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Unit-01 / Paper-05

Anti Symmetric tensor → An antisymmetric tensor has 12 nonzero components and the Antisymmetry constraint yields only six independent element. As

$$T^{\mu\nu} = \begin{pmatrix} 0 & P_x & P_y & P_z \\ -P_x & 0 & -a_z & a_y \\ -P_y & a_z & 0 & -a_x \\ -P_z & -a_y & a_x & 0 \end{pmatrix}$$

Withoutloss of generality. This implies that the tensor can be considered as being constructed using two purely spatial vectors, **P** and **a**. We represents this two sets, One for each of the Covariant and Contravariant forms.

$$T^{\mu\nu} = (P, a), \; T_{\mu\nu} = (-P, a)$$

If we perform a reflection of all the spatial (~~Related to Space~~) coordinates, then the components with a single time index(o) switch sign, but those with two Spatial indices (i.e. no temporal ones) do not. This is tantamount to the vector P reversing direction under reflections (odd parity). It is then called a polar vector (hence the symbols) For Example → Electromagnetic field tensor, $F_{\mu\nu} = \partial_\mu A_\nu - \partial_\nu A_\mu$, Angular velocity tensor