

Modeling Radio Astronomy



Background: To collect their data radio astronomers use giant dish-shaped telescopes. The large size of the telescope is necessary because radio waves are weak so you need a lot of them to get enough information to make scientific discoveries. Unlike optical telescopes radio telescopes don't provide an image you can see because radio waves are invisible to human eyes. After the radio waves are collected a computer adds color to the data so the scientists (and everyone else) can see the images. Today you and your group will be modeling this process as you collect and analyze radio waves.

Materials: Umbrella, Bucket of Ball Pit Balls, Clip Board, Lab Sheet, Pencil

Directions: For this activity the group will be going outside. Please remember the rules about outdoor activities and behave accordingly. Before we go outside work with your group to decide the roles for each person for each of the rounds. Roles should change from round to round so everyone has a chance to try all the roles.

Jobs:

Radio Telescope - Hold the umbrella upside down to "catch" radio waves being emitted. You are not allowed to move your feet once planted in your spot. You may tilt from side to side but your feet must remain stationary.

Recorder - Place the data sheet on the clipboard and stand behind the radio telescope. Once the data collection round is complete, you will record the radio frequency colors.

Celestial Objects - You will "emit" radio waves by throwing ball pit balls towards the radio telescope (umbrella). You will also be responsible for picking up all the ball pit balls after each round.

Data Chart

Round	Red	Orange	Yellow	Green	Blue	Purple
1						
2						
3						
4						
5						
Totals						

Using the telescope data to generate a radio color image.

When radio telescopes are used to study a spot in space they do not collect data from only that spot. The telescope scans the entire area in order to get a complete picture of the energy emitting from that location in space. After all the data has been collected a computer analyzes the strength of each signal. All of the signals with similar strengths are assigned a specific color so that when you look at an image you can see the strength of the signals based on the color. If any area is not emitting radio waves then it is colored black.

Directions to Color your image: Look at your totals from your group's data and determine which colors will be assigned 1, 2, 3, 4, 5. Remember, smallest total is a 1, and largest total is a 5.

Color Scale:

0 = Black 1 = 2 = 3 = 4 = 5 =

0	0	0	4	4	4	4	5	5	5	4	0	0	0	0	0	0	0	0	4	4	4	5	4	4	0	0	0	0
0	0	4	4	4	4	5	5	0	0	0	0	0	0	0	0	0	0	0	0	4	4	4	5	4	4	0	0	0
0	4	4	4	4	4	5	5	0	0	0	0	0	0	4	4	4	0	0	0	0	0	0	4	4	5	4	0	0
0	4	4	4	4	4	0	0	0	0	4	4	4	4	4	5	5	4	4	0	0	0	0	0	4	4	5	4	0
4	4	4	4	0	0	0	0	4	4	4	4	5	5	4	6	6	5	0	4	0	0	0	0	0	4	4	5	0
4	4	4	0	0	0	0	4	4	4	5	5	4	4	5	6	6	5	5	4	4	0	0	0	0	4	4	5	5
4	4	4	0	0	0	0	4	4	5	5	4	4	4	4	4	4	4	4	5	4	4	4	0	0	0	0	0	0
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4	4	0	0	0	0	4	5	5	0	0	0	0	0	0	0	0	4	4	4	5	5	4	0	0	0	0	0	0
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0	0	0	0	0	5	4	4	5	5	4	4	4	4	4	4	4	0	0	0	0	0	0	0	0	5	5	6	
0	0	0	0	0	0	0	0	4	5	4	0	0	4	4	0	0	0	0	0	0	0	0	0	0	5	6	6	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	5	5	6	6	4	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	4	4	4	4	5	5	6	4	4	4	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	4	4	4	4	4	5	6	6	4	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	4	4	4	4	4	4	4	5	5	5	4	4	4	0	0	
0	0	0	0	0	0	4	4	4	4	4	4	4	4	4	4	4	4	4	5	5	4	4	4	4	0	0	0	