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Title: Heterodyne Detection by Miniature Neon Indicator Lamp Glow Discharge Detectors

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Abstract: Miniature neon indicator lamps acting as glow discharge detectors (GDD) are candidates to serve as very inexpensive room-temperature Terahertz radiation detectors and as pixels in THz imaging systems. Previous experiments with GDD devices with THz waves showed good responsivity and noise equivalent power using direct detection. Significant improvement of detection performance is expected using heterodyne detection. Since THz sources are expensive and heterodyne detection requires two sources, we show here a proof of concept at low frequencies. In this paper, we compare the performance of GDDs in direct detection to the performance of GDDs in heterodyne detection at 10 GHz. The experimental results show that heterodyne detection is almost two orders of magnitude more sensitive than direct detection, and that in general sensitivity is inversely proportional to increasing local oscillator power. Heterodyne detection at 300 GHz is also demonstrated.