

FM Technology

(Frequency Modulation Technology)

An Essay

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List of abbreviations

AAA: American Academy of Audiology.

ABR: Auditory brainstem responses

AD: Auditory Dys-synchrony

ADD: attention deficit disorder.

AI: Audio-input.

ALS: Assistive listening System.

ALDs: Assistive Listening Devices.

AM: Amplitude modulation

AN: Auditory neuropathy.

ASD : autistic spectrum disorder.

ANSD: auditory neuropathy spectrum disorder.

APD: Auditory processing disorder

ASHA: American Speech-Language-Hearing Association.

BTE: Behind the ear.

CAN: Computer-Assisted Note taking.

CART:Communication Access Real Time Translation.

CAPD: Central auditory processing disorder.

CI: Cochlear Implants.

CM: Cochlear microphonics.

DAI: Direct Audio-Input.

DSL: Desired sensation level.

DSS:developmental sequencescoring.

EM: Environmental microphone.

ESP: Early Speech Perception test

FM: Frequency modulation

FCC: Federal communication commission

HAs: Hearing aids.

IT-MAIS: Infant-Toddler: Meaningful Auditory Integration Scale.

IR: Infra-red.

MARRS: Mainstream Amplification Resource Room Study.

MEMR: Middle –ear muscle reflexes.

MSL: Mean sentence length

OAE: Otoacoustic emissions.

OCR: Olivo-cochlear reflexes.

PB: Phonetically-balanced.

PDD: pervasive developmental delay.

RECD: Real –ear-coupler-difference.

RTs: Reaction time to auditory stimuli.

SNHL : Sensorineural hearing loss

SNR or S/N: Signal to noise ratio.

SRT: Speech Reception Threshold test

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بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

قَالُوا سُبْحَانَكَ لَا عِلْمَ لَنَا إِلَّا هَا
عَلَّمْتَنَا إِنَّكَ أَنْتَ الْعَلِيمُ الْحَكِيمُ

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Introduction and Rationale

The major complaint of individuals with sensorineural hearing loss (SNHL) is communicative difficulty, especially in situations of background noise. Fortunately, personal frequency modulation (FM) technology has been shown to be an effective strategy for improving speech perception in noise for these individuals **(Lewis et al., 2004)**.

Individuals with SNHL have significant difficulties understanding speech, especially in noisy or reverberant listening environments **(Killion, 1997 & Moore, 1997)**.

Overall, lot of studies reported that FM technology significantly improved speech intelligibility over the hearing aid conditions, both in omni- directional and directional listening conditions. Additionally, speech recognition performance is further enhanced by almost 3 dB using of two FM receivers rather than one FM receiver. These data suggest that FM technology will offer significantly better communicative performance in adverse listening situations than any type of hearing aid microphone configuration **(Lewis et al., 2004)**.

For maximum speech intelligibility in noise to occur for listeners with SNHL, the hearing healthcare professional should consider the utilization of FM technology and counsel their patients how to maximize their use in everyday listening situations **(Lewis et al., 2004)**.

FM systems were the most significant educational tool developed for hearing impaired children since the advent of group and personal amplification devices **(Ross, 1992)**.

FM systems, in all their various permutations, remain the single most effective way of increasing the speech to noise (S/N) ratio. Perhaps the most important factor underlying speech perception performance, and crucial as for adults, it is even more important for hearing-impaired children who are in the process of developing speech and language **(Ross, 2002)**.

The potential advantages of an FM system are not limited to children. Hearing-impaired adults can also realize a great of benefit from FM system. There are many occasions when adults require a boost in the S/N in order to improve their comprehension of a message. Although the technical sophistication of modern hearing aids is wonderful, none can improve the S/N as well as a close-talking microphone **(Ross and Yuzon, 1994)**.

Hearing aids, even with the best directional microphones, cannot pick up a signal from across the room or separate the signal from the ambient noise but FM system can **(Ross, 2002)**.

FM& digital HAs combination improved the speech discrimination ability in-patients suffering from SNHL, either in quiet or in noise. **(Tawfik et al., 2004)**

When FM systems did not exist, an adult with a hearing loss had no other option but hearing aids. If he or she couldn't hear well in some situations, it was tough, but that was the reality. Now, hearing-impaired adults have an additional option that help them hear better in college classrooms, in meetings, on tours, and in many other listening situations, but this possibility does require a concerted effort on the part of the professional community if it is to be realized **(Flexer et al., 2002)**.

In order to develop the sound solutions, the current status of the technology as well as what is possible in the future, and the environmental needs for clear communication in today's society should be reviewed. Therefore, the review of the possibilities for wireless applications in the future with recognition of the constraints of space and power consumption. This provides the foundation for considering possible options to address the incoming challenges (**Ledermann and Hendricks, 2003**)

In considering the future applications of the emerging technology, one must take into account the current communication needs outside of an individual's home and into the public arena of theatre, education, mobile communication, conferences, and social venues (**Compton, 2000**).

Results of adult evaluations with FM amplification which illustrate the significant benefit they can provide. The benefits extend beyond speech recognition to potentially the overall physical and psychological health of individuals (**Crandell et al., 2002**).

Finally, the use of this technology is also expanding to interface with devices other than amplification such as cochlear implants.