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Mid-Infrared Through Terahertz Cameras Based on Superconducting Technology[1]

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A new generation of cameras is set to make a tremendous impact on the field of mid-infrared to Terahertz astronomy. Take for example, the SCUBA-II instrument to be deployed on the James Clerk Maxwell Telescope at Mauna Kea , Hawaii. The existing SCUBA instrument has two arrays of 37 and 91 pixels, observing at 850 μm and 450 μm. The SCUBA-II arrays have 5120 pixels each and the noise contribution from the detectors is less than the sky load noise. As a result, large regions of the sky can be mapped about 1000 times faster. Superconducting thin film devices play multiple critical roles in these large format arrays. We will discuss the superconducting detector, multiplexing, and amplifier technology developed at NIST Boulder by the Quantum Sensors Project and the integration all of these technologies into a science grade imaging array. We will also survey the role that superconducting detectors, multiplexers, and thin film refrigerators will play in future instruments at both longer and shorter wavelengths.

[1]Quantum Sensors Project: Jim Beall, Randy Doriese, Will Duncan, Lisa Ferreira, Gene Hilton, Rob Horansky, Kent Irwin, Ben Mates, Nathan Miller, Galen O'Neil, Carl Reintsema, Joel Ullom, Leila Vale, Barry Zink, and Yizi Xu.