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Abstract

In a prior paper [1] ultracolour was added back in to the Extended Rishon Model, and the I-Frame structure explored using the proton as an example. Bearing in mind that because Maxwell's equations have to be obeyed, the Rishons have to have actual phase, position, momentum and velocity. The only pattern of motion that fitted the stringent requirements was if the Rishons circulated on *mobius strips*. Fascinatingly and very excitingly, exactly such a previously-theoretical elliptically-transverse mobius topology of light [4] has been *experimentally* confirmed last year [3].

The next logical task of writing out Rishon triplets in a circle as actual starting phases of the elliptically polarized mobius-walking light has proven to be a huge breakthrough, providing startling insight with massive implications such as implying the existence of two previously undiscovered quarks very similar to up and down (provisionally nicknamed over and under), logically and naturally confirming that "decay" is just a "phase transform", and generally being really rather disruptive to both the Standard Model *and the Extended Rishon Model*.

A huge task is therefore ahead, to revisit the available data on particle decays and masses (bear in mind that the Standard Model's statistical inference confirmation techniques assume the up and over, and down and under, to be *the same particles*), so this paper endeavours to lay some groundwork and ask pertinent questions.

Contents

1 Introduction

I have to start by admitting that I've never been so excited and so annoyed at the exact same time in discovering new information or insights, before. Both have occurred mutually exclusively, but never at the same time. Excited because the hypothesis that Rishon Triplet colour, makeup and layout is simply the relative starting phase of an elliptically polarised mobius-looped phased gaussian array of photons fits (and vindicates) thirty years of work, but incredibly annoyed because not only has the Standard Model completely missed the possibility of there being two undiscovered quarks (over and under), but *so did I*. That means that a complete overhaul of the Extended Rishon Model is needed, where the available data has and *every other theoretical physicist* has also missed them. I therefore have to be really, *really* sure about this.

Taking one step at a time however, I outline the Rishon triplets on a phase diagram (circle) then show, through some examples, the changes (simplifications) that need to be made to the Extended Rishon Model rules, as well as those of phase transforms ("decay"). A *preliminary* analysis is done into the significance of the undiscovered phase positions indicative of the two new quarks, over and under.

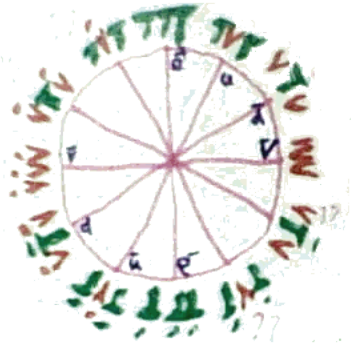

Figure 1: Twelve Rishon positions, 4 unidentified

2 The 12 phase diagram

Let $\tau = 2\pi$! [14] In the paper in which I explored hypercolour [1] I arbitrarily laid out the proton as below and concluded that if all three quarks were following parallel mobius strips, the Rishon triplets would represent phases.

$$\begin{pmatrix} T \\ V \\ T \end{pmatrix} (\overline{V}\overline{T}\overline{V}) \begin{pmatrix} T \\ V \\ T \end{pmatrix} \quad (1)$$

This led me to the sudden realisation that the Rishon triplets must simply represent the phase (I,Q) on a full τ revolution in complex space, i.e. that they *really would* be transverse photons on a mobius strip, exactly as demonstrated experimentally last year [3].

What I *didn't* know was what the phase angle actually was. Bear in mind that I was assuming that there were only eight Rishon triplets, that the "rules" of the Extended Rishon Model only permitted eight Triplets. So, naturally, I tried laying out the triplets in a circle, separate by 45 degrees: they didn't fit. $T\overline{V}T$ cannot be made to line up 180 degrees opposite to $\overline{V}T\overline{V}$ if we also expect the electron to be 180 degrees lining up opposite the positron. The breakthrough therefore was to lay them out separated by 30 degrees ($\tau/12$), as shown in figure 1

Immediately the symmetry caught my attention, as did the puzzle of the extra four unidentified phases at $4\tau/12$, $5\tau/12$, $10\tau/12$ and $11\tau/12$. However before exploring that, I noticed that T, if we assume it to be "real number", matched perfectly with the phases (going negative in the second half) and likewise, *exactly* $\tau/4$ out of phase, if we were to assume it represented a "complex number", V correspondingly matched. Bear in mind that, in the previous paper, I had just done a rotational analysis which showed that two up quarks remained perpendicular to down at all times, as long as a transverse mobius circuit may be assumed.

Excitedly, I checked the VT0-paired phase transform "rules" from my notes, identifying those quarks which, from phase-transform (aka "decay") analysis I had derived four years earlier, and marked the triplet-pairs (phase-pairs) that are permitted to transform to any *other* triplet-pair (including positional interchange i.e. swapping places with each other in any given particle), marking $V\overline{T}0$ in pink and $\overline{V}T0$ in purple, below:

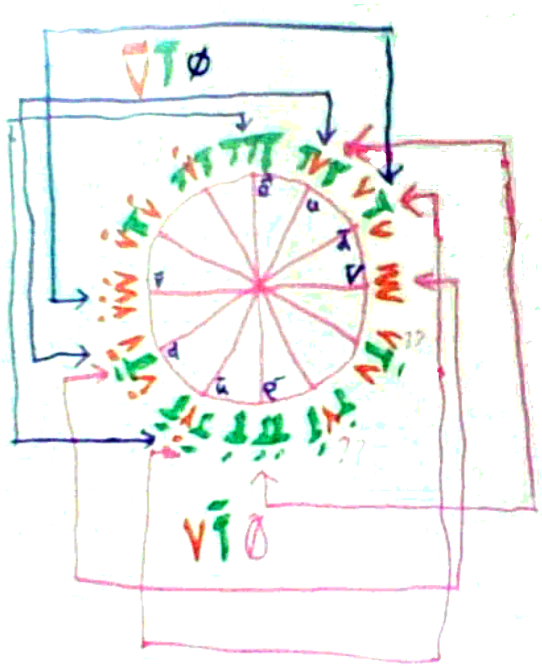

Figure 2: VT0 Phase Transforms

The key thing which is very exciting here is that the VT0 transform pairs are all separated by $5\tau/12$ (just in a different direction for each type of VT0 transform) and the two quarks that make up a gluon (aka "ultra-ultra-short-lived-pion") are separated by $1\tau/12$. So, immediately, I wondered if there was a refinement of the VT0 phase transformation rules, that only transforms are permitted that flip exactly $1\tau/12$ (30 degrees) rather than, as previously surmised, a jump which represents *60 degrees* is in fact "permitted". This is going to need careful investigation.

But even before that, I wondered "what the heck is at $4\tau/12$ and 5, 10 and 11? Because if we consider these to be simply different starting positions of Freund's multi-twisted elliplically-polarised mobius-strips [4], there's absolutely nothing that would prevent or prohibit the occurrence of those phases by nature: Maxwell's equations have to be obeyed... period.

Also, I have to relay that I initially made the mistake (repeatedly) of thinking that a single photon would fit the model: it doesn't. Freund very kindly explained it to me: a photon has a vector, so it is different when rotated through 180 degrees from its orientation at 0 and 360. Elliptical polarisation is an *axis* so is a line **not** a vector. The exact significance of this is still a little beyond me, but I am "going with it" for now.

2.1 Spot the deliberate mistake...

The first thing to observe about Figure 1 is: I've placed the up and down quark nomenclature against the Rishon triplets that I believed to be correct according to the Extended Rishon Model... but that rather unfortunately puts up and down at $5\tau/12$ instead of at 90 degrees ($3\tau/12$), and from the I-Frame layout and the prior "rotational" exercise we deduce this to be wrong.

argh.

The *correct* position for the up quark would be at $10\tau/12$. Now we need to re-verify *all* of the phase transformations in light of this new information... bear in mind that there's the strong possibility that some of the particle "decay" patterns from which the Extended Rishon Model's rules are deduced might actually be over and under quarks, and the problem quickly becomes a bit of a handful.

So, beginning that process I laid out the Rishon triplets again (reverting once again to Haim Harari's original sign for the Vohu Rishon [6]), and quickly realised that the $5\tau/12$ relationship was going to be unavoidable:

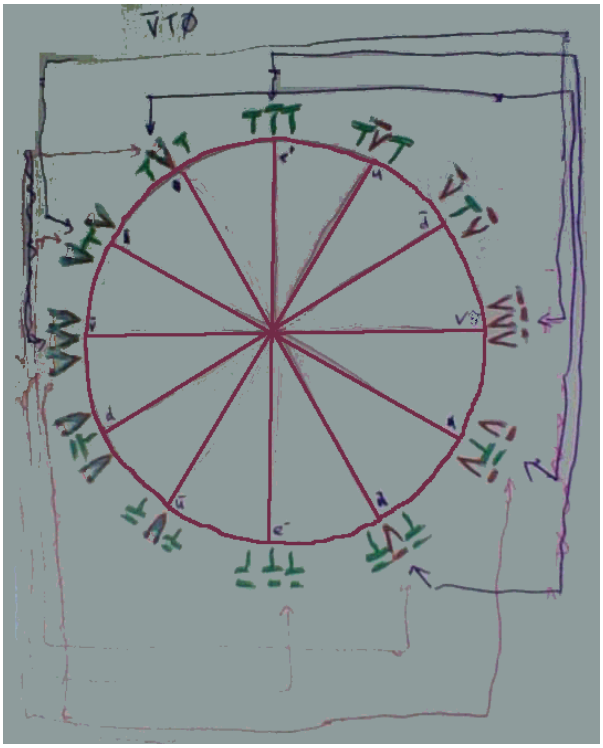

Figure 3: 12 Rishons, inverted Vohu (imaginary)

Once again, frustratingly, when walking by hand through the sum of T and V particles, very quickly it became apparent that if the proton is now made up of (TVT,$V\overline{T}\overline{V}$,$TVT$) the pions still have to be made up of quarks that are $1/\tau$ apart. In short: it just doesn't work. Not only that but whilst T increases and decreases in a clockwise direction, V increases and decreases in an *anti* clockwise direction.

I did however have the opportunity to analyse the VT0 phase transforms again, and discovered something quite interesting:

- The up, down, electron and neutrino triplets are separated by matched $V\overline{T}0$ and $\overline{V}T0$ phase transforms
- The over, under, electron and neutrino triplets are separated by $VT0$ and $\overline{VT}0$ phase transforms (same-sign per transform)
- Constructing a pion from over anti-under or under anti-over would still obey the rules of integer (1 or -1) Vohu and Tohu, but that when compared to the corresponding pion+ and pion-, the sign of the sum total Vohu would be inverted.
- The $VT0$ (and opposing) transformations **cannot be applied** to the up and down quarks, just as $V\overline{T}0$ and $\overline{V}T0$ cannot be applied to over and under.

These observations still apply to the originally-chosen orientation of Vohu's sign. This latter observation is where we might begin to be getting some insight as to why over and under have not been detected, or that if they have, they're part of a kind of "mirror set of decay patterns" which are in effect near-indistinguishable from the corresponding phase-transforms, apart from potentially a small mass discrepancy.

The real answer may turn out to be much more straightforward, given that we're talking about Maxwell's Equations here, and talking about electro-magnetism. It could simply be the case that the over and under quarks, by virtue of the inverted Vohu sign, are oppositely-magnetic and thus where we would expect the "normal" particles to attract, they simply repel instead. So it may turn out to be the case that far from ever expecting to see existence of over and under quarks in the wild, the *complete opposite* is the case!

All that aside: we still have to point out the mistake that was spotted which turns out not to exist, in relation to the up-down-up layout of the proton.

2.2 ...which turned out not to be

My initial objection to the fact that up and down are separated by $5\tau/12$ was that this could not possibly stabilise three quarks at 90 degrees ($3\tau/12$) phase-differential, which we now appreciate to potentially represent a stable non-interfering E.M. relationship between three ellipcically-transverse mobius beams on their circular orbit.

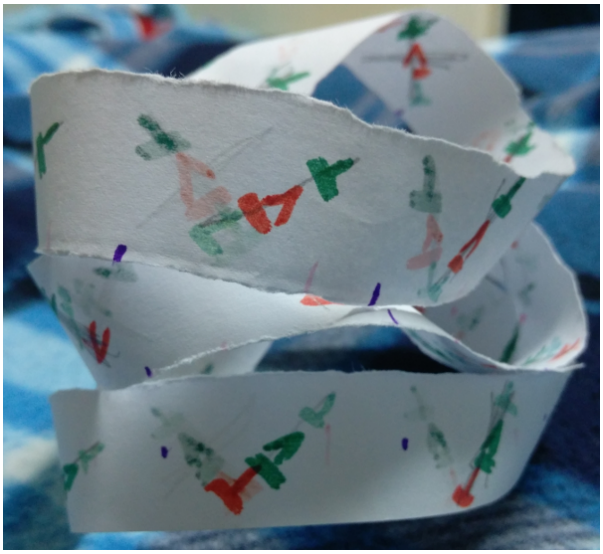

Figure 4: Proton Mobius stack)

Then I remembered what I had done: when at a restaurant entertaining some young children, I had made three mobius strips out of paper. When they tired of playing with them, it was my turn, so I tried to stack them together in a similar arrangement to that which I had described in my previous paper [1]. The only arrangement that "fitted" was if:

- the two "up" mobiuses were twisted slightly through 45 degrees
- the central "down" mobius was twisted slightly through -45 degrees
- the central "down" mobius was turned upside-down (rotated about the X-axis by 180)
- the central "down" mobius was *rotated about the Z axis through an entire 180 degrees compared to the two up strips.*

Then and **only** then did the angle *at all times* of the three strips line up *exactly* at 90 degrees to each other as outlined in the "stages" of the previous paper when starting from that initial I-Frame setup. Thus, the fascinating point is: the rotation by 180 degrees of the middle (down) quark about the X-axis *mirror-images* the up quark's relative angle when compared to the two up quarks (whereas the Z-axis rotation just shifts the phase by $\tau/2$), and the combined effect of the two 180 degree rotations *bring it back into sync* so that the three quarks *all travel together* in the same orbit about the Z axis.

I find this to be absolutely fascinating, that there would happen to be an exact corresponding arrangement of elliptical transverse polarised arrangements of light that *happen* to match the I-Frame rotation, which *happens* to have been deduced from a comprehensive analysis of particles.

So now I had to come up with a way to map these paper-and-pens proton experiments back to the I-Frame representation in a way that made sense. My primary objection - from O-Level physics - is the "right-hand motor rule" must be obeyed: "First-finger field, middle finger current, thummmmb-motion". It basically tells me that at all times the three Rishons (aka elliptical polarisation axis) need to be at right angles.

So I tried adding the Rishon values up: no dice. I tried treating the Rishons as vectors: no dice. Then it hit me: of course, this is complex numbers: you multiply and divide them! Which means simply adding and subtracting the angles. So from figure 3, take the (starting) position of the up quark - $-1\tau/12$ - and *subtract* it from the (starting) position of the down quark - $4\tau/12$. We now have $3\tau/12$ which is a 90 degree angle and I'm happy at last, because *that's* finally an explanation as to why the Rishon I-Frame is laid out as it is.

This is rather hard to see in figure 4, not least because it's not possible to show the axis-inversion which actually occurs in elliptically-polarised light: for that you have to go to Bauer et al's paper [3] and examine figure 2(b). They've very kindly laid out two examples (C1 and C2) which happen, apart from the starting angle needing to be shifted by $-1\tau/12$, is pretty much exactly the up and down quark respectively. We can surmise that the up quark will be the one that starts primarily in the real numberplane (primarily electrical presence) and the down quark in the complex.

One last thing: if you *add* (superimpose) all three fields, the sum total angle comes to $6\tau/12$ (a real number, -1): it's not the right sign for a proton (should be +1) but one step at a time, eh?

2.3 Analysing additional particles and phase-transforms

To be able to do phase-transforms we need the pion. Let's take the $\pi+$:

$$\begin{pmatrix} T \\ V \\ T \end{pmatrix} \begin{pmatrix} V \\ T \\ V \end{pmatrix} \quad (2)$$

Subtracting the phase angle of these two quarks equals $1\tau/12$ (which explains why they're not stable) but adding them we get $3\tau/12$. This is slightly different from our initial supposition (where the sum total number of separate V and T was required to add up to integer 1, 0 or -1) but it's actually much simpler and, in light of the recognition of Rishon triplets being phases, makes a lot more sense.

We could also do the same thing here for any of the other quarks (including over anti-under), but the main point's been made: subtraction and addition of the phase-angles that the triplets represent are not *both* on a compass-point for any combination which makes up a pion (unlike the electron and neutrino, which already are, and the proton and neutron, which by a nice mathematical coincidence fit onto the compass points). Neutral pions, obviously being comprised from quark-anti-quark would, if the two quarks represent a superposition of opposite-phased elliptically-polarised mobius light, obviously result in cancellation aka "anti-matter explosion" which gives us a rational explanation as to why we don't see any stable particles in the pion-0 family.

Phase transforms (aka "decay") involving the W and Z Bosons are so fantastically laborious that it's best to start with a simple example first of all: pion+ "decay":

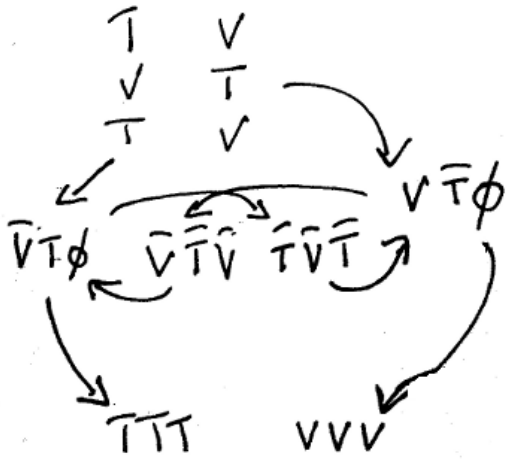

Figure 5: Simple Pion Phase Transition

The "gluon" - which I re-classify in light of the insights from the Extended Rishon Model as a "pion that get's created and destroyed pretty much instantly" - we can now understand to be a superposition of two more phase-angles that, again, happen to be separated by $1\tau/12$ and happen to sum up to a compass point (1, i, -1, -i).

Now within the framework of elliptically-polarised phase-ordered light, the prior "rule" that particles must be made in combinations, the sum total of which must come to zero - summarised as "the universe does not just create "charge" out of thin air" - begins to make sense. Re-evaluating the $VT*$ rule in light of phases, it may be written as "four Rishon Triplets may only materialise out of thin air if the sum total phase is a zero-sum game". We also surmise that it's simply too challenging (too much energy required) for the universe to pull up electron, positron, neutrino and anti-neutrino out of "thin air", preferring instead to go via the intermediaries of the compass points *in between* the major N, S, E, W ones.

Returning to the pion phase transform: I suspect that due to this being the pion+ that's "decaying", and it needs a pion- to complete the transition, the "resonance" conditions are right there already, making the two pions sort-of their own "VT*". It feels like a bit of a cheat, but when you think of it in terms of superimposition of the phases, it makes sense.

To take an analogy, here: take two sources of light that can generate Red, Green and Blue. Make one source shine Red light, and the other Green-plus-Blue light. Now shine both sources onto the same spot: what do you get? You get white light of course. Now change the intensity of source 1 so that it includes green light and *at the exact same time and by the exact same amount* decrease the intensity of the Green in source 2. Keep shining the two sources onto the same spot: can you tell if anything is happening? No of course not, because the sum total is *still white light.* At the point at which source 2 becomes entirely only Blue, move them away: you've just interchanged the Green from source 2 to source 1 *without anyone being able to tell.* Something remarkably similar is going on with the VT phase transforms, that extends all the way up to the W and Z Bosons, which I determined from comprehensive analysis to be made up simply from... more pions.

3 Discussion

The original Extended Rishon Model rules were based on numerical values, so naturally it felt right to sum them up. Surprisingly, when moving to the complex numberplane represented by twelve equidistantly-spaced points along $e^{-i\tau\omega}$, $0 <= \omega < 1$, the rules *still work* and remain intact, with the notable exception of the pion being that the superposition (sum) of its phases is on a major compass point, *not* as we previously surmised, V=+/-1 and simultaneously T=+/-1. This also makes much more sense: a particle with sum-total 1 magnetic, 1 electrical magnitude charge (as opposed to $\sqrt{2}$ of the same) just doesn't feel quite right.

Also we have a natural explanation as to why the I-Frame "works": the two outermost Rishon triplets are exactly $3\tau/12$ apart, and, if a particle is to be stable, the sum total (superposition) of all Rishons phase again must come to a major compass point, which represents either electrical charge +/-1 or magnetic charge +/- 1. This is why the proton (and neutron reasonably so) are stable.

We also note that:

- Carl Brannen and Marni Sheppeard were the first to notice that $\pi/12$ is involved in advanced mass analysis (extended Koide relationships) [8]
- Zenczykowski's Equation (14) in phase-space is also of the form $e^{-i\tau}$ [9] but that there is no actual enumeration of the phases as fractions that would allow them to be identified in the way outlined in this paper
- Freund's equation 1 [4] being based on gaussian beams also includes $e^{-i\omega}$
- Jay Yablon's work on mass-fitting (yang mills monopoles) uses a *gaussian ansatz* to gain incredibly-accurate mass predictions [11]
- that the de Vries formula includes a factor $e^{-\tau/4}$ which we consider to be highly significant [13]

I feel compelled to mention that I am deeply saddened by the mainstream reactions towards anyone that puts forward a hypothesis, or references work from the earlier half of the 20th Century, which summarises as "electrons are photons in mobius strips". *Both* mainstream scientific forums where such ideas were put forward were censored, with several people stepping forward to vilify the moderator for his actions, until he simply closed all comments [5]. It is noted with some anger that the moderator recommended that readers simply "close their minds" to any views that they disagreed with (just as the moderator himself did).

The role of a scientist is *not to be judgemental*. Certainty is a *pathological* state of mind! I cannot ignore the overwhelming evidence stacking up and will continue to explore until someone provides *proof* that the hypothesis under exploration is wrong. That's stacking up to be quite a lot of circumstantial evidence.

Open questions still to be investigated:

- Is it *really* this simple?
- What is the relationship (if any) between the de Vries formula and equation 4 of Freund's paper [4]?
- Is it really as simple as being that the Rishon triplets "superimpose" one over the top of the other to create compound particles, or do the fields generated by the elliptically-polarised mobius-strips keep each other separated by some distance? Bear in mind that braided light is possible [10] so we consider it reasonable that the superposition of mobius strips would not result in the destruction of the strips, except where the phase differential is sufficiently close to cause "decay".
- How the heck can the up and over quarks be discerned from each other, likewise down and under?
- Is the elementary charge simply the influence of the elliptical polarization effect of the mobius-strip light?

There is so much here that needs to be investigated it's overwhelming.

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