Phase noise of two wavelength coherent imaging system as function of spatial frequency content. Benjamin Dapore, Ladar & Optical Communications Institute (USA); David Rabb, AFRL/RYMM; and Joseph Haus, Ladar & Optical Communications Institute (USA).

ABSTRACT

Two wavelength coherent imaging is a technique that offers advantages over conventional coherent imaging. A significant advantage is the ability to derive range information from the phase contrast image at a known difference frequency. Phase noise detracts from the accuracy at which this range information can be extracted. We therefore describe a method for developing a relation of phase noise relative to the correlation of the image planes corresponding to each wavelength. A previously derived equation is modified and extended beyond the general case, which allows for the calculation of a correlation between each image field at various spatial frequencies. This correlation coefficient can be used to generate a probability distribution function which represents the overall phase noise of the system relative to the spatial frequency content. In general, this spatial frequency content is based on the tilt angle of the target. We discuss both a computer based model of the analytic equation, as well as an experimental spatial heterodyne verification of said model. In the future, the model will be adapted for more complex scenes.