# Two-Dimensional Collisions on an Air Table:  Part II

In this experiment you will examine the collision of two steel pucks where the external interference is reduced to a minimum.  You can achieve this by using the air table where each puck leaves a trail of points from the carbon paper placed under the newsprint.  The pucks are launched by hand so that they collide near the center of the table.  Note that the points produced by the high voltage are made at the same time for both pucks.

**Recommendations**:

- Use a spark frequency of 20 Hz.
- Manually smooth the newsprint to eliminate small bumps that might interfere with the motion
- Make sure the rubber tubing does not become entangled during the motion
- Do a number of practice runs first
- Press the foot pedal immediately after you release the pucks.  WARNING:  If you press the pedal early, you will give yourself a shock.  And, hold down the pedal through the entire collision until the pucks strike the edge of the table.
- When you remove the newsprint from the table and look at the marks, remember that right and left are reversed as the newsprint is turned over.

**Collisions:**

Select two of the following configurations for collisions and subsequent analysis

- Pucks of unequal mass
- Pucks with Velcro collars
- Magnetic pucks

**Analyses:**

Using a straight edge, draw lines through the paths of both pucks before and after the collision.  These points should lie on four straight lines.  Since the high voltage is applied between the two pucks, pairs of points are made at the same time.  By examining points near the point of collision, determine which pairs belong together.  Draw straight lines between all points which occurred at the same time.

Locate the center of mass on the newsprint for each simultaneous pair of points.  Does the motion of the center of mass agree with your expectations?

Define your y axis as a line parallel to your center of mass line.   Construct a perpendicular as your x axis.  Now, determine the x- and y- components of the velocity of the center of mass.  Extend the straight lines corresponding to the four puck paths to the x and y axes and measure the angles between these lines and the axes.  Determine the x and y components of each of these four velocities.

Determine the momentum vectors of each puck both before and after the collision.  To what extent is momentum conserved in the collision?  Is the result in agreement with your expectations?  Why?  Under what circumstances is momentum conserved in a collision?

Determine the kinetic energy of each puck both before and after the collision.  To what extent is kinetic energy conserved in the collision?  Is the result in agreement with your expectations?  Why?  Under what circumstances is kinetic energy conserved in a collision?