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Microwave auditory effect



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The **microwave auditory effect**, also known as the **microwave hearing effect** or the **Frey effect**, consists of the human perception of audible clicks, or even speech, induced by pulsed or modulated radio frequencies. The communications are generated directly inside the human head without the need of any receiving electronic device. The effect was first reported by persons working in the vicinity of [radar transponders](#) during [World War II](#). In 1961, the [American neuroscientist](#) Allan H. Frey studied this phenomenon and was the first to publish information on the nature of the microwave auditory effect.^{[1][2]} The cause is thought to be thermoelastic expansion of portions of the auditory apparatus,^[3] although competing theories explain the results of [holographic interferometry](#) tests differently.^[4]

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Research in the U.S.

Allan H. Frey was the first American to publish on the microwave auditory effect (MAE). Frey's "Human auditory system response to modulated electromagnetic energy" appeared in the *Journal of Applied Physiology* in 1961.^[1] In his experiments, the subjects were discovered to be able to hear appropriately pulsed microwave radiation, from a distance of a few inches to hundreds of feet from the transmitter. In Frey's tests, a repetition rate of 50 Hz was used, with pulse width between 10–70 microseconds. The perceived loudness was found to be linked to the peak power density, instead of average power density. At 1.245 GHz, the peak power density for perception was below 80 mW/cm². According to Frey, the induced sounds were described as "a buzz, clicking, hiss, or knocking, depending on several transmitter parameters, i.e., pulse width and pulse-repetition rate". By changing transmitter parameters, Frey was able to induce the "perception of severe buffeting of the head, without such apparent [vestibular](#) symptoms as dizziness or nausea". Other transmitter parameters induced a [pins and needles](#) sensation. Frey experimented with nerve-deaf subjects, and speculated that the

human detecting mechanism was in the [cochlea](#), but at the time of the experiment the results were inconclusive due to factors such as [tinnitus](#).^{[1][5]}

Auditory sensations of clicking or buzzing have been reported by some workers at modern-day microwave transmitting sites that emit pulsed microwave radiation. Auditory responses to transmitted frequencies from approximately 200 MHz to at least 3 GHz have been reported. The cause is thought to be thermoelastic expansion of portions of auditory apparatus, and the generally accepted mechanism is rapid (but minuscule, in the range of 10^{-5} °C) heating of brain by each pulse, and the resulting pressure wave traveling through the skull to the [cochlea](#).^[5]

In 1975, an article by neuropsychologist Don Justesen discussing radiation effects on human perception referred to an experiment by [Joseph C. Sharp](#) and Mark Grove at the [Walter Reed Army Institute of Research](#) during which Sharp and Grove reportedly were able to recognize nine out of ten words transmitted by "voice modulated microwaves". Since the radiation levels approached the (then current) 10 mW/cm² limit of safe exposure, critics have observed that under such conditions brain damage from thermal effects of high power microwave radiation would occur, and there was "no conclusive evidence for MAE at lower energy densities".^{[6][7]}

Electronic warfare

In 2003–04, WaveBand Corp. had a contract from the [U.S. Navy](#) for the design of an MAE system they called [MEDUSA](#) (Mob Excess Deterrent Using Silent Audio) that was intended to temporarily incapacitate personnel through remote application.^[8] Reportedly, Sierra Nevada Corp. took over the contract from WaveBand.^[9] Experts, such as Kenneth Foster, a [University of Pennsylvania](#) bioengineering professor who published research on the microwave auditory effect in 1974, have discounted the effectiveness of the proposed device. Foster said that because of human [biophysics](#), the device "would kill you well before you were bothered by the noise". According to former professor at the [University of Washington](#) Bill Guy, "There's a misunderstanding by the public and even some scientists about this auditory effect," and "there couldn't possibly be a hazard from the sound, because the heat would get you first".^[10]

Microwave effects have been proposed as the cause of otherwise [unexplained illnesses](#) of U.S. diplomats in Cuba and China occurring since 2017 and 2018.^{[11][12][13]} However, this explanation has been debated. Bioengineer [Kenneth R. Foster](#) noted of the health effects observed in the diplomats, "it's crazy, but it's sure as heck not microwaves."^[14] As of October 2021, a microwave cause remains one of the major hypotheses.^{[15][16]}

Conspiracy theories

Numerous individuals suffering from [auditory hallucinations](#), [delusional disorders](#),^[17] or other [mental illnesses](#) have



claimed that government agents use forms of [mind control](#) technologies based on microwave signals to transmit sounds and thoughts into their heads as a form of [electronic harassment](#), referring to the alleged technology as "voice to skull" or "V2K".^[18]



Protesters in Toronto claiming mind control in 2009. ✂

There are extensive online support networks and numerous websites^[17] maintained by people fearing mind control. California psychiatrist Alan Drucker has identified evidence of [delusional disorders](#) on many of these websites and other psychologists are divided over whether such sites reinforce mental troubles, or act as a form of group social support.^{[19][20]}


Psychologists have identified many examples of people reporting 'mind control experiences' (MCEs) on self-published web pages that are "highly likely to be influenced by delusional beliefs". Common themes include "Bad Guys" using "[psychotronics](#)" and "microwaves", frequent mention of the CIA's [MKULTRA](#) project, and frequent citing of Frey's 1962 paper entitled "Human auditory system response to modulated electromagnetic energy".^{[21][22]}

See also

- [Cosmic ray visual phenomena](#)
- [Electronic harassment](#)
- [Electroreception](#)
- [Photoacoustic effect](#)
- [Sound from ultrasound](#)
- [Specific absorption rate](#) – government standards for measurement of human radio frequency exposures
- [Tin foil hat](#)

Notes

1. [^] ^{[a](#)} ^{[b](#)} ^{[c](#)} Allan H. Frey (1962). "Human auditory system response to modulated electromagnetic energy". *Journal of Applied Physiology*. **17** (4): 689–692. doi:10.1152/jappl.1962.17.4.689. PMID 13895081. Archived from the original on March 28, 2020. Retrieved November 23, 2019.
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