Errata

Page 67 in Prespacetime Journal Vol. 1 No. 1 (Bettini, G. Clifford Algebra and Dirac Equation for TE, TM in Waveguide) should read:

quaternions in 3D space while the components $1, \hat{i}\hat{j}$ give the ordinary complex numbers in the 2D xy plane.

Among the various consequences of the rotation in spacetime there is one now, e.g., a four-velocity can be rotated with a bivector like $\hat{i}\hat{j}$ and then rotate on $\hat{i}$, $\hat{j}$ plane, but also with a bivector like $\hat{i}\,\hat{T}$ and then rotate on $\hat{i}$, $\hat{T}$ plane or speeds up or slows down.

The law of transformation "single-sidedly" of spinors is summarized effectively by Doran et. al. (see, for example. "States and operators in the Spacetime Algebra", Found. Phys. 23 (9), 1993).
If a vector such

(119) $\hat{s} = \psi \hat{k} \psi^*$

is rotated through $R'(\_)R'^*$, the result of the rotation is

(120) $\hat{s}' = R'\hat{s}R'^*$

then the corresponding spinor must transform

(121) $\psi' = R'\psi$

“We use the term spinor to denote any object wich transforms single–sidedly under a rotor R” (Doran).

A7

We show that the equations of transmission lines for TE and TM modes in waveguide are the Dirac equations. The treatment of TM along with TE leads to these equations (e.g. by Franceschetti or [6], [7]):

TE
$$\frac{dV}{dz} = -i\omega\mu I$$
$$\frac{dI}{dz} = -i\omega\varepsilon\left(1-\frac{\omega_0{}^2}{\omega^2}\right)V$$

(122)

TM
$$\frac{dV}{dz} = -i\omega\mu\left(1-\frac{\omega_0{}^2}{\omega^2}\right)I$$
$$\frac{dI}{dz} = -i\omega\varepsilon V$$

Let in (27) with respect to TM

(123) $$\alpha = \frac{\sqrt{\omega}}{\sqrt{\omega+\omega_0}}$$

and so you get a new set of equations for the TM similar to (41) for the TE.
By grouping all