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Modern optics uses the ethereal Doppler effect erroneously

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In all radars, the measurement of the speed of moving objects is erroneously based on the ethereal Doppler effect proposed 180 years ago, which leads to measurement errors. It is shown that when the light source moves, the frequency change is determined by the same formula as when the receiver moves. Using the corrected effect allows you to accurately determine the changes in frequencies in the GPS system and in a new way to explain the cosmological redshift without the mystical recession of galaxies.

Analizing the propagation of vibrations **in ether or air,** Doppler in 1842 showed that instead of a frequency ν_0 a moving receiver should see a frequency $\nu = \nu_0(1+\frac{V}{C})$, (1)

and in the case when only the source moves, the receiver sees the frequency $\nu = \frac{\nu_0}{1-\frac{V}{C}}$. (2)

It follows from these expressions that the receiver will not see any change in frequency if the relative velocity is zero. That is, in the case when the source of oscillations and the receiver move in the same direction with the same speed **V**, the frequency should not change

For cases of sound propagation in different media, the Doppler effect was confirmed experimentally. And since in the 19th century light was considered as oscillations of the ether, the effect was immediately extended to light. The ethereal formulas of the Doppler effect are used in the special theory of relativity. In this form, the Doppler effect has been used in optics for 180 years.

A simple comparison of the emission of photons of light with the emission of sound in air makes it possible to understand that the ethereal formula (2) is used in optics erroneously, and in both cases - when the receiver is moving or when the light source is moving - instead of two different formulas (1) and (2) the same formula $\nu = \nu_0(1+\frac{V}{C})$ must be used.

In acoustics and optics, when the source is stationary and only the receiver is moving, the frequency changes at the moment when oscillations meet with receiver and is determined by the same expression $\nu = \nu_0(1+\frac{V}{C})$.

If the **source is moving** and it is assumed that the light propagates through the ether in the same way that sound propagates through air, a stationary receiver should see the frequency $\nu = \frac{\nu_0}{1-\frac{V}{C}}$.

But light propagates in vacuum, not in ether, and therefore the process of light emission differs in principle from the process of sound emission: the frequency of light does not change at the moment of emission and therefore formula (2) turns out to be erroneous.

It is more convenient to compare the radiation of light and the radiation of sound using the example of laser radiation.

When the **source moves**, in the ethereal wave theory the frequency changes at the moment of radiation: since the speed with which the oscillations propagate in the medium does not depend on the movement of the source, the moving source, as it were, catches up with the emitted wave, the wavelength decreases and the stationary receiver sees the frequency $\nu = \frac{\nu_0}{1 - \frac{V}{C}}$.

The **laser** does not create oscillations of some medium, but actually **emits** photons of frequency ν_0 into space. **If the laser is stationary** relative to a given inertial frame, at the moment of emission, photons always move **relative to the laser** in the empty space with a speed C. This speed is measured with high accuracy and is determined by the property of atoms to emit photons only at a speed of C. Since almost immediately the photons collide with the air atoms, they are re-emitted by them and travel with the speed **C/n** relative to the air. The fixed receiver sees the frequency ν_0.

If the **laser moves** at a constant speed **V (**for clarity, let's imagine that it moves at a relatively low speed), exactly the same photons of the same frequency ν_0 are fired from it as from a stationary laser.

In accordance with the principle of relativity, motion does not affect the process of photon emission in any way, and a**t the moment when photons exit from the laser**, they move in vacuum with a speed **C** relative to the moving laser and at a speed **C + V** relative to the inertial frame.
Due to re-emission by air atoms, photons almost immediately change their speed to **C / n**, but this obviously does not mean that before re-emission, the speed of photons relative to the laser was not equal to **C.**

The fact that photons at the moment of exit from the laser move relative to the laser at a speed of **C,** and not at a speed of **C-V**, as Doppler assumed in accordance with the ethereal wave theory, means that, meeting with atoms of a stationary air, photons are re-emitted and change the frequency from ν_0 to $\nu = \nu_0(1 + \frac{V}{C})$. And with such frequency they go in the air to a fixed receiver. That is, from a light source moving at a speed **V,** a stationary receiver receives not a frequency $\nu = \frac{\nu_0}{1 - \frac{V}{C}}$, as the ethereal version of the Doppler effect claims, but a frequency $\nu = \nu_0(1 + \frac{V}{C})$.

Replacing the formulas $\nu = \frac{\nu_0}{1 - \frac{V}{C}}$ and $\nu = \nu_0(1 + \frac{V}{C})$ in the Doppler effect with one formula $\nu = \nu_0(1 + \frac{V}{C})$ will improve the accuracy of the operation of mobile radars (especially at cosmic speeds). But more importantly, Doppler effect extended to the optic allowed us to explain the **cosmological redshift** without Lemaitre's recession of galaxies and the myth of the Big Bang.