A Physical Review of Unitel's proposed Aerospace Vehicle

E. F. Halerewicz, Jr.*

June 15, 2003

Abstract

The underlying physics behind Unitel's proposed aerospace propulsion system is outlined and reviewed. It is found that the advocated 'magnetic laser' propulsion proposal can be entertained within the fringe branches of theoretical physics. Although Unitel's proposal for interstellar travel remains speculative and unproven which raises many fundamental questions about its proposed behavior and its feasibility.

1 Introduction

It is the mandate of the *Journal of Advanced theoretical Propulsion Methods* (JoAPM) to explore new propulsion forms and the physics utilized to describe them. A small Portland based group known as Unitel has proposed a form of reaction-less propulsion based upon 20 years of internal R&D, their proposal therefore seems to be an ideal review candidate for the JoAPM. Since this journal attempts to keep an open forum on all propulsion forms the concept and physical feasibility of the above reaction-less propulsion system is addressed within this review article. What Larry Maurer and Michael Miller of *Unitel, Inc.* have proposed is a radical new form of aerospace propulsion based upon the principles of quantum physics [1][2]. Thus the very concept of Unitel's proposed 'quantum propulsion' system as seen by current reactionary aerospace technologies seems almost alien by comparison. As such the concept of 'quantum propulsion' is immediately put onto shaky ground for trade specialists such as engineers who deal primarily with classical mechanics. As well as for physicists who tend to specialize in a particular field thus making it difficult an outsider to grasp the broader physical and engineering aspects of Unitel's proposed craft. Further muddying the waters is the fact that Unitel's engineering staff attempts to describe complex theoretical physical models in terms of their trade skills rather than the physical language which describes the underlying behavior of the propulsion system. This unintentionally leads to inconsistencies in the description of Unitel's proposed propulsion system both in terms of physical and

*halgravity@yahoo.com

engineering parameters for those who are not familiar with the intricacies of Unitel's proposal. The first intent of this article it to clear up the inconsistencies described above by giving a broad physical picture of how the proposed system *could* operate in terms of known theoretical physics. The second intent of this article is to compare and contrast Unitel's proposal with established physics so that the reader can make an informed decision about the plausibility of the proposal discussed within this review article. Although as the reader progress through this article it will become abundantly clear that discussed propulsion system is built upon a series of educated hypothesizes rather than established scientific facts. The purpose of this review therefore serves as a model for what criteria must be met when considering alternative means of propulsion.

This review is presented as follows in section 2 the basic description of the Unitel aerospace craft is outlined. Section 2.1 introduces the the quantum means of propulsion which Unitel advocates. Section 3 outlines the theoretical properties of Unitel's proposed 'magnetic laser' propulsion system. Section 3.1 describes how the crafts projected laser field could possibly interact with the craft itself so that the two may coexist in the same entangled quantum state. In section 4 Unitel's speculative proposal for 'quantum interstellar propulsion' is presented. Finally this review ends with a discussion of the pros and cons of Unitel's proposed propulsion system within section 5.

2 Underlying description of Design Concept

The Unitel propulsion concept is based upon what is termed as Quantum Electromagnetic Laser Propulsion (QELP), which is essentially a laser that is designed to induce macroscopic quantum effects [2]. Unitel also hopes to setup quantum fields around the hull of a spacecraft in order to simulate the properties of a single elementary quantum state. This is so that a spacecraft may take advantage of the well known 'quantum tunnelling' phenomena of quantum mechanics in which semiconducting technologies are based in order to establish a new form of propulsion. The process which transports Unitel's proposed spacecraft over interstellar distances is termed Macroscopic Quantum Tunnelling (MQT), as the proposal acts to "quantum tunnel" a spacecraft across large macroscopic distances. From the introductory description laid out above the basic design of Unitel's proposed aerospace vehicle can be broken down into two key parts.

The first part of the design is the laser system which induces macroscopic quantum fields by proposing an interaction with the quantum electromagnetic Zero Point Field (ZPF) in a non trivial way. The ZPF is the theoretical collection of all energy forms found within the vacuum of space which are carried through virtual process such as the creation and annihilation of electron-positron pairs. In the lowest possible energy state of a wave function there is always a fluctuation of quantum energy at zero modes as a product of $hv/2$ which is mediated through the Heisenberg Uncertainty Principle. By isolating a single frequency an enormous energy potential exist assuming a cutoff at the planck frequency one finds $\rho_{\Lambda}^{pl} \sim \hbar k_{max}^4 \sim 2 \times 10^{86} kg/m^3$ [3], which is very close to the planck

density scale for 'quantum gravitation' $\rho_G^{pl} = c^5\hbar/G^2 = 5.02 \times 10^{96} kg/m^3$ believe to have been present in the early inflationary period of the universe. While some readers will find tapping into the energy of the ZPF a new concept its an idea that has been around in physics for quite a while, the most famous example being the Casimir force [4] introduced in 1948. In fact even the idea that engineering the ZPF for spaceflight has been recently explored by Puthoff and Ibison [5]. Therefore tapping into the ZPF is not quite as revolutionary as it may first sound, although how such engineering may be achieved is very much an open question.

The laser system advocated by Unitel, Inc. according to their design proposal will act to induce a plasma field which isolates the planck energy scale in order to create a rotating *naked singularity*[1]. Which possibliy could have a two-fold effect, first charged particles within the plasma may act to create a large magnetic field strength, thus the artificial singularity could act as a very strong electromagnet. The second effect is that the engineered naked singularity may create an artificial conical potential around the local spacetime surrounding the spacecraft, which may affect the properties of MQT (see section 4) "quantum jump' potentials. The laser field properties of the design proposal is also intended to interact with elementary quantum particles flowing on the hull of the spacecraft, creating a charge-less version of ferromagnetism [6], so that the quantum particles flowing on the hull of a craft could share the same entangled spin characteristics as the laser plasma. The consequence of the proposed laser-hull interaction is that both the ship and the projected laser plasma could behave as though they were in the same quantum state just like an elementary particle.

The second part of the system is the ships hull which acts as a superconductor at a temperature of roughly $10^{\circ}K$ due to the electronic properties of ${}_{41}Nb$ (niobium) [7] which comprises the hull of the craft. Through the Meisner Effect the quantum fields induced by the laser could be expelled from the hull surface, therefore the charged particles on the hulls surface may form a macroscopic quantum superposition. From that the Unitel craft may then act as a superposition of quantum states similar in principle to Bose-Einstein condensations (BECs) which were first observed in 1995 [8]. BECs are essentially super cooled gases which can form a macroscopic quantum state which many atoms can share. The hull of Unitel's proposed craft consist of semiconducting band layers which store magnetic energy and are connected to Semiconducting Element Diodes (SEDs) which may act to control the flow charges on the hull of the craft [2]. The purpose of the SEDs are two-fold as varying the charges on the hull can allow for the field properties of the laser plasma to surround the entire hull of the craft, and altering the flow of charge may also allow for directional control of the craft.

[1] A naked singularity is a theoretical mathematical object similar to the point-like region found within the core of a black hole where infinite spacetime curvature occurs. However unlike a black holes singularity a naked singularity can be viewed by observers who are not trapped by a relativistic horizons, as such localized causual (time) shortcuts can form around these objects in theory.

From a physical point of view the basic design requirements discussed above immediately brings up two potentially crippling problems which other critics have brought up against Unitel, Inc. The first problem is that for a laser to interact strongly with the ZPF would seem to require astronomically large amounts of energy which current technology doesn't seem capable of replicating. Secondly the WKB (Wentzel-Kramers-Brilliouin) approximation of quantum mechanics (which describes a slowly changing potential function marking the transition from quantum to classical states) requires that as quantum systems grow they behave more and more classically, and hence MQT shouldn't even be considered a possibility at all. From standard physical and technological perspectives alone Unitel's proposed aerospace vehicle is so conceptually difficult to conceive that it is virtually deemed as impossible from anyone initially looking at the design. It is for these reasons this article attempts to come up with an outline of how MQT may be entertained so that at the very least one can use Unitel's own arguments against them should flaws arise. It is also noted that an entertained version of MQT will be reviewed in this article, so that the proposal may be taken as a whole rather than stopping this review at the easy to spot partial physical inconsistencies that arise from Unitel's proposal (thus we give Unitel the benefit of the doubt, where these inconsistencies are viewed to be flawed engineering interpretations rather than flawed underlying physics).

2.1 underlying description of tunnelling propulsion

The propulsion system of Unitel's proposed spacecraft consist of both classical and quantum means of locomotion. The classical means of propulsion is not hard to visualize, as the craft is simply attracted to a strong magnetic field (similar in principle to the tractor beams of science fiction, but operating in the opposite direction). The second mode of classical travel is the usage of stored magnetic energy within the hull to interact with other magnetic fields so that the interactions between the combined fields act to propel the craft. Since magnetic means of locomotion are based on classical electrodynamics the classical modes of travel of the craft only pose engineering feats to overcome as the physics behind such fields are well understood and documented. This leaves us to deal with the quantum means of locomotion which is similar to quantum tunnelling and is termed MQT. Quantum tunnelling is one of the easier to understand aspects of quantum mechanics, as spectral lines of elements show quantum jumping, and the effect was even included in the early Bohr model of the atom. In essence when quantum particles absorb energy they make transition states into higher energy states which can be connected to physical distances. The wave functions of quantum systems however seem to be instantaneously connected through so called Einstein-Podolsky-Rosen (EPR) states[2], so instead of seeing a linear transition in the energy state a "quantum jump" is observed.

[2]The 'EPR effect' is also known as "spooky-action-at-a-distance" as it allows for one quantum system to interact instantaneously with another, even when separated by distances which make classical communication impossible.

The problem with "quantum jump propulsion" is that the WKB approximation of quantum mechanics dictates that an object as large as a ship shouldn't be able to tunnel, although other forms of macroscopic tunnelling have been observed [9][10]. Further Yoshinari Minami has demonstrated that the WKB approximation does not apply to Unitel craft due to the nature of its superconducting hull creating a macroscopic quantum state [14], this is because the ship is treated as a single wave function. Another potential confusion of the MQT concept was generated by Michael Miller [1], where Miller states that the spacecraft copies the wave function of a distant photon, and exchange places through EPR type connections. The modern terminology for such a possible interaction is called Quantum Teleportation (QT) which was first demonstrated by IBM with photons in 1993 [11]. So a way to clear up the previous MQT confusion may be found by considering how the details of Unitel's proposed laser plasma (see section 3) could affect MQT. This is because the laser plasma design emits particles which are capable of quantum tunnelling and these particles should also contain entangled information about the plasma field (this possibility can be argued because the laser has a properties of what is known as Berry's phase [12], a well known effect generated by this phase is the Aharonov-Bohm Effect [13]). So that MQT may describe QT between the initial EPR state of the spacecraft with that of the tunnelled particles within the laser plasma, thus the spacecraft may simply exchange places with the tunnelled particles induced by the EPR state created by Berry's phase of the laser plasma. This means the ability of a spacecraft to MQT could possibly be connected to the degree at which the particles within the laser plasma are tunnelled, it is also possible that the presence of the proposed engineered naked singularity could amplify this potential allowing for astronomical distances to be travelled in short time. Although the above interpretation will be used for this review, it is rather incomplete and there is little reason to scientifically believe that such a method of travel is possible without giving stringent proofs for this reasoning. So therefore this entertained means of propulsion should only be considered a hypothetical argument for how the proposed craft may operate, rather than being considered an actual description of how it operates.

3 Properties of the laser plasma

The heart of the Unitel's proposed aerospace vehicle is the Red Green Blue (RGB) laser lens which drives the laser plasma. The lens consist of a honeycomb layer of crystals which is described to transition elementary particles into supercounducitng states in the form of excitons (electron-holes) as they pass through the lens [2]. Excitons are particles which behave in a manner similar to phonons (or acoustical electron-pairs also known as Cooper pairs) but are capable of propagating in a vacuum. The plasma laser according to Unitel's design proposal is powered through a microwave frequency horn, as microwaves pass through the lens the design hypothesizes that they are phase shifted to the RGB optical spectrum, forming a coherent packet of group waves (or a beam of

white light). The crystal induced phase then again by Unitel's proposal begins a 720° rotation of the laser plasma. As excitons carry electrical charge and travel through the plasma they may angularly rotate near the speed of light c with the induced wake plasma as proposed by Unitel. Unitel also hypothesizes that the angular velocity of the excitons is also near c which they believe will force a Lorentz-Fitzgerald length contraction of order $l_p = \sqrt{G\hbar/c^3} = 1.63 \times 10^{-35} m$ (although relativistic physics limits this contraction by a few orders of magnitude).

We now examine the theoretical electric field properties of the proposed engineered singularity based on the descriptions above. First the electric field strength of Unitel's proposed laser would be of order:

$$E_s = \frac{q}{4\pi\epsilon_0 (l_p)^2} = 5.42 \times 10^{60} \frac{kg \cdot m}{s^3 A} \tag{1}$$

where ϵ_0 is the permittivity of free space. As charge is distributed within the laser and on the hull of the craft the electric flux of the gauss surface of the field must be considered:

$$\Phi_e = E_s A_E = 3.43 \times 10^{62} \frac{kg \cdot m}{s^3 A} \tag{2}$$

where $A_E = 4\pi \cdot 5.02m$ (this represents the ellipse area of the spacecraft and the projected plasma laser). The reason the 4π cycle exist is because the magnetic field of the laser can be seen to be connected to a magnetic monopole in quantum theory, and hence can form a topological gauss manifold [15]. A magnetic monopole is a theoretical particle that can exist in quantum theory which behaves as an electron but instead carries a quantum unit of magnetism [16]. Returning to the electric field the magnetic strength of Unitel's engineered singularity becomes

$$B_s = \frac{\Phi_e q}{qc} = 1.14 \times 10^{50} G \tag{3}$$

since the charged particles on the vehicle hull move at the speed of sound v_s (see section 3.1) by Unitel's proposal and are not "planck contracted" [2] we can assume the non singular portion of the laser has a field strength of order:

$$B_f = \frac{E_f A_E}{v_s} = 2.02 \times 10^{-14} G \, . \tag{4}$$

So the magnetic strength of the laser plasma varies as an integral of

$$B_T = \int_{B_f}^{B_s} r dr \equiv 1.14 \times 10^{50} G \tag{5}$$

since the magnetic strength of neutron stars top off at $10^{15} G$, **the above magnetic strength is far beyond the energy scales produced by known stars** [17]! This tends to strongly imply that either new laws of magnetic physics take over or that the proposal put fourth by Unitel is simply wrong.

While the magnetic field strength described above is not theoretically impossible it is very close to the maximum limit allowed assuming magnetism can be carried by monopoles whose masses approach the planck mass [18]:

$$B_{max} \sim \alpha \left(\frac{\eta}{m_e}\right)^2 \frac{m_e^2 c^3}{\hbar q} \sim 1.25 \times 10^{52} G \tag{6}$$

where $\alpha = q^2/\hbar c$ and $\eta = \hbar c/2q$, which raises serious physical and practical engineering questions about the feasibility of this proposal. As for the proposed charged velocity it is not an unheard requirement to have a charge propagate at the speed of light as this is how Nickish and Mollere have proposed a ZPF origin for geodesic paths [19], but is the alleged contraction down to the planck length reasonable? To answer the previous question we must consider the initial radius of an electron, the approximation which classical mechanics gives is

$$r_e = \frac{q^2}{4\pi\epsilon_0 m_e c^2} = 2.82 \times 10^{-15} m \tag{7}$$

where m_e is the rest mass of an electron. Therefore for r_e to reach the planck length would require a contraction of order 10^{20}, such a contraction is is not physically realistic but a contraction down to $10^{-30}m$ is within reason

$$L = \frac{c - 10^{-6} m/s}{\sqrt{1 - \left(\frac{c - 10^{-6} m/s}{c}\right)^2}} = 3.6 \times 10^{15} \frac{m}{s} \tag{8}$$

which corresponds to an electron travelling at $0.99999999999999967c$, so the electron would virtually be travelling at the speed of light. The momentum of the electron therefore becomes

$$\gamma_{Lp} = \frac{m_e c - 10^{-6} m/s}{\sqrt{1 - \left(\frac{c - 10^{-6} m/s}{c}\right)^2}} = 3.35 \times 10^{-15} \frac{kg \cdot m}{s} \tag{9}$$

thus the relativistic energy of the exciton therefore must become $E = pc = 10^{-6} J$ or 10 Trillion electron Volts (TeV). The proposed plasma acceleration therefore would require the rest mass of an electron to increase by a factor of at least 10,000 times. It is also interesting that an electron would be required to achieve an energy within the TeV range as this is the energy scale threshold for extra dimensions in Randall-Sundrum (RS) gravity [20]. It may therefore be possible to conceive that the laser plasma could replicate the ZPF of a higher-dimensional space so long as electrons within the plasma reach a transitional energy at or above the TeV range, even if a bit hard to swallow. With the electric field contraction allowable by eq. 8 requires that field strength of eq. 3 be revised to

$$B_{mod} = \frac{E_{mod} A_E q}{q c_{approx}} = 3.06 \times 10^{39} G \, . \tag{10}$$

While it is conceivable that charges rotating near the speed of light can produce high energy magnetic fields, its is most certainly unclear how such fields can create a direct interaction with the ZPF. The only clue from the considerations above is the fact that through quantum field theory the laser plasma could create a topological charge field which would mimic the field properties of the theoretical monopole. That may therefore lead to the possibility that the energy scale of the monopole resides within the TeV range (assuming of course that all these "what if" scenarios are correct). From that perspective a large magnetic field strength may be possible by artificially setting up quantum fields which mimic a monopole. As monopoles aren't allowed to exist classically without a symmetrical geometric property known as duality it may be possible for an artificial monopole to induce a symmetry breaking of classical field theory which may result in the presence of ultra high energy scales (it is also believed that monopoles haven't been observed directly because their masses may be greater than what current particle accelerators can produce [16]). However the above possibility is only speculation and Unitel doesn't seem to give any further clues as to how such an interaction with the ZPF might take place. At best it seems that producing a high strength magnetic field is possible in theory, but how such strengths could be created in practice remains an open question. The author can not comment on the ability of the described laser to produce the properties discussed above. Although if the hypothetical fields describe above could be proven to exist then Unitel's proposal would just barely fit into the realm of modern theoretical physics and with little breathing room. However at the very least if a wake plasma could rotate electric particles emitted from an 'electron gun,' it is possible for a laser to acquire a magnetic field which is interesting in its own right.

3.1 laser-hull interaction

The MQT propulsion system proposal utilizes a variation of QT as a form of locomotion, to remain valid the hull of the spacecraft would also have to share the properties of the induced laser plasma. This requires that charges on the hull of a spacecraft be in phase with the RGB properties of the plasma laser. To explore this possibility let us examine the phase transition from an arbitrary microwave wavelength $\lambda_{mw} = 0.075m$ to the green optical frequency $f_G = 5.97 \times 10^{14} Hz$:

$$v_{pG} = f_G \cdot \lambda_{mw} = 4.50 \times 10^{13} \frac{m}{s} \, . \tag{11}$$

We now attempt to determine the properties of this phase on the hull of a craft. Since excitons behave in manner similar to hydrogen atoms and the ambient temperature of outer space we will assume to be $4^{\circ}K$ for simplification, the speed of sound for the charged particles induced by the crafts SEDs is given by

$$v_s = \sqrt{\frac{\frac{3}{5} k_B 4^{\circ} K}{3.58 \times 10^{-27} kg}} = 160.35 \frac{m}{s} \tag{12}$$

where k_B is Boltzmann's constant. This allows us to calculate the mechanical de Broglie wavelength of an electron which is expressed as

$$\lambda_d = \frac{h}{m_e v_s} = 4.57 \times 10^{-6} m \ . \tag{13}$$

Therefore the quantum phase velocity of an electron is given as

$$ev_p = \sqrt{\frac{m_e^2 c^2 \lambda_d^2}{h^2} + 1} = 5.61 \times 10^{14} \frac{m}{s} \tag{14}$$

so that if an electron on a crafts hull oscillates with the laser plasma frequency (which may act to simulate a monopole?) the electron phases flowing on the hull will match the phase of the plasma as seen by $ev_p \equiv 4\pi \cdot v_{pG} = 5.65 \times 10^{14} m/s$. Thus it seems reasonable that SEDs could modify the phases on the hull of the spacecraft to match the Red and Blue states of the RGB laser lens. This translates in the ability of the aerospace vehicles hull to share the same spin properties of the projected plasma field (and hence be able to mimic a quantum particle as proposed by Unitel). At first the RGB lens seems arbitrary but according to geometric phase optics [21] the fractional $1/3\,q$ RGB charges on the hull [2] causes the full electromagnetic field of the plasma laser to surround the whole of the spacecraft (rather than partially covering the hull). It has also been recently demonstrated that three bit or "triqubit" entanglement is possible giving further wait to this possibility [22]. While the properties of the magnetic laser strength explored in section 3 was somewhat speculative, the possibility that a charged hull could share the same quantum spin properties of a projected laser beam fit very comfortably into the framework of established physics, a similar effect where lasers can effect electron spins has been recently observed [6]. The only legitimate question which this concept seem to raise is can the hull cause the interior of the craft to simulate a single state. Without explicit proof as how the hull could effect the interior we will have to assume no because of the WKB approximation, which brings into some doubt the use of MQT for a means of propulsion.

4 MQT

The most interesting aspect of Unitel's proposal is the concept of interstellar travel by means of MQT. Yet this is the least explained aspect of the spacecraft design which seems more akin to QT rather than quantum tunnelling. The only references Maurer and Miller [2] give to MQT is the work of Minami [14] which primarily suggest that entangled quantum systems do not obey the WKB approximation of the Schördinger wave equation. Although Minami suggest that a spacecraft could tunnel through the hyperspace of Anti de-Sitter (AdS) spacetime, this is also the same background space in which RS gravity resides. Taking into consideration the TeV energies seen in section 3, we may speculate that the spacecraft could tunnel through five-dimensional AdS spacetime. A

further clue resides in the microwave horn of the RGB plasma laser system, where microwaves can produce nonlinear exciton wave equations (known as fluxons) which gives them energy to tunnel through potential barriers [23]. This suggest that the length of time a spacecraft can remain within hyperspace could be dependent upon the potential of the tunnelled fluxons. In other words only the fluxons actually tunnel through hyperspace, but as the excitons can be entangled with the fractional charge of the hull through triqubits [22] from which a QT like effect may be created which could transport a spacecraft. This would then echo Miller's interpretation that Uniel's spacecraft copies the wave function of a distant particle [1] (the key difference is that particles which the ship copies are the entangled states carried by the microwave imparted fluxons). A possible explanation as to what distance such a propulsion system can cover may be a related to Berry's phase of the projected laser beam and the tunnelling potential of the fluxon particles. This would tend to suggest that Berry's phase remains in hyperspace so that the fluxon jumps would be in proportion to the gauss surface of the laser-hull system. Thereby increasing the ability of the fluxons as well as the ship to apparently tunnel through normal spacetime.

Unitel also makes the claim that the monopole like state their ship mimics is capable of reflecting spacetime [2], but the how is somewhat elusive. The potential benefit of this is that a craft could be isolated in its own mini-universe or baby universe, and therefore the craft as a whole would not be limited in its tunnelling ability. Even under the scenario where the laser-hull can exist in the same quantum state as described in section 3.1, the tunnelling ability of the craft would be limited to the entangled particles on the hull of the craft. However if spacetime could be reflected then all that would be required for the whole of the ship to tunnel is to have the baby universe mimic the quantum state of the laser-hull configuration. There are however problems which can arise from this interpretation, the first is that nothing is known to "reflect spacetime" so this argument is very speculative to say the least. The second problem is the nature of the proposed interaction suggest that the crafts baby universe would reside in AdS spacetime. The problem with that is that extra-dimensions are required be highly contracted in theory, ranging from the sub-millimeter range to far below the planck length l_p [24], so theoretically a baby universe should reside within those ranges. For obvious reasons a spacecraft within four-dimensional spacetime can not be contracted to the spatial scales required for five-dimensional AdS spacetime. Although it still may be possible to resolve this issue, for example in an earlier work I demonstrated that spacetimes with differing vacuum mediums can interact [25], although the boundary conditions of these interactions were not considered. However in an up coming article by Loup et. al. [26] the possibility that the field properties of extra-dimensions can be recreated in four-dimensions with a proper set of metric pressures is explored. This could lead to an interpretation where fluxons simply move through hyperspace, but appear to tunnel in four-dimensional space. This interpretation would also allow the so called classical communication routes required for QT to take place within five-dimensional AdS spacetime. If everything works out the way Unitel proposes it may be possible for a spacecraft to quantum tunnel through space as claimed.

Although again there is much speculation about the vehicles function in MQT mode and not much physics on how it actually would function. Thus if you were to accept the MQT proposal you would also have to accept a lot of untested theory and speculation, which seems to raise questions about the realism of this proposal.

5 Discussion

The purpose of this paper was to address the level of understanding required to grasp the basic description of Unitel's proposed aerospace vehicle. It was generally found that the description of the propulsion system can wedge itself into the very fringe branches of theoretical physics, as long as you are willing to consider a smorgasbord of untested theory and speculation. For any propulsion method to be taken seriously all possible questions of how it functions should be answered in advance, the proposal by Unitel, Inc. however falls short of that mark and therefore can only be considered speculation. If any organization wants an alternative means of propulsion to be taken seriously they should bend over backwards so that a reader can easily grasp the main points, the reverse should not be the case as in this article. Of the claims explored in depth in this review it was found that the high magnetic strength field which Unitel advocates is allowable but no known process is capable of producing fields of such strength. Thus from a physical point of view no actual claims of how the proposed aerospace vehicle operates can be made and therefore must be considered speculation.

From this review it seems that only two physically justified claims can be made with Unitel's proposal. The first is that SEDs may be able to control magnetic fields on charged surfaces and perhaps carry encode triqubits of information (which could be interesting to study in its own right). Secondarily while Unitel's high strength magnetic laser plasma seems somewhat suspect (i.e. the ability of an optical lens along with microwaves to amplify quantum effects as greatly as required by section 3), it is certainly theoretically possible to create lasers which possess a magnetic field strength without having to invoke the ZPF. In general it seems that most of Unitel's arguments for MQT seem to be based on the research of others although how MQT actually relates to the proposed properties of the vehicle directly is unknown to the author.

In short it is the opinion of the author that either explicit experimental and or mathematical proofs are required before the Unitel proposal for MQT can be consider on any grounds to be physically realistic, at the moment it is pure speculation. MQT is however intriguing enough to warrant further investigation to prove or disprove the on theoretical grounds as it may provide useful insights into other alternative means of propulsion. On the other hand while the author feels that 'magnetic laser propulsion' may be theoretically possible Unitel still needs to go beyond the proof of concept stage. What is further needed is a description of what theoretical effects must occur to produce the proposed high field strength, as well to state the strengths which existing technologies can

produce in order to demonstrate its usefulness as a realistic propulsion system.

References

[1] Miller M. and Kirsch P. *Journal of Interdimensional Travel* **1** (1999)

[2] Maurer L. and Miller M. Quantum Electromagnetic Laser Propulsion. Unitel Inc.: Portland OR, 2002.

[3] Carroll S. "The Cosmological Constant", *Liv. Rev. Rel.* **4** (2001), 1. [Online article]: cited on 5 Jun 2003 `http://www.livingreviews.org/Articles/Volume4/2001-1carroll/`

[4] Casimir H. "On the attraction between two perfectly conducting plates. *Proc. K. Ned. Akad. Wet.* **51** (1948) 783-5.

[5] Puthoff H. and Ibison M. "Engineering the Zero-Point Field and Polarizable Vacuum for Interstellar Flight. *JBIS* **55** (2003), pp.137-144 astro-ph/0107316

[6] Stevens M, et. al. *Phys. Rev. Lett.* **90** (2003) 136603

[7] L. Pauling. General Chemistry. Dover, 1970. edtition: third

[8] Anderson M, et. al. "Observations of Bose-Einstein condensation in a dilute atomic vapor." *Sci* **269** (1995) 198-201

[9] Benakli M, et. al. "Macroscopic Angular Momentum States of Bose-Einstein Condensates in Toroidal Traps." cond-mat/9711295

[10] Raghavan S, et. al. "Coherent oscillations between two weakly coupled Bose-Einstein Condensates: Josephson effects, π-oscillations, and macroscopic quantum self trapping." cond-mat/9706220

[11] Bennett C, et. al. *Phys. Rev. Lett.* **70** (1993) 1895-99

[12] Berry M. "Quantal Phase Factors Accompanying Adiabatic Changes." *Proceedings of the Royal Society of London A* **392** (1984) 54-57

[13] Aharonov Y. and Bohm D. *Phys Rev* **115-3** (1959) pp. 485-91

[14] Yoshinari Minami. "Hyper-Space Navigation Hypothesis for Interstellar Exploration. NEC Corporation, Yokohama, Japan, IAF-IAA 44 th Congress of the International Astronautical Federation, Graz, Austria, Oct. 16-22, 1993, No, IAA.4.1-93-712.

[15] Cohen M. "Clifford Residues and Charge Quantization." gr-qc/0207107

[16] Song J. *J. Undergrad. Sci.* **3** (1996) 47-55

[17] Harding A. "Physical Processes in Strong Magnetic Fields of Neutron Stars." Invited talk at Pulsars, AXPs and SGRs Observed with BeppoSAX and Other Observatories, Marsala, Sicily, Sept. 2002 astro-ph/0304120

[18] Duncan R. "Physics in Ultra-strong Magnetic Fields." Fifth Huntsville Gamma-Ray Burst Symposium. astro-ph/0002442

[19] Nickish L. and Mollere J. "Connectivity and the Origin of Inertia." physics/0205086

[20] Ahn E, Cavagliá M, and Olinto V. "Brane factories." hep-th/0201042

[21] Galvez E, et. al. *Phys. Rev. Lett.* **90** (2003) 203901

[22] Vazirii A, Weihs G, and Zeilinger A. *Phys. Rev. Lett.* **89** (2002) 240401

[23] Zhai Z, Parimi V, and Sridhar S. *Phys. Rev. B* **59** 14 (1998) 9573-9580

[24] Hogan C. "Scales of the Extra Dimensions and their Gravitational Wave Backgrounds." *Phys. Rev. D* **62** (2000) 121302 astro-ph/0009136

[25] Halerewicz Jr. E. "Relativistic Crossroads and the possibility of Variable c Space-Times." *JoATPM* **1** (2) May (2003) `http://www.joatp.org`

[26] Loup F, Santos P, Santos D. "Can Geodesics in Extra Dimensions Solve the Cosmic Light Speed Limit? *Gen. Rel. Grav.* **35** (2003) to appear