

Goddard's Electromagnetic Anechoic Chamber Contributes to the Success of NASA's Missions for the Past 50 Years

Communicating with spacecraft is essential to NASA's missions. A spacecraft's communication system allows us to command the spacecraft from Earth, and to send scientific and other types of data back down to Earth.

A crucial component of these systems is the antenna. Without the antenna, NASA's missions and their discoveries simply would not be possible.

However, it is very difficult to test spacecraft antennas on Earth. There are many types of radio waves that are present on Earth and would interfere with the testing of an antenna's signal. Radio waves can come from radio and television broadcasting, mobile phone communication, and more.

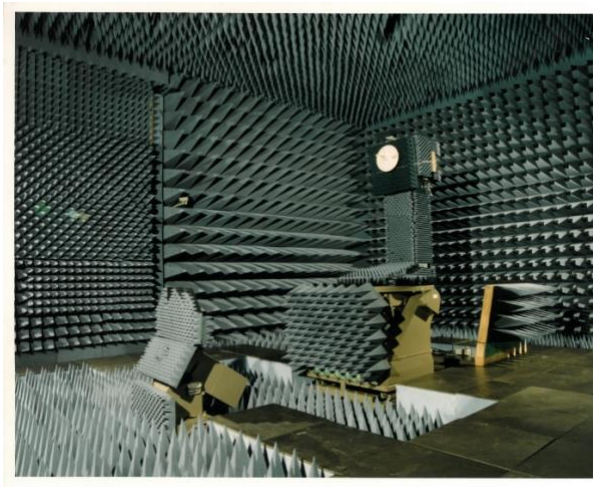
To simulate the environment of space, you need a way of isolating an antenna from all of those other types of radio waves on Earth.

At NASA's Goddard Space Flight Center, there is antenna testing chamber with this type of environment.

Mimics Space

When people first see Goddard's antenna chamber, they usually think it is a soundproof room that someone might use for a recording studio. The antenna chamber is similar to a soundproof room, except instead of sound waves, the antenna chamber blocks radio waves.

Radio waves and sound waves can actually be very similar. Antenna engineers even use the term "noise" when referring to unwanted radio waves happening in the background. The area where they test an antenna in the chamber is called the "quiet zone."



*The tower in the middle of Goddard's Electromagnetic Anechoic Chamber.
Image credit: NASA*

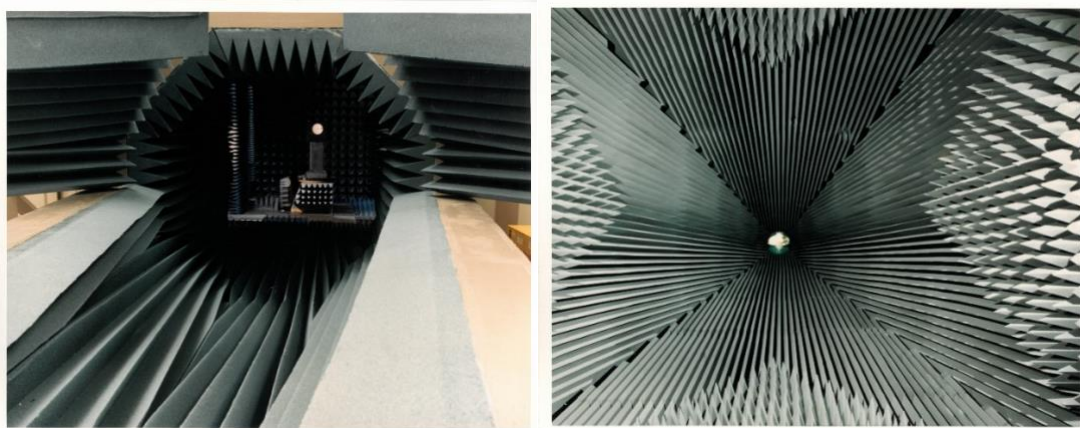
This radio-proof room is called an “electromagnetic chamber” or “antenna chamber.” The antenna chamber is covered in blue foam cones, called absorbers. As the name suggests, the absorbers work to absorb the waves of the antenna, as if in an infinite room of space.

This environment blocks any outside interference and noise. It also keeps everyone safe from the radiation caused by testing an antenna, since high exposures to antenna radiation can have negative effects on one’s health.

Tests Spacecraft Antennas

With this radio-proof environment, Goddard’s Electromagnetic Anechoic Chamber is used to test the antennas of spacecraft. The testing in the chamber allows engineers to measure how the antenna radiates energy, and how efficiently the antenna transfers that energy to where it needs to go.

The chamber also allows them to test whether there is radiation going in unexpected or undesired directions. This testing is done in order to have a characterization of how the antenna’s radiation pattern looks, which is a crucial part of a mission’s success.

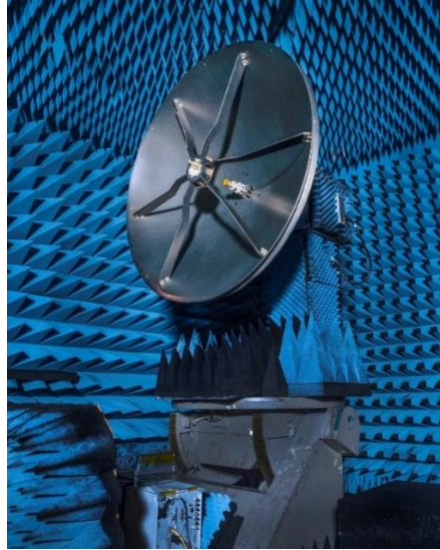


*A section of the anechoic chamber from the outside view (left) and from the inside view (right).
Image credit: NASA*

Today, Goddard’s Electromagnetic Anechoic Chamber has hybrid testing abilities. A hybrid chamber allows for antennas to be tested in two different ways, depending on the type of antenna.

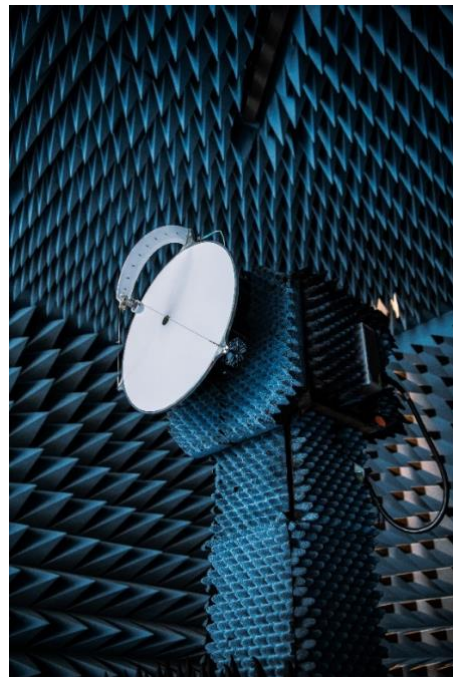
The facility was updated to the hybrid chamber in 1997. Since then, multiple spacecraft that contribute to our understanding of Earth and space have used this testing environment. The antenna chamber has even tested full instruments, such as radars and radiometers.

The antenna chamber was most recently used to test the antenna for the Nancy Grace Roman Space Telescope, as shown in the image below. Roman will allow us to discover exoplanets and understand how the universe expands when it launches in the mid 2020’s.



*The Nancy Grace Roman Space Telescope being tested in Goddard's Electromagnetic Anechoic Chamber.
Image Credit: Chris Gunn/NASA.*

The antenna chamber was also recently used to test the antenna for the Plankton, Aerosol, Cloud, ocean Ecosystem (PACE) spacecraft, as shown in the image below. PACE is anticipated to launch in January of 2024 and is designed to collect data on the processes behind carbon dioxide exchange in the ocean.



*The Plankton, Aerosol, Cloud, ocean Ecosystem (PACE) antenna being tested in Goddard's Electromagnetic Anechoic Chamber.
Image credit: Dennis Henry/NASA*

Supports NASA Missions

Many of Goddard's missions would have been challenging endeavors without the antenna chamber, including Roman and PACE. Ken Hersey, one of the lead designers of the updated anechoic chamber,

explains that the antenna chamber is one of the main tools that antenna engineers use when they build something.

Without the chamber, Hersey says it would be like “taking a calculator away from an accountant.” Since the antenna is such a critical piece of the communication between the spacecraft and Earth, having an accurate measurement of the antenna is an essential part of a NASA mission.