SOME NOTES ON THE INVARIANCE OF B CYCLICS

First Example

Initially:

$$\boldsymbol{B}^{(3)*} = -\frac{i}{B^{(0)}}\boldsymbol{B}^{(1)} \times \boldsymbol{B}^{(2)} \tag{1}$$

Consider a boost in the Z direction, then:

$$\boldsymbol{B}^{(3)} \rightarrow \boldsymbol{B}^{(3)} \tag{2}$$

$$\boldsymbol{B}^{(1)} \times \boldsymbol{B}^{(2)} \rightarrow \gamma^2 \begin{bmatrix} \boldsymbol{B}^{(1)} \times \boldsymbol{B}^{(2)} - \frac{1}{c^2}\left(\boldsymbol{v} \times \boldsymbol{E}^{(1)}\right) \times \boldsymbol{B}^{(2)} \\ -\frac{1}{c^2}\boldsymbol{B}^{(1)} \times \left(\boldsymbol{v} \times \boldsymbol{E}^{(2)}\right) + \frac{1}{c^4}\left(\boldsymbol{v} \times \boldsymbol{E}^{(1)}\right) \times \left(\boldsymbol{v} \times \boldsymbol{E}^{(2)}\right) \end{bmatrix} \tag{3}$$

The left hand side is the κ frame and the right hand side is the κ' frame, moving with respect to κ at v. However, we know that the same boost produces eqn. (2). So the two results are compatible if and only if $v = c$. We then obtain eqn. (1) again, (re. Enigmatic Photon, Vol. 4, p. 91). However, such a boost means that an observer on the photon will record its velocity as zero. This is compatible with special relativity.

Conclusion

A Lorentz boost applied to the B Cyclic theorem is not physically meaningful in any direction. The B Cyclic theorem is invariant under Lorentz transformation.

Second Example

Consider the plane wave in vacuo in frame κ:

$$\boldsymbol{E} = \frac{E^{(0)}}{\sqrt{2}}\left(\boldsymbol{i} - i\boldsymbol{j}\right)e^{i\phi} \tag{1}$$

Then in frame κ':

$$\boldsymbol{E}' = \frac{\gamma}{\sqrt{2}}\left[\left(E^{(0)} - vB^{(0)}\right)\boldsymbol{i} + i\left(E^{(0)} + vB^{(0)}\right)\boldsymbol{j}\right]e^{i\phi} \tag{2}$$

where v is the velocity of frame κ' with respect to κ. However, we know that in vacuo:

$$E^{(0)} = cB^{(0)} \tag{3}$$

So eqn. (2) becomes:

$$E' = \frac{E^{(0)}}{\sqrt{2}} \begin{pmatrix} 0 \\ \overline{0} \\ 0 \end{pmatrix} (i - ij) e^{i\phi} \tag{4}$$
$$= \boldsymbol{E}$$

The Maxwell's equations in vacuo are invariant under Lorentz transform, which cannot be applied to them.