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Missile warning using infrared spectroscopic velocimetry

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We describe a concept using mid-infrared (MIR) interferometric spectral velocimetry to passively detect and discriminate missile exhaust (e.g. MANPADs or launch phase ICBMs). Velocimetry can add unique “false – real” assessment by confirming that specific high-velocity missile exhaust gas exists in the field of view. Spectroscopy can be used to measure radial velocity by detecting a Doppler shift of the radiation emitted or reflected by an object. We describe “Externally Dispersed Interferometry” (EDI), a method of high-resolution spectroscopy using an interferometer in series with a classical spectrometer. The EDI is efficient at sensing Doppler shifts of spectral features in hot plume gas and can spectrally determine both plume chemical composition and velocity. EDI’s are much smaller than conventional high-resolution spectrometers, and unlike Fourier transform spectrometers, can measure a large simultaneous bandpass using no moving parts. We therefore envision that small, rugged and monolithic EDI systems that could be used for anti-missile countermeasure systems. This work was performed under the auspices of the U.S. Dept. of Energy by the University of California, Lawrence Livermore National Laboratory under contract No. W-7405-Eng-48.