Shot noise of a superconductor/nanotube junction in the SU(2) and SU(4) Kondo regime

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Abstract

When a quantum dot in the Kondo regime is connected to superconducting electrodes, interplay between the two many-body effects gives rise to a wide variety of transport properties [1, 2]. In a carbon nanotube quantum dot, Kondo effect presents two different symmetries: SU(2) when the spin is the only degenerate degree of freedom and SU(4) when spin and orbital momentum are degenerate [3]. Combining conductance and shot noise measurements, we have investigated the competition between Kondo effect and superconducting proximity effect in the unitary limit of the two different Kondo symmetries.
Figure 1 shows symmetry is barely distinguishable in the normal state since conductance reaches the same unitary value 2e2/h[3]. However, we have demonstrated that both conductance and shot noise reveal the symmetry of the Kondo state in the superconducting state. SU(2) conductance around zero bias is enhanced in the superconducting state, showing that transport takes place through a single perfect channel. However, SU(4) conductance presents Multiple Andreev Reflections at voltages 2D/n, demonstrating that transport occurs through two half transmitted channels (T1=T2=0.5). We have also measured the shot noise, which shows a similar behavior and need further theoretical developments to be fully understood.

References

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