

Abstract Submitted  
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**A portable Rydberg RF field probe and measurement instrument for SI-traceable, self-calibrated, broadband RF field sensing, measurement, and imaging.**<sup>1</sup> DAVID ANDERSON, RACHEL SAPIRO, GEORG RAITHEL, Rydberg Technologies Inc. — We present a self-calibrating, SI-traceable broadband Rydberg-atom-based radio-frequency (RF) electric field probe (the Rydberg Field Probe or RFP) and measurement instrument (Rydberg Field Measurement System or RFMS) [1]. The RFMS comprises an atomic RFP and a remote portable mainframe control unit with a software interface for RF measurement and analysis, rendering real-time RF field readouts and allowing rapid RF waveform visualization. The instrument employs electromagnetically induced transparency (EIT) readout of spectral signatures from RF-sensitive Rydberg states of an atomic vapor for continuous, pulsed, and modulated RF field measurement. The RFP atomic probe has been characterized by polar field and polarization patterns at 12.6 GHz RF; the patterns have been obtained in the far-field of a standard gain horn antenna. A detailed calibration procedure and uncertainty analysis are presented. The effects of hardware choices and other systematic effects are accounted for in the procedure, providing an absolute-standard SI-traceable calibration of the RFP. Pulsed and modulated RF field measurement, and time-domain RF-pulse waveform imaging are also demonstrated. [1] Anderson, D.A. et al., arXiv:1910.07107v2 [physics.atom-ph] (2019).

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