

**BEFORE THE
FEDERAL COMMUNICATIONS COMMISSION
Washington D.C. 20554**

In the Matter of)	
)	
A National Broadband Plan)	GN Docket No. 09 -47, 09-51
For Our Future)	09-137
)	

**COMMENTS OF
SHURE INCORPORATED
ON PUBLIC NOTICE # 6 SPECTRUM FOR BROADBAND**

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SUMMARY

Shure Incorporated ("Shure") applauds the Commission's efforts to develop a National Broadband Plan and to explore how spectrum use will be a part of broadband deployment. However, Shure strongly cautions that broadband deployment can and should be accomplished without launching radical changes to allocations that would disrupt and cause widespread harm to existing valuable spectrum services and their many users. The Commission's approach to spectrum changes should be fine-tuned to identifying reasonable opportunities to make additional use of spectrum for this single purpose without wreaking havoc to existing operations.

Shure herein offers insight into existing innovative uses of wireless audio technology, particularly Part 74 wireless microphone operations. The public "value" of wireless microphone operations, as well as of many other spectrum uses, cannot be easily reduced to a simple financial measure. Today, wireless microphone technology is essential to news gathering, entertainment, sports, religious, civic, business and educational productions that are all core to daily American life. Many sectors, including television, moviemaking, entertainment, sports, arts, business -- to name just a few-- rely on wireless microphone technology. Accordingly, it is imperative that allocation decisions reflect qualitative assessments of public benefits and not rely on simplistic quantitative measures. In the Commission's assessment of "efficiency" and "productivity," Shure urges the Commission to give great weight to spectrum usage that is widespread and proven -- spectrum use that is already delivering significant public value. Further, the Commission must be careful not to render decisions that effectively make technology choices based on outdated or narrow notions of the superiority of certain technologies, spectrum efficiency, or sources of innovation.

Reallocation should be a last resort undertaken only in compelling circumstances given the disruption, high costs, and real risk to the services being ordered to move and the ever-present risk that a new allocation will not succeed. Comparable replacement spectrum must be identified first and the Commission needs to provide for sufficient transition time to migrate, develop new equipment and standards.

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Shure Incorporated ("Shure") is pleased to submit these Comments in response to the Commission's Public Notice #6 regarding issues relating to spectrum for broadband.¹ In the Public Notice, the Commission sought comment on the fundamental question of whether current spectrum allocations, including but not limited to the "prime" bands below 3.7 GHz, are adequate to support near and longer term demand for wireless broadband. Shure applauds the Commission's efforts to develop a National Broadband Plan and promote the development of a ubiquitous, technology-neutral broadband infrastructure in the United States. However, Shure strongly cautions that broadband deployment can and should be accomplished without launching radical changes to spectrum allocations that would disrupt and cause widespread harm to existing valuable spectrum services and their many users. The Commission's approach to spectrum changes should be fine-tuned to identifying reasonable opportunities to make additional use of spectrum for this single purpose without wreaking havoc to existing operations.

Shure offers its unique perspective on spectrum issues from the vantage point of a long-time leading manufacturer of low power auxiliary devices authorized under Part 74 of the

¹ DA 09-2100 (released September 23, 2009)

Commission's Rules.² Shure recognizes that spectrum issues are often analyzed from the perspective of higher power mobile voice and data providers or unlicensed Part 15 consumer devices. With these Comments, Shure hopes to expand the Commission's insight into existing innovative uses of wireless audio technology, particularly wireless microphone technology.³ Today, this advanced wireless audio equipment is essential to news gathering, entertainment, sports, religious, civic, business and educational productions all of which are core to daily American life. Shure believes that these uses are integral to and consistent with the Commission's goal to bring the benefits of broadband deployment to as much of the American public as possible. With that in mind, Shure herein offers its real-world perspective on certain issues regarding the Commission's examination of current spectrum uses and how to analyze the complex spectrum issues in bands below 3.7 GHz.

For the purpose of these Comments, Shure has limited its discussion to the matters raised in Question # 4 of the Public Notice:

- 4. WHAT ARE THE KEY ISSUES IN MOVING SPECTRUM ALLOCATIONS TOWARD THEIR HIGHEST AND BEST USE IN THE PUBLIC INTEREST?**
 - (A) HOW SHOULD WE DEFINE AND DETERMINE THE VALUE (E.G., FINANCIAL, ECONOMIC AND PUBLIC INTEREST) OF DIFFERENT USES TO EVALUATE WHETHER SPECTRUM USAGE IS MAXIMIZING THE PUBLIC INTEREST?**

² For nearly eighty years, Shure has been a respected U.S. manufacturer of high-quality, innovative audio products. Today, headquartered in Niles, Illinois, Shure is a global leader in audio electronics, including professional wireless microphone products that operate in the United States as authorized Part 74 low power auxiliary equipment. Shure has been an active participant in Commission proceedings relevant to the core TV bands and the 700 MHz band, among other proceedings.

³ "Wireless microphones" as used herein includes a variety of audio devices authorized under Part 74 of the Commission's Rules as secondary users of locally unoccupied television channels. In addition to wireless microphones, this equipment includes in-ear monitors, wireless intercoms, wireless assist video devices (WAVDs) and wireless cueing (IFB) systems.

(i) The “Value” Of Many Spectrum Uses Cannot Be Easily Reduced To A Simple Financial Measure And Allocations Must Reflect Qualitative Assessments of Public Benefits

Shure agrees with the Commission that spectrum allocations must reflect “public value.” Shure cautions, however, that “public value” and the “public interest” are key concepts that cannot be reduced to a simplistic quantitative analysis that is, by definition, incapable of capturing and reflecting the qualitative nature of many critical public benefits and “value” of a service. Certainly the price of spectrum purchased at public auction is one data point for some spectrum allocations. In other uses, the Commission could review data regarding revenues based on minutes of wireless use or messages or revenue size of firms in the industry sector, the cost of replacement facilities, prices of spectrum related stocks, and the like. However, these measures do not account for the beneficial nature of services and are limited even on their own terms. Does highest estimated auction value at any given time really equate directly to a level of “public value” or the “public interest? Does the cost of a spectrum holder’s public stock really point to the “value” that a particular spectrum use brings to the public at large?

An undue reliance on simplistic quantitative evaluations aimed at assigning a quick economic measure to technology applications will significantly misread real public “value” that many wireless operations deliver to the U.S. citizenry today. Obvious examples are wireless applications that support public health, cultural life, and/or commerce. When the qualitative benefits created by a service are a more appropriate measure of its value, the Commission’s analysis must reflect these benefits, even if they are more difficult to distill or reduce into easily digested data.

(ii) Wireless Microphone Audio Technology Is One Example

There are many examples of spectrum uses whose “public value” cannot readily be defined by simple financial calculations. Wireless microphone audio technology, medical telemetry, satellite radio, and ship-to-shore communications are just a few examples. Wireless microphone audio technology is a spectrum use that delivers vast public value and benefits that are difficult, if not impossible, to reduce into conventional quantitative spectrum value measurements. The ultimate beneficiaries of these services are members of the public that expect and demand high-quality audio in a broad range of news, entertainment, religious, civic, educational and business contexts.

Wireless microphones are a class of equipment authorized under Part 74 of the Commission’s Rules as low power auxiliary devices. They provide real-time, high-quality, interference-free audio during live events, recorded live events, and movie-making. They operate on a secondary basis predominantly in the core TV bands.⁴ They have successfully co-existed for decades with other services populating the TV band including full service television, low power television, certain public safety and land mobile applications, radio astronomy, and medical telemetry. Wireless microphone users typically avoid interference through a frequency coordination process that determines which channels should be used by which microphones at what time and in what location in a particular production. In larger productions, frequency coordination is often handled by full time technical staff or consultants on the production team for an event. In the very largest events, such as the SuperBowl, multiple full-time coordinators

⁴ Although the Commission’s current Part 74 rules permit wireless microphones to operate in several spectrum bands, the core TV bands not occupied by television signal are the primary location of operations due to significant interference and technical limitations present in other bands. Current rules permit low power auxiliary devices to operate in 700 MHz band but the Commission has proposed that these secondary uses be prohibited in the future to accommodate high power users that have purchased spectrum at auction and public safety users. *See Revisions to Rules Authorizing the Operation of Low Power Auxiliary Stations in the 698-806 MHz Band, Notice of Proposed Rulemaking*, WT Docket Nos. 08-166, 08-167 (released August 21, 2008).

will work together to plan the wireless microphone operations used by the many event participants, including individual athletes, coaches, team organizations, musicians, half-time show talent and producers, television networks, international, national and local news, to name a few. This planning starts months in advance and coordinators will work sometimes around the clock as the event approaches.

Most wireless microphones use FM transmission with an occupied bandwidth limit of 200 kHz and typical working range of 300 feet. They are inherently itinerant and relatively low power. Most models operate with a conducted output power of only 10-50 mW, although the effective radiated power (ERP) is even lower than the conducted levels due to body absorption and shadowing.⁵ Wireless microphones are designed for lower power to take advantage of frequency reuse: with lower power, simultaneous operation is achievable for more wireless systems within a given amount of spectrum. The low power design also conserves battery life and reduces equipment size, weight and cost.

Wireless microphone users require the highest sound quality from their microphones. Audio anomalies such as “clicks,” “pops,” static or fades are not tolerated and “dropouts” (a momentary loss of sound) caused by interference are completely unacceptable. Professional users of wireless microphones -- *and their public audiences* -- have an exacting standard for sound transmission quality. Wireless microphones must work perfectly or content will be damaged, destroyed, or, in the case of live events, potentially lost forever.⁶ A typical requirement for television broadcast audio quality is over 100 dB of signal-to-noise ratio

⁵ Commission rules provide for a maximum output power of 250 mW.

⁶ When one light in a production goes out, no one notices. In stark contrast, when one wireless microphone goes out or experiences interference, every viewer of the telecast notices. This type of miscue can go so far as to supplant viewers' memories of the entire performance. And when the telecast is the Super Bowl, the mistake is amplified 98.7 million times.

throughout the duration of the program.⁷ In Shure’s view, the American standard of excellence in video and audio production is a foundation for this country’s global leadership in content creation.⁸

(iii) Numerous American Industries Rely On Wireless Microphone Technology

In assessing the “public value” of spectrum uses, the Commission must consider the nature and extent to which current uses meet existing user needs. As discussed further below, numerous industries currently rely on wireless microphone technology for live and recorded productions to disseminate news, sports, entertainment, religious, educational, government and business information and programming. While it is not possible to assign a specific financial figure to the value of wireless microphone use of spectrum across the country, it is a fact that wireless microphones are part of the critical infrastructure that supports the creation of media content that generates billions of dollars in revenue and is enjoyed by tens of millions of Americans. By way of example, this infrastructure is important to the entertainment-based economies in New York City, Las Vegas, Los Angeles, San Francisco, Nashville, Austin, Orlando, Miami, and Branson, Missouri, not to mention the major sports-based activities in the NFL cities and locations across the country that host MLB, NBA, The PGA Tour, NASCAR, NCAA and other popular sporting events. It is also important to the business and convention-based economies in these cities as well as in Boston, Chicago, Philadelphia, St. Louis, Louisville, San Diego, Tampa, and Phoenix, among many other locations.

⁷ Current alternative technologies are unable to perform at these levels. For example, Bluetooth, Wi-Fi and digital wireless microphones suffer from latency and limited angle issues. Even if current alternative technologies could perform at the level of wireless microphones, multi-channel systems would require significant amounts of spectrum to operate successfully.

⁸ American content is not only an important export to the rest of the world representing not only a significant economic sector, but also an important channel for American culture and democracy.

Virtually all television programming, whether distributed by network, cable or satellite TV, and including news, scripted shows, talk shows, nature, reality shows, or live event coverage, rely on wireless microphones as an important part of their production technology. It is accepted that television programming is enjoyed by the majority of Americans on a daily basis. An estimated 98.7 million viewers watched SuperBowl 2009.⁹ Wireless microphones are used extensively in the U.S. filmmaking industry which represents, together with television, more than \$ 35 billion in economic activity and provides more than 200,000 jobs in California alone.¹⁰ Wireless microphones are integral to the live theater industry. More than 12 million people attended Broadway shows in 2008-09, with gross tickets receipts of approximately \$943 million.¹¹ Wireless microphones support these economic activities by making it possible to deliver the content, the access, and the feeling of “being there” that audiences demand.

(B) HOW SHOULD THE COMMISSION DEFINE WHAT IT MEANS TO USE SPECTRUM EFFICIENTLY AND PRODUCTIVELY IN THE PUBLIC INTEREST?

(i) An Assessment Of “Efficiency” And “Productivity” Should Recognize Spectrum Usage That Is *Widespread And Proven*.

Shure acknowledges that there are many measures that may be appropriate in considering spectrum “efficiency” and “productivity” but that “one size does not fit all.”

⁹ <http://tvbythenumbers.com/2009/01/18/historical-super-bowl-tv-ratings/11044> 10/23/ (visited October 23, 2009) (citing February 2009 SuperBowl XLIII Neilson viewer ratings). American Idol’s premier show drew over 30 million viewers its eighth season. Ratings for American Idol Season 8, Los Angeles Times, by Scott Collins, January 15, 2009.

¹⁰ According to California Governor Arnold Schwarzenegger, “[T]he motion picture and television industry helps drive California’s diverse economy, employing over 200,000 Californians and generating more than **\$35 billion in economic activity**. And the reach of production goes beyond the people directly employed by the industry, affecting businesses large and small throughout our economy. We value the production industry not only for its contribution to our economy in these challenging economic times, but also for its creative and entrepreneurial spirit – for which California is known throughout the world.” The Economic Impact of the Motion Picture & Television Industry on the United States, Report by the Motion Picture Association of America, at 14, April 2009.

¹¹See http://www.broadwayleague.com/index.php?url_identifier=season-by-season-stats- (visited October 23, 2009).

Certainly, the Commission will have to assess how both will be evaluated where spectrum holders have made no use of assigned spectrum, despite ample opportunity to do so. The Commission should also examine services that have been authorized but that have failed to fully develop for a variety of reasons. Given the attention that the Commission is devoting to reviewing spectrum usage, those instances should be a first priority in the Commission's examination.

In assessing "efficiency" and "productivity," the Commission should place significant value in these respects to spectrum usage that is *widespread* and *proven*. Wireless microphones have been used extensively in the United States for over three decades and the demand for this wireless audio technology is increasing. This trend reflects the growing appetite of the American public for more -- not less-- innovative and sophisticated performances and content.

Wireless audio technology is at "the front of the content chain." Wireless microphone technology gives news crews, movie directors, athletes, musicians, actors, government and commercial speakers freedom of movement. This enables unlimited innovations in content production that serve the purpose of the particular event. Examples in a wide range of contexts include well-known entertainment productions of Cirque du Soleil, the Academy Awards, the Grammy Awards, the SuperBowl, American Idol, Grand Ole Opry, major theaters on Broadway and in Las Vegas, to name just a few. Many of these events are so core to our culture that they are considered national events.

It is also commonplace to find sophisticated audio production in any major shareholder's meeting, gatherings for commercial product launches, worship services at religious facilities, business and political conventions.¹² This technology has been so useful that today it is deeply

¹² Wireless microphones are also used for other essential purposes such as law enforcement, public safety, and utility operations that are not discussed in these comments.

ingrained in many sectors of American life and can be seen as a part of the essential and permanent “content production infrastructure” for:

- Television
- Filmmaking
- Musical Performances
- Sports Stadiums
- Houses of Worship
- Theaters
- Business Offices
- Convention Centers
- Hotels
- Universities and other Educational Facilities.
- Government Facilities
- Amusement Parks

This production content is delivered to live audiences at events, in live format distributed to public audiences via conventional and digital television, cable or satellite TV, online via the internet and other forms of video and audio distributions.

The Commission should give great weight to technologies that have stood the test of time and are *proven* -- in contrast to technologies, applications and services, that may seem to have interesting potential, but that do not yet exist or have not been commercially launched. It would be a gross mistake if proven spectrum technologies in widespread use were disregarded in favor of proposals for promised technologies and applications.

(C) HOW WOULD WE DETERMINE THAT THE PUBLIC INTEREST WOULD BE BETTER SERVED BY REALLOCATING SPECTRUM FROM AN EXISTING SERVICE TO WIRELESS BROADBAND SERVICE?

(i) The Commission Should Be Careful Not To Adopt Outdated Notions Of Superior Technologies And Efficiency Or Assume That Innovations In Spectrum Uses Are Only Available With New Uses.

The Commission should be careful in making assumptions about technologies that imbed a judgment, unintended or otherwise, that certain technologies are inherently superior or inferior to others. For example, in the course of various spectrum discussions, Shure has observed a general presumption that digital technologies are superior to analog technologies in performance and efficiency. This presumption is misguided because it fails to take into account the performance demands of particular applications. In the context of advanced audio, analog systems deliver excellent real-time, clear transmission free of latency, drop offs, etc. In fact, analog systems are still prevalent due to these attributes and the fact that they are very robust. Further, “efficiency” in this context should be a concept that recognizes the intense localized re-use of frequencies that are enabled by low power characteristics.

The Commission should also be wary of the notion that technology “innovation” is a characteristic reserved for *new* spectrum uses. There is continuous reinvestment in research and development in the audio services world to bring new technologies and products to market. These efforts are prompted by customer demand and continue to generate innovations in technologies to provide new features, more available capacity, new applications, etc. The same could probably be said about many -- and maybe most -- other existing spectrum-based industries.

Moreover, in Shure’s experience in the case of wireless audio technology, continued innovations in advanced wireless audio has driven innovation in other industries. Some types of sophisticated popular productions available today – sports events and Broadway shows, for example – have evolved to their current state of sophistication only *because of* the availability of reliable advanced wireless audio equipment. Wireless microphones have made possible the types of music-intensive Broadway shows and on-the-field coverage of sports events that Americans enjoy today. Accordingly, the Commission should reject attempts to dislodge existing spectrum uses on the mistaken notion that replacing existing with *new* uses is in itself a final public interest objective.

(D) WHAT ARE THE COSTS OF MOVING CURRENT OCCUPANTS AND USERS OF UNDER UTILIZED SPECTRUM BANDS TO OTHER BANDS, TO OTHER TECHNOLOGIES OR SOLUTIONS THAT DO NOT REQUIRE LICENSED SPECTRUM, OR CONSOLIDATING USE TO AVAIL UNDER-UTILIZED SPECTRUM? WHAT ARE THE ALTERNATIVES AND COSTS OF MOVING CURRENT USERS OF UNDER-UTILIZED SPECTRUM TO DIFFERENT BANDS?

(i) Reallocating Spectrum And Migrating Incumbents To New Frequencies Is Highly Disruptive, Cost Prohibitive, And Inappropriate In All But The Most Compelling Circumstances

Reallocation of spectrum and “migration” of existing users is a hugely complex, highly disruptive and costly process that the Commission should only consider in very limited, compelling circumstances as a “last resort.” In cases where the Commission decides to resort to this step, new, comparable spectrum must first be identified where the incumbent can relocate without suffering a degradation in the performance of its service. Compensation, which Commission precedent typically requires the new technology entrant in the vacated band to bear, should be paid to the incumbent for expenses associated with the migration. New equipment must be developed and made available for the incumbent’s use in the new migration band. Then,

only after these initial phases of the migration have concluded, can the incumbents begin the actual transition which involves selecting new equipment, initiating and troubleshooting service in the new band, migrating affected end users or customers, and ultimately decommissioning old equipment.

Reallocation decisions have extremely high stakes. Reallocations, by definition, are disruptive and costly and risk permanently undermining the existing operations ordered to move. Given the harm and risks, reallocation should not be undertaken where the success of the promised future products are uncertain. There is no guarantee that new services replacing existing services will be successful and that ever-present risk should be given weight in any reallocation considered. New services can be stalled for any number of reasons. For example, Unlicensed Personal Communications Service (“UPCS”) did not effectively use the 1910-1930 MHz band, the 218-219 MHz band (previously referred to as Interactive Video and Data Service) is underutilized more than 15 years after it was auctioned even with amended service rules that permit the licensee to provide many different types of service, and the “licensed-lite” service in the 3650-3700 MHz band has not generated significant business activity to date. Indeed, the D Block 700 MHz spectrum is perhaps the most dramatic example of prime spectrum that remains underutilized today.

Going forward the Commission should be exceedingly cautious to avoid undertaking a reallocation and migration that costs hundreds of millions of dollars, irreparably harms longstanding incumbent industries and users, and that may ultimately leave the vacated spectrum underutilized.

- (ii) **Before Any Reallocation, “Comparable” Replacement Spectrum Must Be Identified And Set Aside For The Migrating Incumbent**

The Commission has generally been reluctant to reallocate spectrum used by longstanding incumbents, but on the occasions when it has proceeded with a reallocation it identified and made available “comparable” facilities for the migrating incumbent, including replacement spectrum.¹³ Going forward, any evaluation the Commission undertakes to determine the feasibility of reallocating an incumbent user below 3.7 GHz should begin with a thorough analysis of the replacement spectrum available to the migrating incumbent. If spectrum cannot be identified that provides at least the same capacity, benefits and utility to the migrating incumbent as the original spectrum, the Commission should not proceed with reallocation.

The Commission has set a high bar for “comparable” facilities that should not be lowered when attempting to identify replacement spectrum for an incumbent user below 3.7 GHz that provides significant public benefits and that is required to involuntarily relocate to new frequencies. Specifically, the Commission has stated that an evaluation of whether replacement facilities are “comparable” should be conducted on a “case-by-case basis” and that such facilities “must be equal to or superior to existing facilities.”¹⁴ Among other factors to consider when evaluating comparability, the Commission stated that it would consider “reliability, capability, speed, bandwidth, throughput, overall efficiency, [radiofrequency] bands authorized for such services, and [radiofrequency] interference protection.”¹⁵

Based on the Commission’s criteria for “comparable” facilities, any evaluation of replacement spectrum for potentially relocated incumbents in spectrum below 3.7 GHz needs to examine propagation and other core characteristics of the spectrum. For example, to the extent

¹³ See, e.g., *Redevelopment of Spectrum to Encourage Innovation in the Use of New Telecommunications Technologies*, ET Docket No. 92-9, Third Report and Order and Memorandum Opinion and Order, 8 FCC Rcd 6495 at ¶ 36 (“*PCS (Emerging Technologies)/Fixed Microwave Transition Order*”).

¹⁴ *Id.* at ¶¶ 35, 36.

¹⁵ *Id.* at ¶ 36.

an incumbent requires low-gain, omni-directional antennas for highly mobile applications, “comparable” spectrum would need to support the same mobile functionality. Alternatively, to the extent an incumbent requires frequencies with low ambient noise to provide mission critical services that cannot tolerate interference, “comparable” spectrum would need to have similar levels of ambient noise.

(iii) Costs Associated With A Reallocation And Migration Should Be Borne By The New Entrant

The Commission has a well-established policy that requires new technology entrants to pay the costs associated with a relocating incumbent’s migration.¹⁶ This policy encourages incumbents to participate in the transition to the new band, protects the integrity and utility of the spectrum the incumbents are vacating, and should be utilized for any future migration that results from a reallocation in the frequency bands below 3.7 GHz.

Failing to compensate incumbents for their migration costs could create a “knock-on” effect harmful to the utility of vacated and replacement spectrum. Incumbents not compensated for their migration costs would be discouraged from migrating and upgrading equipment before their existing gear failed outright and had to be replaced. Although they would likely be forced to endure heightened co-channel interference that might disrupt their own operations, incumbents that continued to operate in the band being vacated could delay the deployment of new entrants. Simultaneously, the slower migration of incumbents into the replacement spectrum would create disincentives for manufacturers to develop equipment capable of operating in the new frequencies for incumbents who do elect to migrate early in the transition period.

¹⁶ See, e.g., *Amendment of Part 2 of the Commission’s Rules to Allocate Spectrum Below 3 GHz for Mobile and Fixed Services to Support the Introduction of New Advanced Wireless Services*, Ninth Report and Order and Order, 21 FCC Rcd 4473 at ¶ 1 (“*BRS Relocation Order*”); see also *PCS (Emerging Technologies)/Fixed Microwave Transition Order* at ¶ 5.

The migration costs the Commission has historically required the new entrant to pay have included expenses directly related to equipment replacement as well as expenses associated with engineering, logistics and site surveys. The Commission has also expressly approved reimbursement for relocation related FCC fees, frequency coordinations, and the testing of replacement facilities.¹⁷

(iv) The Commission Must Give Displaced Incumbents Sufficient Time To Migrate, Taking Into Consideration The Need To Develop New Equipment And Standards

Should the Commission determine that a reallocation and migration is absolutely necessary as a “last resort,” it must implement a reasonable transition period that takes into account the considerable logistical and technical hurdles involved in a spectrum migration. Financial considerations may also need to be factored in if the Commission’s scheme does not provide for compensation. Routine band migrations that involved longstanding commercial incumbents have previously required in excess of ten (10) years to undertake, and that reflects the transition period *after* “comparable” replacement spectrum was identified for the migrating incumbent and the rules for the new entrant’s operation in the vacated band were finalized.¹⁸ Alternatively, the Commission has grandfathered existing incumbents indefinitely in the reallocated spectrum and created incentives to encourage a gradual migration into the incumbents’ replacement spectrum.¹⁹

¹⁷ See *PCS (Emerging Technologies)/Fixed Microwave Transition Order* at ¶ 5.

¹⁸ See, e.g., *Redesignation of the 17.7-19.7 GHz Frequency Band, Blanket Licensing of Satellite Earth Station in the 17.7-20.2 GHz and 27.5-30.0 GHz Frequency Bands, and the Allocation of Additional Spectrum in the 17.3-17.8 GHz and 24.75-25.25 GHz Frequency Bands for Broadcast Satellite-Service Use*, Report and Order, 15 FCC Rcd 13430 (granting fixed microwave operations co-primary status with Ka-band satellite transmissions for a ten year period); see also *PCS (Emerging Technologies)/Fixed Microwave Transition Order*.

¹⁹ See, e.g., *Amendment of Parts 2 and 95 of the Commission’s Rules to Create a Wireless Medical Telemetry Service*, Report and Order, 15 FCC Rcd 11206 (permitting medical telemetry equipment to continue

Given that many commercial incumbents in spectrum below 3.7 GHz have been operating in their current spectrum for several decades or longer, the Commission should expect any transition period to involve a complicated logistical effort that requires a number of years to conclude, after all relevant rules necessary to undertake the migration are in place. To the extent an incumbent needs to modify or develop entirely new technology to operate in its replacement spectrum, which is very likely unless the incumbent is relocated in spectrum immediately adjacent to its current allocation, the Commission should incorporate additional time into any transition to ensure the incumbent and its equipment suppliers have an opportunity to thoroughly vet different technologies and conduct the research and development necessary to refine new technologies.

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operating in the 450-470 MHz band indefinitely, but instructing OET to cease type accepting new devices for the band).

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