Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C.

In the Matter of Clarification of Sections 90.1207(c), 90.1207(d), and 90.1215 of the Commission's Rules to Conform with Findings and Conclusions in WT Docket No. 00-32

AMENDED PETITION FOR CLARIFICATION OR, IN THE ALTERNATIVE, PETITION FOR RULEMAKING OF M/A-COM, INC.

Pursuant to Sections 1.2 and 1.401(a) of the Commission's rules,[1] M/A-COM, Inc. ("M/A-COM"), petitions the Commission to conform Sections 90.1207(c), 90.1207(d), and 90.1215 of its rules with its objectives and conclusions in WT Docket No. 00-32 and thereby promote the deployment of broadband public safety networks with enhanced mobility in the 4940-4990 MHz frequencies ("4.9 GHz band").[2] Specifically, M/A-COM petitions the Commission to clarify that—consistent with the language of the *Third Report and Order*—licensees in the 4.9 GHz band have authority to operate on a primary basis point-to-point and

[1] 47 C.F.R. §§ 1.2, 1.401(a). M/A-COM will defer to the Commission judgment on the question of whether to address this petition through a declaratory ruling or notice of proposed rulemaking.

[2] *See 4.9 GHz Band Transferred from Federal Government Use, Memorandum Opinion and Order and Third Report and Order*, 18 FCC Rcd. 9152 (2003) ("*Third Report and Order*").

point-to-multipoint fixed links using directional antennas, other than point-to-point links operated on a stand-alone basis for uses such as backhaul.

By amending the above-referenced rule sections as M/A-COM proposes below, the Commission would further innovation, spectrum flexibility and efficiency, and interoperability, while allowing public safety users and first responders to implement broadband network architectures most suited to their needs—particularly the need for connectivity to the enterprise. In doing so, the Commission would also further its objectives of promoting frequency re-use and limiting harmful interference.

I. BACKGROUND

On April 23, 2003, the Commission adopted the *Third Report and Order* in WT Docket 00-32, establishing licensing and service rules for use of the 4940-4990 MHz band by public safety entities. In doing so, the Commission recognized the need to "provide 4.9 GHz licensees with the maximum flexibility practicable and to encourage effective and efficient utilization of the spectrum."[3]

To meet this need, the Commission—among other decisions—allocated the band for mobile services on a primary basis. Recognizing that "prohibiting fixed uses in the band would restrict licensee flexibility and could prohibit future technologies that could benefit public safety,"[4] the Commission decided to permit "hot spot" operations from hot spots to mobile units,

---

[3] *Third Report and Order*, 18 FCC Rcd. at 9153 ¶ 3. *See also id.* at 9157 ¶ 13 (Appendix B: Final Regulatory Flexibility Analysis) (noting that with regard to "our decision to allow both fixed and mobile use, as well as point-to-point microwave operations on a secondary basis in the 4.9 GHz band, . . . we do not anticipate any adverse affect on small entities. Instead, our approach here should benefit public safety entities by allowing greater flexibility in meeting each licensee's particular operational needs.").

[4] *Id.* at 9166 ¶ 32.

and to permit fixed services on a temporary basis.[5] The Commission cited automatic high-speed file transfers, map transfers, building layouts, emergency medical service files and wanted or missing persons images as examples of hot spot operations.[6] The Commission defined temporary links as those operating for one year or less.[7] But the Commission did not define "permit" with regard to allocation status of hot spots or temporary fixed links, *i.e.*, whether such hot spots and links have primary or secondary status, and the Commission's Part 90 rules do not address the allocation status of such links.[8]

The Commission also decided to permit "traditional," fixed point-to-point microwave operations on a secondary basis, noting that in rural areas, there might be a need for 4.9 GHz operations to cover greater distances than might be the case in an urban deployment.[9] With regard to assigning secondary status to this sub-category of the fixed service, the Commission stated its belief that "permitting such operations only on a non-interference basis addresses the concerns of those commenters who opposed such operations on the grounds that traditional or backhaul microwave operations would exhaust available frequencies."[10]

---

5 *Id.* at 9166 ¶ 33 (stating that "[i]n addition to the broadband mobile services the Commission originally contemplated for the band, we will permit "hot spot" operations").

6 *Id.* at 9166 ¶ 33. This application is analogous to "hot spot" applications in the 2.4 GHz and 5 GHz unlicensed bands, where a fixed access point transceiver is established to communicate with client transceivers. Generally, this operation is a point-to-multipoint one, with the clients being "transportable," rather than highly mobile as in the case of a cellular radio operation.

7 *Id.* at 9166 ¶ 33.

8 *See id.* 18 FCC Rcd. at 9166 ¶ 33-34; 47 C.F.R. Part 90.

9 *Third Report and Order*, 18 FCC Rcd. at 9166 ¶ 34. Presumably, with lower user density in rural areas, there is less likelihood that a licensee operating a secondary "traditional" point-to-point microwave link would be required to shut down due to interference to a primary mobile link.

10 *Id.* at 9167 ¶ 34.

Yet neither of the concerned commenters cited by the Commission—APCO or Motorola—took issue with the use of fixed links in the 4.9 GHz band *per se*. APCO opposed use of the 4.9 GHz band for permanent fixed point-to-point microwave facilities, believing that traditional "backhaul" or "backbone" fixed facilities would exhaust 4.9 GHz frequencies and would be difficult to coordinate.[11] Similarly, because of the limited amount of spectrum available in the 4.9 GHz band, Motorola urged the Commission "not to allow routine use of traditional point-to-point microwave applications in the band."[12] Both APCO and Motorola expressed concern about the impact of "stand-alone", high-powered fixed links on spectrum availability and the interference environment. At the same time, both APCO and Motorola clearly envisioned fixed links as part of a network, particularly when deployed to provide broadband connectivity as well as fixed point-to-multipoint hot spots.

Nevertheless, the Commission did not refine its 4.9 GHz rules to reflect properly these concerns and distinctions as expressed in the *Third Report and Order*. Nowhere did the Commission define what constitutes a "traditional" fixed microwave link or distinguish such a link from any other type of fixed service. The Commission did not explicitly address the allocation status of fixed links other than "traditional" point-to-point links. And the Commission did not explicitly address the allocation status of point-to-multipoint fixed links. So although the Commission intended to limit only certain fixed links, based on concerns about frequency exhaust, frequency re-use, and interference, the text of the rules it adopted potentially sweep more broadly.

---

[11] APCO Comments, WT Docket No. 00-32, at 6 (filed July 8, 2002).

[12] Motorola Comments, WT Docket No. 00-32 at 7 (filed July 8, 2002).

II. TO PROMOTE THE DEPLOYMENT OF BROADBAND PUBLIC SAFETY NETWORKS WITH ENHANCED MOBILITY IN THE 4.9 GHZ BAND, AND TO REDUCE REGULATORY UNCERTAINTY, THE COMMISSION SHOULD CONFORM ITS PART 90 RULES WITH ITS OBJECTIVES AND CONCLUSIONS IN WT DOCKET NO. 00-32

To promote the deployment of broadband public safety networks with enhanced mobility in the 4.9 GHz band, and to reduce regulatory uncertainty, the Commission should conform its Part 90 rules to its objectives and conclusions in the *Third Report and Order* in WT Docket No. 00-32. To optimize 4.9 GHz broadband networks operating in the 4.9 GHz band, M/A-COM believes that public safety users and first responders will need integrated networks with scalable network architectures that allow for dynamic routing of traffic over both fixed and mobile links. In the *Third Report and Order*, the Commission anticipated such needs and networks, but its present Part 90 rules create regulatory uncertainty—as they are either vague or potentially inconsistent with the *Third Report and Order*—and could discourage public safety users and first responders from deploying such broadband networks.

M/A-COM therefore proposes that the Commission amend its Part 90 rules to grant primary status to point-to-point and point-to-multipoint fixed links that are part of a 4.9 GHz public safety network. By granting primary allocation status for such links, the Commission would enhance the ability of public safety users and first responders to communicate among hot spots via fixed links, thereby enhancing the communications capabilities and, ultimately, the mobility of users of such public safety networks. In so clarifying its rules, the Commission would maximize the ability of public safety users and first responders to implement broadband network architectures most suited to their needs, thereby furthering the Commission's objectives of promoting spectrum flexibility and efficiency, frequency re-use, and minimization of harmful

interference. M/A-COM believes that the Commission should continue to grant secondary status to traditional, stand-alone point-to-point links for purposes such as backhaul.[13]

A. Public Safety Users and First Responders Seek Flexibility to Deploy 4.9 GHz Broadband Networks with Mobile and Fixed Links Having Similar Power Levels and Propagation Distances—Links that Differ Fundamentally from Traditional Fixed Point-to-Point Links Used for Backhaul

Public safety users and first responders seek flexibility to deploy 4.9 GHz broadband networks with mobile and fixed links having similar power levels and propagation distances. These links differ fundamentally from traditional fixed point-to-point links used for backhaul—the links the deployment of which the Commission (rightly) sought to deter in the *Third Report and Order*.

Public safety and first responder customers have told M/A-COM that they are keenly interested in integrated mobile-fixed networks that distribute broadband services to a combination of fixed and mobile clients. These networks have the ability to adapt in real time to permit the shifting of network resources according to particular needs (often between fixed and mobile links), and permit dynamic routing of traffic. These capabilities are particularly critical in disaster situations where certain elements of a given network are compromised. By using dynamic routing between fixed and mobile links, public safety users can be assured of continuity of communications. These types of networks will support broadband wide-area enterprise applications, such as:

- Emergency medical services, *e.g.*, transmission of real-time critical patient data from field to hospital;
- Fire fighting services, *e.g.*, transmission of detailed building information and plans to firefighters; and

[13] *See* 47 C.F.R. § 90.1207(d).

- Law enforcement, *e.g.*, transmission of video and data from the precinct to the field and from an incident scene to the precinct.

Figure 1 below illustrates a public safety network incorporating such applications.

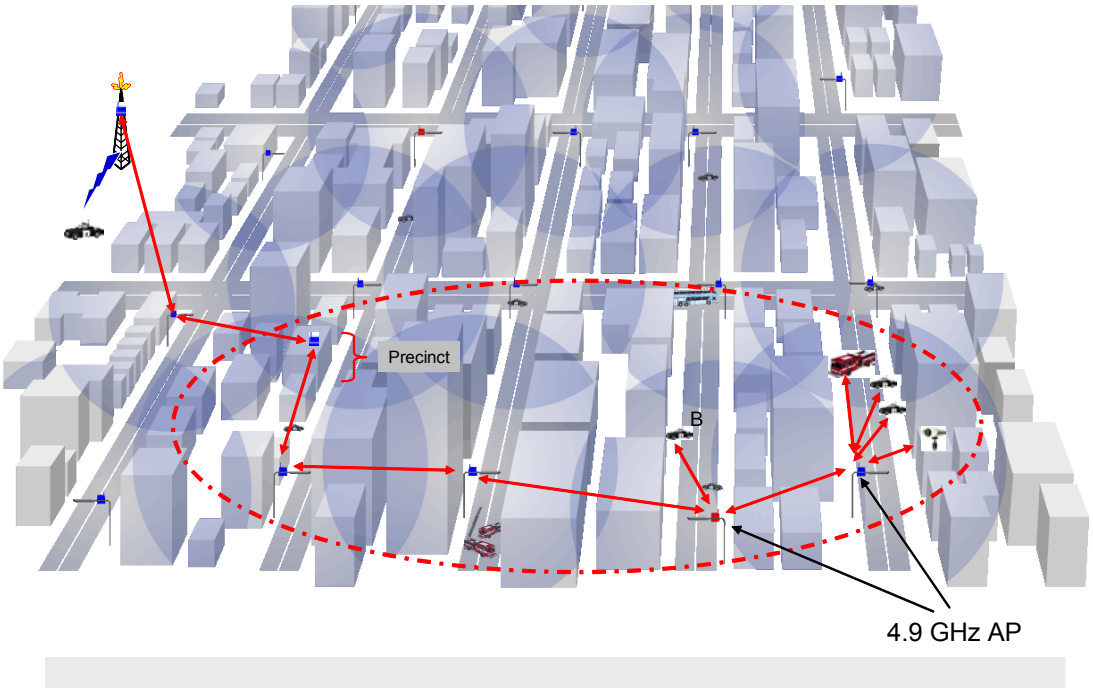

Figure 1

In Figure 1, 4.9 GHz hot-spots are placed on traffic lights to provide broadband connectivity to users, such as those in the scene of an incident in the lower right hand corner. By allowing the hot spots to communicate with other hot spots through fixed links, it is possible to expand the communications capabilities to and from the incident, including users outside the range of the first hot-spot, *i.e.*, police car B. Moreover, by allowing these messages to "hop" along a meshed grid of access points using fixed links, the network allows users at the scene of the incident to connect back to the precinct.

By and large, the point-to-point and point-to-multipoint fixed links contemplated for integrated 4.9 GHz broadband network architectures such as those exemplified in Figure 1 have

power levels and propagation distances almost identical to those of the mobile links within the same networks. This similarity should come as no surprise. Responding to user needs, suppliers have designed these networks to limit self-interference and to promote frequency re-use, particularly in urban areas with higher user density through careful selection of power levels and use of directional antennas for fixed links. Suppliers have also sought to achieve network scalability with dynamic routing of traffic where a given traffic load might be routed to its final destination over mobile or fixed links or both. In this architecture, there may be peer-to-peer communications (mobile-to-mobile and fixed access point-to- fixed access point) as well as point-to-multipoint communications. The dynamic routing feature can be particularly advantageous in critical situations where events cause some links to fail. Suppliers and operators have focused less on the mobile or fixed nature of the link, and instead on issues of network capacity and the need to deliver communications to a given destination. By allowing for a combination of fixed and mobile links, maximum flexibility is provide to user and the network can dynamically adapt to provide the connectivity required for a given incident, as shown in Figure 1.

M/A-COM believes that with the public safety broadband network architectures contemplated for the 4.9 GHz band, mobile and fixed links will be largely converged. Consequently, to a 4.9 GHz frequency user operating outside of the broadband network, it will make little difference whether links within the network are mobile or fixed.

Fixed links within emerging broadband network architecture differ fundamentally from the "traditional" fixed point-to-point links the deployment of which the Commission sought to limit in the *Third Report and Order*. Although the Commission did not define "traditional" with regard to point-to-point microwave operations, M/A-COM believes the Commission intended to

limit fixed links characterized by relatively high-powered transmitters operating through high gain, narrow beamwidth antennas installed high above the ground, in other words, the type of fixed operations generally governed the Commission's Part 101 rules for fixed microwave services.

As the Commission noted in the *Third Report and Order*, "traditional" point-to-point microwave links are typically used for backhaul communications.[14] In some cases a backhaul application is truly point-to-point, *i.e.*, the communication is initiated at point A and terminates at point B. In other cases, it is point-to-point-to-point, *i.e.*, backhaul traffic is relayed along links to, for example, *work-around* terrain features.

In fact, the Commission's Part 90 rules already deter deployment of traditional fixed point-to-point links in the 4.9 GHz band. *First*, in the *Third Report and Order*, the Commission adopted power and antenna gain limits that essentially preclude deployment of "traditional," high-powered point-to-point fixed microwave operations. *Second*, M/A-COM believes that in most planned 4.9 GHz broadband network architectures, fixed links will be an integral element of providing the necessary mobility at incident scenes and thus will complement mobile use, not interfere with it.

B. THE COMMISSION SHOULD AMEND SECTIONS 90.1207(C), 90.1207(D), AND 90.1215 OF ITS RULES TO GRANT PRIMARY STATUS TO POINT-TO-POINT AND POINT-TO-MULTIPOINT FIXED LINKS USED IN 4.9 GHZ BROADBAND NETWORKS

To clarify its Part 90 rules to comport with the Commission's objectives and conclusions in the *Third Report and Order*, the Commission should amend Sections 90.1207(c), 90.1207(d),

[14] *Third Report and Order*, 18 FCC Rcd. at 9166 ¶ 34. For example, such links are used to relay telephone network traffic from point to point.

and 90.1215 of its rules to grant primary status to point-to-point and point-to-multipoint fixed links used in 4.9 GHz broadband networks.

First, M/A-COM proposes that the Commission amend Section 90.1207(c) to read as follows:

> **(c) A 4940-4990 MHz band license gives the licensee authority to operate mobile units (including portable and handheld units), point-to-point fixed stations, and point-to-multipoint fixed stations in the licensee's public safety network, or between public safety networks, operating in the 4940-4990 MHz band, and to operate temporary (1 year or less) fixed stations anywhere within the area authorized by the license. Such licensees may operate mobile units and/or temporary fixed stations outside their authorized area to assist public safety operations with the permission of the jurisdiction in which the radio station is to be operated. Temporary fixed stations are subject to the requirements of paragraph (b) of this section.**

With this rule language, the Commission would clarify that point-to-point and point-to-multipoint fixed links in 4.9 GHz public safety networks are co-primary with mobile links. And it would grant primary status to fixed links connecting public safety networks with each other using the 4940-4990 MHz band.

Second, M/A-COM proposes that the Commission amend Section 90.1207(d) to read as follows:

> **(d) A 4940-4990 MHz band license does not give the licensee authority to operate permanent fixed point-to-point stations except within the licensee's public safety network, or between public safety networks, operating in the 4940-4990 MHz band. Licensees choosing to operate fixed stations on a stand-alone basis must license them individually on a site-by-site basis. Such fixed operation will be authorized only on a secondary, non-interference basis.**

With this rule language, the Commission would state explicitly that secondary status applies to permanent fixed point-to-point stations that are used on a stand-alone basis.

Third, M/A-COM proposes that the Commission amend Section 90.1215 to read as follows:

(a) The maximum conducted output power should not exceed:

Channel Bandwidth (MHz)	Low Power Maximum ConductedOutput Power (dBm)	High Power Maximum Conducted Output Power (dBm)
1	7	20
5	14	27
10	17	30
15	18.8	31.8
20	20	33

High power devices are also limited to a peak power spectral density of 21 dBm per 1 MHz. High power devices using channel bandwidths other than those listed above are permitted; however, they are limited to peak power spectral density of 21 dBm/MHz. If transmitting antennas of directional gain greater than 9 dBi are used, both the maximum conducted output power and the peak power spectral density should be reduced by the amount in decibels that the directional gain of the antenna exceeds 9 dBi. However, high power point-to-point and point-to-multipoint operations may employ transmitting antennas with directional gain up to 26 dBi without any corresponding reduction in the maximum conducted output power or spectral density. Corresponding reduction in the maximum conducted power and peak power spectral density should be the amount in decibels that the directional gain of the antenna exceeds 26 dBi.

(b) Low power devices are also limited to a peak power spectral density of 8 dBm per one MHz. Low power devices using channel bandwidths other than those listed above are permitted; however, they are limited to a peak power spectral density of 8 dBm/MHz. If transmitting antennas of

directional gain greater than 9 dBi are used, both the maximum conducted output power and the peak power spectral density should be reduced by the amount in decibels that the directional gain of the antenna exceeds 9 dBi.

(c) The maximum conducted power is measured as a conducted emission over any interval of continuous transmission calibrated in terms of an rms-equivalent voltage. If the device cannot be connected directly, alternative techniques acceptable to the Commission may be used. The measurement results shall be properly adjusted for any instrument limitations, such as detector response times, limited resolution bandwidth capability when compared to the emission bandwidth, sensitivity, etc., so as to obtain a true maximum conducted power measurement conforming to the definitions in this paragraph for the emission in question.

* * *

(e) The ratio of the peak excursion of the modulation envelope (measured using a peak hold function) to the maximum conducted output power shall not exceed 13 dB across any 1 MHz bandwidth or the emission bandwidth whichever is less.

With this rule language, the Commission would clarify that any fixed station in a public safety network may employ directional antennas. By adding a new Section 90.1215(d), the Commission would also update Section 90.1215 consistent with changes the Commission recently made to Section 15.407(a) of its rules.[15]

C. By Clarifying Its Part 90 Rules, the Commission Will Remove Regulatory Uncertainty, Allowing Users to Deploy Innovative 4.9 GHz Technologies That Will Serve the Public Interest

By clarifying its Part 90 rules, the Commission will remove regulatory uncertainty, allowing users to deploy innovative 4.9 GHz technologies that will serve the public interest. M/A-COM knows from experience that the regulatory uncertainty generated by the Commission's Part 90 rules has caused concern among some public safety users and first

[15] *See* 47 C.F.R. § 15.407(a); *Modification of Parts 2 and 15 of the Commission's Rules for Unlicensed Devices and Equipment Approval, Report and Order*, 19 FCC Rcd. 13,539, 13,548 ¶¶ 30-36 (2004)

responders, and could deter those users from investing in broadband networks with innovative architectures most suited to their needs.

Moreover, the Commission would further its own objectives of promoting innovation, spectrum flexibility and efficiency, and interoperability.[16] Because the fixed links within a 4.9 GHz broadband network are similar in power levels and propagation distances to mobile links within the same network, deployment of such links would not impair frequency re-use or worsen the interference environment for users of the 4.9 GHz band. Ultimately, the Commission would foster the deployment of innovative broadband networks designed to ensure connectivity to the enterprise by eliminating technically irrelevant distinctions between point-to-point and point-to-multipoint links, and between mobile and fixed links.

CONCLUSION

Consistent with the specific proposal and reasons stated above, M/A-COM petitions the Commission to clarify that—consistent with the language of the *Third Report and Order*—licensees in the 4.9 GHz band have authority to operate on a primary basis point-to-point and point-to-multipoint fixed link other than "traditional," high-powered point-to-point backhaul links operated on a stand-alone basis.

Respectfully submitted,

M/A-COM, INC.

Dennis Martinez
Vice President, Technology
Gregory Henderson
Principal Technologist

Kent D. Bressie
Damon C. Ladson
HARRIS, WILTSHIRE & GRANNIS LLP
1200 18th Street, N.W., Suite 1200

[16] *Third Report and Order*, 18 FCC Rcd. at 9152 ¶¶ 2-3.

Nikos Nikolopoulos
Director, Business Affairs
Wireless Systems Business Unit
M/A-COM, INC.
1011 Pawtucket Blvd.
Lowell, Massachusetts 01853
+1 978 442 5000 tel

Ernest Hofmeister
Technology Fellow
Wireless Systems Business Unit
M/A-COM, INC.
221 Jefferson Ridge Parkway
Lynchburg, Virginia 24551
+1 434 455 9555 tel

22 July 2005
23 August 2005 (amended)

Washington, D.C. 20036-2560
+1 202 730 1337 tel

Counsel for M/A-COM, Inc.