

## Can alien beings listen in on TV and radio broadcasts from earth?

June 22, 2012

*Dear Cecil:*

*TV programs about space exploration and the search for extraterrestrial intelligence (SETI) often say our broadcast signals are traveling into space and will someday be seen by intelligent beings many light years from here. On the other hand, on the program Life After People they said these signals disperse after a few light years and are too scattered and weak for anyone to see or hear them. What's your take on this?*

— Carrboar

Cecil replies:

My first reaction was that the answer would depend on what assumptions you made about extraterrestrial beings and whether they were actively looking for us, as opposed to just turning on the television and having Charlie Sheen show up. The odds of the latter, thank God, are vanishingly small. But on second thought, I'm inclined to think the chances of aliens finding us under any circumstances aren't much better, for reasons SETI enthusiasts are only now starting to grasp.

The earth is surrounded by a shell of manmade electromagnetic radiation that's expanding outward at the speed of light. (This phenomenon is depicted to great cinematic effect at the beginning of the film *Contact*, with the virtual camera pulling back from earth to the sound of successively older radio transmissions, all the way to Morse wireless telegraphy.) It's sometimes called passive electromagnetic radiation because it's being leaked into the cosmos unintentionally. The most powerful passive leakers are VHF television stations and military radar, mostly located in North America and Europe.

Even believers acknowledge that detecting our electromagnetic jetsam won't be easy due to the implacable workings of the inverse square law, which says every doubling of distance weakens a signal by a factor of four. That makes even a powerful broadcast signal almost imperceptible above the cosmic background noise within a relatively short distance from earth.

Then again, the thinking goes, if you can pinpoint where to look, you can accomplish seemingly miraculous feats. Just ask the project team for Voyager 1, which is still communicating with a spacecraft so far away its incoming radio signals have less than a twenty-billionth the power of a watch battery.

But let's put that in perspective. Voyager 1 is the most distant manmade object in the universe, far beyond the orbit of Pluto. It'll soon leave the outer reaches of the solar system behind and enter the depths of interstellar space. Even so, another 14,000 years will have to pass before Voyager attains a distance of one light year from earth. The star closest to us, Proxima Centauri, is more than four light years away.

The point is, the distances separating us from our so-called neighbors in the galaxy are unimaginably vast, and the technical obstacles to getting a message to them are close to insurmountable. Alien listeners would be likely to detect passive radiation only in certain frequencies, generally 10 to 200 GHz, where the background noise of the cosmos is weaker. They'd need a huge antenna, and they'd have to listen for a long time before gathering enough traces of signal to confirm intelligent origin.

Believers contend it can be done. An antenna similar to the 1,000-foot-diameter Arecibo radio telescope in Puerto Rico could probably detect our passive radiation from 30 to 50 light years away. With a giant array of 1,000 100-meter dishes linked together, that distance could be extended to 500 light years.

Just one problem. The aliens would be able to hear us at those enormous distances *only if they already knew where we were* and could point their telescope at us. If all they had was a hunch that we were out here somewhere, the likelihood they'd find us seems almost nil.

Even under the most favorable circumstances, all alien listeners would be able to detect would be a signal that stood out against the background buzz. The notion that they'd be able to collect and decode enough signal to be able to listen to, say, *I Love Lucy* reruns is fantasy — the signal would need to be 20,000 times stronger.

But one last factor in my opinion virtually eliminates the possibility of aliens detecting us. As SETI astronomer Seth Shostak has pointed out, our profligate hurling of entertainment into the universe is coming to an end. Digital television transmitters have a much lower peak power output than older analog stations, making the signal harder to detect. The age of pumping high-power terrestrial noise into the ether is

likely to be a mere blip lasting less than a century.

Shostak argues that radar astronomy, which sends out microwaves to map asteroids and such, is likely to continue a lot longer, and those signals are detectable up to 1,000 light years away. Maybe so, but radar is a directed beam — alien observers might pick it up if it's pointed their way and they know where to look for it, but realistically, how likely is that? And if there's a low probability of aliens hearing us, the odds are equally poor of us hearing them.

— Cecil Adams

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