Extreme Energy-Symmetry Model and its fundamental tenets

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The Extreme Energy-Symmetry Model is a novel hypothesis which is based on the principle that, in every system, for every fundamental mass energy and emergent mass-related energy there is an equal and opposite fundamental charge energy and emergent charge-related energy. This means that is impossible for a single observer to tell, at every level, what is positive or what is negative mass or charge, or their emergent related energies, because all the effects are exactly the same whichever is chosen to be defined either as positive or negative. This implies that there is no natural energy symmetry breaking anywhere - it is always a case of looking for where the opposite mass/charge/emergent related-energy is concealed - like matter and anti-matter where the latter is hiding in plain sight, having been misidentified. The model enables the use of a pre-fermion hypothesis that is self-consistent and allows the replication of most of the observations of the universe and solutions to multiple paradoxes. The foundations of the model and pre-fermion hypothesis are drawn together in this paper in a simple manner that enables a better understanding of how and why they are so powerful in producing something very close to a theory of everything across both relativistic and quantum realms, from the smallest to the largest scales.

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I. INTRODUCTION

The current standard model has well known limits, although it works well within them. Observations beyond those limits [1] [2] [3] have strengthened the case for models which go further. Paradoxes such as baryon asymmetry [4] suggest that matter outweighs anti-matter by a staggering amount. This paper together with its references show that this paradox is incorrect, and that anti-matter is hiding in plain sight within normal nuclei and atoms. The source of the foundations of the Extreme Energy-Symmetry Model (EESM) will begin with the deepest tenets that apply to all systems and imply that there are no natural asymmetries in physics, just mistaken interpretations.

II. BACKGROUND

Many previous papers [5] [6] [7] [8] [9] [10] [11] [12] have proposed symmetry in the actions of energies and a pre-fermion hypothesis that fermions are composite particles, that the same unmerged building blocks forming those fermions are also, in partially merged form, the fabric, or base material, from which the universe is made. Our current SI system of units acts to hide the real relative strengths and sizes of those underlying building block fundamental properties of adjusted-Planck sized mass, charge and radius.

III. SIGNIFICANCE and OBJECTIVES

The significance is in laying out as the main foundation, the EESM which is based on the core principle that, in every system, for every fundamental mass energy and emergent mass-related energy there is an equal and opposite fundamental charge energy and emergent charge-related energy. This means that is impossible for a single observer to tell, at every level, what is positive or what is negative mass or charge, or their emergent related energies, because all the effects are exactly the same whichever is chosen to be defined either as positive or negative. Only when two observers physically interact, each composed mainly of opposite sign energies, can they discover that they are so – but without being able to define which is the positive and which the negative.

This implies that there is no natural symmetry breaking anywhere - it is always a case of looking for where the opposite mass/charge/related energy is concealed - like matter and anti-matter where the latter is hiding in plain sight, having been misidentified.

The EESM enables the use of a pre-fermion hypothesis that is self-consistent, allows the replication of most of the observations of the universe and brings together the main foundations of the pre-fermion hypothesis in a way that clearly sets out how it is self-consistent and is a real candidate for a theory of everything.

The objective is to show how and where the tenets of the EESM and pre-fermion hypothesis are different from those that underlie the Standard Model. It is not the case that just one or two SM foundation principles can be amended, but that a completely new way of looking at existing observations is required. Many of the current basic physics principles need reinterpretation.

The paradoxes and issues of gravitation, baryon asymmetry, dark matter, dark energy, neutrino oscillation and mass,

symmetry breaking (or lack of) and anomalies in cosmology are explained through the model.

The result is a system of one single building block, one single observable composite form and only two fundamental energy types that both underlie and expand beyond the Standard Model.

IV. OUTLINE

The paper simply sets out in the first section what are the fundamental tenets of the EESM and pre-fermion hypothesis proposed. It then simply lists what the consequences are of those tenets in the second section. How or where there are differences to, or produce underlying reasons for, current interpretations of the physics in the Standard Model are given in italics in each section in a short form.

V. FUNDAMENTAL TENETS

These apply across all emergent consequences and are mostly not yet accepted by physicists, whilst the consequences are either in line with observations or reinterpret observations using those tenets. These are needed to produce almost all the observations that are made of the universe.

1 In every system, for every fundamental mass energy and emergent mass-related energy there is an equal and opposite fundamental charge energy and emergent charge-related energy *(Total energy of the universe is always zero and conservation of total energy)*

2 It is impossible to tell, at every level, what is positive or what is negative mass or charge, or their emergent related energies, because all the effects are exactly the same whichever is chosen to be defined either as positive or negative *(Extreme symmetric property definitions)*

3 For the chasing/chased fundamental particles and anti-particles – as defined below – it doesn't matter which way they chase/are chased - it is always the same result *(Symmetry of action)*

4 There is no natural symmetry breaking anywhere - it is always a case of looking for where the opposite mass/charge/emergent related-energy is concealed or how it works *(Zero total energy for every system)*

5 There is only one universe of three spatial dimensions *(What is observable with Occam's razor)*

6 There is only one type of fundamental particle and its anti-particle in the universe *(Only one building block for everything)*

7 Fundamental particles have only one base size of mass and charge energies, although they are increased or decreased on unmerger or relative motion with balancing decreases or increases in emergent energies, and one size of spherical radius *(One base size for all building blocks)*

8 Fundamental particles have energy densities which exceed those in large black holes *(No singularities)*

9 There are no singularities, because the fundamental particles and anti-particles are the densest objects possible, and physics rules everywhere, even inside large black holes *(Physics does not break down anywhere)*

10 Negative mass fundamental particles attract other negative mass fundamental particles and positive mass fundamental particles attract other positive mass fundamental particles. Negative mass fundamental particles 'chase/are chased' - as described below - positive mass fundamental particles, and vice versa *(Symmetry of interactions for fundamental masses)*

11 Symmetry in the actions of mass and charge energies and forces between fundamental particles is absolute, even in chasing where chaser and chased can be reversed *(Newton's third law, adjusted)*

12 Fundamental particles exist usually only as pairs, although they can swap partners *(No magnetic monopoles)*

13 There are two forms of pairs –partially, or fully, merged or completely unmerged *(Same building blocks, different states)*

14 Myriad partially merged pairs are the fabric or background material of the universe *(Source of all building blocks)*

15 Space cannot inflate because the fundamental particles and anti-particles that comprise the fabric of the whole universe do not *(Space does not inflate)*

16 There is no true vacuum except where the background is excluded *(The background is not a true vacuum)*

17 All isolated single particles, of whichever type, and complex systems always have zero total energy *(Energies always balance)*

18 Particles and anti-particles in partially merged pairs do not spin about their own individual axis *(There is*

no surface discontinuity for any force to act on within the pair)

19 Partially merged pairs may spin about a mutual axis or vibrate or translate laterally within the background *(The mass and charge fields of the partially merged pair are affected by external fields)*

20 Forces are transmitted only by chains of partially merged pairs *(Chains are formed from the background and their motions are due to those mass and charge fields present)*

21 There are only fundamental mass and charge, and emergent mass and charge-related, energies and forces *(There are no separate symmetry-breaking forces and no phase transition in forces at different strengths)*

22 Kinetic energy is a vector property along the line of its associated force and radially outwards for a moving mass in a stable rotating system *(Force and energy differ only by a distance factor)*

23 Unmerging each partially merged pair results in the generation separately of both positive and negative one-sixth the electron size charges, then chasing by one to try to re-merge with the chased one and the chased one trying to maintain separation from the chaser ('chasing') *(Always equal amounts of positive and negative charge generated and the non-Newton exception to his third law)*

24 The unmerger of a pair is always at the same energy and the observable one-sixth charge energies are balanced by the mass-related spin energies ('twists') of each particle and anti-particle about each individual axis *(Always equal and opposite mass and charge-related energies generated and always the same size charges generated)*

25 Unmerged pairs chase other unmerged pairs to form chains *(Unmerged pairs are never stationary)*

26 Chasing chains catch onto their own tails to form loops, the only observable composite form for unmerged pairs *(Loops are more stable than chains)*

27 Loops are the only composite form of multiple partially merged pairs or unmerged pairs *(There is only one relatively stable form of matter in the universe)*

28 Loops of unmerged particles and anti-particles are the only potentially directly observable objects, observed using loops, in the universe *(Without loops, there can be no observation)*

29 In the rotating frame of reference of a loop, a loop has total fundamental mass energy of zero *(All loops have equal amounts of fundamental positive and negative mass)*

30 The type of energy in one loop acts on the same type of energy in another loop, even though both may have total energies of zero overall due to all types *(Only same-energy types interact)*

31 The background provides a shear viscosity to the motion of the unmerged fundamental particles in loops and produces a photon local terminal velocity, called light speed *(All motion within the background loses energy to the background)*

32 Loops of three pairs are our observable normal matter. Other pair-number loops are dark matter, observable only indirectly *(All matter has the same basic loop form)*

33 If matter is defined as all positively charged loops, then anti-matter is all negatively charged loops *(Definition of matter and anti-matter based on loops is more precise than for what are currently called 'particles')*

34 Matter and anti-matter at the fundamental level are always present in the universe in equal amounts *(Equal charges always result from unmerging partially merged pairs)*

35 There is no space-time except specifically for a single loop or as an average over a number of loops *(A separate loop or multiple loops are different to the continuous background of partially merged pairs)*

36 Anti-matter is hiding in plain sight because of the loop composite form providing extra degrees of freedom in defining mirroring properties *(Definition of anti-matter)*

37 The background is the relativistic environment where velocities are constrained to light speed or slower *(Background viscosity requires energy to move through it)*

38 The quantum environment excludes the background so non-local velocities exist through tunnels whose walls are composed of partially merged pair chains that have temporarily formed loops *(Without viscosity, no energy is lost)*

39 The viscosity of the background partially merged pairs is what separates the relativistic and quantum realms *(Quantum mechanics and relativity are irreconcilable)*

40 Fundamental particles and anti-particles travel with their axis of twisting always along their direction of travel in their own frame of reference *(Due to the*

background viscosity and the mass and charge fields of the partners that they are chasing)

41 Entanglement is the partial merger of two or more loops whose subsequent physical separation enables the formation of a tunnel, within which the background is excluded, between them *(Reformation of partially merged pairs across the respective different loops with same rotational orientation)*

42 Superposition is the digital averaged observation, over time, at tunnel ends, of the properties of each entangled loop that is randomly swapping tunnel ends *(Not the net of the continuous existence of the properties of both loops)*

43 Observing a tunnel, or tunnel end, sufficiently collapses the tunnel and each loop is then trapped at whichever tunnel end it occupied at that instant *(Spooky action at a distance)*

44 Relativity and quantum mechanics are irreconcilable - travel is either within or without the background *(Two simultaneously inconsistent environments for any loop)*

45 Loops stack to form bosons, including nucleons, Higgs and, when loop and anti-loop stack with the same orientation, photons *(How loops interact attractively, Higgs is just a boson not the source of mass for bosons)*

46 Fermion loops can exist within nucleon stacks *(It is the fundamental particles and anti-particles that are within nucleon stacks)*

47 The strong force is the direct mass and charge effects between loops in nucleon stacks to loops in other nucleon stacks *(The strong force is an emergent effect of the fundamental mass and charges within loops)*

48 The weak 'force' is instead the dislodging of a high energy electron loop and anti-neutrino loop from a neutron stack by incident neutrino/anti-neutrinos to leave a proton core stack *(The weak 'force' is not a force)*

49 Loops and anti-loops stacking in the same orientation are gauge bosons, although they transfer no forces. Loops and anti-loops stacking with the opposite orientation are scalar bosons and include the equivalent of the zero spin photon – called a 'zeron' *(Zerons underlie zero point energy*)

50 Zerons exist at all points in space and at all radii and their physical exclusion between parallel conductive plates causes a net attractive effect on the plates *(Casimir effect)*

51 Zerons can be separated into loop and anti-loop by impact for a time period dependent on the radii (energy) of the two component loops *(Quantum mechanical pair-creation)*

52 Photons stack on symmetric charged leptons to boost their orbital energies in atoms, as the absorption process, and unstack when emitted *(Spontaneous emission or emission spectrum)*

53 Photons transmit frequency to loops to replace energy lost to the background, not to transmit electromagnetic forces *(There are no force carriers except partially merged pair chains and only mass and charge, or related-emergent, forces exist)*

54 Differing pair-number loops cannot together form a stable stack because their symmetries, or asymmetries, of one-sixth electron size charges cannot balance the stack overall. Three-pair loops are our normal matter and other pair-number loops are dark matter. *(Dark matter cannot be observed directly by three-pair matter loops since stacking is required for observation)*

55 The inertia of a loop is a translational energy that the loop has in a stationary frame of reference *(Kinetic energy is retained within a loop in motion)*

56 A loop in motion in a stationary frame of reference has mass kinetic energy that was given to it to start its motion and it retains that energy, subject to background viscosity, until an external force acts *(Reverse Newton's first law)*

57 The relative orientation of two loops governs the strength and direction of charge-related spin-spin attraction or repulsion between them *(Spin coupling)*

58 A slower rotating loop cannot speed up the rotational frequency of a faster rotating loop *(Second law of thermodynamics)*

59 All motion through the background by loops loses mass energy that cannot be recovered by reversing that motion *(Arrow of time)*

60 A loop accelerated and then decelerated will have a different rotational phase on return when compared to that same loop had it remained stationary. A change in loop phase is a change in time *(Twin's paradox)*

61 Rotational motion produces a centrifugal force, not a centripetal acceleration because force and energy are both vector properties along the same direction *(Reverse Newton - there is no acceleration on change of direction)*

62 The use of some of the fundamental constants hides the equal strength of mass and charge fields *(Size and strength of fundamental mass M and charge Qc are identical)*

63 The Planck, Gravitational and Boltzmann constants are all dimensionless ratios set by the units used, regardless of their current professed units *(To be a constant, there must be no relationship on any property)*

64 The Planck, Gravitational and Boltzmann constants can each be eliminated from all equations *(They can be subsumed within the adjusted-Planck mass and distance parameters)*

65 The Planck and Gravitational constants can be eliminated in pure DASI units by adjusting both the mass and distance properties by the factor $M \rightarrow M\sqrt{G/h}$ and $R \rightarrow R/\sqrt{hG}$ respectively *(Stretching those properties differently)*

66 The other change from SI units into DASI units is that choice made for the SI unit of charge, between electrostatic CGS-ESU and electromagnetic CGS-EMU systems, was wrong - by the factor $\sqrt{1x10^{-7}}$ *(This has confused the mathematics that define the adjusted-Planck charge Q_* and the electron charge $q = \sqrt{\propto/2\pi}Q_*$)*

67 There is only one number required by EESM, other than the unit size of the adjusted-Planck properties, - the fine structure constant α which defines the energy associated with the unmerger of every partially merged pair - and the three families of loop sizes set by inflation in our big bang event *(All charges on all loops are multiples of one-third the size of the electron charge)*

68 The relationship between different properties, at their adjusted-Planck size, is defined by the powers of the dimensionalities of the properties using the base $\sqrt{c}$ *(Physics is the same everywhere)*

69 The relationship between different properties, at their observable maximal size, is defined by the powers of the dimensionalities of the properties using the base $\sqrt{\alpha c/2\pi}$ *(Physics is the same everywhere)*

70 The size of the loops is a random consequence of the amount of inflation along each of the three spatial planes during any different big bang unmerging event *(Different big bang events lead to different chemistries)*

71 Chemistry requires odd pair-number loops so that an odd number of loops is required to balance its stack asymmetry. Then a net spin exists in its nucleon-equivalent stack that can be balanced, by an orbiting electron-equivalent, to enable photons to stack, atoms to form and emission spectra to emerge *(Only odd pair-number matter produces chemistry – ours is the lowest odd number - but five-pair (and other odd numbers) dark matter loops may do so)*

72 There is no beginning or end to the universe *(The background has always existed and all loop and unmerged pair energies will eventually return to the background)*

73 The pure DASI unit system is based on the adjusted-Planck size properties of mass $M_* = \sqrt{c} = Q_* c$, where Q_* is the Planck charge and the electron charge is $q = \sqrt{\alpha/2\pi}Q_*$ *(Mathematical consistency)*

VI. EMERGENT CONSEQUENCES

Based on the tenets above, among the following consequences flow, most of which are observable or reinterpret observations differently.

1 A big bang is the random start of the unmerger of myriad partially merged pairs to form loops and their subsequent collisions that require radial increases in loop size to maintain internal loop angular momentum at Planck's constant *h*, in partial DASI units where *h* is retained, - within the only universe. Big bangs do not create new universes or multiverses. *(How 'matter' is 'created', why loops inflate and conservation of momentum)*

2 Each loop radius increase is inflation in one spatial plane *(Inflation may be different along each of the three spatial axes, forming three planes within which all loops end up)*

3 Inflation is in loop size, not space. *(Space cannot inflate because it is built everywhere from the same size building blocks)*

4 Loop inflation along three spatial axes produces three inflation planes and the three fermion families whose sizes are locked-in, but subject to viscosity energy loss that is replaced by frequent photon frequency transfer *(Fermion 'mass' sizes depend on different inflation amounts)*

5 Large inflation produces large radius, small mass, loops and a likely successful big bang within our only, and unique, universe, not an external universe *(Longevity of our big bang shows extreme initial imbalance in mass-related gravitational versus expansionary energies)*

6 Small inflation produces small radius, large mass, loops and a likely failed big bang, within our only universe *(Observable as galaxies and massive black holes since original partially merged pairs cannot be reformed in the gravitational collapse)*

7 All big bangs occur randomly within the only universe, past present and future *(Past failures could be within or outside our own big bang envelope)*

8 All big bangs use the same fundamental pairs as building blocks to form their loop systems *(Physics is the same everywhere)*

9 The ratio of normal matter to total matter depends on the probabilities of the formation of loops with different pair-numbers during a big bang event *(The calculation shows that the ratio is expected to start around 17%, but will reduce over time as large black holes break loops on entry and reform different pair-number symmetric loops on emission)*

10 No loops exceed light speed when travelling within the background *(Space does not inflate)*

11 The small mass size of the electron probably resulted in our long-lived big bang, caused by large loop radius inflation which resulted in low frequency loops whose gravitation was insufficient to cause collapse *(Providing time to enable evolution)*

12 What is currently called ‘mass’ is an emergent property due to the rotational rate of the fundamental particles and fundamental anti-particles’ masses in a loop combined with the effect of attached partially merged pair chains sweeping through the local background, and the effect of the local background on the loops *(Mass is an emergent-fundamental mass effect and matter and anti-matter loops have the same gravitational effect)*

13 What is currently called ‘spin’ is an emergent property due to the rotational rate of the fundamental particles and fundamental anti-particles’ charges in a loop combined with the effect of attached partially merged pair chains sweeping through the local background, and the effect of the local background on the loops *(Spin is an emergent-fundamental charge effect)*

14 The mass energy of a loop is ½ *hw*, equal and opposite to the spin energy ½ *hw (The two emergent energies are equal and opposite, although consider using the relativistic reconciled factor f, which at low loop rotational frequencies is used as ½)*

15 In a charged lepton loop, the total charge angular momentum, not just its anomalous magnetic moment, can be split into two equal components, due to the rotation of the fundamental charges and to the one-sixth charges, where the fundamental particles and anti-particles rotate at slightly different radii *(Base electron magnetic moment twice expectations so that the spin g-factor =2)*

16 Colour ‘forces’ are the result of the asymmetries of the loops in a stack. The fundamental and emergent masses and charges of the fundamental particles and anti-particles act directly between loops in the same stack to balance the stack *(Colour is not a force but a balancing of loop asymmetries in a stack to provide stack stability)*

17 The strong force is the action of the fundamental and emergent masses and charges of the fundamental particles and anti-particles that act directly between loops in one stack to adjacent stacks *(Fundamental mass and charge energies are the same size and have the same field strengths)*

18 It is not necessarily the case that the number of loops and anti-loops in the universe are the same *(Fermion and anti-fermion numbers are not constrained to be the same, although the total charge of the universe is always zero)*

19 Some charge-neutral loops are matter and some are anti-matter *(Definition can be complex and relative, dependent on chosen starting point within a loop)*

20 A stable nucleus, where positively charged loops are defined to be matter, consists of equal numbers of matter protons and anti-matter neutrons. Where the numbers are not equal, the nucleus is less stable. *(Baryon asymmetry is not correct)*

21 Stable charge-neutral atoms are charge-balanced matter and anti-matter systems due to matter protons balancing anti-matter electrons *(Preference for neutrality in each property)*

22 A large black hole stretches and breaks an approaching loop, which does not have its rotational plane parallel to the surface of the hole, into a chain, because of the differential strength of the gravitational field across the loop *(How loops break into chains near large black holes)*

23 The mass and spin energies of the loops that break are taken by the black hole overall *(The properties that are transferred to the black hole in bulk form)*

24 The fundamental mass and charge properties, and one sixth electron size twist mass and charge energies, of the fundamental particles and fundamental anti-particles in a chain, remain with those particle in the chain as it enters a large black hole *(The properties that are added to the black hole individually by the fundamental particles and ant-particles but remain with those individuals)*

25 All black holes are composed identically of fundamental particles and anti-particles in chains that continually break and form or reform other chains *(Black*

holes are where building blocks of unmerged pairs are stored for emission)

26 Information and properties are not lost in a black hole and chains can form loops and anti-loops to emerge as symmetric photons *(No black hole information paradox)*

27 A large black hole is a chain star composed of chains that cannot stably form loops except at the surface of the hole *(No quantum mechanics within massive black holes)*

28 Loops and anti-loops at high frequency can reform photons at, and parallel to, the black hole surface and then escape, losing most of their energy as they do so, to form the event horizon *(Massive black holes are not black)*

29 The most likely place for photons to form and possible other loops to escape, on the surface of a large black hole, is at the poles on the axis of rotation of the hole *(Symmetric emission beams)*

30 Quantum mechanics does not exist inside a large black hole surface since there are no stable loops present to enable, and form, tunnels to exclude the background *(A large black hole is a relativistic environment)*

31 Large black holes over time convert entered asymmetric loops into exiting symmetric photons, increasing symmetry in the universe *(A massive black hole is a symmetry sieve)*

32 All loop motion returns energy to the background over time and distance in the form of extra motions of the partially merged pairs, or effectively heat *(Mass energy transforms in a circuit to return to its origin)*

33 Our understanding of time does not exist within large black holes *(There are no stable loops to provide frequencies or to measure them)*

34 Loops provide our observable time, but there are more fundamental times in partially merged pairs or chains that cannot be observed using loops *(To a stationary non-rotating fundamental particle or anti-particle in a partially merged pair there is no time, so everything is happening at the same instant, at the deepest level)*

35 Background viscosity produces frequency-independent tired light in photons as it is the fundamental particles and anti-particles in the loops that are its subject, not the loops *(All fundamental particles and anti-particles experience the same viscosity in the same background environment)*

36 Viscosity red shift of photons has not been accounted for to date in cosmic red shift observations *(Viscosity red shift of local objects within our galaxy are not large enough to observe)*

37 Frequency-independent tired light changes the current calculated distances to observed objects whose red shifts have been observed *(Our universe is much smaller physically than currently calculated)*

38 Dark energy is interpreted here instead as due to the almost-pure viscosity red shift of objects beyond our own big bang envelope, producing an increased Hubble rate outside that envelope *(There is no dark energy)*

39 The lower Hubble rate within our big bang envelope implies that our big bang is now collapsing, as beyond that envelope is a higher Hubble rate *(Even though red shift increases with distance, it does not exceed the 'pure' viscosity red shift rate of tired light within our envelope)*

40 Within our big bang envelope there are pre-existing failed big bangs whose red shifts are inconsistent with those of our co-moving objects, where both are unarguably adjacent in space *(Halton Arp was partially correct)*

41 Large well-formed galaxies observed at high red shifts, too soon after current cosmology indicates that they should exist, are galaxies either formed before our own big bang or probably outside our big bang envelope *(Discordant mature galaxies at high red-shifts)*

42 The hypothesis is a mix of inflation, steady state and non-multiverses *(Within the adjusted usage of each)*

43 In rotational orbits the kinetic energy of the spin energy of loops, not the loop spin energies unless they are not net overall zero, should be included in equations, meaning that the force and energy equations become consistent *(Force and energy equations differ only by a distance factor)*

44 Only gravitation, impact and charge act between different pair-number loops *(Dark matter is not directly observable using normal matter loop stacking)*

45 Even though total matter and anti-matter are always equal in size at the fundamental particle/anti-particle level, that is not necessarily the case at loop level *(Loop types, like normal matter neutrinos and anti-neutrinos, may not form in equal numbers)*

46 Nucleons only stack stably when their asymmetric loops balance along the stack and overall stack charges are

zero or multiples of the size of the electron charge *(The stack needs to have physical rotational balance to remain as a stack and the correct charge for that environment)*

47 Batteries are matter/anti-matter devices *(Sources of matter/anti-matter loops and fields that can do work)*

48 An anti-matter neutron composed of core stack two anti-matter down quark loops and one positive matter up quark loop can also be composed of a matter proton core of two matter up quark loops and one anti-matter down quark loop with an end cap of anti-matter electron and anti-matter anti-neutrino loops *(How a neutron can transform into a proton plus high energy electron and anti-neutrino)*

49 The matter positron spin + ½ *h* loop merging with the anti-matter spin + ½ *h* electron loop forms a perfect neutral photon spin + 1 *h* double loop *(A photon is the most balanced double-loop combination)*

50 Within the photon loop each particle in one loop is both chasing its adjacent anti-particle rotationally in the same loop and an anti-particle translationally in the other loop *(Partially merged pairs reform when possible, and chase/are chased)*

51 The merger of a loop and anti-loop in a photon reforms six partially merged pairs chase/chasing perpendicular to the plane of the loops *(Chase/chasing is the effect of the fundamental particle and anti-particle mass and charge forces which drive a photon to its terminal velocity, in the local background environment, of local light speed)*

52 Passage through filters only constrains which of an entangled photon pair passes at the filter *(Both continue swapping paths through their shared tunnel after the filter)*

53 A photon is both a physical double-loop and a 'tunnel-like' expanding spherical shell, from the point of emission, where the photon 'skips' randomly within the shell as it expands at local light speed *(This is the dual state nature of photon emission and motion)*

54 Skipping is non-local, between physically separated orbitals when in atoms *(Otherwise the total probabilities of all the orbitals would not sum to 100%)*

55 A photon either stacks on observation, then the shell collapses, or the shell is perturbed and the photon becomes trapped where it is at that instant *(The two states are connected non-locally)*

56 The "shell and loop states' nature of the photon separates wave versus particle observations *(Wave-particle duality)*

57 Single asymmetric loops, the quarks and some types of neutrino, cannot long remain alone because their rotational charge asymmetry and non-unit electron size charge, or zero charge, are not stable in the local environment and need find a suitable partner loop or loops to provide balance *(Unitized stable charge systems)*

58 Asymmetric neutrinos, for example, within a beam of symmetric neutrinos may explain why neutrinos are considered to have a small mass. It is the number and positioning of the one-sixth electron size charges around a loop that produces symmetry or asymmetry. The intermittent frequency of sweeping chains of partially merged pairs attached to the fundamental particles and anti-particles in a neutrino loop may have a mass-like effect on the background, despite the overall zero loop charge *(The fractional charge on a loop is a factor on the observed loop mass, along with the loop frequency)*

59 Since symmetric neutrinos are stable without requiring balancing, and their radii generally match those of the charged leptons, their loop sizes can move between families, provided the total rotational frequencies are conserved, without needing to have any observable mass, as neutrino oscillation *(neutrino loops rotate and can stack in and on nucleons, with appropriate frequency adjustment, so can swap rotational angular momentum between stack loops or other neutrino family loops)*

60 To understand why nuclei can form stable combinations of nucleon stacks requires eliminating the Planck's, Boltzmann's and the Gravitational constants as dimensionless ratios to expose the strength of gravity *(The strength of mass/gravity is larger than currently mis-understood)*

61 The strength of gravity and charge for identical sized sources is the same without *G* and means that fundamental mass forces are strong in nuclei and nucleon stacks *(Fundamental particle, and anti-particle, mass and charge energies are the same size and have the same field strength)*

62 Two loops can swap some fundamental particle pairs to form two other loops provided total internal loop properties are conserved *(The strongest fields in the universe are adjacent to all fundamental particles and anti-particles)*

63 Loops of the same charge type can transfer frequency, mass and charge moments between family members to change family identity *(Muons can change to electrons, or vice versa)*

64 Loops modeled to produce exactly the observed, and predicted, magnetic moments of the charged lepton loops each have the same outer fundamental particles' rotational velocity to within $\pm 5x10^{-12}c$ *(The resultant mass angular momenta for each fundamental particle is however larger than Planck's constant h)*

65 The 'mass' energy of an isolated stationary loop in its own frame of reference is just a counting system because it always has total energies of zero, but still rotates *(The mass-chase energies total zero but still produce rotation)*

66 Gravity and acceleration can be differentiated at the non-point scale by the shape of their field volumes. An accelerating body will have positive total mass energy whilst the non-stable orbiting body in a gravitational field will have negative total mass energy *(Gravity is not the same as acceleration)*

67 Our time is measured using loops on loops. The background has different unobservable times *(Only a loop-based directly observable system can exist)*

68 The motions of the fundamental particles and loops are ruled by different equations and represent different levels of the universe. *(Bohr and Einstein were both correct, describing their own interpretation of the fundamentals of the universe)*

69 The avoidance of singularities requires that no fundamental particle or anti-particle in motion within a loop has a greater mass energy density than that when stationary, with the mass angular momentum not exceeding Planck's constant *h*. *(The resulting dynamics show that it is the external motion of the charged lepton loops at the 'magic' frequency in Penning traps and cyclotrons that produce the observed full magnetic moments of those loops, including the anomalous parts)*

70 The spin quantum number of a fermion is h and not ½ h. Energy and momenta are reconciled when using the relativistic reconciled loop rotational mechanics in which $\sqrt{f}\mathrm{v} = (\mathrm{r}/\sqrt{f})(f\mathrm{w})$ *(The relativistic reconciled* ***f*** *factor, usually used as ½ , is a relativistic effect that is linked to the velocity, radius and angular frequency of the fundamental particles and anti-particles as they rotate about a loop The energy of the intrinsic spin* $h\ (f\ w)$ *of a lepton is exactly equal and opposite to the mass energy* $h\ (f\ w)$ *of the lepton, which is itself the size of the kinetic energy of each of the fundamental particles and anti-particles* $M_*(fv^2)$ *in that lepton loop where* ***f*** *at low velocity is equated to ½)*

VII. CONCLUSION

Based on the fundamental tenets listed above, the EESM and pre-fermion hypotheses described here represent overall a strong candidate for a theory of everything.

VIII. CONTRIBUTION

The author is pleased to record the assistance of Kristoffer Laurson in discussions and advice on presentation and separation of definitions in the paper.

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