

**Before the  
National Telecommunications and Information Administration  
WASHINGTON, D.C. 20230**

In the Matter of

United States Spectrum Management Policy  
for the 21<sup>st</sup> Century

Docket No. 040127027-4027-01

**COMMENTS OF MOTOROLA, INC.**

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Motorola, Inc. (“Motorola”) is pleased to submit these comments in response to the recent *Notice of Inquiry* (“*NOI*”) issued by the United States Department of Commerce National Telecommunications and Information Administration (“NTIA”) in the above-captioned proceeding.<sup>1</sup> Motorola commends the Bush Administration’s commitment to develop and implement a modernized United States spectrum policy.<sup>2</sup> As a technology company with \$3.77 billion dollars dedicated to research last year<sup>3</sup> and an equipment supplier and technical advisor to public safety, private wireless and commercial licensees, Motorola offers its views on improving the United States’ spectrum management polices regarding the organization, processes, and procedures affecting Federal government, State, local and private sector spectrum use.

**I. INTRODUCTION**

Radio communications play an increasingly important role in how people live, how businesses operate and how our country is protected and secured. As the scope and scale of

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<sup>1</sup> United States Spectrum Management Policy for the 21<sup>st</sup> Century, NTIA Docket No. 040127027-4027-01, *Notice of Inquiry*, (Feb. 2, 2002) (“*NOI*”).

<sup>2</sup> Presidential Memorandum on Spectrum Policy for the 21<sup>st</sup> Century, 69 Fed. Reg. 1568 (Jan. 9, 2004).

<sup>3</sup> Motorola Consolidated Statement of Operations - Q4 2003, [http://media.corporate-ir.net/media\\_files/irol/90/90829/reports/ERFinancials\\_Q403.pdf](http://media.corporate-ir.net/media_files/irol/90/90829/reports/ERFinancials_Q403.pdf)

systems and services available to meet the nation's communications needs continues to increase, proper management of the spectrum resource becomes increasingly important. Real world spectrum management must blend technical, economic, and public interest objectives in a way that provides the greatest benefit to the public. It is important to recognize that there can be no single methodology to managing the spectrum; it is necessary to apply the approaches and rules that best meet the needs of specific and diverse groups of spectrum users. However, it is possible to apply guiding principles to ensure a consistent and thoughtful approach.

Proper spectrum management will accommodate services that meet the requirements of users, supply the regulatory certainty necessary to drive investment in services and systems, maintain sufficient flexibility to allow an evolution of technologies, promote efficient operations, and provide opportunities for the introduction of new technologies. It is indeed a daunting task to balance these numerous—and sometimes competing—requirements, but finding the proper balance is key to promoting a competitive industry that leads in technology and provides the means for a more efficient and safer society.

## **II. SPECTRUM MANGEMENT PRINCIPLES**

In creating an effective plan for managing the spectrum, a set of guiding principles must be adopted against which individual decisions can be made. Motorola recommends the following such principles:

- 1) ***Base allocations on user requirements*** – Regulators must understand the needs of the users for which the spectrum is being allocated. Not all users or types of spectrum use are alike. To be effective, spectrum management must match the users' needs, such as cost-effective communications or mission-critical applications, with the spectrum under consideration.

- 2) ***Provide regulatory certainty*** – Allocation decisions should be made consistent with an overall framework for use of the spectrum that provides users with certainty that they will have full access to the spectrum and will be able to operate without suffering harmful interference from co-channel or adjacent channel licensees.
- 3) ***Promote efficient operation*** – Promoting efficient use of the spectrum is increasingly important. Efficient operation and spectrum use is much broader than merely a measurement of bits/Hz. The least efficient spectrum use is that which does not meet the users' key communications requirements. For example, channel widths can be made smaller, but any efficiency gains are outweighed if users are unable to complete the necessary communications reliably within the smaller bandwidths. One of the best ways to facilitate efficient use of the spectrum from a regulatory perspective is to provide a clear framework for how the spectrum will be used. Greater certainty about how the spectrum will be used will make the spectrum more attractive to manufacturers and licensees and will drive greater investment and competition in technologies. Equipment must be designed to be cost effective and usable in the environment that it must operate. An unpredictable environment where interference protection or the interference environment is highly uncertain makes it very difficult to design for efficient spectrum use and will drive away investment.
- 4) ***Strive for global harmonization*** – Because manufacturing and services are increasingly global in scale, spectrum harmonization should be a goal for any allocation decision. Harmonization will drive investment in technologies and services and will result in lower costs due to economy of scale. While differences in uses and requirements sometimes make it difficult, harmonization should be the norm rather than the exception. The U.S. should take a leadership role in shaping the international harmonization of spectrum use to ensure that it meets U.S. objectives and that U.S. bands can be deployed in other countries to the extent possible.
- 5) ***Use technical judgment*** – Allocations should be made in accordance with a technical framework that meets service and user requirements. For instance, wide-area mobile operations are best accommodated in spectrum below 3 GHz, while most fixed services and some localized on-site operations can be accommodated in higher frequencies. It is also more efficient to provide larger blocks of frequencies for a service rather than spread allocations over numerous smaller bands. Over the years, as services have been allocated in the absence of an overall plan or vision, a patchwork of relatively small blocks of spectrum has developed. This piece-meal process quickly fills up the bands and results in incompatible services being located adjacent to one another. Taking a long-term view of spectrum use would help ensure that sufficient spectrum would be allocated to cover both immediate and future needs and that operations would be compatible.
- 6) ***Encourage flexibility*** – There should be sufficient flexibility to allow evolution of technology and services. However, flexibility must be properly balanced against the greater need to protect users from interference and provide sufficient certainty to attract investment.

### **III. NEED FOR COMPREHENSIVE SPECTRUM POLICY**

#### **A. Lack of a Comprehensive Policy Plan Presents Obstacles to the Most Efficient and Beneficial Uses of the Spectrum.**

One of the biggest impediments to effective spectrum management in the U.S. is the lack of a comprehensive and long-term spectrum policy. In Motorola's view, the lack of comprehensive plan has resulted in insufficient spectrum allocations for a variety of radio services including public safety, private land mobile services and the commercial radio services.

For example, the piecemeal allocation of spectrum to public safety over time without adequate inventories for future growth has created a foundation that does not fully support interoperability and advanced technologies for public safety use. The U.S. should have a spectrum policy that supports homeland security by ensuring that adequate spectrum is available for local and state public safety, federal law enforcement and related defense activities. Simply put, failure to do so can lead to devastating results for American citizens.

For commercial mobile radio services, the lack of spectrum resources has caused exorbitant auction prices for the spectrum that is available for commercial use. The existing spectrum management approach has also resulted in: 1) commercial U.S. allocations not being harmonized with global spectrum allocations; 2) the US having less commercial spectrum allocations than many other countries; and, 3) an uncertain future for additional spectrum allocations. Such issues have negatively impacted the cost and timely availability of services in the commercial wireless sector.

The lack of a comprehensive national spectrum policy also has severe consequences for domestic productivity and global competitiveness of the United States. Without additional spectrum to put more communications and information technology applications into the hands of more end-users, the United States cannot maintain and advance its position as a leader and

shaper of the 21<sup>st</sup> century global economy and society. Not only does this have consequences for job creation by the wireless industry, which could be substantial, it puts at risk existing jobs as well.

**B. The Federal Government Should Establish a High Level Focal Point to Ensure Cohesive Spectrum Management Strategy and Policy.**

To bridge the divide between the spectrum management functions of the NTIA and the FCC and to facilitate resolution of interagency disputes that arise during spectrum management activities, the White House should appoint a special assistant to the President to oversee spectrum management.<sup>4</sup> As suggested by the CSIS Panel Report, this appointment, which could be accomplished through an executive order, should have three primary responsibilities:

- Oversee the development and implementation of a national spectrum strategy;
- Manage a new senior group for spectrum management that would develop the national strategy and serve as a dispute resolution mechanism for interagency spectrum issues;
- Provide guidance and continuity and assure interagency coordination and broad adherence to U.S. policy objectives in international spectrum negotiations.<sup>5</sup>

Certainly, the creation of a White House position to oversee spectrum policy during challenging times is not unprecedented.<sup>6</sup> Moreover, spectrum management functions were located within the White House until the Carter administration moved them to the Commerce Department. To be effective such an office must strive to understand the needs of key user groups, including local and state public safety, Federal law enforcement and emergency management, the military, commercial carriers and general public use of unlicensed spectrum. Each group's needs are

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<sup>4</sup> "Spectrum Management for the 21<sup>st</sup> Century," CSIS Commission on Spectrum Management, at 11 ("CSIS Panel Report").

<sup>5</sup> *Id.*

<sup>6</sup> CSIS Report at 12.

different and their input would play an important role in formulating a comprehensive spectrum management policy direction which FCC and NTIA could cooperate to implement.

**C. The United States Should Have One Unified Table Of Frequency Allocations**

A basic example of how the Administration could create efficiencies with a unified spectrum management policy is by establishing a single national policy document for the United States Table of Frequency Allocations. As the *NOI* notes, there are two published versions of the United States Table of Frequency Allocations, one compiled by NTIA<sup>7</sup> and the other by the FCC.<sup>8</sup> The tables have different priorities but are duplicative in other respects. Motorola supports replacing the existing tables with a single table of allocations to avoid discrepancies and potential confusion and promote a collaborative working arrangement between the two agencies.

The *NOI* also asks whether current exclusive allocations, such as government exclusive and non-government exclusive, are justified.<sup>9</sup> Motorola submits that exclusive allocations are justified in some cases to avoid the potential for interference to critical services. In other cases, exclusive allocations can provide for the most efficient operation.

**D. Improving The U.S. Approach to International Spectrum Management**

The *NOI* seeks comment on how to improve the effectiveness and efficiency of the U.S. national process for meeting with international telecommunications bodies such as the International Telecommunications Union (ITU).<sup>10</sup> Motorola believes that the Federal government must place a greater priority on international spectrum negotiations.

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<sup>7</sup> 47 C.F.R. Part 1.

<sup>8</sup> 47 C.F.R. § 2.106 (2002).

<sup>9</sup> *NOI*, question 4.

<sup>10</sup> *NOI*, question 7.

The division of responsibilities and leadership among the State Department, FCC, and NTIA has hindered a coordinated national strategy for international spectrum negotiations. In its report on DoD frequency spectrum issues, the Defense Science Board task force<sup>11</sup> concluded that the United States suffers on the international level from a lack of a cohesive spectrum management policy. In its report the Board concluded:

The United States lacks a national spectrum policy/strategy. The multiplicity of organizations charged, by the Communications Act of 1934, with spectrum management responsibility in the US each have different goals, objectives and constituencies. There is no effective mechanism to resolve conflicts, such as those that arise from pressures for spectrum from burgeoning civilian wireless services and military necessity. US delegations' ability to negotiate at international spectrum allocation meetings is hampered by lack of consistent attention to international spectrum matters. DoD must push for a single, national authority to rationalize the nation's approach to allocation the limited spectrum resource.<sup>12</sup>

An important improvement to international spectrum negotiations would be the appointment of a permanent ambassador to lead negotiations at World Radiocommunications Conferences (WRCs).<sup>13</sup> In a time of increasing global activity and technological change, the WRC every two to three years is the key forum for development of international spectrum policy through the revision of the ITU's Radio Regulations. Under the United States' current process, the U.S. ambassador to the WRC is appointed just a few months before the conference takes place and several years after preliminary negotiations among other countries have begun. This puts the U.S. ambassador at a severe disadvantage to his or her counterparts from other countries.

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<sup>11</sup> The mission of the Board is to advise the Secretary of Defense, the Deputy Secretary of Defense, the Under Secretary of Defense for Acquisition, Technology and Logistics, and the Chairman of the Joint Chiefs of Staff on matters relating to science, technology, research, engineering, manufacturing, acquisition process, and other matters that are of special interest to the Department of Defense.

<sup>12</sup> Report of the Defense Science Board Task Force on DoD Frequency Spectrum Issues, *Coping with Change: Managing RF Spectrum to Meet DoD Needs*, November 2000.

<sup>13</sup> CSIS Panel Report, 17.

Furthermore, because the position of the United States is created with input from the public and private sectors, as well as the various U.S. agencies with spectrum management responsibilities, the reconciliation process is complex and time consuming. The FCC initiated the public sector preparation process for WRC-07 shortly after the WRC-03 completed.<sup>14</sup> Given the time consuming nature of the reconciling private sector and government positions a joint process should be initiated as early as possible. If the United States is not ready to present its common positions at international preparatory meetings, the influence of the United States may be diminished as it is left out of the process. To resolve this shortcoming, the preparations of spectrum negotiation should be part of a longer-term planning process under a White House led spectrum policy process and a permanent WRC ambassador position should be established or, alternatively, the WRC ambassador should be appointed much earlier in the negotiating cycle.<sup>15</sup>

#### **IV. BARRIERS TO ACHIEVING INTEROPERABILITY OF RADIOCOMMUNICATIONS FACILITIES USED BY FEDERAL, STATE, LOCAL AND TRIBAL GOVERNMENTS**

The *NOI* requests comment on existing barriers to achieving interoperability of communications facilities among different government entities for homeland security and other government functions.<sup>16</sup> Specifically, NTIA asks for comment on how to improve standardization of the communications facilities used by State, local, and tribal governments to enhance interoperability among the equipment used by these various types of government entities. In addition, NTIA asks what technical assistance is most needed by State, local, and

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<sup>14</sup> FCC Chairman Powell appoints chair and vice-chare to the 2007 world radio-communication conference advisory committee, October 17, 2003, [http://hraunfoss.fcc.gov/edocs\\_public/attachmatch/DOC-240069A1.pdf](http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-240069A1.pdf)

<sup>15</sup> *Id.*

<sup>16</sup> *NOI*, question 6.

tribal governments for communication facilities planning for effective and efficient use of spectrum.

The vast majority of public safety communications pertains to the day-to-day activities of first responders within their local jurisdictions, and meeting these requirements must come first and foremost. However, a number of events require improved interoperability among agencies within a given jurisdiction, among different jurisdictions and even among state/local jurisdictions and Federal agencies. Such interoperability between among state and local first responders and federal agencies will best be achieved through planning, use of common industry-developed standards, and the availability of comparable spectrum resources. For example the P25 interoperability standard has been developed and supported by a partnership of local and state public safety agencies, Federal entities and industry. Multiple manufacturers build equipment to this standard. While much progress has been made in the area of standards, additional work is needed in the areas of ensuring spectrum availability and planning and spectrum practice. .

In responding to the tragic events at the Pentagon on September 11, 2001, the multiple local first responders were able to communicate effectively with one another because they operated on the same spectrum band and had planned and coordinated how to communicate with and between the local jurisdictions prior to the event. However, communication with federal entities joining in the response was not as effective because operation in other bands had not provided the foundation for planning and prior coordination was not conducted between local and federal entities. A greater emphasis should be placed on providing compatible spectrum and overall coordination and planning between any among all potential responders to ensure that they have the foundation and equipment necessary to provide interoperability among the various

communications networks used in day-to-day activities, and that they are prepared to respond in a coordinated manner.

As noted, one key aspect of achieving interoperability among the various jurisdictions is ensuring that sufficient spectrum is available and that state and local and federal responders have access to comparable and adequate spectrum resources. Such resources are not available today.

In 1997, Congress mandated that 24 MHz of spectrum in the 700 MHz band be made available for public safety at the state and local level. This spectrum will provide additional voice capacity, and will also accommodate a new generation of advanced wideband communications providing first responders video and data services that will greatly enhance their effectiveness and safety. However, nearly seven years later, there is still no certainty as to when this much needed spectrum will be available in most major urban areas due to the slow pace of the digital television transition. Congress, the FCC, NTIA and the Administration should act aggressively to ensure that this spectrum is made available for public safety use no later than the original anticipated date of December 31, 2006.

While spectrum for advanced services has been allocated for state and local public safety in the 700 MHz band, no spectrum for such advanced services has been identified for federal emergency responders or critical infrastructure. This is a critical shortcoming that must be addressed. It is unacceptable that federal responders and critical infrastructure entities do not have the spectrum resources available to provide access to video and data services that will enable more effective and safe operations, resulting in better protection for the entire public. Providing spectrum in a nearby band as that identified for state and local first responders will greatly facilitate the interoperability between and among federal and state and local responders. The 30 MHz of spectrum currently allocated for CMRS use in the 700 MHz band adjacent to that

already allocated to public safety could provide additional capacity and improved interoperability for state and local, Federal and critical infrastructure users. Accordingly, Congress, the Administration, FCC and NTIA should take steps to reallocate this commercial spectrum in the 746-806 MHz band and make this spectrum available for public safety and homeland security. After reallocation, a committee including representatives from the FCC, NTIA, Department of Homeland Security, state and local agencies, Federal law enforcement and emergency management agencies, critical infrastructure entities and industry should be charged with developing a plan how to apportion this 30 MHz of spectrum to maximize its use for Public Safety and Homeland Security.

**V. RECEIVER STANDARDS HAVE LIMITED POTENTIAL TO INCREASE SPECTRUM EFFICIENCY AND MINIMIZE HARMFUL INTERFERENCE**

The *NOI* seeks comments on how receiver performance standards can be used to increase spectrum efficiency and minimize harmful interference.<sup>17</sup> Motorola agrees with the idea that receiver performance impacts the efficient utilization of the spectrum; however, spectrum management should not rely on receiver standards to the exclusion of other system performance factors. Moreover, the introduction of receiver performance specifications should not be viewed as an opportunity to provide “underlay” users with access to licensed spectrum. Such an approach would create a more uncertain interference environment at the expense of users of licensed services and therefore undermine the impact of improved receiver performance.

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<sup>17</sup> *NOI*, question 24.

**A. Receiver Standards Are Just One Of Several Measures That Can Be Used To Minimize Interference**

Receiver performance represents only one factor in the interference equation. The susceptibility of a system to interference depends on the overall system design, not just the performance of the receivers. Moreover, as there are numerous different types of interference mechanisms, mitigation techniques need to be matched to the specific problem that is predicted or being experienced in a particular setting. For example, a requirement for appropriate spectral masking of transmitters is just as important as receiver selectivity in controlling out of band interference and increasing spectrum efficiency.<sup>18</sup> Accordingly, U.S. spectrum managers should not elevate their reliance on receiver performance standards above all other system performance factors. Rather, they should address interference mitigation from an overall system perspective.

To achieve efficient and predictable use of spectrum, the agencies responsible for spectrum management should seek to maximize the compatibility of services and users. This will require active spectrum management, rather than reliance upon any single technical parameter, such as receiver performance standards. Furthermore, effective spectrum management will require appropriate limitations on technical flexibility.<sup>19</sup> Unlimited flexibility would allow extreme variations in technical parameters and could result in systems with radically different power and operating characteristics operating in the same or adjacent

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<sup>18</sup> Comments of Motorola, Inc., FCC, ET Docket No. 02-135, Jan. 27, 2003, at 15 (“Motorola SPTF FCC Comments”). Increasing channel selectivity of receivers will have only a limited impact on out-of-band interference, whereas spectral masks at the transmission source can minimize this type of interference much more effectively. *See id.* Spectral masks therefore generally provide the more efficient and appropriate solution to out-of-band interference.

<sup>19</sup> *See* Spectrum Policy Task Force Report, FCC, ET Docket No. 02-135, at 16 (2002) (“FCC Spectrum Task Force Report”) (“[C]lear technical rules remain necessary in all spectrum bands in order to facilitate co-existence of multiple spectrum uses in common and adjacent bands.”); *see also id.* at 64 (recommending that flexible use should be permitted “within technical parameters”).

channels. Such a scenario would create the significant potential for harmful interference, uncertainty in the radio operating environment and inefficient use of spectrum.<sup>20</sup> For example, the FCC must continue to incorporate adequate frequency separation between base and mobile transmit bands and also designate the uplink and downlink bands for paired channel mobile operations.<sup>21</sup> Intermixing paired and “reverse paired” operations in the same channels invites increased interference. Practical receiver standards are not a solution to this interference.

Furthermore, there is a need to provide greater certainty regarding the interference and operating environment. Motorola supports the adoption of a more quantitative approach to defining the interference environment, though it has noted that this is a highly complex problem that requires considerable further study before it can be applied in the real world.<sup>22</sup> It is well understood that changes in the spectrum environment in which a particular licensee operates may affect the probability of interference. Depending on the type of interference, the licensee’s operational requirements and the nature of the change in environment, increased receiver interference immunity can be one element that helps mitigate interference. However, simply specifying a target level of receiver interference immunity without considering the other variables is not a solution to either interference mitigation or spectrum efficiency.

**B. Receiver Standards Should Not Be Used To Allow Underlay Users To Increase The Potential For Interference**

The process of developing receiver performance specifications should not be used as an opportunity to impose overly burdensome standards on the industry in order to increase access by unproven “underlay” users that are seeking to operate in licensed bands. Allowing such

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<sup>20</sup> See *id.* at 4-6.

<sup>21</sup> See, e.g., Comments of Motorola, Inc., FCC, WT Docket No. 02-353, Feb. 7, 2003, at 5.

<sup>22</sup> See Motorola SPTF FCC Comments at 13-14 & Appendix A.

underlay access would introduce myriad new sources of interference into the operating environments of existing licensees, which is antithetical to the objective of interference avoidance. Because unlicensed underlay users may operate without consultation with incumbents, the operating environment for licensees would become significantly less predictable than it is today, increasing the potential for unanticipated incidences of interference. The end result would be to limit innovation and to deter licensees and the manufacturers who serve them from making the investments necessary to develop and deploy new technologies. Furthermore, in such a scenario, the additional cost of deploying receivers with improved performance specifications would be placed on existing licensees, not on the unlicensed users who would be given additional rights to spectrum access.

For all of these reasons, the Administration's objective should be to promote efficient use of spectrum consistent with users' operational requirements, thereby attracting the investment necessary to develop and deploy useful and reliable systems. This requires continued spectrum management to ensure that incompatible systems are not placed in the same spectrum in the interest of some elusive efficiency or flexibility goals. Motorola thus believes that underlay access to licensed bands should be established through secondary market arrangements, not a "commons" underlay approach.<sup>23</sup>

## **VI. CONCLUSION**

Motorola again commends the Administration on its efforts to promote efficient spectrum use consistent with operational needs and a predictable spectrum environment upon which to base system designs. The first step to creating an effective plan for managing the spectrum is the adoption of a set of guiding principles against which individual decisions can be made. Next, the

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<sup>23</sup> See Motorola SPTF FCC Comments at 23 & n.72.

Federal government should establish a focal point to guide development of a long-term spectrum management policy. One key element of this policy would be to allocate the spectrum needed by local, state, Federal and critical infrastructure entities to form the foundation for improved interoperability and implementation of advanced technologies to support Homeland Security for both day-to-day and catastrophic events. Other key elements include improved focus on commercial services and, in particular, improved harmonization with global allocations. Finally, receiver standards should be used as only one of several tools for achieving interference mitigation and cannot be relied on as a substitute for active spectrum management.

Respectfully submitted,

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