4.1 The Luminal Moments (\(K_L\)) and (\(K_M\)) and their relation to Spin and Torsion:

The cross product “\(\mathbf{K} = \mathbf{I} \times \nabla \times \Phi\)” is measured in “Watts/Meter”. Here “\(\mathbf{I} = G_0 \mathbf{c} \mathbf{A} = G_0 \Phi\)”. To explore, we need two Photor groups, the Lorentz Moment group (\(K_L\)) representing the Spin, and the Maxwell Moment group (\(K_M\)) representing Torsion:

\[
\begin{align*}
\tilde{K}_L & = t \cdot \tilde{E} + c \cdot \tilde{I} \times \tilde{B} + i \cdot \tilde{I} \circ \tilde{E} \\
\tilde{K}_{LT} & = t \cdot \tilde{E} - c \cdot \tilde{I} \times \tilde{B} + i \cdot \tilde{I} \circ \tilde{E} \\
\tilde{K}_{LC} & = t \cdot \tilde{E}^* + c \cdot \tilde{I} \times \tilde{B} + i \cdot \tilde{I} \circ \tilde{E}^* \\
\tilde{K}_{LA} & = t \cdot \tilde{E}^* - c \cdot \tilde{I} \times \tilde{B} + i \cdot \tilde{I} \circ \tilde{E}^*
\end{align*}
\]

\[
\begin{align*}
\tilde{K}_M & = c \cdot t \cdot \tilde{B} + \tilde{I} \times \tilde{E} + i \cdot \tilde{I} \circ \tilde{B} \\
\tilde{K}_{MT} & = c \cdot t \cdot \tilde{B} - \tilde{I} \times \tilde{E} + i \cdot \tilde{I} \circ \tilde{B} \\
\tilde{K}_{MC} & = c \cdot t \cdot \tilde{B} + \tilde{I} \times \tilde{E}^* + i \cdot \tilde{I} \circ \tilde{B} \\
\tilde{K}_{MA} & = c \cdot t \cdot \tilde{B} - \tilde{I} \times \tilde{E}^* + i \cdot \tilde{I} \circ \tilde{B}
\end{align*}
\]

Take care to discriminate between the magnetic scalar potential (iota) and the complex number (i).

\[
\begin{align*}
\frac{1}{c} \tilde{K}_L & = \frac{1}{2} \cdot \nabla \tilde{I}^2 - (\tilde{I} \circ \nabla) \tilde{I} \\
\frac{1}{c} \tilde{K}_{LT} & = \frac{1}{2} \cdot \nabla (\tilde{I}^* \tilde{I}) + (\tilde{I} \circ \nabla) \tilde{I}^* \\
\frac{1}{c} \tilde{K}_{LC} & = \frac{1}{2} \cdot \nabla \tilde{I}^2 - (\tilde{I} \circ \nabla) \tilde{I} \\
\frac{1}{c} \tilde{K}_{LA} & = \frac{1}{2} \cdot \nabla (\tilde{I} \tilde{I}^*) + (\tilde{I} \circ \nabla) \tilde{I}^*
\end{align*}
\]

We use the potentials \((A), (\Phi)\) or \((\mathbf{I})\) at will. To explore the Lorentz Spin and the Maxwell Torsion further, evaluate each of their Photor Divergence, starting with the simpler of the two, the Maxwell Torsion:

\[
\begin{align*}
\nabla \circ \tilde{K}_M & = -2 \cdot \tilde{I} \circ (\nabla \times \tilde{E}) \\
\nabla \circ \tilde{K}_{MT} & = -2 \cdot \tilde{E} \circ (\nabla \times \tilde{I}) \\
\nabla \circ \tilde{K}_{MC} & = 2 \cdot (\nabla \times \tilde{I}) \circ (\tilde{E}^* + \nabla \Phi) \\
\nabla \circ \tilde{K}_{MA} & = 2 \cdot (\nabla \times \tilde{I}) \circ \nabla \phi
\end{align*}
\]

\[
\begin{align*}
\nabla^* \circ \tilde{K}_M & = -2 \cdot \tilde{I} \circ (\nabla \times \tilde{E}^*) \\
\nabla^* \circ \tilde{K}_{MT} & = -2 \cdot \tilde{E}^* \circ (\nabla \times \tilde{I}) \\
\nabla^* \circ \tilde{K}_{MC} & = 2 \cdot (\nabla \times \tilde{I}) \circ (\tilde{E} + \nabla \phi) \\
\nabla^* \circ \tilde{K}_{MA} & = 2 \cdot (\nabla \times \tilde{I}) \circ \nabla \phi
\end{align*}
\]

Note that \((\mathbf{K}_M)\) will vanish if \((\mathbf{I} = \mathbf{A}/\mu)\) is orthogonal to \((\partial \mathbf{B}/\partial t)\). Further, \((\mathbf{K}_{MT})\) does the same if \((\mathbf{E})\) is orthogonal to \((\mathbf{B})\). We conclude, that the Maxwell Moment is “small” in macroscopic engineering electricity, just as the Maxwell Force is “small” when the Current Density \((\mathbf{j}_0)\), is orthogonal to \((\mathbf{B})\) and parallel to \((\mathbf{E})\).

\[
\begin{align*}
\frac{1}{c} \nabla \circ \tilde{K}_L & = -\varepsilon \cdot \tilde{E}^2 + \frac{1}{\mu} \cdot \tilde{B}^2 - \tilde{A} \circ \tilde{j} \\
\frac{1}{c} \nabla \circ \tilde{K}_{LT} & = -\varepsilon \cdot \tilde{E}^2 - \frac{1}{\mu} \cdot \tilde{B}^2 + \tilde{A} \circ (\tilde{j} - \frac{\varepsilon}{c^2 \mu} \cdot \tilde{E} \circ \tilde{j} + \varepsilon \cdot \tilde{c} \cdot \tilde{I} + \mu \cdot \tilde{c} \cdot \tilde{I} + \varepsilon \cdot \tilde{I} \circ \tilde{E}^*) \\
\frac{1}{c} \nabla \circ \tilde{K}_{LC} & = -\varepsilon \cdot \tilde{E} \circ \tilde{E}^* + \frac{1}{\mu} \cdot \tilde{B} \circ \tilde{E}^* - \tilde{A} \circ (\tilde{j} - \frac{\varepsilon}{c^2 \mu} \cdot \tilde{E} \circ \tilde{j} - \varepsilon \cdot \tilde{c} \cdot \tilde{I} - \mu \cdot \tilde{c} \cdot \tilde{I} - \varepsilon \cdot \tilde{I} \circ \tilde{E}^*) \\
\frac{1}{c} \nabla \circ \tilde{K}_{LA} & = -\varepsilon \cdot \frac{1}{2} (\tilde{E}^2 + \tilde{E}^* - \frac{1}{\mu} \cdot \tilde{B}^2 + \tilde{A} \circ (\tilde{j}^* - \varepsilon \cdot \tilde{c} \cdot \tilde{I} - \mu \cdot \tilde{c} \cdot \tilde{I} - \varepsilon \cdot \tilde{I} \circ \tilde{E}^*)
\end{align*}
\]

With our choice of potentials, both the Lorentz Spin and the Maxwell Torsion is measured in power per meter \([\text{W/m}]\), or force per second \([\text{N/s}]\). Hence, the divergence of it will be energy flux \([\text{J/m}^2\text{s}]\) which is equal to power density \([\text{W/m}^2]\). Power Density divided by speed, is Energy Density \([\text{J/m}^3]\), or Pressure \([\text{N/m}^2]\).
Many interesting objects appear with the application of the divergence to the moment (4.3. Photor Divergence of the Luminal Moments (K=IxE)).

As for the Photor force, there are 64 Photor-moments; each composed of three terms. There is always a Lorentz Spin term, a Maxwell Torsion term, and a Gauge term:

\[ \mathbf{L} \times \mathbf{\nabla} \times \mathbf{\Phi} = -\mathbf{K}_L + \mathbf{K}_M + c \cdot g \cdot \mathbf{I} \]

\[ \mathbf{L} \otimes \mathbf{\nabla} \otimes \mathbf{\Phi} = -\mathbf{K}_L + \mathbf{K}_M + c \cdot g^* \cdot \mathbf{I} \]

4.3 Photor Divergence of the Luminal Moments (K=IxE):

Many interesting objects appear with the application of the divergence to the moment (K):

\[ \nabla \circ (g \cdot \mathbf{A}) = (\nabla \mathbf{A}) \cdot (\nabla \times \mathbf{A}) \]

\[ \nabla \circ (A \times \mathbf{E}) = (\nabla \times \mathbf{A}) \cdot (\nabla \times \mathbf{A}) \]

\[ \nabla \circ (A \times E^*) = -\frac{\partial}{\partial t} (\frac{1}{c} A) - (\nabla \times \mathbf{A}) \cdot (\nabla \times \mathbf{A}) \]

\[ \nabla \circ (g \cdot \mathbf{A}) = (\nabla \mathbf{A}) \cdot (\nabla \times \mathbf{A}) + \frac{1}{c} (\nabla \times \mathbf{A}) \cdot (\nabla \times \mathbf{A}) \]

4.4 Spin, Torsion, Chirality and Helicity:

Recently [23], the Topological Spin Current is given by “S_L = \phi \mathbf{D} + \mathbf{A} \times \mathbf{H} + i c \mathbf{A} \times \mathbf{D}”. Spin (\phi \mathbf{D} + \mathbf{A} \times \mathbf{H}), Torsion (\phi \mathbf{H} + \mathbf{I} \times \mathbf{E}), Force (\rho \mathbf{E} + \mathbf{J} \mathbf{B}) and Moment (c \mathbf{P} \mathbf{B} + J \mathbf{E} / c) have similar structure, just permutate the fields. The (A*E) term is the Chirality and (A* B) is the Helicity:

\[ \mathbf{S}_L = \phi \cdot \mathbf{D} + \mathbf{A} \times \mathbf{H} + i \cdot c \cdot \mathbf{A} \times \mathbf{D} \]

\[ \mathbf{S}_L^T = \phi \cdot \mathbf{D} - \mathbf{A} \times \mathbf{H} + i \cdot c \cdot \mathbf{A} \times \mathbf{D} \]

\[ \mathbf{S}_L^C = \phi \cdot \mathbf{D}^* + \mathbf{A} \times \mathbf{H} + i \cdot c \cdot \mathbf{A} \times \mathbf{D}^* \]

\[ \mathbf{S}_L^A = \phi \cdot \mathbf{D}^* - \mathbf{A} \times \mathbf{H} + i \cdot c \cdot \mathbf{A} \times \mathbf{D}^* \]