Passive millimeter-wave (pmmW) sensors are becoming increasingly prevalent for outdoor applications related to low visibility conditions. This is due in part to the low attenuation characteristics of common obscurants such as dust storms, fog, rain and smoke at millimeter wavelengths as well as low atmospheric attenuation. Millimeter-wave component prices are continuing to drop thanks to the demand for active systems in vehicle anti-collision sensors and airport security sensors. A phased array pmmW sensor is being developed for use by the United States Navy in the H-53 airframe for brownout mitigation and these types of sensors will soon begin operation.

This talk will detail an optical up-conversion approach to millimeter-wave detection and its implications for phased array systems. Movies and images will be shown from the first ever demonstration of a prototype system. In addition, data will be presented from tests conducted at the Yuma Proving Grounds with several different airframes (UH-1, H-60, H-53) for measurements on the attenuation of millimeter-wave radiation by helicopter induced dust storms.

A pmmW simulation tool will also be discussed. This tool is based on the open-source 3D modeling program Blender and the source code has been modified to accurately simulate scenes at millimeter wavelengths. The phenomenology of pmmW imagery will be discussed and experimental data will be compared to current simulations.