

May 1, 2008

Marlene H. Dortch, Secretary  
Federal Communications Commission  
445 12<sup>th</sup> Street SW  
Washington, D.C. 20554

Re: **WRITTEN EX PARTE PRESENTATION**  
RM-11271  
ET Docket Nos. 06-135, 05-213, 03-92

Dear Ms. Dortch:

ON Semiconductor Corporation (“ON Semi”),<sup>1</sup> by its attorneys, hereby responds to a written ex parte submitted by Medtronic on February 25, 2008.<sup>2</sup> Although Medtronic recognized that “wireless hearing aids are critically important to a large segment of the population,”<sup>3</sup> it opposed AMIS’ (now ON Semi) proposal to deploy such hearing aids in the proposed upper MedRadio (“MEDS”) band (405-406 MHz) for the following three reasons:

- “[P]ermitting wireless hearing aid operations in the 405-406 MHz band would effectively preclude use of the entire 1 MHz segment of the MedRadio band by other non-voice wireless medical devices performing important diagnostic, therapeutic, and monitoring functions,”<sup>4</sup>
- Use of the upper portion of the proposed MEDS band would not be consistent with international uses and standards;<sup>5</sup> and
- Other options exist for the immediate deployment of the wireless hearing aids proposed by AMIS.<sup>6</sup>

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<sup>1</sup> On March 17, 2008, ON Semi completed its acquisition of AMI Semiconductor (“AMIS”). See <http://www.onsemi.com/PowerSolutions/pressRoom.do>.

<sup>2</sup> Letter from David E. Hilliard, Counsel for Medtronic, to Julius Knapp, Chief of the Office of Engineering and Technology, FCC, ET Docket No. 06-135 & RM-11271 (Feb. 25, 2008) (“Medtronic Letter”). Medtronic reiterated its objections to the AMIS proposal in a subsequent ex parte. See Letter from John W. Kuzin, Counsel for Medtronic, to Marlene H. Dortch, Secretary, FCC, ET Docket No. 06-135 & RM-11271 at 1 & Attachment, Slides 13-15 (Apr. 10, 2008).

<sup>3</sup> Medtronic Letter at 1.

<sup>4</sup> *Id.* at 1-3.

<sup>5</sup> *Id.* at 3-4.

<sup>6</sup> *Id.* at 4-6.

These claims demonstrate a fundamental misunderstanding of the AMIS proposal and the bands available for wireless hearing aids internationally. Moreover, wireless hearing aids are a critical innovation that will lead to a host of new capabilities for individuals with hearing disabilities. These capabilities include binaural signal processing, audio zoom capabilities, wireless fitting, and the potential elimination of interference to hearing aids from GSM devices.<sup>7</sup> Denial of access to the MEDS band will prevent the timely deployment of wireless hearing aids with these capabilities.

Contrary to the claims of Medtronic, AMIS is not asking for an “exclusive allocation”<sup>8</sup> of the proposed upper MEDS band and AMIS’ proposal would not preclude the use of the band by other non-voice devices.<sup>9</sup> AMIS merely seeks authority for non-exclusive access to the band for wireless hearing aids. As demonstrated by the slides attached to the AMIS February 7<sup>th</sup> Ex Parte,<sup>10</sup> the wireless hearing aids operate at low power. Because of the power constraints associated with the wireless hearing aid and the design parameters, the transmitting range of these devices is approximately one meter. Because of this one meter interference range, numerous other devices could be utilized nearby in the upper MEDS band without creating interference issues. Moreover, the wireless hearing aids proposed by AMIS do utilize a basic “listen-before-talk” spectrum sharing etiquette. Under this process, a blocking signal present in the required communications channel, combined with an appropriate protocol on the hearing aid, will not allow the hearing aid to transmit. For example, if two parties are using wireless hearing aids and one leans in to talk to the other party, there will be no interference because the wireless functionality will temporarily shut-down, but the hearing aid itself will continue to operate. Thus, a wireless hearing aid should not impact the use of other devices operating in the MEDS band.

Further, under the AMIS proposal, three 100 KHz channels would be aggregated together to permit the wireless hearing aid functionality. Thus, a hearing aid would be using only three of the ten 100 KHz channels available in the upper MEDS band in any given space. The remaining 700 KHz in that band would be available for other devices. As such, a hearing aid would use 15% of the total available new spectrum (the proposed MEDS bands), and only within a range of approximately 1 meter from the hearing aid. Outside of that 1 meter range, 100% of the spectrum would remain available.

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<sup>7</sup> See, e.g., Letter from Bryan N. Tramont and Robert G. Kirk, Counsel for AMIS, to Marlene H. Dortch, Secretary, FCC, ET Docket No. 06-135 (Feb. 7, 2008) (“AMIS Ex Parte”), Attachment, Slides 6-7. Binaural signal processing refers to a method of improving audibility and intelligibility of the speech signal and improving safety by increasing sound localization. *Id.* at Slide 6. Wireless fitting permits an audiologist/specialist to test and fit a hearing aid in one continuous setting by eliminating the need to remove the hearing aid from the user in order to make changes. *Id.* at Slide 7.

<sup>8</sup> Medtronic Letter at 3.

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

<sup>10</sup> See, e.g., AMIS Ex Parte, Attachment.

Medtronic also apparently takes issue with AMIS' statement that authorizing wireless hearing aids in the MEDS band would be consistent with international standards and implies that such operations are prohibited in the 401-406 MHz band.<sup>11</sup> However, AMIS has already been authorized to deploy wireless hearing aids in the 402-405 MHz band in Germany.<sup>12</sup> Further, the ETSI is actively considering a new standard that would permit wireless hearing aid deployment in the 405-406 MHz band consistent with the AMIS proposal before the FCC.

Medtronic claims that MEDS spectrum is not needed for wireless hearing aids because other spectrum and technologies are available for such use. The spectrum and technologies identified by Medtronic, however, will not permit the operations proposed by AMIS:<sup>13</sup>

- Part 15 and the Low Power Radio Service (“LPRS”) are not viable options.<sup>14</sup> The characteristics of the carrier frequencies in these bands effectively preclude the wireless hearing aids proposed by AMIS. Given the size of effective antennas that would be required for in-hearing aid use and the associated power budget to operate an ultra low power miniature radio circuit, it would be extremely difficult (if not impossible) to reliably transmit and receive signals between hearing aids located on opposite sides of the head. Even if technically possible, interference to the wireless hearing aid operation would be much more severe in these bands given the higher radiated power permitted. Moreover, the AMIS proposals require 300 KHz channels which are not available in these bands. Use of these bands also would be inconsistent with a worldwide deployment — the frequencies are assigned to radio astronomy, defense systems, and digital audio broadcasting in the European community. Thus, a person with a wireless hearing aid purchased in the United States and operating on the frequencies proposed by Medtronic would be unable to use that hearing aid when traveling overseas.
- The 169.4-169.8125 MHz band will not support the wireless hearing aids proposed by AMIS. Although Medtronic is correct that this spectrum is available for assisting listening devices in Europe, it is not conducive to binaural wireless hearing aids such as those proposed by AMIS. It is possible to design a receiving antenna in this band whose mechanical size could fit some of the larger hearing aids, albeit with very poor reception characteristics. But the power constraints associated with the small battery

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<sup>11</sup> Medtronic Letter at 3.

<sup>12</sup> Restrictions on the deployment of such devices in the 401-406 MHz band have been removed in Germany. See *Allgemeinzuteilung von Frequenzen für medizinische Funkanwendungen*, Vfg. 32/2007 available at [www.bundesnetzagentur.de/enid/22b32d29543eae99f9807fe107798a32,0/Frequenzordnung/Allgemeinzuteilungen\\_9u.html](http://www.bundesnetzagentur.de/enid/22b32d29543eae99f9807fe107798a32,0/Frequenzordnung/Allgemeinzuteilungen_9u.html).

<sup>13</sup> Specifically, Medtronic claimed that wireless hearing aids could be deployed (i) “in four separate bands under Part 15 and the Low Power Radio Service (“LPRS”) in Part 95; (ii) in the 169.4-169.8125 MHz band, (iii) utilizing Bluetooth technology, and (iv) by utilizing an “ultra-low-power inductive system.” Medtronic Letter at 4-5.

<sup>14</sup> *Cf. id.* at 4.

necessary for hearing aids effectively preclude the addition of a separate transmit antenna to relay signals from a wireless hearing aid on one ear to the wireless hearing aid on the other. Further, the allowed radiated output power in this band is substantially higher than what is needed to operate the wireless hearing aids AMIS proposes. As a result, the proposed wireless hearing aids would receive interference from numerous unlicensed devices operating in that same band. Lastly, in Europe, the channel width is limited to 50 kHz in this band whereas the wireless hearing aids proposed by AMIS require 300 kHz.

- Bluetooth initially demonstrated promise, but is not a viable alternative due to higher body tissue absorption issues. In fact, Bluetooth, with its carrier frequencies operating in the 2.4GHz ISM band is possibly the worst choice to operate wireless hearing aids from a body tissue absorption perspective because most of what would get radiated by the power constrained wireless hearing aid would be absorbed by the body. This issue simply cannot be corrected by increasing power given the limited power budget associated with wireless hearing aids. Further, Bluetooth uses a Frequency Hopping Spread Spectrum link protocol to insure a reliable link. This translates into additional computing demand on the radio circuit, which in turn requires additional power unavailable in wireless hearing aids.<sup>15</sup> In addition even if these hurdles could be overcome, interference mitigation would be extremely complex because the 2.4GHz band is shared with other worldwide standards such as WLAN, ZigBee, and short range home automation and building control applications.
- Ultra-low-power inductive systems also require a power budget that precludes use for wireless hearing aids. These systems generally rely on magnetic induction (“MI”). In the hearing aid industry, three manufacturers have deployed such systems, all operating below 15 MHz. MI generally solves antenna size and placement issues by using tiny coiled magnets that fit inside a hearing aid. However, these systems have two major drawbacks that preclude their use in the manner proposed by AMIS — *i.e.*, binaural, wireless hearing aids. First, there is a relatively poor power consumption to range ratio, and second, there are system directionality limitations. With regard to power consumption, the path loss in free space for MI is 1/distance to the power of 6, whereas for Radio Frequency (RF) it is 1/distance to the power of 2. Thus, MI field strength decays much more rapidly than RF, which means that you need much more power to expand the range of an MI device compared to an RF device. The MI hearing aids on the market are unable to maintain continuous communication between the hearing aids due to power consumption. Even if the power issues could be overcome, MI devices are subject to severe directionality requirements. If the wireless hearing aid or an accessory shifts, there is a strong likelihood that the transmission will get lost.

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<sup>15</sup> Although Ultra Low Power Bluetooth (formerly Wibree) is now available, this is a duty cycled version of Bluetooth designed for sensing applications in the “fitness environment” (heart-rate monitors, training bike metrics, *etc.*). ULP-BT still draws four times (4x) the power available in a wireless hearing aid.

In sum, the power budget and size constraints associated with hearing aids effectively preclude use of the bands and technologies identified by Medtronic for binaural transmissions and audio streaming. Much larger devices, most likely ancillary devices, would be required to permit the full wireless hearing aid functionality proposed by AMIS if operations were limited to the bands referenced by Medtronic. Individuals with hearing disabilities should not be required to purchase larger hearing aids or cumbersome ancillary devices to achieve the functionality proposed by AMIS. They deserve wireless binaural transmissions and audio streaming functionality fully integrated in the hearing aid — a capability available today if the upper MEDS band is made available for such devices and a result that can be achieved without adverse consequences to other proposed or current MEDS band uses.

If you have any questions, please contact the undersigned.

Respectfully submitted,

/s/Robert G. Kirk  
Robert G. Kirk

cc: Julius P. Knapp (via e-mail)  
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