$$g = \begin{bmatrix} 1 & (e_E \cdot e_B) & (e_E \cdot e_k) & 0 \\ (e_E \cdot e_B) & 1 & (e_B \cdot e_k) & 0 \\ (e_E \cdot e_k) & (e_B \cdot e_k) & 1 & 0 \\ 0 & 0 & 0 & -1 \end{bmatrix}$$

$X = x_E \boldsymbol{e}_E + x_B \boldsymbol{e}_B + x_k \boldsymbol{e}_k + t \boldsymbol{e}_t$

$K = k \boldsymbol{e}_k + \omega \boldsymbol{e}_t$

$K \cdot X = (e_B \cdot e_k)\, k x_B + (e_E \cdot e_k)\, k x_E - \omega t + k x_k$

$F = (e_B \cdot e_k)\, B e^{i((e_B \cdot e_k) k x_B + (e_E \cdot e_k) k x_E - \omega t + k x_k)} \boldsymbol{e}_E \wedge \boldsymbol{e}_B - B e^{i((e_B \cdot e_k) k x_B + (e_E \cdot e_k) k x_E - \omega t + k x_k)} \boldsymbol{e}_E \wedge \boldsymbol{e}_k + E e^{i((e_B \cdot e_k) k x_B + (e_E \cdot e_k) k x_E - \omega t + k x_k)} \boldsymbol{e}_E \wedge \boldsymbol{e}_t + (e_E \cdot e_B)\, B e^{i((e_B \cdot e_k) k x_B + (e_E \cdot e_k) k x_E - \omega t + k x_k)} \boldsymbol{e}_B \wedge \boldsymbol{e}_k$

Substituting $e_E \cdot e_B = e_E \cdot e_k = e_B \cdot e_k = 0$

$$g = \begin{bmatrix} 1 & (e_E \cdot e_B) & (e_E \cdot e_k) & 0 \\ (e_E \cdot e_B) & 1 & (e_B \cdot e_k) & 0 \\ (e_E \cdot e_k) & (e_B \cdot e_k) & 1 & 0 \\ 0 & 0 & 0 & -1 \end{bmatrix}$$

$X = x_E \boldsymbol{e}_E + x_B \boldsymbol{e}_B + x_k \boldsymbol{e}_k + t \boldsymbol{e}_t$

$K = k \boldsymbol{e}_k + \omega \boldsymbol{e}_t$

$K \cdot X = (e_B \cdot e_k)\, k x_B + (e_E \cdot e_k)\, k x_E - \omega t + k x_k$

Substituting $e_E \cdot e_B = e_E \cdot e_k = e_B \cdot e_k = 0$