

# **The principles of imaging devices for high energy photons from Terrestrial Gamma-ray Flashes**

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Lightning and TLE phenomena are mostly observed at radio frequencies, or as photons with eV energies with familiar optical instruments. However Terrestrial Gamma-ray Flashes are observed as photons with keV to MeV energies, requiring imaging instruments not familiar to those in optical physics. This paper will outline the principles and physics of two high energy imaging instruments currently available - Coded Mask Imagers and Compton Imagers - and the particular advantages or disadvantages they have in observing TGF sources, which will most likely have a diffuse beam structure, photon counts in the hundreds only, with Poisson Statistics effects, and are prone to high backscatter background due to a significant MeV energy spectral component. Simulations of TGF ignition and expansion will be shown, along with simulations of examples of these two types of instrument, and their subsequent image reconstruction, to clarify their structure, operation and imaging performance.