



Marlene H. Dortch, Secretary
Federal Communications Commission
Office of the Secretary
445 12th Street, SW
Washington, DC 20554

February 8, 2010

Re: Comments of Motorola in ET Docket RM-11592

Dear Ms. Dortch:

Motorola provides the attached information related to the Petition filed by the 700 MHz Good Faith Purchaser Alliance (“Alliance”). The petition seeks a Commission mandate that mobile devices operating in the 700 MHz band be capable of operating on all paired commercial 700 MHz blocks and seeks an immediate freeze of all commercial equipment authorized by the Commission unless the equipment is capable of operation over all commercial licensed blocks in the 700 MHz lower and upper blocks.

Motorola urges the Commission not to pursue the restrictions requested by the Alliance. Such a requirement would constitute an unwarranted and unprecedented restriction on the design and operation of devices and would attempt to use regulatory fiat to overcome the technical difficulties of implementing devices in the 700 MHz band. Because the work to define band classes in the standards body is based on technical realities, a Commission action to require mobile devices to be capable of operation over all of the commercial blocks would significantly delay deployment of broadband services in the 700 MHz band.

The LTE standards developed by the 3GPP standards organization have defined 4 band classes which cover the paired 700 MHz blocks auctioned by the Commission. As manufacturers work in partnership with license holders to develop plans to deliver products for commercial deployment many factors must be taken into account. These factors are driven by market and technical requirements for the segment an operator is planning to address. If that market segment is a mobile device then the form factor, number of legacy bands to support and requirements for national and international roaming¹ will place severe constraints on the device due to the issues associated with limited power availability² and available physical space with-in the device³. If the

¹ Such as the legacy mobile bands such as the cellular bands, the PCS bands or the AWS bands and generally includes some of the band requirements for GPS capabilities, WiFi features and Bluetooth features. For a mobile device which is intended to roam internationally, specific bands for intended roaming countries will require support.

² Power consumption of a mobile device will be factors of the number of filters, duplexers, power amplifiers which must be included to support the multitude of bands included in the device.



operator is looking to meet a US specific market segment via a device such as PCMCIA card or USB dongle then requirements for multiple bands may not be present (i.e. a device may not require Bluetooth/WiFi and/or roaming on international 3G bands) and the device will have a different form factor compared to a handheld mobile device. All these factors must be taken into consideration as manufactures develop plans for devices and continuing to allow the market, rather than regulations, to dictate the appropriate combination of technical features and form factors provides a robust competitive market that provides the best drive the features / capabilities for each unique segment of the marketplace.

The multiple band classes defined by the 3GPP standards organization result from that organization's recognition of this variability among devices and the technical challenges of producing mobile devices in the band that cover all of the commercial blocks given the particularly difficult interference environment. One example is 3GPP band class 17 which specifies operation in the lower 700 MHz blocks B and C. In this case, the difficulties associated with potential interference from mobile devices to TV channel 51 receivers and interference from block D and E 50 kW transmitters drove the development of this band class in order to implement duplexer / filter requirements with current technology. On interference to Channel 51 TV receivers, the 3GPP standards decision is similar in function to the requirements the FCC placed on personal / portable TVWS devices in 15.709(a)(2) where the operation of a TVWS device, when it is within the adjacent channel service area of a broadcast station, is limited to 40 mW EIRP, much less than the 3W ERP permitted under 27.50(c) for 700 MHz portable stations in block A. High power transmitters on blocks D and E also drive a requirement for duplexers to ensure that mobile devices will not perform poorly in the areas surround the high power transmitters. Both the interference to channel 51 TV receivers and interference from block D and E high power transmitters are dependant upon the capabilities of filters / duplexers and have been provided previously to the Commission as part of the its AWS-2 (WT Docket No. 04-356)⁴ and AWS-3 (WT Docket No. 07-195)⁵ proceedings.

For the reasons detailed above Motorola urges the Commission to dismiss the petition. Failure to do so will introduce delays in developing and delivering devices to the wireless broadband market place and will increase cost, complexity and form factor of devices due to the technical challenges associated with the requested mandate.

³ As more bands are added to a device quite often multiple specific parts are required to be added, this increases the physical space with-in the device and competes with form factors demanded by mobile device users.

⁴ ExParte Notice of Motorola, WT Docket 04-356, August 24, 2005 at slide 10 for duplexer data.

⁵ Erratum to Comments of Motorola, WT Docket 07-195, December 17, 2007.



Pursuant to the Commission's Rules, one copy of this notice is being filed electronically with the Commission. If you require any additional information please contact the undersigned at (202) 371-6953.

Sincerely,

/s/ Steve B. Sharkey
Steve B. Sharkey
Senior Director, Regulatory and Spectrum Policy
Motorola, Inc.

/s/ Robert D. Kubik
Robert D. Kubik, Ph. D.
Director, Regulatory and Spectrum Policy
Motorola, Inc.

/s/ Alexander Gerdenitsch
Dr. Alexander Gerdenitsch
Radio Spectrum Engineer
Motorola, Inc.

Cc: Tom Peters (OSP), John Leibovitz (WTB), Walter Johnston (OET), Ira Keltz (OET), Alan Stillwell (OET)

Motorola Comments on Petition for Rulemaking Regarding 700 MHz Mobile Equipment



Motorola - Petition for Rulemaking regarding 700 MHz Mobile Equipment

Background

- **“700 MHz Block A Good Faith Purchaser Alliance” filed Petition for Rulemaking Regarding the Need for 700 MHz Mobile Equipment to be Capable of Operating on All Paired Commercial 700 MHz Frequency Blocks¹.**
- **700 MHz Block A Good Faith Purchaser Alliance:**
 - **Cellular South Licenses, Inc.; Cavalier Wireless, LLC; Continuum 700, LLC; and King Street Wireless, L.P.**
 - **Petitioners purchased spectrum in the lower 700 MHz band Block A as well as Block B**
 - **Top Block A Winning Bidders in Auction 73:**

Cellco Partnership d/b/a Verizon Wireless	\$2,569,509,000
MetroPCS 700 MHz, LLC	\$313,267,000
Cox Wireless, Inc.	\$276,264,000
Cellular South Licenses, Inc.	\$184,245,000
King Street Wireless, L.P.	\$169,227,000
Vulcan Spectrum LLC	\$112,793,000
CenturyTel Broadband Wireless LLC	\$112,102,000
Continuum 700 LLC	\$88,179,000
Cavalier Wireless, LLC	\$58,115,000
- **The Petitioners raise the concern that equipment availability will be only in limited bands.**
- **Petition is asking FCC to initiate rulemaking to adopt rules that place severe product restriction on equipment manufactures**
 - **Equipment has to be capable to operate on all paired commercial Lower and Upper 700 MHz bands**
 - **Immediately freeze any equipment authorization in 700 MHz bands**



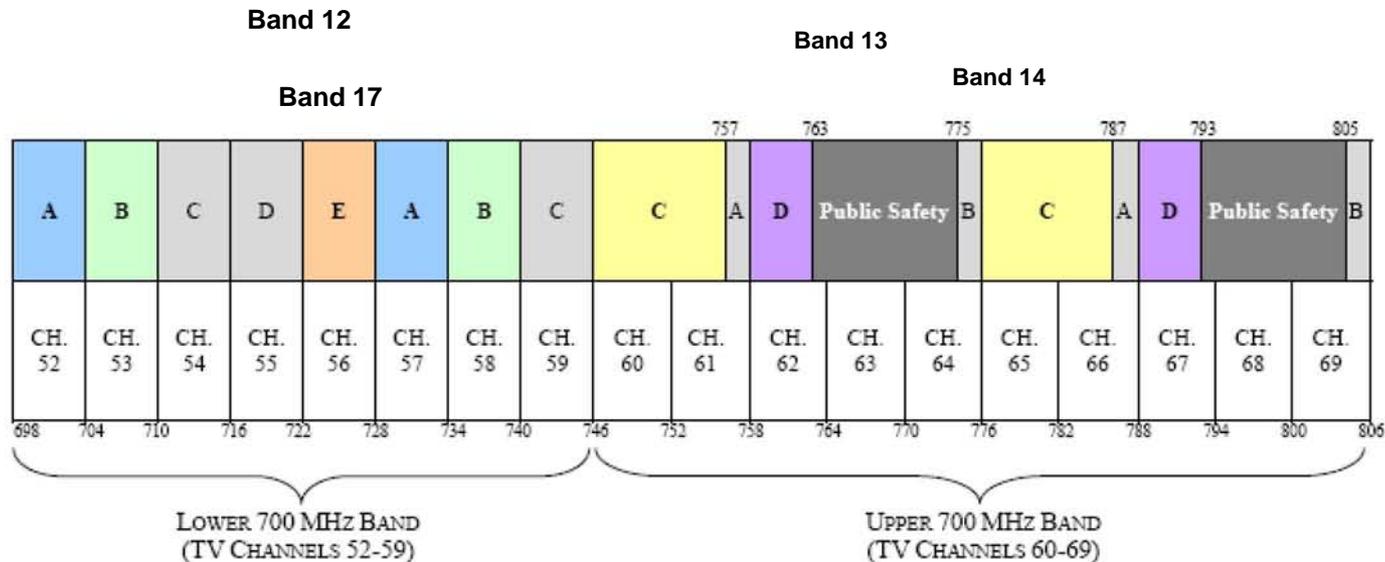
¹See Petition of 700 MHz Block A Good Faith Purchaser Alliance, *Petition for Rulemaking Regarding the Need for 700 MHz Mobile Equipment to be Capable of Operating on all Paired Commercial 700 MHz Frequency Blocks* (FCC filed Sept. 29, 2009).

Motorola - Petition for Rulemaking regarding 700 MHz Mobile Equipment

700 MHz Band Plan Overview

Mobile Tx
Base Tx

- 3GPP defined bands:

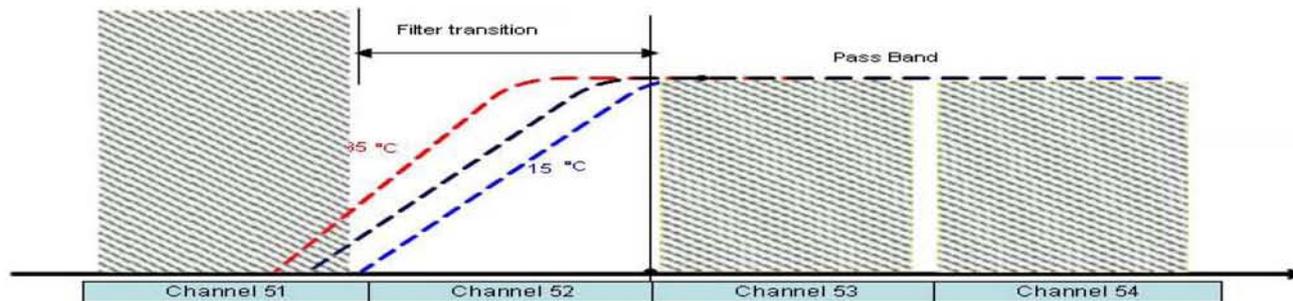


- In total 4 defined bands to cover both, lower and upper 700 MHz band:
 - Lower 700 MHz: Band 12 and Band 17
 - Upper 700 MHz: Band 13 and Band 14
- 3GPP defined bands after diligent technical assessment
 - Requirements and technical feasibility
 - Interference situation with broadcast and public safety systems
 - Device-to-device interference

Motorola - Petition for Rulemaking regarding 700 MHz Mobile Equipment

Introduction of 3GPP Band 17

- Introduction due to interference situation with broadcast
- Motorola contributed to 3GPP work¹
- New band to address co-existence issues with high power TV broadcast transmission in channel 51 (up to 1000kW ERP)² and other high power transmissions in Lower 700 MHz³
- Implementation aspects:
 - Impact on Tx IMD and Rx Blocking → Block A (channel 52 and 57) used as filter transition



- Duplexer performance: wider duplex gap
- Improved self interference

Motorola - Petition for Rulemaking regarding 700 MHz Mobile Equipment

Implementation of 3GPP Band 12 versus Band 17

- **State of the art duplexers yield filter transition of ~5MHz**
 - Considers variations of temperature and duplexer variations
- **Lower 700 DL Challenges:**
 - Due to filter transition, Block E TX will be received in the 3GPP Band 12 passband
 - **Block E TX jamming of 3GPP Band 12 receiver due to:**
 - Receiver P1dB compression
 - Receiver second order Intermodulation
 - Crossmodulation when in the presence of adjacent channel interferers
 - **Block E TX emissions land in Block A**
- **Lower 700 UL Band Challenges:**
 - **Block A TX emissions land in Channel 51 receivers (OOB emission requirements)**
 - **3GPP Band 12 duplexer makes it more difficult to attenuate channel 51 TX**
 - Leads to reverse PA intermodulation, which falls into mobile receive band of 3GPP Band 12
 - Same effect occurs with Block D or E TX

Motorola - Petition for Rulemaking regarding 700 MHz Mobile Equipment

Roaming – User Equipment for Global Market

- **3GPP defines a set of band classes for TDD and FDD: currently 24 bands¹**
- **For national and international roaming user equipment has to support several bands:**
 - 4 GSM bands (850 MHz Cellular, 1.9 GHz PCS, European GSM bands)
 - AWS band
 - 2 GHz UMTS band for Europe / Japan
 - 2.6 GHz band
 - US 700 MHz (4 bands defined by 3GPP)
 - EU 800 MHz
 - Region 3 Digital Dividend bands (at least 2 bands to be defined)
 - TDD band (e.g roaming for China)
- **User Equipment has to support at least several bands and several technologies**
 - **Technical limitation on number of bands supported, as for each band full Tx/Rx chain is required**
 - Filters, duplexers, PA, switches are all factors that must be considered along with power consumption and form factor
 - **In addition to commercial mobile service bands, devices included other wireless technologies.**
 - GPS, WLAN and Bluetooth
- **Current technology would limits bands selection in devices**
 - **Antenna performance for multi band terminal becomes a challenge**
 - **RX diversity is mandatory for LTE**

Motorola - Petition for Rulemaking regarding 700 MHz Mobile Equipment

Summary

- **Motorola urges the FCC not to adopt restrictions that would delay broadband services in the 700 MHz band**
- **All Technology decisions by carriers are covered by the 3GPP standards**
 - 3GPP defined in total 4 bands to cover lower and upper 700 MHz band based on FCC band plan
 - Introduction of those 4 bands consider factors related to technical requirements
 - Devices delivered to the marketplace take into account not only national requirements to support new and legacy bands but also international roaming requirements
 - Any band selection requirements not driven by the marketplace would likely delay the introduction of equipment and increase costs
- **The proposed freeze of equipment authorization and subsequent rulemaking would only delay the development and marketplace deployment of 700 MHz broadband equipment**
- **Motorola urges the FCC to dismiss the petition**

Motorola - Petition for Rulemaking regarding 700 MHz Mobile Equipment

BACKUP SLIDES

Motorola - Petition for Rulemaking regarding 700 MHz Mobile Equipment

3GPP defined band classes¹

Table 5.5-1 E-UTRA operating bands

E-UTRA Operating Band	Uplink (UL) operating band BS receive UE transmit	Downlink (DL) operating band BS transmit UE receive	Duplex Mode
	$F_{UL_low} - F_{UL_high}$	$F_{DL_low} - F_{DL_high}$	
1	1920 MHz – 1980 MHz	2110 MHz – 2170 MHz	FDD
2	1850 MHz – 1910 MHz	1930 MHz – 1990 MHz	FDD
3	1710 MHz – 1785 MHz	1805 MHz – 1880 MHz	FDD
4	1710 MHz – 1755 MHz	2110 MHz – 2155 MHz	FDD
5	824 MHz – 849 MHz	869 MHz – 894 MHz	FDD
6	830 MHz – 840 MHz	875 MHz – 885 MHz	FDD
7	2500 MHz – 2570 MHz	2620 MHz – 2690 MHz	FDD
8	880 MHz – 915 MHz	925 MHz – 960 MHz	FDD
9	1749.9 MHz – 1784.9 MHz	1844.9 MHz – 1879.9 MHz	FDD
10	1710 MHz – 1770 MHz	2110 MHz – 2170 MHz	FDD
11	1427.9 MHz – 1447.9 MHz	1475.9 MHz – 1495.9 MHz	FDD
12	698 MHz – 716 MHz	728 MHz – 746 MHz	FDD
13	777 MHz – 787 MHz	746 MHz – 756 MHz	FDD
14	788 MHz – 798 MHz	758 MHz – 768 MHz	FDD
17	704 MHz – 716 MHz	734 MHz – 746 MHz	FDD
...			
33	1900 MHz – 1920 MHz	1900 MHz – 1920 MHz	TDD
34	2010 MHz – 2025 MHz	2010 MHz – 2025 MHz	TDD
35	1850 MHz – 1910 MHz	1850 MHz – 1910 MHz	TDD
36	1930 MHz – 1990 MHz	1930 MHz – 1990 MHz	TDD
37	1910 MHz – 1930 MHz	1910 MHz – 1930 MHz	TDD
38	2570 MHz – 2620 MHz	2570 MHz – 2620 MHz	TDD
39	1880 MHz – 1920 MHz	1880 MHz – 1920 MHz	TDD
40	2300 MHz – 2400 MHz	2300 MHz – 2400 MHz	TDD

