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New Electromagnetism (V3)

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For the v1 version of this paper, see www.distinti.com/docs/v1/ne.pdf

ABSTRACT

New Electromagnetism (NE) is comprised of three charge force equations (also called point charge forms, see table below) which provide a more complete description of electromagnetic phenomenon than classical electromagnetic theory (CE). Furthermore, NE is free of paradoxes and anomalies associated with CE (see apoce.pdf).

The most interesting aspect of NE is that relativistic effects are built into the equations. This was not expected, but is explored in this paper.

The major improvement in NE over CE is the model for Magnetic fields. In NE, magnetic field are spherical; whereas CE describes a toroidal (donut) shaped field.

This paper releases the version three (V3) description of NE. Although the fundamental point equations have not changed from the V2 description, the fields and energy definitions have been improved. Also improved are the “wire fragment” forms of NE.

Once the models and identities have been introduced, NE is applied to solve the following:

1) **Einstein’s Energy Equation $E = mc^2$ is derived from New Electromagnetism (page 27).**
2) **Mass of electron derived from New Electromagnetism (page 26).**

Name	Point Charge forms	Notes
Coulomb’s Model	$\mathbf{F} = \frac{K_E Q_S Q_T \hat{\mathbf{r}}}{\lvert\mathbf{r}\rvert^2}$	$K_E = \frac{1}{4\pi\varepsilon}$
New Magnetism (see nm.pdf)	$\mathbf{F} = \frac{K_M Q_S Q_T}{\lvert\mathbf{r}\rvert^2}\left[(\mathbf{v}_T \bullet \hat{\mathbf{r}})\mathbf{v}_S - (\mathbf{v}_S \bullet \hat{\mathbf{r}})\mathbf{v}_S - (\mathbf{v}_S \bullet \mathbf{v}_T)\hat{\mathbf{r}}\right]$	$K_M = \frac{\mu}{4\pi}$
New Induction (see ni.pdf)	$\mathbf{F} = \frac{-K_M Q_S Q_T \mathbf{a}_S}{\lvert\mathbf{r}\rvert}$	$K_M = \frac{\mu}{4\pi}$

New Electromagnetism (V3)

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1 Please Read.

There is no such thing as an irrefutable model or theory. Models are nothing more than mathematical mimics of observed natural phenomena. A theory is simply a guess as to the underlying "mechanism" which explains a given model. Here are some quotes that support this position:

> **"There's no such thing as 'facts of life'. Only standing theories that haven't been disproved as of yet." --Simon Travaglia**

> **"Progress does not consist of replacing a theory that is wrong with one that is right. It consists of replacing a theory that is wrong with one that is more subtly wrong." --Dr. David W. Hawkins**

It is my objective to make NE the most "subtly wrong" expression of electromagnetic physics possible. Improvements will be released as new facts are learned and validated.

This is to be considered a living document. Past versions can be found on the website. See

1) www.distinti.com/docs for current versions (V3)
2) www.distinti.com/docs/v1 for NE version 1
3) www.distinti.com/docs/v2 (This document was not revised for v2 – just didn't get to it)

Also, I'm in the process of eradicating the use of the word "Law" from prior documentation. As far as physics is concerned, only nature has laws; our models and theories are merely crude attempts to mimic those laws. These attempts are constrained by human stupidity, perception, superstition and arrogance. It is for this reason Coulomb's Law is now referred to as Coulomb's Model. Also, the use of the word "law" gives the false impression that a model is beyond reproach. Here is another quote:

> **"The greatest obstacle to science in the illusion that we think we really know what's going on." – Dr. David Disney.**

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2 Introduction

New Electromagnetism (NE) was developed because there are too many instances where classical electromagnetic theory (CE) fails to predict the proper outcome of well known experiments (see apoce.pdf, or the_secrets_of_qvxb.pdf). In some cases CE predicts over-unity (Maxwells_dilemma.pdf) and in other cases, such as self-induction, no valid solutions can be obtained (see my graduate thesis neThesis.pdf).

New Electromagnetism is founded upon the principle that ALL electromagnetic fields are created by forcing charges to behave a certain way. And, ALL fields are measured by observing the behavior of charges affected by the field. Since charges are the most fundamental source of electromagnetic field effects (as far as I know now), then all electromagnetic interactions must be resolvable to "charge/force" equations such as Coulomb's model.

The "charge/force" equations are also called "point charge" equations.

Since electric circuits (RLC) are modeled using second order differential equations then correspondingly, there must exists a set of equations that describe second order effects among point charges. This means that the equations must consider charge position, velocity and acceleration. These equations can then be reformed into charge flow equations as the need requires.

The table on the abstract page shows the three point charge equations which address charge position, velocity and acceleration.

The first model is Coulomb's model which relates force to charge position. Other than notational differences, it is the same as CE.

The second model is New Magnetism (NM). It relates force to charge velocity. There are two different ways in which NM can be derived. The original method found in the New Magnetism paper (nm.pdf) derives it by reconciling the binary mass particle (BMP) with predictions of Einstein's Relativity. A simpler method is found in the paper **the_secrets_of_qvxb.pdf** which derives NM by reconciling three simple parallel wire experiments.

The third model is New Induction (NI). NI relates force to charge acceleration. NI was found by sifting experimental data through a numerical algorithm (see ni.pdf). NI was the first NE model to be developed. It was the catalyst the led to NM and the concept of redefining EM theory.

NE will be discussed in more detail in later chapters. Presently, the reader should become familiar with NE terms, definitions and identities.

2.1 Definitions

This document uses abbreviations and symbols in order to keep descriptions as short as possible. Furthermore, NE introduces nomenclature which is unique.

2.1.1 General

Table 1 Definitions

$\times$	This Symbol denotes a Cross Product, not scalar multiplication.
$\mathbf{A}\times\mathbf{B}\times\mathbf{C}=(\mathbf{A}\times\mathbf{B})\times\mathbf{C}$	Chains of cross products without parenthesis are evaluated from left to right. $\mathbf{A}\times\mathbf{B}\times\mathbf{C}=(\mathbf{A}\times\mathbf{B})\times\mathbf{C}\neq\mathbf{A}\times(\mathbf{B}\times\mathbf{C})$ (This usage is being phased out)
$\bullet$	This symbol represents Dot Product. In some cases, smaller dots are used.
$\mathbf{r}$	This symbol represents the vector distance from source to target in all usage.
$\hat{\mathbf{r}}$	A symbol embellished this way represents a direction vector.
$\lvert\mathbf{r}\rvert=r$	Vertical bars around an expression denote that the magnitude of the enclosed quantity is desired. Non bold characters are always scalar.
V_P	Potential Voltage. Potential Energy per coulomb $V_P=PE/Q$ (volts = J/C).
V_K	Kinetic Voltage. Kinetic Energy per coulomb $V_K=KE/Q$ (volts = J/C).
emf	emf is an obsolete term. NE now uses the term Kinetic

	Voltage instead of emf. $emf \equiv V_K$ ← for NE papers prior to V3.
Q_S, Q_T	Source and Target point charges.
$K_E = \frac{1}{4\pi\varepsilon}$	The Electric field constant.
$K_M = \frac{\mu}{4\pi}$	The Magnetic field constant.
$C = \sqrt{\frac{K_E}{K_M}}$	The Speed of light.
——▶	Velocity or Current.
——▶▶	Acceleration or Current change.
⟶	Force.
——>	Distance.
Bold Face	Bold face characters represent vector quantities.
CE	Classical Electromagnet theory. Maxwell's Equations, Faraday's Model, Biot-Savart, F-QvxB etc.
E = Electric field.	An Electric Field. An electric field is a conservative force per coulomb field which is associated with potential energy. This is a vector quantity
FRAGMENT	A differential length of conductor is represented by a differential vector length $d\mathbf{L}$
KE	Kinetic Energy
L (not bold face)	Self inductance (henries): This is the back emf in an inductor resulting from the current change through it such that: $V_K = -L\frac{dI}{dt}$.
M (not Bold face)	Mutual inductance (henries): This is the emf generated in a target loop resulting from the current change in a source loop such that: $V_K = -M\frac{dI}{dt}$.
M = Magnetic field.	A Magnetic Force Field. A "force per coulomb" field generated from charge motion (velocity and acceleration). It is associated with kinetic energy. This

	is a vector quantity
PE	Potential Energy
POINT CHARGE	A quantity of charge occupying an infinitesimally small space. Point charges are represented by a "Q" and have the units of Coulombs.
SOURCE	A source is an object emitting energy into space. This energy affects the object we are observing known as the TARGET. A subscript "S" denotes a property, object or energy of the source.
TARGET	A target is the object we desire to understand. We measure (or compute) the forces acting on a target by summing the effects produced by all of the sources. A subscript "T" denotes a property, object or energy of the target.

2.1.2 Point Charge Systems

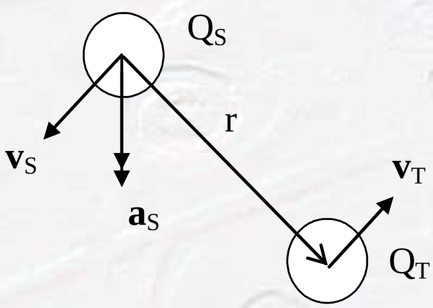


Figure 2-1 Point Charge systems

Figure 2-1 shows that vector motion (velocities and accelerations) and scalar point charges comprise point charge systems. The total effect on the target is the vector summation of the effects produced by all sources.

The charge-force models are also called the point-charge models. They are the most fundamental expression of NE. All other forms are derived from the point charge forms.

2.1.3 Wire Fragment Systems

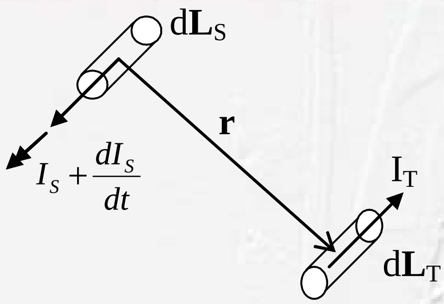


Figure 2-2 Wire Fragment systems

New Electromagnetism enables the modeling of a system as a collection of fragments (fragment = vector differential length of wire = $d\mathbf{L}$). Each fragment can be a source ($d\mathbf{L}_S$) that emits energy into surrounding media and each fragment can be a receptor (target fragment = $d\mathbf{L}_T$) to energy that strikes it.

2.1.4 The constants K_E and K_M

To ease the handling of the constants for electromagnetism and to make the constants symmetrical with other branches of physics we use:

$K_E = \frac{1}{4\pi\varepsilon}$ Electric Field Constant = $8.98755 \bullet 10^{9}$

$K_M = \frac{\mu}{4\pi}$ Magnetic Field Constant = $1 \bullet 10^{-7}$

These forms give us $C = \sqrt{\frac{K_E}{K_M}}$ for the speed of light in a vacuum instead of $C = \frac{1}{\sqrt{\mu\varepsilon}}$. The new form is symmetrical with the wave velocity equations of classical mechanics.

2.2 Identities

2.2.1 Charge-to-Fragment conversion Identities

Note: These identities are slightly different from previous versions. The change involves a more rigorous definition that allows more certainty of usage. This change does not affect the results obtained in previous NE papers.

The Charge to Fragment conversion identity allows one to convert between the fragment and point forms of equations. The Identity is:

$Id\mathbf{L} = dQ\mathbf{v}$ for $d\hat{\mathbf{L}} = \hat{\mathbf{v}}$.

This identity states that the current (I) traveling through a fragment (d**L**) is equal to a differential charge (dQ) moving at velocity (**v**).

To prove this identity, we substitute the differentials for velocity (dL/dt) and current (dQ/dt) into the equation to obtain:

$$\frac{dQ}{dt}d\mathbf{L} = dQ\frac{d(\mathbf{position})}{dt}.$$

Since $d\hat{\mathbf{L}} = \hat{\mathbf{v}}$ (from above), then d**L** and d(**position)/dt** are in the same direction.

For d**L** and d(**position)/dt** along the x axis:

$$\frac{dQ}{dt}dx = dQ\frac{dx}{dt}.$$

Thus, according to chain rule, $Id\mathbf{L} = dQ\mathbf{v}$.

To make this useful we integrate both sides to arrive at

$$\int_L Id\mathbf{L} = Q\mathbf{v}$$ (**L** and **v** in same direction)

Equation 2-1: Charge to Fragment Velocity Identity (CFVI)

Another useful form of this equation is derived by taking the derivative with respect to time. This is:

$$\int_L \frac{dI}{dt} d\mathbf{L} = Q\mathbf{a} \,. \quad (\mathbf{L} \text{ and } \mathbf{a} \text{ in same direction})$$

Equation 2-2Charge-to-Fragment Acceleration Identity (CFAI)

Because we would also like a Charge-To-Fragment conversion Identity for Coulomb’s Model, the following is provided

$$\int_L \rho_L d\mathbf{L} = Q$$

Equation 2-3: Charge-to-Fragment Density Identity (CFDI)

Where ρ_L is defined as coulombs per unit length $\rho_L = dQ / dL$. If more resolution is desired, this can be converted to a volumetric integration which would require a volume charge density value ρ_v .

3 New Electromagnetism

The following equations are the NE V3 equations. This is the most complete set of interactions known at this time. These are subject to change as new experiments and phenomena are reconciled. The changes that occurred between the V2 and the V3 models are mostly notational except for new energy definitions.

3.1 The Charge-Force Models

Name	Charge-Force forms	Notes
Coulomb's Model	$\mathbf{F} = \dfrac{K_E Q_S Q_T \hat{\mathbf{r}}}{\lvert\mathbf{r}\rvert^2}$	$K_E = \dfrac{1}{4\pi\varepsilon}$
New Magnetism	$\mathbf{F} = \dfrac{K_M Q_S Q_T}{\lvert\mathbf{r}\rvert^2}\left[(\mathbf{v}_T \bullet \hat{\mathbf{r}})\mathbf{v}_S - (\mathbf{v}_S \bullet \hat{\mathbf{r}})\mathbf{v}_S - (\mathbf{v}_S \bullet \mathbf{v}_T)\hat{\mathbf{r}}\right]$	$K_M = \dfrac{\mu}{4\pi}$
New Induction	$\mathbf{F} = \dfrac{-K_M Q_S Q_T \mathbf{a}_S}{\lvert\mathbf{r}\rvert}$	$K_M = \dfrac{\mu}{4\pi}$

3.2 The Charge-Field Models

By dividing through by the Target charge, the charge-field models are developed.

Name	Charge-Field forms	Notes
Coulomb's Model	$\mathbf{E} = \dfrac{K_E Q_S \hat{\mathbf{r}}}{\lvert\mathbf{r}\rvert^2}$	$K_E = \dfrac{1}{4\pi\varepsilon}$
New Magnetism	$\mathbf{M} = \dfrac{K_M Q_S}{\lvert\mathbf{r}\rvert^2}\left[(\mathbf{v}_T \bullet \hat{\mathbf{r}})\mathbf{v}_S - (\mathbf{v}_S \bullet \hat{\mathbf{r}})\mathbf{v}_S - (\mathbf{v}_S \bullet \mathbf{v}_T)\hat{\mathbf{r}}\right]$	$K_M = \dfrac{\mu}{4\pi}$

New Induction	$\mathbf{M} = \frac{-K_M Q_S \mathbf{a}_S}{\lvert\mathbf{r}\rvert}$	$K_M = \frac{\mu}{4\pi}$

The V3 models use $\mathbf{M}$ in place of $\mathbf{E}_M$ from the V2 models.

Note: present developments are hinting that the New Induction field should be a separate field (the I-field will be used if that is the case). This is still under investigation.

3.3 The E and M fields

In NE V3 there are two types of force-per-coulomb fields, the Electric Force Field (E) and the Magnetic Force Field (M). E (Electric or Electro-Potential) fields are developed from Coulomb's Model while M (Magnetic or Magneto-Kinetic) fields are developed from both New Induction and New Magnetism.

E-fields convey potential energy and are conservative.
M-fields convey kinetic energy and are not conservative.

The M field is NOT the B-field of classical theory since the M-Field truly is a "Force" field like the Coulomb field. Furthermore, the M-Field is a spherical field whereas; the B-Field is torroid shaped.

4 Energy

NE provides more rigorous definitions of energy than CE. CE defines energy in a ubiquitous fashion that makes no distinction between Potential and Kinetic energy.

NE (V3) provides definitions for Kinetic and Potential Energy. It also introduces a concept known as displaced energy.

4.1 Potential Energy (PE)

In NE, potential energy (PE) is developed from Coulomb's Model. It is defined by the following expression

4-1) $PE = -Q\int_a^b \mathbf{E} \bullet d\mathbf{L}$

PE is acquired (work) as a charge is moved against the applied electric field. A negative result indicates potential energy lost to other energy forms such as kinetic energy.

PE can be divided into two sub categories. The first is called "work energy" and the second is called "total energy." Work energy (work) is defined as the amount of energy gained by a system as a charge is moved over a finite interval (perhaps ΔPE would be a better term). Total energy is the total amount of energy in a system at a given instant.

Here is a simple sentence that will help to highlight the difference:

By doing work on a system you are adding the energy to the energy that was already there.

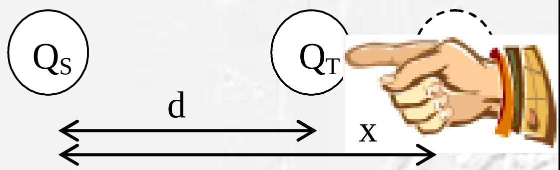
Here is an expression:

Final_total_energy=initial_total_energy+work_energy.

The following diagrams demonstrate work and total energy using Coulomb's model alongside the analogy of a spring (for reference).

<table>
<tr><th>Energy Form</th><th>Analogy</th></tr>
<tr><td>

$$PE_{work} = -Q_T \int_x^d \mathbf{E}_S \bullet d\mathbf{L}$$



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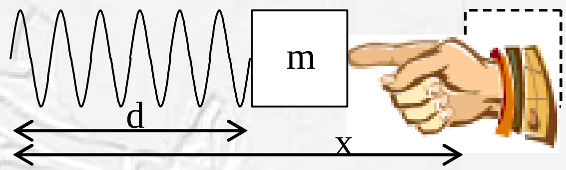
$$PE_{work} = -\int_x^d \mathbf{F}_{spring} \bullet d\mathbf{L}$$



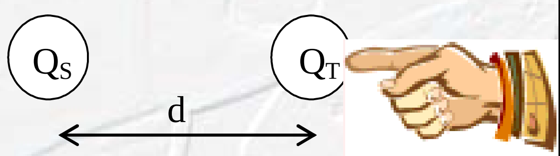
</td></tr>
</table>

PE is acquired (work) as a charge is moved against the applied electric field. A negative result indicates potential energy lost to other energy forms such as kinetic energy.

Again, “work” is defined as the energy acquired over a finite interval (from “x” to “d”). To find the TOTAL potential energy between two charges you must integrate from “infinity” to “d” as shown in the following diagrams.

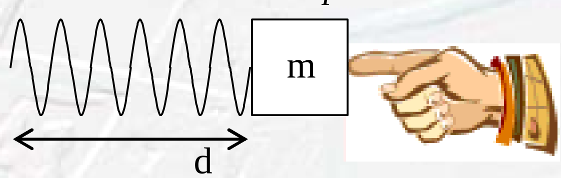
<table>
<tr><th>Energy Form</th><th>Analogy</th></tr>
<tr><td>

$$PE_{total} = -Q_T \int_\infty^d \mathbf{E}_S \bullet d\mathbf{L}$$



</td><td>

$$PE_{total} = -\int_{rest\ pos}^d \mathbf{F}_{spring} \bullet d\mathbf{L}$$



</td></tr>
</table>

4.2 Kinetic Energy (KE)

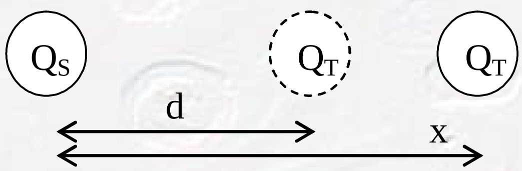
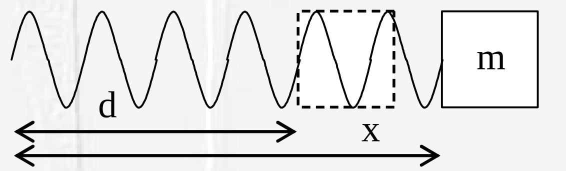
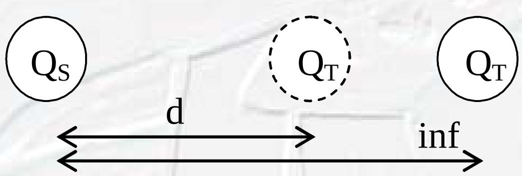
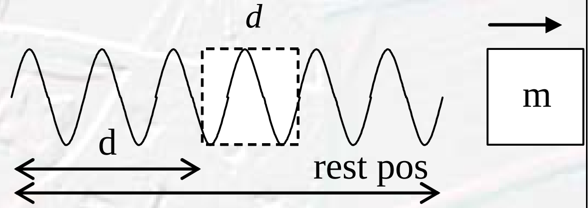
Kinetic energy (KE) is developed from both E and M fields. Its is defined by the following two expressions

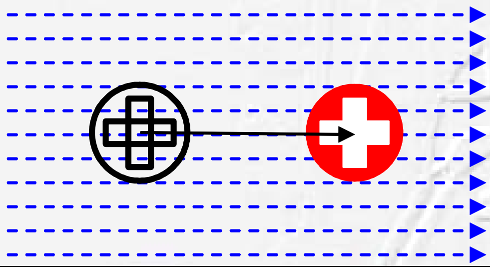
4-2) $KE = Q\int_a^b \mathbf{E} \bullet d\mathbf{L}$

4-3) $KE = Q\int_a^b \mathbf{M} \bullet d\mathbf{L}$

These equations state that a charge acquires kinetic energy if it is allowed to move in the direction of the applied field. A negative result indicates kinetic energy lost to other forms. Other forms of energy include, but are not limited to, potential energy or energy dissipated in the form of heat (see displaced energy in next section).

There are two subordinate definitions for KE, one for “work energy” and another for “total energy”. The following sets of diagrams highlight this and should be self explanatory.

Energy Form	Analogy
$KE_{work} = Q_T \int_d^x \mathbf{E}_S \bullet d\mathbf{L}$ 	$KE_{work} = \int_d^x \mathbf{F}_{spring} \bullet d\mathbf{L}$ 
$KE_{total} = Q_T \int_d^\infty \mathbf{E}_S \bullet d\mathbf{L}$ 	$KE_{total} = \int_d^{rest} \mathbf{F}_{spring} \bullet d\mathbf{L}$ 

$KE_{work} = Q_T \int_d^x \mathbf{M} \bullet d\mathbf{L}$ 	Need Analogy
$KE_{total} = Q_T \int_d^\infty \mathbf{M} \bullet d\mathbf{L}$	Need Analogy

More diagrams and descriptions are forthcoming.

4.3 Displaced Energy (DE)

Displaced energy is energy that is transferred from the system that we are modeling to another system.

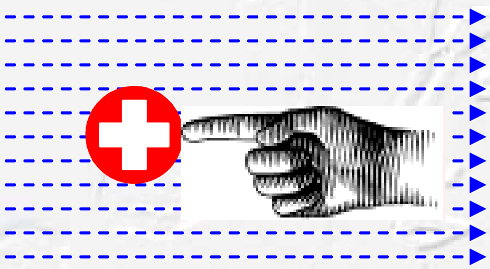
An example of displaced energy is energy lost in the form of heat (or dissipated energy).

Another example is electrical energy converted to mechanical energy such as the armature of an electric motor. Depending upon what the armature is coupled to, the displaced energy can take the form of mechanical kinetic or mechanical potential energy. In either case, the energy has the potential to be coupled back. This is the reason for the term displaced energy as opposed to dissipated energy.

Presently, DE is only defined for the M-Field.

4-4) $DE = -Q\int_a^b \mathbf{M} \bullet d\mathbf{L}$

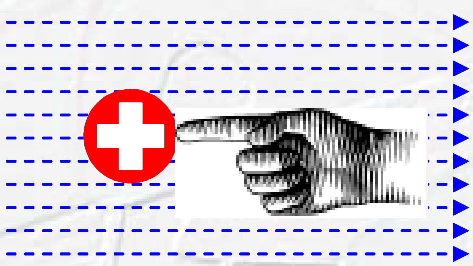
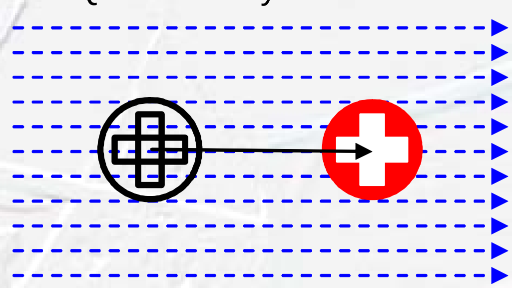
Energy is displaced whenever a charge is moved against an M-Field



Note: DE is new for this release. More will be published in the future as details are worked out. This section should be considered preliminary.

4.4 Overview of energy forms

The following chart provides a quick overview of the energy forms discussed.

Q moved against field	Q moved by the field
	
$PE = -Q \int_{against} \mathbf{E} \bullet d\mathbf{L}$	$KE = Q \int_{with} \mathbf{E} \bullet d\mathbf{L}$
$DE = -Q \int_{against} \mathbf{M} \bullet d\mathbf{L}$	$KE = Q \int_{with} \mathbf{M} \bullet d\mathbf{L}$

4.5 Voltage V_K and V_E

Multiple definitions of energy imply multiple definitions of voltage.

4-5) $V_K = \frac{KE}{Q}$ **= kinetic voltage (Joules per coulomb)**

4-6) $V_P = \frac{PE}{Q}$ **= potential voltage (Joules per coulomb)**

At this time, there does not seem to be a need to define "displaced voltage"

Voltage measuring equipment, such as Oscilloscopes and Digital Volt Meters, directly measure potential voltage and indirectly measure kinetic voltage. To explain how kinetic voltage is indirectly measured by these instruments, consider the following.

Suppose an almost closed loop of wire (target) is exposed to a field caused by a changing current in another loop (source). The field generated will be an M-Field which will impart kinetic energy to the target loop. The acquired kinetic energy will force charges around the loop causing a charge concentration at one side of the gap and charge depletion at the other side of the gap. An E-Field will be established across the gap due to the regions of depletion and concentration. This is what we measure when we measure the open circuit voltage of the secondary of a transformer. In essence, the kinetic energy is converted to potential energy (just as in a ballistic pendulum). If there is no loss in the conversion, then the measured potential voltage will equal the acquired kinetic voltage.

Therefore, for low frequency, low loss systems we can use the following rule:

The rule of nearly instantaneous conversion:

4-7) $V_K \cong -V_P$ **(for low frequency and low loss only).**

The techniques for measuring kinetic voltage under high frequency and/or loss are the subject of future releases.

4.6 Rules and Assumptions

NE like other modeling techniques has certain rules which help eliminate ambiguities and misconceptions. These rules represent the "best understanding" at the moment and should not be considered irrefutable.

4.6.1 Charges do not couple to themselves

NE is based on measurements of the interaction between point charges. These models should not be construed to represent or imply the coupling of a charge to itself.

At this moment, I'm not aware of any experiment which demonstrates the self-coupling of charges.

4.6.2 Field changes propagate radially

When a charge changes position, velocity or acceleration, the corresponding field changes radiate spherically outward from the point of change.

At the present moment, use the assumption that the field changes propagate at the speed of light. This assumption represents a simplification of actual events which is sufficient for macro scale modeling such as antenna radiation pattern modeling (nia1.pdf) and most other Electrical Engineering scale applications.

Models which describe field velocities and field mechanisms will be released in later publications. The knowledge of these mechanisms is not required to effectively use NE for Electrical Engineering applications.

4.7 Use of the charge-to-fragment conversion identity

NE is typically shown in point form because these forms are the most fundamental. In order to be useful for electrical engineers, they need to be converted to wire or wire-fragment forms. This is done with the charge-to-fragment conversion identities shown in section 2.2.1.

4.7.1 Conversion of Coulomb's Model to wire forms

To convert Coulomb's Model into its wire forms we start by writing down the charge-field model which is:

1) $\mathbf{E} = \frac{K_E Q_S \hat{\mathbf{r}}}{|\mathbf{r}|^2}$.

We next write down the acceleration form of the point-to-fragment conversion identity

2) $\int_L \rho_L dL = Q$.

Substitute step 2 into step 1 and bring constants outside integral

3) $\mathbf{E} = K_E \int_S \frac{\rho_{LS} \hat{\mathbf{r}}}{|\mathbf{r}|^2} dL_S$.

Step 3 shows the E-field generated by a wire containing a non-zero charge distribution. This is a hybrid form since it contains both point and fragment structures.

We next write down an expression for potential voltage.

4) $V_P = -\int_L E \bullet d\mathbf{L}$.

Apply step 4 to step 3

5) $V_P = -K_E \int_S \int_T \frac{\rho_{LS}}{|\mathbf{r}|^2} dL_S \hat{\mathbf{r}} \bullet d\mathbf{L}_T$.

If the charge distribution is constant over the length of the source loop, then it can be brought out of the integration.

6) $V_P = -K_E \rho_{LS} \int_S \int_T \frac{dL_S \hat{\mathbf{r}} \bullet d\mathbf{L}_T}{|\mathbf{r}|^2}$ (for uniform charge distribution)

4.7.2 Conversion of NI to wire forms

To convert NI into its wire forms we start by writing down the charge-field model of NI which is:

1) $\mathbf{M} = \frac{-K_M Q_S \mathbf{a}_S}{|\mathbf{r}|}$.

We next write down the acceleration form of the point-to-fragment conversion identity

2) $\int_L \frac{dI}{dt} d\mathbf{L} = Q\mathbf{a}$.

Substitute step 2 into step 1

3) $\mathbf{M} = \int_S -K_M \frac{dI_S d\mathbf{L}_S}{dt|\mathbf{r}|}$.

Bring constants out of integration

4) $\mathbf{M} = -K_M \int_S \left(\frac{dI_S}{dt} \frac{d\mathbf{L}_S}{|\mathbf{r}|} \right)$

Step 4 shows the M-field generated by a current carrying wire. This is a hybrid form since it contains both point and fragment structures.

We next write down an expression for kinetic voltage.

5) $V_K = \int_L M \bullet d\mathbf{L}$.

Apply step 5 to step 4

6) $V_K = -K_M \int_T \int_S \left(\frac{dI_S}{dt} \frac{d\mathbf{L}_S \bullet d\mathbf{L}_T}{|\mathbf{r}|} \right)$.

If the current is constant over the length of the source loop, then it can be brought out of the integration.

7) $V_K = -K_M \frac{dI_S}{dt} \int_T \int_S \frac{d\mathbf{L}_S \bullet d\mathbf{L}_T}{|\mathbf{r}|}$ (for uniform distribution of current change)

This expression looks similar to the Neumann equation of classical theory. The major difference is that this model is not constrained to closed loops. (See ni_neumann.pdf for more details)

4.7.3 Conversion of NM to wire forms

See the New Magnetism publication (nm.pdf) for complete treatment of this topic.

5 Practical Applications

The practical applications of NE are expanding daily and have thus been moved to their own documents. Here is a directory of present documents

1) New Induction Applications Volume 1 (nia1.pdf). Involves mutual inductive applications to include dipole radiation pattern modeling
2) New Induction Applications Volume 2 (neThesis.pdf). This is my graduate thesis; it shows the only non-singular and highly accurate method for computing the inductance of PCB and IC traces.
3) New Magnetism (nm.pdf) which derives New Magnetism as well as provides interesting applications.
4) Paradox2 Experiment (see www.distinti.com/docs/pdx directory) which shows an effect that can not be explained by classical theory.

6 Hypothetical Applications

The following applications are developed from hypothetical particles that have charge and no mass. They are called massless charged particles (MCP) for brevity.

These applications are developed by asking the following question: Is there a configuration of 2 or more MCPs in which the sum of the New Electromagnetic forces equals zero? The answer is yes; the following subchapters explore this question is detail.

6.1 Binary Mass Particle (BMP)

Pronounced "Bump" for short

The Binary Mass Particle (or BMP) is a system of two massless charged particles of like charge. This system exhibits the properties of matter to include mass, inertia, time dilation and others.

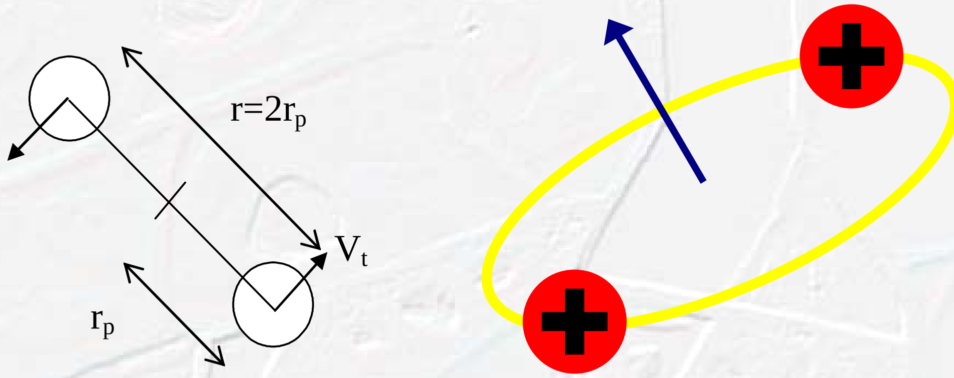


Figure 6-1

This system has the two charges in orbit about a central point as shown in Figure 6-1. To find the conditions where the electromagnetic forces are in balance, we sum the NE equations and set the result equal to zero:

1) $$0 = \frac{K_E Q_S Q_T \hat{\mathbf{r}}}{|\mathbf{r}|^2} + \frac{K_M Q_S Q_T}{|\mathbf{r}|^2}\left[(\mathbf{v}_T \bullet \hat{\mathbf{r}})\mathbf{v}_S - (\mathbf{v}_S \bullet \hat{\mathbf{r}})\mathbf{v}_S - (\mathbf{v}_S \bullet \mathbf{v}_T)\hat{\mathbf{r}}\right] - \frac{K_M Q_S Q_T \mathbf{a}_S}{|\mathbf{r}|}$$

The geometry of the system shows that Coulomb forces and New Magnetic forces are repulsive forces while the New Induction provides the sole attractive force.

Next, we substitute the following for elements of the equation in step 1):

- The distance (r) between the two charges is twice the radius of the system (r_p). Therefore $2r_p$ replaces the distance between the charges (r).
- The acceleration for the Inductive component is replaced by the centripetal acceleration equation: $a = \frac{V_t^2}{r_P}$.
- The tangential velocity (V_t) of the system is substituted for the velocities in the New Magnetism terms. Thus $\mathbf{v}_S = V_t$ and $\mathbf{v}_T = -V_t$. This yields $[(\mathbf{v}_T \bullet \hat{\mathbf{r}})\mathbf{v}_S - (\mathbf{v}_S \bullet \hat{\mathbf{r}})\mathbf{v}_S - (\mathbf{v}_S \bullet \mathbf{v}_T)\hat{\mathbf{r}}] = V_t^2\hat{\mathbf{r}}$.

Substituting and reducing yields:

2) $0 = \frac{K_E}{2r_P} + \frac{K_M V_t^2}{2r_P} - \frac{K_M V_t^2}{r_P}$. Further reduction yields: $0 = \frac{K_E}{2} - \frac{K_M V_t^2}{2}$.

Finally:

3) $V_t = \sqrt{\frac{K_E}{K_M}} = C$.

Thus, in this hypothetical model, the forces cancel when the tangential velocity of the charges reaches the speed of light. This stability is independent of the distance between the charges.

Note: This system requires electromagnetic fields to travel much faster than the speed of light. This will be addressed in a later paper.

6.1.1 Effective mass of the System

Although the charges in the above system have no mass by definition, electromagnetic induction provides the system with effective mass (or inertia). We know from classical mechanics that the inertial force produced by an object is the product of the mass and the acceleration of the object. The inertial force retards the applied force and is in a direction opposite to the acceleration of the object. Therefore, the inertia force of an object is $F = -Ma$. Setting this equation equal to New Induction and dividing through by acceleration to yield the effective mass:

4) $M = \frac{K_M Q_S Q_T}{2r_P}$. Since there are two charges contributing inertia to the system , we multiply by two to yield the total effective mass of the system :

$$M = \frac{K_M Q^2}{r_P}$$

Equation 6-1: Effective mass

The Effective Mass equation yields an interesting answer when Q is replaced by the charge of an electron $(Q_e = 1.602177 \cdot 10^{-19})$ and r_P is replaced by the classical electron radius $(r_e = 2.817941 \cdot 10^{-15})$:

$$M = \frac{K_M {Q_e}^2}{r_e} = \frac{\mu {Q_e}^2}{4\pi r_e} = \frac{4\pi \cdot 10^{-7}(1.602177 \cdot 10^{-19})^2}{4\pi(2.817941 \cdot 10^{-15})} = 9.109386 \cdot 10^{-31} kg$$

The result is the mass of an electron. A more precise hypothetical model for an electron uses half charges and particle radius equal to $r_e / 4 = 7.0448525 \cdot 10^{-16}$ meters.

In the paper ne_hydrogen.pdf we show how the mass of a hydrogen atom can be derived from these techniques.

6.1.2 Energy of the model

The energy of the model is found by summing the potential and kinetic energies.

The kinetic energy is stored in the rotation the system. If you apply an impulse to each of the charges of the system to stop rotation, the total energy will equal:

1) $KE = \frac{1}{2} MV^2 = \frac{1}{2} MC^2 = \frac{K_M Q^2}{2r_P} C^2$, where M is replaced by the effective mass described in Equation 6-1.

The potential energy is the energy stored in the electrostatic field. If two like charges a distance of $2r_P$ from each other were to fly apart due to the electrostatic force, how much energy would be released? The amount of energy released is equal to the amount of energy needed to bring the two charges within $2r_P$ of each other.

2) $PE = QV = -Q\int_{\infty}^{2r_P} \mathbf{E}\cdot d\mathbf{L} = -K_E Q^2 \int_{\infty}^{2r_P} \frac{1}{r^2} dr = \frac{K_E Q^2}{2r_P}$.

Then, by summing 1) and 2), we get the total energy contained in the model:

3) $E = KE + PE = \frac{K_M Q^2}{2r_P} C^2 + \frac{K_E Q^2}{2r_P}$. We know that $K_E = K_M C^2$; therefore:

4) $E = \frac{K_M Q^2}{r_P} C^2$. Since $M = \frac{K_M Q^2}{r_P}$ (Equation 6-1) then:

5) $E = MC^2$

The result is Einstein's energy/mass relationship. If these hypothetical applications are correct, then it suggests that Electromagnetism is the fundamental description of both mass and energy.

6.2 Binary Antimass Particle (BAP)

Formerly titled Negative Mass Binary Model

Consider the same system as above except that the charges are opposite (one positive and one negative). Again, is there a condition where the NE forces sum to zero? The answer is yes.

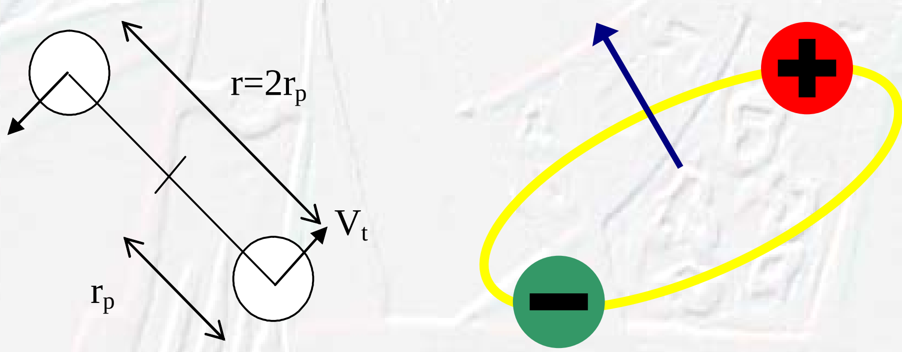


Figure 6-2

Following the same steps as before:

1) $0 = -\frac{K_E Q_S Q_T \hat{\mathbf{r}}}{|\mathbf{r}|^2} - \frac{K_M Q_S Q_T}{|\mathbf{r}|^2}\left[(\mathbf{v}_T \bullet \hat{\mathbf{r}})\mathbf{v}_S - (\mathbf{v}_S \bullet \hat{\mathbf{r}})\mathbf{v}_S - (\mathbf{v}_S \bullet \mathbf{v}_T)\hat{\mathbf{r}}\right] + \frac{K_M Q_S Q_T \mathbf{a}_S}{|\mathbf{r}|}$

2) $0 = -\frac{K_E}{2r_P} - \frac{K_M V_t^2}{2r_P} + \frac{K_M V_t^2}{r_P}$. Further reduction yields: $0 = -\frac{K_E}{2} + \frac{K_M V_t^2}{2}$.

Finally:

1) $V_t = \sqrt{\frac{K_E}{K_M}} = C$.

Just as in the previous application, the forces cancel when the tangential velocity of the charges reaches the speed of light. This condition is independent of the distance between the charges.

6.2.1 Effective mass of the system

Although the charges in the system have no mass by definition, electromagnetic induction provides the system with effective mass (or inertia). We know from classical mechanics that the inertial force produced by an object is the product of the mass and the acceleration of the object. The inertial force retards the applied force and is in a direction opposite to the acceleration of the object. Therefore, the inertia force of an object is $F = -Ma$. Setting this equation equal to New Induction and dividing through by acceleration to yield the effective mass:

2) $M = -\frac{K_M Q_S Q_T}{2r_P}$. Since there are two charges contributing inertia to the system, we multiply by two to yield the total effective mass of the system. Because the result is negative, it is called antimass.

$$M = -\frac{K_M Q^2}{r_P}.$$

Equation 6-2: Effective Antimass

6.2.2 Energy of the model

The energy of the model is found by summing the potential and kinetic energies. The kinetic energy is simply:

1) $KE = \frac{1}{2}MV^2 = \frac{1}{2}MC^2 = -\frac{K_M Q^2}{2r_P}C^2$, where M is replaced by the effective antimass described in Equation 6-2.

The potential energy is found by calculating the amount of energy required to bring two dislike charges to within $2r_P$ of each other. The answer is negative because of the fact that we are using dislike charges:

2) $PE = QV = -Q\int_{\infty}^{2r_P} \mathbf{E} \cdot d\mathbf{L} = K_E Q^2 \int_{\infty}^{2r_P} \frac{1}{r^2} dr = -\frac{K_E Q^2}{2r_P}$.

Then, by combining 1) and 2), we get the total energy contained in the model:

3) $E = KE + PE = -\frac{K_M Q^2}{2r_P}C^2 - \frac{K_E Q^2}{2r_P}$. Since $K_E = K_M C^2$ then

4) $E = -\frac{K_M Q^2}{r_P}C^2$

The result is negative energy.

6.3 More Hypothetical Applications

These hypothetical applications are continued in the following documents

1) New Gravity (ng.pdf) which hypothesizes that induction, inertia and gravity are all the same force. Black holes are derived.
2) Ethereal Mechanics (to be released in 2008). Ethereal Mechanics takes the above “crude” derivation to a higher level of detail and resolves most of the outstanding issues listed above. Furthermore, the Kinetic energy of the model is stated in terms of magnetic fields instead of the simplified 1/2MVV method used above.

7 Conclusion

This paper introduces the new models of electromagnetism called New Electromagnetism. These are the version three (V3) models and nomenclature. As new experiments and effects are brought to light and reconciled, then these models will be corrected as appropriate.

These models do not attempt to explain how the field effects are conveyed from the source charge to the target charge. These models are only concerned with accurate prediction of the interactions among charges. Only until we can accurately model these interactions can we then confidently hypothesize about the actual field mechanisms which convey these effects. Classical theory is incomplete with regard to charge interactions and can not be considered a credible authority of the propagation of light. The field mechanisms which convey electromagnetic effects (to include the propagation of light) are continued in a hypothetical new science called Ethereal Mechanics (EM). EM is developed from a new model for the old concept of ether which is combined with New Electromagnetism. Ethereal Mechanics is introduced in the paper titled New Gravity (ng.pdf).

See http://www.distinti.com/docs/poster_ne3_qr.pdf for a quick reference chart of all NE V3 Equations.

