ASK AN ENGINEER

CAN BRAIN WAVES INTERFERE WITH RADIO WAVES?

Not likely. Brain waves are too slow, and so weak they're extremely hard to measure...

Radio waves and brain waves are both forms of electromagnetic radiation—waves of energy that travel at the speed of light. The difference between brain waves, radio waves, and other electromagnetic waves (such as visible light, X-rays and Gamma rays) lies in their frequency—that is, how often the waves peak and trough in a second.

Radio waves, which include radio and other wireless transmission signals, as well as other natural signals in the same frequency, peak and trough at between 50 and 1000 megahertz—that's between 50 million and one billion oscillations per second.

The human brain also emits waves, like when a person focuses her attention or remembers something. This activity fires thousands of neurons simultaneously at the same frequency generating a wave—but at a rate closer to 10 to 100 cycles per second.

Interference happens when two waves of the same or very similar frequencies bump into each other. This might happen when the signals from two radio stations, both broadcasting at 89.7 megahertz from different cities, bump into one another. "The shape of the waves changes linearly, they add to and subtract from one another," says **Dimitrios Pantazis (http://mcgovern.mit.edu/component/content/article/3-technology/422-dimitrios-pantazis)** , director of the Magnetoencephalography (MEG) Laboratory at MIT's McGovern Institute. As a result, songs become static.

But, says Pantazis, since their frequencies are so wildly different, brain waves don't interfere with radio waves. Even if that was the case, brain waves are so weak, they are hardly measurable at all. For comparison, says Pantazis, "the magnetic field of the earth is just strong enough to move the needle of a compass. Signals from the brain are a billionth of that strength."

Hard to measure, but not impossible. MIT recently installed a new MEG scanner to study the function of the human brain. To capture brain signals, the MEG scanner is in a room shielded with mu metal, a special alloy that blocks external magnetic fields. "Like a rock in the middle of a river, this metal forces all electromagnetic signals to flow around the room and doesn't let any inside," says Pantazis.

The MEG scanner consists of a helmet that contains 306 sensors spaced uniformly across its surface. These "superconducting quantum interference detectors" (SQUID) are cooled to near absolute zero, which makes them superconductive and, according to Pantazis, "able to measure even the slightest magnetic signals from the brain."

The **MEG lab (http://mcgovern.mit.edu/technology/meg-lab)** , open since March 2011, is used by researchers across MIT. Projects are as diverse as studying visual attention, language processing, or even olfactory responses to pleasant and unpleasant smells. "It is a very exciting field of research, you never know how the brain will respond to different stimuli", says Pantazis. Meanwhile, the song on the radio remains the same. — *Elizabeth Dougherty*

Thanks to 19-year-old Adroit Dexter from India for this question.

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