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Ionization of Rydberg Atoms in Controlled Surface Electric Fields[1] YU PU, BARRY DUNNING, Rice University — Earlier work shows that the ionization of xenon Rydberg atoms at metal surfaces is strongly influenced by the presence of stray patch fields. In the present work lithographically patterned electrode arrays comprising two interleaved "combs" are used to generate controlled surface electric fields by applying different potentials to each "comb." Xenon ions produced near the surface are collected by an ion collection field applied perpendicular to the surface. With equal biases applied to the electrodes, the observed ion signal increases rapidly with increasing ion collection field above some threshold eventually saturating when each incident Rydberg atom is detected as an ion. Application of surface electric fields leads to a dramatic increase in the ion signal seen at low ion collection fields due to field ionization in the surface field well above the surface. The data are in good qualitative agreement with the predictions of a simple ionization model and suggest that such surface field ionization could allow efficient detection of low-n Rydberg atoms.

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