

March 17, 2009

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

Re: **NOTICE OF EX PARTE PRESENTATION**
ET Docket Nos. 06-135, 05-213, 03-92

Dear Ms. Dortch:

Pursuant to Section 1.1206 of the Commission's rules,¹ the purpose of this letter is to notify the Commission that the undersigned representatives of ON Semiconductor Corporation ("ON Semi") met yesterday with Acting Chairman Michael J. Copps and Paul Murray, his Legal Advisor for Wireless and International Issues:

Robert Tong, Vice President, Head of Medical Division, ON Semi
Bryan N. Tramont, Wilkinson Barker Knauer, LLP
Robert G. Kirk, Wilkinson Barker Knauer, LLP

The parties discussed the attached slides and prior filings by ON Semi in this proceeding regarding the possible authorization of wireless hearing aids in the proposed MedRadio ("MEDS") bands.²

If you have any questions concerning this notice, please contact the undersigned.

Respectfully submitted,

/s/Robert G. Kirk
Robert G. Kirk

cc: Paul Murray (via e-mail)

¹ See 47 C.F.R. §§ 1.1206(a), (b).

² See, e.g., Letter from Robert G. Kirk, Counsel for ON Semiconductor Corporation to Marlene H. Dortch, Secretary, FCC, ET Docket No. 06-135 (Sept. 18, 2008); Letter from Robert G. Kirk, Counsel for ON Semiconductor Corporation to Marlene H. Dortch, Secretary, FCC, ET Docket No. 06-135 (May 1, 2008); 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).



ON Semiconductor[®]

**Ultra low power wireless hearing aids
for operation in the proposed
MedRadio (MEDS) band**

March 16, 2009

ON Semiconductor - Quick Facts

- **Founded:** ON Semiconductor spun off from Motorola in 1998
Motorola Semiconductor was founded in 1960; AMI Semiconductor was founded in 1966
- **Operations:** Worldwide Headquarters: Phoenix, Arizona
Design Centers and Manufacturing: Worldwide Locations
- **Revenues:** \$2.2 billion (pro forma 2007)
- **Employees:** ~14,000 worldwide
- **NASDAQ:** ONNN
- **Business:** Design and manufacture of mixed signal and digital semiconductor products. Preferred supplier for efficient power solutions in the fields of:
 - Automotive
 - Computing
 - Communications
 - Consumer Electronics
 - Industrial
 - Medical
 - Military and Aerospace
- **Medical applications include:**
 - Implantable Medical Devices (IMD) such as defibrillators, pacemakers, neurostimulators
 - Hearing Audio Solutions (HAS) such as hearing aids, electronic stethoscopes
 - Diagnostic Therapy and Monitoring (DTM) such as glucose, pulse-oxy meters



Summary

- The MICS/MEDS bands are optimal for body worn communications
- MEDS bands provide perfect opportunity to permit deployment of next-generation hearing aids that improve hearing capabilities by utilizing wireless technology:
 - Bi-directional ear-to-ear synchronization and communication
 - Remote sound pick up and relay to the hearing aid
 - Secondary audio device to the hearing aid
- MEDS bands would be harmonized with proposed international standards and therefore provide worldwide access and deployment capability for these hearing aids
- Deployment of next-generation wireless hearing aids in the MEDS bands would not interfere with MICS-based devices, nor preclude operations of MEDS-based devices
- ON Semiconductor proposed rules would permit deployment of these hearing aids in only one (the upper) of the two proposed MEDS bands, leaving 85% of the MEDS spectrum exclusively available for non-hearing aid devices!



Proposed MICS/MEDS band plan

To accommodate worldwide hearing aid deployment



MEDS lower wing band
(left unchanged)

MEDS upper wing band
(only 3 channels change)

Permit aggregation of 3 100kHz channels
(for a total of 300kHz)

Permit voice content in transmission

-16dBm, LBT, 100% DC

-36dBm, no LBT, 100% DC



Proposed MEDS Rules

- New § 95.401(h). The Medical Device Radio Communication Service (“MedRadio” or “MEDS”) – a service that may be used for ultra-low power transmissions from implanted and body-worn devices that restore bodily functions (*i.e.*, sight, hearing, muscle movement) and/or perform critical diagnostic, therapeutic, or monitoring functions. The rules for this service are contained in subpart M of this part.
- Add new § 95.631(l). MEDS transmitters may transmit any emission type appropriate for communications in this service. Given potential hearing aid applications, MEDS transmitters may be used to provide voice communications.
- The MEDS bands are perfectly suited for wireless Hearing Aid operations but:
 - One 300kHz segment is necessary for optimal hearing aid operation, thus aggregation of three 100kHz channels should be permitted.
 - Only a portion of one of the two MEDS bands is necessary for hearing aid applications – only 3 of the 10 100kHz channels in the upper band
 - The MEDS maximum allowed duty cycle and ERP should be the same as for MICS:
 - 16dBm, 100% DC when listen-before-talk (LBT) spectrum access is observed
 - For the ultra low radio power tier devices, -36dBm, 100% DC should be permitted for hearing aids, without LBT, only in the 300kHz band located in one of the two MEDS bands



Safely sharing the MEDS band...

- Wireless hearing aids will only operate in one 300kHz channel¹ located in one of the two proposed MEDS bands²
 - Hearing aids would co-exist with other MEDS devices in 15% of the proposed new spectrum (3 channels); 85% of MEDS (17 channels) remain exclusively available to all other non-hearing aid MEDS devices
- Within their single channel, wireless hearing aids will use a Listen Before Transmit (LBT) spectrum access protocol where applicable, to minimize risk of interferences
 - This is conform with the current access protocol in the MEDS proposal for the high radio power level devices
 - As such, wireless hearing aids will behave no differently from other such MEDS devices
- Wireless hearing aids operate with extremely low power. Achieved range is engineered with minimal radio energy
 - In a binaural (ear to ear) configuration two users of wireless hearing aids³ can sit next to each other without their aids interfering with one another
 - As such the same radio spectrum becomes re-usable every ~40cm
 - As such only one channel is required for hearing aids, they can co-exist!
- Hearing aids will still operate when wireless functionality is temporarily unavailable due to LBT or interference from other MEDS devices.

¹ made of 3 consecutive, aggregated 100kHz channels ² the upper band: 405 – 406MHz ³ using the one and only proposed band set to the same frequency



Different use cases, different radio power levels

Ultra short distance, ultra low radio power

- Distance to bridge: ~30cm
 - from the user's one ear to the other ear
- Required RF output power: < -36dBm
- Channel bandwidth: 300kHz
- Duty cycle: 100%
- Spectrum access: no LBT

Ear to ear synchronization

Sound relay

Close, around the body, low radio power

- Distance to bridge: < 3m
 - from the programmer to the hearing aid
 - from a hand-held device to the hearing aid
- Required RF output power: up to -16dBm
- Channel bandwidth: 100kHz or 300kHz
- Duty cycle: up to 100%, on sporadically only
- Spectrum access: LBT

Wireless programming

Wireless audio zoom

Wireless Link
Sound Waves
Sound pick up zone

Interference matters

- **Two types of interferences need to be considered**

- In channel interference
 - Where two different transmissions may collide because they want to use the same channel
 - If these two transmissions are far enough apart, they will ignore each other and thus no longer interfere
 - The distance to no interference depends on the transmitter's radio output power levels
- Interference into the adjacent channels
 - Where one transmission may “spill over” into an adjacent channel and interfere with a “neighbouring” transmission
 - “spilling over” into adjacent channels is regulated by the wireless link standard; a “maximum radio energy” is allowed to spill over, thus the distance of interference can be determined

- **Two interference distances can be calculated**

- The distance to the blocker limit [**d**] is the distance where another transmission stops interfering
- The distance to the background [**D**] is the distance after which no signal is present anymore



Interference metrics

In channel interference

Two transmissions may compete for the spectrum, if in range

RF output power	Distance to blocker [d]	Distance to background [D]
Ultra low radio power (-41dBm)	2.7m	8.3m
Low radio power (-16dBm)	47m	150m

Interference into adjacent channels

The radio is designed to filter/limit out of band emissions at all radio power levels

RF output power	Distance to blocker [d]	Distance to background [D]
Ultra low radio power (-41dBm)	0.3m	0.9m
Low radio power (-16dBm)	0.3m	0.9m



FCC PROCEEDING

- **Wireless Hearing Aids Should Be Authorized Today**
 - The purpose of this proceeding was to modify the rules to accommodate new devices that (i) improve bodily functions and (ii) are “immediately and imminently available” (NPRM at ¶¶ 3, 5)
 - Wireless hearing aids improve hearing
 - The devices are currently available and being sold in Europe
 - ON Semi proposed wireless hearing aids in the MICS band (to mirror current European deployments) during the rulemaking and modified its proposal based on comments in the proceeding
 - Thus, grant of On Semi’s proposal would be a logical outgrowth of the proceeding
 - Devices will not cause interference – they would be limited to only one 300 kHz channel and operate at low power with a very short range
- **If Wireless Hearing Aids are Not Authorized in Order, A New NPRM Should Be Promptly Launched**
 - The issue of deploying wireless hearing aids within the MEDS/MICS band was raised in this proceeding nearly 2 1/2 years ago (See Comments of AMI Semiconductor, October 30, 2006)
 - Devices are ready for the market today

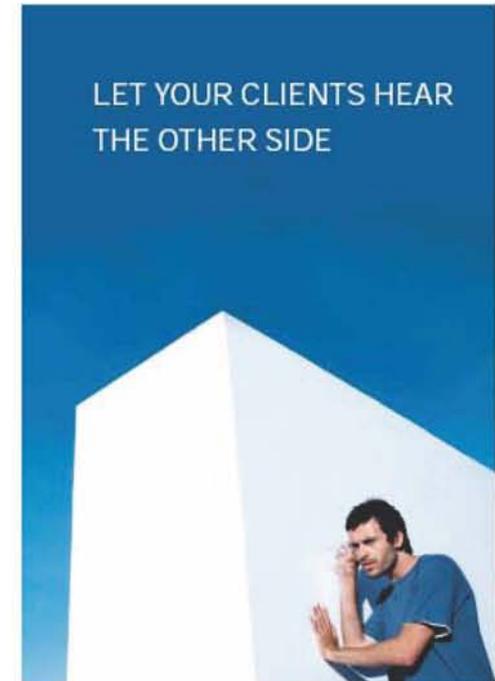


Status in Europe: 400MHz based HAs are shipping....

) RELAY (

DIGITAL WIRELESS CROS

- HA manufacturer **Resound**, under its brand **Interton**, is selling wireless hearing aids in select European countries today; the brand name is: **RELAY**
 - The application is: “Sound Relay”
 - The countries are: Germany, Great Britain, France, The Netherlands, Sweden, Finland, Ireland, Iceland, Portugal, Poland, The Czech Republic, Romania and Greece
 - Devices operate at 404.2 MHz
- The EHIMA (**E**uropean **H**earing **I**nstrument **M**anufacturer’s **A**ssociation) presented a draft document (SRDoc) detailing spectrum needs for wireless hearing aids
 - The document captures the various spectrum needs for widely different wireless hearing aid use cases
 - For around the body and short range distances, the spectrum proposal is consistent with ON Semi’s proposal before the FCC
 - The final document will be presented at the June ETSI ERM meeting for voting (June 15-19, 2009)
 - The proposed standard will then be presented to the ITU in July



 **INTERTON**
simply different



OPPOSITION TO PROPOSAL UNFOUNDED

- Medtronic and Zarlink are the principal opponents to authorizing wireless hearing aids
- They fail to demonstrate likelihood of interference
- They are seeking to exclude devices they do not manufacture
- ON Semi manufactures components for traditional MICS devices, as well as hearing aids. Thus, it would not propose rules that would undermine a substantial portion of its business
- The Opponents fail to recognize the difference between the ultra low power nature of wireless hearing aids and low power auxiliary applications
 - Day-to-day wireless hearing aid operations would be ultra low power – less than -36 dBm
 - Low power auxiliary applications related to fitting the hearing aid and other temporary applications are sporadic, duty cycled and will abide by current MEDS spectrum access rules
- Zarlink cautions that wireless hearing aids will proliferate and crowd out the band. This claim is unfounded due to low power operations and proposed limitation to operations within only one 300 kHz portion of the band





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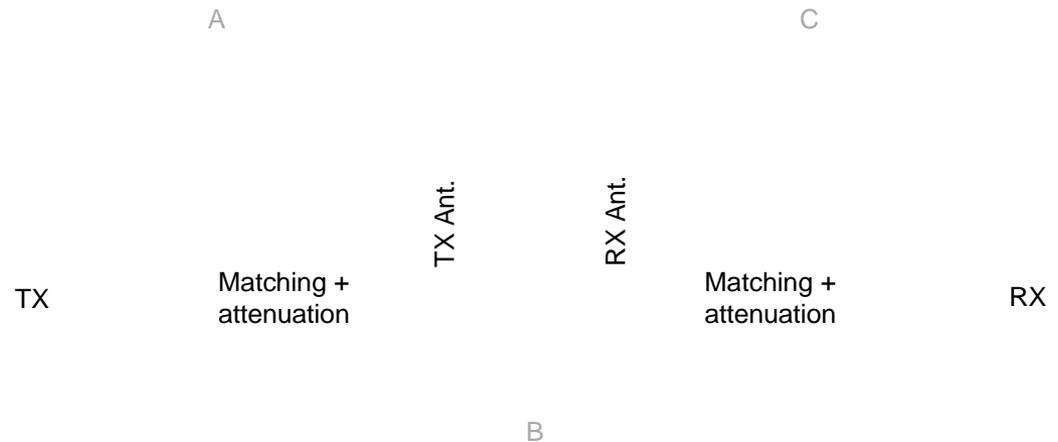
Technical Slides

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Sound relay: link budget

Wireless “sound relay” for more safety

- When sound emanates from one direction only, in the case where that side’s ear is fully impaired, capturing the sound with the remaining ear can be challenging.
- Capturing and relaying the sound from one side to the other adds listening comfort, safety by restoring a 360° aural field!



Typical required range 0.3m
 Duty cycle 100%, constantly on

- LINK BUDGET -

- Net dBm -

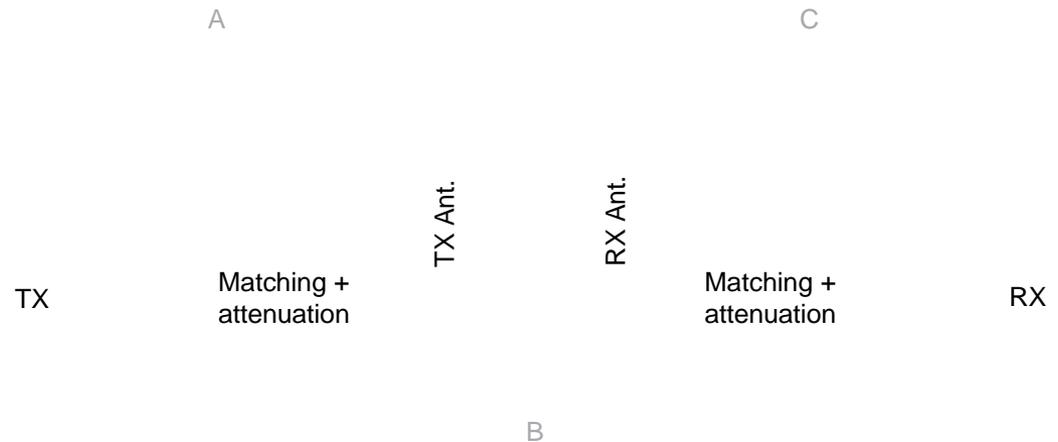
A	TX out at antenna	-41dBm
B	Path loss (0.3m) + margin (10dB)	24dBm
C	Signal level at RX antenna	-65dBm



Audio zoom: link budget

Wireless “audio zoom” for increased listening comfort

- Hearing impaired peoples are challenged the most in noisy situations
- Hand-held or body worn “zooming microphones” can help select sounds of interest.
- Wirelessly relaying it to the aids adds freedom of movement



Typical required range 1.0m

Duty cycle 100 %, when on, however sporadic utilization

- LINK BUDGET -

- Net dBm -

A	TX out at antenna	-30dBm
B	Path loss (1.0m) + margin (10dB)	35dBm
C	Signal level at RX antenna	-65dBm

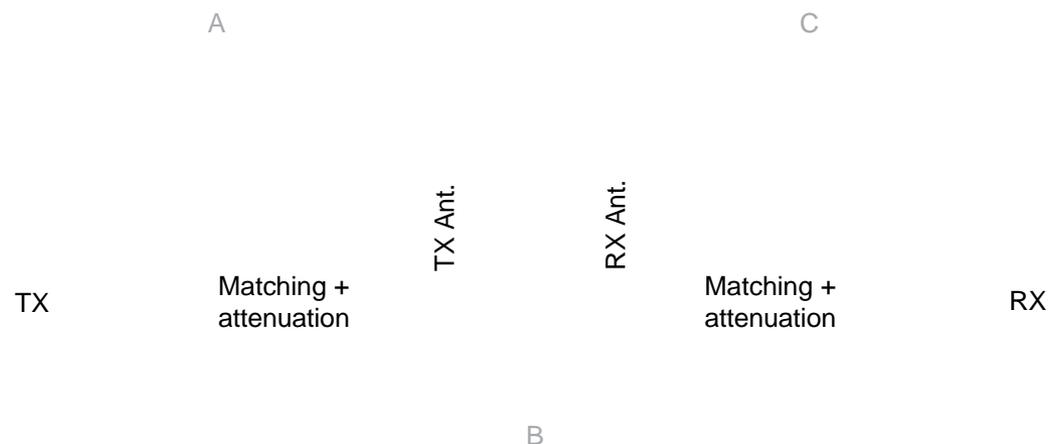
Wireless Link
Sound Waves
Sound pick up zone



Remote programming (fitting): link budget

Wireless “fitting” for best results and comfort

- Hearing aids are typically programmed with the user’s audiogram information so that best correction can be achieved.
- Wirelessly programming aids from the Audiologist’s computer insures they can be adjusted while being worn for best results and comfort!



Typical required range 2.0m
 Duty cycle 0.1%, burst mode

- LINK BUDGET -

- Net dBm -

A	TX out at antenna	-20dBm
B	Path loss (2.0m) + margin (10dB)	41dBm
C	Signal level at RX antenna	-61dBm



For additional information

Robert Tong

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