Rotation of the Earth

By Mary Lou West

Objective: to measure the period of time for the rotation of the Earth on its axis. Estimated value is _____.

Equipment: Sunspotter solar telescope, paper with circles, pencil, stopwatch

Procedure:

Use a Sunspotter to form an image of the sun on its viewing screen. On a piece of paper draw or select a circle the exact size of the sun's image on your viewing screen. Fasten this paper to the telescope. Aim the sun's image in this circle, then stand back and use the stopwatch to time how long it takes for the sun's image to drift completely out of the circle. This time t is _____ seconds.

Analysis:

This apparent motion of the sun is really due to the rotation of the Earth on its axis, of course. The sun is about half a degree wide, so should take twice as long as t to drift a whole degree. How long should it take to drift 360 degrees, or all the way around? _____

Using your value of t, calculate the Earth's rotation time. _____

How close did you come to the expected value? _____ What is your percent error? _____

Analysis with more accuracy:

The sun is not exactly .5000 degrees wide, and also is not constant in angular diameter. The values are:

Date, (first day of month)	Sun's diameter, D, degrees
1	0.5422
2	0.5411
3	0.5381
4	0.5336
5	0.5292
6	0.5258
7	0.5244
8	0.5253
9	0.5282
10	0.5324
11	0.5371
12	0.5406

Use these values to tighten up your analysis and calculation.

New period and % error _____

Plot the sun's angular diameter vs. date and explain why the curve has this form.