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Terahertz Imaging and Security Applications

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Imaging at millimeter-wave and terahertz frequencies could vastly improve the security of personnel checkpoints, because of the penetration through clothing and spatial resolution available in this spectral range. Since 9/11, the social need for improved checkpoint screening has been obvious and great. However, although efforts to develop such imagers had been underway for many years before that, practical low-cost systems, analogous to IR uncooled imagers, still don't exist. An emphasis on purely passive imaging places very stringent sensitivity requirements on such imagers. A number of long-term efforts, which I briefly mention, are underway to improve the sensitivity of such passive imagers. However, most of the emphasis in our program is on active imaging. With this approach, much simpler and lower-cost detectors, such as (uncooled) antenna-coupled microbolometers can be used, at the expense of incorporating slightly more complex optics and illumination components. I discuss several tradeoffs presented in the design of active imaging systems for the 100 to 1000 GHz frequency range, describe how we have addressed them in the design of a scanning, 95 GHz, bolometer-based imager for concealed weapons detection that is nearing completion, and describe how the system architecture can be modified to scale the operating frequency to the 650 GHz atmospheric window.

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