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Electronic Structures of Quasiperiodically Modulated Thin Ag films D. EOM, J. SHI, Q. NIU, C.-K. SHIH, The University of Texas at Austin — When electrons move in crystalline solids, the coherent scattering with the periodic potential enables them to sneak by all ions uninhibited, forming Bloch electrons with their own E vs. k dispersion relationship. This "Bloch description" underlies the electronic structures of all crystalline solids. In quasicrystals, however, such a description encounters conceptual difficulties since the Bloch theorem no longer applies. While theoretical investigations showed exotic characteristics such as the Cantor-set energy spectrum early experiments did not reveal such exotic properties. Recent attempt to measure E vs. k relation in a quasicrytal using angle-resolved photoemission revealed free-electron like states. Nevertheless, critical questions remain as how electronic states in a quasiperiodic solid differ from those in a periodic solid. By using low-tempeature scanning tunneling spectroscopy (STS) to probe a quasiperiodically modulated Ag metallic thin film, and by using Fourier analysis, we unravel the influences of individual Fourier components of the scattering potential (periodic vs. quasiperiodic) on the electronic structures.

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