

## LAB A8e: TESTING THE HORIZONTAL ACCELEROMETER

10/14/00

In this lab, one person will stand in place while rotating at constant speed and holding the horizontal accelerometer in an outstretched arm. Since the acceleration of an object rotating in a circle at constant speed is directed toward the center of the circle, orient the accelerometer so that the plane of the card is radial (i.e., the card should be upright, with its side edge aimed towards the person who is holding it). The side of the accelerometer that has markings for the full range of angles (0-90°) should be pointed away from the person who's holding the card. The bottom edge of the card should be parallel to the ground; hopefully the middle BB lies directly below the zero-degree mark. (Some accelerometers read different angles on the two sides. What can you do about this?)

While the person holding the accelerometer rotates at constant speed, two other people should measure the rotation period accurately (which means timing for at least 5 or 10 periods, right?), the angle at which the BB's remain, and the radius of the circular motion. In order to determine the acceleration experienced by the accelerometer BB's, what radial distance should be measured ? Be specific.

**Clearly** record all directly measured data - **label** all numbers with symbols.

- 1) Use your distance and time data to calculate the horizontal acceleration experienced by the accelerometer BB's. Show work clearly; **do not** start with numbers first.
- 2) Now use your direct angular measurement from the accelerometer to calculate another value of the acceleration. Compare this with the value from the previous part.
- 3) Now group members will switch roles. The person who rotated initially will now make observations, and one of the observers will now rotate. This time, the rotating person should try to keep the **SAME** rotation period as the first person, but should hold the accelerometer at a **DIFFERENT** radius from his/her body than the first person did. **BEFORE** you do this experiment, though, you should **PREDICT** what value of the acceleration you expect to obtain. Again, show your work clearly, starting with symbols and only substituting numbers at the end. Then do the experiment (i.e. measure the actual period, radius and accelerometer angle, then repeat steps 1 and 2 above, calculating the acceleration by two methods and comparing the two values you obtain). Was your prediction close to the actual values ?
- 4) Now switch roles one more time. The third group member will now rotate while the other two make measurements. This time, the rotating person should rotate at a **DIFFERENT** period than the other times, but should try to hold the accelerometer at the **SAME** radius that one of the other persons used. Again, predict what value of acceleration you should get before doing this experiment. Then do the experiment, collect data, calculate the acceleration by the two methods and compare the two values you obtain. Was your prediction correct ?
- 5) Predict the position of the BB's if the accelerometer were placed on the center of the head of the person who is rotating. Explain.