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Title:Interferometric technique for measuring terahertz antenna phase patterns
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Abstract:A quasi-optical interferometric technique capable of measuring antenna phase patterns without the need for a heterodyne receiver is presented. It is particularly suited to the characterization of terahertz antennas feeding power detectors or mixers employing quasi-optical local oscillator injection. Examples of recorded antenna phase patterns at frequencies of 1.4 and 2.5 THz using homodyne detectors are presented. To our knowledge, these are the highest frequency antenna phase patterns ever recovered. Knowledge of both the amplitude and phase patterns in the far field enable a Gauss-Hermite or Gauss-Laguerre beam-mode analysis to be carried out for the antenna, of importance in performance optimization calculations, such as antenna gain and beam efficiency parameters at the design and prototype stage of antenna development. A full description of the beam would also be required if the antenna is to be used to feed a quasi-optical system in the near-field to far-field transition region. This situation could often arise when the device is fitted directly at the back of telescopes in flying observatories. A further benefit of the proposed technique is simplicity for characterizing systems in situ, an advantage of considerable importance as in many situations, the components may not be removable for further characterization once assembled. The proposed methodology is generic and should be useful across the wider sensing community, e.g., in single detector acoustic imaging or in adaptive imaging array applications. Furthermore, it is applicable across other frequencies of the EM spectrum, provided adequate spatial and temporal phase stability of the source can be maintained throughout the measurement process. Phase information retrieval is also of importance to emergent research areas, such as band-gap structure characterization, meta-materials research,

electromagnetic cloaking, slow light, super-lens design as well as near-field and virtual imaging applications. © 2001-2012 IEEE.

Number of references:69

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Uncontrolled terms:Adaptive imaging - Antenna gains - Antennas and propagation - Band-gap structures - Efficiency parameters - Electromagnetic cloaking - Far field - Flying observatories - Frequency antennas - Gauss-Laguerre - Heterodyne receivers - Homodyne detector - Interferometric techniques - Local oscillators - Measurement process - Microwave theory and techniques - Near-field - Performance optimizations - Phase patterns - Power detectors - Quasi-optical - Quasioptical systems - Submillimeters - Terahertz antennas - Transition regions - Virtual imaging

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