Pure energy

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Abstract

Energy appears in many forms, but this document focusses on the energy that can be transferred between particles. Particles have no limbs, thus the field that embeds them must transfer the energy via suitable field excitations.

Introduction

The Hilbert Book Model introduces one-dimensional shock fronts as the carriers and transporters of a quantized amount of pure energy. One-dimensional shock fronts are solutions of a second order partial differential equation. Absorbing mechanisms can store this energy in oscillations or the energy can be exchanged against an equivalent of mass by massive objects. The energy packages that are carried by the one-dimensional shock fronts are too tiny to be perceived in isolation but arranged equidistantly in strings they can create a noticeable impact. This does not mean that the one-dimensional shock fronts cannot exist in isolation. However, each one-dimensional shock front must be generated by an emitter. These objects do not appear spontaneously. Once emitted, the front keeps moving with light speed through its carrier field until it is absorbed by an appropriate absorbing mechanism. During travel the front keeps its shape and its amplitude.

Photons

Photons are strings of equidistant one-dimensional shock fronts that obey the Einstein-Planck relation $E = h\nu$. Consequently, at the instant of emission, all photons share the same emission duration and the same spatial length.

It is not clear whether mechanisms exist that can break photons into pieces. These pieces would no longer obey the Einstein-Planck relation.

Vacuum energy

Energy is often considered as the partner of time in the Heisenberg uncertainty principle. However, this principle only rules between two variables that are each other's Fourier conjugates. This happens when one of the variables is controlled by a stochastic process, while the stochastic process owns a characteristic function that is defining the other variable. Such relation occurs between the location of elementary particles and their momentum. In the Hilbert Book Model no situation exists in which this relation exists between time and energy. Still, in physics the uncertainty relation is used to explain the existence of vacuum energy. However, physics does not explain which mechanism generates the stochastically distributed instants. According to the Hilbert Book Model, without such explanation the vacuum energy does not exist.

Instead, the Hilbert Book Model supports the one-dimensional shock fronts. These objects are ideally suited as dark energy quanta.

Elementary modules

All elementary particles are elementary modules. Together, they constitute all other modules that exist in the universe. Some modules constitute modular systems.

All elementary particles reside on a private platform, which is a separable Hilbert space that applies a private version of the quaternionic number system to define the inner product of pairs of Hilbert vectors. At each subsequent instant a private stochastic process that owns a characteristic function specifies a new location for the elementary particle. Together with the corresponding time-stamp this location is archived in an eigenvalue of a footprint operator that resides in this platform. A reference operator applies the rational members of the selected version of the quaternionic number system to manage a private parameter space for the platform. The private parameter spaces determine the symmetry related properties of the platform, such as their electric charge and color charge.

Composed modules

A private stochastic process that owns a characteristic function also controls each composed module. The characteristic function equals a dynamic superposition of the characteristic functions of the components of the module that can be elementary modules or composed modules. The dynamic superposition coefficients act as displacement generators. Thus, they control the internal oscillations of the components that together with the deformation of the embedding field install the binding of the components within the composed module.

Compound modules

Compound modules are composed modules for which the geometric centers of the platforms coincide. The charges of the platforms of the elementary modules establish the binding of the corresponding platforms. Physicists and chemists call these compound modules atoms or atomic ions.

In free compound modules, the electric charges do not take part in the oscillations. The swarms don’t oscillate. Instead the targets of the private stochastic processes of the elementary particles oscillate. This means that the hopping path of the elementary particle folds around the oscillation path. The oscillation path is a solution of the Helmholtz equation. Each fermion must use a different oscillation mode. A change of the oscillation mode goes together with the emission or the absorption of a photon. The center of emission coincides with the geometrical center of the compound module. The center of emission coincides with the geometrical center of the compound module. During the emission or absorption, the oscillation mode and the hopping path halt, such that the emitted photon does not lose its integrity. Absorption cannot be interpreted that easily. In fact, it can only be comprehended as a time-reversed emission act. Otherwise the absorption would require an incredible aiming precision for the photon.

The type of stochastic process that controls the binding of components appears to be responsible for the absorption and emission of photons and the change of oscillation modes. If photons arrive with too low energy, then the energy is spent on kinetic energy of the common platform. If photons arrive with too high energy, then the energy is distributed over the available oscillation modes and the rest is spent on kinetic energy of the common platform. The process must somehow archive the modes of the components. It can apply the private platform of the components for that purpose. Most probably the current value of the dynamic superposition coefficient is stored in the eigenspace of a special superposition operator.

Molecules

Molecules are conglomerates of compound modules that each keep their private geometrical center. However, electron oscillations are shared among the compound modules. Together with the electric charges this binds the compound modules.

Zigzag

Elementary particles can zigzag in time. This can only be comprehended from the creator's view of the Hilbert Book Model. The HBM applies a read-only repository in which at the instant of the creation of the model, the creator archives all dynamic geometric data of the point-like creatures in the eigenspaces of the footprint operators that reside on the private platforms of the elementary particles. Immediately after the creation, the creator left his creatures alone. Only after sequencing, the time-stamps of these data the content tells a story. A window that travels with these time-stamps splits the repository in a historic part and a future part. The window itself represents the current static status quo. Creatures that can take the role of observers must travel with that window and can only retrieve data that for them contain a historic time-stamp. That data is transferred to them via a field that embeds both the observed event and the observer. The observers perceive in spacetime format. A hyperbolic Lorentz coordinate transform converts the Euclidean storage format into the perceived spacetime format. The conversion introduces time dilation and length contraction. The creator can access all archived data independent of the archived time-stamp. Thus, the creator's view enables the investigation of the time zigzag of elementary particles that observers can only view as pair production and pair annihilation events of an elementary particle and its antiparticle. In the same creator's view, the absorption of photons becomes comprehensible as a time-inverted photon emission.

Zigzag poses problems with the generation of composed modules.

Floating modules

Change of the kinematic energy of floating modules results from:

Exchange of energy by one-dimensional shock fronts or photons.

The deformation of the embedding field.

The attraction or repelling of the charges of the electric field.

The oscillations of module components.

Vibrations in condensed matter.

Conversion of mass into energy or vice versa.

Binding or binding release.

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