

Lab R2: Time Dilation and Length Contraction
PH305 3/25/03

You will use the Train “Paradox” simulation again, this time studying the time intervals between events that occur and the distances between endpoints of objects that move on the screen. Run the START program for the SPACETIME software, then open the file TRAINING.STS that you used in Lab R1.

Collecting Data:

Use the clocks and distance scale for the ground observer’s reference frame to determine the four quantities in the table below, as measured by the ground observer. Then use the clocks and distance scale for the train’s reference frame to determine the four quantities in the table below, as measured by the train passenger. Pay attention to units of all numbers ! Finally, decide which reference frame measures the rest time, or rest length, for each measurement.

| Measurement | According to Ground Observer | According to Train Passenger | Which RF’s (G’s or T’s) measurement is rest (and how do you know) ? |
|---|-------------------------------------|-------------------------------------|--|
| L = Length of train | | | |
| D = Distance between ground observer’s left and right clocks | | | |
| Δt = Time interval between (front of train and ground observer’s right clock being side-by-side) and (rear of train and ground observer’s right clock being side-by-side) | | | |
| ΔT = Time interval between front flash reaching train passenger and rear flash reaching train passenger | | | |

