

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

In the Matter of	)	
	)	
Amendment of Part 90 of the	)	WT Docket No. 11-69
Commission's Rules to Permit	)	
Terrestrial Trunked Radio (TETRA)	)	
Technology	)	
	)	
Request by the TETRA Association for	)	ET Docket No. 09-234
Waiver of Sections 90.209, 90.210 and	)	
2.1043 of the Commission's Rules	)	

**REPORT AND ORDER**

**Adopted: September 19, 2012**

**Released: September 21, 2012**

By the Commission:

**I. INTRODUCTION**

1. In this *Report and Order (R&O)*, we modify our rules to permit the certification and use of Terrestrial Trunked Radio (TETRA) equipment under Part 90 of our Rules.<sup>1</sup> TETRA is a spectrally efficient digital technology with the potential to provide valuable benefits to land mobile radio users, such as higher security and lower latency than comparable technologies. It does not, however, conform to all of our current Part 90 technical rules. In the *Notice of Proposed Rule Making and Order (NPRM)* in this proceeding, the Commission proposed to amend Part 90 to accommodate TETRA technology.<sup>2</sup> We conclude that modifying the Part 90 rules to permit the certification and use of TETRA equipment in two bands – the 450-470 MHz portion of the UHF band (421-512 MHz) and Business/Industrial Land Transportation 800 MHz band channels (809-824/854-869 MHz) that are not in the National Public Safety Planning Advisory Committee (NPSPAC) portion of the band – will give private land mobile radio (PLMR) licensees additional equipment alternatives without increasing the potential for interference or other adverse effects on other licensees.

**II. BACKGROUND**

2. Subpart I of Part 90 of our rules sets forth the general technical requirements for use of frequencies and equipment in the PLMR services.<sup>3</sup> For devices operating with 25 kilohertz channel spacing, Section 90.209(b)(5) of our rules limits the authorized bandwidth to 20 kilohertz, and Section 90.210 of our rules specifies particular emission masks.<sup>4</sup> The purpose of these technical standards is to limit wireless systems' interference potential.<sup>5</sup>

<sup>1</sup> 47 C.F.R. Part 90.

<sup>2</sup> See Amendment of Part 90 of the Commission's Rules to Permit Terrestrial Trunked Radio (TETRA) Technology, *Notice of Proposed Rule Making and Order*, WT Docket 11-69, 26 FCC Rcd 6503 (2011) (*NPRM*).

<sup>3</sup> See 47 C.F.R. § 90.201. Such requirements include standards for acceptability of equipment, frequency tolerance, modulation, emissions, power, and bandwidths.

<sup>4</sup> See 47 C.F.R. §§ 90.209(b)(5), 90.210. The emission mask is the technical specification that limits the distribution of power of a radio transmitter as a function of frequency. The Development of Operational, Technical (continued....)

3. TETRA is a digital, trunked radio technology that operates with Time Division Multiple Access in four time-slot channels within a 25 kilohertz channel bandwidth.<sup>6</sup> The TETRA standard, which was developed by the European Technical Standards Institute (ETSI) and is used around the world,<sup>7</sup> does not set occupied bandwidth limits; rather, it sets standards for adjacent channel power (ACP) and for unwanted emissions at different frequency offsets. Consequently, TETRA equipment exceeds the Part 90 occupied bandwidth limits and emission masks: it operates with a bandwidth of up to 22 kilohertz, and excursions of up to five decibels from Part 90 emission masks B, C, and G.<sup>8</sup> In 2009, the TETRA Association requested waivers of the Part 90 occupied bandwidth limits and emission masks in order to permit implementation of TETRA technology in the United States.<sup>9</sup>

4. In 2011, the Commission released the *NPRM* in this proceeding. In the *NPRM*, the Commission granted the TETRA Association's waiver request in part pending the outcome of the rulemaking proceeding.<sup>10</sup> The Commission noted that the technical information submitted by the TETRA

(Continued from previous page)

and Spectrum Requirements for Meeting Federal, State and Local Public Safety Agency Communication Requirements Through the Year 2010, *First Report and Order and Third Notice of Proposed Rulemaking*, WT Docket No. 96-86, 14 FCC Rcd 152, 213 n.337 (1998). The emission mask is an important technical parameter that affects the efficient use of a frequency band by limiting emissions from one channel into adjacent channels. 1998 Biennial Regulatory Review - 47 C.F.R. Part 90 - Private Land Mobile Radio Services, *Report and Order and Further Notice of Proposed Rule Making*, WT Docket No. 98-182, 15 FCC Rcd 16673, 16689 ¶ 33 (2000).

<sup>5</sup> See Biennial Regulatory Review – Amendment of Parts 1, 22, 24, 27, and 90 to Streamline and Harmonize Various Rules Affecting Wireless Radio Services, *Report and Order and Notice of Proposed Rulemaking*, WT Docket No. 03-264, 20 FCC Rcd 13900, 13923 n.168 (2005).

<sup>6</sup> By accommodating four voice paths in a 25 kHz channel, TETRA achieves 6.25 kHz per voice path efficiency, thus meeting, indeed exceeding, the 12.5 kHz per voice path “narrowbanding” efficiency standard applicable to the 150-174 MHz and 450-512 MHz bands effective as of January 1, 2013 and codified at 47 C.F.R § 90.209(b). Note that the Wireless Telecommunications Bureau, Public Safety and Homeland Security Bureau, and Office of Engineering and Technology have waived the narrowbanding deadline for stations in the 470-512 MHz band in light of recent legislation directing the Commission to reallocate spectrum in that band. See Implementation of Sections 309(j) and 337 of the Communications Act as Amended; Promotion of Spectrum Efficient Technologies on Certain Part 90 Frequencies, *Order*, WT Docket No. 99-87, 27 FCC Rcd 4213 (WTB/PSHSB/OET 2012).

<sup>7</sup> We note, for example, that Industry Canada recently amended its rules to permit implementation of TETRA technology by establishing requirements for equipment with a 25 kilohertz channel spacing and an occupied bandwidth greater than 20 kilohertz operating in the frequency bands 406.1-430 MHz, 450-470 MHz, 806-821/851-866 MHz, and 821-824/866-869 MHz. See Industry Canada, Spectrum Management and Telecommunications, Radio Standards Specification RSS-119, Issue 11, Radio Transmitters and Receivers Operating in the Land Mobile and Fixed Services in the Frequency Range 27.41-960 MHz, June 2011.

<sup>8</sup> See *NPRM*, 26 FCC Rcd at 6506-07 ¶¶ 10-11.

<sup>9</sup> See Request for Waiver of Sections 90.209, 90.210 and 2.1043 (filed November 20, 2009) (Request). The Commission's Office of Engineering and Technology sought comment on the waiver request. See Office of Engineering and Technology Declares the TETRA Association's Request for Waiver of Parts [sic] 90.209, 90.210 and 2.1043 to Be a “Permit-But-Disclose” Proceeding for *Ex Parte* Purposes and Requests Comment, *Public Notice*, ET Docket No. 09-234, 24 FCC Rcd 14718 (OET 2009). The TETRA Association is now known as the TETRA + Critical Communications Association. See Letter from Henry Goldberg, counsel for the TETRA + Critical Communications Association, to Marlene H. Dortch, Federal Communications Commission (August 1, 2012). It is composed of 150 organizations from 37 countries and promotes the use of TETRA technology around the world. Request at 2.

<sup>10</sup> See *NPRM*, 26 FCC Rcd at 6509-12 ¶¶ 16-24. In response to requests for clarification of the scope of the waiver, the Wireless Telecommunications Bureau, Public Safety and Homeland Security Bureau, and Office of Engineering and Technology released an *Order on Clarification*. See Amendment of Part 90 of the Commission's Rules to (continued....)

Association suggested that TETRA equipment provides at least as much interference protection as other available technologies.<sup>11</sup> Consequently, the Commission proposed to amend the rules to permit the certification and use of TETRA equipment in Part 90 UHF and 800 MHz bands. Specifically, it proposed to permit equipment that does not meet the Part 90 occupied bandwidth limits and emission masks if the equipment meets the ACP limit set forth in the ETSI standard.<sup>12</sup> The Commission also asked whether any other rule changes were necessary, and sought comment on a number of related issues, including whether TETRA technology should be limited to or excluded from particular bands or services.<sup>13</sup> In particular, the Commission sought comment on whether the use of TETRA technology should be permitted on Public Safety Pool frequencies, and how this would affect public safety interoperability.<sup>14</sup> In response to the concern expressed in comments to the waiver request that TETRA technology uses a low-elevation, cellular-type architecture that could cause near-far interference to incumbent high-site systems, the Commission sought comment on whether any restriction should be placed on the use of TETRA technology with such architecture.<sup>15</sup> Thirteen comments to the *NPRM* and three reply comments were filed.<sup>16</sup>

(Continued from previous page)

Permit Terrestrial Trunked Radio (TETRA) Technology, *Order on Clarification*, WT Docket 11-69, 26 FCC Rcd 13360 (WTB/PSHSB/OET 2011). Enterprise Wireless Alliance (EWA) then requested further clarification. See Request for Further Clarification Filed by Enterprise Wireless Alliance (filed October 26, 2011). Because the waiver was granted pending the outcome of the rulemaking proceeding, and the instant *Report and Order* resolves the rulemaking proceeding, we dismiss EWA's request for further clarification of the waiver as moot.

<sup>11</sup> See *NPRM*, 26 FCC Rcd at 6506-07 ¶¶ 9-11. The Commission noted that the concerns of some commenters that the deployment of TETRA technology could cause harmful interference to existing land mobile systems were generally unsupported by any technical analysis. *Id.* at 6506 ¶ 9.

<sup>12</sup> *Id.* at 6506-07 ¶¶ 10-11, 6514-16.

<sup>13</sup> *Id.* at 6508 ¶ 13.

<sup>14</sup> *Id.* at 6505 ¶ 8, 6508 ¶¶ 14-15. Part 90 defines interoperability as "an essential communication link within public safety and public service wireless communications systems which permits units from two or more different entities to interact with one another and to exchange information according to a prescribed method in order to achieve predictable results." See 47 C.F.R. § 90.7.

<sup>15</sup> See *NPRM*, 26 FCC Rcd at 6507-08 ¶ 12. The Commission has described near-far interference as follows:

Cellular systems, by design, are composed of large numbers of base stations within a relatively small geographic area. Public safety systems, on the other hand, are typically composed of high-powered base stations operating at a few sites that provide coverage to a large geographic area. This mix of network architectures often results in an interference scenario--sometimes referred to as "near-far"--that arises when a cellular system operates in close proximity to a public safety system. In the near-far scenario, interference occurs where a public safety mobile/portable unit receives a stronger signal from a nearby, adjacent channel commercial base station rather than from the desired, distant public safety transmitter.

See Service Rules for the 698-746, 747-762 and 777-792 MHz Bands, *Second Report and Order*, WT Docket No. 06-150, 22 FCC Rcd 15289, 15386 n.606 (2007).

<sup>16</sup> Comments were received from 4765 Oak Hill Partnership (Partnership), the Association of Public-Safety Communications Officials-International, Inc. (APCO), Cassidian Communications, Inc. (Cassidian), EF Johnson Technologies, Inc. (EF Johnson), EWA, Harris Corporation (Harris), Motorola Solutions, Inc. (Motorola), the National Public Safety Telecommunications Council (NPSTC), Nielson Communications, PowerTrunk, Inc. (PowerTrunk), the Project 25 Technology Interest Group (PTIG), the Telecommunications Industry Association (TIA), and the TETRA Association. Reply comments were filed by Motorola, TIA, and the TETRA Association. Because the Partnership's filing does not meet the signature and verification requirements in Section 1.52 of the Commission's Rules, 47 C.F.R. § 1.52, we will treat it as an informal *ex parte* comment pursuant to Section 1.419(b) of the Commission's Rules, 47 C.F.R. § 1.419(b).

### III. DISCUSSION

5. The record is clear that TETRA is a valuable option for licensees requiring a spectrally efficient wireless solution and we conclude that it imparts minimal interference potential to the RF spectrum considered herein, *i.e.*, the UHF band and the non-NPSPAC portion of the 800 MHz band. The benefits to PLMR users of permitting TETRA equipment under Part 90 in terms of equipment cost and capability exceed the asserted costs to other users, which we find to be largely speculative. Therefore, as discussed below, we modify our rules to permit the use of TETRA technology in the 450-470 MHz and 809-824/854-869 MHz bands.

6. *Interference potential.* Some commenters oppose the operation of TETRA equipment due to potential interference to other users,<sup>17</sup> but only Motorola Solutions, Inc. (Motorola) attempted to provide a technical justification for its concerns. The TETRA Association submitted with its waiver request a TSB-88 analysis<sup>18</sup> comparing the ACP ratio (ACPR) of a TETRA signal with typical victim receiver characteristics.<sup>19</sup> The Commission concluded that the analysis, which indicates that TETRA has a lower interference potential to adjacent channel users than currently used analog FM and Project 25 Phase I transmitters,<sup>20</sup> was useful in determining the relative interference potential of TETRA devices.<sup>21</sup> It rejected Motorola's suggestion that ACPR is not an effective method of evaluating potential interference, noting that ACPR is a widely accepted test parameter for characterizing interference potential and is utilized in the Commission's Rules in lieu of emission masks to determine interference potential in certain public safety bands.<sup>22</sup>

7. In the TETRA Association's analysis, the center frequency of a 25-kilohertz TETRA signal is offset 18.75 kilohertz from the center frequency of a 12.5-kilohertz analog FM signal.<sup>23</sup> Motorola now asserts that the spacing to the first adjacent 12.5-kilohertz bandwidth channel is 12.5 kilohertz rather than 18.75 kilohertz, and that analyzing the signals at that separation reveals a high potential for interference.<sup>24</sup> We disagree. Because TETRA is a trunked technology and is not capable of monitoring a frequency prior to transmitting, TETRA equipment is not suitable for use on shared channels,<sup>25</sup> and may be deployed only

<sup>17</sup> See, e.g., PTIG comments at 2-3; TIA comments at 8.

<sup>18</sup> See Telecommunications Industry Association/Electronics Industry Association Telecommunications Systems Bulletin 88 (TSB-88), *Wireline Communications System -- Performance in Noise and Interference-Limited Situations -- Recommended Methods for Technology-Independent Modeling, Simulation, and Verification* (January 1998). TSB-88 is a technical bulletin describing a methodology for predicting coverage and interference for private land mobile radio stations operating below 512 MHz. In general, the TSB-88 methodology is used by frequency coordinators and others to determine channel availability based on predicted contours, *i.e.*, TSB-88 is used to ensure that the predicted interference contour of a proposed station does not impinge on the service contours of other stations. National Science and Technology Network, Inc., *Memorandum Opinion and Order*, 25 FCC Rcd 549, 549 n.4 (2010).

<sup>19</sup> See Request, Attachment A. ACPR is the ratio of the average power in the adjacent frequency channel to the average power in the transmitted frequency channel.

<sup>20</sup> See *id.* at 7.

<sup>21</sup> See *NPRM*, 26 FCC Rcd at 6506 ¶ 9.

<sup>22</sup> See *id.* at 6506 n.26 (citing 47 C.F.R §§ 27.53(e), 90.543(a)).

<sup>23</sup> See Request, Attachment A at 3.

<sup>24</sup> See Motorola comments at 6.

<sup>25</sup> See EWA comments at 5; TETRA Association reply comments at 12. Consequently, we agree with Motorola that TETRA networks operating below 512 MHz should be considered centralized trunked systems with the base stations licensed with a station class code of FB8. See Motorola comments at 14. This does not require any modification of (continued....)

by licensees that are exempt from any monitoring requirements.<sup>26</sup> For a 25-kilohertz channel not to overlap a 12.5-kilohertz channel, the center frequencies must be separated by at least 18.75 kilohertz.<sup>27</sup> Consequently, unless the stations are geographically separated, a TETRA station cannot operate on a center frequency separated by 12.5 kilohertz from that of a 12.5 kilohertz station because of the spectral overlap.<sup>28</sup> In light of this constraint, we agree with the methodology utilized by the TETRA Association and do not believe it was necessary to perform this analysis at frequency offsets less than 18.75 kilohertz. We thus conclude that the TETRA Association's technical analysis accurately represents TETRA systems' interference potential.<sup>29</sup> Consequently, consistent with the Commission's analysis in the *NPRM*, we find that TETRA offers adjacent channel protection that is often better than other narrowband systems currently operating in the LMR bands.<sup>30</sup>

8. *Public Safety Pool.* Several commenters oppose the use of TETRA technology on Public Safety Pool frequencies, primarily because TETRA is not interoperable with Phase I Project 25 technology, which many Public Safety Pool licensees are adopting.<sup>31</sup> They argue that implementation of TETRA technology in the Public Safety Pool would therefore undermine public safety interoperability, because interoperability could be achieved only through the use of dual-mode devices or other means that would significantly increase equipment complexity and costs.<sup>32</sup>

9. We agree that interoperability is critical for public safety applications<sup>33</sup> and are sensitive to the concerns that parties have raised about the interference potential of TETRA on public safety systems. In light of these concerns, we do not believe the record supports allowing TETRA on the 800 MHz public safety NPSPAC channels.<sup>34</sup> The NPSPAC 25 kHz channels are spaced only 12.5 kilohertz apart and are

(Continued from previous page)

or addition to the technical rules adopted herein. *See* Wireless Telecommunications Bureau Establishes a New Station Class Code in Connection with Licensing Trunked Radio Systems Operating Between 150-512 MHz, *Public Notice*, 16 FCC Rcd 7515 (WTB 2001).

<sup>26</sup> Part 90 licensees operating on frequencies below 512 MHz must monitor the transmitting frequency for communications in progress and avoid transmitting if a signal from another system is present, unless the licensee has exclusive use of the transmitting frequency. *See* 47 C.F.R. §§ 90.187(b), 90.403(e). Co-channel 800 MHz band stations generally have a 70-mile minimum distance separation. *See* 47 C.F.R. § 90.621(b).

<sup>27</sup> That is, half of the 25-kilohertz channel (12.5 kilohertz) plus half of the 12.5-kilohertz channel (6.25 kilohertz) equals 18.75 kilohertz.

<sup>28</sup> *See* 47 C.F.R. § 90.187(b)(2)(ii)(A) (requiring contour overlap protection to any incumbent operating within 15 kilohertz of the center frequency of an applicant seeking exclusivity on a 25 kilohertz channel).

<sup>29</sup> According to Motorola's analysis utilizing typical receiver types used in the band, an ACPR in the 60 to 70 dB range is not realized until spacing is beyond 15 kHz. This is similar to the results of the TETRA Association analysis. *See* Request, Attachment A at 7; *see also* Cassidian comments at 4-5.

<sup>30</sup> *See NPRM*, 26 FCC Rcd at 6506 ¶ 9.

<sup>31</sup> *See* APCO comments at 2; EF Johnson comments at 2; Harris comments at 2-3; Motorola comments at 16-18; NPSTC comments at 5; PTIG comments at 3-6.

<sup>32</sup> *See* APCO comments at 2-3; EF Johnson comments at 3; PTIG comments at 5; TIA comments at 7. Other commenters suggest that public safety interoperability with TETRA equipment is reasonably achievable. *See* Cassidian comments at 9-12; TETRA Association comments at 5-6.

<sup>33</sup> The TETRA Association has assured the Commission that it does not intend to supplant Project 25 as the choice for public safety interoperability and will not promote TETRA to the public safety sector. TETRA Association reply comments at 13.

<sup>34</sup> We address the issue of so-called "reduced power" or "low power" TETRA separately at paragraph 13, *infra*.

therefore more susceptible to adjacent channel interference than the channels in the rest of the 800 MHz band, which are spaced 25 kilohertz apart.

10. We also will not allow TETRA technology to operate in 700 MHz public safety spectrum.<sup>35</sup> TETRA technology is not suitable for use in the 700 MHz public safety broadband spectrum because both the Commission and the recent legislation passed by Congress have specified Long Term Evolution (LTE) as the required broadband technology for that segment.<sup>36</sup> With respect to the 700 MHz narrowband spectrum, the Commission's rules require that 700 MHz narrowband radios use Project 25 Phase I technology on the 700 MHz narrowband interoperability channels, and there is no indication in the record that TETRA equipment would conform to this standard. In addition, we note that the petitioner did not request that TETRA operation be authorized in the 700 MHz band. Accordingly, we do not consider the 700 MHz narrowband spectrum to be a candidate for TETRA operation.

11. *System architecture.* Some commenters are concerned that deployment of TETRA technology in low-elevation, cellular-type architecture could cause near-far interference to incumbent high-site systems,<sup>37</sup> but these commenters do not explain why the use of TETRA technology in a cellular-type system is any more likely to cause such interference than the use of other technologies. In the 800 MHz band where high-density cellular networks are an interference concern, rules are currently in place to help prevent such interference to public safety systems.<sup>38</sup> We conclude that the existing rules for controlling near-far interference need not be supplemented for a particular technology, so we decline the suggestion to classify every TETRA system as a cellular-type system regardless of the actual system architecture.<sup>39</sup> However, should TETRA systems evolve to such high-density architecture, with consequent interference to public safety and other "high site" systems, the Commission will consider what rule changes are needed to provide a degree of interference protection comparable to what is now afforded to such high-site systems in the 800 MHz band.

12. *Technical rules.* The *NPRM* proposed to permit equipment to comply with the ACP limits in the TETRA standard for emissions close to the carrier, or up to 75 kilohertz offset from the carrier.<sup>40</sup> At offset frequencies greater than 75 kilohertz, the Commission proposed that the emission limits default to the standard limit for Part 90 devices,  $43 + 10\log(P)$ .<sup>41</sup> Most commenters addressing the issue support the proposed ACP limits.<sup>42</sup> We do not find it necessary, as proposed by Motorola, to incorporate all of the

<sup>35</sup> See *NPRM*, 26 FCC Rcd at 6508 ¶ 15.

<sup>36</sup> Middle Class Tax Relief and Job Creation Act of 2012, Pub. L. No. 112-96, 126 Stat. 156, § 6203(c)(2) (2012); see also Recommendations of the Technical Advisory Board for First Responder Interoperability, *Order of Transmittal*, PS Docket No. 12-74, 27 FCC Rcd 7733 (2012).

<sup>37</sup> See APCO comments at 3; EF Johnson comments at 2; NPSTC comments at 6; PTIG comments at 3. Commenters disagree with respect to whether TETRA equipment typically is employed in low-elevation, cellular-type architecture. Compare, e.g., EF Johnson comments at 2 with, e.g., Cassidian comments at 8-9.

<sup>38</sup> See 47 C.F.R. § 90.614.

<sup>39</sup> See Harris comments at 2; Motorola reply comments at 6.

<sup>40</sup> See *NPRM*, 26 FCC Rcd at 6507 ¶ 11.

<sup>41</sup> *Id.*

<sup>42</sup> See Cassidian comments at 6; Harris comments at 2; PowerTrunk comments at 1. We agree with PowerTrunk that the measurement bandwidth for determining ACP should be 18 kilohertz, to conform to the ETSI TETRA standard, rather than 25 kilohertz as proposed in the *NPRM*, see *NPRM*, 26 FCC Rcd at 6515, and have revised new Section 90.221 accordingly. See Appendix A, *infra*. We decline the suggestion that we undertake to amend Part 90 to provide alternate ACP limits for all Part 90 bands. See Partnership comments at 4-5. The current proposal from the TETRA Association is the only one before us at this time. We do not believe it is practical to develop rules for technologies that do not yet exist.

emission limits in the TETRA standard into the rules.<sup>43</sup> While we will require the TETRA limits for emissions close to the carrier, we retain the current limits for emissions more than 75 kilohertz from the carrier to reflect the current rule requirements, which have successfully limited interference in adjacent bands.

13. *“Reduced Power” TETRA Variants.* In the course of this proceeding, we have received several *ex parte* communications regarding so-called “reduced power” or “low power” TETRA systems that operate at less than the 22 kilohertz bandwidth associated with standard TETRA operation.<sup>44</sup> PowerTrunk, Inc. (PowerTrunk) indicates that it has developed a reduced-power technology that uses the TETRA waveform but operates at 20 kilohertz bandwidth, which PowerTrunk asserts complies with the current technical rules for the 800 MHz NPSAC band.<sup>45</sup> Harris Corporation (Harris) asserts that PowerTrunk’s technology will cause interference in the NPSAC band and has filed a separate petition for rulemaking to prohibit reduced-power TETRA in the band.<sup>46</sup> Because the issue of prohibiting reduced power TETRA was not raised in the *NPRM*, we conclude that it is outside the scope of this proceeding. Accordingly, we take no action in this *Report and Order* with respect to reduced power TETRA or the Harris petition, but will address these matters separately.

## V. PROCEDURAL MATTERS

14. *Final Regulatory Flexibility Analysis.* As required by Section 603 of the Regulatory Flexibility Act, 5 U.S.C. § 603, the Commission has prepared a Final Regulatory Flexibility Analysis (FRFA) of the possible significant economic impact on small entities of the decisions in the *Report and Order*. The FRFA is set forth in Appendix B.

15. *Paperwork Reduction Analysis.* The *Report and Order* does not contain proposed new or modified information collection requirements.

16. *Congressional Review Act.* The Commission will send a copy of this *Report and Order* to Congress and the Government Accountability Office pursuant to the Congressional Review Act, *see* 5 U.S.C. 801(a)(1)(A).

17. *Alternative formats.* To request materials in alternative formats for people with disabilities (Braille, large print, electronic files, audio format), send an e-mail to <[FCC504@fcc.gov](mailto:FCC504@fcc.gov)> or call the Consumer and Government Bureau at (202) 418-0530 (voice), (202) 418-0432 (TTY). This *Report and Order* also may be downloaded from the Commission’s web site at <<http://www.fcc.gov/>>.

---

<sup>43</sup> Motorola comments at 10-11.

<sup>44</sup> *See, e.g.*, Letter from Patrick Sullivan, Harris Corp. to Marlene Dortch, Secretary, FCC (March 16, 2012); Letter from Elizabeth Sachs, Esq., counsel for New Jersey Transit Corp. to Marlene Dortch, Secretary, FCC (March 16, 2012) (summarizing *ex parte* presentation from representatives of New Jersey Transit Corp, PowerTrunk, Inc., and Alcatel-Lucent); Letter from Kevin Krufky, Alcatel-Lucent Corp. to Marlene Dortch, Secretary, FCC (March 23, 2012); Letter from Gregory T. Riddle, President, APCO, to Marlene Dortch, Secretary, FCC (March 27, 2012).

<sup>45</sup> Letter from Jose Martin, PowerTrunk, Inc. to Marlene Dortch, Secretary, FCC (March 23, 2012) at 3-7.

<sup>46</sup> Harris Corp. Petition for Rulemaking (filed Apr. 30, 2012). We have not received any report of actual interference to public safety licensees in the NPSAC band from reduced-power TETRA. Nevertheless, we have sought separate comment on the Harris petition, *see Public Notice*, Report No. 2952 (CGB rel. May 31, 2012), and the Commission staff is reviewing the comments and preparing a recommendation for further response. We are prepared to take appropriate action if the record indicates an interference risk to public safety that needs to be addressed.

**VI. ORDERING CLAUSES**

18. IT IS ORDERED that pursuant to Sections 1, 4(i), 303(f), 303(g), and 303(r) of the Communications Act of 1934, as amended, 47 U.S.C. §§ 151, 154(i), 303(f), 303(g), and 303(r), this *Report and Order* IS ADOPTED.

19. IT IS FURTHER ORDERED that Part 90 of the Commission's Rules IS AMENDED as set forth in Appendix A, effective 30 days after publication in the Federal Register.

20. IT IS FURTHER ORDERED that the Commission's Consumer and Governmental Affairs Bureau, Reference Information Center, SHALL SEND a copy of this *Report and Order*, including the Final Regulatory Flexibility Analysis, to the Chief Counsel for Advocacy of the Small Business Administration.

21. IT IS FURTHER ORDERED that the Request for Further Clarification Filed by Enterprise Wireless Alliance filed October 26, 2011 IS DISMISSED AS MOOT.

FEDERAL COMMUNICATIONS COMMISSION

Marlene H. Dortch  
Secretary



## APPENDIX A

## Final Rules

Chapter 1 of Title 47 of the Code of Federal Regulations is amended as follows:

**Part 90 – Private Land Mobile Radio Services**

1. The authority citation for Part 90 continues to read as follows:

AUTHORITY: Sections 4(i), 11, 303(g), 303(r), and 332(c)(7) of the Communications Act of 1934, as amended, 47 U.S.C. 154(i), 161, 303(g), 303(r), 332(c)(7).

2. Section 90.209 is revised by amending paragraph (b)(5) to add footnote 6 to the table to read as follows:

**§ 90.209 Bandwidth limitations.**

\* \* \* \* \*

(b) \* \* \*

(5) \* \* \*

## STANDARD CHANNEL SPACING/BANDWIDTH

Frequency band (MHz)	Channel spacing (kHz)	Authorized bandwidth (kHz)
* * *		
406-512 <sup>2</sup>	<sup>1</sup> 6.25	<sup>1,3,6</sup> 20/11.25/6
* * *	* * *	* * *
809-824/854-869	25	<sup>6</sup> 20
* * *		

<sup>1</sup> For stations authorized on or after August 18, 1995.

<sup>2</sup> Bandwidths for radiolocation stations in the 420-450 MHz band and for stations operating in bands subject to this footnote will be reviewed and authorized on a case-by-case basis.

<sup>3</sup> Operations using equipment designed to operate with a 25 kHz channel bandwidth will be authorized a 20 kHz bandwidth. Operations using equipment designed to operate with a 12.5 kHz channel bandwidth will be authorized a 11.25 kHz bandwidth. Operations using equipment designed to operate with a 6.25 kHz channel bandwidth will be authorized a 6 kHz bandwidth. All stations must operate on channels with a bandwidth of 12.5 kHz or less beginning January 1, 2013, unless the operations meet the efficiency standard of § 90.203(j)(3).

\* \* \*

<sup>6</sup> Operations using equipment designed to operate with a 25 kHz channel bandwidth may be authorized up to a 22 kHz bandwidth if the equipment meets the Adjacent Channel Power limits of § 90.221.

\* \* \* \* \*

3. Section 90.210 is revised by amending the introductory paragraph to add footnote 5 to the table to read as follows:

**§ 90.210 Emission masks.**

\* \* \*

APPLICABLE EMISSION MASKS

Frequency band (MHz)	Mask for equipment with Audio low pass filter	Mask for equipment without audio low pass filter
* * *		
421-512 <sup>2, 5</sup>	B, D, or E	C, D, or E
* * *		
809-824/854-869 <sup>3, 5</sup>	B	G
* * *		

\* \* \*

<sup>2</sup> Equipment designed to operate with a 25 kHz channel bandwidth must meet the requirements of Emission Mask B or C, as applicable. Equipment designed to operate with a 12.5 kHz channel bandwidth must meet the requirements of Emission Mask D, and equipment designed to operate with a 6.25 kHz channel bandwidth must meet the requirements of Emission Mask E.

<sup>3</sup> Equipment used in this licensed to EA or non-EA systems shall comply with the emission mask provisions of § 90.691.

\* \* \*

<sup>5</sup> Equipment may alternatively meet the Adjacent Channel Power limits of § 90.221.

\* \* \* \* \*

4. New Section 90.221 is added to read as follows:

**§ 90.221 Adjacent Channel Power limits**

(a) For the frequency bands indicated below, operations using equipment designed to operate with a 25 kHz channel bandwidth may be authorized up to a 22 kHz bandwidth if the equipment meets the adjacent channel power (ACP) limits below. The table specifies a value for the ACP as a function of the displacement from the channel center frequency and a measurement bandwidth of 18 kHz.

(b) Maximum adjacent power levels for frequencies in the 450-470 MHz band:

Frequency Offset	Maximum ACP (dBc) for devices 1 watt and less	Maximum ACP (dBc) for devices above 1 watt
25 kHz	-55 dBc	-60 dBc
50 kHz	-70 dBc	-70 dBc
75 kHz	-70 dBc	-70 dBc

In any case, no requirement in excess of -36 dBm shall apply.

(c) Maximum adjacent power levels for frequencies in the 809-824/854-869 MHz band:

Frequency Offset	Maximum ACP (dBc) for devices less than 15 watts	Maximum ACP (dBc) for devices 15 watts and above
25 kHz	-55 dBc	-55 dBc
50 kHz	-65 dBc	-65 dBc
75 kHz	-65 dBc	-70 dBc

In any case, no requirement in excess of -36 dBm shall apply.

(d) On any frequency removed from the assigned frequency by more than 75 kHz, the attenuation of any emission must be at least  $43 + 10 \log (P_{\text{watts}})$  dB.

## APPENDIX B

## Final Regulatory Flexibility Analysis

As required by the Regulatory Flexibility Act (“RFA”),<sup>1</sup> the Commission prepared an Initial Regulatory Flexibility Analysis (“IRFA”) of the possible significant economic impact on small entities by the policies and rules proposed in its *Notice of Proposed Rule Making*.<sup>2</sup> Written public comments were sought in the *NPRM*, including comments on the IRFA. This present Final Regulatory Flexibility Analysis (“FRFA”) conforms to the RFA.<sup>3</sup>

**I. Need for, and Objectives of, the Final Rules:**

The rules adopted in the *Report and Order* are intended to amend the Part 90 rules for authorized bandwidth and emission masks in order to permit the implementation in the United States of land mobile radio equipment utilizing Terrestrial Trunked Radio (TETRA) technology. TETRA is a spectrally efficient digital technology that we believe can provide valuable benefits to land mobile radio users.

**II. Summary of Significant Issues Raised by Public Comments in Response to the IRFA:**

No parties have raised significant issues in response to the IRFA.

**III. Description and Estimate of the Number of Small Entities to which the Proposed Rules Will Apply:**

The RFA directs agencies to provide a description of, and where feasible, an estimate of the number of small entities that may be affected by the proposed rules and policies, if adopted.<sup>4</sup> The RFA generally defines the term “small entity” as having the same meaning as the terms “small business,” “small organization,” and “small governmental jurisdiction.”<sup>5</sup> In addition, the term “small business” has the same meaning as the term “small business concern” under the Small Business Act.<sup>6</sup> A “small business concern” is one which: (1) is independently owned and operated; (2) is not dominant in its field of operation; and (3) satisfies any additional criteria established by the SBA.<sup>7</sup>

---

<sup>1</sup> 5 U.S.C. § 603. The RFA, 5 U.S.C. §§ 601-612 has been amended by the Contract With America Advancement Act of 1996, Public Law No. 104-121, 110 Stat. 847 (1996) (CWAAA). Title II of the CWAAA is the Small Business Regulatory Enforcement Fairness Act of 1996 (SBREFA).

<sup>2</sup> See Amendment of Part 90 of the Commission’s Rules to Permit terrestrial Trunked Radio (TETRA) Technology, Request by the TETRA Association for Waiver of Sections 90.209, 90.210 and 2.1043 of the Commission’s Rules, *Notice of Proposed Rule Making and Order*, WT Docket 11-69, 26 FCC Rcd 6503 (2011) (*NPRM*).

<sup>3</sup> 5 U.S.C. § 604.

<sup>4</sup> 5 U.S.C. § 603(b)(3).

<sup>5</sup> 5 U.S.C. § 601(6).

<sup>6</sup> 5 U.S.C. § 601(3) (incorporating by reference the definition of “small-business concern” in the Small Business Act, 15 U.S.C. § 632). Pursuant to 5 U.S.C. § 601(3), the statutory definition of a small business applies “unless an agency, after consultation with the Office of Advocacy of the Small Business Administration and after opportunity for public comment, establishes one or more definitions of such term which are appropriate to the activities of the agency and publishes such definition(s) in the Federal Register.”

<sup>7</sup> 15 U.S.C. § 632.

Nationwide, there are a total of 22.4 million small businesses, according to SBA data.<sup>8</sup> A “small organization” is generally “any not-for-profit enterprise which is independently owned and operated and is not dominant in its field.”<sup>9</sup> Nationwide, as of 2002, there were approximately 1.6 million small organizations.<sup>10</sup> The term “small governmental jurisdiction” is defined generally as “governments of cities, towns, townships, villages, school districts, or special districts, with a population of less than fifty thousand.”<sup>11</sup> Census Bureau data for 2002 indicate that there were 87,525 local governmental jurisdictions in the United States.<sup>12</sup> We estimate that, of this total, 84,377 entities were “small governmental jurisdictions.”<sup>13</sup> Thus, we estimate that most governmental jurisdictions are small. Below, we further describe and estimate the number of small entities, applicants and licensees, that may be affected by our action.

*Private Land Mobile Radio Licensees.* PLMR systems serve an essential role in a range of industrial, business, land transportation, and public safety activities. These radios are used by companies of all sizes operating in all U.S. business categories, and are often used in support of the licensee’s primary (non-telecommunications) business operations. For the purpose of determining whether a licensee of a PLMR system is a small business as defined by the SBA, we use the broad census category, Wireless Telecommunications Carriers (except Satellite). This definition provides that a small entity is any such entity employing no more than 1,500 persons.<sup>14</sup> The Commission does not require PLMR licensees to disclose information about number of employees, so the Commission does not have information that could be used to determine how many PLMR licensees constitute small entities under this definition. We note that PLMR licensees generally use the licensed facilities in support of other business activities, and therefore, it would also be helpful to assess PLMR licensees under the standards applied to the particular industry subsector to which the licensee belongs.<sup>15</sup>

As of March 2010, there were 424,162 PLMR licensees operating 921,909 transmitters in the PLMR bands below 512 MHz. We note that any entity engaged in a commercial activity is eligible to hold a PLMR license, and that any revised rules in this context could therefore potentially impact small entities covering a great variety of industries.

*RF Equipment Manufacturers.* The Census Bureau defines this category as follows: “This industry comprises establishments primarily engaged in manufacturing radio and television broadcast and wireless communications equipment. Examples of products made by these establishments are: transmitting and receiving antennas, cable television equipment, GPS equipment, pagers, cellular phones, mobile communications equipment, and radio and television studio and broadcasting equipment.”<sup>16</sup> The

---

<sup>8</sup> See SBA, Programs and Services, SBA Pamphlet No. CO-0028, at p. 40 (July 2002).

<sup>9</sup> 5 U.S.C. § 601(4).

<sup>10</sup> Independent Sector, *The New Nonprofit Almanac & Desk Reference* (2002).

<sup>11</sup> 5 U.S.C. § 601(5).

<sup>12</sup> U.S. Census Bureau, *Statistical Abstract of the United States: 2006*, Section 8, page 272, Table 415.

<sup>13</sup> We assume that the villages, school districts, and special districts are small and total 48,558. See U.S. Census Bureau, *Statistical Abstract of the United States: 2006*, section 8, p. 273, Table 417. For 2002, Census Bureau data indicate that the total number of county, municipal, and township governments nationwide was 38,967, of which 35,819 were small. *Id.*

<sup>14</sup> See 13 C.F.R. § 121.201, NAICS code 517210.

<sup>15</sup> See generally 13 C.F.R. § 121.201.

<sup>16</sup> U.S. Census Bureau, 2002 NAICS Definitions, “334220 Radio and Television Broadcasting and Wireless Communications Equipment Manufacturing”; <http://www.census.gov/epcd/naics02/def/NDEF334.HTM#N3342>.

SBA small business size standard for Radio and Television Broadcasting and Wireless Communications Equipment Manufacturing is all such firms having 750 or fewer employees.<sup>17</sup> According to Census Bureau data for 2007, there were a total of 919 establishments in this category that operated for the entire year. Of this total, 771 had fewer than 100 employees and 148 had more than 100 employees.<sup>18</sup> Thus, under this size standard, the majority of firms can be considered small.

**IV. Description of Projected Reporting, Recordkeeping, and Other Compliance Requirements for Small Entities**

There are no projected reporting, recordkeeping or other compliance requirements.

**V. Steps Taken to Minimize Significant Economic Impact on Small Entities and Significant Alternatives Considered**

The RFA requires an agency to describe any significant alternatives that it has considered in reaching its proposed approach, which may include the following four alternatives: (1) the establishment of differing compliance or reporting requirements or timetables that take into account the resources available to small entities; (2) the clarification, consolidation, or simplification of compliance or reporting requirements under the rule for small entities; (3) the use of performance, rather than design, standards; and (4) an exemption from coverage of the rule, or any part thereof, for small entities.<sup>19</sup>

None of the decisions in this *Report and Order* impose any adverse burden of significant economic impact on small entities. Accordingly, there is no need to consider significant alternatives.

**VI. Federal Rules That May Duplicate, Overlap, or Conflict with the Proposed Rules**

None.

---

<sup>17</sup> See 13 C.F.R. § 121.201, NAICS code 334220.

<sup>18</sup> See [http://factfinder.census.gov/servlet/IBQTable?\\_bm=y&-geo\\_id=&-fds\\_name=EC0700A1&-\\_skip=4500&-ds\\_name=EC0731SG3&-\\_lang=en](http://factfinder.census.gov/servlet/IBQTable?_bm=y&-geo_id=&-fds_name=EC0700A1&-_skip=4500&-ds_name=EC0731SG3&-_lang=en)

<sup>19</sup> 5 U.S.C. § 603(c)(1)-(4).