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Advances in Using Rydberg Atoms to Characterize Radio-Frequency Fields and Modulated Signals AMY ROBINSON, University of Colorado, Boulder, MATTHEW SIMONS, JOSHUA GORDON, CHRISTOPHER HOLLOWAY, National Institute of Standards and Technology — The use of Rydberg atoms for measuring the amplitude of radio frequency (RF) electrical (E) fields has made significant progress in the past few years. Last year, techniques were developed to detect the phase of RF fields as well as receiving modulated signals. As a result of these recent developments it is now possible to fully characterize RF fields and modulated signals with Rydberg atom-based sensors, in that the amplitude, phase, and polarization can be determined in one compact quantum-based sensor. These sensors range from isolated atomic-vapor cells, fiber-coupled vapor cells, to vapor-cells integrated into conventional antenna structures. With amplitude, phase, and polarization detection capabilities, we can now start looking at a wide array of applications for the Rydberg atom-based RF sensor. In this talk, we will discuss the sensing technique and present several implementations of these Rydberg-atom sensors. These demonstrations range from detecting RF field amplitude, polarization selectivity of E-fields, RF power calibrations, detecting weak E-fields, detecting the phase of continuous wave (CW) fields, detecting phase-modulated signals, characterizing waveforms, and detecting the angle of arrival of a remote source.

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