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An optical parametric terahertz beam generator for remote sensing applications DONG HO WU, Naval Research Laboratory — Terahertz remote-sensing applications require high sensitivity detectors and high-power terahertz sources, since terahertz signals can be quickly attenuated by water molecules present in the target, as well as in the environment between the source and the target. Of the many terahertz source technologies available, the one based on the optical parametric generation technique seems to be the most promising as it is portable and can produce a relatively high-power terahertz beam. We have developed a terahertz source based on an optical parametric technique. We have used a Nd:YAG Q-switched laser as the pump source, and a $LiNbO_3$ crystal as the optical parametric medium. With a $LiNbO_3$ crystal our generator could produce a terahertz beam over the frequency range of 100 GHz through 3 THz. The output power was highly dependent on the detailed materials property. For terahertz detection we used a Si-bolometer or an electro-optic (EO) detector, which was specifically developed to detect CW terahertz signals. In addition to the EO sensor, we are presently developing a new detector based on a quantum-dot structure, whose noise equivalent power (NEP) is expected to be about 10^{-21} W/(Hz)$^{1/2}$. This is a few orders of magnitude better than the sensitivity of our bolometer (10^{-13} W/(Hz)$^{1/2}$) at 4.2 K, or our EO detector (10^{-12} W/(Hz)$^{1/2}$) at room temperature.

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