

Relativistic Doppler Formula invalid?

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According to Quantum electrodynamics electric fields are composed of photons. On the other hand charged particles are surrounded with a cloud of virtual electron positron pairs. Combining this two findings one can conclude that virtual photons and virtual pairs are the same.

Universal classical Doppler effect for moving source is defined as

$$f' = f \frac{1}{\sqrt{1 + \frac{v^2}{c^2} - 2 \frac{v}{c} \cdot \cos \varphi}}$$

or approximately for small speeds

$$f' = f \frac{1}{1 - \frac{v}{c} \cdot \cos \varphi}$$

and relativistic Doppler effect because of supposed time dilatation should be

$$f' = f \frac{\sqrt{1 - \frac{v^2}{c^2}}}{1 - \frac{v}{c} \cdot \cos \varphi}$$

After Planck every photon emitted by stationary source possesses an energy $E=hf$ while photons emitted by the moving source have an energy $E'=hf'$ because of frequency change due to Doppler effect.

Quantum electrodynamics regards an electron as a point source which emits and absorbs 'virtual' photons in all and from all directions. In the static case all field photons have the same energy, thus the energy of the electromagnetic field of electron is equal to the sum of energies of all photons of the field (energy conservation law)

$$E = \sum hf$$

For moving electron the Doppler formula for moving point source must be applied. Because of symmetry of the problem the average value of Doppler shifts can easily be calculated and the energy of the field is again the sum of average energies of all field photons

$$E' = \sum hf' = \sum hf \frac{1}{\pi} \int_0^\pi \frac{d\varphi}{1 - \frac{v}{c} \cdot \cos \varphi} = \sum hf \frac{1}{\sqrt{1 - \frac{v^2}{c^2}}} = \frac{E}{\sqrt{1 - \frac{v^2}{c^2}}}$$

If relativistic formula is used one receives

$$E' = \sum hf' = \sum hf \frac{1}{\pi} \int_0^\pi \frac{\sqrt{1 - \frac{v^2}{c^2}}}{1 - \frac{v}{c} \cdot \cos \varphi} d\varphi = \sum hf = E$$

i.e. the energy is the same as in the static case.

Conclusion: Formula for relativistic Doppler effect can be regarded as invalid.
