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| **Title:** | Incoming Liaison Statement to IEC TC100 on Wireless connections to hearing aids | |

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| **Source:** | | ITU-T FG AVA | | | | | |
| **Title:** | | LS to IEC TC100 on Wireless connections to hearing aids | | | | | |
| **LIAISON STATEMENT** | | | | | | | |
| **For action to:** | | | IEC TC 100 | | | | |
| **For comment to:** | | | - | | | | |
| **For information to:** | | | ITU-T SG16, ITU-R SG6, TSAG, JCA-AHF | | | | |
| **Approval:** | | | Agreed to at FG AVA meeting (Geneva, 15 September 2011) | | | | |
| **Deadline:** | | | 6 January 2012 | | | | |
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The ITU-T Focus Group on Audiovisual Media Accessibility (FG AVA) is pleased to inform you that we are continuing the work and made progress at our second meeting in Geneva, 15 September 2011. A highlight of the meeting results is found in the FG AVA website, [http://itu.int/en/ITU-T/‌focusgroups/ava/Pages/](http://itu.int/en/ITU-T/focusgroups/ava/Pages/).

As there are many work areas of common interest, and with the intention to maximize coordination, FG AVA would like to inform IEC TC100 about the following.

The European Hearing Instrument Manufacturers Association made a contribution at the last FG AVA meeting on the topic of "Wireless connections to hearing aids" (see [Annex 1](#_ANNEX_1_Contribution) herein).

Emerging wireless connections and services include access of hearing aids to public, home and personal audio services. Personal access services include access to mobile phones and personal audio and home services include access to television, radio and alarms. Public services include access to points of sale, public address systems at religious places, theatres, events' and cinema's public announcement systems at airports, stations and other. For these services and in particular for public use, a standardized system is required to allow world-wide access. A critical requirement is that wireless connections to hearing aids could make use of common or harmonized radio spectrum world-wide which industry may pursue further in conjunction with ITU.

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The use of wireless connections to hearing aids allows the direct transmission of audio information (speech, music, alarms, etc.) from the source to the ear, rather than using the built in microphone of a hearing aid. Such direct transmission would largely improve intelligibility of communication for hearing impaired persons.

Wireless communication in hearing aids will improve on currently used t-coil systems which have limited quality, have single channel capacity, and apply an induction loop. Furthermore, these t-coil systems only cover a restricted area and their induction loop requires a specialist in installation and maintenance.

ITU-T FG AVA looks forward to a fruitful collaboration and to your response on this matter.

**Annex:** **ava-i-0030**

# ANNEX 1 Contribution AVA-I-30 (EHIMA) "Wireless connections to hearing aids"

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| INTERNATIONAL TELECOMMUNICATION UNION | | **Focus Group On Audiovisual Media Accessibility** |
| **TELECOMMUNICATION STANDARDIZATION SECTOR**  STUDY PERIOD 2009-2012 | | **AVA-I-30** |
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| **DOCUMENT** | | |
| **Source:** | European Hearing Instrument Manufacturers Association (EHIMA) | |
| **Title:** | Wireless connections to hearing aids | |

**Summary**

This document provides contribution to WG-D Emerging Access Services. It follows the format of input documents for the ITU AVA focus-group.

The document provides input for the emerging wireless connections and services of hearing aids to public, home and personal audio services. Personal access services include access to mobile phone and personal audio services; Home services include access to television, radio and alarms; Public services include access to points of sales, counters, public address systems at religious places, theatres, events and cinema's. For public use it is required to have a standardized system, to allow world-wide access. A critical requirement is that common or harmonized radio spectrum should be obtained world-wide.

**A. What is the state of the art of emerging access services for hearing aids**

# A.1 Existing work practices: Wireless connections to hearing aids

Hearing impairment is, next to an increase in hearing threshold, associated by a reduced ability to discriminate speech within background noise and competing speech sources. The use of wireless connections to hearing aids allows the direct transmission of audio information (speech, music, alarms, etc.) from the source to the ear, rather than using the built in microphone of a hearing aid. This will reduce the level of disturbing background noise and competing sources, thus improving the capability to understand speech for hearing impaired users.

Existing systems for wireless connections to hearing aids [1]:

1. Using a system with induction loop that provides an analog solution to transmit audio information from audio source to hearing aid. The system consists of wired loop to generate a magnetic field and the hearing aid to contain a coil to pick up the magnetic field. The hearing aid is required to stay within the magnetic field of the induction loop. Loops can be mounted in in a chair (e.g. cushion), on the ground (room, area in church, theatre, etc.), in a counter, worn around the neck connected to a mobile phone etc. More than 50% of all hearing aids have a pick-up coil (named: telecoil, t-coil) built-in.   
   The technical properties of induction loop systems are standardized in IEC 60118-4 [2] and ANSI S3.22 [3].
2. Using a system FM transmitter near the source such as television/radio/microphone and with an FM receiver attached to or integrated in the hearing aid. The systems and technology are manufacturer specific. FM systems are used in schools and at home. Less than 0.5% of hearing aids are used in combination with an FM system.
3. Using a specific personal communicator or media gateway worn on the body that provides a wireless connection to audio sources at one side (e.g. Bluetooth connection to TV, Radio, mobile phone, etc.) and a proprietary short range wireless link with the hearing aid(s) at the other side. The systems and technology are manufacturer specific.   
   The use of a Bluetooth link allows standard use of personal communication to mobile phones and to transmission equipment connected to television and radio sets.

## Audiovisual services for wireless connection to hearing aids

* Public address systems (theatre, movies, churches, etc.)
* Public announcement systems (airports, stations, theatres, events, etc.)
* Public point of sale systems (counter, box-office)
* Home television, video and audio systems
* Home intercom systems (doorbell, alarms)
* Personal and home telephony (landline, mobile)
* Personal audio, video, gaming
* Personal handheld information devices
* Personal computers, tablets and other
* Classroom teaching audio systems.

Public, home and personal use of wireless connections to hearing aids

The table below provides an overview of usability of existing wireless connection of hearing aids in different situations.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Usability of wireless connection solutions** | | | |
|  | **public** | **home** | **personal** | **school** |
| **Induction loop** | ++ | + | +/- | +/- |
| **FM** | -- | + | + | ++ |
| **Personal communicator** | -- | + | ++ | + |

Induction loop systems are used in the public space, personally and at home.

* **Public** applications include: counters, box-offices, points of sales, public address systems at religious places, theatres and cinema's.
* **Home** applications include television, radio and alarm.
* **Personal** applications include connection to mobile phones and personal audio using a neck-loop. In some cases induction loops are also used at schools.

FM systems connected to hearing aids are applied most at **home** (television, radio, alarm) and at **schools**.

Personal communicator systems are used on the body with a short range wireless connection to the hearing aid(s). The communicator provides wireless (e.g. Bluetooth) or wired connections to the **personal** area: mobile phone, personal audio and **home** area: television, radio and alarm.

# A.2 The value network and the key stakeholders for Wireless connections to hearing aids

End-users for wireless connection to hearing aids

A wireless connection can be used for users of hearing aids that have:

* Moderate to severe hearing loss (for hearing loss classification see [3])
* Persons having problems in discriminating speech in noise. Most hearing aid users may benefit from an improvement of signal to noise. If the loss in speech discrimination is more than 3 dB (SNR) the additional use of wireless communication in situations with high background noise or competing speech levels is strongly advised.

Hearing aid users are organized in national and international organizations of end users for instance:

* IFHOH, International Federation of the Hard Of Hearing
* Action on Hearing Loss (UK, former RNID).

Stakeholders for wireless connection to hearing aids

* Manufacturers of:
  + Hearing aids
  + Induction loops
  + Public address and announcement systems
  + Assistive devices for hearing impaired users
  + Mobile telephones
* Public service providers:
  + Theatre, cinema
  + Religious places
  + Public transport authorities

# A.3 Examples of good practice for Wireless connections to hearing aids

End-user pressure

Organizations of persons with hearing impairment put pressure on authorities and service providers to facilitate wireless connections to hearing aids in public space. At present this is concentrated on the installation of loop systems in public places.

**B. What is the vision for 2015 and 2020 for wireless connections to hearing aids?**

**B.1 Scenario for wireless connections to hearing aids**

Needs and interests

Induction loop systems (T-coil) have a number of problems that reduce use and acceptance for a large group of hearing impaired persons. Most important drawbacks are:

* Limited sound quality. Magnetic loop systems are very sensitive to magnetic and electric interferences. These originate from electronic equipment, power lines, fluorescent lighting, mobile phones etc. Hearing impaired persons have higher demands on sound quality (in particular: low noise, low interference)
* Single audio channel; no possibility to transmit and to detect alternative services (e.g. translations, clean speech).
* Small range: user is required to stay within magnetic loop (area on ground).
* Installation and maintenance costs of loops. Installation in public places requires several constructive measures to deploy the induction loop. Regular professional maintenance is required to assure low interference operation.

For the long term wireless communication to hearing aids, the induction loop systems (T-coil) should be replaced by a new wireless system. The key characteristics of such system are:

* Single system for public, home and personal usage
* High sound quality to allow optimal communication for hearing impaired persons
* Multi-channel to allow selection of services (e.g. language selection)
* Automatic service detection
* Flexible omnidirectional range: 10 to 50 m
* Low cost transmitters that can easily be installed also by non-professionals
* Receivers integrated in hearing aids: small size, low power consumption, low cost.

**B.2 The design and production processes**

Wireless connections to hearing aids are designed and produced by hearing aid manufacturers. Special non-standard radio circuitry, antenna and software for receiving (and transmitting) need to be integrated into hearing aids. Main requirements on design and use for adding circuitry and antenna to hearing aids are:

* Small enough to be included in hearing aids without increasing size of hearing aid that may negatively affect the visibility and acceptance of a hearing aid. An increase of 10-20% size of a hearing aid is considered acceptable
* Low power to save battery life-time. A reduction of 10 to 20% of battery lifetime is considered acceptable.
* Circuits for wireless connections should be sufficient low cost to allow general acceptance. By worldwide standardization and integration in the majority of hearing aids the costs will be reduced strongly by economy of scales.

**B.3 Key Technology for harmonised wireless links for hearing aids**

For integration of wireless connections in small hearing aids, there is a high demands on size of circuitry, antenna's and power consumption.

Size restrictions on antennas and low power consumption will put requirements on the spectral bandwidth:

* low interference in adjacent spectrum
* effective low interference spectrum protocols
* efficient antenna design (= small size) requires high-frequency spectrum bandwidth (>1 Ghz)

**B.4 Legislation and Regulations**

The ITU world radio conference (WRC), with CEPT and FCC regulate the availability of wireless spectrum and used modulation schemes in EU and USA respectively and word-wide. Spectrum allocation for a new wireless service should be handled through these organizations and should be common worldwide.

Organizations like ITU, ETSI, IEC and ANSI are active in standards for short range wireless connections and for hearing aids. These organizations will be involved in the development of standards for new wireless protocols.

Accessibility regulations in EU, USA, JP and other countries will increasingly oblige public service providers to offer interference free communication for hearing impaired (theatre, points of sale, church, etc.).

**B.5 Business models**

It is expected that most hearing aid users will benefit from high quality wireless connections to their hearing aid(s).

All stakeholders (users, manufacturers, provider) must be willing, to adopt a new connection service. There must be a migration path from the present loop and FM systems to the new wireless service. Normal life-time of a hearing aid is 5 to 7 years. Full migration is expected to take about 10 years.

The annual turn-over of new hearing aids is about 10 to 13 Million (2010) aids, which is expected to increase to more 15 to 20 Million aids in 2015. Of this 50 to 70% of may include wireless connections.

**C. What are the barriers in 2011 that currently prevent these visions from becoming a reality?**

For introducing a new high quality wireless connection for hearing aids the following barriers exist:

1. Allocation of a common global spectrum:

* exclusive spectrum is impossible
* unlicensed free spectrum bands lack long-term guarantees for low interference from other users
* sharing of spectrum with primary users in "quiet" bands is feasible, but must be negotiated worldwide.

1. Worldwide commitment of stakeholders on a single wireless connection system between manufacturers, end-users and authorities.
2. Shared development of technology and components to assure compatibility and to reduce costs
3. Standardization of protocols and system design.

**D. What actions are needed to break down current barriers in order to make the 2015 and 2020 visions a reality?**

For the development and introduction of a new public wireless connection service for hearing aids the following steps can be identified:

1. Identify radio spectrum that is suitable and achievable and define characteristics of candidate frequency bands
2. Contact stakeholders and reach agreement on system approach and worldwide spectrum band(s)
3. Prepare proposals for frequency bands through CEPT and FCC and submit to WRC
4. Develop prototype systems and outline standards
5. Develop standards within ITU, ETSI, IEC as needed
6. Develop standardized key-components
7. Develop marketing approach for introduction and migration.

The time-frame of above steps is estimated to be between 3 to 5 years. Several of the steps should be taken in parallel.

**References:**

[1]: Draft ETSI TR 102 791 (2010): Electromagnetic compatibility and Radio spectrum Matters (ERM); System reference document; Short Range Devices (SRD); Technical characteristics of wireless aids for hearing impaired people operating in the VHF and UHF frequency range. V1.1.1\_0.0.14 (2010-05).

[2]: IEC 60118-4 (2006): Induction loop systems for hearing aid purposes - Magnetic field strength.

[3]: ANSI S3.22 (2009), Specification of Hearing Aid Characteristics.

[4]: Bisgaard N, Vlaming MSMG and Dahlquist M, (2010): Standard Audiograms for the IEC 60118-15 Measurement Procedure. Trends in Amplification, 2010; 14(2) 113–120.

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