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HERE is an interesting application of polarization tomography:

suppose the space-time metric is written

$$g_{\alpha\beta} = \eta_{\alpha\beta} + h_{\alpha\beta}$$

where $\underline{\underline{\eta}} = \begin{pmatrix} -1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix}$ and $\|h\| \ll \|\eta\|$

eg. "almost flat space-time". Then if $\phi = -\frac{1}{2} h_{00}$, then The equation for a ~~the~~ tangent, $\hat{\underline{x}}$ (a 3-vector), to a light ray is:

$$\frac{d}{dt}\hat{\underline{x}} = \hat{\underline{x}} \times (\hat{\underline{x}} \times \nabla\phi)$$

see Weinberg, Gravitation & cosmology, p222, Wiley, 1972.

But compare with Menke & Abbott's formula for the ~~tangent~~ to an acoustic ray (M&A 8.7.11)

$$\frac{d}{ds}\hat{t} = \hat{t} \times \left[\hat{t} \times (-c\nabla c^{-1})\right]$$

hence light rays act as acoustic rays with

$$-c\nabla c^{-1} = -\nabla\phi = \nabla \frac{h_{00}}{2}$$

HENCE the existing polarazation tomography method can be used in ASTRONOMY, to study the curvature of space-time.