Name _____ Date _____

Velocity Curve Activity Part 1: Quadrant II & III Observations

Introduction

We previously made some observations of the Milky Way Galaxy (MWG) using the horn radio telescope, detecting the 21 cm wavelength radio waves emitted from neutral hydrogen atoms, (referred to as "HI"). You will now be given an assigned coordinate in the galactic plane to look at with the horn telescope. You will analyze the HI peak detected, and as a class we will compare all of our results.

Pre-Observation Prep

1. Assigned galactic coordinates: _____
2. Use *Stellarium* to look up what horizontal coordinates (azimuth and elevation) correspond to your galactic coordinates on the dates specified below. Record 5 minute intervals during the class period in preparation for an observation at any point during the class period.

   Date and time of class period: _____

Time	Azimuth	Altitude

3. Before the day of collecting data, if possible, practice pointing the telescope in the classroom using a compass and a level.

Data Collection

Assigned galactic coordinate: gal. long. = _____; gal. lat. = 0º

Horizontal coordinates (azimuth and elevation):

Az = _____; El = _____

Exact time when the data was saved to a file: _____

Name of your data file: _____

Graph the Spectrum

1. Open your .csv data file in a spreadsheet program, either *Google Sheets* or *Excel*. (If any screens pop up regarding the format of the data, just hit enter to select the defaults.)
2. Graph the Data
    a. In the spreadsheet, insert a row above the first row.
    b. In the first row of Column A type “Frequency (MHz)”, and in the first row of Column B label it“Signal”.
    c. Click on the column labels A and B to highlight these columns.
    d. Insert Chart. Choose Smoothed Line. In Google Sheets, under Data Range, select “use row 1 as headers” and “use column A as labels”.
    e. Add axis titles with units. Add a graph title.
    f. Change the *x*-axis scale to range from 1419.5 to1421.5 MHz, and the *y*-axis accordingly.
    g. Add grid lines so that the minor gridlines are in increments of 0.01 MHz.

Analyze the peaks

1. Measure the frequencies as accurately as you can where the tips of the peaks occur. Record these in the table below to the hundredths of a MHz.
2. Use the Doppler shift formula to calculate the velocity from the frequency of any peaks that appear in your spectrum. Show your work.

3. Compare the measured frequencies to the frequency expected for neutral hydrogen. Explain what this comparison implies about the neutral hydrogen detected.

Frequency (MHz)	Velocity(km/s)	Red Shifted or Blue Shifted?

Explanation: