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Gate-controlled charging effects in superconducting nanowires: low-energy spectrum and time scales for Majorana manipulation MICHAEL HELL, Division of Solid State Physics and NanoLund, Lund Univ., Sweden / Center for Quantum Devices and Station Q Copenhagen, Univ. of Copenhagen, Denmark, JEROEN DANON, Center for Quantum Devices and Station Q Copenhagen and Niels Bohr International Academy, Univ. of Copenhagen, Denmark, MARTIN LEIJNSE, Division of Solid State Physics and NanoLund, Lund Univ., Sweden / Center for Quantum Devices and Station Q Copenhagen, Univ. of Copenhagen, Denmark, KARSTEN FLENSBERG, Center for Quantum Devices and Station Q Copenhagen, Univ. of Copenhagen, Denmark — In this talk, we investigate the gate-controlled crossover between different operating regimes of a superconducting nanowire segmented into two islands each Josephson-coupled to a bulk superconductor. This device may host two pairs of Majorana bound states and could be realized in the near future as a platform for testing Majorana fusion rules. We present a numerical study of the low-energy spectrum of this device covering both the charge-dominated regime utilizable for initialization and readout of the Majorana bound states as well as the Josephson-dominated transmon regime allowing for Majorana manipulations. Depending on the relative size of the energy scales associated with the Majorana coupling, the charging energy, and the transmon frequency, the fine structure of the low-energy spectrum differs. We finally discuss the associated time scales for implementing a fusion-rule testing protocol discussed in the talks by J. Alicea and R. V. Mishmash.

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