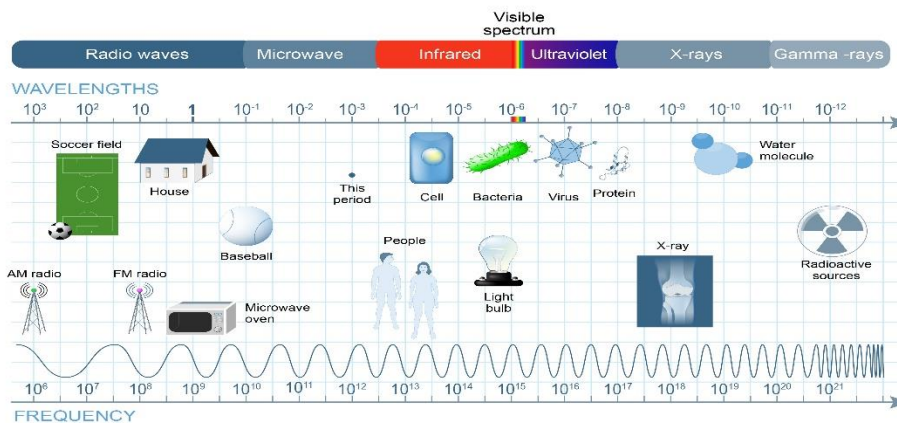


## Can Radio Waves Be Blocked Investigation

As you may know, radio waves are a part of the electromagnetic spectrum. This spectrum represents all of the electromagnetic energy known to humans (see diagram below). As you can see on the diagram there are six categories of energy, including radio, represented in the spectrum. If you take a close look at the diagram you will notice that the wavelengths get larger as you move from right to left. In addition, if you look at the bottom of the diagram you will see that the frequency of waves increases from right to left. During this investigation, we are only concerned with radio waves but it is important to understand how they relate to other kinds of electromagnetic energy.

### ELECTROMAGNETIC SPECTRUM



One use of radio waves is transmitting cell phone signals. Remember, that radio waves are electromagnetic waves, not sound waves. The signals received by your cell phone must be converted to sound waves by the computer in your phone before you can hear the words your caller is speaking. Cell phones have changed the way our society communicates. Today you can go almost anywhere and still be able to connect with friends and family. The distance radio waves can travel is one reason scientists and engineers selected them for this purpose. Another reason is that radio waves can travel through many different types of materials. This is why you can be inside a building and still make a phone call or send a text. However, sometimes radio waves are blocked and you lose signal. During today's lab you are going to investigate materials that prevent radio waves from reaching a cell phone.

#### Pre-Lab Questions

1. What type of energy does a radio wave carry?
2. What is wavelength?

3. What is the frequency of a wave?
4. Why does frequency increase when wavelengths decrease?

**Materials:** 2 cell phones, felt, metal pot with lid (choose metal or glass), plastic box, foam squares, pie tins, cardboard, tiles, aluminum foil, Styrofoam trays, vinyl, felt, bubble wrap, paper towels, tape (only for holding materials around cell phone if needed)

**Procedure:**

1. Have 2 people in your lab group get out their cell phones and share contact information by sending a text message between phones. Reminders: cell phones should only be used for lab purposes today, text messages should be simple and school appropriate, make sure the ringer is turned on.
2. Place a call between phones. Not all cell phone plans work well in the building, so this will establish signal is working well between the phones.
3. Why don't all cell phones work in our school/building? Discuss as a group and respond.
  
4. Now you are going to test the shielding ability of some common materials. Go to the supply counter and choose 3 different materials to test. Make sure you can provide a reason for your selections. Before you determine if any of the materials can block your cell phone signals from each other fill out the first two columns of the table below.
5. Now you are ready to test the materials.
  - a. Begin by completely covering one of the cell phones in your first material.
  - b. Try to send a text message to that phone. Record the result.
  - c. Try to call that phone. Record the result

Material	Reason for choosing the material	Text Went Through YES/NO	Call Went Through YES/NO	Radio Waves Blocked YES/NO	Explanation for Results
If you have not discovered a material to block radio waves, continue to explore more. If you have time to explore					

	more, see if you can find more and hypothesize what they have in common.				
Material		Text Went Through YES/NO	Call Went Through YES/NO	Radio Waves Blocked YES/NO	

Conclusions

1. During your investigation were you able to block radio waves? Which materials were successful?
  
2. What is special about the material or materials that blocked radio waves? In other words, what set those materials apart from the ones that didn't block radio waves?
  
3. Why would someone want to block radio waves? Why not just turn it off or simply ignore unwanted messages?

Once completed, continue to practice your Morse Code at <https://genemecija.github.io/learn-morse-code/>.