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Contribution ID: **664** Type: **Oral Competition (Graduate Student) / Compétition orale (Étudiant(e) du 2e ou 3e cycle)**

(G*) Towards the atomic scale readout of single acceptor states in p-doped Si

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Single acceptor dopants in Si along with dangling bonds are enabling technologies for atomic scale charge and spin-based devices.1 Additionally, recent advances in hydrogen lithography have enabled the patterning of quantum dot based circuit elements with atomic precision.[2] We engineered a single acceptor coupled to a dangling bond wire on highly doped p-type H-Si(100) and characterized its electronic properties with scanning tunneling spectroscopy. The coupled entity has an electronic structure that behaves as a conductive wire from which the charge state of the dopant can be accessed and has a complex dependence on the dangling bond wire length. In addition, dI/dV mapping reveals features reminiscent of charging rings that are centered over the dopant and overlap with the wire.[3] This overlap varies with electric field and its tunability may augment the functionality of dangling bond based quantum devices.

References:
1 A. Laucht et al., "Roadmap on quantum nanotechnologies", Nanotechnology, vol. 32, no. 16, p. 162003, 2021. Available: 10.1088/1361-6528/abb333
[2] T. Huff et al., "Binary atomic silicon logic", Nature Electronics, vol. 1, no. 12, pp. 636-643, 2018. Available: 10.1038/s41928-018-0180-3
[3] N. Turek, S. Godey, D. Deresmes and T. Mélin, "Ring charging of a single silicon dangling bond imaged by noncontact atomic force microscopy", Physical Review B, vol. 102, no. 23, 2020. Available: 10.1103/physrevb.102.235433

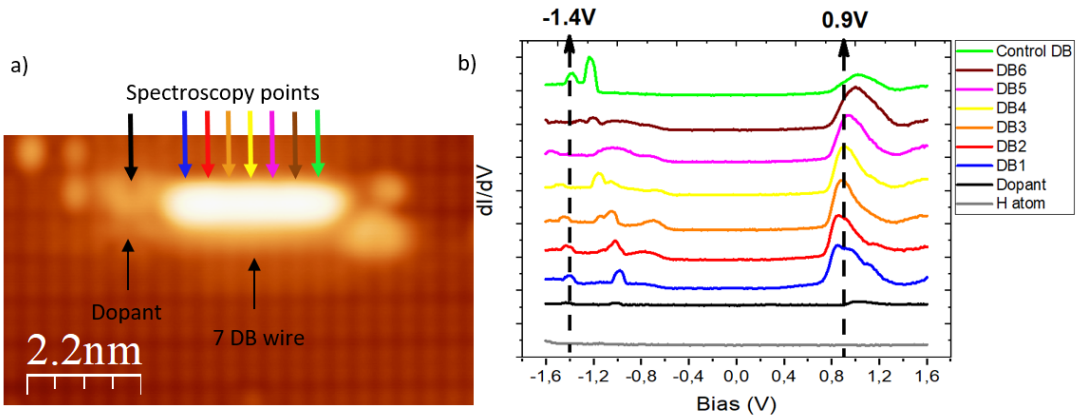

Figure 1: Figure 1. a) (1.8 V 50 pA) STM image of a 7 dangling bond wire fabricated next to a subsurface Boron dopant on highly doped P type H-Si (100) with individual spectroscopy points denoted by arrows. b) dI/dV spectroscopy taken over the dopant and wire shown in a), exhibiting previously unobserved peaks at -1.4 V and 0.9 V.

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