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Characterization of Image States in Graphene on Ir(111)[1] JERRY I DADAP, Columbia University, New York, MARKO KRALJ, MARIN PETROVIC, Institut za fiziku, Zagreb, Croatia, KEVIN KNOX, NADER ZAKI, ROHAN BHANDARI, PO-CHUN YEH, RICHARD M. OSGOOD JR., Columbia University, New York — Two dimensional electron systems involving graphene and graphene/metallic interfaces are increasingly of interest in condensed matter physics. Here, we demonstrate two-photon photoemission to map the image states of highly perfect and weakly bonded graphene on an Ir(111) substrate to reveal the effects of interaction with the underlying metal substrate. We observe a monotonic decrease in the work function with increasing graphene coverage from 5.6±0.1 eV for clean Ir to 4.5±0.1 eV for full graphene ML. We observe n=1, 2, 3 image states with nearly free electron dispersion. Despite the minimal coupling between the graphene and Ir, the energy spacing of the image states is consistent with a single Rydberg series description, in contrast to the expected bifurcation of the image states into odd and even states for a pure graphene layer. At large $k_{||}$, we observe a weak state deviating from the n=1 dipersion. We explain this effect in terms of scattering from the Ir substrate.

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