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Time reversal symmetry breaking in hole-doped cuprates ANDREY CHUBUKOV, YUXUAN WANG, University of Wisconsin-Madison — We consider charge-density-wave (CDW) instability in weakly hole-doped cuprates. We show that the interaction mediated by spin fluctuations gives rise not only to $d-$wave superconducting pairing but also to (CDW) order with momentum $(\pm Q, 0)$ and $(0, \pm Q)$. We show that this particular order has two components, one symmetric and another anti-symmetric under time reversal. We derive and analyze the corresponding Ginzburg-Landau functional and show that both components appear simultaneously at T_{CDW}, i.e., the CDW-ordered state breaks time reversal symmetry. We further show that time-reversal symmetry actually gets broken even before CDW orders develop, as the two CDW components form a (4-fermion) bound state at some $T_{bs} > T_{CDW}$. In between T_{bs} and T_{CDW}, time-reversal symmetry is broken, but CDW order does not yet develop. We show that the same result can be obtained by re-expressing the Ginzburg-Landau functional in terms of collective variables and solving saddle-point equations. We discuss experimental consequences of this emerging order.

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