

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

In the Matter of

Improvements to Benchmarks and Related
Requirements Governing Hearing Aid-
Compatible Mobile Handsets

WT Docket No. 15-285

Amendment of the Commission's Rules
Governing Hearing Aid-Compatible Mobile
Handsets

WT Docket No. 07-250

COMMENTS OF APPLE INC.

Paul Margie
S. Roberts Carter
E. Austin Bonner
HARRIS, WILTSHIRE & GRANNIS LLP
1919 M Street NW, 8th Floor
Washington, DC 20036
(202) 730-1300

Counsel for Apple Inc.

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I. INTRODUCTION AND SUMMARY

When Congress passed the Hearing Aid Compatibility (“HAC”) Act almost three decades ago, it envisioned that the Federal Communications Commission would structure its rules in a manner that would “not discourage or impair the development of improved technology.”¹ Consistent with this mandate, the Commission has now “urge[d] stakeholders to think broadly in developing alternative approaches” beyond compliance with the existing ANSI HAC standard in order to help realize the goal of 100% hearing aid compatibility.² More generally, the Commission has sought information on “whether wireless handsets can be deemed compliant with the HAC rules through means other than by measuring RF interference and inductive coupling.”³

Apple is driven to make its devices truly accessible, and believes that consumers with hearing loss deserve a better experience than what traditional hearing aid compatibility technologies offer today. iPhones comply with existing HAC rules. But as the Commission has recognized, Apple has also invested heavily to improve accessibility by developing “a new hearing aid platform that relies on Bluetooth® technology.”⁴ Apple believes that this Made for iPhone (“MFi”) hearing aid platform represents a substantial improvement to consumers over devices that are deemed accessible by today’s HAC rules. In order to encourage innovators to

¹ See 47 U.S.C. § 610(e).

² *Improvements to Benchmarks and Related Requirements Governing Hearing Aid-Compatible Mobile Handsets*, Fourth Report and Order and Notice of Proposed Rulemaking, FCC 15-155, ¶ 77 (rel. Nov. 20, 2015) (“NPRM”).

³ *Id.* ¶¶ 82-84. This inquiry was one of the substantive recommendations made in the Joint Consensus Proposal submitted by several consumer advocacy organizations and industry trade associations. See *id.* ¶ 82.

⁴ *Id.* ¶ 77. The Commission also notes that alternative compliance approaches could “build on Apple’s experience... .” *Id.*

develop new and better ways to improve handset accessibility, the Commission's rules should recognize solutions such as the MFi hearing aid platform as alternatives for hearing aid compatibility compliance. When doing so, moreover, the Commission should rely on qualitative assessments rather than traditional RF interference measurements. The goal of the Commission's HAC rules should be to determine how well handsets and hearing aids will work together for consumers, not simply to measure compatibility of devices based on RF emissions.

II. THE MFi HEARING AID PLATFORM ADVANCES ACCESSIBILITY FOR INDIVIDUALS WITH HEARING LOSS

The Commission has observed that creative solutions to hearing aid compatibility “can significantly advance the interests of consumers with hearing loss without hobbling wireless innovation.”⁵ Apple agrees. In fact, with rules that reward fresh thinking and new approaches, Apple believes that the FCC's HAC rules can actively promote innovation.

Although today's rules did not require Apple to develop the MFi hearing aid platform, the company did so to improve the performance of its devices for an underrepresented market segment.⁶ As Apple has previously explained, the MFi hearing aid platform does not rely on the acoustic or inductive coupling techniques contemplated by the Commission's existing HAC rules in order to facilitate telephone conversations.⁷ Rather, the platform employs a wireless protocol that incorporates Bluetooth Low Energy technology to enable compatible hearing aids to interact

⁵ *Id.*

⁶ See generally Apple Inc., *Made for iPhone Hearing Aids*, <http://www.apple.com/accessibility/ios/hearing-aids/>.

⁷ See generally Reply Comments of Apple Inc., WT Docket Nos. 10-254 and 07-250 (filed Feb. 20, 2015) (“Apple 2014 PN Reply Comments”).

directly with iPhones and other supported devices via a digital wireless connection.⁸ This digital link makes several important benefits possible.

First, iPhones and other Apple devices that support the MFi hearing aid platform are able to deliver high-quality, power-efficient direct audio access to compatible hearing aids. This connection supports not only voice call output, but also lets individuals with MFi hearing aids access audio from FaceTime, VoiceOver, Siri (Apple’s intelligent personal assistant), turn-by-turn navigation, stereo music and movies, and output from third party apps, including games, audiobooks, and educational programs.

Second, the MFi hearing aid platform’s digital connection can be used to enable additional features for users with compatible hearing aids. For example, as the Georgia Institute of Technology, Center for Advanced Communications Policy and the Rehabilitation Engineering Research Center for Wireless Technologies (“Wireless RERC”) has explained, users can configure settings for MFi hearing aids directly on the iPhone, including settings that allow individuals “to switch between audiologist-prescribed preset configurations for different environments.”⁹ Apple has also created a feature called “Live Listen,” which enables an individual to use her iPhone’s microphone to pick up directed sound and deliver it to the MFi hearing aid, thereby using the iPhone as an assistive listening device that extends the range of the hearing aid (*e.g.*, by placing the iPhone near a presenter in a meeting) without relying on any third party equipment.

⁸ Apple 2014 PN Reply Comments at 3.

⁹ Comments of Georgia Institute of Technology (Georgia Tech), Center for Advanced Communications Policy (CACP), and the Rehabilitation Engineering Research Center for Wireless Technologies (Wireless RERC) at 12, WT Docket Nos. 07-250 and 10-254 (filed Jan. 22, 2015) (“GA Tech/CACP/Wireless RERC 2014 PN Refresh Comments”).

Finally, hearing aid manufacturers have created iOS apps that use the MFi hearing aid platform to enable features such as “geotagging” locations so that the hearing aid automatically adjusts to preferred settings when the iPhone arrives at a particular place, and providing assistance in locating misplaced hearing aids by indicating whether the iPhone is getting closer or farther away from the hearing aid. Manufacturers have also developed applications to let users view and adjust hearing aid settings quickly, easily, and discreetly using their Apple Watch.¹⁰

In short, the MFi hearing aid platform enables compatible hearing aids to provide excellent sound quality as well as many helpful new features when compared with the traditional coupling technologies contemplated by the Commission’s existing rules.

III. THE COMMISSION SHOULD RECOGNIZE THE MFI HEARING AID PLATFORM AS A VIABLE ALTERNATIVE FOR HEARING AID COMPATIBILITY COMPLIANCE

Consumer advocates, hearing aid manufacturers, and wireless industry commenters have all recognized the potential of solutions that digitally stream information from handsets to hearing aids to improve real-world accessibility performance.¹¹ Similarly, the Commission has

¹⁰ See Lindsey Banks, Au.D., *The Complete Guide to Using Hearing Aids with Apple Watch*, EVERYDAY HEARING, <http://www.everydayhearing.com/hearing-aids/articles/complete-guide-apple-watch-hearing-aids/>.

¹¹ See, e.g., GA Tech/CACP/Wireless RERC 2014 PN Refresh Comments at 12 (noting the success of the MFi hearing aid platform); Letter from Lise Hamlin, Director of Public Policy, Hearing Loss Association of America, to Marlene H. Dortch, Secretary, FCC, at 2, IB Docket No. 13-213 (filed Oct. 2, 2015) (“[H]earing aids and hearing aid accessories now have functionality that depends on interaction with smartphones and computers. That functionality, in turn, requires using technologies in the unlicensed frequency bands.”); Comments of CTIA – The Wireless Association at 5, WT Docket Nos. 07-250 and 10-254 (filed Feb. 5, 2015) (“[H]earing aid manufacturers are developing new methods of interacting with wireless handsets using ‘off-the-shelf’ technologies, such as Bluetooth, that may produce better results for consumers with hearing loss than the existing radio frequency (‘RF’) immunity and telecoil approaches to HAC.”); Comments of the Telecommunications Industry Association at 9, WT Docket Nos. 07-250 and 10-254 (filed Feb. 5, 2015) (similarly noting the ability of technologies such as Bluetooth to support coupling between hearing aids

acknowledged that alternative approaches such as those relying on Bluetooth could “achiev[e] compatibility with hearing aids.”¹² However, the Commission also seeks comment on several other factors it should consider in order to determine whether to recognize a new compatibility solution as a viable alternative.¹³ The MFi hearing aid platform satisfies these additional criteria as well.

A. Consumers Have Access to a Range of MFi Hearing Aid Compatible Devices Today

First, the Commission asks about the cost of devices used for alternate hearing aid compatibility approaches, as well as the “ease of procuring devices needed to use such alternatives.”¹⁴ Solutions using the MFi hearing aid platform are already widely available from different manufacturers, and Apple anticipates that consumers will be able to obtain additional compatible hearing aid models from additional manufacturers in the near future.

Apple includes MFi hearing aid compatibility as a standard feature *at no extra charge* on supported Apple devices, which are widely used. These devices include all iPhone models

and handsets); Comments of the Alaska Telephone Association at 5, WT Docket Nos. 07-250 and 10-254 (filed Feb. 5, 2015) (“[A] move toward more universal compatibility through the use of Bluetooth technology would make it easier for hearing impaired users to access devices and would also make it easier for carriers to provide more and lower cost choices.”); Reply Comments of the Hearing Industries Association at 3, WT Docket Nos. 10-254 and 07-250 (filed Feb. 20, 2015) (“HIA 2014 PN Refresh Comments”) (noting that Bluetooth based technologies “show[] great promise”). Although HIA has argued that the Commission should not “premature[ly] abandon[]” the telecoil compatibility requirement, *see* HIA 2014 PN Refresh Comments at 3, HIA has also observed that “the transition to Bluetooth could bring an end to the burdensome Hearing Aid Compatibility (‘HAC’) regulatory requirements imposed on handset manufacturers and carriers.” Letter from Laura Stefani, Counsel for The Hearing Industries Association, Fletcher, Heald & Hildreth, to Marlene H. Dortch, Secretary, FCC, IB Docket No. 13-213 and RM-11685 (filed Dec. 14, 2015).

¹² NPRM ¶ 83.

¹³ *See id.*

¹⁴ *Id.*

Apple currently offers.¹⁵ In addition, Apple anticipates that the list of supported Apple devices will continue to grow over time as Apple includes this feature in future products.

iPhones that support MFi hearing aids are available at a range of price points. For example, several wireless carriers currently offer MFi-compatible iPhone models at no additional charge from Apple when their customers sign up for new service plan agreements.¹⁶ Apple also makes its most recent model—the iPhone 6s—available as part of an annual upgrade program starting at \$32.41/month, which includes service and support through Apple’s AppleCare+ program.¹⁷

Hearing aid manufacturers already offer a range of MFi-compatible devices as well. As the Wireless RERC has recognized, manufacturers worked quickly to introduce 11 different hearing aid models following Apple’s announcement of the MFi hearing aid platform.¹⁸ The number of supported models and form factors continues to grow.¹⁹ For example, one audiologist has observed that hearing aids supporting the MFi platform are now available in a range of sizes and styles, including behind-the-ear (BTE), receiver-in-canal (RIC), and “custom styles down to the [in-the-canal models],” thereby “ensur[ing] that practically anyone can wear a Made for

¹⁵ See Apple Inc., *About Hearing Aid Compatibility (HAC) Requirements for iPhone*, <http://www.apple.com/support/hac> (describing iPhone models that are compatible with MFi hearing aids).

¹⁶ Apple Inc., *iPhone 5s*, <http://www.apple.com/shop/buy-iphone/iphone5s>.

¹⁷ Apple Inc., *iPhone Upgrade Program*, <http://www.apple.com/shop/iphone/iphone-upgrade-program>.

¹⁸ See GA Tech/CACP/Wireless RERC 2014 PN Refresh Comments at 12.

¹⁹ See Apple Inc., *Made for iPhone Hearing Aids*, <http://www.apple.com/accessibility/ios/hearing-aids/>.

iPhone hearing aid.”²⁰ Individuals can now obtain MFi-compatible bone conduction implant systems as well.²¹

With respect to cost, initial support by hearing aid manufacturers has focused on models that compete on features such as advanced digital signal processing rather than price. However, as Dr. Robert Erlandson, Director of the Enabling Technologies Lab at Wayne State University, has explained, it is common for new technologies that can be used to advance accessibility to be introduced first in higher-end products—as is the case with new technologies generally.²²

Demand for successful technologies then results in economies of scale, thereby reducing costs.²³ This is already starting to occur with MFi hearing aids. For example, Costco has recently introduced MFi hearing aid support for its Kirkland Signature™ Premium digital hearing aids, which retail for approximately one third of the price of the first hearing aids that supported the MFi hearing aid platform.²⁴

Recognizing approaches such as the MFi hearing aid platform as compliant under the FCC’s HAC rules will accelerate adoption, increase scale, and reduce cost of new technologies that can improve accessibility compared with today’s HAC-compliant technologies, thereby

²⁰ Linsey Banks, Au.D., *What’s New in Hearing Aids, Spring 2015 Edition*, EVERYDAY HEARING, <http://www.everydayhearing.com/hearing-aids/articles/whats-new-in-hearing-aids-spring-2015-edition>.

²¹ The Hearing Review, *Cochlear Releases Baha 5 Sound Processor with Streaming*, <http://www.hearingreview.com/2015/04/cochlear-releases-baha-5-sound-processor-streaming> (noting that the “Baha 5 Sound Processor is full of advanced hearing technologies, and is the first hearing implant system that lets people stream sound, and control their sound processor directly from the iPhone, iPad, or iPod touch”).

²² See Robert F. Erlandson, *Universal and Accessible Design for Products, Services, and Processes*, 182 (2008).

²³ See *id.*

²⁴ See Costco Hearing Aid Center, *Kirkland Signature™ 6.0 Premium Digital Hearing Instruments*, <http://www.costco.com/kirkland-signature-hearing-aid.html>.

providing further incentive for future third party development. Doing so will also increase consumer awareness of—and demand for—accessibility solutions based on these platforms.

B. Deeming Approaches Such as the MFi Hearing Aid Platform Compliant Furthers the Goal of Technological Neutrality

The Commission also has expressed interest in “alternative compliance approaches that can, in a technologically neutral manner, ensure that devices are fully accessible for users with hearing loss.”²⁵ Apple supports the Commission’s longstanding commitment to technological neutrality. Expanding the hearing aid compatibility rules to provide handset and hearing aid manufacturers with the flexibility to choose additional technical options for compatibility will further promote this goal.

The legislative history of the HAC Act confirms that Congress made a conscious effort to avoid mandating that any particular type of technology be required to achieve hearing aid compatibility. As the Commission recognized when it first adopted hearing aid compatibility rules for wireline handsets, Congress did not intend for the HAC Act to “tie manufacturers to a particular technology and inhibit future development; instead, it sought only to require that telephones be compatible.”²⁶ In the context of hearing aid compatibility, therefore, technological neutrality must not mean that the lowest common denominator subset of coupling technologies that are available for existing hearing aids (or, for that matter, handsets) should always constrain new approaches. For example, while Apple anticipates that the number of MFi-compatible hearing aids will continue to grow, Apple’s MFi platform is unlikely to ever be compatible with all hearing aids in existence, if only because hearing aid manufacturers are likely to continue

²⁵ NPRM ¶ 77.

²⁶ *Section 68.4(a) of the Commission's Rules Governing Hearing Aid-Compatible Telephones*, Report and Order, FCC 03-168, 18 FCC Rcd. 16753 ¶ 28 (2003) (citing H.R. Report No. 100-674, at 8 (1988)).

offering hearing aids with varying feature sets, including models that do not have support for wireless digital connections. But the FCC has not in the past, and should not now, require that manufacturers ubiquitously implement coupling technologies that can function with every hearing aid. To do so would undermine companies' ability to attract consumers with hearing loss by differentiating their products in the marketplace, and would severely constrain innovation.

Instead, consistent with the Wireless RERC's recommendations, the Commission's rules should provide an incentive for "wireless handset manufacturers to partner with hearing aid manufacturers to produce devices that are designed to work together,"²⁷ thereby enabling accessibility advances such as those described above. Handset and hearing aid manufacturers can then provide specific information to consumers about product compatibility.²⁸ For example, Apple's website provides a list, by manufacturer, of Made for iPhone compatible hearing aids,²⁹ and hearing aid manufacturers display a standard MFi logo on their websites and product materials indicating that the device has been designed specifically to use the MFi hearing aid platform.

IV. THE COMMISSION SHOULD DETERMINE HEARING AID COMPATIBILITY FOR NEW DIGITALLY BASED APPROACHES THROUGH QUALITATIVE ASSESSMENTS

The Commission seeks comment on the logistics of determining hearing aid compatibility for new solutions "outside of compliance with the applicable ANSI standard," including standards that should apply, as well as testing and rating criteria.³⁰ For systems that

²⁷ GA Tech/CACP/Wireless RERC 2014 PN Refresh Comments at 12.

²⁸ See NPRM ¶ 83 (seeking comment on disclosure requirements for alternate approaches).

²⁹ See Apple Inc., *Made for iPhone Hearing Aids*, <http://www.apple.com/accessibility/ios/hearing-aids/>.

³⁰ NPRM ¶¶ 83-84.

rely on digital modulation to convey audio from the handset to the hearing aid and that are designed to work together, Apple agrees with the Wireless RERC that the Commission’s rules could “specify the desired outcome from a user-experience perspective” rather than through adherence to technical requirements that focus on the potential for RF interference caused by the handset.³¹

The Commission’s existing interference-based assessment approach would not be meaningful for solutions that rely on digital modulation to convey audio to the hearing aid. This is because the impact of interference potentially introduced by the handset on the digitally modulated transmission is quite different than the impact on an analog signal generated by the handset and received by the hearing aid. As the Commission is aware, while analog signals degrade gradually as interference increases and is introduced to the original signal, there is not a similar correlation between the presence of an interfering signal and the impact on the desired signal for digital modulation. Instead, digital modulation typically enables a receiver to obtain sufficient binary data to recreate the original audio signal even in the presence of interfering RF energy—up to the point where interference is so great that the receiver cannot obtain enough data to render the signal. This phenomenon is known as the “waterfall” or “cliff” effect.³² For this reason, the Commission need not require compliance with specific standards that are intended to determine the “acceptable” levels of RF interference attributable to the handset when the user is placing or receiving a telephone call, as long as the manufacturer can demonstrate that

³¹ GA Tech/CACP/Wireless RERC 2014 PN Refresh Comments at 12.

³² See, e.g., *Amendment of Section 2.106 of the Commission’s Rules to Allocate Spectrum at 2 GHz for Use by the Mobile-Satellite Service*, Third Report and Order and Third Memorandum Opinion and Order, FCC 03-280, 18 FCC Rcd. 23,638, n.154 (2003).

the handset does not introduce interference to the degree that would impair receipt of the digital signal by the hearing aid in the handset's normal use cases.

Rather, as the Wireless RERC suggests, the Commission's standards for digitally based approaches should include a qualitative assessment to confirm that the handset delivers a good quality digital audio signal. For example, the FCC could require manufacturers to demonstrate that handsets can deliver digital audio to representative compatible hearing aids that meets thresholds for good quality audio systems set forth in established assessment methodologies such as ITU-R Recommendation BS.1534³³ or ITU-T Recommendation P.800.³⁴ Once the Commission has validated an alternative compliance approach for hearing aid compatibility, it could then maintain a list of approved approaches and issue guidance to telecommunications certification bodies that would permit them to issue grant codes for hearing aid compatibility for future devices that use these solutions. Manufacturers could then submit a certification as part of the equipment authorization process that the device supports the compliance approach approved by the Commission.

V. CONCLUSION

The Commission HAC rules should recognize innovators that develop solutions such as the MFi hearing aid platform which result in meaningful accessibility improvements, even if those technologies are not contemplated by the existing ANSI standard for hearing aid compatibility. By doing so, the Commission will advance accessibility by encouraging Apple

³³ See generally International Telecommunication Union, *Recommendation ITU-R BS.1534-3, Method for the subjective assessment of intermediate quality level of audio systems* (2015), http://www.itu.int/dms_pubrec/itu-r/rec/bs/R-REC-BS.1534-3-201510-I!!PDF-E.pdf.

³⁴ See generally International Telecommunication Union, *ITU-T Recommendation P.800, Methods for subjective determination of transmission quality* (1996), https://www.itu.int/rec/dologin_pub.asp?lang=e&id=T-REC-P.800-199608-I!!PDF-E&type=items.

and other manufacturers to think broadly and creatively about the best ways to enhance handset accessibility for individuals with hearing loss, and to bring those ideas to market.

Respectfully submitted,

A handwritten signature in cursive script, appearing to read "P. Margie", is written above a horizontal line.

Paul Margie

S. Roberts Carter

E. Austin Bonner

HARRIS, WILTSHIRE & GRANNIS LLP

1919 M Street NW, 8th Floor

Washington, DC 20036

(202) 730-1300

Counsel for Apple Inc.

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