Non-Coherent Access to Hidden Precession Energy in Ferromagnetic Materials
by
Cyril Smith

Summary.

It is shown that extremely fast flux switching could give access to the quantum forces driving electron precession, if true this would provide free energy replenished from the active vacuum. This anomalous behaviour would manifest as a “magnetic capacitor”, a component which to the author’s knowledge has not existed before. Magnetic analysis using this new found component shows the possibility of an undiscovered form of magnetic resonance associated with the OU behaviour. This theory allows a new avenue of research into OU phenomenon to begin. It is possible that many existing devices using back emf spikes already unwittingly exploit this source of energy

1. Introduction.

To a quantum physicist the quantum states for electron spins in a magnetic field are well known. Electron spin axes are known to precess about the applied field at the Larmor frequency, giving rise to electron spin resonance (ESR) which occurs when the normally random phases of the many electron precessions are driven into phase coherence. In ferromagnetic material the precession frequency of the electrons responsible for its magnetic properties is known as ferromagnetic resonance (FMR). In the case of bulk ferromagnetic material it is not normally possible to induce measurable FMR, inhomogeneity of the inter-atomic magnetic field causes the Larmor precessions to occupy too wide a bandwidth: for this reason FMR studies are usually conducted on thin film samples. *That the FMR precessions are not detectable does not indicate that the dipoles are not precessing. Indeed they are, but in bulk materials their ordering is chaotic*.

Even when dealing with small material samples the number of active electrons is huge. The bulk magnetization created by this large number exhibits a static longitudinal component (aligned with the applied magnetic field) and, when excited into resonance, a transverse component rotating at the resonant frequency. When the excitation is removed this transverse component decays due to damping effects. Thus the precessing magnetization vector traces a cone with a decreasing cone angle. It could be argued that this spiralling action is common to each individual electron, but quantum rules do not allow that. According to quantum rules each electron's magnetic dipole stays at a fixed angle with respect to the applied field. Therefore the disappearing transverse component is simply due to the individual electron precessions becoming de-phased, in the limit a large number of random phasors yielding zero, *but the individual electron precessions are still there*.

Of interest in this report is this non-coherent, therefore normally unobservable, precession within bulk materials. *In the case of a hard material (permanent magnet) it can be shown that the total precession energy is significant, being of the same order as the magnetic energy available from its external magnetic field*. If we slowly apply an additional magnetic field to a permanent magnet, the precession frequency, and hence energy, of each active electron increases while the magnetization remains unchanged. That increase in precession energy is not supplied by the source of the additional field, it comes from whatever is driving the quantum rules. *Access to this hidden source of precession energy is usually denied us, but were we able to connect to it we would have an engine driven by the virtual particle flux of quantum space.*

It is proposed in this paper that we gain access to the precession energy, not via coherent coupling to the rotating transverse magnetization component as in FMR, but via the spatially static longitudinal component. Take a permanent magnet at full magnetization saturation, then apply to it an additional field. As noted above, normally the magnetization does not change, the incremental permeability is the free-space value μ_0. But if the applied magnetic field changes magnitude "instantaneously", in this sudden attempt to change the precession angle of each electron dipole, the quantum reaction (change of precession frequency) to keep the angle the same takes time to establish equilibrium, so the dipoles could initially take on temporary alignment related to their original precession frequency. The angle would then decay back to the correct quantum value over a period of time (which we will designate as *relaxation time*) during which the precession frequency moves to *its* new value. Within this period of time the bulk material would exhibit anomalous permeability behaviour, initially there would be an "instantaneous" change of longitudinal magnetization, which then decays away while the precession adjusts itself. Note that this relaxation time is not the same as the de-phasing time in FMR, although it may be related to it. If, during this anomaly, we couple a load to the magnetic field, e.g. via a coil with resistive load, then the quantum force which is striving to get each electron back to its proper state is also coupled to the load. Not only will this extract energy from the quantum underworld but it will also slow down the restoration time.

The condition necessary to open this quantum time-window is a very rapid change in applied magnetic field, perhaps a rise time in the order of nanoseconds, and that implies a fast flux-switching action. The usual approach is to use a closing switch to apply a voltage pulse to a coil, where a voltage rise time of say 1 nS is certainly feasible, but that is misleading. It is *flux* rise time that is important, the application of a voltage from a low resistance source merely creates the condition where the rate of change of current, hence flux, is proportional to the voltage, being the initial part of a flux/current rise with a very long L/R time constant, i.e. the current/flux rise is a linear ramp. Where one *can* get fast flux rate is at switch-off, where the high impedance open-circuit now ensures a much shorter time constant for the current decay. There are many instances where experimenters have reported over-unity performance from back-emf spikes on switch-off, but lacking any rigorous theoretical explanation these are usually dismissed as fraudulent claims or measurement error. Hopefully this report will give credible support to some of those claims.

2. About Electron Precession.

Atomic electron motion is characterized by quantum numbers of which two are relevant to the subject under discussion. Firstly, the angular momentum associated with electron spin is quantized in terms of Planck's constant, it can only have a value of 0.866. Secondly, in the presence of a magnetic field, the projection of the spin angular momentum onto the field direction must be numerically equal to ½ and can be either parallel or anti-parallel to the field direction. Thus the permitted state for electron spin is at an angle of 54.7° (or its complement) to the magnetic field. The spinning electron acts like a small bar magnet, so when at an angle to an applied magnetic field it is subject to a torque trying to align it with the field. To maintain the angle at a constant 54.7° this torque has to be balanced by a gyroscopic one of equal but opposite magnitude. Therefore quantum rules force the electron spin-axis to precess around the field direction at the angular velocity needed to provide this counter-torque, it acts like a miniature precessing gyroscope. The precession frequency is known as electron spin resonance (ESR) or, in the case of magnetically active electrons in ferromagnetic materials, ferromagnetic resonance (FMR).

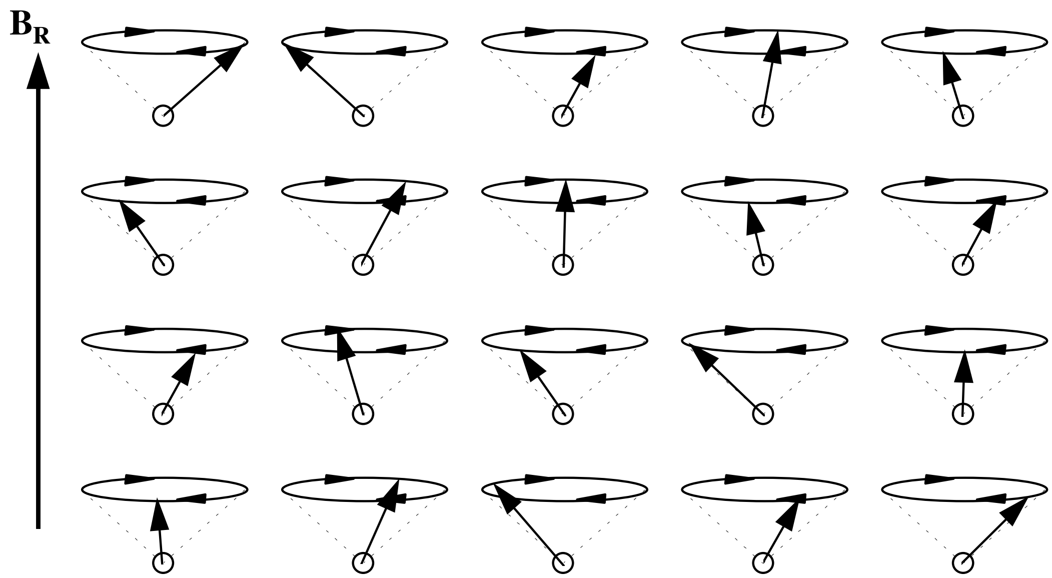
Figure 1 depicts an array of magnetically active electrons within an anisotropic permanent magnet, which are responsible for the remanent field $\mathbf{B_R}$. This field permeates the magnet material so each electron spin/dipole axis is inclined to it at 54.7° and precesses at nominally the same rate. However they are at random phases so there is no observable rotating transverse field. Since the magnetization $\mathbf{M}=\mathbf{B_R}/\mu_0$, and knowing that the electron-spin dipole has a moment $\boldsymbol{\mu}$ (=1.606.10^{-23}Am^2), we can calculate the active-electron number density as

$$N = \frac{\mathbf{M}}{\boldsymbol{\mu}\cos 54.7°} = \frac{1.732\mathbf{B_R}}{\mu_0\boldsymbol{\mu}} \qquad (1)$$

We can also calculate the frequency of precession ω necessary to balance the gyroscopic torque with the magnetic torque as

$$\omega = \frac{e}{m} B_R \sin 54.7° \qquad (2)$$

where e and m are the electron charge and mass respectively. This FMR frequency is not normally observable.

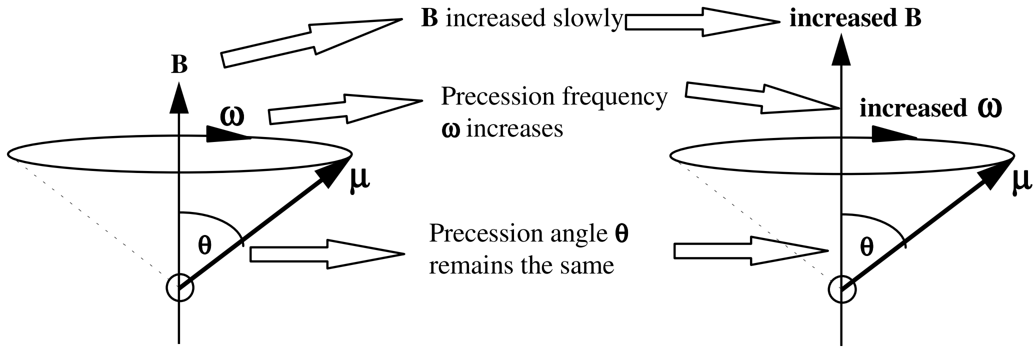


All electrons precess at nominally the same frequency around the same cone angle. Random phasing yields zero transverse field. N dipoles yield Nμcos54.7° dipole moment responsible for B_R.

Figure 1. Electron-dipole Array in a Permanent Magnet

Note that if Nature could be cheated into aligning all the dipoles with the field direction, the magnetization, and hence $\mathbf{B_R}$, would increase by a factor 1.732. *A fast change in applied **B** is proposed as a way of cheating Nature.* This anomalous state would give the permanent magnet a remanent field of 1.732B_R, an increase in magnetic field energy of 200%. Thus the potential for energy extraction from material with B_R=1Tesla is 8.10^5 J/m^3. *Take that energy at say 10KHz rate and we get 8KW from just 1cm^3. Even just a small fraction of 8KW from 1cm^3 of material would be desirable.*

Figure 2 shows the normal situation for a single electron if we slowly increase the value of **B**, either by changing the load line on the magnet or by applying an additional field. The quantum rules force the precession angle to remain at 54.7°, which can only occur if the precession frequency changes. The quantum forces act very quickly to speed up this precession, so we do not usually observe any change in the magnetization.



The quantum background flux drives the precession rate so that the precession angle θ remains at the permitted state (54.7 °), while maintaining balance between magnetic and gyroscopic torque. The longitudinal magnetization μcosθ does not change.

Figure 2. No Change in Magnetization for Slow Change in B.

It is now proposed that if the change of **B** is applied very quickly, at a rate faster then quantum forces can accelerate the precession, then we do see a sudden increase in magnetization. That represents an anomalous incremental permeability obtained from the electron dipole temporarily moving to a "non-permitted" quantum state. This is unlike normal permeability which comes from electrons flipping to their other "permitted" state (at the complementary angle). Spin flips between permitted states requires energy exchange, whereas a temporary move outside a permitted state may not. Thus the anomalous permeability could be very high. It will then take time for the permitted quantum state to be re-established. This is shown in Figure 3.

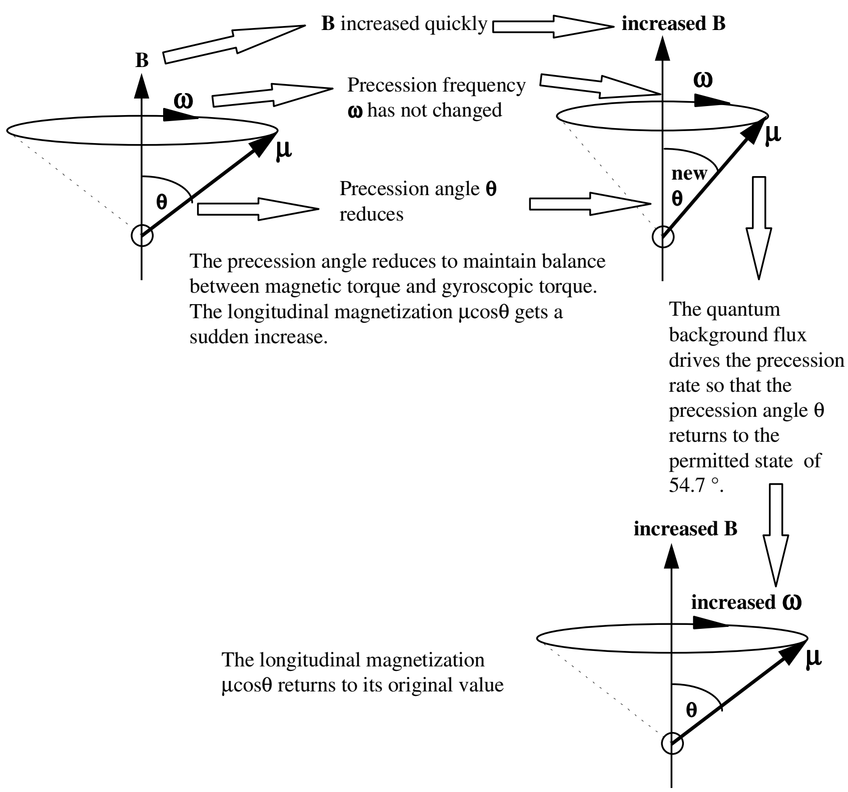


Figure 3. Anomalous Change of Magnetization for Fast Change in B

3. Energy Considerations on the B v. H curve.

The B v. H curve is well known in magnetics. Any area on a B v. H graph has dimension of B·H which is energy volume density (joules/m^3). The most common area is that within a hysteresis loop for a ferromagnetic material whereby, if that material is driven around its loop, the energy obtained from the area of the hysteresis loop (multiplied by the volume of the material) represents an energy loss. Note that the BH loop does not indicate in what form the energy is transported, in the case of hysteresis loss it is assumed it goes as heat into the material. However some calorimeter measurements have given anomalous results indicating that there may be another energy transport mechanism at work, perhaps energy carried away as random virtual photon flux.

It is possible to create other energy diagrams on the BH graph, where the changes are influenced by loads such as mechanical ones on moving parts or resistive ones across coils. In the case of interest where we use a coil, it can be appreciated that the H values will be influenced by current in the coil, and the changing B values will induce voltage in the coil, hence the area product B·H is directly connected to the electrical energy pulse in the coil. An important consideration is the circumferential direction around the area in question, an anti-clockwise direction (as in the hysteresis loop) representing energy loss. *A clockwise direction represents an energy gain. In this case it could act like a hysteresis loop in reverse, transporting energy in from the quantum environment*

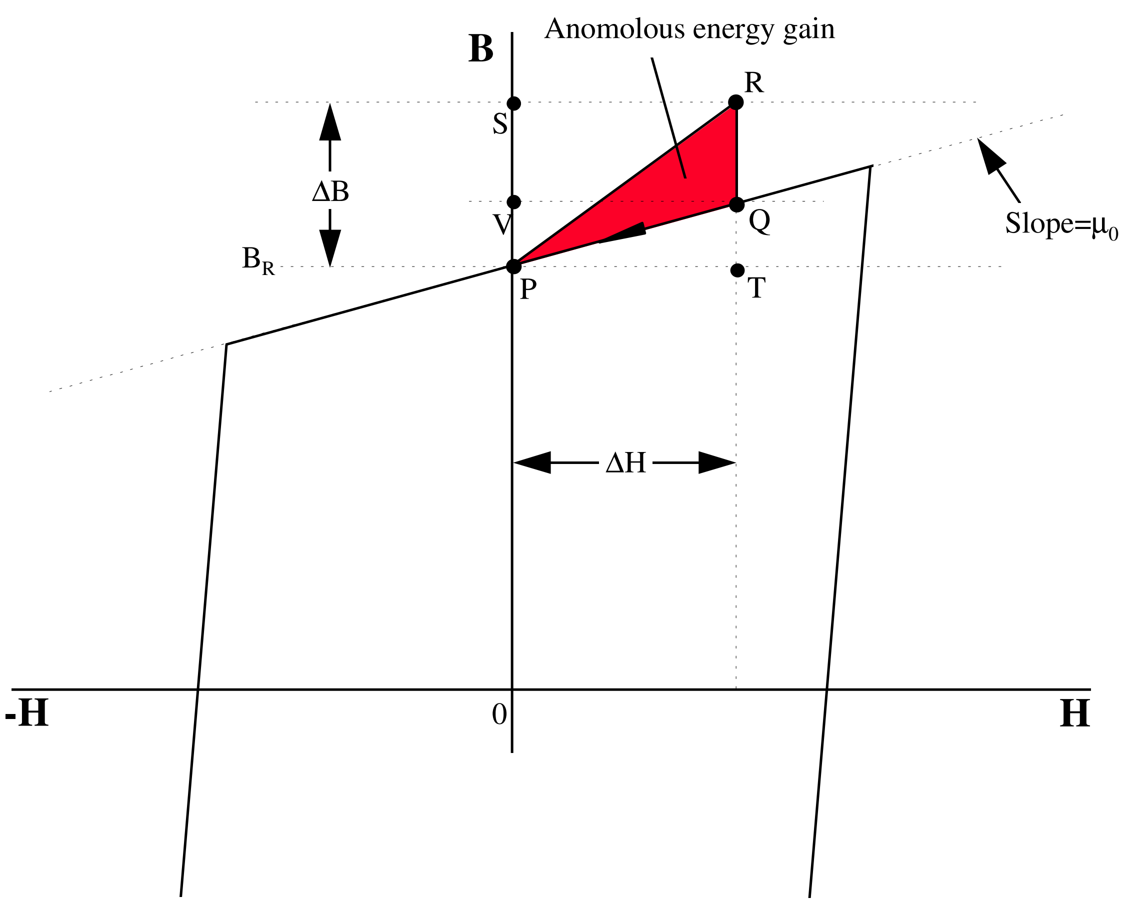


Figure 4. Anomalous Energy on the BH Characteristic of a Permanent Magnet.

Figure 4 shows part of an idealised BH curve for a permanent magnet. Note that the slope of the top part of the hysteresis loop is μ_0. We assume the magnet has a keeper on so that the starting point P is at H=0, $B=B_R$. If we increase the H value slowly (e.g. by passing current through a coil wound around the magnet or the keeper) by a value ΔH, then we would expect the operating point to move to point Q. Slowly removing the current simply moves the point back to P, as far as the coil is concerned the magnet behaves like air. Traversing the "loop" PQP has not traced out an area, so there is no overall loss or gain of energy, but there are energy flows of equal magnitudes into then out of the coil inductance, represented by the triangle PQV (this is simply charge and discharge of the coil's air-cored inductance). Note that the magnetization does not change.

Now imagine H changing very quickly so that we get a temporary change in magnetization as described in the previous section. The operating point moves to R, where the slope from P to R represents the short term anomalous permeability $\Delta B/\Delta H$, μ_A times greater than μ_0, due to the temporary magnetization. This magnetization then decays to zero over the relaxation time, so the operating point moves to Q. Slow removal of the coil current takes the material back to point P. *Note that the loop PRQP is traversed clockwise, which means that the source of ΔH (in this case the current driven coil) gains energy.*

It is instructive to analyse the energy flows in this situation. In the move from P to R the current source supplies energy to the triangle PSR to the left of the line PR, the flux change ΔB being directly related to the voltage (or rather the voltage-time integral) the current source has to drive against. Then going from R to Q the current (and H value) remains constant, but the decaying B value induces an opposite polarity voltage, *thus driving energy back into the current source*. This energy is represented by the rectangle SRQV. *It is the quantum engine driving the dipoles back to their proper state which supplies this energy*. Moving from Q to P there is also induced voltage into the coil which is of polarity to feed back energy into the source, this energy value being denoted by the triangle PQV: this is simple discharge of an air cored coil. When we do the energy balance we find that the source gains a net energy equal to the triangle PQR. If we had started with a reduction in H, we would get the same result, the anomalous loop would still be traversed clockwise.

In practise we would expect the anomalous incremental permeability $\Delta B/\Delta H$ to be a function of the flux rise-time, because the quantum action taking place during the rise time is going against the drive: the faster the rise-time the better. It is noted that there are many novel magnetic switching systems where flux is constrained to flow within one magnetic circuit, and then suddenly switched into another circuit, which may achieve the desired result.

4. Time Considerations.

Viewing the anomalous behaviour on a BH curve does not take into account flux rise and fall times, the only point made so far is the need for a fast rise-time in order to obtain the anomaly. We now consider things from a time perspective, where we look at a sudden step in applied H and note the change in B. This is shown in Figure 5, where the step in H produces a step ΔB given by $\Delta B=\mu_A\mu_0 H$, μ_A being the anomalous permeability due to the temporary misalignment of the electron spins. As this misalignment is corrected by the quantum regime, B decays down to the expected level, a value of $\Delta B=\mu_0 H$. *It is during this decay period that energy is extracted from the quantum world.* The time constant for this decay is at present unknown, but is likely to be connected to one of the time constants already determined in FMR. In all atomic particle resonance systems (NMR, NQR, ESR, FMR) there are two decay time-constants, T_1 and T_2. One of these is associated with energy decay from an excited level down to thermal equilibrium, the other is the time taken for the multitude of phasors to change from a coherent state to a random state. It is the first one which is likely to be of interest here.

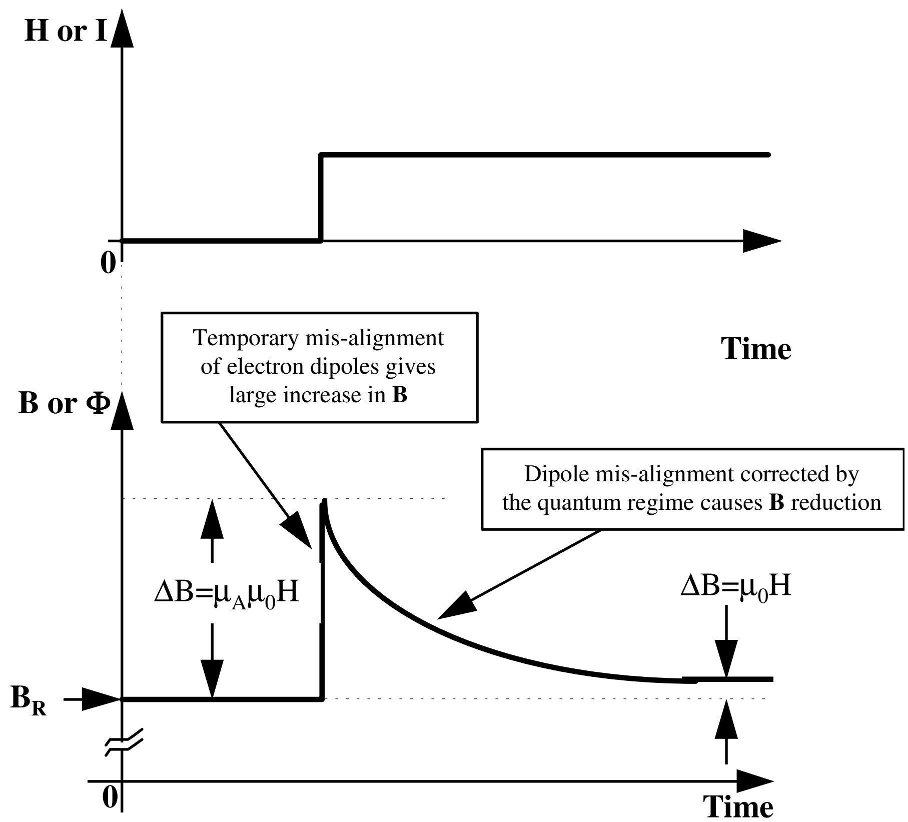


Figure 5. Anomalous Flux Pulse.

5. Magnetic "Capacitance".

The differentiated step response exhibited by the flux waveform in Figure 5 will be recognised as similar to that from a CR electric circuit, and that begs the question, can this magnetic behaviour be modelled in a similar manner? This requires the concept of a "magnetic capacitor", a device which at the present time exists only in theory. Such a device would obey the differential equation relating "magnetic current" (flux Φ) to "magnetic voltage" (mmf U) as $\Phi=C\cdot dU/dt$. Figure 6 shows such an assumed device in a magnetic circuit alongside its electrical equivalent. Here, in response to a mmf step, the flux rises instantaneously to a value determined by the mmf and the circuit reluctance R, followed by an exponential decay with the time constant CR.

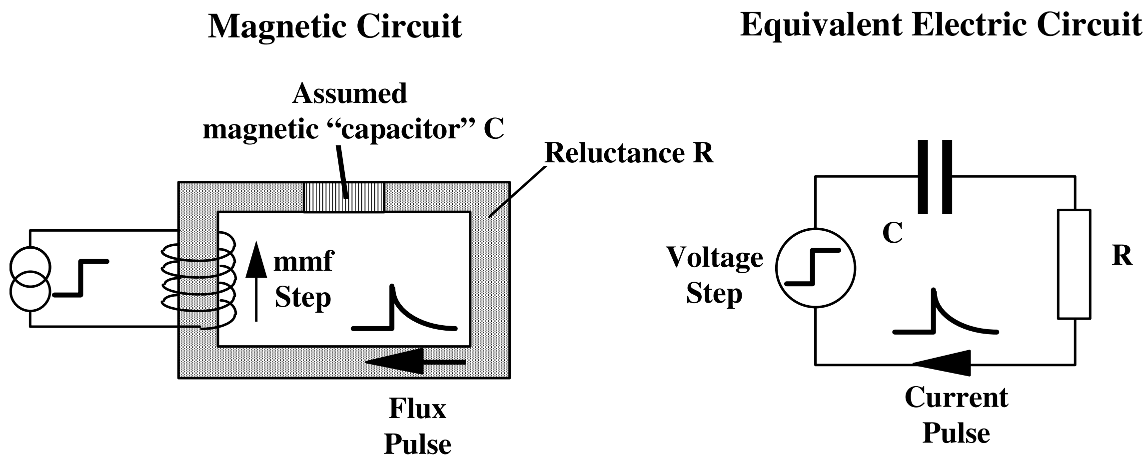


Figure 6. Magnetic Circuit with assumed "capacitance", and Electrical Equivalent

Although such a "magnetic capacitor" may not exist in isolation, the anomalous behaviour shown in Figure 5 can be modelled as a series combination of capacitor C_A and resistor R_A across the recognised permanent magnet model, as shown in Figure 7. Here the magnet mmf (U_M) is the equivalent Amperian sheet current for the magnet, and its reluctance R_M is the reluctance of the air space occupied by the magnet. The anomalous reluctance R_A is R_M divided by μ_A, where μ_A is the anomalous relative-permeability. *Values for C_A and R_A must await results from experiments (if indeed such anomalous behaviour exists), but the fact that we have discovered a mechanism which creates "magnetic capacitance" is a significant breakthrough. We can now explore systems from a theoretical viewpoint, allowing us to make better judgements of experimental results and to design better experiments.*

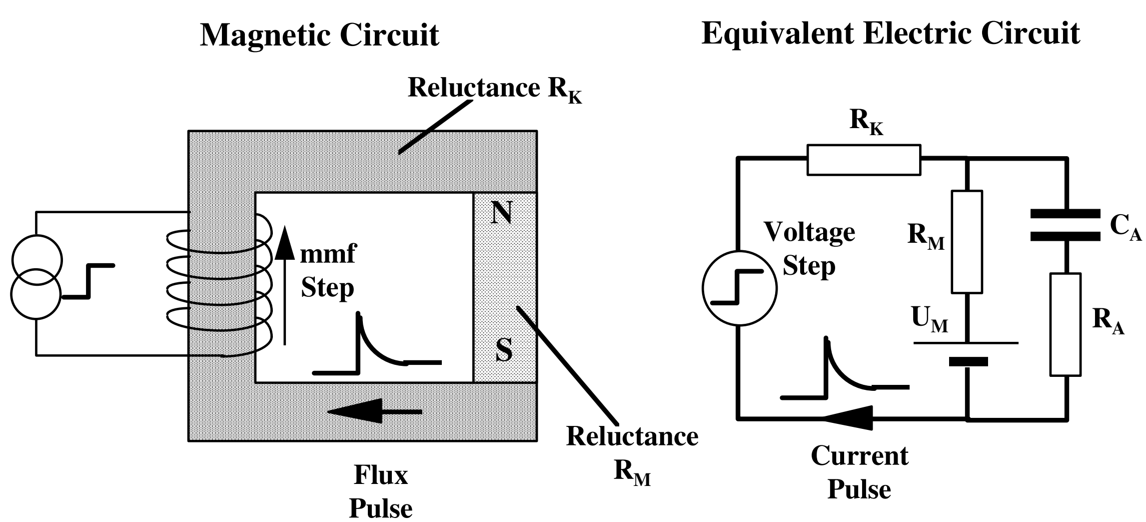


Figure 7. Electrical Model for Anomalous Behaviour

6. Transformer Studies using "Magnetic Capacitance"

Analysing transformers in the flux domain has been the subject of previous papers (see for example "Flux in Transformers and Magnetic Circuits" or "Solving Magnetic Circuits in the Flux Domain"). Here we examine the implications of introducing "magnetic capacitance" into that circuit. Figure 8 shows the magnetic and electrical equivalent for a normal transformer.

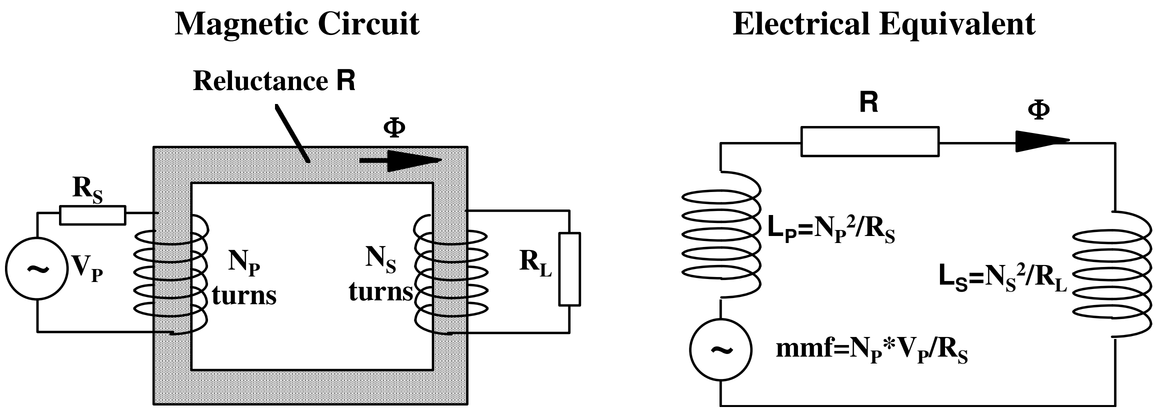


Figure 8. Transformer & Equivalent Circuit

When voltage driven from a low impedance source (internal resistance R_S), the high value of "magnetic inductance" L_P usually dominates the circuit, hence the flux is essentially in phase quadrature to the applied voltage independent of the value of load resistor. If we include a magnet in the circuit, as shown in Figure 9, this situation is little changed at low frequencies.

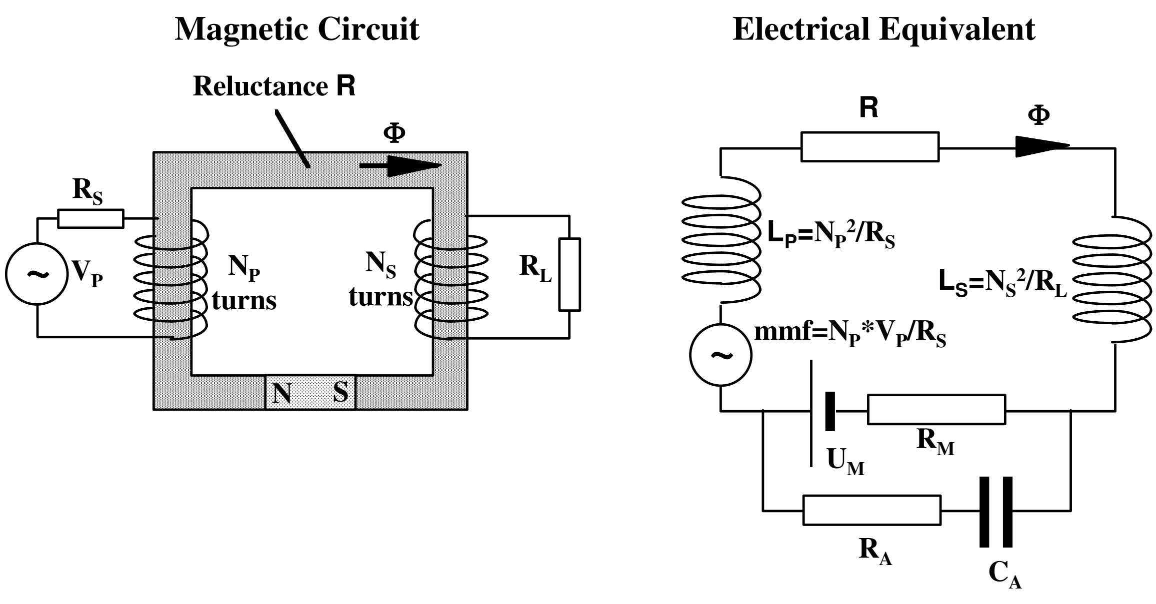


Figure 9. Transformer Including Magnet

At low frequencies the "magnetic impedance" $1/\omega C_A$ of the anomalous capacitance C_A is so high that that branch of the circuit can be ignored, essentially all the flux flows through the magnetic reluctance R_M. Apart from a DC value of flux due to the magnet's mmf U_M, the system performs as a normal transformer (assuming of course that the DC flux does not saturate the core).

Only at high frequencies where $1/\omega C_A << R_M$ does the OU generating anomaly cut in, then the AC flux flows through the $C_A R_A$ branch. It can be seen that the closed magnetic circuit then forms a series resonant circuit embracing L_P+L_S as its "inductance", $R+R_A$ as its "resistance" (actually reluctance) and C_A as the "capacitance". *This is a form of magnetic resonance not previously recognised*. When driven at resonance we get the interesting phenomenon that, even though the induced secondary voltage is driving power into the load, the AC flux is in phase with the voltage applied to the primary coil. This is quite unlike normal transformer action, and means the input impedance as seen by the voltage source is entirely reactive. Thus over a complete cycle no power is taken from the source, the power in the load all comes from the mechanism which is responsible for C_A, in this case the quantum engine restoring the disturbed precession.

It should be noted that this magnetic resonant may be difficult to observe because it does not behave quite like normal electrical resonance. The magnetic domain is time shifted from the electrical domain by a d/dt differential operator, and it is often difficult to transpose one's mind from the familiar electrical domain into this mathematically imaginary one. It is possible that anomalous behaviour has been observed and, without the background knowledge presented in this paper, has been written off as simply weird. It is instructive therefore to examine this magnetic resonance in more detail.

- This is *not* the precession frequency, it is a much lower frequency.
- The value of C_A is likely to be related to the FMR precession frequency, but C_A alone does not determine this new resonance f_M.
- Its frequency $f_M=1/2\pi\sqrt{(L_P+L_S)C_A}$ changes value with different source and load resistances.
- "Damping" is controlled, not by the external resistive loading, but by the magnetic reluctance (which in normal electrical resonance would be responsible for inductance, hence frequency).
- For minimum damping we need minimum reluctance, hence high permeability materials, large cross section and short core length.

Although we have modelled this anomaly as a passive component, a "magnetic capacitance", we must not lose sight of the fact that it represents an energy source internal to the magnetic circuit. Thus, given the right conditions, the magnetic resonance f_M could be self-oscillatory. Note that we have control over the actual frequency f_M with our external coils and resistance values. This then might explain the Floyd Sweet experiments where he conditioned magnets to be oscillatory at frequencies of his choosing.

However resonance is resonance whichever domain we are in, so here we have an important method for finding and recognising the OU anomaly.

We know that, if the anomaly exists, the frequency will be high, so we must design our circuits with this in mind. Minimising the "magnetic inductances" L_P and L_S not only requires few turns, it also requires high values of load and source resistors. *Driving a* *transformer from a voltage source is the wrong thing to do*. We can resort to a switching system where energy is extracted in bursts, then we can expect to get this energy only at switch-off where the drive coil becomes unloaded. Fly-back oscillators of this type using back emf spikes abound, and some researchers do claim OU results without really knowing why. Using this new analysis the evolution for these systems should proceed apace, we know what to look for and how to optimise. The fly-back spike must be collected in a circuit where electrical "ringing" (due to stray capacitance) is recognised and separated from magnetic resonance. The circuit must allow the flux to oscillate rapidly and freely at this internal magnetic resonance, not forced to oscillate at electrical external resonance. This spike collection circuit must be designed along UHF principles.

It may be noted that the value of B_R for the magnet does not appear. However this will have an indirect effect because it controls the unobservable FMR precession frequency, and that in turn will influence the precession relaxation time. Thus a lower B_R could bring the required anomalous resonance down to manageable frequencies. Magnets which have been conditioned to be partially demagnetised could work better than fully magnetised ones. Other conditioning may possibly enhance the relaxation time by altering the short range magnetic coupling between dipoles.

7. Complex Permeability

Is the approach outlined in the previous sections a realistic option or just a pipe dream? Is there any evidence that ferromagnetic materials exhibit anomalous increase in permeability when the applied field is switched quickly? Since producing this paper in 2003 it has been brought to the author's attention that indeed some materials do exhibit such an increase.

Examination of the frequency spectrum of complex permeability shows that certain ferromagnetic materials exhibit a rise in the real value μ' from its low frequency value reaching a peak value at a certain frequency beyond which μ' then falls and even goes negative. This is accompanied by a rise in the loss term μ'' which goes from zero at low frequencies to reach a peak value at a frequency slightly beyond that of peak μ' and a fall thereafter. *This behavior is due to a ferrimagnetic resonance in the core material at a frequency close to the peak value of* μ''. As an example Figure 10 shows a characteristic for TDK PE22 ferrite. It will be noted that the LF value of μ' is 1680, rising to a peak of 2320 at 1MHz. At that frequency μ'' has a value of 300. The intention would be to use the change in μ' (which appears as a change in inductance value) to obtain OU by charging the inductor at low frequency then discharging it at high frequency.

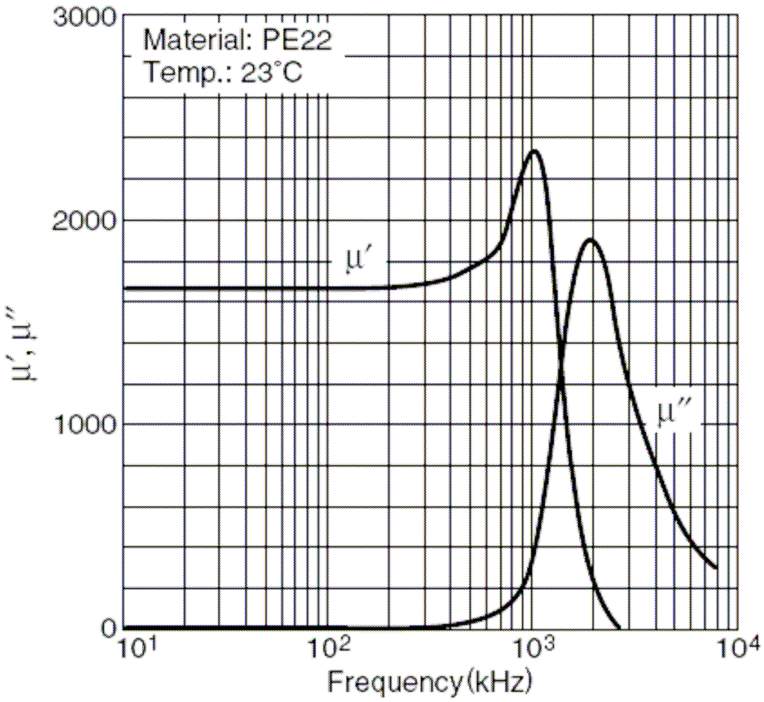


Figure 10. Complex Permeability of TDK PE22 Ferrite

7.1. Example calculation

The approach adopted here would be to create a toroidal inductor using a ring core of suitable material such as TDK PE22. Then choose a capacitor that resonates with the inductor at a suitable low frequency, such as 100KHz. As an example a ring core of PE22 material having an inner diameter of 40mm, an outer diameter of 50mm and a height of 5mm, wound with 10 turns, has an inductance at 100KHz of 37.3μH which for resonance requires a capacitor of 0.068μF (68,000pF). Core losses, derived from μ", are represented by an effective series resistance of 0.14Ω. The circuit Q is 168.

The capacitor is charged to say 10V then switched on to the inductor. In a quarter cycle of the 100KHz resonance the voltage reduces to zero while the current in the inductor rises in a damped sinusoid to reach a peak value of 0.424A. At this point in time the capacitor value is changed to one that resonates at 1MHz. Because of the rise in μ' the inductance at this frequency is 51.56μH requiring a resonating capacitor of 491pF (hence the original 68,000pF would consist of 67,509pF in parallel with 491pF, and the 67,509pF is switched out of circuit when it reaches zero volts). Because of the higher μ" value, core losses are now represented by an effective series resistance of 41.9Ω. The circuit Q is 7.73.

In a quarter cycle at 1MHz the current in the inductor reduces to zero while the voltage across the 491pF capacitor rises in a damped sinusoid to reach a peak value of 124.1V. This capacitor is then switched out of the circuit to be separately discharged into a load. Initial energy fed into the 68,000pF capacitor at 10V is 3.392μJ. Energy discharged from the 491pF capacitor at 124.1V is 3.788μJ. COP=1.117.

7.2. Math Analysis

Let L_{AIR} be the inductance of the toroidal coil if the permeability of the core were to be unity. Then the following equations apply.

$$L = \mu' L_{AIR}, \quad R_S = \omega\mu'' L_{AIR}, \quad Q = \frac{\omega L}{R_S} = \frac{\mu'}{\mu''} \qquad (1), (2), (3)$$

Using the suffix $_L$ to denote the low frequency charging phase, then for resonance at frequency f_L the capacitor value is given by

$$C_L = \frac{1}{4\pi^2 f_L^{\,2} \mu_L' L_{AIR}} \qquad (4)$$

Charged to voltage V_{IN} this stores energy of value

$$W_{IN} = \frac{V_{IN}^{\,2}}{8\pi^2 f_L^{\,2} \mu_L' L_{AIR}} \qquad (5)$$

When connected to the inductor, the undamped peak current that would appear a quarter cycle later is given by

$$i_{PK} = \omega_L C_L V_{IN} \qquad (6)$$

Losses cause an RF voltage or current envelope to decay with a time constant of $\tau = \frac{2Q}{\omega}$, which over a single quarter cycle yields an amplitude reduction given by $\exp\left(-\frac{\pi}{4Q}\right)$, hence the damped peak current becomes

$$i_{PK} = \omega_L C_L V_{IN} \exp\left(-\frac{\pi\mu_L''}{4\mu_L'}\right) \qquad (7)$$

At this point the capacitor is fully discharged. Using the suffix $_H$ to denote the high frequency at the peak value of μ', the capacitor is now reduced in value to one given by

$$C_H = \frac{1}{4\pi^2 f_H^{\,2} \mu_H' L_{AIR}} \qquad (8)$$

Over a quarter cycle at frequency f_H this capacitor charges to a voltage V_{PK} given by

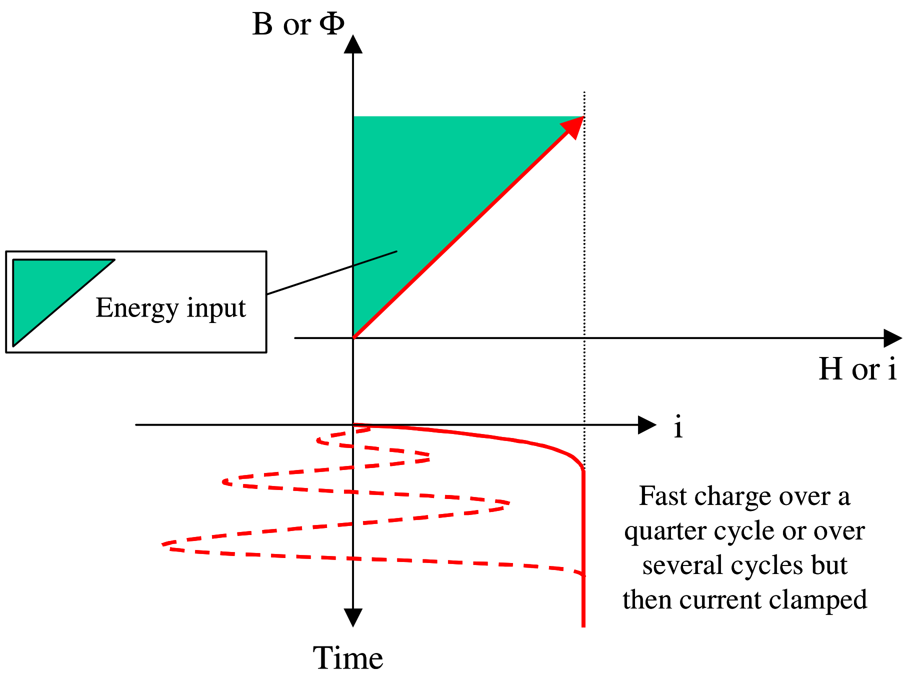
$$V_{PK} = i_{PK} \omega_H L_H \exp\left(-\frac{\pi\mu_H''}{4\mu_H'}\right) \qquad (9)$$

which includes the new damping factor at that frequency. Energy now stored in C_H as given by $W_{OUT} = \frac{C_H V_{PK}^{\,2}}{2}$ leads to the COP

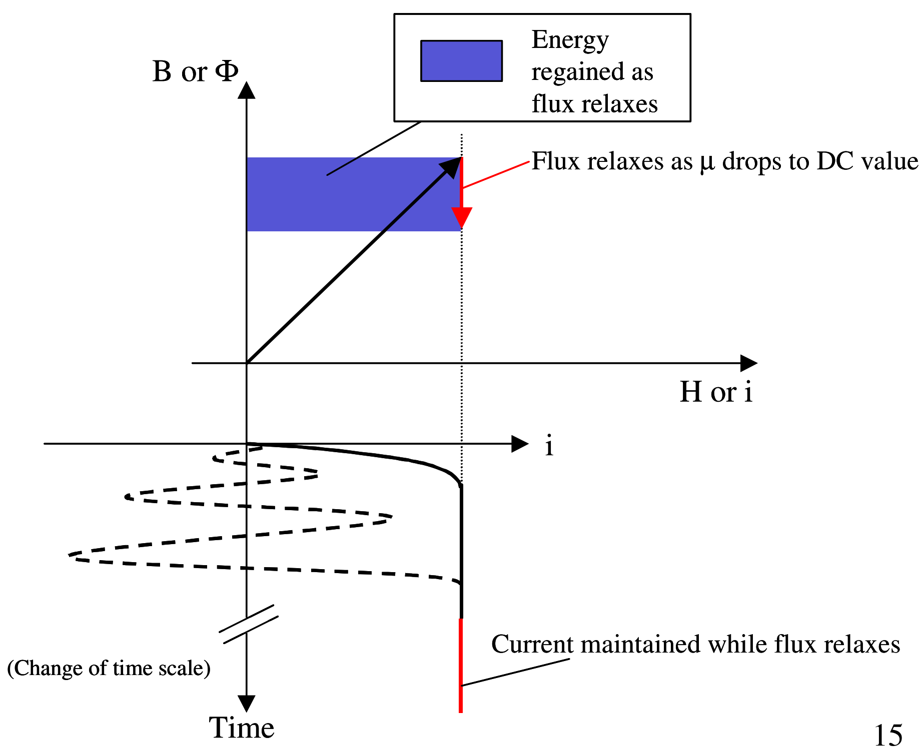
$$COP = \frac{W_{OUT}}{W_{IN}} = \frac{\mu_H'}{\mu_L''} \exp\left(-\frac{\pi}{2}\left(\frac{\mu_L''}{\mu_L'} + \frac{\mu_H''}{\mu_H'}\right)\right) \qquad (10)$$

7.3. Gaining energy from the permeability peak

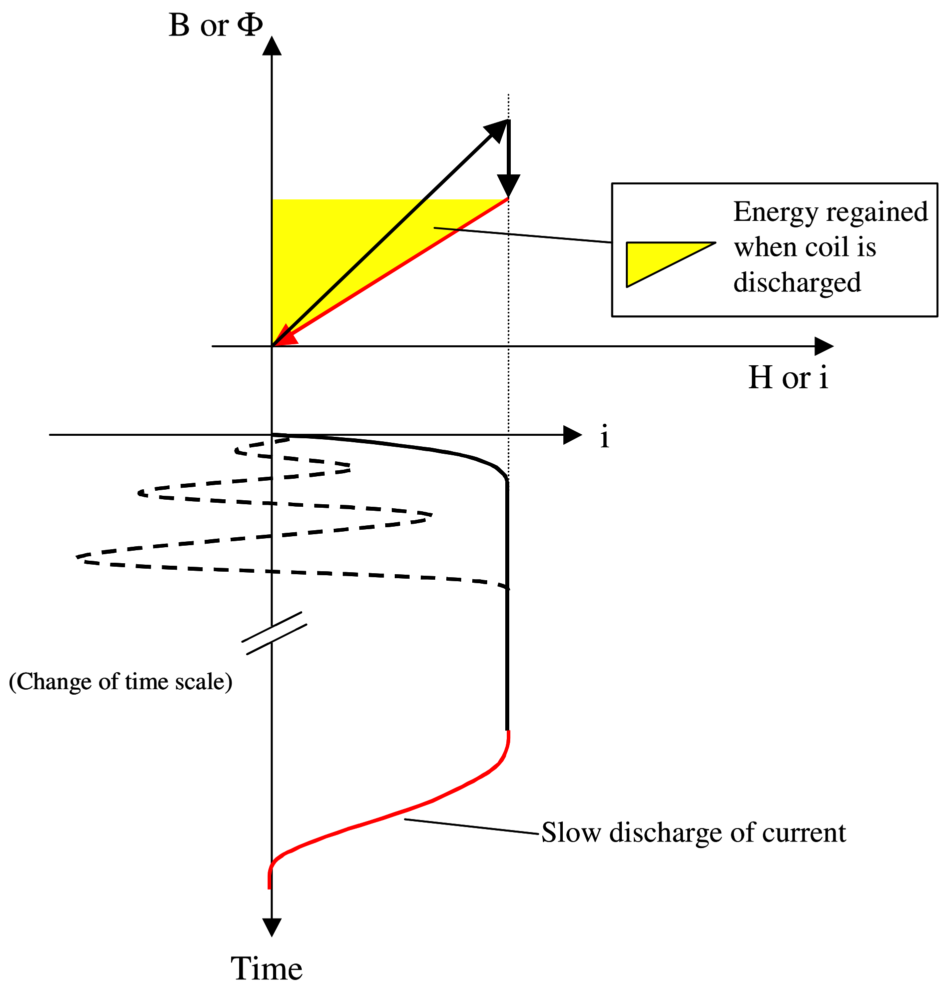
Just to get clear in our minds what is involved in gaining energy from the relaxation from high permeability to low permeability, here are a few pictures. The first one is for a coil that is energized with current quickly, either in a single transient or by a few cycles of RF build-up. The area of the green triangle to the left of the B-H or Φ–i curve denotes the energy that is now stored in the inductor.



If we now hold the current fixed for a period of time much longer that the rise-time, the permeability should relax down to its DC level. Hence the flux will drop, giving a voltage pulse that is of a polarity to feed back energy to the energizing source. Alternatively a pick-off from a second coil wound on the core could be used as an output winding. That energy is depicted by the blue rectangle in the following figure.



Finally the energizing current is switched off so as to decay slowly, yielding another voltage output. The energy releases by that action is shown as the yellow triangle in the next figure.



Comparison of the energy input against energy output shows that the difference is represented by the area of the CW loop taken by the system. Using the PE22 data in equation (10) yields over-unity operation, and the question must be asked where does the extra energy come from? As suggested in the previous sections, the increase in permeability could be due to a temporary change of angle of all the electron precession cones, and energy is extracted while the cones relax back to their proper quantum states. During this relaxation stage it is the quantum forces from the active vacuum which supply the anomalous energy.

8. Summary.

It is shown that extremely fast flux switching could give access to the quantum forces driving electron precession, if true this would provide free energy replenished from the active vacuum. This anomalous behaviour would manifest as a "magnetic capacitor", a component which to the author's knowledge has not existed before. Magnetic analysis using this new found component shows the possibility of an undiscovered form of magnetic resonance associated with the OU behaviour. This theory allows a new avenue of research into OU phenomenon to begin. It is possible that many existing devices using back emf spikes already unwittingly exploit this source of energy.