Re: time dilation

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- *From*: "harry" <harald.vanlintelButNotThis@xxxxxxx>
- *Date*: Fri, 11 Apr 2008 19:19:48 +0200

"rbwinn" <rbwinn3@xxxxxxxx> wrote in message
news:974e7f2d−d7af−4ae9−81a8−45d62b8e06ee@xxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
On Apr 11, 5:37?am, "harry" <harald.vanlintelButNotT...@xxxxxxx>
wrote:

> "rbwinn" <rbwi...@xxxxxxxx> wrote in message
>
> news:dd0d3b7a−58e7−48e4−b9ed−c269b00d1a88@xxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
>
>> The work of famous scientist Galileo Galilei provides us with a question about time dilation and Dr. Albert Einstein's statement that the laws of physics must remain the same in all frames of reference. Galileo carried two lead weights of unequal sizes to the top of the leaning tower of Pisa and dropped them at the same time, disproving the idea of scientists of his time that the heavier of the two weights would strike the ground first. ?Of course, it took some time before scientists accepted the results of his experiment. ?They did not all believe in the principle of equivalence the moment the two lead weights hit the ground.
>> ? ? ? ?This brings us to another question about falling objects which arises from the idea of dropping an object in a moving train car, which writers of textbooks about relativity often use to show how the Lorentz equations work.
>
> Which one for example?

I do not have any in my possession. Einstein's book did not use this example. However, a lot textbooks written by other scientists did.

>> If a weight is dropped from the top of a

train car to the floor, it falls a distance of y'. ?In any transformation equations this is always expressed as y'=y. ? The object travels the same distance vertically in S' as it does in S.
In Galileo's equations, it takes the same amount of time for the object to travel from the roof of the train car to the floor in either frame of reference. ?t'=t.
? ? In the Lorentz equations, a clock in S', the frame of reference of the train car, is slower than a clock in S, the frame of reference of the train tracks.
t'=(t−vx/c^)/sqrt(1−v2/c^2). ?According to this equation, it takes less time for the object to fall from the roof of the train car to the floor in S' than it does in S. ?So how are the laws of physics the same in both frames of reference?
? ? ?If a clock in S ticks once while an object is falling in the train car, it will not tick in S' until after the object has hit the floor. ?This means that the object is falling with a faster velocity in S' than in S.
? ? ?I am sure that some of our scientific friends who believe in a distance contraction will be anxious to explain this phenomenon.
Robert B. Winn

Neat. :−)
First a precision: as measured in all inertial frames, processes of completely moving systems appear to be slower by the Lorentz factor. However, your falling weight process is about a mixed system − thus (as Einstein also briefly pointed out in 1905) your train better not use pendulum clocks. ;−)

: Well, I don't need to use pendulum clocks. I can use two weights as
: clocks.

That's exactly what I meant that you should not do, as I just explained to you, one century after Einstein explained it to his readers. :−)
If you use balance clocks (or better quartz clocks, or even better, atomic clocks) − that's OK.

: If we put an identical train car beside the track and take
: pictures of two weights as they fall in the two train cars, according
: to experiment, the two weights will strike the floors of the train
: cars at the same time as photographed from either frame of reference
: if they are released at the tops of the train cars at the same time.
: This is not some imaginary experiment. It has been done numerous
: times. According to photographs, the two weights fall at the same
: rate and strike the floors at the same time.

If you mean that the other car is not moving: I doubt that your claim corresponds to GRT. Has that been tested with sufficient precision to enable comparing GRT with Galileo? I don't think so.

> Now about laws of physics being the same: If there is another planet that
> is
> at rest in S' with a moving train car that is at rest in S then the story
> will be just the same, with S and S' exchanged.

: That is wonderful, but it does not change anything. The two weights
: will hit the floors at the same time on that planet also. So what
: about the clock that scientists say is running slower? How is that
: supposed to enter into this particular experiment?
: Robert B. Winn

See above.

Harald

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