Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Emergent loop current order from pair density wave superconductivity[1] MANOJ KASHYAP, Univ of Wisconsin, Milwaukee, DREW MELCHERT, Univ of Chicago, Chicago, DANIEL AGTERBERG, Univ of Wisconsin, Milwaukee — In addition to charge density wave (CDW) order, there is evidence that the pseudogap phase in the cuprates breaks time reversal symmetry. Here we show that pair density wave (PDW) states give rise to a translational invariant non-superconducting order parameter that breaks time reversal and parity symmetries, but preserves their product. This secondary order parameter has a different origin, but shares the same symmetry properties as a magnetoelectric loop current order that has been proposed earlier in the context of the cuprates to explain the appearance of intra-cell magnetic order. We further show that, due to fluctuations, this secondary loop current order, which represents the breaking of discrete symmetries, can preempt PDW order, which breaks both continuous and discrete symmetries. In such a phase, the emergent loop current order coexists with spatial short range CDW and short range superconducting order. Finally, we propose a PDW phase that accounts for intra-cell magnetic order and the Kerr effect, has CDW order consistent with x-ray scattering and nuclear magnetic resonance observations, and quasi-particle properties consistent with angle resolved photoemission scattering.

[1]We acknowledge support from NSF grant No. DMR-1335215

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Date submitted: 14 Nov 2014 Electronic form version 1.4