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A charge density wave-like instability in a doped spin-orbit assisted weak Mott insulator[1] HAO CHU, LIUYAN ZHAO, ALBERTO DE LA TORRE, California Institute of Technology, TOM HOGAN, STEPHEN WILSON, University of California, Santa Barbara, DAVID HSIEH, California Institute of Technology, CALTECH COLLABORATION, UCSB COLLABORATION — Layered perovskite iridates realize a rare class of Mott insulators that are predicted to be strongly spin-orbit coupled analogues of the parent state of cuprate high-temperature superconductors. Recent discoveries of pseudogap, magnetic multipolar ordered and possible d-wave superconducting phases in doped Sr_2IrO_4 have reinforced this analogy among the single layer variants. However, unlike the bilayer cuprates, no electronic instabilities have been reported in the doped bilayer iridate $Sr_3Ir_2O_7$. In this talk I will show that $Sr_3Ir_2O_7$ realizes a weak Mott state with no cuprate analogue by using ultrafast time-resolved optical reflectivity to uncover an intimate connection between its insulating gap and antiferromagnetism. However, a subtle charge density wave like Fermi surface instability is detected in metallic electron doped $Sr_3Ir_2O_7$ at temperatures (T_{DW}) close to 200 K via the coherent oscillations of its collective modes, which is reminiscent of that observed in cuprates. The absence of any signatures of a new spatial periodicity below TDW from diffraction, scanning tunneling and photoemission based probes suggests an unconventional and possibly short-ranged nature of this density wave order.

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