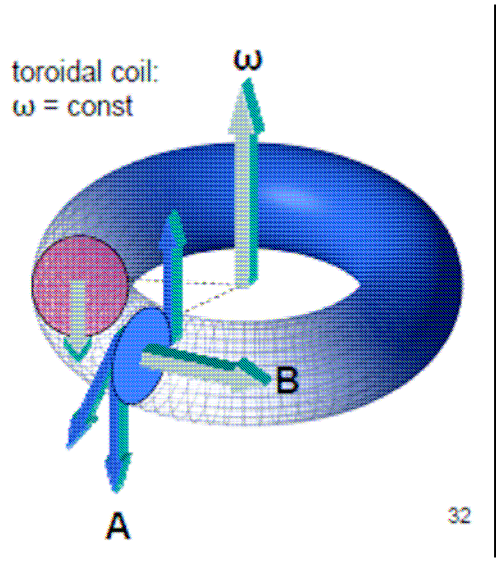
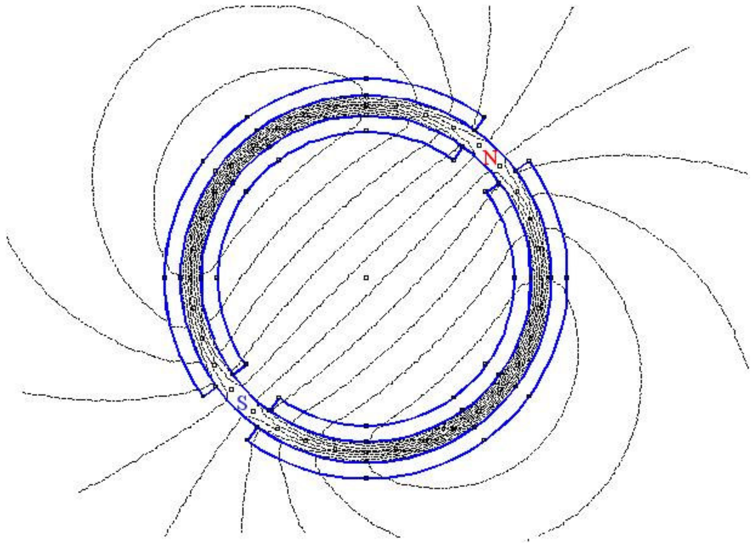
Comments on Horst Eckardt's *ECE Engineering Model, The Basis for Electromagnetic and Mechanical Applications*.

The fist thing that struck me was on page 19 where he states the identity $\frac{d}{dt} = \frac{\partial}{\partial t} + \mathbf{v} \cdot \nabla$ where **v** is the velocity between observer and detector, attributing this to Phipps. I have come across this many times in respect of it being applied to the magnetic vector potential **A** where it becomes $\mathbf{E} = -\frac{d\mathbf{A}}{dt} = -\frac{\partial \mathbf{A}}{\partial t} - (\mathbf{v} \cdot \nabla)\mathbf{A}$. What this implies is that an electric field is created by (a) the first term which is the time rate of change of the **A** field from the perspective of a stationary observer (which we know as transformer induction) and (b) the second term which is known as a convective term which happens when an observer moves through a spatially varying **A** field, hence the observer sees a time varying **A** field due to that movement. This convective term is the subject of much debate since it applies to the Stephan Marinov motor that he bizarrely called the *Siberian Coliu*. In that motor the velocity **v** is the drift velocity of electrons in conductors which, being small, creates hardly observable effects. Hence there is no consensus that the Marinov motor actually works. However it also applies to the generator version where the velocity **v** is now the circumferential velocity of a slip-ring, and that can be quite significant. I have had the opportunity to explore this generator version and this certainly creates observable voltage induction, but the experiment is not conclusive because of the possibility that what I measured actually came from conventional flux-cutting induction (my experiment did not use a non-curl **A** field, hence there was also a **B** field present). This is all reported in another thread on this site. While this has nothing to do with the use of ECE theory, I find it interesting that it is included in Eckardt's paper.

The second thing that stood out was his example of vector spin connection on page 32 where he says "Vector spin connection ω represents rotation of the plane of **A** potential".



Now with a normal toroid, and especially one with a core, the **B** field would be uniform along the core, hence the **A** field would also be uniform on the outside of the core. Then to me that ω has no physical significance, it is just something geometric. However that **A** field could have some modulation along the core which we can easily achieve by using multiple coils along the core and then we would have a standing wave. And we can easily turn this standing wave into a moving wave. Now the ω can represent the rotation of that moving **A** field which to me gives it real meaning. If the **A** field standing wave is a single-cycle sine-wave along the core clearly the **B** field is also cyclic and that means that flux must flow outside the core. This is easily achieved by having two coils at diametrically opposite positions and driven in bucking mode. This creates a N and a S pole on the core, as seen in this FEMM plot.



Also, by having two more coils at a 90 degree orientation, then driving the coil pairs with sine waves having a 90 degree phase shift, we obtain a movement of those poles along the core. Again the ECE ω represents the rotation of those poles and is seen to be the angular frequency of the drive waveforms. So here we have a spin connection that we can recognise, that we can control and that does something useful. I have suggested the possibility that this pole movement can actually conjure-up significant forces from the Earth's huge scalar magnetic potential, and this is dealt with in another thread. Although I got to my result without the use of ECE theory, I think it quite possible that the ECE approach might reach the same conclusions.