

# On Fe Conductors for OU operation.

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## 1. Introduction

The current interest in the use of Fe wire in OU experiments has prompted me to look back at my papers concerning Hans Coler's Stromerzeuger that used Fe rods. Over the years I have posited several reasons why passing current through magnetized Fe could yield OU effects. They are tabulated here with excerpts from the various papers, that can be found here

<https://www.overunityresearch.com/index.php?topic=3844.msg77927#msg77927>

### a. Quantum Ratchet

Coler thought the energy came from space. Even today the claim that a simple iron rod can extract energy from space is ridiculed by the scientific establishment. Somehow Coler's iron rods exhibited *absolute negative resistance*, which in 1926 would also have been ridiculed. However recent progress on electron transport at the mesoscopic scale, including quantum effects, have demonstrated that absolute negative resistance *can* be achieved in conduction channels. Of particular interest here is photon-assisted transport [1] [2]. Few scientists today would challenge the claim that an electron conduction channel can exhibit negative resistance, i.e. can produce electrical power, if the electrons are pumped by an external source of photons, after all the absorbed photons are the real source of the power! It has even been shown that the power can be DC if the channel is conditioned such that the conduction electrons spiral at the cyclotron frequency, and the pump frequency is made to synchronize with that. What Coler achieved in 1926 was exactly that sort of channel, except the photon source was not external, but *internal* to the channel. The magnetically active electrons within the iron atoms not only provide the iron with its ferromagnetic characteristic, they also precess at the Larmor frequency and are the source for the pumping photons. Since both the Larmor frequency and the Cyclotron frequency are determined by the local **B** field, at the local atomic scale they are automatically synchronized. Coler discovered by accident the means to create, within an iron rod, a self-sustaining, power-generating DC conduction channel pumped by the magnetically active atomic electrons. The terms *Quantum Ratchet* or *Quantum Dynamo*<sup>TM</sup> have been used to describe similar pumping actions.

### b. Ferromagnetic Resonance

The Hudson letter in the UK National Archives mentions cores "arranged in zig-zag formation". *That is unlike the cores shown in the Norrby patent where they are all vertical.* Being within the vertical RF magnetic field of the large flat coils it is clear that each core sees a transverse component of RF field. That transverse RF field, along with the longitudinal static magnetizing field, will create a transverse oscillation of the magnetic vector. This transverse oscillation of the vector will tend towards a precessional rotation due to the natural precession of the dipoles. In the Stromerzeuger the cores are arranged in pairs, one on each side of the vertical board, and the electrical connections of the two cores are in series. Magnetization precession in one core will induce a longitudinal voltage in the other and since the two precessions are phase linked by a common driving field the series connection adds the

two induced voltages. Normally FMR in Fe occurs at microwave frequencies, and this is due primarily to the remanent (spontaneous) magnetization. In fact most FMR experiments deliberately saturate the Fe so that magnetization is at a known level. There doesn't appear to be any work done on *partially* magnetized Fe where the FMR frequency could be much lower. Perhaps this is because FMR is used mainly as an investigative tool to examine other characteristics of the sample. It is known that Coler had to adjust the magnetization of his cores: this setting was unstable and could easily be disturbed, then requiring careful readjustment to get back to working condition. He even resorted to heating the cores to above their Curie temperature to remove any inherent magnetization before starting the readjustment. This suggests that partial magnetization was a necessary and critical feature. It is known from the Hudson letter that the cores obtained static magnetization from three windings, the central one being wound in opposition to the two outer ones. Also the electrical connection to the end of the core came via magnetized piano wire through a tapered section like a lathe collet. All these features could be an attempt to eliminate geometric demagnetisation so as to create a highly uniform low value static magnetic field in the core, which would be a prerequisite for obtaining bulk or surface FMR. It is known that Coler used a high purity iron (Armco) in his attempted 1946 replication of the Stromerzeuger. The earlier 1926 demonstration probably used Swedish iron, which was the best quality iron available at that time. Any attempted work would have to do the same, and would have to have access to heating and annealing facilities in order to eliminate magnetic anisotropy and spontaneous magnetization. Also the static magnetization coils and the tapered section to PM's at each end (Coler used magnetized piano wire) would need to be designed using 3D simulation techniques in order to create the maximum uniformity of magnetization along the rod.

### c. Iron Rod as a Transmission Line

The large phase constant  $\beta$  causes the phase of the current to vary with penetration depth from the surface, the inner currents lagging the outer currents considerably. The net result is the 45° angle for the *total* current. However, here no account has been taken of any internal propagation delay *along* the rod. If, as seems likely, there is a delay proportional to the length of the rod, it must then be considered as a transmission line. The propagation constant for propagation along the rod cannot be  $\beta$  else there would also be large attenuation along the rod, but there could be a smaller value associated with the high permeability. The important thing to note is that the transmission line delay would apply to both the resistance  $R$  and more importantly the reactance  $X$ . It has recently been shown that a finite length of transmission line having *reactive* impedance, when terminated with a capacitor, can exhibit a negative value of input resistance, and an iron rod is such a reactive line. It is of interest to note that Coler's machine consists of stacked rectangular copper plates with interweaved flat coils. At each layer there is a transmission line of two iron rods in series terminated by a capacitor plate. Each rod is about 200mm long, hence the total line length is in the order of 400mm. Having plate dimensions of about 1m by 0.25m and separation of about 0.01m the inter-plate capacitance is in the order of 50pF. There is evidence from theoretical work on capacitively-terminated transmission-lines having reactive characteristic impedance that this length of magnetic line terminated in that value of capacitance could produce negative resistance, hence self-oscillation. It is contended this could be the source of the anomalous power generated.

## **2. Suggested Lines of Work**

I can find no evidence that anyone has investigated simple iron rods to any degree, except for [3] that claims the iron behaves like a Bose-Einstein Condensate. Of the three possibilities tabulated above I think the Quantum Ratchet deserves investigation. This will involve procuring rods in a pure form of iron, since that is what Coler used. Then the optimum form of coil or coils to be wound on the rod to obtain uniform field along the rod needs to be determined. One way of measuring the field along the rod is with a single turn coil that can be moved along the rod. If the energized coil(s) have low frequency AC then the induced voltage in the single turn will indicate the magnitude of the field at that point. The aim will be to obtain a constant AC voltage value as the single turn coil is moved over a significant length of the rod.

Having obtained a uniform field the coil(s) can now be energized with DC set to a value that yields a given Larmor precession frequency. DC current can then be fed through the rod and the voltage drop measured to good accuracy. The aim is to see whether the voltage drop differs for current in opposite directions. If such a difference is found it could well be due to the quantum ratchet mechanism. Note that this is a simple DC measurement and does not involve all the complexities of RF measurements. Work can now continue looking for improvements to that differential effect, e.g. how is it affected by the DC coil current (hence Larmor frequency), how is it affected by the initial iron state, does the application of a RF magnetic field from a nearby coil have any effect? Hopefully this line of investigation will lead to systems that can exploit the quantum ratchet as an energy source.

## **Reference**

- [1] Adam C. Durst, Subir Sachdev, N. Read and S.M. Girvin, "Radiation-induced magnetoresistance oscillations in a 2D electron gas".
- [2] Junren Shi and X.C. Xie, "Radiation Induced "Zero-Resistance State" and Photon-Assisted Transport".
- [3] Electrodynamics in Iron and Steel, John Paul Wallace, Casting Analysis Corp, 12 January 2009.