

RADIO EXPLORERS

Messages from Space

Explore the differences between
sound waves and radio waves.



Messages from Space



1 **Make some space!** Place a tied-off balloon in the vacuum chamber and replace the lid. There is no air in space, so use the pump to remove air from the vacuum chamber. **What happened to the balloon after the air was pumped out?**



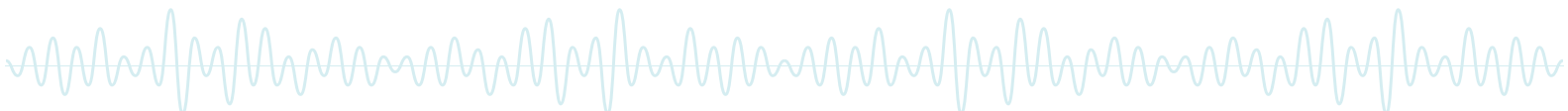
2 **Now, experiment with the remote key finder that uses radio waves.** Press the button on the transmitter. What happens to the receiver? What do you hear and see? Try adding some distance between the transmitter and receiver. How far will the radio waves from the transmitter go?



3 **Measure sound with the Sound Detector app.** Bring the smartphone running the app close to your mouth and talk to it. How does the loudness of your voice affect your readings?



4 Put the key finder in the vacuum chamber—be sure to use a small piece of sponge under the key finder. Now, try measuring the loudness of the remote key finder in the vacuum chamber—with the top on—before and after you pump out the air. **After the air is pumped out, what happens when you activate the remote key finder?** Try other sound sources in the vacuum chamber. What happens?



Radio waves are different from sound waves—they do not require air, water, or another medium to travel.

Imagine if you were an astronaut on the International Space Station and wanted to send a message to someone on Earth. Would you yell your message loudly in your spacesuit, or use a giant speaker attached to the station? We use sound waves from our voice or a loudspeaker to communicate on Earth, so why not in space? With no air in space, we can't make sounds to communicate—but we can use radio. You heard that sound waves are reduced with less air in your vacuum chamber, but what happened to the radio waves between the remote key finder transmitter and receiver?



NASA

How do astronauts send a message in space? They use radio waves.

NRAO NSF



The Very Large Array, a group of radio telescopes near Socorro, NM, has been used to communicate with NASA spacecraft.

Sound waves, like the ones we hear while listening to music, travel by vibrating air particles between the speaker and your ear. Think about the rumble of thunder or the hum of a tuning fork. But radio waves and other electromagnetic waves can travel through the vacuum of space, where there is little or almost no matter.

We take advantage of the properties of radio waves to communicate over vast distances—even through space.

NASA spacecraft and rovers send images back to Earth using radio waves. In fact, radio broadcasts from Earth have traveled many light years away from our planet, reaching dozens of stars and planets beyond our solar system.

