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Atom-based optical RF-power/voltage transducer and sensor RACHEL SAPIRO, Rydberg Technologies, GEORG RAITHEL, Rydberg Technologies, University of Michigan, DAVID ANDERSON, Rydberg Technologies — New technologies for atomic vapor cells enable experiments and applications that require a small footprint. We introduce a detector comprising an atomic vapor cell with integrated electrodes embedded in an RF circuit to serve as a RF-to-optical transducer. In our present demonstration, an RF electrical signal collected by an antenna is converted into intra-cell electric fields, which are then optically read out via spectroscopy of field-sensitive atomic states. By direct conversion of RF electrical signals to an atom-mediated optical readout, the atom-based transducer provides ultra-high bandwidth from DC to THz, absolute (atomic) measurement of RF power or voltage in a compact unit. Here, we demonstrate such a detector consisting of a cesium vapor cell with integrated electrodes connected directly to a microwave horn antenna via an SMA cable. Optical readout is facilitated by EIT spectroscopy of the cesium vapor. The acquired EIT spectra exhibit Autler-Townes line splittings that yield the power-equivalent field of the microwaves collected by the horn.

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