

# Self-Powering Heat Amplifier as the Mechanism for the Final Catastrophic Destruction of the Shuttle Columbia

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## 1.0 ABSTRACT AND EXECUTIVE SUMMARY.

There is a high probability that a version of the proven heat amplifier effect we will discuss below, was in fact the fundamental "puzzling" mechanism that resulted in the catastrophic failure of the shuttle Columbia, once sufficient initiating heat and ablation penetration to the aluminum skin was achieved in the damaged sections of the tiles, wheel wells, etc. This conclusion follows a tip by Marcia Stockton to look at a *Washington Post* article by Kathy Sawyer, pointing out the uncovered anomalous, nearly explosive ignition and burning of the aluminum substructure of the shuttle. In those damaged points, once the fierce heat and ablation actually touched the exposed aluminum skin, the ablation process added aluminum particles to the available energy absorption and emission processes. Then both insulating particles and conducting particles were present in the immediate ablation heat stream, leading to known self-resonance of both types of particles and the immediate appearance of the heat amplification effect.

This effect, under the nomenclature of "negative resonance absorption of the medium", is well-known for insulating particles in the IR region and for conducting particles in the UV region and is documented in the scientific literature. This means that, once sufficient induced particle self-resonance was present and included both resonant insulating particles and resonant conducting particles, very high potentials and fields were induced and substantial local energy amplification in both the UV and IR regions began, with substantially more energy density of the emitted energy than in the "feeding input" of the normal ablation heating NASA scientists are familiar with. The difference frequency between the IR and UV of these two effects covers the visual band, and so photos and other instrumentation may also show amplified flashes or energy flashing or severe extra emission of intense light, etc., including final explosive intensity of the emitted light followed by breakup and destruction of the vehicle. Depending on the rate of progression, this effect could also have been responsible for earlier excess light and electrical discharge phenomena observed with respect to the re-entering shuttle.

## 2.0 INTRODUCTION.

It appears that the Columbia Accident Investigation Board investigators have stumbled onto fierce burning—even explosive burning—initiated in the aluminum substructure material of the doomed shuttle once the initial damage allowed the heating and ablation process to get to the aluminum substructure underneath the insulating tiles. The nearly explosive burning of the aluminum would be guaranteed by—and strongly indicates—the emergence of the known but somewhat obscure heat amplifier effect (i.e., *negative resonance absorption of the medium*), where the heat energy increases at least by more than an order of magnitude (and can increase by much more). Easy gains of 18 to 1

in simple lab bench experiments are already shown experimentally in the nonlinear optics literature. Larger experiments at higher energy should induce very much larger energy gains. In the Columbia, this effect at such high energy intensity of ablation and re-entry led to the intense amplification of the normal EM energy involved in the processes. Consequently catastrophic failure of the Columbia occurred once this effect had grown to very large proportions.

In addition to the well-known diverged Poynting energy flow around a circuit or EM interaction, there is another little known and arbitrarily discarded nondiverged Heaviside energy flow component. This component was discovered by Heaviside in the 1880s, but was not discovered or considered by Poynting. The Heaviside component may be many orders of magnitude greater than the Poynting component, but since it is not diverged and does not usually interact, it usually does nothing. A decade after Heaviside's discovery of that extra and huge energy flow component in circuital rather than linear form, Lorentz arbitrarily discarded the troublesome component that seemingly does nothing, does not interact, and has no classically understood source. Lorentz simply integrated the energy flow vector itself around a closed surface assumed around any volume element of interest. This has the effect of retaining any diverged energy flow component, such as the Poynting component, while arbitrarily discarding any nondiverged energy flow component such as the Heaviside component. Electrodynamists and electrical engineers still universally apply Lorentz's little integration today, as a matter of course. For that reason, the Poynting flow does not represent the actual energy flow through a point, and electrodynamicists are still occasionally debating what the real energy flow is, and what the real energy flow vector should be.

Due to the nondiverging nature of the arbitrarily discarded Heaviside energy flow component in flat spacetime, it can only develop a divergence in *curved spacetime* regions, in which case it can interact strongly if the spacetime region has significant curvature. Such Heaviside component divergence and energy reaction curvature is indeed reached by the heat and ablation of shields and substructures of re-entering vehicles, particularly if both the insulation material and the substructure conductive material (aluminum) are exposed and involved. If the aluminum skin of the substructure is exposed by damage, then the dramatic increase of the resulting fields results in a dramatic increase in the Heaviside component and also in the divergence from it. This acts as a direct and powerful "energy amplifier" extracting very large energy densities from the local vacuum and releasing it in energy flows, sharp discharges, near vaporization and explosive burning of the aluminum skin, etc. The results in the case of the damaged Columbia was catastrophic failure and destruction of the entire re-entry vehicle.

Under such conditions, a peculiarity of Poynting energy flow EXH is also of interest: The mere existence of nonparallel E and H fields, even though they may be static fields, implies a steady energy flow by EXH. Most electrodynamicists ignore this fact, because there is no observable energy input to the source charges of the E and H static fields involved. However, the source charge problem has been solved by the present author and published in 2000, with the firm basis for the solution—the asymmetry of opposite charges—already in particle physics since 1957. The asymmetry tells us that any dipolarity absorbs virtual photon energy from the vacuum, transduces it into observable photons, and emits those observable photons as the associated fields E and H. Further, "static" fields are not static, but are composed of internal Whittaker longitudinal EM waves moving in both directions. Hence "static" EM fields are actually analogous to a waterfall, where the external form appears static but that envelope is filled with internal structured entities in constant motion, and

continuously being replaced in place. This is Van Flandern's analogy, rigorously justified by Whittaker in 1903 and 1904. Indeed, static fields are not static systems at all, but are nonequilibrium steady state (NESS) systems being formed by continuously increasing negentropy of the sort shown by Evans and Rondoni, where the source charges play the role of physical systems exhibiting such negative Gibbs entropy, continuously decreasing toward negative infinity as time passes. The production of negative entropy by the source charge can be shown by application of Leyton's object-oriented geometry (replacing the familiar Klein-Lie geometry which is a subset of object-oriented geometry) and his hierarchies of symmetry. I am preparing these concepts and principles in a paper tentatively titled "Charge Is an Entropy-to-Negentropy Converter Falsifying the Second Law of Thermodynamics."

### **3. DISCUSSION (From Correspondence with a Colleague).**

23 Mar 03

To a Correspondent (edited):

Good luck on your search to extract EM energy from the usually nondivergent Heaviside energy flow (one form of the so-called "dark" energy the astronomers continue to search for). The huge nondivergent Heaviside energy flow component was discovered by Heaviside in the 1880s, and is in addition to the energy flow component entering the circuit, the latter being discovered independently and simultaneously by Poynting. Unable to explain the source of such a huge nondiverged energy flow from every source charge and dipolarity, and from the terminals of every generator and battery, and why it usually does not interact with anything to an observable extent, Lorentz circa the 1890s just arbitrarily excluded that worrisome giant Heaviside energy flow component, reasoning that it "had no physical significance" because it was nondiverged and did not do anything. That is true in a sufficiently linear case or linear situation, but it is not necessarily true in a highly nonlinear situation with high energy density in the involved nonlinear EM fields and potentials. Ablation conditions in spaceship reentry into the atmosphere is one such highly nonlinear area, particularly if damage occurs and the insulation (such as provided by the Shuttle tiles) is penetrated and the heating reaches the aluminum skin.

One points out that normal Maxwell-Heaviside U(1) electrodynamics erroneously assumes a flat spacetime, which if true would mean that local energy density in space could not change. So all EM fields, potentials, and waves would actually be non-existent. Even special relativity assumes a flat spacetime in a rotated frame. These models therefore are already known to be useful approximations only; e.g., Sachs in his unified field theory has specifically pointed out that an unchanging flat spacetime would prohibit any EM wave or field from occurring, a priori.

The trick appears to be to produce local curvatures of spacetime that self-form and are specifically suited to the local Heaviside nondiverged EM energy flow. One does not have to use velocity; ST curvature varies as the local energy density, and therefore varies as the local field intensity or potential intensity. Hence manipulating different ST energy densities (changing local potential and field intensities—such as by intense heating and sharp gradients) constitutes manipulating local ST curvatures and their dynamics. Unfortunately circuit analysis has not gone into that to any great

depth, so far as I can uncover. But using and manipulating deliberately induced local ST curvatures and their dynamics seems to be the fundamental process for recovery of energy from the Heaviside component. That component *does not* necessarily have zero divergence in a ST curvature zone! So in such a zone, some energy can indeed be diverged from it, because the Heaviside component develops a small diverged component in such a ST curvature. Hence this small diverged component can be intercepted, collected, and utilized to power one's circuit or other electrical device. In principle it can also be done "for free", much like an EM analog of a windmill in a wind.

The well-known Bohren experiment (and many related experiments by Letokhov and others) uses "negative resonance absorption of the medium" to unwittingly apply that principle, and thus Bohren's experiment outputs some 18 times as much energy as one oneself has to input and pay for. Early on, reviewers and referees forced that tortuous term upon the researchers, to prevent having to say "excess energy emission of the medium". Its process is fairly simple though deceptive. We explain:

The "field" and the "potential" in electrodynamics really are the "field's *local intensity at a point*, as determined by a unit point *static* charge", and "the potential's *local intensity at a point*, as determined by a unit point *static* charge." We don't calculate the field or potential itself at all, but only its local point field intensity *with respect to some assumed criterion --- such as the divergence of energy from the field or potential by a unit point static charge*.

All that is *assumed* in the very definition of E, B, D, H,  $\phi$ , A, etc.

We also point out the Whittaker 1903 and 1904 decompositions of any EM field or potential. Hence all EM fields and potentials are to be regarded as sets of bidirectional EM longitudinal wavepairs with differential function dynamics impressed upon them.

*If physical conditions change something in that basic definition set of assumptions of the definitions of the fields and potentials, one need not have the same result for their experimentally measured magnitudes (local intensities) at all.* We strongly accent that the very definition of the magnitude of the potential intensity and the field intensity are the outputs of an agreed-upon experimental system with fixed parameters. *Those* parameters are subject to deliberate change and manipulation by changing physical phenomena, just as are other parameters whose changes are conventionally considered.

The *negative resonance absorption effect*—which really means the "excess virtual EM energy absorption from the seething vacuum and consequent excess observable EM energy emission effect"—is accomplished by using particles that go into particle resonance—i.e., particles of such size and constituency as to resonate or self-oscillate to the frequency of the incoming field or potential energy. The insulating particles have essentially pinned charges in them, while the conducting particles have much freer charges in and on them, that readily move in and on the conducting particle. Hence the conducting particles respond and resonate at a higher frequency—the UV zone—while the insulating particles respond and resonate at a lower frequency, the IR. The latter represents what we are referring to as the (*self-powering*) *heat amplification effect*.

E.g., in the Bohren experiment, one uses conducting particles with particle resonance at UV

frequency, and insulating particles with particle resonance at IR frequency. The forced self-oscillation of the particle then has the particle sweeping out a much greater geometric reaction cross section (interception) perpendicular to the infolded EM energy streams (bidirectional EM Whittaker longitudinal wavepairs) comprising the incoming field or potential.

So the self-resonating particle absorbs (and then reradiates) 18 times as much EM energy as we conventionally calculate by static particle field interception and by Poynting energy flow assumptions (since the Poynting theory already assumes the field intensities in EXH are determined by *static* unit point charges). In other words, the resonating particle absorbs and outputs 18 times as much usable energy as we ourselves have to pay to input, or as we "think" the situation itself inputs, as in the case of a shuttle insulation ablation area with damage allowing involvement of the aluminum substructure metal surface.

Poynting energy flow theory mistakenly would have us believe that such extra energy interception and emission is impossible, since it arbitrarily excludes the very process (self-resonant charge interception—the heat amplifier effect) we are invoking. In short, more energy than the Poynting theory allows, is perfectly permissible—both as to absorption and emission. Since we are intercepting energy flow not usually capable of being intercepted by the static charge, we are intercepting that energy flow outside the Poynting flow model—hence we are intercepting a very small part of the huge Heaviside energy flow component. Put another way, the excess local spacetime curvature caused by the increased energy density, allows some of the usually nondiverged Heaviside energy flow to be diverged after all. For the actual experiment and its results, see Craig F. Bohren, "How can a particle absorb more than the light incident on it?" *American Journal of Physics*, 51(4), Apr. 1983, p. 323-327. We have pointed out that reference and its results and implications many times in the past.

I've long wondered why no one develops a great little "heat amplifier" with COP = 18 or so, based on just such resonant insulating particles, and then patents and markets it. Or why the U.S. Department of Energy will not fund such work, extracting copious EM energy from the vacuum, when such experiments are already proven and published in the leading scientific literature. I guess it's because most scientists and engineers think that the "value of the field or potential calculated by standard handbooks" is inviolable and absolute. It isn't; *it's entirely relative to how one approaches intercepting and collecting (diverging energy from) the energy flows comprising the field or the potential!* In that approach, there are parameters just as elsewhere. Deliberately changing the parameters changes the permissible results. So the very same field is "measured" as having a different magnitude, by a static charge compared to the same charge in particle resonance.

Such statement that measurement itself is relative, though absolutely true, is in many quarters considered supreme scientific heresy (you know, dirty old perpetual motion—which latter, by the way, is *absolutely required* by Newton's first law for anything set in motion or put at rest (zero motion), unless and until an external force intervenes by Newton's second law!). Hardly anyone today dares suggest such a "preposterous" and useful a thing as the experimentally *proven* "free heat amplification", even in the face of published and extensively replicated experiments that already prove the basic effect, the feasibility of such a system, and the overunity results.

Sadly, the shuttle Columbia because of its peculiar damage seems to have run headlong into the heat

amplification effect, right where it could have been predicted—in the fierceness of re-entry heating and ablation conditions, once the insulation was sufficiently disrupted and damaged to allow the additional presence of appreciable aluminum (conducting) particles.

The control of science is rigorously exercised in two ways: (1) control the funds of the researchers and what research the funding is designated to be spent for, and (2) retain the current dogma by viciously attacking any substantial and innovative deviation from it, and by destroying the innovating scientist (career, income, ability to publish, employability, credibility, etc.). Unfortunately science has a proven dark history in that respect, and it continues today in its same old dogmatic, controlling way long documented by historians of science. The fact that so many scientific innovations have been accomplished in spite of such control and suppression efforts is a tribute to the indomitable spirit and perseverance of the innovating scientific researchers themselves. As we stated, the U.S. Department of Energy has little or no funded programs in extracting EM energy from the vacuum. There appear to be very few if any scientists in DoE who realize that all EM energy in every EM circuit and device comes directly from the local vacuum via the asymmetry of the source charge and source dipolarity.

The Heaviside component comes into play in nature in several very important ways: (1) its unsuspected presence associated with every EM field/charge interaction—together with its enormous magnitude—provides the unsuspected extra energy density of spacetime that is responsible for the puzzling extra gravity holding the arms of the spiral galaxies together. For very sharp gradients etc., negative energy electrons (Dirac Sea holes in 4-space prior to interaction with mass to form lattice positrons) considered as source charges produce negative energy EM fields and potentials. The unaccounted Heaviside energy flow component associated with those source charges is also comprised of negative energy. This huge and unaccounted production of negative EM energy associated with violent astronomical phenomena with sharp gradients produces substantial negative energy density in large regions of space. That produces substantial antigravity—accounting for the mysterious antigravity that is accelerating the expansion of the universe. Such negative energy can also be utilized to develop practical antigravity propulsion and effects, as shown by an experiment designed by the present author and successfully conducted by Sweet. Based on the above model, the weight of an object was smoothly reduced by 90% on the laboratory bench. The results of the experiment were published in a proceedings.

Anyway, hopefully those remarks give you at least some of the keys you need in considering how to usefully intercept and extract some of that Heaviside energy flow component in circuits and devices, and thereby produce legitimate  $COP > 1.0$  systems. The Heaviside energy flow component has continued to be ignored, since once it is known, one faces the fact that every generator and battery outputs far more (many orders of magnitude greater) EM energy than we pay to input to it, and it always has. Another related problem is the continued ignoring of the fact that all EM fields and potentials and their observable EM energy are already considered (and known) to come from their associated source charges, *without any observable EM energy input at all*. The standard theory just assumes there is no input energy at all, and that the source charge freely creates every EM field, EM potential, and joule of EM energy in the universe from nothing at all, in total violation of the conservation of energy law.

The basis for solving this long-vexing source-charge problem has been in particle physics since 1957, with the award of the Nobel Prize to Lee and Yang, and yet the proven broken symmetry of the

source charge (when considered with its clustering virtual charges of opposite sign, as in quantum field theory) has not migrated across the university campus from the physics department to the electrical engineering department in the nearly half century since broken symmetry was discovered and proven.

Once one understands that all EM energy in any EM device, material, or circuit comes from the local vacuum via the broken symmetry of the source charges and dipolarities, then one recognizes how the Heaviside component can easily exist without violation of energy conservation. Nature does not necessarily conserve *observable* EM energy, but only *total* EM energy—including between the unobservable virtual EM energy in the local vacuum and the observable EM energy in the macroscopic world. That was established by the asymmetry of opposite charges, part of why Lee and Yang were almost immediately awarded the Nobel Prize for initiating such a revolution in physics. Sadly, it has never made it to electrical engineering. Hence the inability for our scientists to comprehend the heat amplification phenomena that can emerge in damaged areas of shuttle insulation, etc.

For practical, usable  $COP > 1.0$  and  $COP = \infty$  EM systems, the beauty of using the heat amplification (infrared  $COP = 18$ ) mechanism is that it's already experimentally proven and published in the hard physics literature, and the excess free energy output is just a great deal more ordinary heat. You do not have to worry about negative energy and antigravity effects, of the kind I discussed in my book, *Energy from the Vacuum*. In other words, close-looping such a system for self-powering is eased considerably. One can indeed develop a "self-powering heat-amplifier" system along such lines. "Self-powering" is a term that is used, though it really means that all the input energy is freely input by the active environment, such as for a windmill or a solar cell. Here the vacuum is just a more subtle active environment, with such activity already well-known in particle physics but totally missing from conventional electrical engineering. By definition, self-powering systems (such as the common solar cell) have  $COP = \infty$ .

I never personally had the funds or opportunity to mount such an effort, and will not in the future, so I have no hesitation in pointing this out and urging that it be experimentally researched. Anyone who wishes is free to do it and develop it and market it at will. I really don't care who does the  $COP > 1.0$  or  $COP = \infty$  EM power systems, so long as they get completed, produced, and placed on the world market to (1) help alleviate human misery and depression because of unaffordable energy, and (2) help clean up the biosphere.

And also to enable the shuttle accident investigating team and its scientists to comprehend the heat amplification problem due to the experimentally proven negative resonance absorption of the medium.

Hope this helps you in your program.

Best wishes,

Tom Bearden

#### 4. RECOMMENDATION.

It is highly recommended that the Columbia Accident Investigation Board (CAIB) formally evaluate and consider the proven negative resonance absorption of the medium, the heat amplifier effect, and the related discussion above, adapted from correspondence with a colleague, as the probable mechanism resulting in highly excess and anomalous heating that catastrophically destroyed the shuttle Columbia, once damage had exposed sufficient aluminum substructure to the conventionally known ablation and heating of re-entry into the Earth's atmosphere.

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"Some of these areas are (1) "... rarefied media, where the idea of local equilibrium fails. The average energy at each point depends on the temperature at the boundaries. Important astrophysical situations belong to this category." (2) "...strong gradients, where we expect the failure of linear laws such as the Fourier law for heat conduction. Not much is known either experimentally or theoretically. Attempts to introduce such nonlinear outcomes ... have led to 'extended thermodynamics' ." (3) "...memory effects which appear for long times (as compared to characteristic relaxation times). ...non-equilibrium processes may have 'long time-tails'...".  
  
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