

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

In the Matter of	)	
	)	
The 4.9 GHz Band Transferred from	)	WT Docket No. 00-32
Federal Government Use	)	

**REPLY COMMENTS OF MOTOROLA, INC.**

Motorola, Inc. (“Motorola”) hereby submits these reply comments in the above captioned proceeding that concerns the technical, licensing and operational rules for the 4940-4990 MHz band allocated for public safety use.<sup>1</sup>

Motorola urges the Commission to develop regulations that facilitate implementation of a variety of broadband solutions required by public safety in a manner that provides the reliability necessary for mission critical operations. To achieve these goals, Motorola’s opening round comments emphasized the following positions:

- Any commercial or consumer use of the band – whether licensed or unlicensed; primary or secondary – is inconsistent with the primary objective to guarantee interference free and secure use of the band for mission critical applications by public safety users.
- The FCC should adopt a channeling plan built on 5 MHz building blocks that permits aggregation of bandwidth up to 20 MHz.
- State and local public safety agencies within a local area should be able to coordinate on an “on-demand” or “real-time” basis to avoid interference as opposed to the pre-licensing frequency coordination traditionally used for land mobile operations.

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<sup>1</sup> *The 4.9 GHz Band Transferred from Federal Government Use*, WT Docket No 00-32, *Second Report and Order and Further Notice of Proposed Rulemaking*, FCC 02-47 (rel. February 27, 2002) (“*Second R&O & FNPRM*”).

- A stringent out-of-band-emissions mask is required to protect adjacent band operations operating at different power levels.
- Broadband public safety services will leverage the semiconductor technology and applications being developed in the nearby 5 GHz U-NII band, in standards such as IEEE 802.11a. However, meeting public safety's specialized mission critical requirements will require some modifications to the technology and applications developed for commercial purposes.
- Public safety users should protect radio astronomy sites through coordination zones within 50 miles of the radio astronomy sites. This will allow public safety agencies to maximize their use of broadband systems in the most populated areas without impacting radio astronomy operations.
- Power levels should permit reliable performance to meet public safety mission critical requirements.

Motorola is pleased to amplify on these points in the following reply comments prepared in response to the comments received in this proceeding. Motorola is encouraged by the variety and level of interested parties who responded with comments to this proceeding, and we believe that there is a good deal of consensus among many of the responders. Many of the major user associations, largest city agencies, and industry representatives commenting in the 4.9 GHz proceeding show solid support for developing service rules for this new band that allow them quick access to this much needed dedicated spectrum and advanced technology.

### **Channeling Plan**

Motorola recommends that the Commission adopt a channeling plan built on 5 MHz building blocks that can be aggregated into larger channels as needed.<sup>2</sup> This will allow public safety the necessary flexibility to meet a wide variety of their broadband requirements and proposed applications. As noted in our comments, Motorola recommends ten 5 MHz channels to allow greater flexibility and a greater number of

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<sup>2</sup> Comments of Motorola at 10.

simultaneous broadband transmissions within a given area.<sup>3</sup> We additionally noted that a baseline channel width of 5 MHz will enable efficient data transfer rates for many of the applications proposed for this band.<sup>4</sup>

In their comments, APCO proposed a channeling plan of eight 5 MHz channels with five 1 MHz channels on each end.<sup>5</sup> We believe the APCO proposal also supports flexibility and Motorola can support the APCO proposal. However, FCC adoption of the APCO band plan would require defining a 1 MHz out of band emissions (OOBE) mask that meets the same stringent out of band emissions as Motorola's proposed OOBE mask for the 5 MHz channels.<sup>6</sup> This would ensure protection to both adjacent channel public safety applications operating at different power levels and bandwidths as well as adjacent band radio astronomy sites.

### **Commercial Use of Public Safety Spectrum**

Atheros Communications, Inc. filed comments recommending that the FCC extend eligibility to use the 4.9 GHz band on a conditional basis to commercial services and unlicensed devices. Atheros proposes techniques that purport to ensure that public safety users have the ability to automatically and seamlessly preempt commercial and unlicensed signals without delay. Atheros states that equipment with the capability of accomplishing such preemption already exists for use in the 5 GHz U-NII bands, and could be modified for the 4.9 GHz band.<sup>7</sup> Atheros indicates that the Enhanced

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<sup>3</sup> *Id.* at 11.

<sup>4</sup> *Id.* at 10.

<sup>5</sup> Comments of The Association of Public-Safety Communications Officials-International, Inc. (APCO) at 9

<sup>6</sup> *See* Comments of Motorola at 13.

<sup>7</sup> Comments of Atheros Communications, Inc. at 5

Distributed Coordination Function (EDCF) supports eight levels of prioritized, preemptive use of the radio channel, even allowing different levels of priority among various types of public safety users. Atheros argues that EDCF would allow commercial and unlicensed users to operate in the 4.9 GHz public safety band without impeding public safety operations, regardless of whether such users are fixed or mobile.<sup>8</sup>

After considerable and extensive simulations of EDCF, Motorola disagrees with Atheros. The Distributed Control Function (DCF) is the current method used by the 802.11 standard to share a wireless channel between multiple users. DCF is a contention-based system, so the probability of getting the channel is equal for all the users (as long as there are no coverage holes) and the channel behavior is unpredictable. EDCF is a proposed improvement to DCF and is currently under development in the standardization process. This improvement specifies a variable delay to the contention time with the smallest delay corresponding to the highest priority assigned to the user, essentially attempting to generate an access priority. Our studies show that when channels are more heavily used, such as is normally the case in a major incident, the EDCF system supports only two levels of priority. The system will not be able to provide the multiplicity and quality of services that are required in a mission critical system. Our conclusion is that the EDCF media access control (MAC) algorithm, the “Layer Two” access that establishes communications, is not sufficient to provide multiple public safety services in the presence of commercial traffic.

Even more importantly, the public safety system must be secure. The use of EDCF requires public safety users to be on the same access point system as commercial

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<sup>8</sup> *Id.* at 8

and unlicensed users, creating an unacceptable security risk for public safety. Using a single access point for public safety as well as commercial traffic means that the “Layer Two” access will open for the commercial traffic, thereby opening a “back door” to the public safety infrastructure. This is similar to allowing commercial users to plug their computer into the Ethernet sockets in police stations.

Alternatively, commercial and unlicensed services could be on different systems as public safety users in the 4.9 GHz band. However, the availability to criminal elements, hackers, and terrorists to operate technology in the same 4.9 GHz band as public safety creates the similar security concerns for public safety systems in this band. Furthermore, inherent interference problems to mission critical public safety broadband communications are not resolvable because commercial services and unlicensed systems are not planned. A commercial or unlicensed system may interfere with a public safety system, degrade coverage and the rapidly deployed public safety system will have no method of mitigating this problem. For these reasons, public safety users have consistently gone on record in these proceedings that public safety cannot share spectrum with commercial or unlicensed users, whether in the unlicensed bands or elsewhere, but rather that they must have dedicated public safety spectrum in 4.9 GHz. Therefore, Motorola supports that view and re-emphasizes that the 4.9 GHz public safety band should not allow any commercial or consumer use of the band, whether licensed or unlicensed, primary or secondary. Further, we note that the Commission previously allocated 300 MHz of spectrum in the nearby 5.2 and 5.8 GHz bands for commercial broadband use. Motorola sees no valid public interest justification for potentially

compromising public safety services by allowing commercial operations in the 4.9 GHz band.

### **Power Limits**

Motorola is concerned about the output power recommendations by Microwave Radio Communications (MRC), specifically, a 10-watt maximum output power for airborne links to achieve the maximum path length.<sup>9</sup> Though the FCC must address the use of aeronautical mobile services in another part of this proceeding,<sup>10</sup> Motorola is replying to the above MRC recommendation filed in their comments responding to the Further Notice of Proposed Rulemaking. Our engineering analysis shows that a 10 watt airborne transmitter will degrade the sensitivity of an adjacent channel WLAN (Wireless Local Area Network) by up to 8 dB within the illumination circle, assuming that the Motorola OOB masks are adopted. Further degradation is probable with a more relaxed OOB mask. If airborne operation is allowed at such power levels, we recommend use of careful channel planning and highly directional airborne antennas. We caution the Commission to recognize that the technical parameters, such as output power, have to be balanced between required public safety coverage and proper reliability on one side and potential conflicts between airborne and terrestrial operations on the other.

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<sup>9</sup> Comments of Microwave Radio Communications at 3

<sup>10</sup> *Petitions for Reconsideration and Clarification for the Second Report and Order and Further Notice of Proposed Rulemaking, Public Notice, Report No. 2557, released June 10, 2002.*

## **Protecting Radio Astronomy**

Motorola reiterates our recommendation that public safety users should protect radio astronomy (RA) sites in primary RA spectrum (4990-5000 MHz) through use of coordination zones. CORF is concerned that the power levels suggested by the Commission in the *Second R&O & FNPRM* would cause detrimental interference to radio astronomy observations and recommends that the Commission support use of coordination zones for fixed transmitters and the exclusion of mobile transmitters within such zones.<sup>11</sup>

Motorola agrees with CORF that coordination zones can be used to control interference to radio astronomy operations in the adjacent band while allowing maximum use of the 4.9 GHz broadband spectrum by public safety users in the most populated areas. However, we believe it is unnecessary to exclude the use of mobile transmitters within these zones, and instead recommend use of coordination techniques within such zones to control interference. Motorola re-emphasizes our recommendation that the requirement for public safety to coordinate with a designated radio astronomy point of contact would be triggered within 50 miles of the radio astronomy site. We base this 50-mile coordination zone on terrestrial calculations of terrain coverage and our recommended OOBE mask. This permits a balance of public safety access to this much-needed broadband spectrum and protection of radio astronomy operations in the adjacent 4990-5000 MHz band.

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<sup>11</sup> Comments of National Academy of Sciences, through the National Research Council's Committee on Radio Frequencies (CORF) at 4

We recommend that the FCC encourage public safety to use best efforts to cooperate in order to limit impact to secondary use of radio astronomy sites in 4950-4990 MHz defined in footnote US311 of the FCC rules 2.106. However, Motorola notes that CORF refers to the National Astronomy and Ionosphere Center in Arecibo, Puerto Rico (65 kilometers from San Juan) and the Haystack Observatory (40 kilometers from Boston) as being near urban areas.<sup>12</sup> As a procedural issue, we point out that the Haystack Observatory was not included in the revised US311 as modified by the *Second R&O* or in the proposed rule changes to Section 2.106.<sup>13</sup> CORF had requested other radio astronomy sites be added to US311, including Hat Creek, CA and Goldstone, CA, but has never mentioned Haystack Observatory as missing from US311. Because the Haystack Observatory is near highly populated areas in Massachusetts, Connecticut and Rhode Island, adding this site to allow secondary radio astronomy use in 4950-4990 MHz band will be a major impediment for public safety use of the band.

### **Conclusion**

Motorola urges the Commission to expedite its development and adoption of the technical service rules and regulations in this band to make this much-needed spectrum usable by the public safety community. Opening this 4.9 GHz public safety band to commercial or consumer use, even on a secondary basis, will compromise the security of public safety mission critical operations. Motorola also reiterates our belief that the coordination zone approach creates the proper balance between public safety use of this broadband spectrum and protection of radio astronomy.

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<sup>12</sup> Comments of CORF at 4

<sup>13</sup> *Notice of Proposed Rule Making*, WT Docket No 00-32, Feb.2000, at ¶18.

Respectfully submitted,

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