05 - Telescope Optics Project

Part A: Field of View & Magnification

You now get to measure the angular sizes of the fields of view for your finder scope, low-power eyepiece and high-power eyepiece by measuring the time it takes for a star to cross each field of view and converting it back to degrees.

1) Find a reasonably bright star near the celestial equator (declination near 0°). One several hours away from your meridian will be easier to observe. Get the star centered in the finder scope. Turn off the clock drive and measure the time for the star to drift from the center to the edge of the field. Double this value to get the edge to edge drift time and record it in Table 1.

2) With the same star and the same procedure, measure the time required for the star to move all the way across the field of the low-power eyepiece. Be sure the star drifts right through the center of the eyepiece. Do this two times, take the average and record your result (don't double it like you did for the finder) in Table 1.

3) Repeat the above for the medium- and high-power eyepieces.

4) Since the Earth rotates 360 ° in 24 hours, or 1° every 4 of time, a star on the celestial equator will drift 1° in the sky every four minutes of time. Use this relationship between drift time and degrees to convert the time it takes the star to drift across your eyepiece to the field of view of your eyepiece;

   4 minutes (m) of TIME = 1 degree of ARC (°)
   4 seconds (s) of TIME = 1 minute of ARC (')

   Convert the drift times to fields of view in °, ' and record the results in Table 1.

5) Calculate the magnification for each eyepiece by dividing the focal length of the telescope in millimeters by the focal length of the eyepiece in millimeters and record the results in Table 1.

6) Examine your results (Table 1), answer questions 1, 2,3 and 4 and summarize what you've learned in your writeup.

Table 1

Objective Diameter of Telescope = _______ Focal length of Telescope = __________

Optical Device	Drift Time min sec	Field of View ° ‘	Magnification
Finder Scope			9
Low Power (mm)			
Med Power (mm)			
High Power (mm)			

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Questions

1) What does your measured "field of view" really mean in terms of how much of the sky you can see through the eyepiece? *Hint: How many degrees is a hand? A finger*

Answer

2) Plot field of view versus magnification in the graph below.

FOV														
6° 15’														
6° 0’														
5° 45’														
5° 30’														
5° 15’														
5° 0’														
4° 45														
4° 30’														
4° 15’														
4° 0’														
3° 45														
3° 30’														
3° 15’														
3° 0’														
2° 45														
2° 30’														
2° 15’														
2° 0’														
1° 45														
1° 30’														
1° 15’														
1° 0’														
0° 45														
0° 30’														
0° 15’														
0° 0’														
MAG	0	10	20	30	40	50	60	70	80	90	100	110	120	130

3) Look at the plot above and describe the relationship between field of view and magnification.

   Hint: As field of view gets larger does magnification get bigger or smaller?

Answer:

4) What is the advantage of using a low-power eyepiece for finding a star?

Answer

5) Why use a high-power eyepiece at all?

Answer