limits reflect our careful consideration of several entities' submissions in the original proceeding.[9]

4. On reconsideration, in the *Upper 700 MHz First MO&O*, the Commission removed its restriction of base station operations to the lower commercial band. This revision responded to several petitions from prospective commercial operators, who contended that limiting commercial base station operations to the lower commercial band (747-762 MHz) would unnecessarily constrain the flexibility of both licensees considering deployment of traditional paired spectrum technologies and licensees intending to deploy non-paired, time division duplex (TDD) technologies. Motorola opposed these revisions. The Commission found, however, that Motorola had not provided sufficient analysis indicating that operation of commercial base stations in the upper band would cause greater interference to public safety communications.[10] The *First MO&O* also addressed a petition by APCO, which sought an increase in the

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> [W]hile we might set extremely stringent OOBE limits in an effort to afford maximum protection to public safety licensees, we conclude that, as a practical matter, at some point, the incremental benefits to protection of public safety from ever higher OOBE limits would be outweighed by the adverse effects on the commercial usefulness of the spectrum. . . . We conclude, therefore, that we should set OOBE limits that, while achieving the primary goal of protecting public safety, also strike a reasonable balance between protecting public safety and maintaining the commercial viability of this band.

700 MHz First Report and Order, 15 FCC Rcd at 518-519 para. 104. Section 337 of the Communications Act, 47 U.S.C. § 337, reads in pertinent part:

(d) CONDITIONS ON LICENSES. In establishing service rules with respect to licenses granted pursuant to this section, the Commission—

(1) shall establish interference limits at the boundaries of the spectrum block and service area;

(2) shall establish any additional technical restrictions necessary to protect full-service analog television service and digital television service during a transition to digital television service;

. . .

(4) shall establish rules insuring that public safety services licensees using spectrum reallocated pursuant to subsection (a)(1) [providing for 24 MHz of public safety spectrum and 36 MHz of commercial spectrum] shall not be subject to harmful interference from television broadcast licensees.

[8] Every transmitter inherently generates energy outside its assigned frequency, in order to modulate the signal transmitted on the assigned frequency. This out-of-band or "sideband" energy can be a source of interference to receivers operating on nearby spectrum

[9] *Upper 700 MHz First Report and Order*, 15 FCC Rcd at 515520 paras. 98-107.

[10] *Upper 700 MHz Second MO&O*, 16 FCC Rcd at 1242-1244, paras. 7-10.

OOBE standard for base stations from 76 + 10log P to 87 + 10log P. The Commission rejected this request, stating that APCO had not provided information in support of the request.[11]

5. Subsequently, in the *Second MO&O*, the Commission considered a petition for reconsideration filed by Motorola, and affirmed its decision in the *First MO&O* to allow base station transmitters in the upper commercial band.[12]

6. Procedurally, NPSTC recognizes that the additional protective measures it seeks are properly before us only to the extent that NPSTC adduces new events or changed circumstances, facts previously unknown despite due diligence, or facts that the Commission determines should be considered in the public interest.[13] The issues properly before us are thus limited to the Commission's refusal to constrain base station operations to the lower commercial spectrum block—as Motorola previously requested in its petition for reconsideration—and related concerns over base-to-base interference.[14] NPSTC contends, however, that technical exhibits prepared by the Telecommunications Industry Association (TIA) and submitted with its petition (*TIA Report*), provide "new information" to demonstrate that interference to public safety operators in other scenarios will not be sufficiently forestalled by the safeguards adopted for the Upper 700 MHz band. These exhibits purport to establish the need for more stringent out-of-band emission limits, as well as other interference mitigation measures to address potential interference from commercial base stations. These varied proposals are directed at the base-to-mobile as well as the base-to-base scenario, which had been the sole focus of the *Upper 700 MHz Second MO&O*.

7. We have determined that, while the scope of the *Upper 700 MHz Second MO&O* was limited to the rule revisions enabling base stations in the upper band, and the related base-to-base interference scenario, a full consideration of all the arguments raised by NPSTC is in the public interest.[15] We have therefore examined the *TIA Report* exhibits, as well as the *TIA Supplement*, and *ex parte* filings directed at the TIA filing, to identify aspects of our rules that may require revision to fully protect public safety services. Having completed a careful analysis, we are unpersuaded that the TIA filings demonstrate new or changed circumstances or previously undiscovered facts that are sufficient to justify reconsideration of our out-of-band emission limits.

8. As noted, other Commission proceedings are considering public safety needs, including interoperability and priority access service for commercial mobile radio services.[16] Our focus here is limited to ensuring that public safety operations in the Upper 700 MHz band are well protected and, consistent with that statutory goal, sustaining the other mandate of Section 337—a regulatory

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[11] *Upper 700 MHz MO&O and FNPRM*, 15 FCC Rcd at 20855 para. 22.

[12] *Upper 700 MHz Second MO&O*, *supra* n.3.

[13] NPSTC Petition at 6-7.

Section 405 of the Communications Act, 47 U.S.C. § 405, reads in relevant part:

> Reconsideration shall be governed by such general rules as the Commission may establish, except that no evidence other than newly discovered evidence, evidence which has become available only since the original taking of evidence, or evidence which the Commission or designated authority within the Commission believes should have been taken in the original proceeding shall be taken on any reconsideration.

[14] Upper 700 MHz Second MO&O, *supra* n.3.

[15] AWS asserts in its Jan. 17 *ex parte*, at 1-2, that the Nov. 6 *ex parte* submitted by TIA should be rejected because it is "highly repetitive," and notes that supplements to petitions for reconsideration are required by Section 1.106(f) of our Rules to be submitted within the same 30-day time frame provided for petitions. Section 1.429(d) of our Rules, however, provides for supplements by grant of leave, and in this instance we consider staff's request for supplemental materials at the Aug. 15 meeting constitutes such leave.

[16] *See* note 2, *supra*.

environment that enables the practicable development of commercial services.

III. DISCUSSION

9. Based on our analysis of the record, we conclude that the interference measures adopted earlier in this proceeding, which are substantially more stringent than those adopted for other spectrum bands, including the 800 and 900 MHz bands, are sufficient to protect public safety uses of this spectrum. Accordingly, as more fully discussed below, we decline to reconsider our decision to permit operation of commercial base stations in the upper band, and also maintain the existing out-of-band emission limits for commercial base stations. We also reject adoption of NPSTC's proposed "zero tolerance" procedure and TIA's proposed limitation on the signal strength of commercial transmissions. In light of our strong interest in protecting public safety operations from potential interference, however, we adopt a "mandatory coordination zone" surrounding public safety base stations.

A. Limit Commercial Base Station Operations to the Lower Band and Revise OOBE Limits to Better Protect Public Safety Operations from Commercial Base Stations.

10. NPSTC asks that the Commission restore the original Upper 700 MHz band plan's limitation of commercial base stations to the lower band, but the predominant focus of its petition, as well as the *TIA Report* and *TIA Supplement,* is its request for substantially more stringent out-of-band emission limits. Specifically, in its supplement, TIA proposes OOBE limits of 110 + 10log P for the base-to-base interference scenario, and 91 + 10log P for the base-to-mobile interference scenario—each substantially more stringent than the 76 + 10log P limit now applicable in both contexts.[17] AT&T Wireless (AWS) and Cingular, in *ex parte* responses, are highly critical of these proposals, indicating that they would have a severe impact on proposed CMRS systems. These parties are also critical of the NPSTC/TIA proposals' focus on CMRS transmitter characteristics, rather than what they consider to be the technical inadequacies of public safety mobile receivers.[18]

11. **Discussion.** We conclude that commercial base station transmitters should continue to be permitted in the upper 700 MHz band. We also conclude that more stringent OOBE limits are not required to protect public safety operations.

12. *"Upper band" base station transmitters.* The Commission originally established this flexibility to allow operations in the upper band by technologies that employ a single spectrum block for both base and mobile transmitters (*i.e.*, "non-paired" technologies)[19] and to enable paired systems operating in the Upper 700 MHz band to employ the upper band for base transmitters in order to minimize interference from incumbent television licensees operating on TV Channels 56-59.[20] These aspects of flexibility in Upper 700 MHz commercial applications remain desirable, especially if they enable the potential use of spectrally efficient technologies.[21] While the technology ultimately employed

[17] 47 C.F.R. § 27.53(c).

[18] Cingular Jan. 23 *ex parte* at 2; AWS Jan. 17 *ex parte* at 2-3.

[19] *Upper 700 MHz MO&O and FNPRM,* 15 FCC Rcd at 20850 para. 8.

[20] *Id.* at 20849 para. 6 (noting BellSouth proposal to 'flip' the base and mobile band designations).

[21] The Commission has also recently allocated spectrum permitting unlicensed use of such non-paired technologies. *See* Reallocation of the 216-220 MHz, 1390-1395 MHz, 1427-1429 MHz, 1429-1432 MHz, 1432-1435 MHz, 1670-1675 MHz, and 2385-2390 MHz Government Transfer Bands, ET Docket No. 00-221, and Amendment of Parts 2 and 95 of the Commission's Rules to Create a Wireless Medical Telemetry Service, ET Docket No. 99-255, PR Docket No. 92-235, and Amendments to Part 90 of the Commission's Rules Concerning Private Land Mobile Radio Services, WT Docket No. 97-153, *Report and Order and Memorandum Opinion and Order*, 17 FCC Rcd 368 at ___ paras. 62-64 (2002).

on these bands depends on the outcome of the auction, NPSTC has provided no new information that supports foreclosing such commercial flexibility. However, NPSTC has, as described below, persuaded us that we should require more focused, mandatory coordination procedures to anticipate and minimize potential base-to-base interference.

13. *Base-to-base interference.* NPSTC has not, either independently or through the *TIA Report* that it endorses, presented new information supporting stronger measures to address the interference scenario that may arise from commercial base station transmitters in the upper band causing interference to public safety base station receivers—*i.e.*, the "base-to-base" interference scenario. We note that the "base-to-base" interference scenario is not a fundamentally new concept. A "base-to-base" scenario was effectively created by the Commission's initial action in the *Upper 700 MHz First Report and Order* that enabled commercial *fixed* transmitters in the upper band.[22] For purposes of assessing potential interference, therefore, such already-permitted fixed stations operating in the upper band are comparable to the lower-height commercial base stations that TIA indicates will operate in that band.[23]

14. These considerations aside, the *TIA Report* provides a different engineering analysis of the "base-to-base" scenario than did Motorola in its petition for reconsideration,[24] but TIA does not adequately justify the need for the higher OOBE limit that it advocates. Specifically, TIA determines that, assuming an overall transmitter/receiver system gain of 25 dB, the required OOBE limit would have to be 110 +10log P in order to protect a public safety base station from interference from a commercial transmitter situated "0.1 mile" away. Assuming for the moment TIA's estimate for overall system gain, the universal OOBE limit that it proposes would be necessary *only* when commercial and public safety base stations are less than 500 feet from one another. Imposing such a categorical limit on an entire CMRS system is an unnecessarily burdensome approach to the possibility that specific CMRS and public safety base stations might be located in such proximity.[25]

15. In the *Upper 700 MHz Second MO&O* we considered Motorola's similar argument that the base-to-base scenario would create coverage holes as large as 4.8 km and that, as a result, base stations should be excluded from the upper band. We indicated, in denying reconsideration, that, based on our calculations, the coverage holes would not be nearly that large, and that, for this reason and others, any occurrences of alleged base-to-base interference would best be addressed on a case-by-case basis.[26]

16. TIA, in its November *Supplement* discussing the matter of base station operations in the 777-

[22] "If fixed transmissions are employed in the 777-792 MHz band, then interference to public safety operations in the 764-776 MHz band from such transmissions would resemble the type of interference to that band that could occur from base stations transmitting in the 746-764 MHz band (and for which we have adopted a 76 + 10log P standard)." *Upper 700 MHz First Report and Order,* 15 FCC Rcd at 520 para. 106.

[23] *Upper 700 MHz Second MO&O*, 16 FCC Rcd at 1244 para. 11. In Motorola's January 18, 2000 comments, it predicted that fixed stations could cause interference to public safety base stations operating 1.9 km away; yet Motorola did not seek reconsideration of our *First Report and Order* based on this interference scenario. Motorola Comments (Jan. 18, 2000) at 16.

[24] *Upper 700 MHz Second MO&O,*16 FCC Rcd at 1241-1244 paras. 5-12. Motorola predicted the existence of a 4.8 km coverage hole surrounding public safety base stations due to signals from commercial base transmitters. Based on this analysis, Motorola sought elimination of base stations in the upper band. In its analysis, Motorola had assumed a total transmitter/receiver system gain of approximately 18 dB.

[25] "While Cingular does not dispute that a 700 MHz CMRS-like base station site located in close proximity to a PS [public safety] site could produce an isolated case of base-to-base interference, such incidents could be easily addressed on a case-by-case basis, or better yet, avoided altogether by site coordination with PS officials . . . 700 MHz licensees would likely install additional base station transmit filters to address any cases of interference to PS caused by OOBE." Cingular Jan. 23 *ex parte* at 2.

[26] *Upper 700 MHz Second MO&O*, 16 FCC Rcd at 1242-1244 paras. 8-13.

792 MHz band, states that "the previous recommendation for OOBE requirements [the 110 + 10logP OOBE limit] . . . must be adhered to when the CMRS base station is *within a few tenths of a mile* of the public safety base or remote site. *This requirement could be relaxed for CMRS stations that are farther removed.*"[27] TIA thus acknowledges that the rather strict 110 + 10log P limit would not have to be applied to all upper band commercial base stations, but only to those that are in very close geographic proximity to public safety base station receivers. We agree with this analysis, which reflects more carefully drawn distinctions than are reflected in the bare language of the TIA proposal. That is, we agree that when a commercial base station transmitting in the 777-792 MHz band and a public safety base station receiver are in very close physical proximity, there could be a need for certain case-by-case mitigation measures. An approach more focused on the circumstances likely to occasion interference thus is preferable to dealing with potential interference by adopting more stringent categorical limits. We therefore decline to adopt either the universal, across-the-board, 110 + 10log P limit that NPSTC advocates, or the more case-specific 110 + 10log P limit TIA now suggests.

17. While we decline to adopt the categorical approaches suggested by NPSTC or TIA, we recognize the public safety community's concern, based on experience in the 800 MHz band, over the substantially greater burdens of resolving, rather than preventing, instances of problematic interference. We have determined, therefore, that additional, anticipatory protections should be adopted to minimize the possibility for base-to-base interference. We thus establish a "mandatory coordination zone" surrounding Upper 700 MHz public safety base stations, and will require any commercial Upper 700 MHz carrier to coordinate with the public safety community any 777-792 MHz band base station transmitter planned within that zone. If a commercial carrier has already begun operating such a base station within the "mandatory coordination zone" of a future public safety base station receiver, we shall require the carrier to coordinate the operation of its base station with the licensee of any such public safety base station and relocate or modify the CMRS base station, if necessary.

18. We do not expect that the coordination zone will present a significant burden for commercial licensees. Such licensees who may use a non-cellular technology should be able to readily configure their systems to avoid close proximity between their base stations and public safety base stations. CMRS operators who use cellular technology will place many base stations within the area covered by a single public safety base station. Although such configurations will increase the possibility for commercial base stations being close to public safety base stations, the limited size of the coordination zone will enable operators using cellular technologies to configure systems to avoid proximity problems. And while there may be multiple public safety licensees in a given area/market, we anticipate that CMRS operators will be able to relocate or modify the few commercial stations affected with relative ease (*e.g.*, by altering antenna location, antenna height, antenna directivity, *etc.*).[28] This is a preferable approach to burdening the public safety community with "after the fact" resolution of interference problems.

19. To determine the size of the mandatory coordination zone, we employ the parameters that we consider appropriate in predicting interference in the base-to-base scenario. That is, we assume a 10 dB rise in the noise floor will presumptively cause interference to a public safety receiver.[29] This results from an interference level from a commercial station that is 9.54 dB above the noise floor (*i.e.*, –116.46

[27] *TIA Supplement* at 2 (emphasis supplied).

[28] The term 'coordination' in this context is not equivalent to traditional situations in which, for example, the coordination function is limited to the frequency coordination of proposed facilities. Because we expect the coordination requirement to result only in comparatively modest adjustments to the configuration of commercial systems, while the consequences to public safety of base-to-base interference are potentially serious, the rule requiring coordination establishes a presumption that a coordinator's decision not to approve CMRS facilities in the 500-meter zone is correct. *See* Appendix A.

[29] *Id.* at 1242-1243 para. 8.

dBm). We also posit a 5 dB clutter factor as appropriate for signals between a low-height CMRS transmitting antenna and a public safety base receiver's antenna. Employing the 18.15 dBi of transmitter/receiver gain indicated by Motorola (which results from a 12.15 dBi gain for the transmitting antenna, and a 6 dBi receiving system gain), and our 76 + 10log P OOBE limit to determine the permissible out-of-band signal level of –46 dBm out of the transmitter, we predict that interference would not be expected to exist at distances greater than 455 meters. We thus establish a 500-meter distance as the "mandatory coordination zone" to address base-to-base interference in the Upper 700 MHz band.

20. *Base-to-mobile interference.* In the *Upper 700 MHz Second MO&O*, we denied the Motorola petition seeking the removal of commercial base station transmitters from the upper band. Motorola failed to demonstrate that the original base station OOBE limit would be ineffective in dealing with interference caused by upper band commercial base station transmitters to public safety base station receivers operating on nearby frequencies (the "base-to-base" interference scenario). As noted in the discussion above, the *Upper 700 MHz Second MO&O* did not consider the base-to-mobile interference scenario. NPSTC, however, in its petition, now also seeks re-examination of the base-to-mobile OOBE limit, which had been addressed and resolved in the *Upper 700 MHz First MO&O*. Although NPSTC does not specifically ask in its petition that we revise the 76 + 10log P OOBE limits applicable to the base-to-mobile scenario, it endorses the *TIA Report's* recommended rule changes, which include a 91 + 10log P dB limit for this condition.

21. TIA's recommendation regarding the need for stricter base-to-mobile OOBE limits is based entirely on what TIA characterizes as new estimates for site isolation[30] in the base-to-mobile environment. Specifically, TIA indicates that while "historically, a value of 75 dB has consistently been available," the current CMRS system environment consisting of "lower, sectored antennas," results in a site isolation closer to 65 dB.[31] Under the assumption of a maximum, acceptable interference level of –126 dBm,[32] this site isolation figure results in a –61 dBm power level as the allowable signal to be produced by the transmitter so as not to cause interference. This power level is achieved through an OOBE limit of 91 + 10log P.[33]

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[30] Site isolation describes the degree to which a transmitted signal is attenuated (diminished) as it travels towards a receiver. Thus, a greater site isolation value reflects more attenuation between transmitter and receiver, and a correspondingly lower signal level at the receiver. Propagation loss is a key component of the site isolation value. Other components include the various antenna and line gains and losses that exist between a transmitter and receiver. Site isolation is a key component in predicting the amount of out-of-band energy absorbed by a receiver, and thus is a key factor in calculating the degree to which out-of-band energy must be initially reduced at the transmitter so as not to cause interference to a receiver. The OOBE standard reflects the reduction in out-of-band energy at the transmitter.

[31] *TIA report* at 1-3 (unpaginated).

[32] This value is based on the assumption of interference being caused by a 3 dB rise in the noise floor due to an interfering signal; the noise floor itself is considered to be at –126 dBm. However, if, as indicated in the *Upper 700 MHz Second MO&O*, public safety systems will likely be designed to withstand a 10 dB rise in the noise floor (*i.e.*, an increase in the noise floor to –116 dBm), then, for an assumed site isolation of 65 dB, an out-of-band emission limit of only 81 + 10log P would be necessary. *See also* footnote 46.

[33] By way of comparison, in its Dec. 2, 1999, comments in this proceeding, Motorola indicated that 75 dB was the correct site isolation assumption for the base-to-mobile environment based on actual measurements taken at Nextel sites in the Chicago area. Motorola concluded at that time that, based on the assumption that a 1 dB rise in the noise floor constitutes objectionable interference, which results from an interfering signal of –132 dBm, the required OOBE limit for base-to-mobile interference should be 87 + 10log P. The Commission rejected Motorola's request for an 87 + 10log P limit in the *700 MHz First Report and Order*, adopting a 76 + 10log P limit instead. In that proceeding, it indicated that the 76 + 10log P limit would "[achieve] the primary goal of protecting public safety" and would also "strike a reasonable balance between protecting public safety and maintaining the commercial viability of [the 700 MHz] band." *Upper 700 MHz First Report and Order*, 15 FCC Rcd at 518-519 para. 104. In

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22. TIA presents, in the *TIA Report*, figures that represent mathematical simulations of site isolation in today's CMRS environment. Our examination of these figures indicates that the 60-65 dB isolation claimed by TIA occurs at distances of approximately 200 to 500 feet from a transmitting antenna.[34] By comparison, Motorola, in comments filed prior to the initial decisions in the *Upper 700 MHz First Report and Order,* where it identified 75 dB as the appropriate site isolation value for commercial systems, indicated that this value would be expected to occur at distances of between 600 and 1000 feet from an antenna.[35] Site isolation increases generally as a function of distance from the antenna.[36] So, for TIA to attribute a 60-65 dB isolation value to today's CMRS systems in general, based solely on site isolation estimates at fairly close distances seems to underestimate the overall site isolation effect for such systems.[37] If instead we, for example, examine site isolation values for the distances upon which Motorola had based its 75 dB estimate (*i.e.*, the 600 feet to 1000 feet distances), an average 67 dB isolation is produced for the first of TIA's site isolation simulations, and an average 75 dB isolation is produced for the second, resulting in an average 71 dB for the two. Thus, it is not self-evident that site isolation in today's system environment is as low as TIA claims, or is significantly lower than what Motorola had claimed earlier in this proceeding. Short of a decision to protect all public safety systems with measures directed at worst-case conditions (*e.g.*, interference that might occur only at certain close-in distances from an antenna), we find it unnecessary, based on the estimates provided by the *TIA Report,* to revisit the current 76 + 10log P standard.

23. In the *TIA Supplement*, TIA provides additional mathematical simulations, which indicate that at certain distances from transmitting antennas, site isolation values are worse than the 65 dB value TIA claimed earlier. However, TIA's data shows that, at other distances from the antennas, site isolation values can be greater than 65 dB.[38] TIA's simulations indicate that potential interference resulting from low site isolation may only occur within a relatively limited range of distances from transmitting antennas. Under the statutory mandate for these bands, the technical rules necessarily strike a balance to enable both commercial and public safety uses,[39] and we determine that those rules already provide

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NPSTC and TIA's request here for a 91 + 10log P limit, they therefore seek a limit only 4 dB stronger than the 87 + 10log P standard we had rejected in the *Upper 700 MHz First Report and Order.*

[34] In Figure 2 of the *TIA Report*, which shows the site isolation profile for a 60-foot tower utilizing a 105 degree sector antenna with 10.5 dBd directional gain, a 60-65 dB isolation occurs at a distance of approximately 200-500 feet from the antenna. In Figure 3, which shows the site isolation profile for a 25-foot tower with 3 dB panel antennas, a 60-65 dB isolation occurs only at a distance of 200 feet from the antenna.

[35] Motorola's site isolation figure for commercial systems was based on actual field measurements. TIA, while indicating that "field experience" found "measured data" to approximate calculated values, TIA's site isolation estimates were based on mathematical simulations. While actual measurements indicating decreased overall site isolation in today's CMRS environment would have been of some value, we consider the use of both actual measurements and simulations as being acceptable methods for predicting site isolation.

[36] Evidence of this characteristic is provided in Figures 2 and 3 of the *TIA Report.* Both figures depict a steady increase in site isolation as the distance from the antenna increases.

[37] We note that while the *TIA Supplement* is formally responsive to the Commission staff's request at the August 15, 2001 meeting for additional substantiation, the material contained in the TIA *Supplement* consisted of mathematical simulations that were similar to those provided in the *TIA Report.*

[38] TIA describes, in Attachment 2 of the *TIA Supplement*, the site isolation values estimated for various antenna heights, by an omni-directional and a directional transmitting antenna. TIA's presents these values in a graph entitled "Site Isolation (Worst Case) dB," where the very lowest site isolation estimates are depicted for each antenna and antenna height (with no consideration given to clutter loss, a factor that increases site isolation). TIA cites these minimum site isolation values in justifying its request for tighter OOBE requirements. See *TIA Supplement* at 4.

[39] *See* note 7, *supra.*

adequate protection for public safety. TIA's proposed rule change, however, would dramatically compromise the usefulness of the upper 700 MHz commercial spectrum blocks. We conclude, therefore, that the data does not justify the establishment of a stronger, uniform OOBE standard for commercial transmitters.[40]

B. NPSTC 'Zero Tolerance' Proposal.

24. NPSTC recommends that, in addition to more stringent technical limits, the Commission adopt a position of "zero tolerance of interference to public safety." Under the "zero tolerance" approach recommended by NPSTC, the Commission would establish a 3 dB rise in the noise floor within any 6.25 kHz public safety channel as a "measurable benchmark" to identify objectionable interference from CMRS to public safety in the Upper 700 MHz band. NPSTC argues that any commercial license holders in the Upper 700 MHz band who "ultimately cause interference to any public safety system" in the Upper 700 MHz public safety band should "be required to eliminate such interference to the satisfaction of the impacted public safety licensee(s) or cease operation."[41] NPSTC urges this approach based on the experience of its members in the 800 MHz band, where the aggregate effect of co-located transmitters in compliance with Commission regulations have apparently resulted in unacceptable interference. NPSTC contends that a threshold standard for determining objectionable interference is necessary because the Upper 700 MHz service rules do not specify the technologies permitted in that spectrum. A practical interference threshold should thus be defined, says NPSTC, without regard to factors in "theoretical [interference] scenarios" that "are often subject to interpretation."[42]

25. **Discussion**. We decline to revise the Upper 700 MHz service rules to adopt a "zero tolerance" approach as a means for limiting the effects out-of-band interference. As we have indicated, the present Upper 700 MHz band service rules establish a much more stringently protected environment for public safety operations than the service rules applicable to other bands. Furthermore, the "zero tolerance" approach, if adopted, would replace our traditional reliance on actual interference as a basis for mitigation measures with an anticipatory standard that would be both overbroad in concept and imprecise in application.

26. In addressing this issue, AWS contends that if out-of-band emissions were a serious problem, there would be significant CMRS-to-CMRS interference in other bands.[43] Similarly, Cingular

[40] TIA also argues that tighter OOBE limits are necessary due to expected public safety use of digital rather than analog systems. However, TIA's analysis is predicated on the use of a 65 dB site isolation factor. TIA notes that to achieve a Delivered Audio Quality (DAQ) level 3 (*see* "Delivered Audio Quality Measurements on Project 25 Land Mobile Radios" by ITS, November 1998), a desired signal would have to be at a level of -102.3 dBm. TIA indicates that, based on the site isolation value of 65 dB and a 76 + 10log P OOBE limit, an interfering signal would occur at -111 dBm. This would result in a C/N ratio that, according to TIA, would produce DAQ 3 with only 8% reliability. TIA observes, however, that if a 91 + 10log P OOBE limit is employed, which reduces the interfering signal to -126 dBm, DAQ 3 would be reached with 90% reliability. We note, however, that if a more conservative 75 dB figure is used for site isolation, in conjunction with a 76 + 10log P limit, the interference level would be at -121 dBm, which would achieve DAQ 3 with somewhat greater reliability than that deduced by TIA. Because it is based on what we consider to be the unsupported assumption of a 65 dB site isolation figure, TIA's analysis does not, in our view, support the need for a tighter OOBE limit to protect digital systems.

[41] NPSTC Petition at 11. NPSTC refers to "public safety in the 746 MHz band" and we construe this to include public safety operations at 794-806 MHz.

[42] NPSTC Petition at 12.

[43] "AWS believes that these unsophisticated public safety receivers are the primary contributor to interference problems. Furthermore, the occurrence of CMRS-to-CMRS interference is relatively low and easily managed. If CMRS base stations were solely to blame for the problems identified by TIA, one would expect the CMRS industry to be plagued with interference problems." AWS *ex parte* filing at 2.

asserts that in-band emissions and inadequate filters on public safety receivers are the primary sources of interference in the 800 MHz band.[44] We do not reach these contentions that a "zero tolerance" approach is unnecessary because, in our view, the "zero tolerance" approach, as proposed, presents other fundamental difficulties.

27. As a general matter, the "zero tolerance" proposal would require significant further study and refinement before being considered for implementation in any service band. More specifically, we do not believe that a categorical noise floor increase should replace observed interference as a premise for mitigation actions when such an increase may have no relation, in particular instances, to the presence of actual interference. The zero tolerance approach also does not appear to make allowances for noise floor increases that might result from sources other than adjacent channel commercial Upper 700 MHz transmitters. Furthermore, TIA specifies neither the method for measuring a baseline noise floor, nor the timing for establishing or updating the baseline as the Upper 700 MHz band is vacated by incumbent broadcast licensees and increasingly used by new licensees. These are substantial deficiencies in an approach intended to protect public safety entities from interference by anticipatory reliance on noise floor standards. Of equal practical importance, the proposal does not explain how a public safety operator, having measured a presumptively objectionable increase in the noise floor, would identify the commercial operator(s) responsible, and apportion the responsibility for corrective measures between multiple operators. These determinations, and the prospect that such measurements could require commercial licensees to cease operations, better suggest the Commission's established spectrum management and enforcement responsibilities than processes delegable to an interested party or parties.[45]

C. Other Issues.

28. *Intermodulation.* TIA raises in the *TIA Supplement* a type of interference not previously mentioned in this proceeding—intermodulation interference. This type of interference occurs when transmissions on two different frequencies interact to cause interference in a receiver operating on a third frequency. TIA is concerned that such interaction between multiple signals received by a public safety mobile or portable could lead to intermodulation interference. TIA concludes that to "minimize the effects of intermodulation interference, the power levels of CMRS base sites should be [kept] down to approximately –45 dBm at street level within approximately 400 meters of the site in any 6.25 kHz band segment in the 764-776 MHz band."[46] AWS expresses concern that this proposal could have a severe affect on the viability of cellular operations,[47] and our own analysis indicates that commercial base stations would likely have to operate at power levels no greater than 5 watts ERP to comply with the proposed limit.[48] We are concerned that TIA's proposal could dramatically compromise the usefulness of

[44] "The level of interference due to OOBE from CMRS transmitters is significantly less than the level of IBE interference due to the filter design of 800 MHz mobile receivers. Therefore, the TIA/PRS claim that interference at 700 MHz will mimic that at 800 MHz is wrong." Cingular *ex parte* filing at 2.

[45] Although we have not considered whether such an approach comports with the statutory mandates to enable commercial services as well as protect public safety services, such a method for protecting public safety operations may deserve Commission consideration if more thoroughly developed. In any case, it would represent a substantial departure from our current approach to interference protection in various contexts. Commission review of specific technical provisions adopted in an individual service rule proceeding is not a context well suited to consider such broad changes in interference protection methods.

[46] *TIA Supplement* at 6.

[47] AWS states that this proposal "would effectively eliminate the use of low-height cell towers, and cripple microcells and in-building distribution systems." AWS January 17 *ex parte* at 3.

[48] Specifically, we find that, in order to satisfy the signal limitation proposed by TIA, a commercial licensee using a half-wave dipole antenna and operating at heights under 90 meters above ground would be limited to a power level of approximately 2.5 watts ERP; and a licensee using a more directional antenna (*i.e.*, one with a gain of 12.6 dBi) (continued....)

the Upper 700 MHz commercial spectrum blocks, and TIA has not provided substantiation for its intermodulation concern that would justify such a drastic unbalancing of the original structure of the band.[49]

29. *Stronger public safety signals.* In general, potential interference issues may be addressed by diminishing the strength of the interfering signal, increasing the strength of the desired signal, or both. We recognize this in our Notice of Proposed Rule Making that seeks to resolve interference issues in the 800 MHz band.[50] Similarly, in the Upper 700 MHz band, if the strength of public safety signals were increased at the edge of a public safety system's coverage area, this increase would provide additional assurance against interference from both intermodulation effects and out-of-band emissions.[51]

30. As discussed above, we are not persuaded that revisions to the service rules for Upper 700 MHz band are justified by the petitioners' submissions, aside from the mandatory coordination zone. We recognize, however, that stronger public safety signals would provide a further increment of protection against interference from out-of-band emissions and intermodulation effects. Should the public safety community wish to consider an increase in the signal levels employed by public safety systems in the Upper 700 MHz band, we would be receptive to considering such a proposal.

IV. CONCLUSION

31. In the present context, while we have thoroughly considered the factual materials submitted by NPSTC and TIA, we are not persuaded that the already-stringent service rules adopted in the Upper 700 MHz band specifically to protect public safety operators should be substantially revised as they request. Rather, we determine that the service rules adopted for the Upper 700 MHz band are generally sufficient to protect public safety operations. We therefore decline to revise the service rules allowing base station transmitters in the upper commercial spectrum block, or the rules governing out-of-band emission limits. We also decline to adopt the proposed "zero tolerance" methodology for addressing potential interference to public safety operators. This would replace our traditional reliance on actual interference as a basis for mitigation measures with an anticipatory, surrogate criteria that would be both overbroad in concept and imprecise in application.

(...continued from previous page)
and operating at heights under 60 meters above ground would be limited to a power level of approximately 5 watts ERP. We note that TIA, in its discussion of intermodulation, had indicated 10 watts as the apparent, typical power output of a CMRS transmitter into a directional antenna. For the directional antennas described by TIA as being used by CMRS systems, this would result in an ERP in excess of 100 W. Furthermore, TIA has indicated that CMRS antennas are now operating at relatively low heights, *i.e.*, below 100 feet (30 meters) above ground. Thus, requiring base stations to operate at power levels of 5 watts ERP or less in order to meet TIA's proposed signal limit would place a significant restriction on commercial operators.

[49] We are considering the causes of intermodulation interference, and approaches to its reduction, in our proceeding on public safety communications in the 800 MHz band. Improving Public Safety Communications in the 800 MHz Band, Consolidating the 900 MHz Industrial/Land Transportation and Business Pool Channels, WT Docket No. 02-55, *Notice of Proposed Rulemaking*, 17 FCC Rcd 4873 at ___ paras 27, 74.

[50] *800 MHz Consolidation NPRM*, *supra* n. 2 at para. 76.

[51] If, for example, the signal at the edge of a public safety service area were to be increased from its expected, current level of 40 dBu to 50 dBu, our adopted 76 + 10log P OOBE limit would be more than adequate to address out-of-band interference, even under the lesser site isolation conditions asserted by TIA. That is, a 50 dBu signal would produce a desired signal of -82.5 dBm, which is 43.5 dB above the –126 dBm receiver noise floor. To provide the 23.7 dB faded C/N ratio indicated by TIA to be needed for DAQ 3 audio quality, an interfering signal could be as high as -106.2 dBm -- and our 76 + 10log P OOBE limit would enable that signal level, even if only 60 dB of site isolation were present. See n. 39, *supra*.

32. We are persuaded, however, that additional, carefully focused procedures are desirable to address the concerns raised by locating CMRS and public safety base stations in close spectral and geographic proximity. We have therefore established a mandatory coordination zone around public safety base stations, to provide additional assurance of protection against possible base-to-base station interference in the Upper 700 MHz band.

33. Finally, we indicate our interest in exploring proposals to increase public safety signal strength levels in the Upper 700 MHz band. An increase in public safety signal strength has the capacity to address base-to-mobile intermodulation problems, as well as provide an additional measure of protection from out-of-band emissions at the edges of public safety base stations' coverage areas.

V. ADMINISTRATIVE MATTERS

34. Section 213 of the Consolidated Appropriations Act, 2000 states that the Regulatory Flexibility Act (as well as certain provisions of the Contract With America Advancement Act of 1996 and the Paperwork Reduction Act) shall not apply to the rules and competitive bidding procedures governing the frequencies in the 746-806 MHz band (currently used for television broadcasts on channels 60-69).[52] Because the rule adopted in this document relates only to assignments of those frequencies, no Final Regulatory Flexibility Analysis or Paperwork Reduction Analysis is necessary.

VI. ORDERING CLAUSES

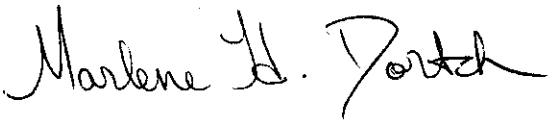
35. Authority. This action is taken pursuant to Sections 1, 4(i), 7, 10, 201, 202, 208, 214, 301, 303, 307, 308, 309(j), 309(k), 310, 311, 315, 316, 317, 319, 324, 331, 332, 336, 337 and 614 of the Communications Act of 1934, as amended, 47 U.S.C. §§ 151, 154(i), 157, 160, 201, 202, 208, 214, 301, 303, 307, 308, 309(j), 309(k), 310, 311, 315, 316, 317, 319, 324, 331, 332, 336, 337, and 534, and the Consolidated Appropriations Act, 2000, Pub. Law 106-113, 113 Stat. 1501, Section 213.

[52] In particular, this exemption extends to the requirements imposed by Chapter 6 of Title 5, United States Code, Section 3 of the Small Business Act (15 U.S.C. § 632), and Sections 3507 and 3512 of Title 44, United States Code. Consolidated Appropriations Act, 2000. Pub. L. No. 106-113, 113 Stat. 2502, 47 U.S.C.A. § 337 note at Sec. 213 (a)(4)(A)-(B).

36. IT IS ORDERED that Part 27 of the Commission's Rules IS REVISED as set forth in Appendix A, and that, in accordance with Section 213 of the Consolidated Appropriations Act, 2000, Pub. Law 106-113, 113 Stat. 1501 (1999), these Rules shall be effective immediately upon publication in the Federal Register.

37. IT IS FURTHER ORDERED that the Petitions for Reconsideration filed by the National Public Safety Telecommunications Council and the Public Safety Wireless Network ARE DENIED as indicated above.

FEDERAL COMMUNICATIONS COMMISSION



Marlene H. Dortch
Secretary

Appendix A: Mandatory Coordination Zone

For the reasons discussed in the accompanying Order part 27 of Title 47 of the Code of Federal Regulations is amended as follows:

1. The table of contents for part 27 is amended by adding a Sec. 27.303 to subpart E as follows:

* * * * *

Subpart E—Application, Licensing, and Processing Rules for WCS

Sec.
27.303 Upper 700 MHz Commercial and Public Safety Coordination Zone

* * * * *

2. Section 27.303 is added to subpart E as follows:

* * * * *

§ 27.303 Upper 700 MHz Commercial and Public Safety Coordination Zone

(a) General. CMRS operators are required, prior to commencing operations of fixed or base station transmitters operating on the 777-792 MHz band that are located within 500 meters of existing or planned public safety base station receivers, to submit a description of their proposed facility to a Commission-approved public safety coordinator.
(1) The description must include, at a minimum—
(i) The frequency or frequencies on which the facility will operate;
(ii) Antenna location and height;
(iii) Type of emission;
(iv) Effective radiated power;
(v) A description of the area served and the operator's name.
(2) It is the CMRS operator's responsibility to determine whether referral is required for stations constructed in its area of license. Public safety base stations are considered 'planned' when public safety operators have notified, or initiated coordination with, a Commission-approved public safety coordinator.

(b) CMRS operators must wait at least 10 business days after submission of the required description before commencing operations on the referenced facility, or implementing modifications to an existing facility.

(c) The potential for harmful interference between the CMRS and public safety facilities will be evaluated by the public safety coordinator.
(1) With regard to existing public safety facilities, the coordinator's determination to disapprove a proposed CMRS facility (or modification) to be located within 500 meters of the public safety facilities will be presumed correct, but the CMRS operator may seek Commission review of such determinations. Pending Commission review, the CMRS operator will not activate the facility or implement proposed modifications.
(2) With regard to proposed public safety facilities, the coordinator's determination to disapprove a proposed CMRS facility (or modification) to be located within 500 meters of the public safety facilities will be presumed correct, but the CMRS operator may seek Commission review and, pending completion of review, operate the facility during construction of the public safety facilities. If coordination or

Commission review has not been completed when the public safety facilities are ready to operate, the CMRS operator must cease operations pending completion of coordination or Commission review. Such interim operation of the CMRS facility within the coordination zone (or implementation of modifications) will not be relied on by the Commission in its subsequent review and determination of measures necessary to control interference, including relocation or modification of the CMRS facility.

(d) If, in the event of harmful interference between facilities located within 500 meters proximity, the parties are unable, with the involvement of the coordinator, to resolve the problem by mutually satisfactory arrangements, the Commission may impose restrictions on the operations of any of the parties involved.

* * * * *