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Title : Kondo screening cloud in an Aharonov-Bohm ring with an embedded quantum dot

Abstract:

The Kondo effect is theoretically examined in a quantum dot embedded in an Aharonov-Bohm ring. In this Kondo problem, there are two characteristic lengths, one is the screening length of the charge fluctuation (L_c) and the other is that of the spin fluctuation, or size of Kondo screening cloud (L_K). Our scaling analysis yields the Kondo temperature T_K and conductance in cases of (i) $L_c \ll L_K \ll L$, (ii) $L_c \ll L \ll L_K$, and (iii) $L \ll L_c \ll L_K$, where L is the ring size.

T_K is markedly modulated by the magnetic flux Φ penetrating the ring in cases (ii) and (iii), whereas it hardly depends on Φ in case (i). Our result indicates the possible observation of the Kondo screening cloud by the measurement of T_K or conductance.

Reference: R. Yoshii and M. Eto, Phys. Rev. B 83, 165310 (2011).