

Before the  
**Federal Communications Commission**  
Washington DC 20554

In the Matter of	)	
	)	
Promoting Spectrum Access for Wireless	)	Docket No. 14-166
Microphone Operations	)	
	)	
Amendment of Part 15 of the Commission’s	)	
Rules for Unlicensed Operations in the	)	
Television Bands, Repurposed 600 MHz Band,	)	
600 MHz Guard Bands and Duplex Gap, and	)	Docket No. 14-165
Channel 37	)	
	)	
Amendment of Part 74 of the Commission’s	)	
Rules for Low Power Auxiliary Stations in the	)	
Repurposed 600 MHz Band and 600 MHz	)	
Duplex Gap	)	
	)	
Expanding the Economic and Innovation	)	Docket No. 12-268
Opportunities of Spectrum Through	)	
Incentive Auctions	)	

**COMMENTS OF SENNHEISER ELECTRONIC CORPORATION**

Sennheiser Electronic Corporation (“Sennheiser”) provides the following comments on the Further Notice of Proposed Rulemaking (“FNPRM”) issued in the above captioned proceedings.<sup>1</sup>

The Federal Communications Commission (“FCC” or “Commission”) previously has recognized the need for certain eligible non-broadcast entities to obtain a Part 74 license to

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<sup>1</sup> *Promoting Spectrum Access for Wireless Microphone Operations; Amendment of Part 15 of the Commission’s Rules for Unlicensed Operations in the Television Bands, Repurposed 600 MHz Band, 600 MHz Guard Bands and Duplex Gap, and Channel 37; Amendment of Part 74 of the Commission’s Rules for Low Power Auxiliary Stations in the Repurposed 600 MHz Band and 600 MHz Duplex Gap; Expanding the Economic and Innovation Opportunities of Spectrum Through Incentive Auctions*, Order on Reconsideration and Further Notice of Proposed Rulemaking, 2017 WL 3000810 (F.C.C.) (2017) (“FNPRM”).

provide “regular and reliable high quality audio services that are free from interference.”<sup>2</sup>

However, not all professional wireless microphone users qualify for Part 74 licenses; specifically, those that do not routinely use fifty or more microphones do not qualify. And as a result of the FCC’s incentive auction and subsequent repacking of the TV band, quality spectrum available to these, and other wireless microphone users, will be “substantially reduced.”<sup>3</sup>

For these reasons, Sennheiser fully supports a path to Part 74 licensing for professional arts organizations which require interference protection in TV band spectrum in order to produce high-quality productions. The public interest will be served by ensuring professional level, interference-free wireless audio capability to more performing arts organizations, which deliver great public benefits such as providing high-quality entertainment, preserving our nation’s cultural heritage, and creating jobs across the country.

## **BACKGROUND**

Sennheiser is part of Sennheiser Electronic GmbH & Co. KG, headquartered in Germany, which is a global leader in advanced microphone technology, RF-wireless and infrared sound transmission, headphone transducer technology, and active noise cancellation. Sennheiser Electronic Corporation is the main U.S. sales and marketing office, located in Old Lyme, Connecticut. Sennheiser also has a research center in San Francisco, California, and a manufacturing plant in Albuquerque, New Mexico that produces the majority of Sennheiser wireless microphones sold in North America, South America, Canada, and Asia.

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<sup>2</sup> FNPRM at ¶ 80.

<sup>3</sup> FNPRM at ¶ 78, ¶ 83.

The Commission has recognized that wireless microphones are vital to a large component of the U.S. economy.<sup>4</sup> Wireless microphones are ubiquitous in all aspects of the entertainment business, in news reporting, in sports, and in U.S. commercial, civic, and religious life. They are essential to the production of virtually all content creation in the U.S., a one trillion dollar industry. The Commission should proceed in recognition of these facts by crafting a policy that ensures maximum flexibility for how wireless microphones are needed for content creation now and in the future.

## DISCUSSION

Sennheiser appreciates the Commission's efforts to extend Part 74 licensing to additional professional user groups. Professional wireless microphone users have the most demanding performance needs, requiring extremely high fidelity, reliability, and low latency performance links for critical on-stage or on-air wireless microphones and ear monitors so that a full audio response and dynamic range may be achieved.<sup>5</sup> Clean blocks of UHF spectrum is needed for these hyper-critical performances.<sup>6</sup> Performers, audience members, members of the recording industry and other content providers all have extremely high standards that must be met.

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<sup>4</sup> See Stephen E. Siwek, Copyright Industries in the U.S. Economy: The 2014 Report (Economists Incorporated 2014). Available at <http://www.iipaweb.com/pdf/2014CpyrtRptFull.PDF>.

<sup>5</sup> The latency requirement arises because a performer on stage or in the studio is exposed to his own voice, via monitor speakers or in-ear monitors, through the same microphone system that delivers his voice to the audience. Any significant delay becomes intolerable to the performer and deteriorates the experience for the audience as well.

<sup>6</sup> As Sennheiser has explained in previous filings, alternative spectrum bands are not viable substitutes for UHF spectrum. See *Promoting Spectrum Access for Wireless Microphone Operations*, Docket No. 14-165, Comments of Sennheiser (filed Feb. 4, 2015). Alternative spectrum is suitable for non-professional wireless microphone users, such as schools, auditoriums, churches, karaoke bars, local bands, etc., which already have migrated to the unlicensed bands. It is also suitable for non-performance links used by professional users, such as "backstage," intercom, cueing, and interruptible fold back; these uses also have moved to the unlicensed or other bands.

For these reasons, the Commission should provide a path for more professional performing arts organizations to obtain Part 74 licenses so that they may register for interference protection from unlicensed white space devices when operating on the TV bands. During the long course of these proceedings, dozens of professional arts organizations filed in support of expanded Part 74 eligibility for professional users.<sup>7</sup> One example is the Baltimore Symphony Orchestra (“BSO”), which provides approximately 150 performances a year to hundreds of thousands of audience members.<sup>8</sup> The BSO explains that, without a rule change such as what is being considered in this proceeding, the Commission “would leave [the] organization without any interference protection mechanism from the many TV Band Devices that may soon flood the

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<sup>7</sup> Many other arts organizations already have expressed support for the proposed rule change: Comments of Actors Theatre of Louisville (filed Jan. 28, 2015); Comments of Alley Theatre (filed Jan. 29, 2015); Comments of the Alliance Theatre (filed Feb. 3, 2015); Comments of the Arden Theatre Company (filed Jan. 28, 2015); Comments of Aquila Theatre (filed Jan. 29, 2015); Comments of Asolo Repertory Theatre (filed Jan. 15, 2015); Comments of BMCC Tribeca Performing Arts Center (filed Jan. 29, 2015); Comments of Center for the Arts in Ithaca and Hangar Theatre (filed Jan. 28, 2015); Comments of Center Theatre Group (filed Jan. 29, 2015); Comments of Center Stage (filed Jan. 28, 2015); Comments of Classic Stage Company (filed Jan. 29, 2015); Comments of Denver Center for the Performing Arts (filed Jan. 29, 2015); Comments of the Fort Mason Center (filed Jan. 29, 2015); Comments of Fort Worth Academy of Fine Arts (filed Jan. 8, 2015); Comments of Goodspeed Opera House (filed Jan. 28, 2015); Comments of the Houston Symphony (filed Jan. 29, 2015); Comments of Hubbard Street Dance Chicago (filed Jan. 29, 2015); Comments of Indiana Repertory Theatre (filed Jan. 28, 2015); Comments of Kansas City Repertory Theatre (filed Jan. 29, 2015); Comments of the Kentucky Shakespeare Festival (Jan. 28, 2015); Comments of La Jolla Playhouse (filed Jan. 29, 2015); Comments of McCarter Theatre Center (filed Jan. 28, 2015); Comments of Milwaukee Repertory Theater (filed Jan. 28, 2015); Comments of the New York Musical Theatre Festival (filed Jan. 29, 2015); Comments of the Oregon Shakespeare Festival (filed Jan. 28, 2015); Comments of the Pacific Conservatory Theatre (filed Jan. 28, 2015); Comments of the Public Theater (filed Jan. 29, 2015); Comments of the San Francisco Playhouse (filed Jan. 29, 2015); Comments of the Shakespeare Theatre Company (filed Jan. 28, 2015); Comments of Signature Theatre (filed Jan. 29, 2015); Comments of Theatrical Outfit (filed Jan. 20, 2015); Comments of the University of Miami’s Jerry Herman Ring Theatre (filed Jan. 29, 2015); Comments of West Coast Black Theatre Troupe (filed Jan. 27, 2015); Comments of the Westside Theatre (filed Jan. 29, 2015); and Comments of the Yale School of Drama and Yale Repertory Theatre (filed Jan. 29, 2015).

<sup>8</sup> *Letter from Tabitha M. Pflieger, Director of Operations and Facilities, Baltimore Symphony Orchestra to Chairman Tom Wheeler, et al., Re: Comments in ET Docket No. 14-165 and GN Docket Nos. 12-258 and 14-166* (filed Jan. 13, 2015).

market. Frequency coordination with other known wireless microphone users has become common practice, but there is no way to coordinate with TVBDs if you don't know about them.”<sup>9</sup> Another example is the Steppenwolf Theater in Chicago, which provides 700 performances a year to 200,000 audience members, as well as education programs to 15,000 students.<sup>10</sup> While internationally renowned, Steppenwolf generally uses only six to twenty-four microphones for its performances, preventing it from meeting the current requirements for Part 74 licensing.<sup>11</sup> The Commission's proposal would help these and many other professional arts organizations continue to present important performances without fear of inference from white space devices.

A. *Sennheiser Supports Expanded Part 74 Eligibility.*

The FCC should adopt its proposal to expand Part 74 eligibility so that more professional users can obtain interference protection. As the Commission rightly recognized, the current eligibility threshold is “unnecessarily restrictive as it excludes many entities that have the need for professional high-quality audio for their events/productions.”<sup>12</sup>

The Commission, when it last modified Part 74 eligibility requirements to include professional sound companies and venues that routinely use fifty or more microphones, recognized key aspects of eligibility that apply equally in this instance. Namely, the Commission considered that entities with sophisticated knowledge of wireless microphones, with the capability to manage the use of spectrum, and with the ability to coordinate the use of a large

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<sup>9</sup> *Id.* at 1.

<sup>10</sup> *Letter from David Schmitz, Managing Director, Steppenwolf Theater to Chairman Tom Wheeler, et al.*, Re: Comments in ET Docket No. 14-165 and GN Docket Nos. 12-258 and 14-166 (filed Jan. 14, 2015).

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

<sup>12</sup> FNPRM at ¶ 84.

number of microphones, register in the white space database and comply with FCC rules, were the types of professional users that should be eligible for Part 74 licenses.<sup>13</sup> This makes sense. And rather than considering only the number of microphones routinely used, which is no clear measure of the caliber of performances or the ability to manage the use of spectrum, the Commission should take a broader view of the meaning of “professional.”

In particular, the Commission proposes to revise its definitions to include as eligible entities users “that otherwise can demonstrate a particular need for, and the capability to provide, professional, high-quality audio that is integral to their events or productions.”<sup>14</sup> The Commission seeks comment on how it can identify qualified applicants.<sup>15</sup>

As an initial matter, any entity that has the wherewithal to prepare, pay for, and file an FCC license application and regulatory fees, with accompanying information to demonstrate eligibility, is most likely a professionally-run organization able to comply with the responsibilities of being a FCC licensee. After all, the FCC makes far fewer demands on many other low power users of the spectrum, such as those that are licensed by rule.

In terms of the actual showing, the Commission suggests a two-part test, first a demonstration of a “clear need” for a license and second a demonstration that use of the spectrum will be done in a spectrally efficient manner and with professional-level technical and operational capabilities.<sup>16</sup> These are appropriate test criteria, as the Commission should ensure that its rules remain flexible enough to apply to various specific situations.

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<sup>13</sup> See FNPRM at ¶ 80.

<sup>14</sup> FNPRM at ¶ 86.

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

<sup>16</sup> FNPRM at ¶¶ 86-88.

With regard to the demonstration of need, Sennheiser suggests that some useful criteria to consider would be: whether an entity belongs to a professional affiliation, such as the Audio Engineering Society (“AES”), Theater Communications Group, The Recording Academy, or the American Society of Composers, Authors and Publishers (“ASCAP”); whether it is creating content that will have commercial value; whether its facility provides assistive listening system for the hearing and visually challenged;<sup>17</sup> and the longevity of the organization and its stature in the community. With regard to the second part of the test, this showing should be similar to what professional sound companies and large venues are required to show. Additionally, licensees need not have permanent engineering staff. It is quite common in the industry for venues to use consultants or contractors for spectrum management work.

Microsoft has suggested that the proposed case-by-case licensing regime would be too difficult or “administratively burdensome” for the Commission staff to manage.<sup>18</sup> Microsoft even questions the ability of the Commission staff to determine license eligibility.<sup>19</sup> Sennheiser does not anticipate extremely high numbers of applicants under the new eligibility criteria. More importantly, the Commission is well-versed in determining license eligibility, having done so

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<sup>17</sup> The Department of Justice requires assistive listening systems in public assembly areas where audible communications are integral to the use of the space. *See 2010 ADA Standards for Accessible Design*, U.S. Department of Justice (Sept. 15, 2010), available at <https://www.ada.gov/regs2010/2010ADASTandards/2010ADASTandards.htm>.

<sup>18</sup> *Letter from Paul Margie, Counsel for Microsoft Corporation, to Marlene H. Dortch, Secretary, Federal Communications Corporation, Re: Promoting Spectrum Access for Wireless Microphone Operations, GN Docket No. 14-166, Amendment of Part 15 of the Commission’s Rules for Unlicensed Operations in the Television Bands, Repurposed 600 MHz Bands and Duplex Gap, and Channel 37, and Amendment of Part 74 of the Commission’s Rules for Low Power Auxiliary Stations in the Repurposed 600 MHz Band and 600 MHz Duplex Gap, ET Docket No. 14-165 (filed July 3, 2017) (“Microsoft Ex Parte”).*

<sup>19</sup> Microsoft Ex Parte at 3.

since its inception. The proposed rules are sound and reasonable and should not add significantly to the Commission's workload or stymie its staff.

*B. Other Part 74 Spectrum Bands Should be Available to the Expanded Class of Licensees.*

The Commission additionally has proposed that it make portions of the 900 MHz, 1.4 GHz, and 7 GHz spectrum bands that are already available to Part 74 licensees also available to the newly eligible licensees.<sup>20</sup> Sennheiser fully supports this proposal, as the newly eligible licensees can require use of licensed spectrum outside of the TV band.

The Commission specifically asks whether the newly eligible licensees will need access to each of these spectrum bands. As the Commission notes, the new rules for wireless microphone use of 1.4 GHz already have numerous restrictions and limitations, such as pre-coordination and the use of highly-specialized and more costly equipment that employs an “electronic key.”<sup>21</sup> The 7 GHz band is also a very poor substitute for UHF, appropriate only for short-range (*e.g.*, 10 feet), line-of-sight audio applications, not for performers moving around a stage. Therefore, of the newly available spectrum for wireless microphones, only the 900 MHz band would be useful to most newly eligible licensees. Nonetheless, there is really no need for the Commission to treat the proposed newly eligible licensees differently from others. The newly eligible licensees should have access to the same Part 74 spectrum bands as the other non-broadcast licensed wireless microphone users.

*C. Wireless Microphones are Innovative Technologies.*

Microsoft's recent filing also parrots an old canard – that the spectrum needs of professional wireless users will be magically reduced if only manufactures truly embraced the

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<sup>20</sup> FNPRM at ¶ 90.

<sup>21</sup> 47 C.F.R. § 74.803(d).



“digital transition.”<sup>22</sup> The audio industry has led the digital transition and has been at the forefront of innovative digital technologies ever since. Sennheiser introduced digital microphone equipment in 2000. Moreover, spectral efficiency has been a design criteria for microphone manufacturers for decades, which has allowed for large numbers of wireless microphones to operate in very small geographic areas such as Times Square and the Vegas Strip, where available spectrum has always been limited.

Furthermore, digital is not inherently more spectrally efficient than analog. Digital does allow for data compression or reduction, which can result in denser packing of microphones, but only at the cost of audio quality, latency (sound lag), transmission reliability, range, transmitter size, battery life, or a combination of these variables. Critical applications with high-end demands preclude compromise, such as historical events broadcast live to millions that need to be archived in a high resolution format. Such applications require uncompressed digital audio, which necessitates sufficient bandwidth. However, there is a variety of digital microphone systems available today targeted at less demanding applications that can pack dozens of microphones into a 6 MHz channel. The spectral efficiency demanded by Microsoft is already offered by microphone manufacturers. Regardless, choice of technology should be dictated by market demands.

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<sup>22</sup> Microsoft Ex Parte at 2.

## CONCLUSION

The Commission should expand Part 74 license eligibility for professional arts organizations that can demonstrate that they regularly stage professional productions and have the technical and operational capacity to use the spectrum, as detailed above.

Respectfully submitted,

/s/

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