Abstract Submitted
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Spin-orbit Josephson ϕ_0-junction in nanowire quantum dots DANIEL SZOMBATI, STEVAN NADJ-PERGE, TU Delft, DIANA CAR, ERIK BAKKERS, TU Eindhoven, LEO KOUWENHOVEN, TU Delft — The Josephson effect describes supercurrent flowing through a junction connecting two superconducting leads by a thin barrier[1]. This current is driven by a superconducting phase difference ϕ between the leads and it is strictly zero when ϕ vanishes, due to the chiral and time reversal symmetry of the Cooper pair tunneling process[2]. Only if these underlying symmetries are broken the supercurrent for $\phi = 0$ may be finite[3]. This corresponds to a ground state of the junction being offset by a phase ϕ_0. Here, for the first time, we report such Josephson ϕ_0-junction. Our realization is based on a nanowire quantum dot. We use a quantum interferometer device in order to investigate phase offsets and demonstrate that ϕ_0 can be controlled by electrostatic gating. Our results have possible far reaching implications for superconducting flux and phase defined quantum bits as well as for exploring topological superconductivity in quantum dot systems. 1. Josephson, *Phys. Lett.* **1,** 251–253 (1962). 2. Yip, S.-K., De Alcantara Bonfim, O. F. & Kumar, P., *Phys. Rev. B* **41,** 11214–11228 (1990). 3. Zazunov, A., Egger, R., Jonckheere, T. & Martin, T.,*Phys. Rev. Lett.* **103,** 147004 (2009).

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