# 0-π TRANSITIONS IN JOSEPHSON JUNCTIONS WITH ANTIFERROMAGNETIC INTERLAYERS

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## Introduction and Discussion

As part of a new research effort[1-3] into the properties of correlated interfaces, we showed that the dc Josephson current through superconductor-antiferromagnet-superconductor (S/AF/S) junctions manifests a remarkable atomic scale dependence on the interlayer thickness. At low temperatures the junction is either a 0-or π-junction depending on whether the AF interlayer consists of an even or odd number of atomic layers. This is associated with different symmetries of the AF interlayers in the two cases. In the junction with odd AF interlayers an additional π-0 transition can take place as a function of temperature. This originates from the interplay of spin-split Andreev bound states.

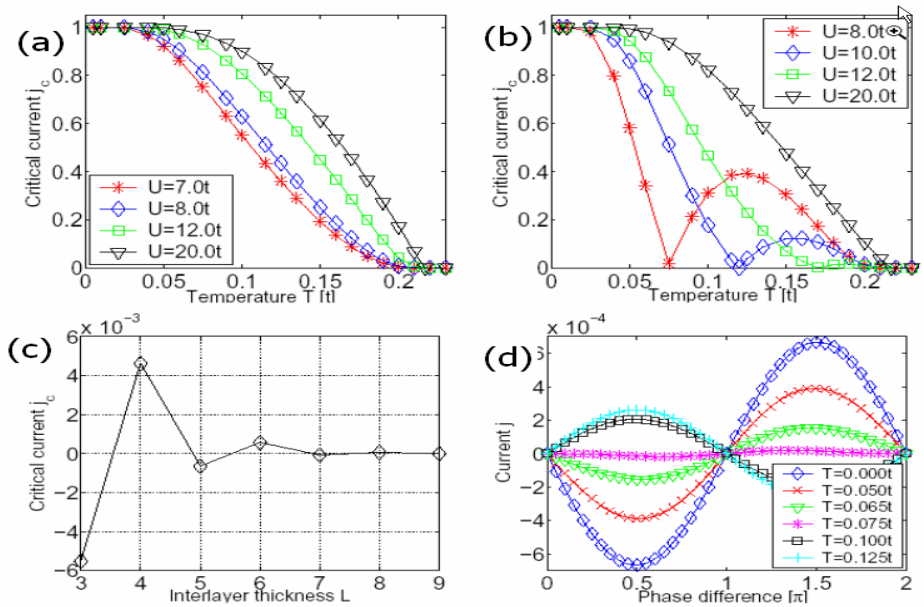


**Fig. 1.** Temperature dependence of the critical current for S/AF/S (110) junctions with AF interaction strength U=8.0t and L=6 (a) and L=5 (b). In (a,b) the graphs have been normalized to their values at T=0. (c) Oscillations of the critical current as a function of the AF layer thickness L. Current-phase relation at various temperatures along the U=8.0t curve in (b). Parameters used in all figures: pair interaction V=2.0t, chemical potential μ=0. t is the nearest-neighbor square lattice hopping matrix element.

## References

1 Bobkova, I.V., *et al.*, Phys. Rev. Lett., **94**, 037005 (2005).
2 Andersen, B.M., *et al.*, Phys. Rev. B, **72**, 184510 (2005).
3 Andersen, B.M., *et al.*, submitted to Phys. Rev. Lett.