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Certain Sounds Played on Laptops Can Cause System Crashes and Disrupt Hard Drives

Researchers at the University of Michigan and Zhejiang University have found that specialized sounds played in speakers found in laptop and small form factor (SFF) computers can be co-opted to cause damage to traditional hard disk drives, according to a recent paper [link]. While the risk is not limited to the aforementioned devices—speakers placed near drives have the same effect—this would imply that attackers have physical access to a given device. The researchers found that audible sound can cause the drive head mechanics to "vibrate outside of operational bounds" while "ultrasonic sound causes false positives in the shock sensor, which is designed to prevent a head crash," the paper noted. This effect has been demonstrated in hard drives from all three major vendors—Seagate, Western Digital, and Toshiba—and tests have resulted in drives becoming unresponsive (until the system is rebooted) on both Windows and Linux, as well as causing intermittent freezing and complete system crashes on Windows. The volume of the sound required to cause this is fairly high—the researchers played tones at 5 kHz at 115.3 dB, resulting in partial throughput, with complete throughput loss experienced at 117.2 dB on a test Western Digital drive. The researchers note in the paper that "tests have measured a Dell XPS 15 9550 laptop's output to be as high as 103 dB SPL from 1 cm away from the laptop" with write-blocking signals being "as low as 95.6 dB." While no drive completely stopped working in testing, all of the drives experienced extensive amounts of remapped sectors, and a physical inspection of one drive showed scratches to a platter visible to the human eye.