The complete Doppler formula: Return to the origin

A new Doppler formula that shows the flawed limits of applicability of Special Relativity

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A source of light is receding from an observer at a relative fixed speed v . So, if original frequency of light is f_0, the observed frequency is $f < f_0$, because of that receding speed. The aim of this experiment is to accelerate the observer towards the source until both source and observer were at rest. So that will happen when the speed of the observer was $-v$, with respect to the frame where he is now at rest. In order to achieve this, we increase the observed frequency f a differential df in rest frame of observer, by increasing his rest with a differential speed, dv, and that differential Doppler is addressed by means of the classical first order approximation Doppler formula,

$$f + df = f\left(1 + \frac{dv}{c}\right)$$

It is saying, the measured frequency by the observer when he is at rest in his frame is f , and when he starts to move a differential speed dv towards the source, he achieves to measure a greater frequency $f + df$ because of the Doppler effect. So, simplifying, we get,

$$f + df = f + \frac{f\ dv}{c}$$

$$df = \frac{f\ dv}{c}$$

$$\frac{df}{f} = \frac{dv}{c}$$

So now, we are ready to integrate this differential equation, and the solution is

$$\ln\left(\frac{f}{f_0}\right) = \frac{v}{c}$$

$$f = f_0 \exp\left(\frac{v}{c}\right)$$

Q.E.D.

This notable solution means that when the observer achieves to be at rest in the rest frame of the source of light, the measured frequency will be $f = f_0$. This result is also notable for the following consideration: since we used the classical first order aprroximation Doppler fórmula for expressing a differential of speed, then when that equation is integrated, we attain the correct solution for any speed. small or large, showing that it in blatant discrepancy with Special Relativy .

The hilarious part of all of this, is that if anyone wants to prove my formula wrong, he must perform an experiment for discriminating between the relativistic formula and mine. But, nobody on Earth is still able to perform that test because of a little detail (the devil is in the details): the expansion series (Taylor series) of both formulas are indistinguishable within the third order approximation of c, and that means there is no manmade technologies available nowadays that could achieve such accurate measurements for discriminating one formula from the other. Can you believe it?

$$\frac{f}{f_0} = \exp(\tfrac{v}{c}) = 1 + \tfrac{v}{c} + \tfrac{v^2}{2c^2} + \tfrac{v^3}{6c^3} + \tfrac{v^4}{24c^4} + ...$$

$$\frac{f}{f_0} = \sqrt{\tfrac{1+v/c}{1-v/c}} = 1 + \tfrac{v}{c} + \tfrac{v^2}{2c^2} + \tfrac{v^3}{2c^3} + \tfrac{3v^4}{8c^4} + ...$$