Conservation of Energy and Linear Momentum

In this lab we will be examining the conservation of momentum and energy in a "near-elastic" collision. The actual setting is an air table (or "air hocky" table) on which two identical metal pucks are pushed at each other and suffer a collision in which they bounce off each other. Please watch the following YouTube clip which shows exactly what was performed in our own lab.

https://www.youtube.com/watch?v=-KKlPGYLnEU

The individual paths are tracked with a "spark-trail" of burn marks on a large sheet of paper which were produced at exactly equal time intervals. I have photographed two actual runs of this kind from last semester and sent them along – as **these will be your data** for this experiment.

The Lab

I will perform the analysis in front of the class during our Zoom lab time. You are then to either print out the data sheet, do the analyses for yourself and send me a photo -or- for those of you with drawing programs on your computer – you may use the drawing capacity of your drawing program to effect the analyses. In the end you are to provide three separate analyses:

1) **Comparison of total vector outgoing momentum to total vector incoming momentum. (compare *direction* and *magnitude*!)**

2) **The ratio of total outgoing Kinetic Energy to total incoming Kinetic Energy.**

3) **A direct confirmation that, indeed,** $\vec{P}^{tot} = M^{tot}\,\vec{V}^{C.M.}$

Comments

• Display all the results on the face of the sheet. You will find that a noticeable fraction of the kinetic energy actually "disappeared" in the tiny moment (perhaps a hundredth of a second or less!) that the collision actually took. This is a serious lesson for all engineers …

• Estimate the % difference in the incoming/outgoing total-momentum magnitudes.

• Use collision "A" if you are in the 12-2 PM lab section and collision "B" if you are in the 3-5 PM section.