

NASA spacecraft records 'Earthsong'

October 1 2012, by Dr. Tony Phillips



The Radiation Belt Storm Probes are on a two-year mission to explore the Van Allen Belts. Credit: Science@NASA

Nobody ever said anything about singing, though. A NASA spacecraft has just beamed back a beautiful song sung by our own planet.

"It's called [chorus](#)," explains Craig Kletzing of the University of Iowa. "This is one of the clearest examples we've ever heard."

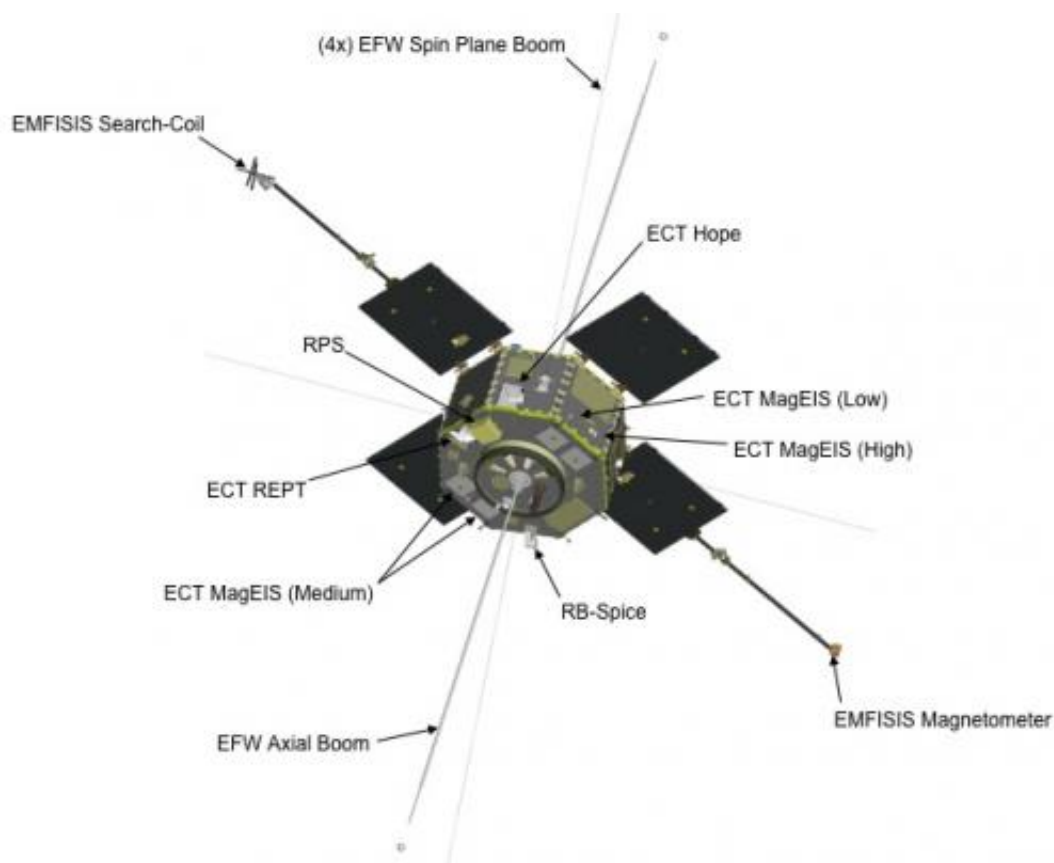
Chorus is an electromagnetic phenomenon caused by [plasma waves](#) in Earth's radiation belts. For years, ham radio operators on Earth have been listening to them from afar. Now, NASA's twin Radiation Belt Storm Probes are traveling through the region of space where chorus actually comes from—and the recordings are out of this world.

"This is what the radiation belts would sound like to a human being if we had [radio antennas](#) for ears," says Kletzing, whose team at the University

of Iowa built the "EMFISIS" (Electric and Magnetic Field Instrument Suite and Integrated Science) receiver used to pick up the signals.

He's careful to point out that these are not [acoustic waves](#) of the kind that travel through the air of our planet. Chorus is made of [radio waves](#) that oscillate at acoustic frequencies, between 0 and 10 kHz. The magnetic search coil antennas of the Radiation Belt Storm Probes are designed to detect these kinds of waves.

"Chorus emissions are front and center for the Storm Probe mission," says Kletzing. "They are thought to be one of the most important waves for energizing the electrons that make up the [outer radiation belt](#)."



Each of the two Storm Probes is bristling with sensors to count energetic particles, measure plasma waves, and detect electromagnetic radiation. Credit:

NASA

In particular, chorus might be responsible for so-called "killer electrons," high-[energy particles](#) that can endanger both satellites and astronauts. Many electrons in the radiation belts are harmless, with too little energy to do damage to human or electronic systems. But, sometimes, these electrons can catch a chorus wave, like a surfer riding a wave on Earth, and gain enough energy to become dangerous—or so researchers think.

The Radiation Belt Storm Probes are on a mission to find out for sure.

"The production of killer [electrons](#) is a matter of much debate, and chorus waves are only one possibility," notes the Storm Probes' mission scientist Dave Sibeck.

Launched in August 2012, the two probes are orbiting inside the radiation belts, sampling electromagnetic fields, counting the number of energetic particles, and listening to plasma waves of many frequencies.

"We hope to gather enough data to solve the mystery once and for all," says Sibeck.

At the moment, the spacecraft are still undergoing their 60-day checkout phase before the main mission begins. So far, things are checking out very well.

"One of things we noticed right away is how clear the chorus sounds in the recording," notes Kletzing. That's because our data is sampled at 16 bits, the same as a CD, which has not been done before in the radiation belts. This makes the data very high quality and shows that our instrument is very, very healthy."

Eventually, Kletzing hopes to release unprecedented stereo recordings of Earth's chorus.

"We have two spacecraft with two receivers," he says, "so a stereo recording is possible."

Such a recording would not only sound wonderful, but also have real scientific value. "One of the things we don't know is how broad the region is over which chorus occurs. The widely-separated 'stereo capability' of the Storm Probes will give us the ability to figure this out," he explains.

With a two-year mission planned for the Storm Probes, the chorus is just getting started.

Provided by NASA

Citation: NASA spacecraft records 'Earthsong' (2012, October 1) retrieved 10 April 2024 from <https://phys.org/news/2012-10-nasa-spacecraft-earthsong.html>

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