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Lateral extension of quantum well states: scanning tunneling spectroscopy study SUJIT MANNA, JÜRGEN KIRSCHNER, Max-Planck-Institut für Mikrostrukturphysik, Weinberg 2 D - 06120 Halle — Quantum well states(QWS) in thin metal films have been extensively studied mostly by laterally averaging techniqes such as photoemission or inverse photoemission.A complementary approach is opened by scanning tunneling spectroscopy(STS) and microscopy(STM), which extends the range of this extremely surface sensitive device into the interior of the sample, and make it possible to image features of a buried interface with lateral resolution on the atomic scale. We present low temperature STS results of ocuupied sp-QWS localized in Ag(111) films. For thin film with local varying thickness,we recall the fundamental question-how the transition of QWS takes place,and at what length scale? We demonstrate that the QWS of thin Ag(111) films are highly perturbed within the proximity of a step edge.Atomic resolved scanning tunneling microscopy/spectroscopy indicates that the energy of these states has a strong distance dependence within the proximity of the step edge with large energetic shift equaling up to $\sim$ 200meV. For an Ag layer of 30ML thick, we obtain a lateral extension of the QWS in the order of $\sim$ 10Å. This spatial extension of QWS can be understood within the context of electron scattering within the proximity of the buried interface.

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