

The Problem With The Equivalence Principle

Eric Louis Beaubien
X @el_beaubien
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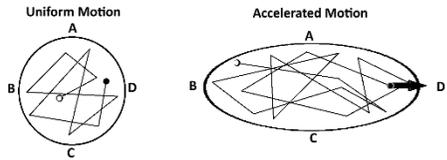
Abstract

The “*Equivalence Principle*” first noted by Albert Einstein has an obvious defect in it that forces a re-evaluation of deductions made from it. This is not a minor defect but rather a critical error that, when properly evaluated, leads to the cause of the stability of electrons in atomic orbitals and the underlying cause of electromagnetic radiation from accelerated charged particles. This should have been noted by physicists in the late 19th century but was missed.

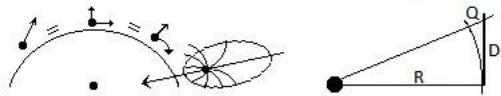
In the model of existence here posited, there are two types of fields. One Newtonian-Euclidean 3-dimensional field (the α -reference frame) in which are embedded spherical reference frames (β -fields) whose centers constitute matter (the baryon number).

Because the transmission velocity of information in these fields is always finite, the “*action*” associated with the center points self-interacts with its own spherical frame producing inertia and gravitation. (viXra:2507.0161)

In a state of uniform motion, the action has no preferred direction so that the center remains in place. If however, it random walks away from its centered non-accelerated frame ... the spherical reference frame lags behind its center (the particle) producing an ellisoidal field. The distances from that center origin to A, B, C, D are altered such that probability favors a return to the an equilibrium state of maximum isotropy.



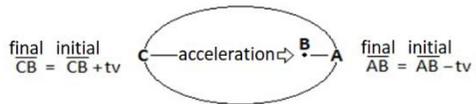
A clump of such spherical fields upsets the general isotropy and favors acceleration towards the clump. Then the distortion caused by that acceleration cancels out the distortion from the clump thereby producing uniform acceleration.



The *problem with the equivalence principle* is that there are two types of acceleration ... linear and radial. In linear acceleration the distortion caused by acceleration is “*cumulative*”. Whereas the distortion caused by radial acceleration is “*limited*”.

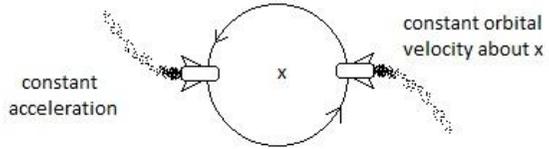
This is easy to see because the speed of light is finite ... so ... in linear acceleration the notice to stop accelerating cannot result in a restoration of sphericity until the particle stops accelerating. In fact, the deformation caused by acceleration continues to increase without limit ... resulting in increasing inertia as a byproduct of that acceleration.

Observe three points in a line. The middle point (B) is the particle. A and C are initially equidistant points in B’s spherical field. Then B accelerates followed by the copied acceleration of A and C after a “*lagging interval*”. In this situation B will always be traveling faster than A or C for the duration of A, C and B’s acceleration. Hence, the distance $B_{t_0}A$ will always decrease while the distance $B_{t_0}C$ will always increase ... producing an increasing inertia by way of B’s self-interaction with its own field.



If we consider A and B as “simultaneously” accelerating spaceships, B accelerates ... then A ... after an interval determined by the transmission velocity in the α field. Because B is *always* traveling at a velocity greater than A, it must reduce the distance B_{toA} . The final distance, when the acceleration of B (and A) ceases will be $[(A_{toB})_{initial} - tv]$, where ‘t’ is the time required for light to traverse the final distance $(A_{toB})_{final}$, and v is the final velocity of both A and B, which are necessarily the same. The final distance C_{toB} is the opposite.

In radial mode, acceleration is applied at right angles to the direction of motion, resulting in a curved trajectory, but no increase in velocity.



Constant radial acceleration

then produces a constant state of compression-expansion in the β -field, that ultimately produces a non-decaying electron orbit in the atom (rather than the ever-increasing compression-expansion ratio of linear acceleration).

In radial acceleration, the spherical field obtains a static distortion which constitutes stored energy. It cannot accumulate without limit because the notice of acceleration can catch up to the particle’s center upon completion of an orbit, leaving it with a static ellipsoidal configuration. Whereas in linear acceleration, there are always more notices of acceleration “in the pipe” to cause an increase in distortion.

In linear acceleration, the notices of acceleration cannot “catch up” and the distortion accumulates producing increasing inertia (an energy potential) that MUST be radiated away for acceleration to continue. There is necessarily a “stop and go” alternating parameter that repeats as the ellipsoidal inertial energy sink is emptied then fills up again.

Bremstrahlung Radiation

By the virial theorem, an accelerated charged particle must give up half of its acquired energy to be sequestered in the general void (*entropy*) while retaining the other half as *increase* in velocity.

When a particle is accelerated, its field is distorted because of the finite transmission velocity of information through that field. From this we derive the inertia of a particle as resistance to acceleration due to self-interaction with its own field.

When an electron falls to a lower potential energy level in an atom ... by the virial theorem ... one half of the lost potential energy is radiated away as a photon, and the other half becomes the higher kinetic energy of the electron in the lower energy orbit. These two parts (Hartree energy) constitute the total potential energy lost in dropping down the gradient.

Half is sequestered in the interstellar medium, increasing the entropy of the universe, and the other half is converted into increased kinetic energy.

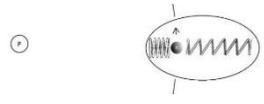
The electron then ceases to radiate energy because a stable orbit involves only radial acceleration. That is, the field, distorted by radial acceleration, achieves a stable expansion-compression differential because, though the electron is constantly changing direction, its linear velocity is unchanged.

Note: It was thought that because an electron radiates energy when linearly accelerated, the same should be true of radial acceleration. However, these two forms of acceleration are mechanically different in the context of finite transmission velocity.

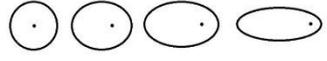
Understand that for the electron to drop to a lower energy level, logically requires some mechanism that initiates the drop, else it would stay in the higher orbit like a planet orbiting the sun, even though lower energy orbits are available. The mechanism that initiates the electron drop to a lower orbital is the uncertainty principle. Thus, an electron can move to a higher or lower orbit by chance in accordance with that principle.

However, it cannot remain in a higher orbit unless it receives the necessary energy from an external source. But moving to a lower orbit only requires emitting energy that it already possesses. This is the driving mechanism of downward orbital transition.

A field distorted by radial acceleration, is like a spring being compressed or stretched by a fixed amount, which then remains that way because the notice of changes in acceleration traveling through the field at a finite transmission velocity, can overtake any point in an orbiting particle's field. The delay of notifications in the field of a particle radially accelerated is only sufficient to maintain a constant stress state ... uniform over time.



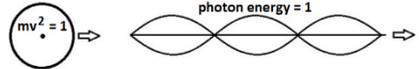
In a linear acceleration, the field expansion-compression differential increases without limit, resulting in increasing inertia. Here, a forward point in the particle's field is always travelling at a lesser velocity than the particle itself, because of the finite travel time of any notice traveling through the field. The effect is cumulative ... as long as any linear acceleration continues ... the field keeps compressing in the forward direction and expanding in the rearward.



At some point, half of the energy is emitted as a photon, and the other half is retained as increased kinetic energy ... again in accordance with the virial theorem.

The expansion-compression differential is the measure of the energy to be distributed to the photon and to increased kinetic energy of the accelerated charged particle.

After the emission of a photon, the expansion-compression differential is eliminated, and the field is at rest ... but, leaving the electron with a greater velocity. However, as acceleration continues, an expansion-compression differential is reconstituted, and the same problem recurs resulting in the emission of more photons.



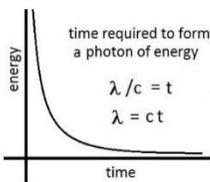
The emission of energy during the *deceleration* of a charged particle is Bremsstrahlung radiation, though it is no different than that of the same charged particle during *acceleration*. In either case, it is the expansion-compression differential that is increasing leading to photon emission.

In decelerating Bremsstrahlung radiation, the electron loses momentum and kinetic energy upon photon emission, 1/2 of its lost kinetic energy being deposited in the object it collides with (most often as heat) ... while in linear acceleration, it gains kinetic energy in addition to photon emission. In either case, the entropy of the universe increases because energy escapes into space where it is effectively sequestered.

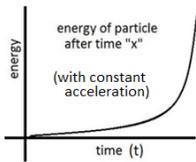
The emission of a photon is determined by the change in the velocity of the particle, from the beginning of the acceleration of its relaxed or 'rest field', and the time taken to achieve that velocity.

For linear acceleration, a particle must:

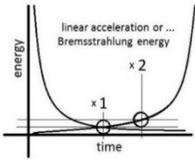
- acquire *twice* the energy of the photon to be emitted
- have *time* in which to form that photon (determined by the wavelength of the emitted photon)



The time required to form a photon can be taken minimally as its wavelength divided by the speed of light. A graph of this function would look something like this ... a short amount of time for a high energy photon and a much longer time for a photon of long wavelength and low energy.



Thus, a small amount of energy cannot be emitted, if the elapsed time of acceleration is insufficient to form a photon of a long wavelength. A large energy photon cannot be emitted if the rate of acceleration is too slow. Such acceleration would then allow for the emission of a photon of less energy, prior to the accumulation of enough energy to form a photon of higher energy.



$$E = f(t) = \frac{m_0 c^2}{\sqrt{1 - a^2 t^2 / c^2}} - m_0 c^2$$

The accumulated energy of a linearly accelerated particle is given as the relativistic mass energy acquired during the acceleration, minus the particle's rest mass. This is the amount of energy available to form the photon.

It should be understood here that the field distortion caused by acceleration is a relativistic phenomenon, because it involves the transmission velocity (c). It is NOT a Lorentz argument and appears to be unknown to science, judging by the available literature, i.e. it should be found in high school (perhaps college) physics textbooks as far back as the early 20th century.

In either acceleration or deceleration, upon emission of the photon, the field is returned to its rest state, and the process can begin again. As long as either continues, radiation will be emitted intermittently in staccato fashion. This process is heavily dependent on the mass of the particle. A given force will cause an electron to acquire 1836 times the energy of a proton, i.e. {energy = $\sim mv^2$... proton = 1836×1^2 ... is less than ... electron = 1×1836^2 }.

Conclusions

The “mistake” here is understandable. The two states (linear and radial) strongly resemble one another. But standing on the earth’s surface IS a radial acceleration while accelerating in a spaceship IS a linear acceleration. These are entirely different and require a different mathematical treatment (though results of experiments do agree with general relativity). Physicists of the late 19th century were aware of the finite velocity of light and ... could have easily grasped the significance of the simple principles presented here. Why they did not see that orbiting electrons would not decay by radiating energy ... because of the difference between radial and linear accelerations ... cannot be known from hindsight. But they did miss it, and it remains missing from the corpus of physics.

References

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- “Nuclear and Gravitational Interactions Are Flip Sides of the Same Coin” – E. Beaubien (viXra:2507.0161)
- “Ex Nihilo – The Logic of Existence” – E. Beaubien (2020)