Using an FM system with a Cochlear Implant
An FM system provides one simple and effective way to enhance communication with hearing impaired people in difficult “one person to many” listening situations such as in a classroom.

How does it work?

FM systems are composed of:

- a microphone/transmitter worn by the speaker,
- a frequency tuned receiver plugged into the listener sound processor.

The transmitter picks up the speaker’s voice through a microphone and sends it via radio waves directly to the Cochlear Implant user’s FM receiver.

The FM receiver transmits the speech directly to the sound processor for listening.

Regardless of the distance between speaker and listener, the signal is delivered directly to the FM receiver at a constant intensity level. The proximity of the lapel microphone to the speakers’ mouth ensures that his/her voice is delivered at a level that is significantly louder than the level of any background noise.

In Europe, authorized FM transmission ranges vary from country to country. However, within each of the designated transmitting range, FM transmission is divided into narrow bands or operating channels. Both transmitter and receiver must be tuned to the same channel if the system is to work. Receivers will capture the signal of the closest transmitter using the matching channel, rejecting other weaker signals.

Connecting an FM system to a sound processor

**Step 1** Attach the microphone of the FM transmitter to the lapel of the speaker (e.g. teacher).

**Step 2** While the FM system and sound processor are turned off, ensure that the volume on the FM receiver and the volume/sensitivity on the speech processor are both set to the minimum.

**Step 3** Connect the FM receiver to the sound processor with a specific cable (and/or earhook) defined and provided by the audiologist.

**Step 4** Turn on the transmitter, receiver, and sound processor in that order.

*It is important that you turn on the equipment in the proper order to prevent the cochlear implant user from hearing any adverse sound percepts.*

**Step 5** Sound processor: gradually increase the volume and sensitivity up to the settings advised by the audiologist.

**Step 6** FM receiver: gradually increase the volume up to a comfortable listening level or as specified by the audiologist.

**Step 7** For body worn processors, place the FM receiver into the belt-worn pouch or harness of the cochlear implant user.

**Step 8** Walk a few meters away from the cochlear implant recipient and administer a simple auditory only test, e.g. Ling 6 Sound test. Performance should not be significantly different than when the same test is administered using the implant system alone at a distance of 1 meter in quiet environment.
Hints and Tips

Group discussions:
try to pass the transmitter’s microphone to each person who speaks.

When conversation is not directed towards the implanted person (within a group, in the playground), remind him/her to disconnect his/her FM receiver from the sound processor.

Multi-media use (e.g. on TV, tape or video):
place the transmitter microphone near the sound source, or alternatively connect the TV directly to the FM transmitter via an adaptor cable.

While the FM system allows the cochlear implant user to focus his/her hearing towards one speaker he/she may need to hear his own voice and environmental sounds. The balance between these different audio sources is called audio-mixing. Programs on the sound processor are set with specific audio-mixing parameters; one may be dedicated to FM System use. Ask parents of the child or the audiologist which program it is.

Two transmitters close one to another:
ensure that the transmitting frequency channels are as distinct as possible. Remind the Cochlear Implant user to change channels if he/she moves from group to group. (e.g. in a team teaching situation).

Beware:
FM can transmit beyond the line of sight. A child wearing their FM to the bathroom may still be able to hear you!
If the Cochlear Implant user reports the following problems:

- Bad sound quality perception (noise, static, distortions or listening responses poorer than normal).
- Can’t hear his/her own voice or others voices in the environment.
- Can’t hear the FM signal at all.

Please follow the further guidances:

**Step 1** Verify the program selector of the sound processor is set to the appropriate program (configured for optimal FM system use).

**Step 2** Visually inspect the connection between the FM receiver and the Sound Processor and the integrity of cables. *In case of damages, please contact the parents of the child or the programming centre for changing the adaptor cable.*

**Step 3** Check the FM System alone:

a. Disconnect the FM system from the sound processor.

b. Place the FM receiver at least at 1 meter from the transmitter.

c. Verify that a signal is being received and is clear by connecting the FM receiver to amplified speakers (e.g. computer speakers) or plugging headphones into the FM receiver output.

d. If the FM system is not working, these are some additional questions to ask (FM manufacturer recommendations):

   • Are the FM transmitter and receiver on the same channel?
   • Are the cables on the FM transmitter or receiver frayed or kinked?
   • Has the transmitting distance been exceeded?
   • Do the batteries for the FM transmitter and/or receiver need to be replaced?
   • Is the microphone of the transmitter working?
   • Are the FM settings set properly?

**Additional testing in case of bad sound quality.**

**Step 4** Increase the physical distance between the FM receiver and the sound processor when using a body worn FM receiver.

**Step 5** Reduce the volume or gain of the FM receiver.

**Step 6** Contact the programming centre or the parents of the child.