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2D and 3D Temperature Measurements with a Multi-band Plenoptic Camera DUSTIN KELLY, Auburn University, CHRIS CLIFFORD, U.S. Air Force Research Laboratory, BRIAN‘ THUROW, Auburn University, ADVANCED FLOW DIAGNOSTIC LABORATORY TEAM — Re-entry vehicles experience very harsh environments that can compromise the integrity of materials. At these extreme temperatures, materials can have wildly varying properties. Emissivity, an important property for optical pyrometry, is a function of wavelength and temperature. Traditional optical pyrometers have difficulty with varying spectral emissivity. The multi-band plenoptic camera is a combination of a camera, microlens array, and a wavelength filter array placed at the aperture plane. The microlens array placed at a specific location samples the aperture plane, which traditionally captures spatial and angular information of light rays. Additionally, the inclusion of a filter array provides spectral content. With the spectral filter placed forward of the camera, the multi-band plenoptic camera provides flexibility in filter and wavelength design. The multi-band camera captured surface temperatures of a copper (Cu) melt pool during solidification to show efficacy in capturing temperatures when a material has large spectral emissivity and reflectivity variation. With the availability of angular and spectral information, the information can be used to produce 3D scalar field reconstructions. Finally, some preliminary 3D reconstructions of simulated flames will be presented.

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