

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

In the Matter of	)	
	)	
Unlicensed Operations in the TV Broadcast Bands	)	ET Docket No. 04-186
	)	
Additional Spectrum for Unlicensed Devices Below 900 MHz and in the 3 GHz Bands	)	ET Docket No. 02-380
	)	

**PETITION FOR RECONSIDERATION OF MOTOROLA SOLUTIONS, INC.**

Motorola Solutions, Inc. (“Motorola Solutions”)<sup>1</sup> hereby seeks reconsideration of the Commission’s Second Memorandum Opinion and Order in the above-captioned proceeding.<sup>2</sup> Motorola Solutions urges the Commission to make further modification to its rules governing the out-of-band emissions (“OOBE”) limits applicable to fixed TV Band Devices (“TVBD”) in order to better support the Commission’s goal of extending broadband service. These recommended changes can be implemented without negatively impacting protected incumbent services.

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<sup>1</sup> Motorola Solutions has previously participated in this proceeding under the corporate name Motorola Inc. (“Motorola”). On January 4, 2011, Motorola, Inc. completed the separation of its Mobile Devices and Home businesses through the distribution of all of the common stock of Motorola Mobility Holdings, Inc. to its stockholders. Motorola, Inc. then changed its name to Motorola Solutions, Inc. and will continue to operate Motorola’s Enterprise Mobility Solutions and Networks businesses to offer a comprehensive end-to-end portfolio of products and solutions, including rugged two-way radios, mobile computers, secure public safety systems, barcode scanning, RFID readers and wireless network infrastructure to enterprises and governments, as well as 4G broadband infrastructure, devices and services to network operators globally.

<sup>2</sup> *Unlicensed Operation in the TV Broadcast Bands; Additional Spectrum for Unlicensed Devices Below 900 MHz and in the 3 GHz Band*, ET Docket Nos. 04-186 and 02-380, *Second Memorandum Opinion and Order*, FCC 10-174 (rel. Sept. 23, 2010) (*Second MO&O*).

## I. Introduction and Summary.

The *Second MO&O* refines the technical standards originally adopted in the *Second Report and Order* that are applicable to unlicensed devices designed to operate in unoccupied portions of the spectrum allocated to the TV broadcast services.<sup>3</sup> Motorola Solutions is a strong supporter of the Commission's actions in this proceeding because TVBDs offer remarkable promise for helping this nation expand the provision of wireless broadband services, particularly to underserved and rural communities.

The goal of promoting the development of cost-effective broadband TVBD technologies must be balanced against the need to protect incumbent services from interference. Throughout this proceeding, Motorola Solutions has supported the vast majority of the technical framework adopted by the Commission, including the many provisions that are intended to protect incumbent services from interference.<sup>4</sup>

In this petition, Motorola Solutions asks the Commission to reconsider one rule that could seriously impede the development of TVBDs.<sup>5</sup> Specifically, Motorola Solutions recommends that the Commission modify the rules for adjacent channel OOB as they apply to fixed TVBDs. The adopted limits for suppressing OOB far exceed industry standards for IEEE 802.11 and

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<sup>3</sup> *In the Matter of Unlicensed Operations in the TV Broadcast Bands*, Second Report and Order and Memorandum Opinion and Order, 23 FCC Rcd 16807 (2008).

<sup>4</sup> *See, e.g.* Petition For Reconsideration And Clarification, Motorola, Inc., ET Docket No. 04-186, submitted March 19, 2009, at 2.

<sup>5</sup> While this petition seeks reconsideration solely on the OOB issue for fixed TVBDs described herein, Motorola Inc. was a party to a recent letter seeking modifications to the height limitation on TVBD antenna placement above average terrain (*i.e.*, "HAAT"). *See Written Ex Parte Presentation from The Wireless Internet Service Providers Association, Motorola, Inc., Spectrum Bridge, Inc., Comsearch, Carlson Wireless Technologies, Inc. and the Federation of Internet Solution Providers of the Americas to Julius Knapp, Chief, Office of Engineering and Technology, Federal Communications Commission*, ET Docket No. 04-186, submitted December 14, 2010. The HAAT issue is being addressed in a separate petition for reconsideration to the *Second MO&O*.

IEEE 802.16 compliant technologies. This will preclude the use of existing, off-the-shelf spectrally efficient technologies and require the development of unique transmitter and variable frequency filtering solutions for TVBDs. The additional costs associated with the development of this additional filtering will place TVBDs at a distinct disadvantage to unlicensed devices designed to operate in the 2.4 GHz and 5 GHz bands and will likely threaten the economic viability of TV white space devices, especially to provide broadband service in rural areas.

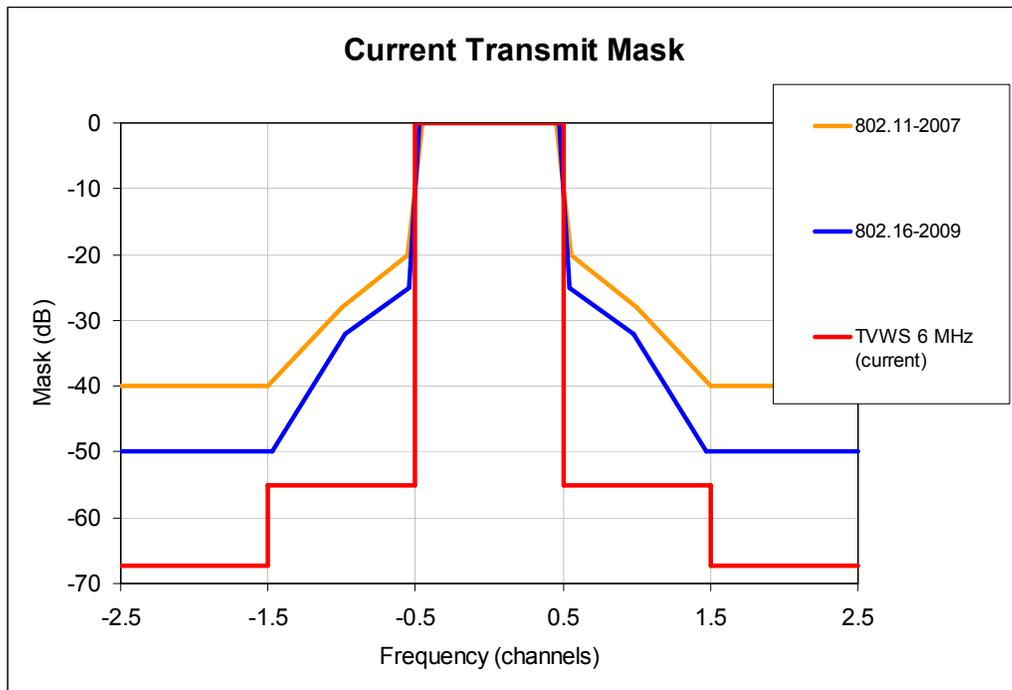
While Motorola Solutions would support consideration of a straight-forward relaxation of the OOB mask for all fixed TVBDs, it recognizes that such rule changes can be involved and take months to consider. Motorola Solutions therefore recommends that the Commission consider a more expedient alternative that would allow fixed TVBDs to operate with less stringent OOB limits in areas further removed from adjacent channel TV facilities. The Commission's rules already prohibit fixed TVBDs from operating within the protected service contour of adjacent channel television stations by specifying the minimum distances that TVBDs must be located beyond the protected contours of adjacent channel television stations.<sup>6</sup> If the Commission relaxes the OOB limits for fixed TVBD, it can provide equivalent protection to adjacent channel TV reception by increasing the required separation from the protected TV contours. To this end, Motorola Solutions recommends that the Commission allow fixed TV band devices to operate with less stringent adjacent channel OOB attenuation requirements when they are operated at certain, specified distances beyond the protected contours of adjacent channel television stations. Geo-location database technology can be used to ensure that fixed devices subject to a relaxed adjacent channel OOB mask are operated only in appropriate areas based on the increased separation distances recommended herein.

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<sup>6</sup> See 47 C.F.R. § 15.712(a).

## II. The Adopted OOB Limits Exceed Industry Standards.

Section 15.709(c)(1) of the Commission's Rules provides that in the 6 MHz channels adjacent to the operating channel, emissions from TVBD devices shall be at least 72.8 dB below the highest average power in the band.<sup>7</sup> As shown in the following figure (expressed in terms of OOB rejection per normalized channel bandwidth, e.g., 6 MHz), this level of attenuation greatly exceeds industry standards for wireless broadband technologies that are currently operating in other frequency bands.



At the channel edge, the Commission's current OOB mask for devices operating in the TV white spaces is 30-40 dB more stringent than the channel bandwidth normalized masks for the IEEE 802.11 and IEEE 802.16 industry standards established for Wi-Fi and WiMAX

<sup>7</sup> See 47 C.F.R. § 15.709(c)(1). Note that OOB that are -72.8 dB in the adjacent channel when measured in a 6 MHz on-channel bandwidth and a 100 kHz off-channel bandwidth are equivalent to adjacent channel OOB that are -55 dB in the adjacent channel when measured in a 6 MHz on-channel bandwidth and a 6 MHz off-channel bandwidth.

technologies. In addition, TVBD devices are also required to meet the “absolute” emission levels in the alternate channel (*e.g.*, 6 MHz beyond the edge of the TVBDs’ channel) as specified in Section 15.209(a).<sup>8</sup> Taken together, these emission limits are far more stringent than other competing technologies and preclude the use of existing broadband communications technologies in TVBDs. Motorola Solutions estimates that these emissions limits combine to impose a 65% surcharge on fixed TVBD customer premises equipment compared to comparable devices operating in other frequency bands.<sup>9</sup>

The OOB limits also impact network capacity and data throughput as more of the 6 MHz channel used by the TVBD network will need to be used as a transition band to achieve the required level of suppression at the channel edge. Accordingly, less of the channel bandwidth will be available for data traffic and wide area coverage. Additional access points will be needed to account for this loss of capacity, further driving up system deployment costs. Motorola Solutions estimates that for a given wide area network, the need for additional infrastructure will increase network costs by approximately 33%.<sup>10</sup> Combined with the additional fixed device CPE costs, Motorola Solutions estimates that wireless broadband service providers would need to increase customer monthly service fees by 50% to account for these costs.<sup>11</sup>

While Motorola Solutions intends to develop TV band devices, these cost penalties threaten their market viability. By allowing fixed TVBDs to operate with relaxed OOB specifications, the Commission will enable such devices to fulfill the promise of new broadband

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<sup>8</sup> For frequencies above 216 MHz, this emission limit is 200 microvolts/meter measured at a distance of 3 meters from the radiating device. *See* 47 C.F.R. § 15.209(a).

<sup>9</sup> *See Letter from Barry S. Lamberman, Director, Motorola Inc. to Marlene H. Dortch, Secretary, Federal Communications Commission, ET Docket No. 04-184, submitted December 7, 2010, at Attachment, page 4.*

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

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

services, especially in rural areas. In the following section, Motorola Solutions provides its analysis and recommendations on how to maintain protection to incumbents equivalent to that provided by the current rules when using a relaxed OOBE mask.

### **III. A Relaxed OOBE Mask Coupled With Greater Distance Separation Can Provide Equivalent Protection To Incumbent Services.**

In the *Second MO&O*, the Commission did not adopt the recommendation of Motorola Inc. to relax the OOBE mask because “[a]djacent channel emissions from a TV bands device appear as co-channel emissions in an adjacent channel used by a TV station or other authorized service” and noted that “[p]ersonal/portable TV bands devices are permitted to operate within the protected contours of adjacent channel TV stations, and fixed TV bands devices can operate as close as 0.1 kilometers outside the contours of adjacent channel stations and at significantly higher power than personal/portable TV bands devices.”<sup>12</sup>

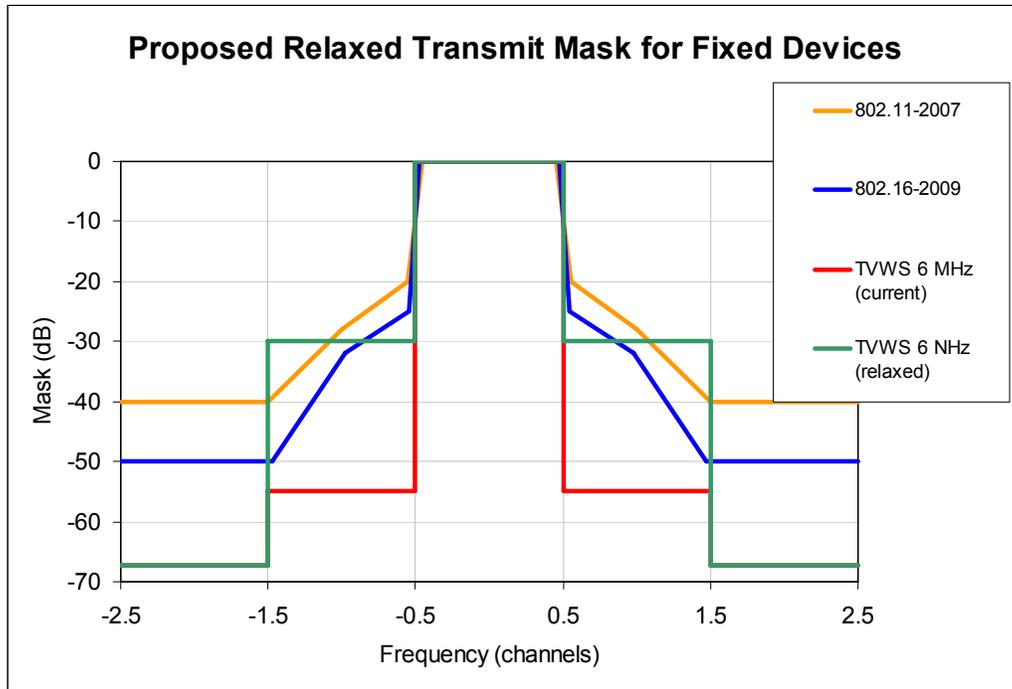
The Commission’s analysis on fixed devices implicitly recognizes that the level of protection for adjacent channel TV reception is a function of TVBD transmitter power, OOBE suppression, and separation from the protected adjacent channel TV contour. The degree of adjacent channel OOBE suppression can be relaxed without harm to protected TV service if the separation distance outside the protected contour of an adjacent channel station is increased. To foster the development of cost-effective products and service, Motorola Solutions urges the Commission to adopt rules that implement this type of flexibility, as discussed below.

Motorola Solutions recommends that the Commission allow fixed TVBD devices to operate with OOBE limits that are more consistent with other industry technologies such as Wi-Fi and WiMAX. Doing so will leverage the use of state-of-the-art filters and other components that are available in volume quantities, thereby reducing costs. Specifically, Motorola Solutions

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<sup>12</sup> *Second MO&O* at ¶ 88.

recommends that the Commission adopt adjacent channel transmit spectral mask requirements for fixed TVBDs to be -47.8 dBr/100 kHz, which represents a 25 dB relaxation.<sup>13</sup> In the following chart, the proposed adjacent channel levels are normalized to 6 MHz for fair comparison with other industry masks:



Use of this relaxed OOB mask would require additional separation distance corresponding to an additional 25 dB compensating path loss between the TVBD and the protected TV contour to maintain equivalent signal levels at the edge of protected contours as under the current rules. In analyzing the required separation distances, fixed TVBD adjacent channel OOB (falling co-channel into the TV receiver, when operating outside of a protected contour) dominate the interference protection computations. Using the DTV protected contour levels and receiver co-channel D/U protection ratios previously established in this proceeding, as

<sup>13</sup> The “r” in “dBr” indicates that the measurement is relative to the 6 MHz on-channel bandwidth power.

well as the relevant FCC propagation tools to model interference from fixed TVBDs (TM-91 for antenna heights below 30 meters and the F(50,10) propagation curves for antenna heights of 30 meters), Motorola Solutions has calculated the additional separation from the TV contours that would be necessary to provide equivalent protection as the existing rules. Motorola Solutions recommends that the Commission adopt the following distance separations in conjunction with the relaxed mask.

Antenna Height of Fixed Unlicensed Device	Required separation distance (km) from Digital or Analog TV (Full Service or Low Power) Protected Contour		
	Co-Channel Separation Distance (No Change)	Adjacent Channel Separation Distance (for existing mask)	Adjacent Channel Separation Distance (for relaxed mask)
Less than 3 m	6.0 km	0.1 km	0.8 km
3 m – Less than 10 m	8.0 km	0.1 km	1.4 km
10 m – Less than 30 m	14.4 km	0.74 km	2.5 km

To implement this recommended change, the Commission could simply allow the more relaxed mask with increased separations to be applicable to all fixed devices. This approach avoids the need to classify or distinguish which type of fixed device is operational (*i.e.* whether the fixed device is operating with the original or relaxed mask).

Alternatively, the Commission could also create a new class of fixed TVBD that would utilize the relaxed spectral mask level and be subject to the greater separation distances outside the protected adjacent channel TV contour.<sup>14</sup> To prevent unauthorized operation, all TVBDs are assigned an FCC ID, which must be transmitted to the database in a secure manner in order to verify that the device is authorized under the rules. Using this information, the geo-location databases can readily enforce different separation distances depending upon the device type that accesses the database through the use of an internal mapping table that associates valid FCC IDs

<sup>14</sup> Under either scenario discussed above, all fixed TVBDs would continue to be required to meet current Section 15.209 emissions levels in the alternate channels.

with device class. Motorola Solutions has spoken to several database applicants seeking to maintain a geo-location database for TVBD operation and is not aware of any issues with the database management of this proposed approach. In fact, requiring the geo-location data base to determine available frequencies based in part on the out-of-band performance of the TVBD device is the approach being recommended by the UK's Ofcom for that country's use of TV white spaces.<sup>15</sup>

Motorola Solutions does not believe that any additional measures would be needed to protect other incumbent services from fixed TVBDs that operate with a relaxed OOB mask. In the 11 markets where land mobile services are allocated spectrum in the 470-512 MHz band, fixed TVBDs are already prohibited from operating within 134 km for co-channel operations and 131 km for adjacent channel operations from the center-city coordinates of the cities where land mobile service is authorized.<sup>16</sup> These separation distances are sufficient to protect land mobile stations from the increased TVBD OOB proposed herein. Similarly, Motorola Solutions believes that it is not necessary to provide increased adjacent channel protection to other services or devices that use the TV band spectrum such as TV receive sites (*e.g.*, cable head-ends) and wireless microphones as a result of adopting the proposed relaxed OOB mask. However, if data is presented that demonstrates an increased potential for interference, these services and devices could be similarly protected by slightly increasing the separation or keep-out zones around those services for adjacent channel TVBD usage in the geo-location database. Again, such changes would be straightforward to implement in the database if necessary.

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<sup>15</sup> See *Implementing Geolocation*, Ofcom, November 9, 2010, Annex 4, available at <http://stakeholders.ofcom.org.uk/binaries/consultations/geolocation/summary/geolocation.pdf>.

<sup>16</sup> 47 C.F.R. § 15.712(d).

#### **IV. Conclusion.**

Motorola Solutions shares the Commission's goals of expanded broadband connectivity to all U.S. citizens and believes that TVBDs could be a key component of an overall improved broadband access approach. However, if the technical standards price the technology beyond what the market can bear, the broader vision will be frustrated and TVBDs will be reduced to an insignificant niche technology. Motorola Solutions therefore urges the Commission to reconsider its rules for unlicensed devices in the TV white space spectrum in accordance with the recommendation provided herein.

Relaxing the adjacent channel OOB mask for fixed TV band devices as recommended will provide significant benefit in the deployment of cost-effective broadband equipment and deployment, especially for underserved and rural areas where consumer cost sensitivity is high. Motorola Solutions recommends modifications to the rules that will maintain equivalent interference protection for incumbent operations as that provided by the rules adopted in the *Second MO&O*. Motorola Solutions urges the Commission to modify the rules as recommended expeditiously for fixed devices so that TVBD manufacturers and service providers can enable broadband solutions that help implement the goals of the National Broadband Plan.

Respectfully Submitted,

/s/ Chuck Powers

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