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**Ionization of Xenon Rydberg Atoms at Conducting Surfaces**[1] H.R. DUNHAM, J.C. LANCASTER, F.B. DUNNING, P. NORDLANDER, Rice University, Houston, Texas — The ionization of xenon Rydberg atoms at an atomically flat Au(111) surface is being studied to explore how atoms respond to the presence of a nearby surface and to probe electron tunneling processes. Remarkably, experiments using atoms in Stark states in which the electron probability density is initially oriented towards the surface or towards vacuum lead to ionization at similar atom/surface separations. This disagrees with the predictions of hydrogenic theory, which suggests that ionization distances should be very different. This apparent discrepancy is explained in terms of perturbations in the structure of the atomic states induced by the presence of the surface. These result in energy level shifts as the surface is approached and in the appearance of avoided crossings between states in adjacent n-manifolds. These avoided crossings result in the electron probability density oscillating between being oriented toward the surface or toward vacuum. Thus, on average, the electron probability densities associated with the extreme red and blue members of adjacent Stark manifolds are similar, leading to ionization at similar atom/surface separations.

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