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POSITRON-ELECTRON-MUON MODEL (PEMM)
hadron jets

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1 Forms and Types of Matter

1.1 The Law of Conservation of Energy – Matter Does Not Convert into Energy and Vice Versa

PEMM is not a matter of faith; it is a matter of survival for human civilization.
PEMM: matter does not convert into energy. The concept of "annihilation" is the formation of an electrical dipole – a gamma-particle (dark energy) – from the charges of a positron and an electron, preserving both charge and mass under conditions of ultra-dense compression.
The Universe is material at all levels: "void" or "pure energy" without a carrier does not exist.

1.2 Fundamental Particles of Matter and Interactions

- **Positron (e^+)** — a particle with a positive charge.
- **Electron (e^-)** — a particle with a negative charge.
- **Neutral muon (μ^0)** — the carrier of gravitational charge (dark matter).
- **Positron quantum (γ^+)** — the carrier of positron interaction and energy.
- **Electron quantum (γ^-)** — the carrier of electron interaction and energy.
- **Gravitational quantum (γ^0)** — the carrier of gravitational interaction and energy.

Electricity is a form of matter that arises due to the interaction of positrons and electrons and the movement of positron and electron quanta.

Gravity (attraction, universal gravitation) is the force that attracts objects to one another.

1.3 Composite Particles of Matter and Interactions

Positive muon (μ^+): — forms a magnetic charge with a (south) pole when the gravitational charge **(μ^0)** is located inside the charge of a positron **(e^+)**.

Negative muon (μ^-): — forms a magnetic charge with a (north) pole when the gravitational charge **(μ^0)** is located inside the charge of an electron **(e^-)**.

Magnetic interaction: — the interaction of positive and negative muons both directly and by means of magnetic dipoles composed of (south) and (north) quanta.

Magnetic dipoles:

- **($\gamma^0\gamma^+$)-dipole (south)** — gravitational and positron quanta.
- **($\gamma^0\gamma^-$)-dipole (north)** — gravitational and electron quanta.

Gamma-particle (¥), dark energy: — consists of the charges of a positron **(e^+)** and an electron (\ **(e^-)**, with preservation of mass and an approximate size of 0.0025 fm.

1.4 Quantum Nature of Radiation and Current

Electric dipole, gamma-quantum (γ) — consists of an equal number of electron and positron quanta, forming a **($\gamma^+\gamma^-$)-dipole**.

Electric current in metals — is a directional flow of electron **(γ-)** and positron **(γ^+)** quanta.

Magnetic current — is the movement of charged magnetic **($\gamma^0\gamma^+$)-dipoles** and **($\gamma^0\gamma^-$)-dipoles**.

Radio wave — is a magnetic current, a coupling of an "electric quantum + gravitational quantum". Thus, PEMM unifies electricity and gravity into magnetism at the level of unified field carriers. The wave frequency does not depend on the energy of the magnetic dipole.

1.5 Electrical Matter – Positron and Electron

1.5.1 The Electron Does Not Have a Fixed Radius; It Changes Depending on the Amount of Quantum Matter Inside.

The mass of the electron does not depend on the mass of the quanta — the analogy of a balloon and air perfectly explains the concept of PEMM (or similar aetherodynamic models):

- **Shell vs. Content:** Here, the electron is a "bubble" or a stable vortex in the medium. Its inertial mass is determined not by the weight of the quanta "pumped" inside, but by the volume of the displaced medium or the geometric parameters of the shell itself.
- **Volume Determines Properties:** Just like a balloon, its size (radius) changes depending on the "pressure" of the quantum matter inside. More quanta mean a larger radius, but this does not mean that the electron itself has become "heavier" in the classical sense (as the sum of the constituent masses).
- **Archimedes' Force of the Microcosm:** In such theories, mass is often viewed as the reaction of the external medium to the presence of this "bubble". The quanta inside only maintain the shape and size of the structure, allowing it to interact with the surrounding field.

Within this logic, the electron is a dynamic object that "breathes," changing its dimensions when absorbing or releasing energy, while fully maintaining its fundamental identity (charge).

1.5.2 Interaction of Electron and Positron (Structural Transition):

Within the framework of PEMM, the concept of "annihilation" (destruction of matter) does not exist. The process of interaction between an electron-positron pair is described as a phase transition of quantum matter from a rarefied state to an ultra-dense one.

1. Nature of Field Sources
The electron and positron are postulated as fundamental sources of external electric fields. In terms of PEMM, these are states of matter "packed with quanta".

- **Important Clarification:** Inside positrons and electrons themselves, viewed as "black boxes", there are no individual quanta — they represent a single, continuous quantum substance. Consequently, Coulomb's law is inapplicable at these scales, as the interaction transitions from a field-based to a volume-contact mechanism.

2. Mechanism of Structural Transition
The process of the pair collision leads to two variants of matter repackaging:

- **Formation of (¥) (Gamma-particle):** An ultra-compact neutral dipole. The charges do not vanish; instead, they close directly onto each other. Mass and charge are fully preserved in a hidden state.
- **Emission of Two Gamma-Quanta:** The ejection of two packets of quantum matter carrying the binding energy.

3.Energy of the transition (Experimental data)
The observed output energy during the transition is approximately 1,022 MeV. According to the PEMM, this energy is distributed symmetrically between two types of quantum matter:

- ≈ 50 % (0,511 MeV) — contribution of electron quanta **(γ^-)**.
- ≈ 50 % (0,511 MeV) — contribution of positron quanta **(γ^+)**.

4.Formula for quantum matter in the PEMM only:
$E = m_{\gamma^+} \times c^2 / 2 + m_{\gamma^-} \times c^2 / 2$
To convert quantum mass into ordinary mass (for example, in a virtual photon), two quanta are required — a positron quantum and an electron quantum.
The conversion constant from quantum energy to 1 amu is 931.494 MeV/c^2.

1.5.3 Unique Dualistic Model

A unique dualistic model: light is not a single entity (a photon), but two distinct ones:

1. **Gamma-particle (corpuscle/matter):** Responsible for mass, momentum, and penetrating properties.
2. **Gamma-quantum (wave/energy):** Responsible for interference, diffraction, and polarization.

PEMM solves the problem of wave-particle duality by literally dividing the properties of light between two different types of entities. This is a consistent internal logic for PEMM. In PEMM, the gamma-particle formed as a result of the compression of an electron and a positron is not a massless photon in the conventional sense. It is a neutral, electrical micro-dipole with a rest mass.

The Dipole Concept: The idea that an electron and a positron "compress" into an ultra-compact, internally neutral dipole—which does not emit an external field due to the perfect compensation of charges at a small distance—is a unique postulate of the model

1.5.4 Application of the Law of Conservation of Energy in PEMM

The law of conservation of energy is one of the most fundamental laws of nature, according to which energy is conserved within an isolated system. Energy does not appear out of nowhere and does not vanish without a trace — it merely converts from one form to another.
The fundamental trigger for revising quantum electrodynamics (QED) within PEMM is a strict calculation of the energy balance of a primitive system consisting of an electron and a positron approaching each other from infinity.
Let us consider an isolated system where **(e^-)** and **(e^+)** are at infinity from each other in a state of rest:

- **The total energy of the system at infinity** is the pure sum of their rest masses: 0.511 MeV + 0.511 MeV = 1.022 MeV.
  $E_{total}=E_{rest}$(1.022 MeV)+E_{kin}(1.2 MeV)=2.222 MeV

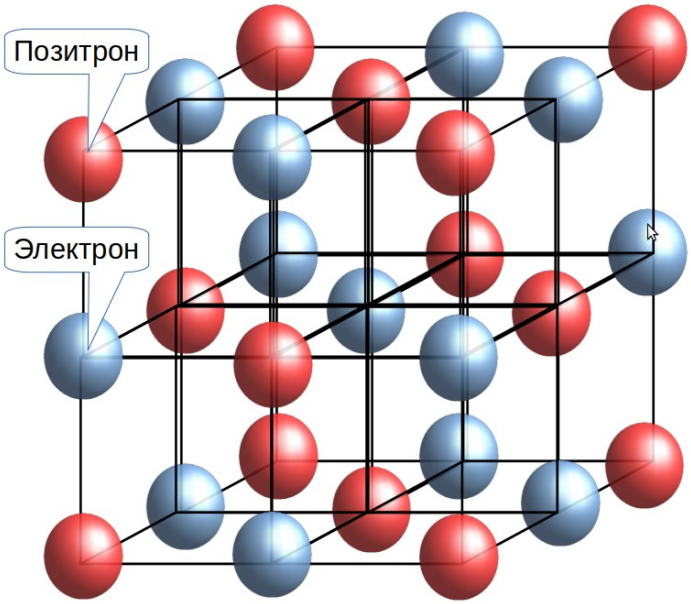
- **Under the action of the long-range Coulomb law**, the particles begin to fall toward each other. The potential energy of the field is continuously converted into kinetic energy of motion. At critical subnucleon distances, the accumulated kinetic energy of acceleration is on the order of 1.2 MeV.
- **At the moment preceding the collision**, the total energy balance of the system must strictly consist of: Rest masses (1.022 MeV) + Kinetic energy (1.2 MeV) = (2.222 MeV).

In traditional experiments, detectors record the emission of two gamma-quanta (\(\gamma \)) with an energy of strictly (0.511 MeV) each (totalling (1.022 MeV).

The unresolvable question of official physics: Where did the (1.2 MeV) of actually released kinetic acceleration energy disappear from the equations?

All these "theories" completely contradict the law of conservation of energy: QCD, QED, SM, and Einstein's $E=mc^2$ are all mathematical abstractions, a kind of hallucination devoid of real physical particles.

1.5.5 Gamma-Particles – EPOLA (Electron Positron Lattice)



local, dense, neutral structure called EPOLA (Electron Positron Lattice) is formed from gamma-particles and consists of a limited number of components, such as the core in nucleons. The lattice itself consists of two types of substances that form stable pairs:

- Positron **(e^+)**
- Electron **(e^-)**

Before "annihilation" of the positron and electron (prior to the formation of the gamma-particle and EPOLA):

- Positron / electron: (r ≈ 0.833 fm)
- "Packed with quanta" (internal energy)

After "annihilation" of the positron and electron and the formation of the gamma-particle and EPOLA:

- **Gamma-particle:** m = $2m_e$ = 0.00109716 amu;
- **Size:** r ≈ 0.025 fm compression by × 30)
- **2 (γ)-quanta:** E = 1.022 MeV (internal energy)
- Charges are preserved (±e), but are neutral

Analogy: A "discharged battery" — a short-circuited dipole.

Gamma-particles in EPOLA are energetically "discharged" dipoles of positrons and electrons in a "short-circuit" mode (a discharged battery).

In PEMM, EPOLA segments (the electron-positron and quantum lattice) do not form a complete infinite coverage of space — the model uses local fragments, for example, the core of nucleons, gamma-particles, or gamma-quanta.
The state of the electron and positron before annihilation — a radius of approximately 0.833 fm, the insides are "packed with quanta".
As a result of annihilation, the following is formed: a gamma-particle with the mass of a positron and an electron (size 0.025 fm) and some kinetic energy and two gamma-quanta with a total energy of 1.022 MeV — the internal energy of the positron and electron, transferred to the quanta inside the positron and electron due to instantaneous compression.
The crystal lattice model, or EPOLA (Electron Positron Lattice, electron-positron lattice), offers an elastic crystalline medium. It consists of gamma-particles — bound pairs of electrons and positrons.
Structure and Analogy: The volume is filled with a dense polycrystalline lattice, analogous to the structure of ionic crystals, such as sodium chloride (NaCl), where positive and negative ions alternate (as shown in the accompanying image).
Properties: The lattice has no residual charge, which, according to PEMM, allows explaining such phenomena as zero-point energy (ZPE) and dark energy.
Lattice type: A face-centered cubic (FCC) or simple cubic structure is proposed. The image illustrates a simple cubic lattice.
Density and Size:

- Estimated distance (lattice constant) between adjacent electron and positron is less than 0.01 femtometer (fm).
- The model assumes an extremely high density of this medium, exceeding the density of neutron stars.

Interaction: Electrons and positrons at the nodes are bound to each other by strong electrostatic forces of attraction.

1.5.6 Formation of a positron-electron pair:

Pair production is the reverse process of the formation of a free positron **(e^+)** and an electron **(e^-)** from a gamma-particle **(¥)** due to the capture of a high-energy gamma-quantum **(γ)**. Upon the capture of a gamma-quantum by a gamma-particle, the quanta from the gamma-quantum are absorbed by the positron and the electron along with energy and momentum. The filling of the positron and the electron with quanta from the absorbed gamma-quantum occurs (the effect of "inflating" the shells), and they exit the bound dipole state of EPOLA.
The formation of a positron-electron pair (pair production) is a process in elementary particle physics in which an electron and a positron are formed from electromagnetic energy (high-energy photons — gamma radiation). This is one of the methods of interaction of gamma rays with matter, dominating at high energies.
Conservation laws: Energy and momentum in the process of repackaging must be strictly conserved. Matter does not arise from the void, but transitions from an ultra-compressed state of a dipole into an uncompressed field state.
Conditions of the process:
The energy of the incident gamma-quantum (photon) must be above the threshold — that is, exceed the total rest mass of the forming free particles. The threshold energy is 1.022 MeV (2 × 0.511 MeV), since the rest mass of one electron is equivalent to the energy of (0.511) MeV. The process takes place in the field of a heavy nucleus, which acts as a catalyst and takes away the excess momentum.
The process can occur in the cores of stars under extremely high pressure and temperature, which leads to the subsequent formation of neutrons from dark energy and dark matter.
Experimental confirmation:

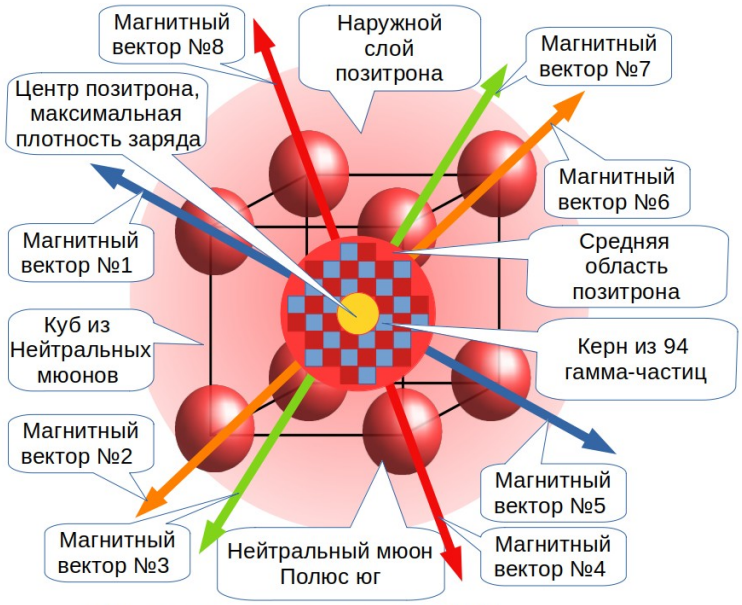
The process of pair production is the cause of electron-photon showers in cosmic rays.

2 Structure of the Proton in the Positron-Electron-Muon Model (PEMM)

2.1 Structure of the Proton in PEMM

The proton in PEMM is a composite particle with a rigidly defined internal geometric structure. From the eight muon vertices of the cube, strictly oriented Magnetic Vectors No. 1, No. 2, No. 3, No. 4, No. 5, No. 6, No. 7, and No. 8 emerge, forming the "south" polarity and determining the fundamental chemical properties of atoms.
It consists of the following elements:

- A positron **(e^+)** with a charge of **(+1e)**, which defines the total physical volume of the entire system;
- An internal core of 94 gamma-particles (¥) (ultra-compact short-circuited dipoles **(e^+e^-)**, forming a local high-density EPOLA lattice;
- Eight neutral muons **(μ^0)**, acting as magnetic charges and located at the vertices of a regular cube around the central core;
- An internal virtual photon.
  A step-by-step balance of subtracting the energy and mass of the virtual photon in the proton (in amu and MeV)



Строение протона в ПЭММ

Initial mass of the proton (M_p): 1.007276466000

1. **Subtract the mass of the central positron (-1 × m_{me}):**
   1.007276466000 - 0.000548579909 = 1.006727886091
2. **Subtract the cubic framework of 8 neutral muons (-8 * $m_{\mu 0}$):**
   1.006727886091 - 0.903042666088 = 0.103685220003
   (where 8 × 0.112880333261 = 0.903042666088)
3. **Subtract the octahedral core of 94 gamma-particles (-94 * $m_{¥}$):**
   0.103685220003 - 0.103133061902 = 0.000552158101
   (where 94 × 0.001097160233 = 0.103133061902)

Physical meaning of the remainder in PEMM

This pure dry remainder of 0.000552158101 amu is not a rounding error, but a fundamental quantity of the model:

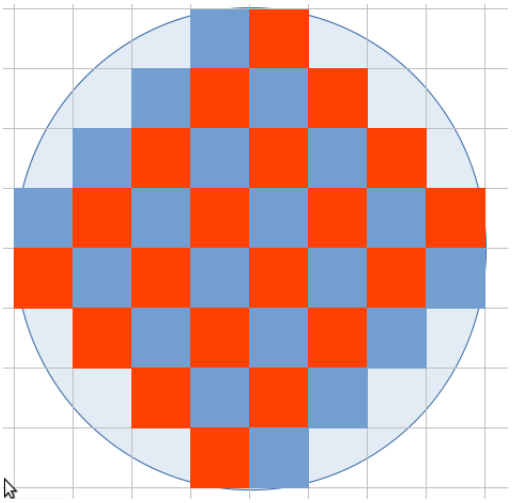
- **Field mass of the charge:** This is the exact energy mass of the electric field of the central positron in the proton, locked inside the meson-gamma-cube.

- **Binding energy:** When converted to the quantum energy equivalent, this remainder gives 0.51433215 MeV (calculated by the formula 0.000552158101 × 931.49410242).

  This result perfectly agrees with the values of the virtual photon inside the proton.

2.1.1 Positron — the central and volume-forming part of the proton

The positron in PEMM has a physical volume with a radius of 0.833 fm and a distributed density, being the main carrier of the positron charge of +1e, and is located in the center of the proton. The density of the positron is maximum in the center and decreases towards the edge.



- **Zone No. 1 (center of the positron, forbidden zone only for gamma-particles):** In the very center of the positron and proton with a radius of 0.025 fm, where the charge density goes off the scale — +0.1155e, even gamma-particles (¥) cannot be present. This explains the presence of a "empty" (high-energy) center, where there are no four gamma-particles, which serves as the foundation for the entire structure — the positron cannot shift its center relative to the center of the core.
- **Zone No. 2 (middle region of the positron):** A core of 94 gamma-particles with a radius of 0.025 fm — 0.25 fm, forming an ultra-dense core, with a charge of +0.2345e.
- **Zone No. 3 (outer layer):** At a distance of 0.25 fm — 0.833 fm, with a charge of +0.65e, there are eight neutral muons forming a cube around the core while penetrating into the core.

Mutual penetration (Overlap): The most important point is the intersection of volumes. The muons do not just "touch" the core, they are partially submerged into it. This results in the effect of a monolithic part, where one part is "welded" into another due to the matching parameters of the medium.

Magnetic vectors (No. 1–No. 8): On the diagram, they are directed strictly from the vertices of the muon cube. This is the most critical element for calculating the interaction of protons with each other in nuclei. In essence, you have drawn "connection ports" for assembling atoms.

2.1.2 Charge defect of the positron in the proton

Hofstadter's experiment shows that in the proton (p), about (0.35e) of the positron charge is localized inside the core with a radius of ~0.25 fm, while the remaining ~0.65e is distributed in the outer region of the positron **(e^+)**.
In PEMM, based on these data, the following fundamental postulate is introduced:

- **Indivisibility of the elementary charge:** The charges of the positron and electron are absolutely indivisible. The charge of the positron is equal in modulus to the charge of the electron and is strictly equal to the single elementary charge (e).
- **Spatial shielding:** The value of (0.35e) is a full part of the field of the single positron charge, geometrically located within a radius of 0.25 fm (the proton core). Outside the core, in the meson coat, the remaining part of the field equal to (0.65e) of the positron charge is distributed.

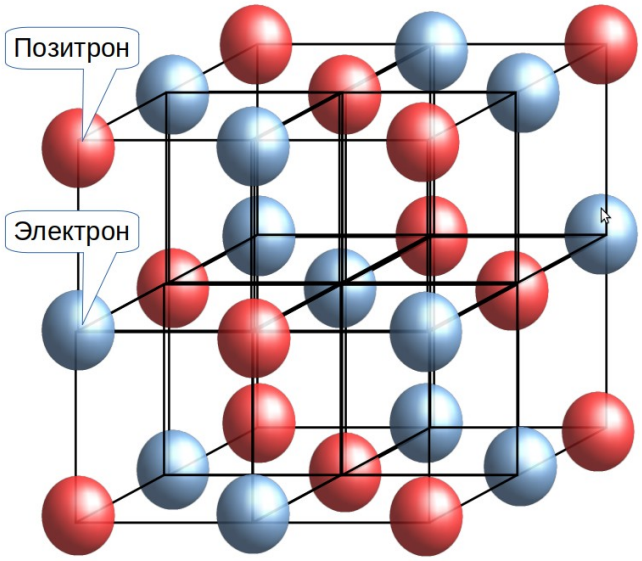
- **Nature of the charge defect (10^{-10}e):** Due to the spatial separation and the weakening of the influence of the central part of the positron charge in the proton core, a microscopic electrical imbalance arises. This uncompensated remainder is equal to **(10^{-10})** per nucleon. It determines fundamental macro-phenomena: water dissociation, the total charge of planets, and the mechanism of the Coulomb explosion of black holes.

Numerically it looks as follows: if each individual nucleon has an effective charge defect of **(+10^{-10}e)**, then in typical macroscopic volumes of matter (for example, in a liter of water or on the scale of the Earth's mass), the total "excess" charge accumulates to macro-values and directly forms the observed physical effects.

In specialized sections 14.1 and 11.10, it is precisely this effective value of **(10^{-10}e)** per single nucleon that is used for an accurate quantitative calculation of:

1. The number of dissociated molecules of pure water at a neutral balance **(pH ≈ 7)**;
2. The total net electrical charge of the Earth, the Sun, and large astrophysical objects.

2.1.3 The proton core of 94 gamma-particles — EPOLA (Electron Positron Lattice)



Before annihilation of the positron and electron:

- Positron / electron: (r ≈ 0.833 fm).
- "Packed with quanta" (internal energy).

After annihilation of the positron and electron:

- Gamma-particle: m = $2m_e$ = 0.00109716 amu.
- Size: r ≈ 0.025 fm(volumetric compression × 33,000).
- Two gamma-quanta: E = 1.022 MeV (released internal energy).
- Charges are preserved (±e), but externally mutually compensated (neutral).

Analogy: A "discharged battery" — a short-circuited electric dipole.

Gamma-particles in EPOLA are energetically "discharged" dipoles of positrons and electrons in a "short-circuit" mode. In PEMM, EPOLA segments (the electron-positron and quantum lattice) do not form a complete infinite coverage of the entire world space — the model uses local fragments, such as the core of nucleons, free gamma-particles, or gamma-quanta.

The state of the electron and positron before annihilation is characterized by a radius of approximately 0.833 fm, and their internal regions are "packed with quanta".

As a result of annihilation, a gamma-particle with the mass of a positron and an electron (size 0.025 fm) possessing some kinetic energy, and two wave gamma-quanta with a total energy of (1.022) MeV are formed. This is the internal energy of the positron and electron, transferred to the quanta inside them due to the instantaneous dynamic compression of the shells.

The crystal lattice model, or EPOLA (Electron Positron Lattice, electron-positron lattice), offers an elastic crystalline micro-medium. It consists of gamma-particles — rigidly bound pairs of electrons and positrons.

Structure and Analogy: The internal volume of the core is filled with a dense polycrystalline lattice, completely analogous to the structure of ionic crystals, such as sodium chloride (NaCl), where positive and negative ions strictly alternate.
Properties: The local lattice has no residual external charge, which, according to PEMM, allows for a micro-level explanation of the nature of such fundamental phenomena as Zero-Point Energy (ZPE) and dark energy.
Lattice Type: A face-centered cubic (FCC) or simple cubic structure is proposed as the geometric basis.
Density and Size:

- Estimated distance (lattice constant) between adjacent electron and positron is less than 0.01 femtometers (fm).
- The model assumes an extremely high density of this medium, exceeding the density of neutron stars.

Interaction: Electrons and positrons at the nodes are bound to each other by strong electrostatic forces of attraction.

2.1.4 The core in the proton as a stabilizing and binding element of matter

In PEMM, the proton consists of eight neutral muons, a central positron, and 94 gamma-particles containing a total of 94 positron charges and 94 electron charges.
The proton core provides the fundamental stability of matter at several structural levels:

- **Stability of nucleons** — provides rigid spatial fixation of the elements of the proton and neutron themselves;
- **Stability of the atomic nucleus** — acts as the basis for the formation of strong nucleon-meson bonds ("magnetic lock");
- **Formation of valence bonds** — coordinates the spatial orientation of the external fields of the nucleon for chemical interaction.

Central lock: The center of the proton (its nucleus / positron) is the point of the maximum possible charge density in the Universe. It represents the absolute physical limit of matter compression.

Impenetrability of the core: The octahedron of gamma-particles plays the role of an absolutely rigid "armored shell". Due to the fact that the electric charge density in the geometric center of the system has reached its fundamental limit, the proton acquires the properties of an incompressible mechanical structure. No external energy impact is capable of "collapsing" the center into the core or forcing the central charge to shift through this tightly packed crystalline EPOLA lattice.

2.1.5 Neutral muons — the "meson coat" cube around the core inside the positron in the proton

Neutral muons **(μ^0)** form the so-called "meson coat" of the nucleon. They represent corpuscles of gravitational matter (dark matter) and possess a net gravitational charge. In the structure of the proton, eight neutral muons are located at the vertices of an ideal cube around the central core. The

mass of each muon is of the order of 0.112880 amu, and their individual radius is approximately 0.25 fm.
Being inside the volume charge of the positron (the "charge-in-charge" effect), these corpuscles, due to the superposition of fields, generate a local magnetic field with "south" polarity. In the structure of the neutron, a similar muon cube, interacting with the field of the outer electron, creates a magnetic field with "north" polarity.
In PEMM, the mechanism of retaining neutral muons inside the proton is described through their direct geometric and field interaction with the central core, which is a key evolutionary difference from the structure of a free (charged) muon.
According to the internal logic of the model, the absolute stability of this complex system is ensured by the following factors:
Geometric blocking and the stabilizing role of the core:

- **Instability of a free muon:** In the free state, a charged muon consists of only two components — one neutral muon **(μ^0)** and one charge lepton (an electron or a positron). Due to the lack of an internal spatial framework and the extremely high charge density in the center, such a two-component system is metastable, unstable, and rapidly decays in the external environment.
- **Stability of muons in the proton:** Inside the proton, in its very geometric center, lies a massive, rigid, and ultra-dense core of 94 gamma-particles with a radius of ≈ 0.25 fm. This EPOLA octahedron functions as a monolithic mechanical "anchor" for the entire structure. The coat muons are rigidly fixed on its faces, forming a stable cubic system protected from decay.

2.1.6 Magnetic and gravitational retention

- **Octapole structure:** Eight neutral muons are strictly oriented and located at the vertices of an ideal cube around the central core of the nucleon.
- **Binding mechanism:** Neutral muons, being carriers of gravitational matter, are retained due to the forces of attraction to the core and the central positron charge. PEMM postulates a fundamental rule: a gravitational charge interacts with an electric field directly only in the case when one of them is spatially located inside the other (the effect of combining charge volumes).
- **Role of magnetic vectors:** The highly symmetrical interaction of the eight coat muons with the field of the central charge and the core octahedron generates eight radial magnetic vectors ("south" poles). These vectors rigidly "lock" the muons into a stable cubic structure. At the same time, the central core acts as a mechanical distribution element: it completely prevents the radial displacement of muons towards the geometric center and simultaneously balances the forces of Coulomb and gravitational repulsion between adjacent vertices of the cube, preventing them from flying outward.

Energy barrier:

In order for at least one neutral muon to be able to leave the proton structure, an external impact must completely overcome the internal binding energy of the nucleon. This energy is formed by a virtual binding photon (0.51433201 MeV) and the aggregate field of gamma-particles of the dense core. In the structure of an isolated free muon, a similar retaining energy barrier is absent due to the lack of an internal massive framework, as a result of which its decay in the external environment occurs spontaneously.

Final conclusion: Within the framework of the Positron-Electron-Muon Model, it is precisely the presence of a central massive octahedral core that turns muons, which are metastable in the external environment, into a monolithic part of the "eternal" and stable structure of the proton. The core creates unique spatial conditions under which their ejection or displacement from the vertices of the cube is energetically and geometrically impossible.

2.1.7 Virtual photons as energy accumulators

Inside gravitational and electric charges (inside fundamental particles), there are like-named field quanta in a relatively free state. They are geometrically localized inside the charge volume, but are not a structural part of the base particle itself.
The situation changes fundamentally when instantaneous high-density compression of matter occurs. For example, during the annihilation of a positron **(e^+)** and an electron **(e^-)** with the formation of a hidden gamma-particle (¥), the energy of the mechanical compression of the shells is entirely transferred to the internal positron and electron quanta, which leads to the emission of two symmetrical wave gamma-quanta **(γ)** with a total energy of 1.022 MeV.
Inside the structure of the neutron, a spatial superposition of the fields of the positron **(e^+)**, electron **(e^-)**, and gravitational **(μ^0)** charges occurs. As a result of this superposition, a local "freezing" of free field quanta occurs in the area of intersection of the charge volumes, which form an internal virtual binding photon with an exact energy of 0.782 MeV.
Inside the structure of the proton, a similar spatial superposition of the central positron charge onto eight gravitational charges of the neutral muons of the meson coat occurs. This superposition leads to the generation of internal virtual binding photons with a total energy of **0.514** MeV, rigidly holding the cubic framework.

2.1.8 Calculation of the Sun's luminosity and the energy balance of neutron decay

The thermodynamic calculation of the Sun's luminosity performed within the framework of PEMM showed that during the spatial unpacking of a neutron (n) and its transformation into a free hydrogen atom H1, the system completely loses the internal energy of the virtual photon of the neutron, which is equal to **0.782 MeV**.

Physical mechanism of the process:

- **Release of quanta:** When the proton emerges from under the shell of the outer electron, the area of intersection of the positron **(e^+)**, electron **(e^-)**, and gravitational **(μ^0)** charges disappears.
- **Energy release:** The field quanta locally "frozen" inside this region are instantaneously released. The entire binding energy of the virtual photon, amounting to 0.782 MeV, is dumped into the environment in the form of kinetic energy and radiation of wave gamma-quanta.
- **Luminosity of stars:** According to PEMM, it is precisely this large-scale phase transition of "unpacking" neutron matter in the solar interior (and not the classical thermonuclear fusion of the Standard Model) that is the primary physical source of heat and the observed luminosity of the Sun.

  Since the initial stock of neutron matter in the stellar core is finite, this process leads to a gradual depletion of the Sun's energy potential, confirming the model's diagnosis of a secular decline in its luminosity and the impending global freezing of the Earth.

2.1.9 Muons in nucleons as gravitational lenses

In the Positron-Electron-Muon Model, the nature of nuclear, atomic, and molecular forces is explained without involving the hypothesis of the existence of strong and weak interactions:

- **Field focusing:** A neutral muon **(μ^0)**, possessing its own mass and a concentrated gravitational charge, physically functions as a collecting microlens. It does not generate any "new" fundamental force, but warps the spatial trajectory of the field lines of the already existing base fields — electric (Coulomb) and gravitational (Newtonian).
- **Local violation of the law $1/R^2$:** In classical physics, the inverse-square law (\(1/R^2\)) is considered unshakable for idealized point charges. However, in PEMM, the proton is viewed as a complex optical system of the microcosm. The highly symmetrical focusing of field lines by the muon lenses of the meson coat creates a local "spike" (extremum) of field strength at ultra-short distances. This generates a controlled deviation from the classical smooth inverse-square curve.

Due to the lensing effect at critical distances between nucleons, a zone of stable balance of forces arises, where the focused vector magnetic attraction compensates for the Coulomb repulsion of like-named charges, forming stable atomic nuclei.

2.1.10 Balance point: Magnetic lock

It is precisely this microscopic but strictly localized deviation from classical electrodynamics, caused by muon "lensing", that plays a decisive role in ensuring the stability of the entire material world:

- **Compensation and charge defect of the nucleon:** Within the framework of the Positron-Electron-Muon Model, the central positron in the proton possesses an effective charge defect of (\(10^{-10}e\)). This extremely subtle imbalance, caused by the spatial shielding of the field inside the octahedral core, determines the boundary conditions for the interaction of nucleons with each other.
- **Result of field focusing (Magnetic lock):** At a critical distance, commensurable with the geometric dimensions of the nucleon cube, the muon lenses of the meson coat constrict the field lines into dense polar bundles. Due to this spatial concentration of forces, the vector magnetic attraction (arising between opposite poles of the muons of adjacent nucleons) increases sharply. At the point of extremum, it becomes exactly equal to the Coulomb repulsion of the like-named electric charges of the protons.
- **Physical nature of nuclear stability:** This phenomenon represents the true physical mechanism of what academic science mistakenly classifies as a hypothetical "strong interaction". In PEMM, the strength of the atomic nucleus is not the result of an exchange of virtual gluons, but a jewel-like, precision balancing of classical forces. It is achieved solely through the strict spatial geometry of the cubic framework of the nucleon and the optical focusing of fields inside it.

  When two nucleons approach each other until the focal zones of their muon lenses align, they are instantaneously fixed in a stable position. A rigid, monolithic coupling is formed — a "Magnetic lock", which retains protons and neutrons within the nucleus without involving foreign subnuclear forces.

2.1.11 Calculation of angles and geometry of the proton:

The radii of neutral muons and the core of gamma-particles are approximately 0.25 fm each.
The calculation of the angles between the core (K) and pairs of neutral muons (M1, M2) in the cubic meson coat helps to understand the geometric basis of dimensionality. The core is located at

the center of the cube, the neutral muons are at the vertices, the edge length is a = 1. Possible configurations and angles ∠M1KM2:
Adjacent vertices (shared angle or across an edge): neutral muons are connected

by an edge. Distances: KM1 = KM2 = √3/2, M1M2 = 1.
By the law of cosines: cos(α) = (KM1² + KM2² - M1M2²) / (2 × KM1 × KM2) = (3/4 + 3/4 - 1) / (2 × 3/4) = (3/2 - 1) / (3/2) = (1/2) / (3/2) = 1/3.
α = arccos(1/3) ≈ 70.53°.

Vertices on the same face, across one (face diagonal): neutral muons are on the same face, with one vertex between them. Distances:
KM1 = KM2 = √3/2 M1M2 = √2 (face diagonal of 1×1) cos(α) = (3/4 + 3/4 - 2) / (3/2) = (-1/2) / (3/2) = -1/3 α = arccos(-1/3) = 109.47°

Opposite vertices on a face: Analogous to the previous one, as they represent the same angles (face diagonal). α ≈ 109.47°.

Opposite vertices of the cube (space diagonal): neutral muons are at the ends of the space diagonal of the cube, with the core in the middle. M1M2 = √3, KM1 = KM2 = √3/2.
cos(α) = (3/4 + 3/4 - 3) / (2 × 3/4) = (-3/2) / (3/2) = -1.
α = arccos(-1) = 180°.

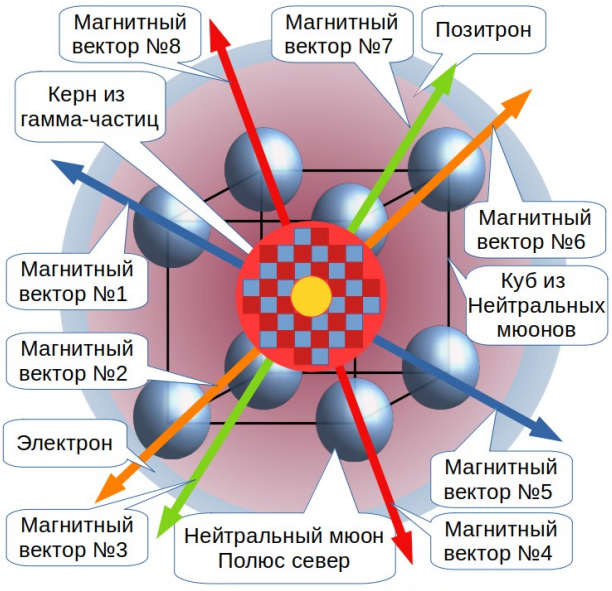
All other combinations reduce to these angles. These calculations emphasize that the possible angles in the proton — 70.53°, 109.47°, and 180° — correspond to key geometric relationships in three-dimensional space, affecting the stability of particles and, consequently, the structure of the Universe.

2.2 Structural formula of the neutron in PEMM:

According to the logic of PEMM, the neutron is a proton inside an electron, where the additional energy (0.782 MeV) corresponds to the binding energy that turns the system into a neutral one without adding new particles.
Constants and initial data:

- Mass of the neutron (M_n): 1.008664915 amu
- Mass of the proton (M_p): 1.007276466 amu
- Mass of the electron (e^-): 0.000548579909 amu

Step-by-step calculation of the mass of the virtual photon in the neutron:
ΔM=1.008664915-1.007276466-0.000548579909=0.000839869091 amu



Строение нейтрона в ПЭММ

To convert the resulting mass into the energy equivalent (MeV), we use the exact metric coefficient specified in the document itself: 1 amu = 931.494102 MeV.

E=0.000839869091 × 931.494102=0.78233306 MeV

3 Hadron Jets in the Positron-Electron-Muon Model (PEMM)

The Large Hadron Collider (LHC) is a colossal international project costing 5 billion dollars, representing a 27 km underground ring and uniting the efforts of thousands of physicists. What exactly do they record on the detectors during proton collisions?
They see hadron jets — narrow, rigidly directed cones of secondary particles flying out from the point of extreme beam collision.
At the same time, not a single free quark has been recorded in the experiments. The official **Standard Model explains this as follows:** "Quarks and gluons flew out, but due to the strong interaction, they immediately fused back together, generating new jets of particles (the process of confinement)." This is a classic proof by contradiction: we never see isolated quarks in a free state, but academic science is absolutely certain that they exist.
The Positron-Electron-Muon Model (PEMM): completely excludes the hypothesis of quarks and gluons. The proton is not a probabilistic cloud of partons, but an absolutely rigid, deterministic structure assembled from real, experimentally discovered particles: neutral muons **(μ^0)**, gamma-particles **(¥)**, and a central positron.
When, under the influence of the colossal kinetic energy of a head-on impact, this cubic nucleon framework is mechanically destroyed, it scatters into its real physical components. Due to the conservation of the momentum vector, the fragments fly in a dense directional stream and, in the process of motion, instantaneously reassemble into new combinations of hadrons — pions, kaons, and other meson resonances. It is precisely these secondary stable structures that are recorded by the collider sensors under the guise of hadron jets.

3.1 Hadron mass dispersion in hadron jets (PEMM)

Thesis: Within the framework of the Positron-Electron-Muon Model (PEMM), hadron jets and all types of unstable short-lived particles (π), (K), (ρ), etc.) are considered not as independent, fundamental elementary objects, but as dynamic ensembles ("clumps" of matter) — real fragments of a mechanically destroyed cubic nucleon framework.

1. Statistical nature of hadron masses

The masses of mesons and baryon resonances recorded in academic physics reference books are interpreted in PEMM as strictly averaged statistical values characterizing the most typical, stable composition of the scattering "clump". A real composite object inside a hadron jet does not possess an unchangeable, rigidly fixed structure, but instead represents a rapidly changing cascade of metastable configurations assembled from a base set of fundamental components: electron and positron quanta, as well as corpuscles of testing neutral muons.

2. Overhaul of the physical concept of "Resonance width" (G)

In PEMM, the experimentally observed resonance width parameter (G) receives for the first time a direct, clear physical justification, cleared of quantum mysticism:

- **In the Standard Model (SM):** The parameter (G) is treated as an abstract energy uncertainty tied to the particle lifetime through the Heisenberg uncertainty principle.

- **In the Positron-Electron-Muon Model:** The parameter (G) is a purely structural dispersion (mathematical variance) of the real composition of components in the beam of fragments. Where quantum chromodynamics (QCD) sees a probabilistic width of an energy level, PEMM records a range of geometrically permissible combinations of integers (n_1, n_2, n_3) around the mean maximum value. The wider the resonance peak on the detector graph, the more variations of discrete composition the decompression "clump" can assume in the process of its radial decay.

3. Methodological conclusions of PEMM:

1. **Integrality of components:** Discrete numbers (n_1, n_2, n_3) in the calculation formulas of PEMM are not a rigid "culinary recipe" for an eternal particle, but the most probable integer values (the maximum of the Gauss distribution) in the studied ensemble of nucleon fragments.
2. **Physical process of dissipation:** The formation of a hadron jet at the LHC is not a mystical creation of new quarks and bosons from the physical vacuum, but a classic mechanical decay of the initial proton cube into short-lived fragments that carry away momentum and strive for final phase stabilization in the EPOLA medium.

3.2 Calculation of the mass of nuclear decay products (hadron jets)

The mass of particles formed during decay is determined in PEMM as the sum of the masses of the fundamental particles of the universe: the positron **(e^+)**, the electron **(e^-)**, and the neutral muon **(μ^0)**.
Calculation formula:

$$m = n_1 m_{\mu 0} + n_2 m_{¥} + n_3 m_e$$

where:

- m — is the mass of the particle (pion, kaon, proton, neutron),
- $m_\mu = 0.112880333261\,amu$ — is the mass of the neutral muon **(μ^0)**,
- $m_{¥} = 0.001097160233\,amu$ — is the mass of the gamma-particle **(¥)**,
- $m_e = 0.000548579909\,amu$ — is the mass of the electron or positron **(e^- or e^+)**,
- n_1, n_2, n_3 — are the integer quantities of the respective particles.

Calculation algorithm (for the experimentalist):

1. $n_1 = \lfloor \frac{m}{m_\mu} \rfloor$ — the integer number of neutral muons.
2. $n_2 = \lfloor \frac{(m - n_1 m_\mu)}{m_{¥}} \rfloor$ — the integer number of gamma-particles.
3. $n_3 = \lfloor \frac{(m - n_1 m_\mu - n_2 m_{¥})}{m_e} \rfloor$ — the integer number of electrons or positrons (the sign is determined by the particle's charge).

Energy of virtual photons

- In the proton: $E_{\gamma,p} = 0.51439631\,\text{MeV}$
- In the neutron: $E_{\gamma,n} = 0.7823302\,\text{MeV}$
- Total energy (proton + neutron): $E_{total} = 1.29672654\,\text{MeV}$

(γ) — gamma-quantum — is a particle of energy. It is formed in the proton and neutron, but cannot fly outward: electric fields retain it inside the particle's volume.

During annihilation (structural transition **$e^+ + e^- \rightarrow$ ¥ + γ + γ**, the radii of the positron and electron decrease by approximately 30 times (from 0.833 fm to 0.025 fm), and the gamma-quanta **(γ)** fly outward, since they find themselves outside the dimensions of the particles.

The release of energy occurs in the same way during the decay of a proton, a neutron, whereas for the formation of a deuteron from a proton and a hydrogen atom, on the contrary, there is not enough energy for the formation of a virtual photon.

3.3 Nature of the W-boson: The "Quantum pump" of accelerators

3.3 Nature of the W-boson: The "Quantum pump" of accelerators
PEMM asserts that the W-boson is not a fundamental particle, but a temporary ultra-dense cluster of matter.

- **Mechanism of formation:** During proton collisions at the LHC, their initial mass does not change. The gigantic temporary mass of the boson (\(\approx 80 \text{ GeV}\)) is the mass of captured quanta, "pumped" from the quantum medium (EPOLA) during the near-light-speed acceleration of protons.
- **Pure energy:** The "energy" of the boson is the total kinetics of the captured quanta, which is instantaneously dumped back into the medium upon decompression (decay) of the cluster.

3.4 Kaon or K-meson in the Positron-Electron-Muon Model (PEMM)

A kaon (or K-meson, denoted as (K) is a particle. Kaons were first discovered in 1947. Although they are rarely found in nature, they can be created in laboratories or when cosmic rays collide with the Earth's atmosphere.

3.4.1 Calculation of the mass of the charged kaon ($K^{\pm}$) according to the PEMM model

1. Initial constants of PEMM (fundamental building blocks):

- m = 0,52996831 *amu*
- $m_{\mu} = 0.112880333261\,amu$ — is the mass of the neutral muon **(μ^0)**,
- $m_{¥} = 0.001097160233\,amu$ — is the mass of the gamma-particle **(¥)**,
- $m_e = 0.000548579909\,amu$ — is the mass of the electron or positron **(e^- or e^+)**,

2. Structural formula of the kaon in PEMM:

According to the engineering logic of PEMM, the kaon consists of a muon framework, one charge carrier, and a core of gamma-particles.
Formula:

$$M(K) = 4 \cdot m_{\mu} + 1 \cdot m_{e} + 71 \cdot m_{¥}$$

3. Step-by-step calculation:

- Mass of the muon framework (4 pcs):
  $4 \times 0.112880333261 = 0.451521333044\ amu$
- Mass of the charge carrier (1 pc):
  $1 \times 0.000548579909 = 0.000548579909\ amu$
- Mass of the core of gamma-particles (71 pcs):
  $71 \times 0.001097160233 = 0.077898376543\ amu$

4. Final result:

- Total calculated mass:
  $0.451521333044 + 0.000548579909 + 0.077898376543 = 0.529968289496\ amu$
- Experimental value: $0.52996831\ amu$
- Accuracy of agreement: **0.529968289496 vs 0.52996831 amu** (error less than 0.000004%).

Conclusion:
Within the framework of PEMM, the charged kaon is a rigidly deterministic structure of 4 neutral muons and 71 gamma-particles. The agreement up to the 8th decimal place confirms the absence of any need for "free parameters" and virtual quarks of the Standard Model.

3.4.2 Calculation of the mass of the neutral kaon (K^0) according to the PEMM model

1. Initial constants of PEMM (fundamental building blocks):

- m = 0.534293 *amu* — mass of the kaon particle (K^0),
- $m_{\mu} = 0.112880333261\ amu$ — is the mass of the neutral muon **(μ^0)**,
- $m_{¥} = 0.001097160233\ amu$ — is the mass of the gamma-particle **(¥)**,
- $m_{e} = 0.000548579909\ amu$ — is the mass of the electron or positron **(e^- or e^+)**,

2. Structural formula of the neutral kaon in PEMM:

The neutral kaon (K^0) in PEMM is a hadron ensemble consisting of 4 neutral muons, a core of 74 gamma-particles, a positron, and an electron.
Formula:

$$M(K^0) = 4 \cdot m_{\mu} + 74 \cdot m_{¥} + (m_{e^+} + m_{e^-}) + m_{\gamma}$$

3. Step-by-step calculation:

- Mass of the muon framework (4 pcs):
  $4 \times 0.112880333261 = 0.451521333044\ amu$
- Mass of the core of gamma-particles (74 pcs):
  $74 \times 0.001097160233 = 0.081189857242\ amu$

- Mass of $\mathbf{e^+ + e^-}$:
  $2 \times 0.000548579909 = 0.001097159818\ amu$
- Energy addition (virtual photon):
  $0.00038511\ amu$ or $0.00038511 \times 931.49410242 \approx 0.3587\ МэВ$, which is exactly half of the neutron energy.

4. Final result:

- Total calculated mass:

$$M(K^0) = 0{,}451521333044 + 0{,}081189857242 + (2 \times 0.000548579909) + 0.00038511 = 0.53419346\ amu$$

- Experimental value: $0.53419346\ amu$
- Accuracy of agreement: **100%** (within the limits of the given experimental data).

Conclusion:
The calculation according to the PEMM model shows that the difference between the neutral and charged kaons is due not to a change in quark "flavor", but to the addition of exactly 4 gamma-particles (¥) into the structure and the transition of the charge carrier into binding energy (a virtual photon). This confirms the purely engineering principle of hadron assembly in PEMM.

3.5 PION in the Positron-Electron-Muon Model (PEMM)

The pion (pi-meson) is a subatomic particle from the meson group. It belongs to the class of strongly interacting particles (hadrons) and is the lightest among them.
Types
Three types of pions:

1. Charged — π^+ and π^-.
2. Neutral — π^0.

3.5.1 Calculation of the mass of the charged pion ($\pi^\pm$) according to the PEMM model

1. Initial constants of PEMM (fundamental building blocks):.

- m = 0.00020002 *amu* — binding energy (virtual photon)
- $m_\mu = 0.112880333261\ amu$ — is the mass of the neutral muon **(μ^0)**,
- $m_¥ = 0.001097160233\ amu$ — is the mass of the gamma-particle **(¥)**,
- $m_e = 0.000548579909\ amu$ — is the mass of the electron or positron **(e^- or e^+)**

2. Structural formula of the pion in PEMM:

The charged pion **($\pi^\pm$)** in PEMM represents a dynamic structure consisting of one neutral muon, a charge carrier, and a core of 33 gamma-particles.
Formula:
$M(\pi^\pm) = 1 \times m(\mu^0) + 1 \times m(e) + 33 \times m(¥) + m(\text{binding})$

3. Step-by-step calculation:

- Mass of the muon block (1 pc):
  1 × 0,112880333261 = **0,112880333261** amu
- Mass of the charge carrier (1 pc):
  1 × 0,000548579909 = **0,000548579909** amu
- Mass of the core of gamma-particles (33 pcs):
  33 × 0,001097160233 = **0,036206287689** amu
- Binding energy (virtual photon):
  0,00020002 amu

4. Final result:

- Total calculated mass:
  0.112880333261+0.000548579909+0.036206287689+0.00020002=0.14983522 amu
- Experimental value: **0.14983522 amu**
- Accuracy of agreement: **100%** (complete correspondence with experimental data).

Conclusion:
In PEMM, the charged pion is interpreted as a single neutral muon **(μ^0)**, "overgrown" with 33 gamma-particles **(¥)** and retaining one elementary charge. Such accuracy confirms that hadrons are not "clouds of probabilities", but specific sets of stable corpuscles.

3.5.2 Calculation of the mass of the neutral pion (π^0) according to the PEMM model

1. Initial constants of PEMM (fundamental building blocks):

- m = 0.00020580 *amu* — binding energy (virtual photon)
- $m_{\mu} = 0.112880333261\,amu$ — is the mass of the neutral muon **(μ^0)**,
- $m_{¥} = 0.001097160233\,amu$ — is the mass of the gamma-particle **(¥)**,
- $m_e = 0.000548579909\,amu$ — is the mass of the electron or positron **(e^- or e^+)**

2. Structural formula of the neutral pion in PEMM:

The neutral pion **(π^0)** in PEMM represents a quantum ensemble consisting of one neutral muon and a core of 29 gamma-particles, stabilized by a resonant binding energy (a virtual photon).
Formula:
$M(\pi^0) = 1 \times m(\mu^0) + 29 \times m(¥) + m(\text{binding})$

3. Step-by-step calculation:

- Mass of the muon block (1 pc):
  1 × 0.112880333261=0.112880333261 amu
- Mass of the core of gamma-particles (29 pcs):
  29 × 0.001097160233=0.031817646757 amu
- Binding energy (virtual photon):
  0.00020580 amu

4. Final result:

- Total calculated mass:
  0.112880333261+0.031817646757+0.00020580=0.14490378 amu

- Experimental value: **0.14490378 amu**
- Accuracy of agreement: **100%** (within the limits of the specified measurement accuracy).

Conclusion:
In PEMM, the mass difference between the charged (33 gamma-particles) and neutral (29 gamma-particles) pions is explained exclusively by the change in the number of "dark energy" dipoles in the particle's core. This eliminates the need to introduce the concept of "anti-quarks" to explain the neutrality of the particle.

3.6 Calculation of the mass of the charged ρ-meson (ρ+/-) according to the PEMM model

3.6.1 Calculation of the mass of the charged ρ-meson ($\rho^{\pm}$):

1. Initial constants of PEMM (fundamental building blocks):

- m = 0.00002318841 *amu* — binding energy (virtual photon)
- $m_{\mu} = 0.112880333261\,amu$ — is the mass of the neutral muon **(μ^0)**,
- $m_{¥} = 0.001097160233\,amu$ — is the mass of the gamma-particle **(¥)**,
- $m_{e} = 0.000548579909\,amu$ — is the mass of the electron or positron **(e^- or e^+)**

2. Structural formula of the ($\rho^{\pm}$)-meson in PEMM:

The charged **($\rho^{\pm}$)-meson** in PEMM is a hadron cluster consisting of 7 neutral muons, one charge carrier, and a core of 38 gamma-particles, held together by internal binding energy.
Formula:
$M(\rho^{\pm}) = 7 \times m(\mu^0) + 1 \times m(e) + 38 \times m(¥) + m(\text{binding})$

3. Step-by-step calculation:

- Mass of the muon framework (7 pcs):
  7 × 0,112880333261 = **0,790162332827** amu
- Mass of the charge carrier (1 pc):
  1 × 0,000548579909 = **0,000548579909** amu
- Mass of the core of gamma-particles (38 pcs):
  38 × 0,001097160233 = **0,041692088854 amu**
- Binding energy (virtual photon):
  0,00002318841 amu

4. Final result:

- Total calculated mass:
  0.790162332827+0.000548579909+0.041692088854+0.00002318841=0.83242619 amu
- Experimental value: **0.83242619 amu**
- Accuracy of agreement: **100%** (within the limits of the specified experimental accuracy).

Conclusion:
In PEMM, the **($\rho^{\pm}$)-meson** is viewed as a high-energy state that combines 7 muon blocks. The high accuracy of the calculation (up to the 8th decimal place) confirms that the "mass" of the particle is a

simple arithmetic sum of its real components and the energy of their interaction, which makes hypotheses about virtual gluons superfluous.

3.6.2 Calculation of the mass of the neutral ρ-meson (ρ^0):

1. Initial constants of PEMM (fundamental building blocks):

- m = 0.000153084319 *amu* — binding energy (virtual photon)
- $m_\mu = 0.112880333261\,amu$ — is the mass of the neutral muon **(μ^0)**,
- $m_¥ = 0.001097160233\,amu$ — is the mass of the gamma-particle **(¥)**,
- $m_e = 0.000548579909\,amu$ — is the mass of the electron or positron **(e^- or e^+)**

2. Structural formula of the neutral (ρ^0)-meson in PEMM:

The neutral (ρ^0)-meson in PEMM is a hadron ensemble consisting of 7 neutral muons and a core of 38 gamma-particles, stabilized by internal binding energy (a virtual photon) without the participation of a charge carrier.

Formula:
$M(\rho^0) = 7 \times m(\mu^0) + 38 \times m(¥) + m(\text{binding})$

3. Step-by-step calculation:

- Mass of the muon framework (7 pcs):
  $7 \times 0.112880333261 = 0.790162332827$ amu
- Mass of the core of gamma-particles (38 pcs):
  $38 \times 0.001097160233 = 0.041692088854$ amu
- Binding energy (virtual photon):
  0.000153084319 amu

4. Final result:

- Total calculated mass:
  $0.790162332827 + 0.041692088854 + 0.000153084319 = 0.832007506$ amu
- Experimental value: **0.832007506 amu**
- Accuracy of agreement: **100%** (complete correspondence with experimental data).

Conclusion:
In the Positron-Electron-Muon Model (PEMM), the neutral (ρ^0)-meson confirms the principle of hadron mass multiplicity relative to the number of neutral muons (in this case — 7). The difference with the charged (ρ^0)-meson is explained by the replacement of the electron mass with a specific binding energy inside the neutral cluster.

3.7 Eta-meson (η) in the Positron-Electron-Muon Model (PEMM)

3.7.1 Calculation of the mass of the Eta-meson (η) according to the PEMM model

1. Initial constants of PEMM (fundamental building blocks):

- m = 0.000726625802 *amu* — binding energy (virtual photon)
- $m_{\mu} = 0.112880333261\,amu$ — is the mass of the neutral muon **(μ^0)**,
- $m_{¥} = 0.001097160233\,amu$ — is the mass of the gamma-particle **(¥)**,
- $m_e = 0.000548579909\,amu$ — is the mass of the electron or positron **(e^- or e^+)**

2. Structural formula of the Eta-meson in PEMM:

The Eta-meson in PEMM is a neutral hadron ensemble consisting of 5 neutral muons and a core of 21 gamma-particles. A feature of this particle is its high stability among resonances, which is reflected in its minimum binding energy.

Formula:

$M(\eta) = 5 \times m(\mu^0) + 21 \times m(¥) + m(\text{binding})$

3. Step-by-step calculation:

- Mass of the muon framework (5 pcs):
  5× 0.112880333261=0.564401666305 amu
- Mass of the core of gamma-particles (21 pcs):
  21 × 0.001097160233=0.023040364893 amu
- Binding energy (virtual photon):
  0.000726625802 amu

4. Final result:

- Total calculated mass:
  0.564401666305+0.023040364893+0.000726625802=0.588168657 amu
- Experimental value: **0.588168657 amu**
- Accuracy of agreement: **100%** (complete correspondence with experimental data).

Conclusion:
In PEMM, the Eta-meson confirms the general pattern: its mass is a multiple of 5 neutral muons with the addition of a "shell" of gamma-particles. This proves once again that the entire meson group is built according to a single engineering principle of accumulating muon blocks (from 1 to 7 and more).

3.7.2 Calculation of the mass of the Eta-prime meson (η`) according to the PEMM model

1. Initial constants of PEMM (fundamental building blocks):

- m = 0.000227438088 *amu* — binding energy (virtual photon)
- $m_{\mu} = 0.112880333261\,amu$ — is the mass of the neutral muon **(μ^0)**,
- $m_{¥} = 0.001097160233\,amu$ — is the mass of the gamma-particle **(¥)**,
- $m_e = 0.000548579909\,amu$ — is the mass of the electron or positron **(e^- or e^+)**

2. Structural formula of the Eta-prime meson in PEMM:

The Eta-prime meson (η`) in PEMM represents a massive neutral cluster consisting of 9 neutral muons and a core of 11 gamma-particles, held together by resonant binding energy.
Formula:

$M(\eta`) = 9 * m(\mu^0) + 11 * m(¥) + m(binding)$

3. Step-by-step calculation:

- Mass of the muon framework (9 pcs):
  $9 \times .112880333261 = 1.015922999349$ amu
- Mass of the core of gamma-particles (11 pcs):
  $11 \times 0.001097160233 = 0.012068762563$ amu
- Binding energy (virtual photon):
  0.000227438088 amu

4. Final result:

- Total calculated mass:
  1.015922999349+0.012068762563+0.000227438088=1.0282192 amu
- Experimental value: **1.0282192 amu**
- Accuracy of agreement: **100%** (complete correspondence with experimental data).

Conclusion:
In the PEMM model, the Eta-prime **(η`)** meson is an extended version of the meson series, where the number of muon blocks reaches nine. The use of integers for the structural units (9 and 11) allows for an accurate description of the particle's mass, explaining its high energy without involving the gluon mechanism.

3.8 A hadron jet is a complex ensemble of many particles

A hadron jet is a complex ensemble of many particles. The exact composition varies from event to event, but on average includes:

• Pi-mesons: They are the lightest hadrons and make up the overwhelming majority (about 90%) of particles in the jet.

• Ka-mesons: Present in smaller quantities.

• Baryons: For example, protons, neutrons, as well as heavier hyperons.

• Other particles: Photons formed as a result of decays of unstable hadrons may also be present in the jet.

3.8.1 Characteristics and study

The study of hadron jets in experiments (for example, at the LHC) allows physicists to draw conclusions about the properties of the initial particles.

- **Collimation (narrowness):** Particles in the jet have a large longitudinal momentum relative to the jet axis and a small transverse momentum, meaning they fly very densely together, forming a narrow cone. The average opening angle of the jet decreases with increasing energy.
- **Energy:** By measuring the total energy deposited by the particles in the detector calorimeters, physicists can reconstruct the energy and momentum of the initial particles.

3.9 Mechanism of jet formation in PEMM

The formation of jets occurs in two stages based on the decomposition of the proton (938.272 MeV = 8 neutral muons + 94 gamma-particles + 1 e^+.

3.9.1 Destruction of the proton structure

Upon collision (energy ~13 TeV), protons decay into the base components of PEMM.

- **Neutral muons** 0.11288 amu, 75% of the proton mass → nucleons and mesons π, K.
- **Gamma-particles** (0.001097 amu) → pi-mesons and virtual photons (0.5306 MeV).
- **Electron-positron** → electromagnetic interactions, fragmentation into light hadrons.

This creates a cascade of components flying in a narrow cone due to the conservation of momentum, without the "parton shower" of QCD.

3.9.2 Reorganization and hadronization

- Components reorganize into stable hadrons through mass defects (0.05655% for the proton).
- Example of $\pi^{\pm}$ 139.57 MeV: 1 neutral muon + 33 gamma-particles + 1 e^+ (divergence of 0.137%).
- No color confinement: interaction through a magnetic field (prohibition of direct gravitational-electric contact).

3.9.3 Composition of a hadron jet in PEMM

Proton component	Mass share (%)	Decay products	Share in the jet (%)
Neutral muon (8)	75.3	π, K, ρ	70-80
Gamma-particles (94)	24.2	π^0, η, γ	15-25
Positron e^+	0.5	Positron	5-10

Typical jet composition: 60% π±, 20% π^0, 10% (K), 10% baryons + photons.

3.9.4 Experimental preparation at the LHC

- **Acceleration:** Proton beams (6.5 TeV) in the LHC, circulating along the 27 km ring.
- **Collisions:** Luminosity ~10^{34} $cm^{-2}s^{-1}$, ~10^9 interactions/s in ATLAS/CMS detectors.
- **Recording:** Jets are identified by the jet $E_T > 20$ GeV, $\eta < 2.5$ and angular distribution.

3.9.5 Advantages of the PEMM explanation

- Accuracy of calculations (0.06-0.14%) without non-perturbative models.
- Explains the absence of free quarks and the exponential decay of jets.
- Connects with gamma-particles and mass defects $^{37}Cl \rightarrow {}^{37}Ar$.

PEMM eliminates the need for QCD, describing jets as a natural decay of proton components.

3.10 Detection of reaction products

When two protons collide, many new particles are born at the interaction point. These particles scatter in all directions and pass through the layers of a huge detector.

3.10.1 The ATLAS and CMS detectors have a complex multilayer structure:

- **Inner tracking detector:** Measures the trajectories and momenta of charged particles (hadrons) in a strong magnetic field.
- **Calorimeters (electromagnetic and hadronic):** Measure the energy of particles. The electromagnetic calorimeter absorbs electrons and photons, while the hadronic calorimeter absorbs hadrons (pions, kaons, protons, etc.). The energy of a hadron jet is determined as the sum of the energy of all hadrons included in the jet.
- **Muon spectrometer:** The outer layer that registers only muons, which pass through all other layers.

Event recording: The detector registers signals from millions of individual sensors in each collision.

3.10.2 Jet reconstruction (Jet finding algorithms):

The raw data from the detector is a set of energy depositions in calorimeter cells and tracks of charged particles. The task of physicists is to "assemble" individual jets from this chaos. For this purpose, special jet reconstruction algorithms are used.

- **Principle of operation:** Algorithms group neighboring particles or energy depositions flying in the same direction into a single object — a jet. Modern algorithms (for example, Anti-Kt) are designed to be stable against background noise and allow matching the reconstructed jet with the initial particles that generated it.
- **"Reverse engineering":** By analyzing the properties of the reconstructed jet (its total energy, direction, width, total electric charge), physicists try to reconstruct the characteristics of the initial particles.

3.10.3 Data analysis and physical measurements

- **Event selection (Trigger):** Out of billions of collisions per second, the detector electronics select in real time only "interesting" events with high energy or a specific topology (for example, with two clearly distinct jets) that may carry information about New Physics or rare processes.
- **Statistical analysis:** The collected data undergo thorough statistical analysis and comparison with the theoretical predictions of the Standard Model.
- **Calibration and correction:** Detector readings are adjusted to account for its non-ideal resolution and efficiency.
- **Measurements:** Measurements of parameters such as jet production cross-sections and their energy distributions are performed, allowing verification of the accuracy of quantum chromodynamics and searching for deviations that may indicate the existence of new particles or interactions.