Doppler Assisted Quantum Unification allowing Relativistic Invariance.

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Abstract.

Free action photo electron cloud build up to accelerated particles is considered, including its relationship to quantum fields, E.M. wave propagation and particle non - conservation. Related implications from cross discipline experiment and observation are reviewed and analysed. Correlations between this, the standard model, field theory, cosmological shocks and halos, dark matter and astrophysical anomalies are drawn and a new model is derived and tested to explore its ability to remove anomalies and paradox. The conceptual model utilises Einstein's postulates of Special Relativity, and constancy of 'c', and his opinion that *"We can't solve problems using the same kind of thinking we used when we created them."* also the conclusions of his 1952 paper[1] that inertial reference frames in space are actually *"an infinite number of spaces...in motion with respect to each other."* The historic pathway to, and assumptions following, the S.T.R. are reviewed against current data and an adjustment derived. A quantum mechanism for Doppler shifting emerges via 'Discrete Fields' which appears to allow Locality with the Reality Einstein sought from a Unified Field Theory.

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 aether, the only property Lorentz 'left it with'[51]. 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. The existence of a quantum field of dark energy and matter of some 93% of the total energy/matter of the universe, is now well evidenced.[2][19]. Generalising relativity to include gravity exacerbated the problem as quantum physics 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. We are still learning about QFT, but GR, followed Maxwell as a field based theory, giving a dichotomy with SR. It's ignored by many that Einstein said in number of ways; "*Space without aether is unthinkable*" and; "*there exists no space empty of field*" (1952). Einstein knew very well that his theory was not yet resolved, saying in a letter to Max Born in 1944 ; *"I hope that someone will discover a more realistic way, or rather a more tangible basis than it has been my lot to find."* and in his 1952 paper; "o*ne should not desist from pursuing to the end the path of the relativistic field theory*". It is also accepted that tensor field GR can't describe spin-orbit coupling due to it's basis in Riemanian geometry. It must fail when angular momentum is present or Cartans complex additional theories must be added. As most mass in space has rotation, and in so far as the spin of of quantum particles may relate to rotation rather than oscillation, the issue between GR and QFT remains. We may only derive from this that the problem preventing unification of the quanta and relativity may lie with either or both. Worthwhile alternative solutions can not be developed for testing without following Karl Poppers advice in revisiting some ruling paradigms. This is done here.

We learn to live with paradox and unexplained phenomenon as the left side of our brains requires it (Aamodt-Wang). Such phenomena include; EPR entanglement, wave particle duality, particle conservation, Hardy's paradox, transverse waves in non solids, the twins paradox, infinity in singularities, a dead and alive cat, black hole data loss, the photoelectric effect, gravity, unstable galaxy edges, Newtons 2nd Law, the Pioneer, Voyager and flyby anomalies, the light box paradox of SR, Lorentz violations[26][36], and Anomalous Cosmic Rays (ACR's) in the Heliosheath[48].

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. 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]

In reviewing basic equivalence and gravity in current quantum and cosmic frameworks an option emerged regarding the use of Christian Doppler's equations appearing to offer a possible 'master key' to unlock a wide suite of issues. A model of this was developed, explored and tested and the

results are discussed in detail below. The description follows Einsteins 'comprehensible language' and 'intuitive logic' postulates[1b] and triple helix analysis,[32] 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 further papers.

Core Issue. The 30 year Einstein-Bohr battle was about concepts of reality. Einstein insisted reality existed with or without observation, but the father of the Copenhagen interpretation of QM insisted the observer was en essential part of reality, which did not exist without him. For Bohr a particles position did not exist until it was measured. For Einstein it was there anyway, and quantum uncertainty only related to our inability to measure it. The best proof of Bells Theorem of inequality is considered to have settled it in favour of QM, but there is no proof of the proof when spin is still so poorly understood, and the proof demands EPR's 'spooky' action at a distance is possible, which is even less well understood and seems also to demand a background field. The issue may then perhaps be resolved to one of, or in terms of, Reality and Locality. To defend his position Einstein had to give up Locality to preserve his precious Reality. A solution would rejoin the two. A physics with a physical and at least largely predictable quantum reality that is also locally consistent.

Central to the STR, and related issues of unification with quantum field theory, is Equivalence, and its basic apparent 'light paradox'. Put simply; If a spacecraft, with headlights 'ejecting photons' at light speed was approaching at $^{C}/_{2}$ the photons would still cross the space between us at the velocity 'c', "*irrespective of the velocity of the emitter*", and also be measured by us at 'c'. If we were also in motion it would cover the distance between us at the same rate/unit distance, but we would still measure it at 'c' when it reached us. When the ship has passed, the photons from it's tail lights would also reach us across space at light speed with respect to (wrt) 'space', but red shifted. The light from the approaching headlights was blue shifted, but 'c' is constant, *both* wrt the distance across space between us, *and* wrt us. This is the basic paradox of the STR, which says each of two astronauts in relative motion has an equal right to say he is at rest and the other is moving. A third, 'ether', inertial reference frame would destroy the equivalence of the first two.

A vectored dark energy field where the old 'ether' was is now more accepted and understood,[2][39] but until this central relativistic paradox is resolved it cannot reasonably be universally adopted. The light box / light clock demonstration of SR has the same apparent paradox of the angled pulse track within the moving box having a velocity greater than 'c' viewed from the rest frame. This

conceptual issue gave rise to the Lorentz Fitzgerald transformation and Einsteins solution, time dilation and length contraction. If nothing could travel faster than 'c', then space and time must change, and it may be assumed that no observer could *see* anything moving faster than 'c'.

We've since explored space and quantum physics and have a lot more data on both. The decision we must take is whether to retain our past beliefs without question, and accept current paradoxes and anomalies, or to re-test them against current knowledge. The mainstream view has tended to be the former. He we try the alternative of the latter option. The normal non-falsifiable approach of theoretical physics will be avoided wherever possible and predictions derived.

Model Axioms. Based conceptually with minimum dimensions in Minkowski space time, the issues with spin implicit with Riemannian geometry are avoided. It uses five pertinent axioms;

1) The postulates of SR are followed. The speed of all EM wave propagation through and locally to any part of space remains at the constant 'c'. This also retains basic causality within the models.

2) Light waves are energy fluctuations propagated through a medium. This is a non-defined form of 'quantum field' including 2.7^0 of heat energy. It is 'immobile' in Einstein's terms and when subject to perturbation is able to propagate quantum level energy concentrations which may be considered as particle activity.

3) The same basic laws of physics apply at all scales. This may mean that the wave function also applies at all scales, from a quantum 'ripple' to a tsunami.

4) Photons are not conserved. Free 'particles' cannot in any case be conserved for unification of relativity and quantum theory to be possible, and few have been continually observed for long. A photon may be Einsteins wave 'corpuscle' quanta of EM energy, but may condense from and be reabsorbed by the energy field. Real, but perhaps non existent if not observed.

5) Reality is maintained. The observer may change reality, including by disruptive measurement. Different observers perceptions will depend on the individuals quantum receptors, but phenomena may exist, with the same properties, whether passively observed or not observed.

The model is constructed of Local inertial frames related to all mass, but, using Reality, proposes these are actually discrete fields of medium. We will term it the Discrete Field Model (DFM).

Photons. A short comparison with some classical photons may be needed. These are zero mass wave bundles, generated by a light source billions of light years away. Population 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 sphere twice the diameter of the emitters distance away. They have zero mass, so $0 \times C^2 =$ zero energy, but they precisely maintain light speed entirely 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 they instantly accelerate back to 186,200m/sec. under their own power. These are not depended on by the model but short range short life photons are allowed. Good evidence exists[37] for the 'quantized energy' short range particle propagation and activity[31] and the Schrödinger wave function for light is used as a sector of the full EM energy wave spectrum.

Quantum Clouds and Halo's. Where the Lorentz transformation 'relativistic' curve has proved to work is where particles are accelerated through the vacuum. They absorb exponentially increasing energy the closer they get to light speed, needing almost infinite energy above 99.9999% of light speed. The laws of conservation of energy seem to be breached as they accept and absorb this energy for reducing additional 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 in proportion to increased speed[35]. This, and the momentum, also increase its total inertial mass towards infinity[4]. See Fig. 2. page 12. We also have growing evidence of galactic halo's, planetary shocks, and of the solar systems heliospheric 'termination' and bow shocks.[47] It seems a similar phenomena may occur at all scales as mass, and discrete fields associated with that mass, move within and with respect to each other[2][5].

The Earths bow shock is considered to be generated solely by the ejected active solar particles interacting with the magnetosphere. In this case the shock will be essentially solar orientated[55]. The model predicts the shock[57] will be orientated more to the planets motion through space. The intense bow shock of the heliosphere experienced by Pioneer and Voyager [47][56] is indeed orientated to the motion through the galaxy.

The high mass of the earth's shocks would help to explain the 'Flybys anomaly', six spacecraft flying by earth since 1990 experiencing unexplained accelerations. (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 is being 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. Voyagers 1 and 2 are bringing major shocks at the intense particle activity[47] approaching the termination and bow shock edges of the heliosphere. This has been considered the 'extent of the solar wind', but our model suggests this propagation activity is due to perturbation caused mainly by the velocity difference between the solar system and galactic quantum fields, generated at the boundary zone by the heliosphere's 220k/sec (45,000mph) motion through the galactic field. It predicts consummate Doppler shifts, and early indications are that these have started to be seen. Galaxies and clusters, both spinning and moving through deep space, will have the most intense areas of halo particle activity at the edges of their fields, as 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 it is predicted no proven conflict with the DFM will arise.[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 condense from the 'dark energy' of the field, and hold high energy, conserving the input acceleration energy, 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, as seems to be the primary form, vibratory resonance. The field disturbances propagating particles may include those of energy wave fluctuations themselves. They certainly arise from field disturbance by the halo particles of massive objects, from single electrons and bunches of protons to galaxies and clusters, in rapid motion through the surrounding 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 70% - 75% of the universe.

When light from a quasar reaches a galaxy receding through space it will pass through it at the light speed of the reference frame of the galaxy. The model says the light that '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 that the light within the galaxy is red shifted. It shifts back on exiting the other side of the galaxy, which maintains 'c' locally. The time taken must vary, and causality may be affected[6]. This is considered with light cones 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 frenetic 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][47]

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 Doppler 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 frequency shift (consider a 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 the 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 is searching for dark matter. It seems this 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). Pressure fluctuations themselves promoting particle activity would follow characteristics of EM fields,[13] but particles themselves may only be required to effect the observed frequency changes.

This is unknown and no conclusions can yet be drawn, but wavelength is a function of relative velocity of emitter, receiver and intermediate carriers. Possibilities of other Planck scale or foam structures would not seem to be affected but the model lacks any such quantum structure beyond the energy of spin or oscillation at present.

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 or medium. It may 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 observed evidence seems to be matched better by 'pressure fluctuation' waves, propagating within a background medium, as with air and water.

Consequences; Some consequences of reconsidering the interstellar 'photon' may include the re-examination of 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 a medium decay in both height and reduced frequency. The concept of light speed effectively increasing as space expands, is, with the cosmological red shift, a 'chicken and egg' phenomenon and current red shift data is still very anomalous[43]. It's still possible that something else may be

generating red shift proportional to distance[23], so 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 is logically said by some to demonstrate a *reducing* expansion rate.[44]

Field Evidence. It will be argued by some that the 'aether' cannot now exist. It may be easier to consider this as the Higgs Field, with or without a 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 permittivity, and 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, and perhaps a slow as well as instant process. 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."*

As our galaxy is in motion through deep space, through and wrt light propagates at 'c', and light also moves through our galaxy at 'c'. Logic dictates that, within it's own reference frame, light *must* 'change speed' as it enters, to stay at 'c'. This is a transformation between reference frames. The model suggests only waves changing frequency in a background medium can do this as without a medium there is no basis for facilitating change to wavelength.

The model suggests frequency shift is the principle function 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 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'. We've very recent discovered in Plasmonics that electron oscillation can

control light[52] but the consequences have not yet been studied. The option was considered then but discarded[46], again due to evidence now shown wrong during 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 effect on the directions physics took is given below[p18].

The thickness and density of the free particle fine structure cloud of a human, or a space suit visor, must 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 is suggested 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 the fine structure particles surrounding the mass, light can only pass through those particles at 'c' in the reference frame of the particle cloud.

This very simple basis of the model meets Occam's Razor, and obviates the paradoxes derived from dilation and contraction. The postulates of SR are preserved and 'c' is perhaps even more of a constant than previously understood. Persistent Lorentz violations are better explained[26][36], and all reference frames will be equivalent while also being background dependent, yet independent.

The moving light box/light clock demonstration of Special Relativity gives rise to the potential paradox of the diagonal light pulse, moving diagonally at more than 'c' when viewed from the rest frame. The time dilation/contraction solution to this leaves the twins paradox. Fizeau, Sagnac and current fibre optic ring interferometers prove light travels at 'c' with respect to the local medium it's travelling in, so would be observable from a 3rd frame at greater than 'c' without the Lorentz transformation. We test the models ability to meet Occam's razor with a simpler solution. The question is also asked; *If the sides of the box were removed* would contraction still be required? Fig 1a. below shows the standard configuration but also a discreet quantum 'fine structure' field (shown exaggerated) moving with the box in motion. 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' locally in its own discrete quantum field and frame. The light reaching the observer, direct from the source and from the moving pulse itself, also does so at 'c'.

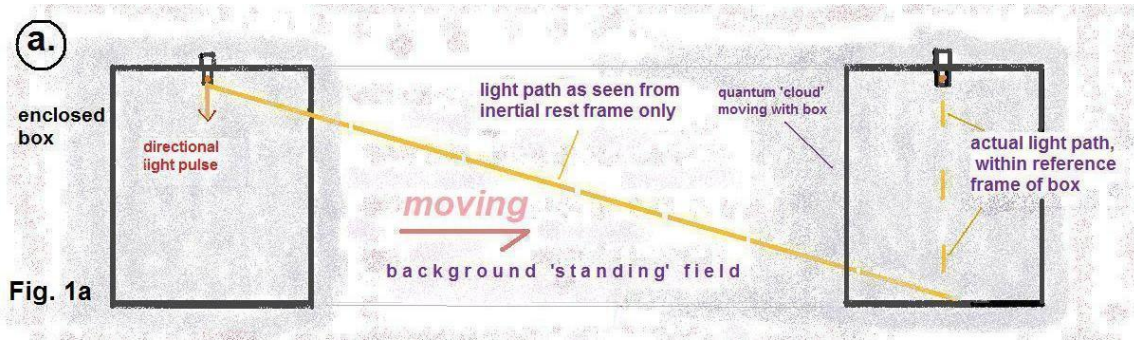


Fig. 1a. Special Relativity Light Box. Standard diagram but using a background dependant model with a discreet 'quantum cloud' field, as experienced in particle accelerators, within and around the mass of the box. (the discreet moving 'cloud' is shown exaggerated).

Fig 1b below shows the box sides removed. The top and bottom mirrors are separate entities with a background field between. They may move independently, but when they move in unison the light pulse will remain vertical and be left behind. This demonstrates how observation can be matched in a mathematically consistent way with Doppler boundary shifts.

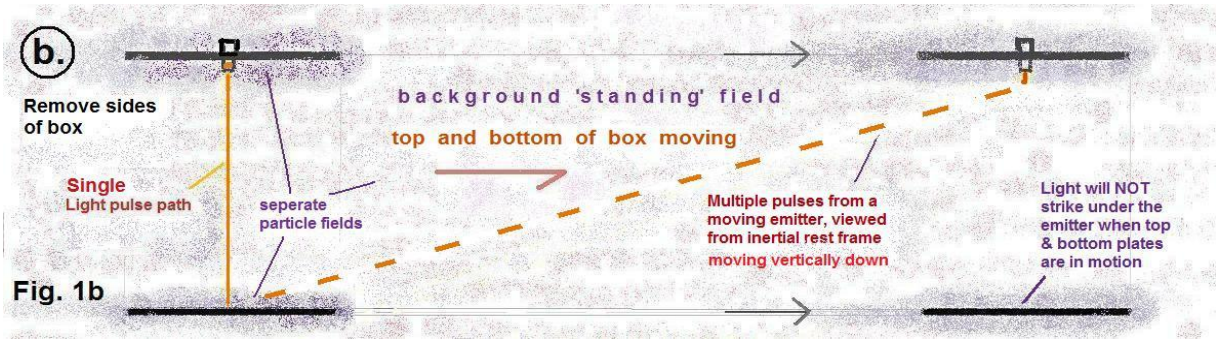


Fig. 1b. Sides of the box removed, but the emitter and receiver are equally in motion through the background field. The result will change. The directional light pulse will not strike the receiver under the emitter. The observer at rest in the background field will only observe the *vertical* light path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

Importantly this solution also follows logic and intuition. The discreet local fields are shown grossly exaggerated and their scale is proportional to their velocity through the background field. This seems to derive the first consistently logical resolution free of paradox. It is also consistent with Einsteins comment (GR Ch22) that; "*..the constancy of the velocity of light in vacuo, ...cannot claim any unlimited validity*". And only works if we "*..disregard ...gravitational fields.*"

Fig 1c. below shows how light waves from a non directional emitter would shift, travel and reach the base at 'c' in it's own frame. It again 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, (not yet observed), length contraction. It suggests that the standard 'light clock' diagram is incorrect. If the two plates are mirrors a vertical pulse misses the bottom plate. If the plates are angled, to create the 'saw tooth' light path, we've simply adjusted the clock rate ourselves in the same way as moving the plates apart. The light simply travels on the angled track at 'c' and arrives later. If it were within it's own 'closed box' quantum field, its rate of change of position would simply make it appear to the observer to be travelling faster than 'c' from his rest frame. Contrary to the 'light clock' phenomena of length contraction this is consistent with actual observation.[16][45]

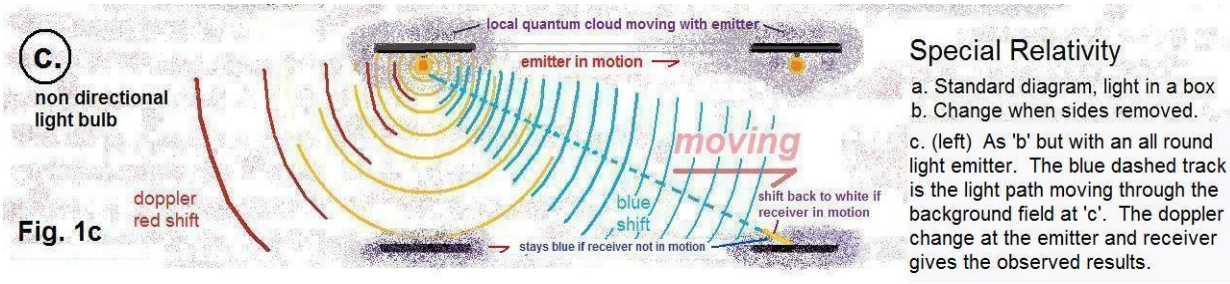


Fig. 1c. **Non directional bulb**. This shows the light track (blue dashed) for an 'all round bulb' source intersecting the receiver. It is emitted at 'c', moves through the background field frame at 'c', (but blue shifted), and is shifted back to white by the discreet field of the receiver, which then 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.

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;

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

(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^{o} 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. The maximum size of field may be a substantial region of space. Hubble has found evidence of a dark matter halo around a large galaxy cluster; Cl 0024+17.

it would be helpful create and keep in mind a picture of the free action particle cloud around all moving mass. The clouds size/density and oscillatory activity is proportional to velocity through the background field. This will allow the simple logic of the new model to be intuitively followed. Fig. 2. below is a simple representation, or refer direct to Cern data. [28] [29]

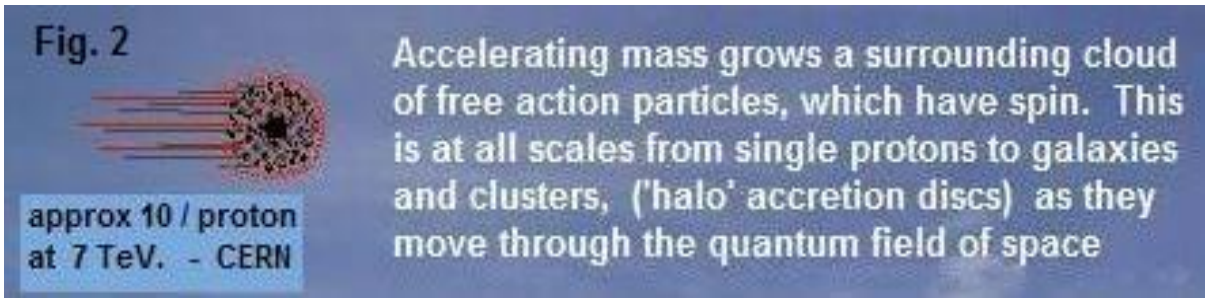


Fig. 2. An accelerated particle of mass, with free action 'photo electron' cloud proportional to velocity.

Model Test. To test the models success in dealing with the light paradox and meeting observation

with the simplest logic we imagine floating, at rest, in a standing quantum field in space, with a spacecraft moving towards us at $^{c}/_{2}$ with headlights and tail lights on. The light waves leave the lenses at 'c' with respect to (wrt) the emitter. We now test what they would now do with 'free action particle' quantum field 'inertial frames' in place around all mass, against observations.

1. Light passes through the discrete particle field of the approaching craft at 'c'. At the boundary zone it is blue shifted to pass into and through the fixed background field at 'c' wrt the field. It reaches the observer at rest wrt the background, at light speed and is seen blue shifted.

2. The observer is in motion through the field towards the ship at c/2. The EM waves do the same as above. The blue shifted waves arrive at the boundary zone with the observers moving field and are further compressed to move through it's own field at 'c'. - Additional blue shift results.

3. The observer moves through the standing field away from and *faster than* the approaching ship. The waves do the same again from the ship, travel through the intervening field at 'c' wrt the field, blue shifted (someone at rest can check them). They arrive at the observer (Sagnac delayed), and are shifted back from blue, and into the red as the observer is moving faster than the source.

4. The spaceship pilot looks in his mirror. The supernova behind is moving away slowly so it's light approaches through space, at 'c', red shifted. When it reaches his own field 'cloud' the waves are further elongated to stay at light speed, so he observes them further red shifted.

5. The observer changes direction, move backwards slowly towards the position he started from, watching at the star the ship is approaching as it passes him. The star is moving away from him so he sees it red shifted, as is the light from the ship when at 90^{o} to us[27]. If the ship is moving faster than the galaxy, the red shifted light reaches its field and is shifted past white into the blue.

6. The ship passes the observer. The light from it's tail lights shifts to red at its field boundary to travel through the space between us at light speed wrt that background field. The observer is still moving away so it shifts even more to the red when it reaches his local fine structure field.

7. The ship comes to rest in the field. The observer moves towards it. The light from the ship travel towards him with zero shift, at his field boundary it is compressed , shifted to blue.

The concept and mechanism is simply and consistently resolved at each level and in all inertial frames. It explains why free action particles are needed, and can knit relativity and quantum field theory into a single harmonious fabric. Both have to be adjusted a little to fit, but adjusted in accordance to observed evidence, and without the need for additional dimensions or leaps of faith. Any number of reference frames are accommodated. This may sounds quite simple, and the mechanism is, but it would have some fundamental consequential effects on physics. Einstein suggested that when the answer he was searching for was found it will be so simple and elegant it will be obvious it *must* be right. But one of the most important tests is; can it solve or help solve other issues and paradox.

Paradoxes. It seems many of the paradoxes and problems in physics could 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 simply by light as wave energy propagated in a field with particle disturbance probability varying with density. Different scale energy oscillations are superposed. Local 'photon' concentrations are also part of macro waves. 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 ejection speed in the Photoelectric effect is simple Doppler shift, blue shift compression of energy into shorter waves. The greater concentration has a greater chance of ejecting energy from the receiver. 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]. We have not yet observed long range discrete photons as all our extended observations are of wave energy.[31]

It is consistent with the Aharonov-Bohm effect,[17] and may help to explain it with the fact that the

generating apparatus and dense EM field particles also create gravity to affect the EM waves. The unstable edges of galaxies, with inadequate visible mass to hold them in against the angular momentum generated by the 914,000 kph rotational velocity, can be explained by significant additional 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 relative 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 may support 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 far from a universal 'theory of everything' but the conceptual framework of an option fitting a wide range of evidence better than some which were formulated before it was available. It has implications suggesting a number of paths to other solutions and it is therefore proposed that it deserves serious investigation and testing.

It is not difficult to conceive tests to falsify the concepts proposed. Any proof that mass could travel through the local field devoid of free action particles would do so. CERN and Fermilab consider the electron clouds hamper their work and are working on ways of reducing them[28]. Proof of local Lorentz violation through any more than the smallest quantum of space between two particles would certainly bring the proposal into serious doubt. Predictions are derived below and evidence considered, but much evidence will need to be investigated in following papers. Two more major issues to consider here are Causality, and, perhaps not yet recognised as a paradox by most, Irwin Shapiro's lensing light delay inconsistencies.

Shapiro Delay and Causality. In the initial testing of this model against observational evidence a serious problem arose which gave cause for abandonment of the concept. It was; If we observe gravitational lensing of a distant light source by a large intervening galaxy with high red shift, we'd observe the light passing through the galaxies taking significantly longer to reach us than the light being lensed around it. Contrary to the bent light path calculation of space/time curvature the arrival difference could easily be months, or even years.

A Galaxy 10 light years thick on a direct receding vector at 0.2c would delay the light passing through it, if it travels at 'c' with respect to the galaxy' by over 500 days, or well over a year, more than the light lensed around it.

Fig. 3. shows light paths through and (lensed) around a galaxy rapidly receding from the emitter.

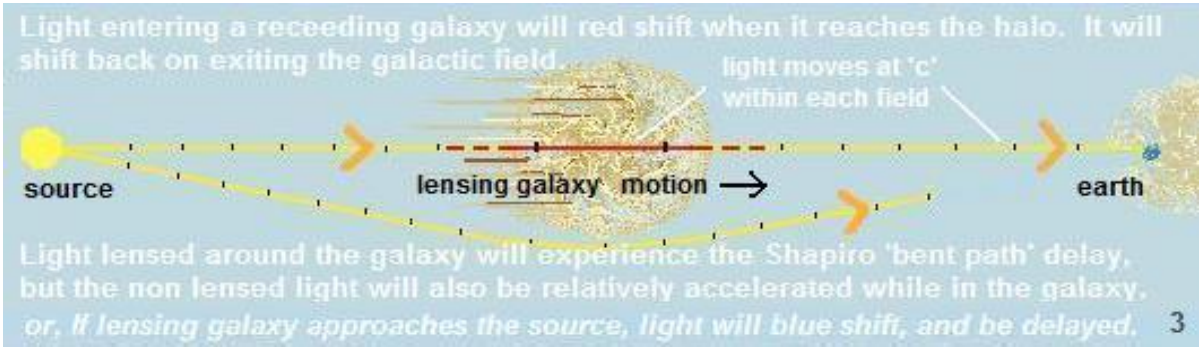
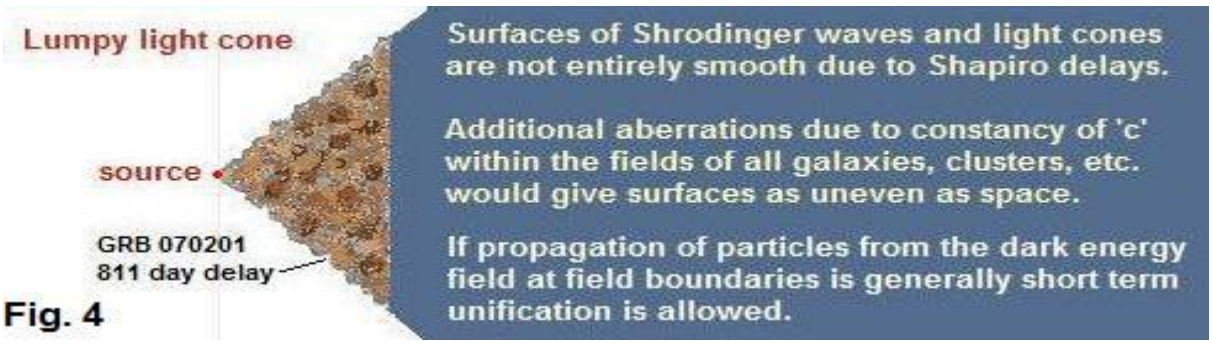


Fig. 3. Galactic Lensing. Anomalies in lensing and Shapiro delays are resolved by the model. Light travels at 'c' in the reference frame of the galaxy it's passing through, changing it's arrival time

This could also have bizarre effects on the causality light cone, although the Hau Lab Bose-Einstein Condensate, and Berkeley, 'slow light' have the same effect. The latest data on lensing and the Shapiro effect was studied. Checking Venus on radar when near the sun in 1964 Irwin Shapiro found a delay of 200ms, meeting prediction. This 'Shapiro delay' in gravitational lensing is caused by space/time curvature and the longer path created. This affects light cone surfaces and, potentially, causality. Consider the 'lumpy' surfaced light cone it would give (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 uncertainty and inconsistency with Shapiro delays. For objects in our solar system it can be calculated with great accuracy, but for 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 gravitational time dilation, it seems many intervening objects would need to be multiple super massive black holes or be of anomalously high density. The large delays in elements of lensed light are as yet unexplained. They are however predicted by the Discrete Field Model as light simply travelling through each moving galaxy or other intervening field at 'c'. wrt that local field.

Papers have been 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, and the accurate results of some nearby observations disguised the issue. A tendency for discrepancies not to be well 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] 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, 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. It appears we may find the average ratio of lumpiness of the cone surface to radius works out to say 1:140 or so. Or, with all the galaxies we have now found, perhaps even in the same order as the mass deficiency.

The DFM was initially dropped as it was clear delays would be large, and few weeks delay could give a very large perturbation on a light cone surface. The difficult problem of finding proof also remained. Researching astronomical results gave 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 time delay between the images was an astonishing 51 days. But then SN 1987a was found at 74.5 days, delay, GRB 070201 at 811 days

delay.[24] Subsequent images 3 and 4 of SDSSJ1004; were found with delays of over 3years.

Many other cases also exist[53], resolving the models prediction of inconsistent Shapiro delays significantly higher than could be expected from simple curved paths referred above. The initial prediction was so bizarre that this paper would not have been published if the observations had not been carried out. Significantly greater delays are also predicted, and are unlikely to have been looked for to date. Solving this also resolves other anomalies and, it appears, provides a key to the solution of issue between QM and SR, as referred below. It seems time and GR may thus in many ways be only simple 'relational' theories. Maryland's Jacobsen and others have long considered a preferred state of rest as the only answer to unification. See also Fig. 3.

Choice of paths. The apparent paradox in STR has always given rise to dissidence, and quantum physics progresses across a divide, but there has been no consistent alternative to resolve it's basis, the Principle of Equivalence. Despite Karl Poppers view we're naturally resistant to questioning long established paradigms. Much credible work has been done [26] and a number of theories put forward, but nothing falsifiable. There is continued argument over the evidence of the Sagnac effect, showing invariance of 'c' is with respect to the local medium irrespective of relative motion with the observer. Any alternative would have to better fit all the evidence. It is suggested the DFM may do this, and recreate the link between theory and physical reality. But if it was missed where did we take a wrong turn? We're now able to use the ideal scenario, go back, and evaluate broad evidence from 150yrs in the future to see if we may have gone astray.

Fresnel/Stokes Ether Drag. Heaviside showed a spherical electric field lost symmetry in motion, in 1889. Michelson & Morley tried to show this also went for light and tested for aether, but got the famous null result, which was not in fact null but well below prediction for Maxwell's "all pervasive" field. If they'd been able to do this in space rather than a cellar the results might have been different[25][46]. Conceptual thinking was strong and many, including Fresnel (1818), George Stokes in 1845, Heaviside, Arago and Dayton Miller etc. supported the 'ether drag' hypothesis, that ether surrounded, and stayed with, massive objects, which the M&M result supported. Fresnel's equation allowed for 'partially' dragged ether, but didn't account for chromatic dispersion, apparently violating Snell's Law. The Fizeau experiment nevertheless seemed to confirm Fresnel's theory, and Lorentz showed later how it could be applied to an immobile ether as well as to frequency 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*'. This may have be true of the ether they envisioned at the time but we now know does not have to be true of a quantum field. Only the wavelength and not the speed of light is affected, except by mediums of condensed matter. Both these were misconceptions due to limited knowledge, but they had lured opinion onto a different path. Stokes said prophetically; *"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."*

The other evidence used against ether drag was a Stellar Aberration, seasonal movement of stars. This was considered in terms of an 'all pervasive' ether and we now know that argument, based on Airy's water filled telescope experiment in 1871, was poorly conceived, assuming Maxwells 'all pervasive' ether. Oliver Lodge first found the solution.[25][46] The 'canting' of wave front angle entering a laterally moving field giving the same effect as would be created by Airy's photons following the centreline of a moving telescope. It also derives the quantum physical explanation of the Doppler formula for change in frequency at the transition between inertial frames.

Fresnel's equation was used by Einstein, unchanged, for relativity. It could now indeed be slotted straight back in to the model *with* a quantum field. It would seem able to explain why the dark *matter* halo/cloud 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 generated to achieve it. This also demonstrates a physical distinction between gravity and acceleration over and above the essential temporary nature of the former.. The velocity/oscillation relationship is not entirely linear 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 also seems to be the possibility that a form of oscillation is in *rate* of motion, which may help explain detection probabilities. All such consequence clearly requires considerable further investigation and analysis. The concept of discrete fields related to relative velocity surrounding and dragged by matter is however apparently supported and evidenced.

The overwhelming body of evidence of mainstream astrophysics suggests a form of quantum dark energy field is a reality and has confirmed the wave function of light. The physics of the halo and Doppler shift suggested by the model is consistent with this and appears a simpler and more symmetrical option than that we've been using. Despite a degree of denial in some quarters it is clear that Einstein was well aware he did not quite have the full solution and was still searching for the key to a unified field theory when he made his comments about finding *" a more realistic way",* in 1944, and that we should "*not desist from pursuing"* a solution, in 1952.

The postulates and effects of special relativity would be unchanged by the DFM, which would simply provide the real physical mechanism we perhaps didn't know we needed. 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.

Shock Detail. NASA's first surprise from Voyager 2 was in the 'squashed' elliptical *shape* of the heliopause, previously assumed roughly spherical. The shape is however consistent with the body being in rapid motion through a medium, led by the bow shock thus propagated. This matches the asymmetric orientation of our planetary shock,[34] the link with the solar flares and coronal mass ejections now being that they highlight more than propagate it. The best evidence for fields in relative motion would be a measurable relative EM wave velocity each side of a major shock. This is available from the Suns magnetic field, which reverses every 13 days, giving an expanding 13 day polarity 'wave'. As Voyager 1 penetrated the termination shock the time this took to pass changed from 13 to over 100 days,[56] but the crafts anticipated progress slowed 'against the wind'. This is a direct measurement supporting discrete fields. The Earth's bow shock provides much more[57]. Since the dominance of mathematics in physics, and the 'lateral wave' concept, we have not recognised any need to imagine more than a mathematical formulae, rather than a real physical entity, floating in space to effect the Doppler shifting we observe. In nature, and reality, it is proposed a real quantum process is needed, also keeping 'c' constant between 'frames'.

We know all is not right in physics, but can tend to fear change. Erwin Schrödinger said; *"..the scientific picture of the real world around me is deficient"* and Richard Feynman said new concepts would always look strange at first[18]. If we'd never seen a bicycle we'd struggle to ride it and be afraid, but it would very quickly become intuitive to most. Lee Smolin is concerned that physicists aren't; *"..doing all we can... ..t*o find the true theory.." [15]. and *"..recognise the wrong*

assumption". It is only an assumption following after the SR postulates that the DFM changes. No new math is needed as it's only a geometric adjustment. Einstein said; "*I hold it true that pure thought can grasp reality.*" Also in '54; "*..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 consider dilation, signal and phase/group velocities etc. in a following paper).

Consequences and Predictions. Extended lensing delays are proven. Astronomer Evelyn Gates of Chicago said of cluster MACS J1149.5+2223; ″The mass...in the...cluster is higher than predicted, a result...also...found for other... clusters ...with gravitational lensing. This implies... we're either *missing some physics*...or we may need to *modify our cosmological model*." It's predicted estimating galactic mass from lensing delays could also be less anomalous using the model. Another prediction arising was that we will observe phenomena apparently moving significantly faster than 'c' across space where within another field, itself fast moving with respect to our own. This 'superluminal motion' has also been found[53], meeting prediction, but details of the many anomalous sources have been long subdued and the effect bizarrely explained away. Others can be made, including the light clock demonstration [16][45] (Fig.1. and *B* below).

We now know light cones may be lumpier than made by Shapiro. We know light can 'accellerate' from zero to 'c' with no energy, apart from what it may draw from a background field. Indeed if it's speed is reduced to zero it's energy may be zero; e = m multiplied by 0^2. But can a 511KeV local 'Photon' energy pulse be held at zero energy then given the energy and velocity back by its release? In photon pair production mass is propagated to make an electron and positron, but immediately re-absorbed to leave the photons, with zero mass; $e^2 = (pc)^2$. If we 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 a full paper and will be covered in further articles.

Minkowski had said at Cologne in 1909; "*from here on, we would no longer have space in the world, but endlessly many spaces".* Einstein recognised the concept himself, writing in 1952 (translated 1954); "*space appears as an unbounded medium or container in which material objects swim around.* ***But it must now be remembered that there is an infinite number of spaces, which are in motion with respect to each other.*** *The concept of space as something existing objectively and independent of things belongs to pre-scientific thought, but not so the idea of the existence of an infinite number of spaces in motion relatively to each other.* ***This latter***

idea is indeed logically unavoidable*, but is far from having played a considerable rôle even in scientific thought."* The quantum Doppler shift mechanism would now allow this in a simpler and more symmetric form than could previously be conceived.

We know light can be manipulated by particles in Plasmonics.[53] Frequency Modulation of EM waves is also familiar in FM radio, where single oscillators act as frequency synthesisers working on the 'gearbox' principle of angular velocity[54]. As oscillation frequency of free action particles propagated with motion increases with velocity, similar to their increase in numbers, they are natural candidates for the symmetrically corresponding local frequency changes needed in a reality model to effect the Doppler shifts observed. It can be said that, in quantum terms, they may be the only candidates available. Fine structure would indeed be a measure of wave particle interaction.

Conclusions.

The testing of the model has failed to falsify it. Significantly more testing seems to be required, across many fields, by specialists. So far a simple logical model incorporating Reality and Locality seems to fit all observation and be able to explain observed phenomenon better than present theories at both the quantum and cosmic scales, allowing relativistic Equivalence.

The successful model uses the axiom that 'c' is constant in all fields, from sub atomic particles to galaxy clusters. Free action spin[12] particle field 'clouds', exist around all mass in motion through surrounding fields, increasing with velocity. Particle spin or oscillation modulates frequency of the wave fluctuation to maintain 'c', and is thus associated with wave propagation. Cosmic shock anomalies are resolved[49] including that; "*These weak shocks frequently exhibit wave structure upstream and downstream of the shock inconsistent with early ideas of the formation of these wave trains"*.[50] Particles are not conserved but condensed from and absorbed, or 'evaporated', back into the background field as 'dark' energy. Entanglement may be more logical with a field medium, and could give an indication of medium characteristics. The small adjustments to and clarification of SR postulates and QFT may allow the full unification of physics. The differences between the maintained acceleration of gravity and the simple inertial rest frame difference of relative motion is still to be fully understood with regard to time dilation.

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 knew there were; "*an infinite number of spaces in motion relatively to each other." (1952).* Anything moving *within* a region of space in motion within another ' background' region,

or field, is observed doing so with *added velocities.*[16][45][53]. Whilst not directly allowing travel faster than 'c' this opens the way to possible express 'tubes' of particle beams within beams effecting the same result. The practical problem may be in establishing a stable starting point.

The bases of the Discrete Field Model have proven surprisingly well rooted in established physics but conflict with much of what may still be considered by many as mainstream science. Physics has however always proven to be a science of continual change and improvement, and the model would appear to resolve a number of known problems. If it continues to be consistently supported by the testing process the potential changes and new opportunities in most branches of physics would appear to be be fundamental and significant.

DFM PREDICTIONS.

Prediction A. Light Box. If we repeat the SR 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. The velocity of light moving through a field in relative motion to our own would vary from 'c' observed from our frame. *Gas jets at between 2.5 and 6 times 'c' from our reference frame (Galaxy M87)[16][45]. Gas at GRS1915+105 measured at 1.25 x 'c', but travelling at 0.92 x 'c' in its local frame.* Other examples exist[53], deriving a simple 'velocity addition' equation where the signal is within another field in motion relative to our own. If we observe an aeroplane at v_1 and a bullet fired at v_2 within it we will observe the bullet moving at $v_1 + v_2$ from our frame.

Prediction C. A light pulse at v_3 in a fibre optic cable fixed to the side of an aeroplane in motion at v_1 may also be observed at velocity $v_1 + v_3$, without the plane appearing to accellerate or shrink, or the cable doing so and becoming detached. No relativistic transformation would apply. The light from the pulse signalling its rate of change of position still reaches the observer at 'c'.

Prediction D. If EM wave velocity is measured in the reference frame of the Earth's surface it will be found to change at the planetary shock, and at the ionosphere, and it will in each case be propagated at light speed in relation to the background. It will also be Doppler shifted each time.

Prediction E. The Higgs boson and graviton 'particle' will not be found. Particles are propagated by disturbance of the energy field, by other particles and perhaps by wave energy fluctuations. Light will travel at 'c' with respect to the LHC dark matter 'clouds', as in all shocks and halo's. This means a light pulse sent along an accelerator pipe when in use will arrive at a different time to one sent along the outside of the pipe. The difference will depend on particle bunch velocity.

Prediction F. If the Michelson-Morley interferometer experiment were recreated outside the planetary shock a different result would occur, confirming ether drag. It would show high fringe shifts and a positive result for a quantum field 'ether', violating Lorentz symmetry. A closed fibre optic ring interferometer would also still demonstrate that the speed of light stays constant within the medium whatever it's rotational velocity or speed through space.

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 $(m1-m2)c^2$, 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 gravity of earth measured from orbit will be inconsistently greater than the 2nd Law provides due to halo mass. This will be higher in advance of our solar orbit ('bow shock'). 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.

Prediction L. Voyager signals will have varied frequency shifts through the heliopause, mainly to blue. Overall shift will equate to the velocity of the heliosphere through the galaxy, plus smaller turbulence effect from 'solar wind' termination, magnetic field and shock disturbance.

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