

Doppler Assisted Quantum Unification allowing Relativistic Invariance.

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Abstract.

Free action photo electron cloud build up to accelerated particles is considered in the contexts of quantum fields, wave propagation and particle conservation. Inductive implications of characteristics established from experiment and observation are reviewed and analysed using a cross disciplinary methodology. A model test experiment identifies and explores correlations between the standard model, field theory, dark matter, cosmological shocks and halos, and certain astrological inconsistencies such as those in Shapiro delays. The dynamic conceptual approach uses a 'triple helix' thought process developed from complex design tasks, with links to Goethe - Zwicky morphology. Analysis of the likely effect of current data on previous historic pathways to current physics was made and alternative models evaluated. A model arose which matched a full observational profile, removed paradox and explained anomalies. It uses only existing maths and dimensions, is logical, intuitive and testable. An insight into the quantum phase shift mechanism gives a new perspective on SR and QFT, and allows unification. Consequences are identified allowing progress in related research areas including quantum gravity. Future papers on these areas are proposed.

Photo-electron cloud build up is a principal inhibitor of accelerator performance.^{[28][29]} It occurs with both photon and electron acceleration, increasing in population and oscillation with charge density and velocity, at 7TeV each proton generating some 10 'virtual photoelectrons'. Techniques are being developed to minimise this build up, but we consider the implications of the phenomena itself in terms of particle and EM wave propagation through vacua. Einstein was concerned that special relativity took 'immobility' away from the ether, the only property Lorentz had left it with^[1]. Equivalence only appeared to be viable with no fixed fabric of space, as two reference frames couldn't be equivalent if they were within a third. Evidence of a quantum field of dark energy and matter, perhaps some 76% of the density of the universe, is now overwhelming^{[2][19]}. Generalising relativity to include gravity only exacerbated the problem as quantum mechanics developed with different concepts of space and time, with uncertain dynamic activity but classic Newtonian time.

They can't both be correct at all scales, but the weight of evidence shows that both work, leaving a major and paradoxical compatibility problem. This is addressed with the new methodology, both with SR and conceptually at the quantum level.

We've learnt to live with other areas of paradox, bizarre or unexplained phenomenon as the left side of our brain demand it (Aamodt-Wang). These relate to; entanglement, wave particle duality, particle conservation, Hardy's paradox, transverse waves in non solids, twins, twin slits, infinite singularities, a dead and alive cat, black hole data loss, the photoelectric effect, gravity itself, unstable galaxy edges, Newtons 2nd Law in space, the Pioneer, Voyager and flybys anomalies, the light paradox of SR, and Anomalous Cosmic Rays (ACR's) in the Heliosheath^[48]. Early origins of relevant theorems were reconsidered in the clearer light of present knowledge and re-tested.

The methodology uses a wide multi disciplinary input of thought processes developed from different specialities, allowing rich cross pollination between disciplines. It principally uses the problem solving organisational methods and complex original visual abstract thought exploration techniques used in architecture and some medical diagnostics. The technique can deal with a very broad information base, in depth where required but not to 'speciality' level. The speciality is in the organisation, analysis, construction and testing, always keeping the the greater picture in focus. The spiral 'triple helix'^[32] thought process used has some links to Goethe/ Zwicky morphology, and allows dynamic model testing and evolution using wide ranging parameters. Earlier assumptions, however long established, were reviewed, tested and value judged in the light of improvements in knowledge in many areas, from particle physics to cosmology, and adjusted formulae considered. Solid axioms, including the constancy of 'c' were used, but worthwhile alternatives could not be developed for testing without following Popper in revisiting some ruling paradigms.

The classic discussion of vector, tensor and scalar fields as in STVG, TeVeS etc. is deferred for a geometrical approach, purposely avoiding focussing in too early, to maintain a hierarchical helical process and essential overview. The more pedantic may assume a dynamic scalar field background if they wish. Constructional methodology is to test the broad foundation concepts first, then the experts in each field can explore and develop the detail within the right context. For example, one point on the helix holds the information that tensor field GR can't describe spin-orbit coupling due to it's basis in Riemanian geometry. It fails when angular momentum is present or Cartans theories must be added. As all quantum particles have spin an issue between GR and QFT exists. This is just one item referred with each cycle, examined in more detail if critical to a model.

A weakness of normal thought process is resistance to retrace pathways and review past decisions when original parameters prove to have changed. Physics continually changes. Louis de Broglie; *"It is proper to submit periodically to a very searching examination, principles that we have come to assume"*. Paradoxes indicate something in our established beliefs may be wrong, as many physicists feel. Roger Penrose expressed concerns^[14] about the '*various tricks needed*' in math to avoid issues, and that present theory *"may perhaps be fundamentally flawed at a deep level."* Lee Smolin feels *"there is something we're all missing, some wrong assumption we're all making."*^[15] If these views are correct only a fundamental review could unearth the causes, and there's no good reason not to carry this out. The evolution of current physics was re-traced in testing alternative models identified. This focussed on inductive evidence, but also used deductive methods where preconception issues could influence model design. Reviewing basic equivalence and gravity in the latest quantum and cosmic frameworks led to an option extending use of the relativistic variant of Doppler's equations. This appeared to offer one possible 'master key' code to unlocking a wide suite of issues so a model was developed, explored and tested through the triple helix review process, including it's implications. The results are discussed in detail below, following Einsteins 'comprehensible language' and 'intuitive logic' postulates,^[1b] Research was then targeted at specific areas where the model varied from established paradigm. Some obvious consequential matters are considered here but other implications will follow in at least one further paper.

Core Issue. Central to SR, and a possible key to related issues of unification with quantum field theory, is the basic apparent 'light paradox', of equivalence. Put simply; If a spacecraft, with headlights 'ejecting photons' at light speed was approaching at $c/2$ the photons would still cross space, and arrive at us, at light speed. If we were also in motion it's light would still be travelling at light speed when it reached us. When the ship went past, the photons from it's tail lights would also reach us across space at light speed. We get red and blue shifts in the light, but 'c' is constant. A third, 'ether', reference frame would destroy the equivalence of the first two. A vectored dark energy field 'ether' is now accepted and better understood^{[2][39]}. We need to solve this central relativistic paradox for quantum issues to be properly understood. The light box demonstration of SR has the apparent paradox of the angled pulse track within the moving box having a velocity greater than 'c' viewed from the rest frame, giving rise to dilation. (Fig 1 below).

Impertinence. Based conceptually with minimum dimensions in Minkowski space time the model should avoid issues with spin implicit with Riemannian geometry. It uses four pertinent axioms;

- 1) Light waves *are* propagated through some form of quantum field, 'immobile' in Einstein's terms and, at the quantum disturbance level, possibly also able to propagate particle activity.
- 2) The speed of all EM wave propagation through any and all fields remains at the constant 'c', which also retains basic causality within the models.
- 3) Invariance is fully retained, and the same laws of physics apply to all scales.
- 4) A photon may not be conserved forever, perhaps only minutes. Particles not be conserved for long if any match-making between relativity and quantum theory is to be possible. Few free particles, protons and neutrons excepted, have been observed for long, neutrons the longest but only minutes. Photons are considered zero mass 'corpuscles', and it is postulated that the photons we 'see' in particle impact activity may vary in characteristics to those crossing deep space. If we propose to use them in our, or indeed any, model we ought to carefully consider and define them:

Photons are zero mass wave bundles which may be generated by a light source billions of light years away, with incalculable numbers of others, continuously. The number is incalculable as, after billions of light years they're still packed tightly together when they reach our eye, wherever we are on the surface of a Schrödinger wave enclosing a sphere twice the diameter of the emitters distance away. They have zero mass, so $0 \times C^2 = \text{zero energy}$, but they manage to precisely maintain light speed all the way, under their own power. They may enter a window at Harvard, go through a cloud of Bose Einstein condensate and slow down to less than 1mph.^[3] But this is not a problem as they're able instantly accelerate back to 186,200m/sec. under their own power. As that may break some laws of physics it is not considered prudent for us to rely entirely on the interstellar version of the photon being identical to the short life particle we've witnessed. The 'photon bending' evidence from Eddington et al was only ever circumstantial as warped space/time warps everything, with or without mass. Short range short life photons will allowed in the model. The Schrödinger wave function works at all ranges so we'll also work with conserved light that's simply a sector of the full energy wave spectrum. Good evidence exists^[37] for the 'quantized energy' short range particle propagation and activity. Much of physics has been moving in this direction in recent years^[31].

Halo's. Particles accelerated through a vacuum absorb exponentially increasing energy the closer they get to light speed, needing almost infinite energy above 99.9999% of light speed. Energy

conservation laws seem to be breached as they accept this energy for little extra velocity, but, when collided, we find they *did have* that energy after all. Much of it went into the growth of its surrounding frenetic free particle 'cloud'^{[28][29]} or halo, growing with increased speed^[35]. This, and the momentum, also increase its total inertial mass towards infinity^[4]. See Fig. 2. page 12. From growing evidence of galactic halo's, the solar systems heliosphere and planetary bow shocks^[47], it seems this phenomena occurs at all scales as mass and discrete fields move within each other^{[2][5]}. The mass in the earth's shocks helps explain the 'Flybys anomaly', six spacecraft flying by earth since 1990 experiencing unexplained acceleration. (PRL Vol. 100, Issue 9. March '08). Halo's of solar systems, galaxies and clusters are being studied by Hubble, Chandra etc. and significant EM activity found^{[19][20]}. Gurnett et al (AIP 1039/1/2008) on the Voyager data; "*..we have shown that the normalized spectrum is very similar to those observed at the bow shocks of outer planets*".

In our model free unstable particle propagation, at any scale above the 'at rest' lower fine structure constant, will increase, largely proportionally, with mass and speed through any field. This is not a prediction as it matches the evidence.^[4] One view of the Fine Structure Constant is as a measure of how light and matter interact^[40]. It is also proportional to e^2/h . Both Voyagers 1 and 2 had severe shocks at the intensity of the particle activity^[47] at the 'termination/bow shock' edges of the heliosphere. Termed the 'extent of the solar wind', our model suggests this propagation activity is caused by the velocity difference between the solar system and galactic quantum fields, generated at the boundary zone by the heliosphere's 220km/sec. (45,000mph) motion through the galactic field. Galaxies and clusters, both spinning and rushing through deep space, will have the most intense areas of halo particle activity at the edges of their fields, as the many recent studies and Hubble images show^{[5][19]}. Little detail is yet known of 'relativistic' or non relativistic shock^[48] particle propagation. Behaviour and results conflict, (Pamela, Fermi etc.) but work continues.^[20]

Spin. Quantum spin is little understood, but we know how bizarre and complex it is. The many and various particles propagated from the field by disturbances, have the many and various spin types of the standard model, and probably more. The actual spin rotations of cloud particles in accelerators are measurable and can be over 100 during one proton bunch passage at close to 'c'. The particles hold high energy, condensed from the 'dark energy' of the field, equal to their mass twice multiplied by the speed of light, ($e=mc^2$). Much may be held in the angular momentum of the spin itself, in field potential, or even in string or vibratory resonance. The field disturbances propagating particles may include those of energy wave fluctuations themselves. They certainly arise from disturbance by halo particles of massive objects, from electrons to galaxies, in rapid

motion through the field. This crazy and uncertain family of spin and particle types is the prime candidate for the vast mass of quantum dark matter propagated from the dark energy fabric of the field that relativity will need to be married to.^[12] Spin is considered further under 'propagation'.

Light Speed. Our axiom is that *all* energy waves, travel through *all* fields at 'c'. Light from a supernova travels across the deep space towards our galaxy at 'c'. If it or the galaxy is in motion this doesn't affect it's velocity across space, or through the galaxy, but affects it's frequency, giving it a red or blue shift. If we're familiar with EM waves this follows intuition, and it is *not* background independent. In our model light energy is propagated at 'c' through whatever background it is in at the time. It always has a consistent fixed reference frame, the 'immobile' quantum field or dark energy fabric of deep space we believe may give rise to some 25% - 95% of the universe.

If we assume our galaxy is receding from a quasar; When it's light reaches us it passes through the galaxy at light speed in the reference frame of the galaxy. The light that 'just misses' and goes past the galaxy, outside the halo, must take longer to travel the width of the galaxy as both waves can only travel at 'c' *in the field they're in*. The difference is we see the light within the galaxy red shifted. It shifts back when it exits at the other side of the galaxy (to maintain 'c'). The time taken must vary, and causality may be affected^[6]. This and light cones are considered below.

This process matches all observation, and we've detected light that's passed through many galaxies before reaching us^[7], with 'absorption' lines in the spectrum denoting the resultant decay and ionisation. The intense activity at the halo, or 'shocks', would be where the change, or rather *non* change of speed of the waves, but the *change of frequency*, would take place. If we're floating in deep space, and measure the wave energy, we find it's being propagated at light speed. If we now want to get back into the passing galaxy, we have to spend significant time fighting our way through the crazy halo activity, accelerating to the galactic motion/frame, then, eventually, we're in, aboard, and rushing through space with it. Voyager 2, doing a million km/day, is presently taking years to pass through the quite modest bow shock halo of just our solar system^[NASA.gov].

Once in the galaxy and adjusted to galactic speed we measure the light and find it's done the same as us. It's still travelling through the field at 'c' but phase shifted. Our planet is orbiting the sun but light from other stars *within* our galaxy also reaches us through the galaxy at light speed, red or blue shifted subject to relative motion. It also reaches the surface of the side of planet earth spinning towards it at the same speed as the side spinning away, but again with a slightly different

Doppler shift (consider a prediction if not agreed proven). Light must go through the same boundary 'ion' particle zone as a space craft re-entering the earth's own field. (or closely passing it as with the flyby anomaly). We will demonstrate below how this could meet with relativity.

Propagation. Our model retains light speed as a universal constant for each medium, limited by quantum behaviour and possibly related to mass deficiency (see on). Tachyons would not be possible, nor velocity degradation without a change in medium. To achieve the latter it must be reasonable to postulate for the purposes of our model that the energy for the propagation of light through space might, ironically, come from the dark energy field itself. It's important that areas where most Doppler shift is required correlate with those where particle propagation is highest.

This gives our model it's simple symmetry; the greater the field speed difference the higher the frequency shift needed, so the more intense the particle halo boundary zone to effect this. 'Spin' may be both rotation and vibration. If it's constant for each particle type spin must be the prime candidate for the process of propagation. The wave energy held in the Bose-Einstein condensate of Harvards Hau Lab,^[3] or new materials at Berkeley,^[42] would have less problem accelerating instantly back to 'c' on exit if it draws the required energy from the spin of the field. Each particle passing on the complex 'codes' within the compound waves to the next, always at the fixed speed of light. The code may have *arrived* at the particle a different speed, corresponding to 'c' of the adjacent field, but it can only be passed on to the next particle *at* light speed, *thus changing the wave frequency*. A relationship between polarisations of spin and light has already been proven.^[38]

The particles themselves, propagated by the disturbances or 'density peaks', should only be local and short lived. This is consistent with observation, and the effect seen first in 1929 in Neville Mott's Cloud Chamber experiment which was reported as exposing the 'short tracks' of alpha particles from radioactive atoms. Short 'con trails' of particles appeared and disappeared, the next with a high probability of being in a direct line with the previous. It indicated a form of action at a distance or quantum entanglement, now being studied more deeply^[8] and even controlled^[22]. In our model the particles are propagated at the boundary 'impact' zone between the fields, which are in relative motion, passing on wave energy at a constant rate, controlled by inertial spin. This includes all massive objects, the fine structure boundary element growing with velocity and creating a 'boundary zone' condition with the background field. The propagation mechanism needs detailed study, but it's *there to maintain 'c' by adjusting wave frequencies as needed*.

CERN will search for dark matter particles. It seems these may already be visible in the 'parasitic' quantum cloud we're trying to strip from the protons (a cloud containing the vast kinetic energy of motion). Perhaps colliding a region of space with another would promote propagation. Pressure fluctuations themselves promoting particle activity would follow characteristics of EM fields,^[13] but particles may only be required to effect the frequency changes. No conclusions can yet be drawn on this. Possibilities of other Planck scale or foam structures wouldn't seem to be affected.

The link referred between mass deficiency and the propagation rate is suggested in the model as relating to the strong nuclear force, the 'gluon' binding force between particles of mass. Lateral wave activity in accelerators rapidly increases with velocity to an instability threshold. Infinite energy would then be required for further acceleration. In this case the bonding force is only effective at up to light speed. At this point gluons, though constituting 90% of the mass, can no longer 'adhere' and all mass reverts to free unstable particles, perhaps trying to infinitely propagate additional mass particles from the field. The 'photo-electron' cloud density reaches saturation at the same population density of the proton beam, giving space charge neutralisation^[28]. This is a possible option for a physical quantum factor setting, limiting and controlling the magnitude of 'c'.

Wave form. It may be impossible not to reconsider the 'lateral wave' form of energy, including that in the visible spectrum. It is a forgotten paradox that lateral waves could only ever form in a solid, yet light had to be termed 'lateral' not pressure waves, as it was thought they had to be moving through an empty vacuum for relativity to work. In our model we accept that they *are* 'in' a field of something. It may not be critical to the model what form the waves are but, now the reason to move to 'lateral' waves has been removed, the Schrödinger wave function and all the evidence is matched better by pressure waves, propagating within a background medium, as air and water. We should remember that surface waves are indeed only a two dimensional lateral representation of pressure variation within the medium.

Consequences of reconsidering the interstellar 'photon' include re-examining other phenomenon such as Compton scattering, it's low intensity conflict with Thompson scattering, and therefore galactic red shift. The 'tired light' theory was largely disproved by the interstellar photon, not by wave energy, and by lack of a mechanism to absorb energy with no field background, which we now postulate there is. The concept of pressure waves gives high and low intensity zones or lines of pressure with greater or lesser probability of particle activity, as the Schrödinger wave function, and not as transverse 'oscilloscope representation' waves. Waves in media decay in both height

and reduced frequency. The Lorenz transformation, light speed effectively increasing as space expands, is, with the cosmological red shift, a 'chicken and egg' phenomenon. Current red shift data is indeed still very anomalous^[43]. It's still possible that something else may be generating red shift proportional to distance^[23], in which case the expansion rate may still be in question. Consider a length of elastic with a mark at its centre. Stretch it at a gradually *decreasing* rate. Looking through our telescope from one end the far end recedes faster than the centre, but *not* due to accelerating expansion. Light from the far end was also emitted well before that from the centre, which is receding more slowly. This could be said to demonstrate a *reducing* expansion rate, as some theories propose.^[44]

Field Evidence. It may still be argued by some that the 'aether' cannot now exist so it may be easier to consider this as the Higgs Field, with or without massive boson, Dirac Sea, or Stochastic ED. But as well as being a medium of propagation in our own model it has other characteristics; It has inertia, as a reaction to acceleration. It has an Impedance, of 337ohms, this figure in turn being determined by an Inductance and a Capacitance per unit length, as determined by Maxwell. It contains the EM forces, including that creating the Casimir effect, and gravity. Feynman talked of the wondrous ability of particles to instantly condense from it, and disappear back into it on annihilation, perhaps better understood as absorption. We don't understand quite what it is or how it works, but we know *something* exists and allow for those characteristics in our model. We must also remember that all particles propagated have and are affected by gravitational acceleration. Einstein said. "...forces do not exist independently of the state of motion". Such motion must be through *something* as the relative basis to define motion. Also; "*The particle can only appear as a limited region in space in which the field strength or the energy density are particularly high.*"

Proposed model. Now we will focus on the main issue, with the assistance of Christian Doppler. In considering the knowledge sequence and pathway taken over 100 years ago it seems that the main reason special relativity developed as it did, not appearing to work with the aether, was due to quantum mechanics coming along just too late. This helps explain why unification of the two sides of physics is not possible. Let's imagine Einstein knew all we know now about the quantum field, and dark matter. We know light travels across the universe at 'c'. Our galaxy is in motion through space, and light also moves through our galaxy at 'c'. Logic dictates that, within its own reference frame, light *must* 'change speed' as it enters, to stay at 'c'. This is a transformation between reference frames. We propose only waves changing frequency in a background medium can do this as without a medium there is no basis for facilitating phase changes.

In the model we propose the frequency change process is one of the principle functions of the frenetic particle activity, and spin, at the field 'halo' boundaries, the bow shocks of the heliosphere, and our planet, and again when it reaches us in motion *on* the planet. This wasn't considered a viable option a century ago due, perhaps understandably, to the belief this would entail photon particles 'changing speed'. But the dense particle cloud that forms the boundary 'shock' zones of our discrete quantum energy fields effects the frequency change to *maintain* 'c'. Other options were indeed considered then but discarded, again due to evidence that can now be reconsidered in the light of over 100 years of new knowledge. The detailed decision paths taken back then, identification of key criteria we now know were incorrect, and analysis of the different directions likely to have been taken in the light of today's knowledge is given below^{p18}.

The thickness and density of the free particle cloud of a human, or a space suit, will increase as we accelerate through the standing field as it does with individual particles. This will be at a quantum scale and thickness but it is postulated in the quantum side of this model that this is the scale at which light propagates through the field. There must be a frequency change mechanism, and this could probably only occur at or below the scale of particles. It's proposed that no other possibility is reasonable. All mass, including the emitter, the receiver, and any particles or bundles between, would follow this rule. Light and energy waves will propagate at 'c' in any and all local fields down to below nm scale whatever the 'macro' wavelength.

Light measured by a sensor probe 'outside' a spacecraft would similarly be affected by the motion of the sensor, and its own, attached, free particle field. It would therefore measure the light at 'c'. as would a sensor at rest in the standing field. The frequency change relating to the motion of the measuring device occurs at a scale of a few particles from the mass, light can only pass through those particles at 'c' in their reference frame.

And *that is* the very simple basis of the model, meeting Occam's Razor, and helping with the struggle time dilation has in doing this. 'C' is even more of a constant than appreciated. And all reference frames can be equivalent while also being background dependent, yet independent.

The standard 'moving light box' demonstration of Special Relativity has the issue of the diagonal light pulse, being projected downwards yet moving laterally and at significantly more than 'c' from the rest frame. The time dilation and twins paradox solution this relates to is often misunderstood.

Inertial equivalence means only *acceleration* can be used to address it, so it may work in curved space/time GR but not in SR. To avoid involvement in the continuing issues there, and to bring some clarity, lets consider; ***If the sides of the box were removed*** would dilation still be required?

In present physics, but with background dependency, this is *not consistently resolvable*, with time dilation, maths, different geometry, logic, additional dimensions, Lorentz transformation or smoke and mirrors. But it can now be resolved by this model. Fig 1a. below is based on the 'standard' light box diagram, from which the 'light clock' is derived. It does however show the discrete quantum field of the box in motion including the space and any particles within the box and which moves with the box. Viewed from the rest frame (through glass sides) the light path will follow the angled line shown, apparently at a significantly greater velocity than 'c'. But it only ever travels at 'c' through its own discrete quantum field in it's own frame.

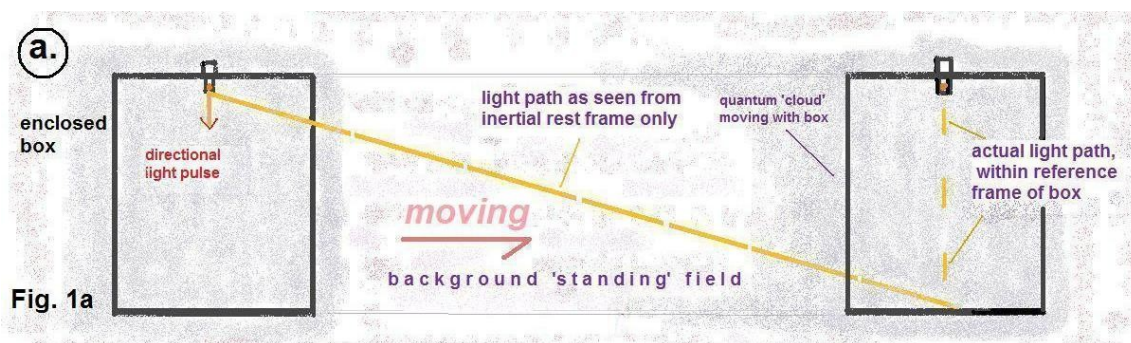


Fig. 1a. Special Relativity Light Box. Standard diagram but using a background dependant model with a discrete 'quantum cloud' field, as experienced in particle accelerators, within and around the mass of the box. (the discrete moving 'cloud' is shown exaggerated).

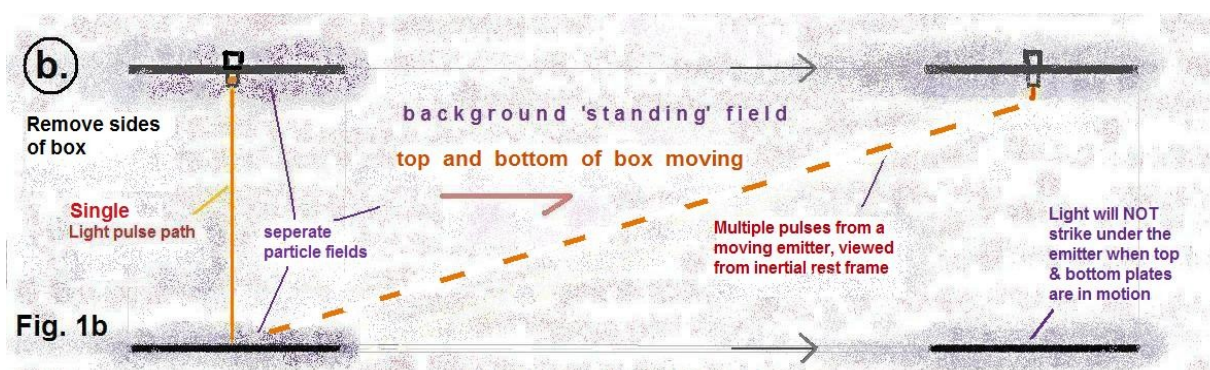


Fig. 1b. Sides of the box removed, but the emitter and receiver are equally in motion through the background field. The result will change. The directional light pulse will not strike the receiver under the emitter. The observer at rest in the background field will only observe the *vertical* light path shown to the left whether the emitter is in motion or not. It always travels at 'c' through the background field.

Fig 1b shows the box sides removed and demonstrates how observation can be matched in a mathematically consistent way with Doppler boundary shifts. Importantly, once the evidence is

properly considered, this also follows logic and intuition. The discreet local fields are shown exaggerated and their depth is proportional, to velocity through the background field. Any other consistent resolution requires a relative leap of faith. This does *not* contradict Einsteins view but explains his comment (GR Ch22) that; "*..the constancy of the velocity of light in vacuo,...cannot claim any unlimited validity*". And only works if we can "*..disregard...gravitational fields.*"

Fig 1c. below shows how light from a non directional emitter would phase shift, travel and reach the base at 'c' in it's own frame. It matches all observational and experimental evidence. This also shows how the light following the angled track can do so at 'c' without the need for, (never yet inductively proven), length dilation. It shows how the standard 'light clock' diagram is incorrect. If the two plates are mirrors a vertical pulse will miss the bottom plate. If the plates are angled, to create the 'saw tooth' light path, we've simply adjusted the clock speed ourselves in the same way as moving the plates apart. The light simply travels on the angled track at 'c' and takes longer to get there, unless it's within it's own 'closed box' quantum field, when it will simply appear to the observer to travel faster than 'c' from our rest frame. Contrary to the 'light clock' evidence for time dilation we now know this can happen^{[16][45]}. (for further astronomical evidence see on).

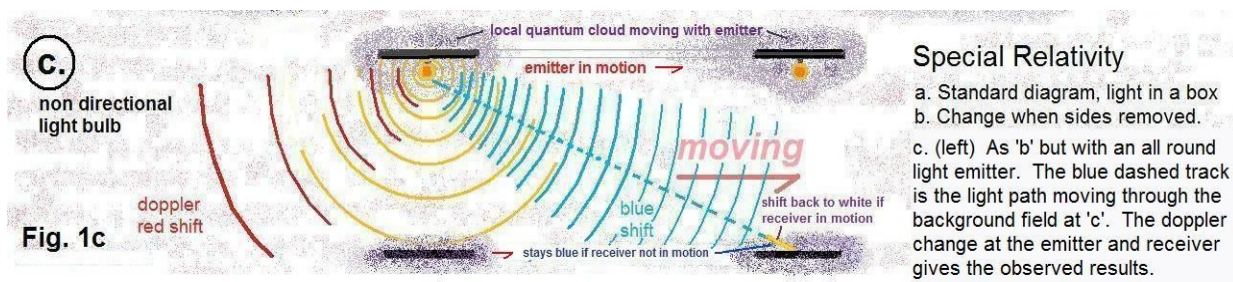


Fig. 1c. Non directional bulb. This shows the light track (blue dashed) for an 'all round bulb' source intersecting the receiver. It is emitted at 'c', moves through the background field frame at 'c', (but blue shifted), and is shifted back to white by the discreet field of the receiver, which then also measures it at 'c'. The disturbance of the local fields moving through the background field propagates the particles, the spin of which effects the Doppler shifts. The Galactic Halo is the same phenomena at a larger scale.

We consider causality, Michelson Morley and the theories of the time further below, but the key point here is that if Einstein *had the firm evidence of a real field we have now*, and had to consider how 'equivalence' could still work, it it reasonably certain he would have discovered this solution. It really only requires some minor mechanical adjustments. Einstein only said the ether wasn't "necessary", and was indeed always quite convinced that 'something' occupied the vacuum^[1].

The Doppler approximation equations for frequency change are relevant for low emitter velocities in relation to 'c'. Those for sound, waves through a medium, are simpler than those for light, where relativistic time dilatory elements are added as well as the significant lateral angle/velocity components. Accepting a quantum field the former can be rewritten in the form for a medium, with 'c' substituted for 'v', expressed as;

$$f = \text{sqrt} \left(\frac{c+v_r}{c+v_s} f_o * f_o \right).$$

(Linear recession condition, and where f = observed and f_o = emitted frequency).

Applying the shift formulae in the correct way is the simple key to removing the light paradox. In the model the frequencies change at boundaries between the fields/frames, including the very local quantum fields of the emitter and receiver, with the background field between them. Assuming the background is consistent, and not expanding excessively, the intermediate field entry and exit will cancel each other out. As the final shift is only experienced in the receivers reference frame the normal lateral angle components are also used when relevant. These will also describe the 'transverse red shift' ^[27] applicable to a pure 90° vector.

The formulae are already repeated for velocities of emitter and receiver. They could however require significant additional repeats for exactness. i.e. Light leaving a binary system will pass out of the stars own field, may pass through the field of it's partner and out again, then out of its solar system and it's galaxy. It may then pass through a galaxy cluster and into and out of two galaxies, including lateral movements and through a solar system in one of the galaxies and an asteroid belt in another. Then into our galaxy, through the solar system bow shock, into our own planets field orbiting the sun, and into a lens spinning with the planet. That would require a string of 19 Doppler equations. The field particles also move due to gravitational acceleration, helping explain the additional gravitational space/time adjustment, new ones propagating at the leading edge of the zone. The model concept and equation may significantly simplify physics but the universe around us is not small or simple. We are likely to know little about the fields the light reaching us has passed through except by spectral analysis.

We should keep the picture of the free action particle quantum cloud around all particles of moving mass in mind to follow the logic of the model. Fig. 2. is a simple representation, or see Cern data. ^[28] ^[29]

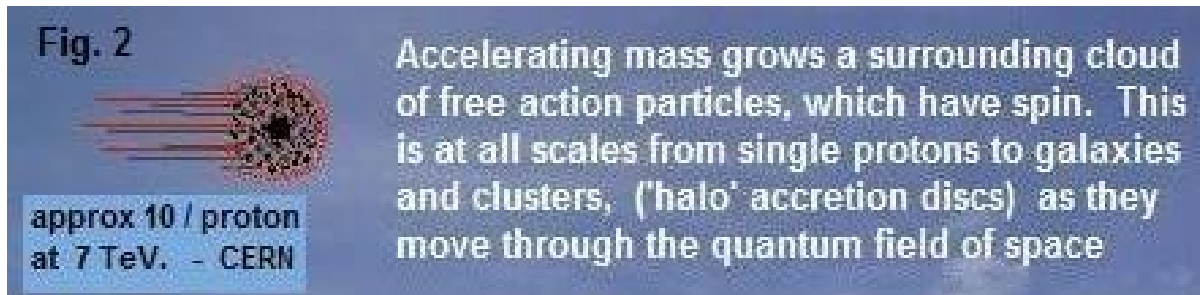


Fig. 2. An accelerated particle of mass, with free action 'photo electron' cloud proportional to velocity.

Model Test. To test the models success in dealing with the light paradox and meeting observation we must move into space to float, at rest, in the standing quantum field of space with a spaceship moving towards us at $c/2$ with it's headlights and tail lights on. The light waves leave the lenses at 'c'. Let's now test what they would now do with our 'free action particle' quantum fields in place around all mass, and check that this meets all observations.

1. The light waves pass through the lens and free action particle field of the spaceship. At the boundary zone they have to blue shift (compress) to pass into and through the 'fixed' background field of space. They reach us at light speed and we, at rest in space, see them blue shifted.
2. We're also moving, towards the ship at $c/2$. The waves do the same from the ship and across space. The blue shifted waves arrive at the boundary zone with our own moving field and have to compress even more to move through our own field at light speed. - Large blue shift.
3. We're moving through the standing field of space away from and *faster than* the approaching ship. The waves do the same again from the ship and travel across the space between us at light speed, blue shifted (someone at rest can check them). They arrive at our field boundary and are shifted back from blue, but past white, as we're moving faster, to show a slight red shift.
4. The spaceship driver looks in his mirror. The supernova behind is moving away slowly so it's light approaches through space, at 'c', slightly red shifted. When it reaches his own field particles the waves are further elongated to stay at light speed, so he sees them even further red shifted.
5. We change direction and move backwards slowly towards the position we started from, looking at the galaxy he is approaching as his ship passes us. The galaxy is moving away from us so we

see it slightly red shifted, (as is the light from his ship when at 90° to us)^[27]. His ship is travelling faster than the galaxy, the red shifted light reaches his field and is shifted past white into the blue.

6. The ship passes us and we watch it go. The light from it's tail lights exits the (clear white plastic) lenses at light speed, has to shift to red at his field boundary to travel through through the space between us at light speed. We're still moving away so it shifts even more to the red when it reaches our own field. We see the lights as red.

7. The ship comes to rest in the field. We move towards it. The light waves leave the ship at light speed and travel towards us with zero shift, at our field boundary they're compressed, so we see his tail lights bluey white.

The concept and mechanism is simply & consistently resolved at every level and for all reference frames. It explains why free action particles are needed, and knits relativity and quantum field theory into *one harmonious fabric*. Both have to be adjusted a little to fit, but adjusted entirely according to the observed evidence before us and without the need for additional dimensions or leaps of faith. Any number of reference frames are accommodated. This all sounds very simple, and it is, but it would have some fundamental consequential effects on physics. Einstein did say when we find the answer we're searching for it will look so simple and elegant it will be obvious it *must* be right. But one of the tests is; can it solve or help solve other issues and paradox.

Paradoxes. It seems many of the above paradoxes and problems in physics could indeed be resolved as incidental consequences of this model. We've considered the duality of light, which is now not necessary through the wider energy field of space. It may now have a different duality, the locally propagated photon 'plasma' particle and the dark energy element of the Schrödinger wave prior to propagation. Linked to this we've mentioned particle conservation, and it must now be considered whether *any* particles of mass are or can be conserved unless they forge together with others, using the strong nuclear force to become long term 'mass' and avoid reverting back to field energy.

The twin slit experiment 'split photon' paradox, leading to Feynman's sum over paths, and it's interference pattern, is explained by the simple fact that light really *is* just wave energy propagated in the field with particle disturbance probability varying with density. The wave sphere does grow through virtually the whole universe from the emitter. Some feel this subject has been debated to

death and duality cast in stone, but that's not good science. Continuous review and fearlessness, or perhaps innocence, is needed to find truth. The scale of the backboard wave pattern is macro in relation to the quanta that build it up. Quantum oscillation, a nanosecond scale phenomena, (if controllable with phase shaping,^[41]) is not the macro wave and interference pattern we observe.

The explanation of photon ejection speed in the Photoelectric effect is simple Doppler shift, blue shift compression of energy into shorter waves. Vibrational momentum stores energy just as the angular momentum in rotation, and spacecraft use vibrational gyroscopes. Recent German UV laser photoelectric effect results are not consistent with classic discrete photons^[21]. Science is still edging away from the long range discrete photon in favour of simple wave energy.^[31]

Even the Aharonov-Bohm effect^[17] may be at least partly explained by the fact that the generating apparatus and dense EM field particles also create gravity to affect the waves. The unstable edges of galaxies, with inadequate visible mass to hold them in against the angular momentum generated by the 914,000 kph velocity, can only be explained by mass in the boundary halo, in turn caused by the motion itself. Our recession from M51 by 500km/sec. and closure with Andromeda by 100km/sec. will also contribute with a high but unknown velocity through the field of deep space.

The excess gravity the Pioneers and Voyagers found in galactic space, can now be explained by the dense free unbonded dark particle mass of the solar systems shock, or halo,^{[47][48]} and by the resistance of the particle propagation proportional with their velocity through the field. This supports Newtons second law with no MOND adjustment needed. Our planets own 100,000kph velocity round the sun as well as our rotation generates our own field boundary particle activity.

This model is not proposed as a universal 'theory of everything' but the conceptual outline of an option with implications that suggest a number of paths to other solutions, which fits a full range of recent evidence better than some which were formulated before it was available. It therefore deserves serious investigation and testing. Most of the discussion so far relates specifically to special relativity but it seems that general relativity, including curved space time, and the search for quantum gravity, may also be usefully informed by the model. These are largely separate matters, which will be considered in a further paper to follow shortly. It will however become apparent that Stephen Hawking may be allowed to collect on his bet that naked singularities can't exist. It will also discuss possible implications in other areas.

It has been difficult to conceive tests to disprove the concepts proposed. Proof that mass could travel through the field devoid of free action particles would raise questions. CERN considers the electron clouds hamper their work and are working on ways of reducing them^[28]. Proof that light can travel at any more or less than light speed through any more than the smallest quantum of space between two particles would certainly bring the proposal into serious doubt. These seem difficult to prove, but there were two more issues to consider; Causality, and, perhaps not yet recognised as a paradox by most, Irwin Shapiro's lensing light delay inconsistencies.

Shapiro Delay and Causality. In the, hopefully rigorous, testing of this model a serious problem arose which originally looked as it gave cause for abandonment of the concept. It was; If we are able to see gravitational lensing of a distant light source by a large intervening galaxy with high red shift, or even two such galaxies, we'd be seeing the light passing through the galaxies taking significantly longer to reach us than the light being lensed around it. And the arrival difference could easily be weeks or even months.

A Galaxy 10 light years deep moving directly away at $0.2c$ would delay the light passing through it by over 500 days more than the light lensed around it. Patently ridiculous, as Einstein might have said? It would certainly have a far more dramatic effect than the simple Shapiro 'curvature' delay Fig. 3. shows light paths through and (lensed) around a galaxy rapidly receding from the emitter.

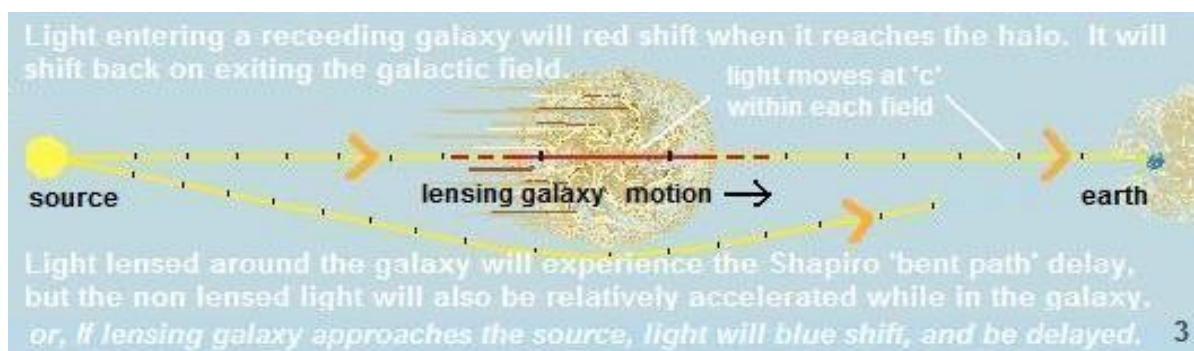
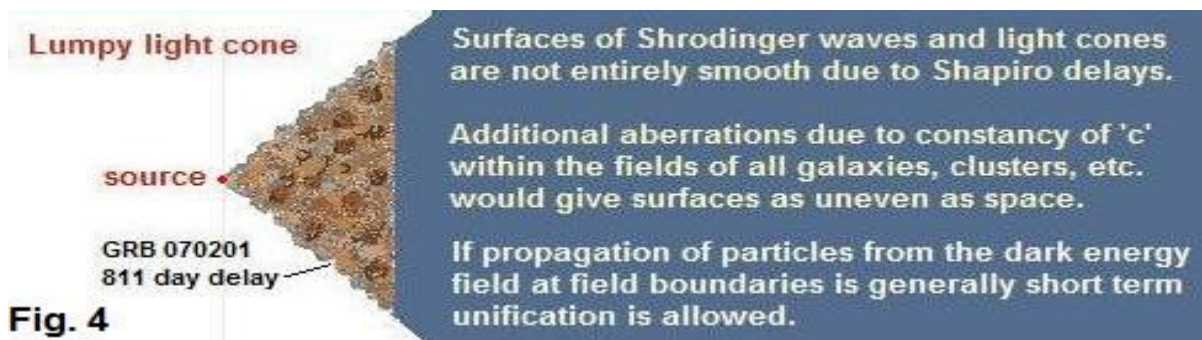


Fig. 3. Galactic Lensing. Anomalies in lensing and Shapiro delays are resolved by the model. Light travels at 'c' in the reference frame of the galaxy it's passing through, changing it's arrival time at earth.

This would also have bizarre effects on our causality light cone, as would the Hau Lab, and now the Berkeley 'slow light' effects. So the latest data on lensing and the 1964 Shapiro effect was investigated. Checking Venus on radar when near the sun Irwin Shapiro found a delay of 200ms to the curved light, meeting prediction. The 'Shapiro delay' in gravitational lensing is caused by space/time curvature, creating a longer path. This affects light cones and, potentially, causality. See the 'lumpy' surfaced light cone it would give in Fig 4.



Light cone. Uneven surfaces caused by Shapiro Delays can be further exaggerated by the difference in arrival time of light passing through, and lensing around, galaxies, accounting for 'Shapiro' anomalies.

But there is some uncertainty and inconsistency with Shapiro delays. For objects in our solar system it can be calculated with great accuracy, but to make the later Jupiter observations work an additional vectored velocity for the planet had to be included.^[9] Even then there was a discrepancy and Kopeikin had to attribute this to gravity slowing the light, adding a substantial adjustment for time dilation. More distant observations will be more inconsistent with significantly greater delays than anticipated, but at such distances accurate prediction is impossible. Without a datum there is no check. They are none the less used as a datum themselves to estimate distances & mass of objects. Including the additional distance travelled through distorted space (Fermat's principle), and an allowance for 'time dilation', intervening objects might need to be super massive black holes. Large measured delays still encourage the view that gravity must slow, rather than just red shift, the light within the background frame, gravitational, not motion, dilation.

Papers were written on additional time delays caused by other 'dark' objects, and probabilities were at best 'unclear'^[10]. This was another paradox but little recognised as such, the accurate results of some nearby observations disguising the issue. A tendency for discrepancies not to be advertised may also play a part. The other key point is that the difference *doesn't have to be a delay*. It's assumed from the Shapiro effect that it must always be a delay but, using equivalence and relativity, it could also be the first image accelerated. This would be on the more rare event of the lensing object moving towards us, giving a blue shift. When light passes through a receding galaxy the *non lensed* light is delayed the most, confusing the issue further and reducing relative delays. As with the red shift expansion issue^[43] some controversy and confusion remains^[33].

So, from the long established Shapiro effect we know the surfaces of causal light cones are not entirely smooth. Let's consider our whole universe (you may now stand in respect at that thought

as Alain Connes once suggested) which is lumpy, uncertain, uneven and moving. Parts of the Schrödinger wave spheres pass through galaxies and clusters, catching lifts, or being delayed by galaxies going the wrong way. This makes the sphere surface rather more lumpy than Shapiro did. We may perhaps find the average ratio of lumpiness of the cone surface to radius works out to say 1:140 or so. Or, with all those galaxies around, perhaps even as much as the mass deficiency!

But a few weeks delay could give a very big lump on the light cone surface, and the difficult problem of proof remained. Then, checking astronomical results came the answer from Belgium; B1600+ 434, is a double gravitational lens system at red shift $z = 1.589$. lensed by two galaxies, one 'edge on' both at red shift $z = 0.414$.^[11]

The maximum time delay between the images was an astonishing 51 days. But then SN 1987a was found at 74.5 days, delay, and GRB 070201 at 811 days delay.^[24]

Other similar cases exist. This has also cleared up the unannounced but 'anticipatory' paradox of Shapiro delay inconsistencies with significantly higher delays than could be expected from simple curved paths, and confirmed that gravity probably still does *not* slow the speed of light. This large lensing delay effect started as a prediction, but one so bizarre that this paper would not have been published if the observations had not been carried out. Greater delays are predicted. Time and GR are thus in many ways only simple 'relational' theories. Maryland's Jacobsen and many others have long realised a preferred state of rest must be the only answer to unification. See also Fig. 3.

Choice of paths. So, if we took a wrong option, where exactly was it? After much deliberation years ago we decided there was effectively no ether and have worked on that basis ever since. Now we know there *is* a quantum field 'ether' of some kind but haven't returned to review all the consequences. In that case it's no surprise our theories don't fit with a quantum field. It was after all our 'holy cows'; the Lorenz transformation, Photons and Relativity that needed reviewing. The paradoxes may have meant few who fully understood them were entirely confident with them anyway so left well alone as we're resistant to questioning long established paradigms. Work has been done ^[26] and a number of theories put forward, but with little evidence. But we're now able to use the ideal scenario, go back, and evaluate broad evidence from 150yrs in the future.

Fresnel / Stokes Ether Drag. This was a watershed. Heaviside pointed the way, by showing a spherical electric field lost symmetry in motion, in 1889. Michelson and Morley tried to show this went for light as well but got the famous null result. If they'd been able to do this in space rather

than a cavern the results would have been different^{[25][46]}. But conceptual thinking was strong and many, including Fresnel in 1818, George Stokes in 1845, Arago and Dayton Muller etc. supported the 'ether drag' hypothesis, that the ether surrounded, and stayed with, massive objects. This is the forebear of our proposed model. It was also here the wave theory of light was originally proven and ruled the ether. Fresnel's equation allowed for a 'partially dragged' ether, but didn't account for chromatic dispersion, apparently violating Snell's Law. Fizeau nevertheless seemed to confirm Fresnel's theory, and Lorentz showed later how it could be applied to an immobile ether as well as to phase shifts with a non Galilean effective time parameter transformation; $t' = t - vx/c^2$.

Stokes meanwhile had proposed a 'fully dragged' ether, but there was limited acceptance of either theory. A principle reason for non acceptance of any 'ether drag' theories at the time was based on the fact that the flow field around a sphere cannot give zero velocity at its surface^[30]. Lorentz said; "...this assumption of an enormously condensed ether, combined, as it must be, with the hypothesis that the velocity of light is not in the least altered by it, is not very satisfactory."

He pointed out to Stokes that ether drag would only be acceptable if the speed of light was not affected by change in density of the ether, which 'plainly contradicts wave propagation in ordinary substances'. We now know that while this may be true of the ether they envisioned it is not true of the quantum field. Only the wavelength and not the speed of light is affected, except by mediums of matter as opposed to the vacuum. Two misconceptions due to limited of knowledge, both now correctable, had lured opinion onto a different path. Stokes prophetically said *"It is very difficult for us,..."* due to our lifelong *"..condition of training, to say what would have been our feelings had such training never taken place."*

An argument used against ether drag was a stellar aberration, seasonal movement of stars. From knowledge of Diurnal and Secular aberration, the field, the troposphere, heliosphere and galactic halo^[19] we now know the argument was misconceived. Oliver Lodge first found the answer.^{[25][46]} The 'canting' of wave front angle entering a laterally moving field is precisely the effect which would be created by rotation of the earth's ionosphere at the point of change in frequency.

But, struggling to prove an alternative theorem, Lorentz had come up with a complex geometry and equation that could work with no ether, explaining the remaining paradox with time dilation. This removed most of the ethers mechanical qualities. Then Einstein, perhaps impressed with that sidestep, seized on dilation to develop equivalence into special relativity. This appeared to have to remove the last characteristic of the ether^[1]. It retained the light paradox but that was partly

forgotten in the complexity of reference frames and dilation. Later evidence that light followed the curved space time of generalised relativity, cited as evidence for a photon with effective mass, led to the further paradox of duality, and another blow to the luminiferous ether. Again, when accepting the photon as a zero mass 'wave bundle' we didn't review the previous conclusions about gravity and propagation, seemingly engendering misconception. Some still may feel now, as with the Shapiro violations referred above, that light, or the 'photon', is affected by gravity in a different way to other EM waves. In our model there is no difference, curved space time affects all.

Fresnel's equation had been used by Einstein, unchanged, for relativity. It could now be slotted straight back in with a quantum field. Crucially it would explain why the dark *matter* halo has to vary proportionally with the speed through the energy field; to balance the system. The greater the Doppler frequency shift required the denser the field is to achieve it. This is not entirely the case however^[28]. The profile of free particle cloud build up in an accelerator is initially consistent but then seems to transform to a non linear profile, and oscillation moves from longitudinal to lateral. There is also a possibility that a form of oscillation is in *rate* of motion, which would help explain detection probabilities, but all such detail requires much further investigation and analysis.

An overwhelming body of evidence has now proved the quantum field a reality accepted by most, and confirmed the wave function of light. But we never returned to inform and untangle the confusion of previous theories, which has allowed gaps and paradoxes to grow between these and modern discovery. The physics of the quantum halo and Doppler shift suggested in the model is far simpler and more symmetrical than that we've been struggling with, and would neatly fill those gaps. Einstein knew, and said, proof of an ether could disprove special relativity. We've thought it fit not to accept that but should now reconsider. The *effect* of special relativity is correct in any case, we may now just understand the mechanism better, the mechanism we already know from QM, the standard model, its extension and our growing understanding of Lorentz violations^[36]. The energy of particle generating boundary disturbance appears to be kinetic, implying an initial mass to allow $mv^2/2$, which may quantify halo activity and velocity in line with accelerator data. To adjust Huxleys quote, if the evidence is correct this may be; 'The slaying of a complex ugly hypothesis by a beautiful fact.' and possibly even bring an example of the Ionian Enchantment.

A Broad Church. The model works, and in a simple elegant way, but it's adoption demands some fundamental re-thinking of some older ruling paradigms. As the work of so many has been based on previous assumptions they may still be difficult to stand back from and re-evaluate. The sub

atomic universe needs far more exploration and there is a need for many to follow up on the implications and questions raised. Physics is now a broad church with many areas that require review. The church of Copernicus and Galileo's day struggled with this. Are we now genuinely able to study and consider different concepts in a new light, and perhaps abandon old beliefs? The solutions to problems and paradoxes are inductively demonstrable, and a central part of the answer was postulated by Fresnel, Stokes et al. Adjustments are constantly being considered, even in main-stream physics^[26]. Erwin Schrödinger said "*..the scientific picture of the real world around me is deficient.*" and "*..ghastly silent about all and sundry that is really near to our heart, that really matters to us*". Feynman said new concepts would always look strange at first^[18]. If we'd never seen a bicycle we'd struggle horribly to ride it and be afraid, but it would very quickly become intuitive to most. Smolin is concerned that physicists aren't; "*..doing all we can... ..to find the true theory.*"^[15]. and "*..recognise the wrong assumption*". Physics is now too broad for anyone to be a specialist in more than a few areas. An important specialism of it's own now is perception and overview. The need for the '*new way of thinking*', suggested as needed by Einstein, Feynman etc. now needs to be accepted, explored and developed, to expand perceptive capabilities hand in hand with static numeration but utilising our minds in more than just that way.

Consequences and Predictions. The light delay prediction above was forestalled but others can be made; One relates to the moving light box demonstration (Fig.1). Another predicts, also probably bizarrely for some, that we will find phenomena apparently moving significantly faster than light speed across space where moving within a fast moving galaxy field, also removing the oft quoted 'light clock' evidence for time dilation as also already evidenced^{[16][45]}, and noted in *B* below. Predictions *A, C, D, and F-K* will be provable by experiment or research, including in space or at the LHC and *E* may be proved over time. Other experiments can be devised.

A simplification of equivalence can be considered via our two people floating in space with digital clocks. At constant range the others clock will seem to be set set slightly slow (0.001sec/300km) due to light (event) travel time. If either accelerates, reducing separation, each will see the others clock running slightly faster, not slower, (with light blue shifted), until they pass, when the times will read the same. The others clocks will start losing time as they move apart. This would not require dilation, and meets Occam's razor and observation. It is a geometric adjustment and no new maths is needed. Einstein said; "*I hold it true that pure thought can grasp reality.*" Also in 1954; "*..there is in my opinion a right way, and that we are capable of finding it.*" Feynman said; "*Nature will find a simpler way to do things that we have thought of.*"

We now know light cones are not smooth but lumpy, and may be lumpier than made by Shapiro. We know light can accelerate from zero to 'c' with no energy, apart from what it may draw from a background field. Indeed if its speed is reduced to zero its energy may be zero; $e = m$ multiplied by 0^2 . But can a discrete 511KeV local 'Photon' energy pulse be held at zero energy then given the energy and velocity back again by simply releasing it? In photon-photon pair production mass is propagated to make an electron and a positron, but they're immediately re-absorbed to leave the photons, with zero mass; $e^2 = (pc)^2$. If we open our eyes and look in the right direction, and with the right perspective, we'll recognise the rich new vein now to be explored.

Further consequential and related effects on quantum gravity, black holes, expansion and travel faster than light are considered in the full paper and will be covered in a further article. This paper is not providing a leap through dense jungle ahead but a retracing of steps and lateral repositioning to a clearer pathway to achieving progress on a broad front. It should help clarify time dilation, and LHC work might be more usefully focussed and results better interpreted. The model implies that the standard model of particle physics is not yet complete or fully understood. This is already suspected with new evidence on multi muons from the CDF collaboration⁽³⁴⁾ Most work on the consequences of this models is still to be done, and most maths is deferred due to space. Criticism of detail would be as easy as criticising the first bicycle for not having gears. It would miss the big picture, and effort will be better spent on disproving it or exploring all its many implications.

Conclusions.

A simple logical model is evidenced which explains relevant observed phenomenon at both the quantum and cosmic scales allowing effective relativistic equivalence. It is based on the axiom that 'c' is constant in all fields, from a group of sub atomic particles to galaxy clusters and nebulae. Free action spin particle fields, or 'clouds', exist around all mass in motion through surrounding fields, increasing with velocity. Particle spin allows phase changes in the wave disturbances to maintain 'c', and is thus associated with wave propagation. Cosmic shock anomalies are solved^[49] Including that;^[50] *"These weak shocks frequently exhibit wave structure upstream and downstream of the shock inconsistent with early ideas of the formation of these wave trains"*. Particles are not conserved in the long term but are condensed from and absorbed or 'evaporated' back into the background field as pure 'dark' energy when disturbance subdues. (Entanglement is more credible with a field medium, and gives an indication of medium characteristics). The small adjustments to and clarification of SR postulates and QFT allows the full unification of physics.

If mass is produced by disturbances in the dark energy field due to motion Einsteins comment "*there is no energy without motion*" may be extended to say there would also be no mass without motion. He also predicted that "*one region of space may move faster than light through another.*" Material moving *within* a region at the same vector the region is moving through another, or the background, field, could do so relative to that field. Evidence of this has recently been found^[16]. Whilst not directly allowing travel faster than 'c' this may open the way to possible express 'tubes' of particle beams within beams effecting the same result. The problem will be a stable start point. The simple basis for the model, providing effective and simple equivalence, is shown in Fig.5.

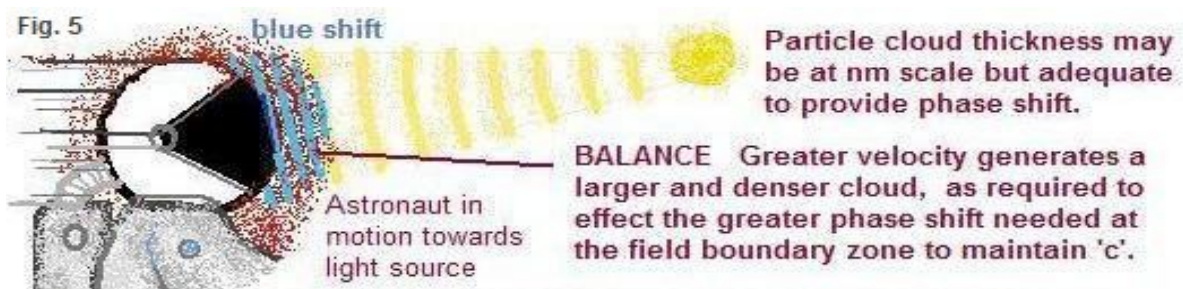


Fig. 5. Doppler shifts at boundaries. The model says that particles behave similarly whether in a small bunch in an accelerator or a large bunch in a galaxy, and anything between. Increased velocity brings an attached thickening cloud of free action particles through which light will propagate at 'c',

PREDICTIONS

Prediction A. If we repeat the special relativity experiment of a light pulse in a moving box of significant height, but with the sides of the box removed, the pulse would meet the floor *behind* the vertical. This is due to the light having to travel through three discrete fields, that of the emitter, the intervening standing field, and that of the floor. The offset would relate directly to rate of motion. See Fig 1c. Light from an 'all round' emitter in motion isn't required to exceed light speed in any reference frame. (Yet it could do so; see Prediction B). This corrects an error in the light box diagram and also removes the fundamental 'light clock' need for time dilation.

Prediction B. If we were able to measure the velocity of light waves moving through another field already moving in relation to our own they would be travelling faster or slower than 'c' in our frame, subject to the field vector. Note; This has already been found for particles. Ejected gas has been measured at between 2.5 and 6 times light speed from our own reference frame (Galaxy M87)^{[16][45]}. Gas at GRS1915+105 is measured at 1.25 x light speed, but within it's own reference frame it is travelling at 0.92 x light speed. This confirms that a 'velocity addition' equation *does* work where the other field is in motion relative to our own. If we watch a fast moving plane and

observe a shot being fired forward inside it we will observe it moving faster than its maximum muzzle velocity in our own frame, and light will also be observed as moving faster than 'c'.

Prediction C. Passing a dense stream of particles past a small light sensor with effectively zero eddying may allow a frequency shift at the sensor equivalent to the speed of the particle stream.

Prediction D. If light or wave energy is measured by a craft in transit to or from the space station or beyond it will find it changes velocity in the planets reference frame at the ionosphere, and it will in each case be propagated at light speed in relation to the background, but phase shifted.

Prediction E. The Higgs massive boson and the graviton 'particle' as such will not be found. Particles will be propagated by disturbance of the energy field by other particles bordering other energy fields moving within it, and probably also by major energy wave fluctuations.

Prediction F. If an accurate version of the Michelson-Morley 1887 interferometer experiment were recreated outside the international space station, with rotation in the orbital plane, a different result would be found to that at the earth's surface. It would show high fringe shifts and a strong positive result for a background quantum field 'ether', violating Lorentz symmetry.

Prediction G. If Fresnel's velocity of light and drag co-efficient equation, as used by Einstein in relativity, were tested in space it would work perfectly in the quantum field at any velocity.

Prediction H. The Q value $(m_1 - m_2)c^2$, or the missing mass that the LHC will be looking for reverts to 'dark energy' by being absorbed back into the quantum field, filling the 'Dirac Hole' to reduce the gravity previously associated with the former particle to zero.

Prediction J. If a laser is fired within another laser beam it's propagation would be measurable at greater than 'c' in the rest frame. The same would be true of other energy/EM waves. If a further beam were fired within the second it would propagate at significantly faster than the 2nd beam.

Prediction K. The gravitational acceleration of earth measured from orbit will be greater than the 2nd Law anticipates in comparison to that at the surface due to halo particle mass. This will be inconsistent, higher both in advance of our solar orbit ('bow shock'), and at lower latitudes. Shock and Halo particle propagation and ACR's will prove to be caused by the relative motion of planetary, heliospheric and galactic fields within the surrounding fields.

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