

Radiation pressure as unphysical fantasy

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Abstract- By applying reprehensible physics in a hidden way, the phenomenon of radiation pressure got the chance to be accepted worldwide.

Argumentation

All text within quotes is copied from reference [1].

“Radiation pressure is the mechanical pressure exerted upon any surface due to the exchange of momentum between the object and the electromagnetic field. This includes the momentum of light or electromagnetic radiation of any wavelength that is absorbed, reflected, or

The associated force is called the radiation pressure force, or sometimes just the force of light.”

Comment:

Mechanical pressure is defined as force per square meter, with the normally used dimension N for force and thus Nm^{-2} for pressure. These two phenomena are mixed up in the text above and even the expression “pressure force” is used for the same phenomenon. Careless physics.

“Radiation pressure can be viewed as a consequence of the conservation of momentum given the momentum attributed to electromagnetic radiation. That momentum can be equally well calculated on the basis of electromagnetic theory or from the combined momenta of a stream of photons, giving identical results as is shown below.”

Comment:

In order to create a momentum ‘ mv ’ by means of a photon such a photon needs to have that mass ‘ m ’. However a photon propagates in vacuum by definition with the velocity c of light. According to Einstein’s theories of relativity, such a photon must get an infinite mass at emission. Consequently, regardless of the strength of the radiation, its momentum ‘ mc ’ is infinite too. There are now three possible scenarios:

- 1 The theories of relativity are rejected.
- 2 It is assumed that a photon is *not* a particle.
- 3 Scenario 1 as well as 2 is accepted.

Choosing for scenario 1 creates the possibility to consider a photon as a particle without the just mentioned problem of creating an *infinite* large momentum at speed c , regardless of the strength of the radiation. But, according to reference [2], the mass of a photon is zero. So, whether radiation is composed of electromagnetic waves or particles, it is massless.

“The energy flux (irradiance) of a plane wave is calculated using the Poynting vector $\mathbf{S} = \mathbf{E} \times \mathbf{H}$, whose magnitude we denote by S . S divided by the speed of light is the density of the linear momentum per unit area (pressure) of the electromagnetic field. So, dimensionally, the Poynting vector is $S = \text{power/area} = \text{rate of doing work/area} = \Delta F/\Delta t \cdot \Delta x/\text{area}$, which is the speed of light ($c = \Delta x/\Delta t$) times pressure ($\Delta F/\text{area}$).”

Comment:

What happens here is that, by stating implicitly: ‘power = rate of doing work’, electrical energy has, in a hidden way, but much more worse: wrongly, been exchanged for mechanical energy.

The open way is the following. The dimension of S/c is $\text{VA}\cdot\text{m}^{-2}/\text{ms}^{-1} = \text{VA}\cdot\text{m}^{-3} = \text{J}_{\text{electrical}}\cdot\text{m}^{-3}$.

This result is implicitly transformed, without explanation, to $\text{J}_{\text{mechanical}}\cdot\text{m}^{-3} = \text{Nm}\cdot\text{m}^{-3} = \text{Nm}^{-2}$.

But there is no mass in electromagnetic radiation, so no *mechanical* energy either.

Conclusion

Apparently some influential physicists once created the opportunity to present this fundamentally wrong physics as advanced modern physics in a suitable medium, after which the less influential physicists were only too happy to pick it up, mesmerized by the erroneous assumption that a photon is a particle.

[1] https://en.wikipedia.org/wiki/Radiation_pressure

[2] https://en.wikipedia.org/wiki/Elementary_particle