Re: Rel. Speed

Source: http://sci.tech−archive.net/Archive/sci.physics.relativity/2007−06/msg03413.html

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- *From*: "Dirk Van de moortel" <dirkvandemoortel@xxxxxxxxxxxxxxxxxxxxxxxxxxxx>
- *Date*: Fri, 29 Jun 2007 16:25:38 GMT

"razyrel" <razyrel@xxxxxxxxxxxxxxxxxx> wrote in message news:f61g48$269$1@xxxxxxxxxxx

> "Dirk Van de moortel" <dirkvandemoortel@xxxxxxxxxxxxxxxxxxxxxxxxxxxx> wrote in message
> news:QdSgi.8428$0W5.201780@xxxxxxxxxxxxxxxxxxxxxxxx
>
>> "razyrel" <razyrel@xxxxxxxxxxxxxxxxxx> wrote in message
>> news:f5vglc$4g5$1@xxxxxxxxxxx
>>
>>> "N:dlzc D:aol T:com (dlzc)" <dlzc@xxxxxxx> wrote in message
>>> news:eoHgi.472804$115.245105@xxxxxxxxxxxxxxx
>>>
>>>> Dear rayzel:
>>>>
>>>> "razyrel" <razyrel@xxxxxxxxxxxxxxxxxx>
>>>> wrote in message
>>>> news:f5vdmjquq1@xxxxxxxxxxx
>>>> ...
>>>>
>>>>> Ok, then
>>>>> how is the situation in the
>>>>> following extension of the
>>>>> above experiment:
>>>>>
>>>>> the ship shoots a torpedo
>>>>> that has an instant speed
>>>>> of 0.4c, into the front
>>>>> direction of the ship, and a
>>>>> second one of the same kind
>>>>> to the rear direction;
>>>>> both shot exactly at the
>>>>> same time (ie. at the same
>>>>> location) as in the scenario
>>>>> above. How far away,
>>>>> relative to the stationary
>>>>> observer, will each of these

torpedos be after 10 seconds
(in c units)?
Is it 0.4*10=4c for both
torpedos, or will they differ?

You say 0.4c... is that as measured by the ship travelling at 0.8c?

Let's say it is the propery of these rockets,
ie. they are that fast if fired from rest (ie. if the ship's v=0).

http://hermes.physics.adelaide.edu.au/~dkoks/Faq/Relativity/SR/rocket.html

You say 10 seconds... is that measured by the stationary observer?

Yes

They could differ, depending on your answers.

Would be interessting to analyse the differences.

This is simple geometry.

The ship has equation of motion
$x = v t$
where
$v = 0.8 c$

The forward torpedo has equation
$x' = u t'$
The backward torpedo has equation
$x' = - u t'$
where
$u = 0.4 c$

After a time t', the distance between the torpedos, according to the ship is
$D'(t') = u t' - (- u t') = 2 u t'$

Hmm, I wonder why there is no difference to the situation
had the ship fired the torpedoes from rest (ie. v=0).

> I mean I would have expected this for v=0, and a different
> value for v>0.

You said that the torpedos are fired at u with respect to the ship, so there you go, I can't help it :−)

> > According to the stationary observer, using the Lorentz transformation, the equation of motion of the forward torpedo
> > $x' = u t'$
> > is transformed to
> > $g (x - v t) = u g (t - v x /c^2)$
> > giving
> > $x = (v + u) / (1 + v u /c^2) t$
> > in which you might recognize the relativistic velocity composition formula.
> >
> > Likewise, the backward torpedo equation
> > $x' = - u t'$
> > is transformed to
> > $g (x - v t) = - u g (t - v x / c^2)$
> > giving
> > $x = (v - u) / (1 - v u / c^2) t$
> >
> > So after a time t the distance between the torpedos, according to the stationary observer is
> > $D(t) = (v + u) / (1 + v u / c^2) t' - (v - u) / (1 - v u / c^2) t'$
> >
> > Al you have to do now, is to fill in the values for u and v and for c and t.
> >
> > I get 2.4 10^9 meters after 10 seconds measured by the ship, and 9.6 10^8 meters after 10 seconds measured by the stationary observer.

> Why does the result differ for both observers?
> How could this be explained rationally?

By the rationality of special relativity, I guess. Do you have a problem with special relativity?

Dirk Vdm

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