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

In the Matter of	
Additional Spectrum for Unlicensed Devices Below 900 MHz and in the 3 GHz Band	ET Docket No. 02-380

COMMENTS OF MOTOROLA, INC.

Motorola, Inc. ("Motorola") submits these comments on the *Notice of Inquiry* in the above captioned proceeding.[1] Motorola believes that increased use of certain television ("TV") broadcast spectrum would be feasible, provided that the existing and future licensed users in such spectrum are adequately protected. Specifically, the 76-216 MHz and 512-698 MHz bands (*i.e.*, TV channels 5-13 and 21-51) may be prime candidates for shared services with unlicensed devices. Motorola opposes, however, permitting any unlicensed use of the 54-72 MHz, 470-512 MHz or 698-806 MHz bands (*i.e.*, TV channels 2-4, 14-20 or 52-69). In addition, we oppose unlicensed use of the 3650-3700 MHz band at this time, before service rules for licensed services in this band have been established.

[1] Additional Spectrum for Unlicensed Devices Below 900 MHz and in the 3 GHz Band, Notice of Inquiry, ET Docket No. 02-380, FCC 02-328, 17 FCC Rcd 25632 (2002); *see also* Additional Spectrum for Unlicensed Devices Below 900 MHz and in the 3 GHz Band, ET Docket No. 02-380, Order Granting Extension of Time, DA 03-1022 (rel. Mar. 31, 2003) (extending the comment filing deadline).

I. INCREASED UNLICENSED USE OF CERTAIN BROADCAST SPECTRUM MAY BE FEASIBLE, PROVIDED THAT EXISTING AND FUTURE LICENSED USERS ARE ADEQUATELY PROTECTED

The *Notice of Inquiry* seeks comments on the feasibility of allowing unlicensed devices to operate in TV broadcast spectrum, while acknowledging that any such use must be limited and subject to technical requirements that would "ensure that such devices do not cause interference to authorized services operating within the TV broadcast bands."[2] Motorola believes that increased opportunistic use by unlicensed devices may be feasible, but not in spectrum where mobile systems operate. Because the locations of mobile handsets are unpredictable, unlicensed use of licensed mobile spectrum presents unique difficulties that prevent adequate safeguards to protect licensed operations from interference. Therefore, the Commission should not allow any increased unlicensed use of broadcast spectrum where mobile operations exist or will be deployed, *i.e*., in the 470-512 MHz or 698-806 MHz bands. In addition, unlicensed use should not be permitted in the 54-72 MHz band, in order to avoid interference to widely deployed consumer electronic devices such as VCRs and set top boxes. Motorola therefore recommends that any increased unlicensed use of broadcast spectrum should be limited to the 76-216 MHz and 512-698 MHz bands.[3]

As noted in its recent comments on the Spectrum Policy Task Force's Final Report ("Task Force Report"), Motorola supports efforts to promote other uses of broadcast spectrum.[4] The Commission should investigate opportunities to reallocate portions of the broadcast spectrum for other licensed uses, particularly mobile services, consistent with the

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2 *Id*. ¶ 1.

3 As the Commission more fully develops its proposal, it should also consider potential interference to adjacent channel mobile and radio astronomy users.

4 *See* Comments of Motorola, Inc., ET Docket No. 02-135, Jan. 27, 2003, at 23 ("Motorola SPTF Comments").

recommendation of the Spectrum Policy Task Force.[5] The Commission's main focus, however, should be on completing the transition to digital television and clearing the lower and upper bands (698-746 MHz and 746-806 MHz), which are still occupied by analog TV broadcasters in many parts of the country. In particular, the Commission's first priority should be the clearing of the upper 700 MHz band, which would provide much-needed additional spectrum for public safety use.[6] Five years have passed since the allocation of 700 MHz band spectrum to Public Safety and at present, these channels remain unavailable for public safety in approximately half of the top eighty metropolitan areas in the United States.

Although Motorola believes the Commission should make future allocations of spectrum for unlicensed use in frequencies above 10 GHz,[7] it does not oppose allowing opportunistic use of licensed spectrum by unlicensed devices below 10 GHz, provided that adequate and pragmatic technical rules are in place to ensure that existing and future licensed users of licensed spectrum are fully protected from interference from unlicensed devices. Certain bands within the TV broadcast spectrum may be well suited for such unlicensed use because licensed operations are limited to fixed broadcast systems. If adequate mechanisms can be developed to protect licensed broadcast operations, the most appropriate candidate band segments for overlay unlicensed use are the 76-216 and 512-698 MHz bands.[8] This spectrum is not shared with other public safety

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5 *See id*. (citing the Task Force Report at 45).

6 *See id*. at 24.

7 *See id*. at 25 ("Motorola supports additional allocations of spectrum for unlicensed use and recommends that the Commission make future allocations in frequencies above 10 GHz with an exception for the 5 GHz band . . . ."). Motorola supports allocation of the 5470-5725 MHz band for unlicensed use because of the unique circumstances regarding that band. *See id*. at 23 n.71.

8 If unlicensed use were allowed in these band segments, the Commission would also need to address the rights of unlicensed services relative to secondary licensed low power auxiliary operations, such as wireless microphones used in connection with broadcast programming. Even though secondary, as licensed services, such operations would normally have priority over unlicensed use. In addition, care should be taken in permitting any shared use of the 512-668 MHz band near hospitals, because this

and private services, as is the 470-512 MHz band; nor is it allocated for future use by public safety and commercial services, as is the 698-806 MHz spectrum.

As Motorola has discussed in previous comments and ex parte filings, secondary unlicensed use of licensed spectrum may be feasible through the exploitation of "spectrum holes."[9] However, such secondary use should be permitted only if unlicensed devices do not cause harmful interference to the primary licensed users. Two fundamental obstacles to secondary unlicensed use are the problems presented by "hidden terminals" and shadowing of unlicensed devices.[10] In either circumstance, an unlicensed device would be unable to detect use of its transmitting frequency throughout the entire zone that is affected by its transmissions. Therefore, use of listen-before-talk protocols would be insufficient to prevent harmful interference from occurring.

These problems may be manageable in spectrum where licensed operations exclusively are fixed, and hence the locations of transmitters and receivers are known. As the *Notice of Inquiry* suggests, unlicensed devices could, in theory, incorporate global positioning system ("GPS") capability, or some other location technology, and the technology to access databases so that they would know when they are operating within the vicinity of licensed operations.[11] Ensuring that unlicensed devices are able to determine their own location and the locations of licensed broadcast facilities in their vicinity with a high degree of reliability will be an important

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spectrum is utilized for life-maintaining monitoring services within medical facilities. *See* 47 C.F.R. § 15.242.

9 *See* Motorola SPTF Comments at 27; Motorola, Inc., *A White Paper on the Exploitation of "Spectrum Holes" to Enhance Spectrum Efficiency*, ET Docket No. 02-135, Oct. 28, 2002 ("Motorola Spectrum Holes White Paper"); Motorola, Inc., *A White Paper on Future Federal Communications Commission Spectrum Policy*, ET Docket No. 02-135, Aug. 30, 2002, at 22-24.

10 *See* Motorola SPTF Comments at 27; Motorola Spectrum Holes White Paper at 3-5 and figures 1 and 3.

11 *See Notice of Inquiry* ¶¶ 13 & 16 n.39.

component in ensuring interference-free operation of unlicensed devices and the Commission should require this capability prior to allowing use. If an unlicensed device is unable to obtain an accurate location fix it should be prohibited from transmitting. With such operating requirements, it should be possible for unlicensed devices to operate on certain TV channels without causing harmful interference to broadcast operations.

Secondary unlicensed use is more challenging, however, in spectrum where licensed mobile operations are present. In general, the dense spectral reuse, area licensing with no database of individual base stations, and high degree of mobility for mobile and portable radios make it impractical for unlicensed devices to access a database. Therefore, unlicensed devices will not be able to determine whether they are in the vicinity of a receiver, even if the unlicensed device has GPS capability.[12] An unlicensed device would not be able to determine in advance whether a transmission would interfere with licensed operations.[13] Therefore, due to the dynamic nature of mobile operations, there is no readily apparent technological solution that would enable unlicensed secondary use without causing harmful interference to licensed services. Accordingly, Motorola recommends against allowing any opportunistic unlicensed operations in the 470-512 MHz or 698-806 MHz bands.

In addition to the preceding comments, Motorola offers the following comments on the potential for increased unlicensed use in specific bands of the TV broadcast spectrum.

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[12] Such technology would be of particularly limited benefit with respect to licensed mobile use, where such operations are not constrained to specific locations.

[13] In fact, for many mobile services, this problem extends to base stations, because base station transmitters are not licensed or recorded in any FCC database.

54-72 MHz (TV Channels 2-4)

As the *Notice of Inquiry* notes, "there are concerns about possible interference to channels 2, 3, and 4 because they are used for, or are adjacent to, the output channels of VCRs and other set top boxes."[14] Motorola shares these concerns. VCRs, set top boxes and other home electronic equipment that operate in the 54-72 MHz band (TV channels 2-4) may be adversely affected by unlicensed operations in this spectrum. Because this home electronics equipment is so prevalent and widely dispersed, allowing increased use of unlicensed devices in this spectrum is not feasible. Motorola therefore opposes allowing any increased use of unlicensed devices in this band or the adjacent 72-76 MHz band.[15]

470-512 MHz (TV Channels 14-20)

The Commission has licensed spectrum in the 470-512 MHz band for the Private Land Mobile Radio Service ("PLMRS"), including public safety and other critical operations, in eleven of the major metropolitan areas in the United States. As noted above, due to the inherently time and location transient nature of mobile services, none of the technological "solutions" suggested in the *Notice of Inquiry* would provide adequate protection from interference for licensed operations in this band. The proliferation of unlicensed devices in the 470-512 MHz band segments would be particularly problematic as this spectrum supports public safety and critical infrastructure users. As the County of Los Angeles has commented in this proceeding, "[i]ntroducing competing [unlicensed] devices into the band – regardless of their power and/or field strength or any geographical limitations – will almost assuredly create

[14] *Notice of Inquiry* ¶ 14.

[15] The 72-76 MHz band between TV channels 4 and 5 is licensed for mobile and radio astronomy operations, which should be protected from interference by unlicensed devices.

interference problems for the communications of public safety organizations, making it more difficult for them to perform their life-saving duties."[16]

Moreover, although the 470-512 MHz band is designated for licensed mobile use in only eleven urban markets, unlicensed devices should be prohibited from the 470-512 MHz band on a nationwide basis.[17] While the Commission generally should adopt safeguards against use of unlicensed devices in areas where they may cause interference to licensed services, the presence of public safety operations in this band warrants an extra degree of caution.[18]

The Commission is rightfully seeking to encourage develop of new services and technology. However, given that over 300 MHz of spectrum is available in the 76-216 MHz and 512-698 MHz bands that is not shared with mobile services, there is no reason for the Commission to risk interference to public safety services by allowing unlicensed use in the 470-512 MHz band.

698-806 MHz (TV Channels 52-69)

The Commission reallocated the 698-746 MHz and 746-806 MHz bands for commercial and public safety mobile operations in 1997. While the slow pace at which this spectrum is being cleared of broadcast TV stations has delayed its use, mobile systems, including public safety operations, will be deployed nationwide. For public safety, every state already has a license to operate, regional plans are actively being developed, and equipment capable of

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16 Comments of Los Angeles County, ET Docket No. 02-380, Apr. 15, 2003, at 6 ("LA County comments").

17 *See id*. at 3 (stating that "permitting the use of [unlicensed] devices in the 470-512 MHz band in Los Angeles County, *or any other areas of the country*, raises serious interference concerns for the emergency service organizations that transmit voice and data on those channels" because unlicensed devices deployed in areas where commercial or public safety systems are not deployed "may be transported and used in Los Angeles County") (emphasis added).

18 *See id*. at 5 ("[A]llowing nascent technologies to share spectrum with public safety organizations simply poses too great an interference risk to consider at this time.").

operation in the band is available. The key holdup in deployment is the continued television incumbency in the band. In addition, band managers licensed to operate in the upper 700 MHz band are making progress in the deployment of services to private radio end users. Given the impending nationwide deployment of these services and the mobility of licensed users, this spectrum is not feasible for secondary unlicensed operations. In particular, given the critical nature of public safety and other critical mobile operations, the Commission should refrain from allowing any additional use of unlicensed devices within the 746-806 MHz band.

Accordingly, Motorola recommends that the Commission should restrict any experimentation with secondary unlicensed use of the TV broadcast spectrum to bands in which only fixed licensed operations exist,[19] *i.e.*, the 76-216 MHz and 512-698 MHz bands. Motorola notes that if adequate and reliable mechanisms can be developed to prevent interference to licensed broadcast operations, these two band segments would provide a substantial amount of spectrum for unlicensed use.

II. PERMITTING UNLICENSED USE OF THE 3650-3700 MHZ BAND WOULD BE PREMATURE AT THIS TIME, BEFORE SERVICE RULES FOR LICENSED USERS HAVE BEEN ESTABLISHED

The *Notice of Inquiry* seeks comments on the feasibility of permitting unlicensed devices to operate in the 3650-3700 MHz band.[20] At present, Part 15 rules prohibit any unlicensed

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19 *See id.*

20 Notably, the *Notice of Inquiry* does not suggest designating 3650-3700 MHz as an unlicensed band; instead, it merely asks whether the current prohibition on unlicensed operation in this band should be lifted to allow some use of unlicensed devices in conjunction with existing and future licensed uses. Consistent with the position expressed in the comments on the Task Force Report, Motorola recommends that future spectrum allocations below 6 GHz should be licensed on an exclusive use basis (or a command-and-control basis for public safety systems), with the exception of the 5470-5725 MHz band, which presents unique circumstances. *See* Motorola SPTF Comments at 23 & n.71.

operations in this band.[21] Motorola believes that amending Part 15 to allow unlicensed operation in this band would be premature at this time, before the Commission has finalized the service rules for licensed services in this band.

The Commission allocated the 3650-3700 MHz band for fixed and mobile (base stations) services on a primary basis in October 2000 and simultaneously instigated a rulemaking proceeding to consider licensing and service rules for this band.[22] That proceeding remains open and no licenses yet have been issued for new fixed and mobile services in the band.[23] Given the present state of flux in that proceeding, and the current lack of understanding with regard to what the technical and operating parameters would be for new licensed services in the 3650-3700 MHz band, it would be inappropriate to allow unlicensed operations to commence in this band.

The Commission should instead focus on developing the licensing and service rules so that new licensed fixed and mobile services can be deployed in the 3650-3700 MHz band. Once these parameters are determined, it would be possible to determine whether unlicensed operations in this band would be feasible, given the requirement that licensed users of this spectrum must be fully protected from interference from unlicensed devices.

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21 *See* 47 C.F.R. § 15.205(a).

22 Amendment of the Commission's Rules With Regard to the 3650-3700 MHz Government Transfer Band, ET Docket No. 98-237, First Report and Order and Second Notice of Proposed Rule Making, 15 FCC Rcd 20488 (2000).

23 *See Notice of Inquiry* ¶ 18.

III. CONCLUSION

Increased unlicensed use of TV broadcast spectrum may be feasible in some, but not all, TV broadcast channels. In particular, Motorola opposes allowing any increased use of unlicensed devices in the 54-72 MHz, 470-512 MHz or 698-806 MHz bands. Furthermore, if the Commission were to allow any increased unlicensed use of broadcast spectrum in the 76-216 MHz or 512-698 MHz bands, it must adopt technical rules to ensure that existing and future licensed users of this spectrum are fully protected from interference from unlicensed devices. With regard to the 3650-3700 MHz band, Motorola opposes allowing unlicensed operations in this band before the service rules for licensed fixed and mobile services are finalized.

Respectfully submitted,

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