An Introduction to Recorder Jammers

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Written on 02/04/2021

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Abstract

Recorder jammers are available commercially. According to their declared technical characteristics, they can prevent analog and digital recorders, including those found on cell phones, from recording conversations between people. This document provides a brief introduction to jamming conversation recordings and the use of ultrasound for this purpose.

1. Technology used

Microphone jammers available on the market use at least three technologies: ultrasound, sound, and radio frequencies. Some devices can use more than one technology simultaneously.

2. Ultrasound

Attempts are made to “saturate” the microphone of recording devices with a high level of ultrasound. For example, with a source power of 105 [dB], equivalent to the sound level present on a dance floor in a nightclub. The principle of disturbance is well known and has to do with microphone technology. These absorb the inaudible ultrasound and convert it (unintentionally) into an electrical signal typical of sounds, returning incomprehensible audio [1].

Ultrasound is inaudible to most people, while some may experience it in a very unpleasant way, due to the particular sensitivity of their hearing systems to high frequencies.

The ultrasound must reach the microphones to be jammed as directly as possible. If the jammer is placed inside a backpack, the fabric will certainly attenuate its effectiveness, although the extent depends on numerous factors, including the thickness of the fabric.

If the microphone to be jammed is inside a bag or a pocket, the thickness and type of fabric also influence the effectiveness of the jamming.

If the jammer is placed on a desk and the microphone to be jammed is placed underneath, the desk material will certainly shield the propagation of the ultrasound, which will reach the microphone by reflection from the walls and objects in the room.

Not all microphones on all devices are effectively disrupted by a single ultrasonic device. Some devices may continue to record normally, while many others may be completely disabled.

The distance between the ultrasonic generator and the recording device is an important variable. The shorter the relative distance, the greater the likelihood that the microphone will be completely affected.

The angle of arrival of the ultrasound wave is important. A microphone struck head-on and directly will react differently than one struck by pressure waves from the side or from behind.

Surfaces that reflect ultrasound pressure waves, such as walls, can play a significant role in the effectiveness of the disturbance.

3. Sounds

Pre-recorded sounds, such as interference signals, music, or human voices, can be used alongside the ultrasound emission. These sounds are designed to disrupt microphones positioned a few meters away from the source of the interference, rather than microphones worn by the interlocutor, which are therefore closer. For example, wall microphones, or microphones from bugs placed inside an electrical outlet, etc.

Sounds can drown out and overlap the voices of the interlocutors. If an audio recording is digitally processed to filter out noise and extract voices, the type of sounds used can make a difference. With digital processing, noise can be filtered out, but if human voices were used as the disturbing sound, then cleanup operations may be impossible.

4. Radio frequencies

Practical experience shows that some recorders can also be affected by radio frequencies emitted by devices such as cell phone jammers. For this reason, some ultrasonic jammers also have circuits and antennas to emit radio frequencies, which can eventually disable listening devices where ultrasound cannot. The operating principle does not appear to be clarified by publicly available scientific papers, but it is conceivable that the electronic flows in the circuit boards' conductors and their components, in audio recording and transmission devices, are severely affected.

The frequencies used are generally those of mobile telephony. The emitting source is therefore located close to the interlocutors, who may experience discomfort and disturbances typical of relatively high-power microwaves.

5. Solutions

For fixed conversation stations, it's a good idea to place multiple jamming units. For example, place them above or near the desk, underneath, or even on the ceiling. This way, one can try to hit the recording devices' microphones as directly as possible.

For conversations that take place in casual settings, the appropriate course of action must be determined on the spot. Even in this case, if the conversation takes place seated at a table, it would be a good idea to place a jammer above and below the table.

When choosing a jammer, omnidirectional models should be preferred, that is, those characterized by having ultrasonic microphones that attempt to radiate pressure waves in all directions of three-dimensional space.

Some jammer models combine ultrasound with a background sound at a tone and volume compatible with conversation. Most, however, emit only ultrasound and are therefore inaudible to most people. When choosing a jammer model, it's important to consider this difference. If one intends to jam any microphones without the other party's knowledge, there obviously must be no audible sound.

Other models integrate ultrasound with radio frequencies. In this case, it's important to consider the possible side effects some people experience, such as a heavy head and nausea, without neglecting the potential health effects. Possible interference and disruption to nearby electrical/electronic systems must also be carefully evaluated.

Bibliography

[1] Understanding the Effectiveness of Ultrasonic Microphone Jammer. By Yuxin Chen et al. https://arxiv.org/pdf/1904.08490.pdf