Basics of ECE Theory

An Explanation of LENR?

(Low Energy Nuclear Reactions)

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AIAS
March 2014

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Topics Covered

- Brief history of physics and a look forward
  - Should be done by a historian and sci-fi writer
- Brief explanation of ECE theory
- LENR and its explanation using ECE

A Pleasant State of Affairs

- By the last half of the nineteenth century, the physics community had over a period of about a hundred years
  - Unified electricity and magnetism
  - Accepted wave theory over particles for light
  - Completely explained thermodynamics
  - Could predict solid, fluid, and gaseous flow
  - Explained the motion of stars and planets

A Pleasant State of Affairs

- Maxwell claimed that the only thing a physicist needed was a paper and pencil
- Michelson said in 1894 that all the fundamental discoveries had been made and subsequent developments would be in the sixth decimal place.
- Experimental science was obsolete; physicists were feeling pretty smug.

Holes in the Armour

- Fraunhoffer -spectral lines, discrete spectrum for light (1817)
- ultraviolet catastrophe – radiated energy proportional to T^4 (1879)
- photoelectric effect -energy of ejected electrons depended on frequency not intensity of incident light (1887)
- Michelson-Moreley experiment – speed of light independent of source-no ether (1887)

Explaining Holes in the Armour

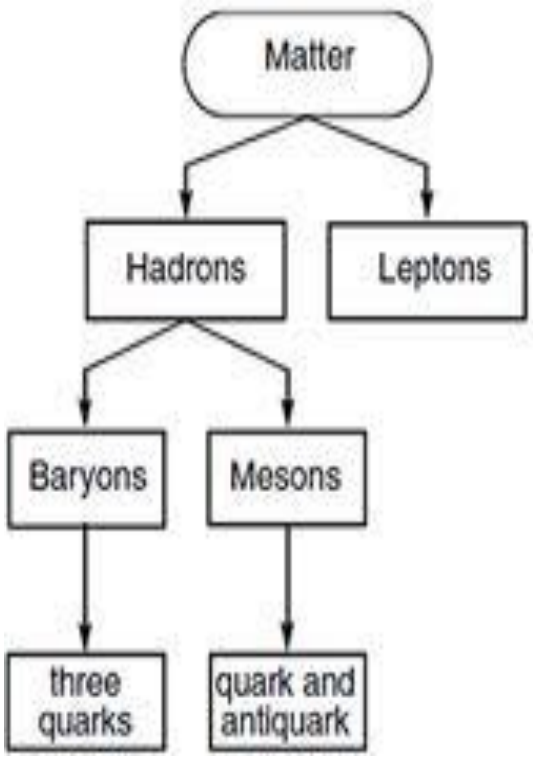
- Planck proposed radiation energy is proportional to frequency and is quantized (1900)
- Einstein – photoelectric effect and wave-particle duality of light (1905)
- Wave-particle duality (started around 1900 but culminated by de Broglie- 1924)

Explaining Holes in the Armour

- Einstein – Special Relativity (1905)
- Bohr model of atom (1913)
- Einstein- General Relativity (1915)
- Eddington-bending of starlight (1919)
- Heisenberg's uncertainty principle (1925)
- Schrodinger's quantum mechanics formulated(1925)
- Whole raft of particle discoveries

Then Came the Standard Model

- By the mid-twentieth century the groundwork for a new physics was in place
- Murray Gell-Mann quark model (1963)
- Weinberg-Glashow electroweak theory (1967)
- Standard model proposed (1973)
  - 61 elementary particles
  - Come in colours and flavours



The Standard Model

- Quarks and Leptons-elementary particles
- Force carriers-virtual particles
  - gluon-strong force
  - photon-electromagnetic force and weak force
- Higgs particle (proposed 1964)
  - discovered 2012-13??explains mass, etc.
  - Is it an experimental artifact?
- Gravity not included in standard model

Holes in the Standard Model

- by 1932 it was recognized that the motions of the galaxies didn't fit the relativistic or Newtonian model of gravity
  - Patch it up with dark matter and energy composed of an as yet undiscovered sub atomic particle. Current thinking is universe consist of (4.9% ordinary matter, 26.8% dark matter, 68.3% dark energy)

Holes in the Standard Model

- Inconsistencies in electromagnetism
  - Can not be unified with gravity
  - Can not explain homopolar generator
  - Cannot explain inverse faraday effect
  - Abranov-Bohm explanation is a stretch
  - Cannot explain the Sagnac effect
  - Polarization of light due to gravity

Holes in the Standard Model

- Multi-universe concept
- Virtual particles
- Conscious thought controls future events
  - pushes Copenhagen model to limit

The Rise of the New Priesthood

- String theory attempts to incorporate gravity in the standard model (Heisenberg 1940)
- M theory or super string theory
  - 11 dimensions most of which are curled up (1994)
  - experimental predictions can't be made to verify its existence
- CERN experiments can`t be duplicated (cost)
  - so goes the scientific method , natural laws understood only by wiser (theoretical only) mediators.

Are We Due for a New Physics?

The standard model is about fifty years old –may be the half live of a physics paradym

- What happened to "Okkam" and "Francis Bacon"
  - Has the scientific method been abandoned?
- 1925-1950 Einstein struggled unsuccessfully to combine electromagnetism and gravity using a torsion based geometry developed by Cartan.
  - Einstein maintained that physics was geometry
  - God "doesn't play dice with the universe"

Introducing ECE Theory

- Building on Einstein & Cartan and employing knowledge gained from developmental work on the B(3) field, EVANS introduced the ECE field theory in 2003.
  - B(3) is right and left circularly polarized components plus a longitudinal component
- Einstein's premise that "Physics = geometry" is the backbone of the theory
- Most suitable geometry was Cartan torsional geometry which combined gravity through curvature and electromagnetism through torsion.

What is ECE Theory?

- Physical theory that unifies electromagnetism, gravitation, strong and weak forces, and in so doing includes quantum theory, making it ideal for explaining LENR
- Beginnings in 2003 by Myron Evans based on original work done by Einstein and Cartan
- Over 250 topical publications and more than 70 supportive publications in refereed publications, university libraries and government archives, and several websites.
- 2 - 3 million website visitors worldwide every year.

What Does ECE Explain
(that the Standard Model doesn't do well if at all)

- LENR
- Inverse Faraday Effect
- Faraday disk (homopolar) generator
- Aharonov-Bohm Effect
- Polarization of light due to gravity
- Sagnac Effect
- Spiral galaxy geometry
- Singularity free cosmology (no dark matter)
- Accurate prediction of photon mass
- Incorporates quantum vacuum with interactions
- And the list goes on.....see (www.AIAS.US)

ECE Reduces to Standard Theories

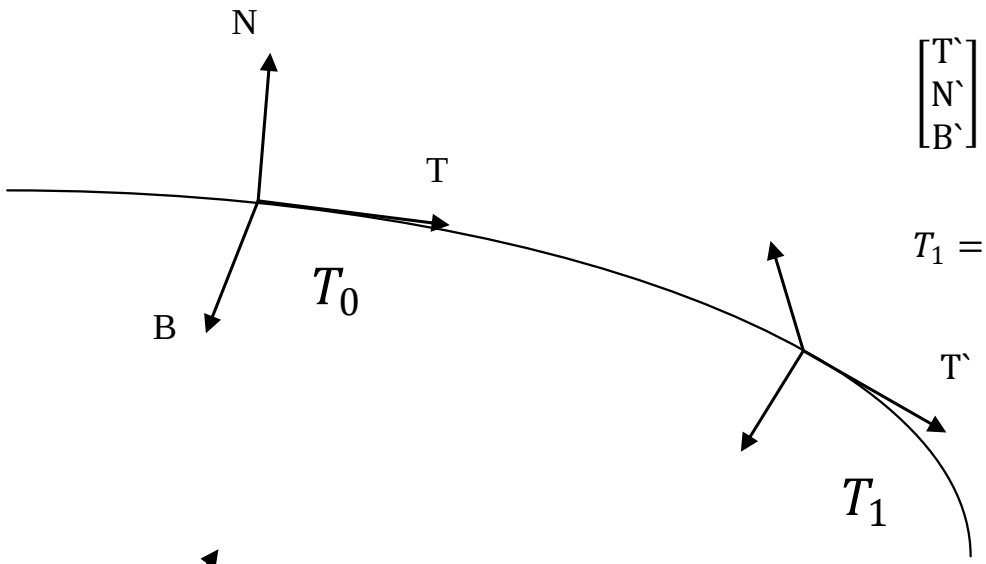
- Mathematically equivalent to Maxwell in absence of matter
- Mathematically equivalent to Einstein in absence of charge
- Reduction to wave mechanics
  - Dirac, Proca, Schrodinger equations
- Particle-particle interactions without virtual particles
- Descriptions of weak fields (no Higgs particle)
- Retains field interactions (em-gravity, etc.) between all fundamental forces

Properties of ECE Equations

- The ECE equations in a potential representation define three well-defined equation systems (each with 8 equations and 8 unknowns); these can be reduced by antisymmetry conditions and additional constraints
- There is much more structure in ECE than in standard theory (Maxwell-Heaviside)
- There is no gauge freedom in ECE theory
- Resonance structures (self-enforcing oscillations) are possible in Coulomb and Ampère-Maxwell law

Torsion and Curvature

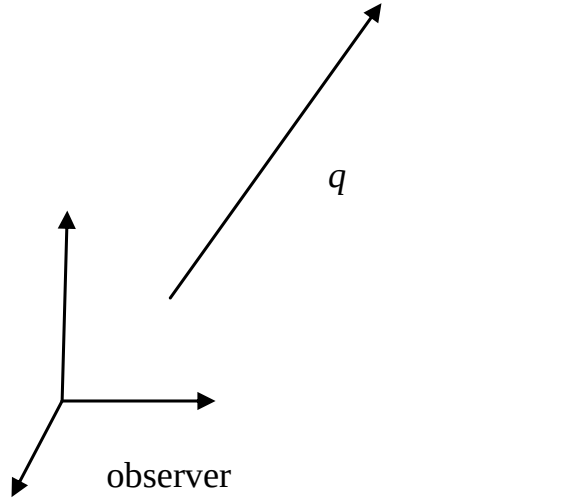
Fresnet-Serret Formula (1850)



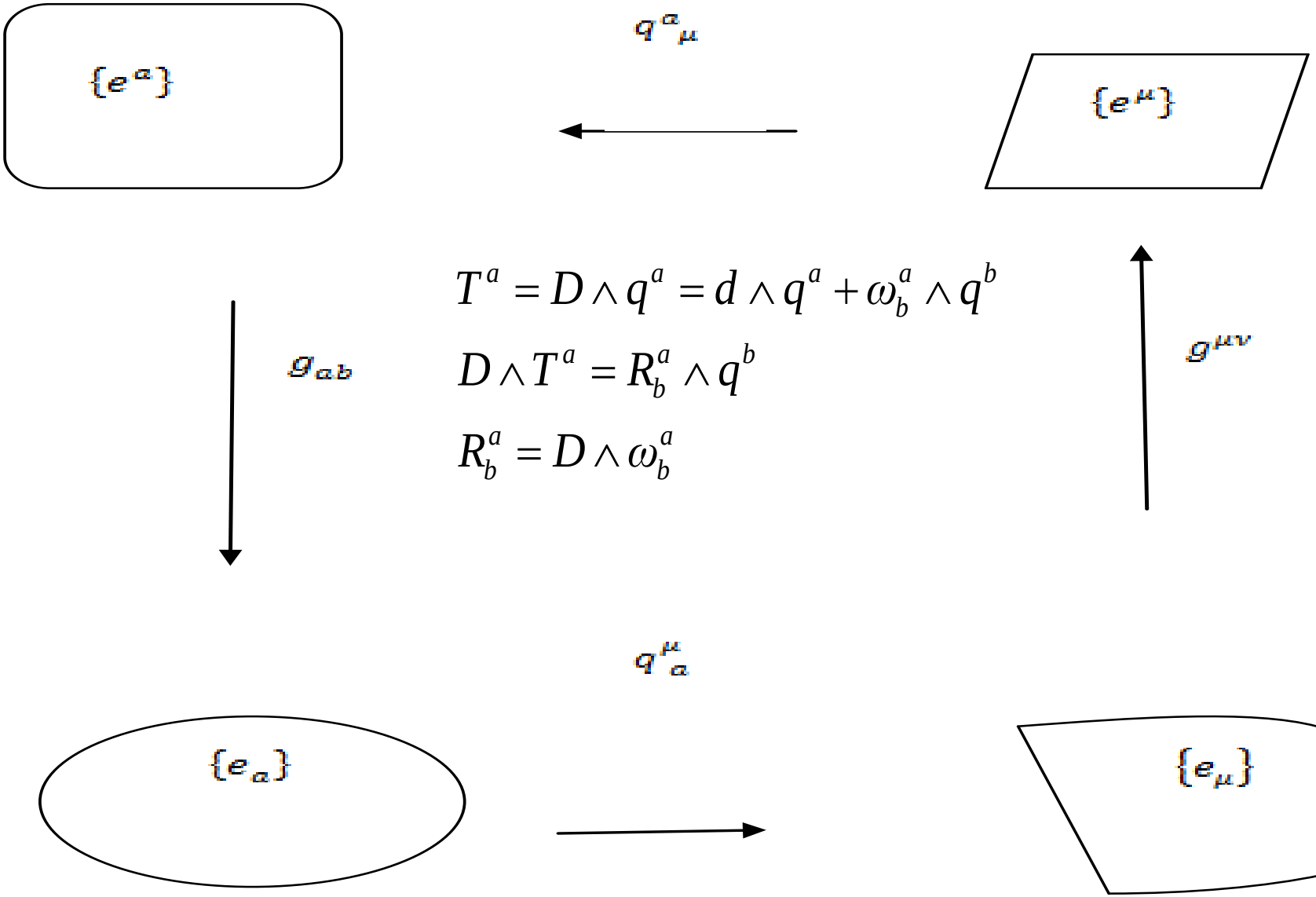
$$B = N \times T$$

$$\begin{bmatrix} T` \\ N` \\ B` \end{bmatrix} = \begin{bmatrix} 0 & \kappa & 0 \\ -\kappa & 0 & \tau \\ 0 & -\tau & 0 \end{bmatrix} \begin{bmatrix} T \\ N \\ B \end{bmatrix}$$

$$T_1 = T_0 + \begin{bmatrix} T` \\ N` \\ B` \end{bmatrix} ds$$



Basic Cartan Geometry



$$T^a = D \wedge q^a = d \wedge q^a + \omega^a_b \wedge q^b$$

$$D \wedge T^a = R^a_b \wedge q^b$$

$$R^a_b = D \wedge \omega^a_b$$

ECE Electromagnetism

$$F = A^{(0)} T$$

$$E^a = \left(-\underline{\nabla}\phi^a - \frac{\partial A^a}{\partial t}\right) + \left(\omega^a \phi^a - \omega_0^a A^a\right)$$

$$B^a = \left(\underline{\nabla} \times A^a\right) - \left(\omega^a \times A^a\right)$$

$$d \wedge F + \omega \wedge F = A^{(0)}\, R \wedge q$$

$$d \wedge \tilde{F} + \omega \wedge \tilde{F} = A^{(0)}\, \tilde{R} \wedge q$$

$$\underline{\nabla} \cdot B^a = \rho_m ; \quad \underline{\nabla} \times E^a + \frac{\partial B^a}{\partial t} = j^a$$

$$\underline{\nabla} \cdot E^a = \frac{\rho^a}{\varepsilon_0}$$

$$\underline{\nabla} \times B^a - \frac{1}{c^2}\frac{\partial E^a}{\partial t} = \mu_0 J^a$$

$$\left[D_\mu, D_\nu\right] V = -\left[D_\nu, D_\mu\right] V$$

$$\frac{\partial A^a}{\partial t} - \underline{\nabla}\phi^a + \omega_0^a A^a + \omega^a \phi^a = 0$$

$$\frac{\partial A_i^a}{\partial x_j} + \frac{\partial A_j^a}{\partial x_i} + \omega_i^a A_j^a + \omega_j^a A_i^a = 0$$

ECE Resonance

- Euler resonance is inherent in basic equations
  - Resonance within the spin structure of spacetime
    - Homopolar generator

$$\frac{\partial^2 A}{\partial t^2} + c\omega_0 \frac{\partial A}{\partial t} + cA\frac{\partial \omega_0}{\partial t} = -c^2 \nabla \times B$$

  - Resonant coupling between the gravitational and electromagnetic fields
    - Floyd Sweet coil
  - Resonance with the ECE vacuum field
    - LENR

$$\nabla^2 \phi + \omega^2 \phi = kA^{(vac)} \cdot \left(\nabla \omega_0 + \frac{\partial \omega}{\partial t} \right)$$

What is LENR?

- Transmutation of one element to another with low energy impacting particles
  - possible release of other particles plus excess energy
- Commercial devices focussing on reactions of Nickel in water (protons)

ECE Vacuum State

- Rich vector and scalar potentials fields exist when the electric and magnetic fields are zero
- Current thinking suggests that the vacuum fields may be composed of $Tanh^{n}(kr)$ terms or perhaps electromagnetic vortices of the Beltrami type

Does ECE Resonance Explain LENR?

- It's been 25 years since Pons and Fleishmann made the physics community squirm, especially the $50 billion hot fusion segment
- Since then
  - Numerous (>1500) replications of the experiment
  - No solid explanation that covers all of the phenomena
  - Commercial devices nearly market ready
    - Rossi device has stability problems
  - DOE this year allows funding for LENR in a disruptive technology funding program.

Levels of Explanation using ECE

- Semi-classical resonant coupling of the em field to the nucleus
  - Non- relativistic quantum field using ECE electrodynamics
  - Relativistic quantum field using ECE electrodynamics
- ECE collision theory with variable mass
- Resonant interactions with vacuum field

LENR and ECE - an example

- Consider following tentative LENR reaction

$$Ni^{a} + p \rightarrow Cu^{a+1} \rightarrow Ni^{a+1} + e^{+} + energy$$

- ECE can explain this on several levels
  - Non-relativistic quantum tunneling of proton dragging a quantized electromagnetic potential into the nucleus with it.
  - Relativistic quantum tunneling with electromagnetic potential again dragging a quantized electromagnetic potential into the nucleus
  - ECE impact theory incorporating change of mass, electromagnetic effects, space time curvature
  - Enhanced proton potential using vacuum state resonance

Non-Relativistic Quantum Tunneling

- Standard model predicts negligible quantum tunneling

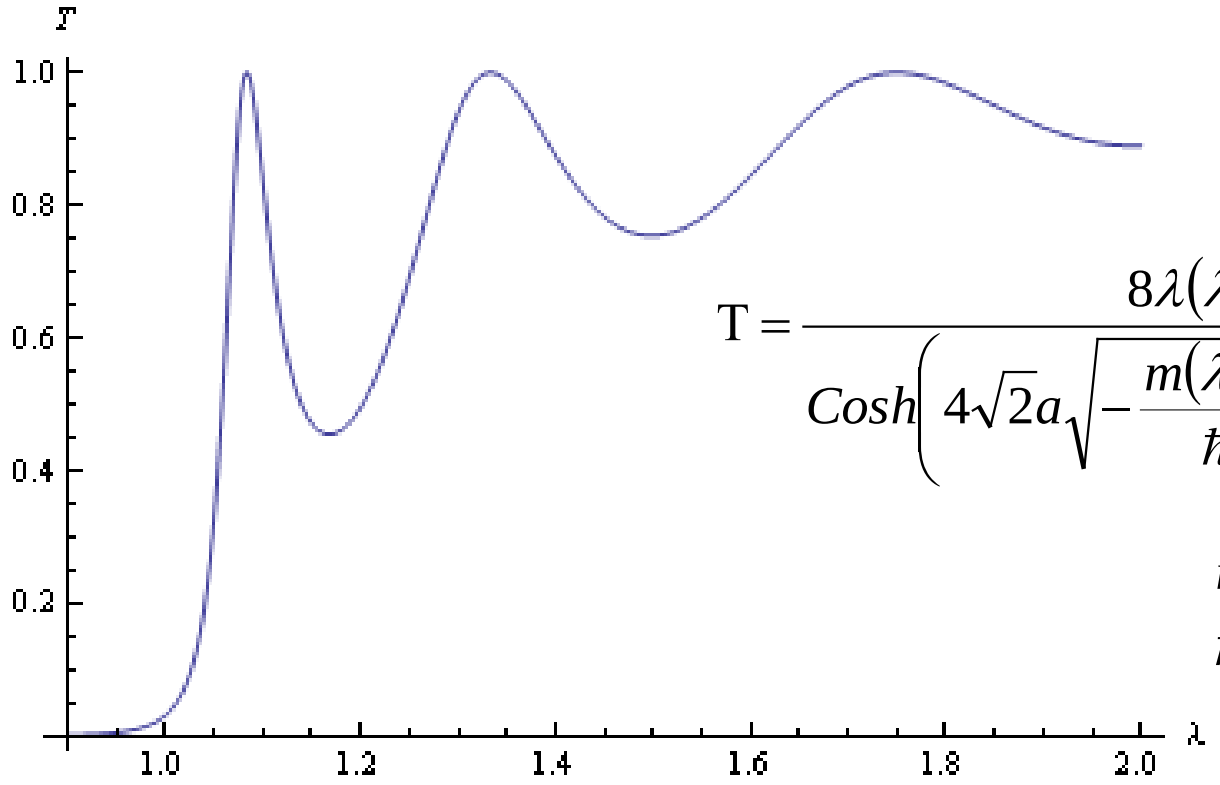
$$T \approx \frac{4}{\left(2\theta + \frac{1}{2\theta}\right)^2}$$

$$\theta = Exp\frac{\sqrt{2\mu}}{\hbar}\int_a^b \left(V(r) - E\right)^{1/2} dr$$

Non-Relativistic ECE

Square Well Potential

- projectile particle tunnels into particle at rest



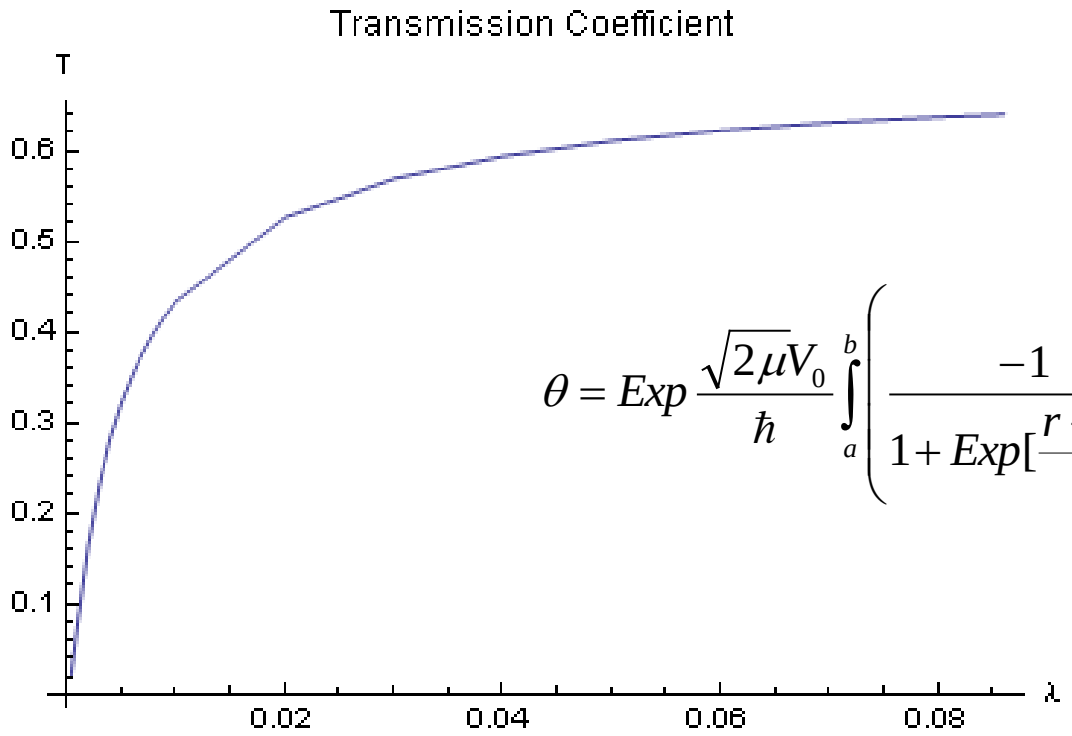
$$T = \frac{8\lambda(\lambda-1)}{Cosh\left(4\sqrt{2}a\sqrt{-\frac{m(\lambda-1)}{\hbar^2}}\right)+8\lambda^2-8\lambda+1}$$

$$m = 1 \qquad a = 3.84$$

$$\hbar = 1 \qquad \lambda = E/V$$

Relativistic ECE

Wood-Saxon Potential



$$\theta = Exp\frac{\sqrt{2\mu V_0}}{\hbar}\int_a^b\left(\frac{-1}{1+Exp[\frac{r-R}{a}]}+V_c-\lambda\right)^{1/2}dr$$

$$T \approx \frac{4}{\left(2\theta+\frac{1}{2\theta}\right)^2}$$

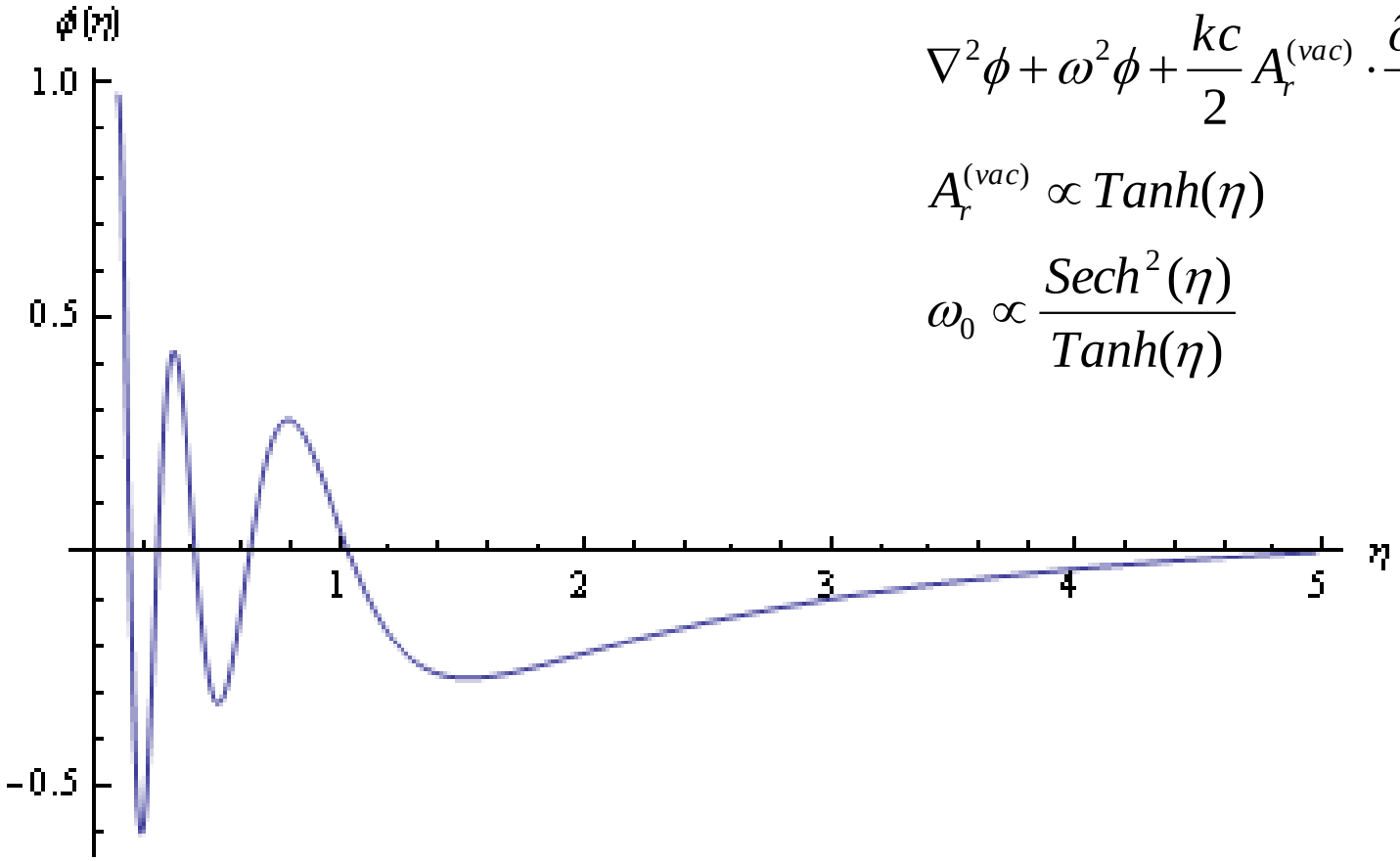
Vacuum State Resonance

- Resonance with ECE vacuum state where electric and magnetic fields are globally zero.
  - Supports a myriad of hyperbolic tangent wavelets or perhaps Beltrami vortices
  - Driving "force" and damping agent in ECE Coulomb's Law

$$\nabla^2\phi + \omega^2\phi = kA^{(vac)} \cdot \left(\nabla\omega_0 + \frac{\partial\omega}{\partial t} \right)$$

$$\theta = Exp \frac{\sqrt{2\mu V_0}}{\hbar} \int_a^b \left(\frac{-1}{1 + Exp[\frac{r-R}{a}]} + V_c - \lambda \right)^{1/2} dr$$

Vacuum Resonance



$$\nabla^2\phi + \omega^2\phi + \frac{kc}{2} A_r^{(vac)} \cdot \frac{\partial \omega_0}{\partial \eta} = 0$$

$$A_r^{(vac)} \propto Tanh(\eta)$$

$$\omega_0 \propto \frac{Sech^2(\eta)}{Tanh(\eta)}$$

How Will This Help?

- Commercial attempts at LENR and other so called over unit energy sources have failed because of
  - Explosions caused by perhaps an uncontrolled resonant effect
  - Designs too sensitive to material and manufacturing variability
  - Location sensitivity (gravitational variation)

$$\nabla^2\phi + \omega^2\phi = kA^{(vac)} \cdot \left(\nabla\omega_0 + \frac{\partial\omega}{\partial t} \right)$$

Only future work will reveal the truth!