[1] *Watanabe H. and Oshikawa M.*
Absence of quantum time crystals in ground states.
arXiv:1410.2143 [cond-mat.stat-mech] (2014).
In analogy with crystalline solids around us, Wilczek recently proposed the idea of "time crystals" as phases that spontaneously break the continuous time translation into a discrete subgroup. The proposal stimulated further studies and vigorous debates whether it can be realized in a physical system. However, a precise definition of the time crystal is needed to resolve the issue. Here we first present a definition of time crystals based on the time-dependent correlation functions of the order parameter. We then prove a no-go theorem that rules out the possibility of time crystals defined as such, in the ground state of a general Hamiltonian which consists of only short-range interactions.

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[2] *Heimes A., Mendler D., and Kotetes P.*
Interplay of topological phases in magnetic adatom-chains on top of a Rashba superconducting surface.
arXiv:1410.6367 [cond-mat.mes-hall] (2014).
We investigate the topological properties and the accessible Majorana fermion (MF) phases arising in a hybrid device consisting of a chain of magnetic adatoms placed on the surface of a conventional superconductor with Rashba spin-orbit coupling (SOC). By identifying the favored classical magnetic ground state of the adatom chain, we extract the corresponding phase diagram which exhibits an interplay of ferromagnetic (FM), antiferromagnetic (AFM) and spiral orders. We determine the parameter regime for which the FM or AFM phases dominate over the spiral and additionally become stable against thermal and quantum fluctuations. For the topological analysis we focus on the FM and AFM cases and employ a low-energy effective model relying on Shiba bound states. We find that for both magnetic patterns the hybrid system behaves as a topological superconductor which can harbor one or even two MFs per edge, due to chiral symmetry. As we show, the two magnetic orderings lead to qualitatively and quantitatively distinct topological features that are reflected in the spatial profile of the MF wavefunctions. Finally, we propose directions on how to experimentally access the diverse MF phases by varying the adatom spacing, the SOC strength, or the magnetic moment of the adatoms in consideration.

[3] *Ishkhanyan H.A. and Krainov V.P.*
One-dimensional Hubbard-Luttinger model for carbon nanotubes.
arXiv:1410.6760 [cond-mat.mes-hall] (2014).
A Hubbard-Luttinger model is developed for qualitative description of one-dimensional motion of interacting Pi-conductivity-electrons in carbon single-wall nanotubes at low temperatures. The low-lying excitations in one-dimensional electron gas are described in terms of interacting bosons. The Bogolyubov transformation allows one to describe the system as an ensemble of non-interacting quasi-bosons. Operators of Fermi-excitations and Green functions of fermions are introduced. The electric current is derived as a function of potential difference on the contact between a nanotube and a normal metal. Deviations from Ohm law produced by electron-electron short-range repulsion as well as by the transverse quantization in single-wall nanotubes are discussed. The results are compared with experimental data.

[4] *Fu J.Y. and Egues J.C.*
Spin-orbit interaction in GaAs wells: from one to two subbands.
arXiv:1410.7358 [cond-mat.mes-hall] (2014).
We investigate the Rashba and Dresselhaus spin-orbit (SO) couplings in GaAs quantum wells in the range of well widths w allowing for a transition of the electron occupancy from one to two subbands. By performing a detailed Poisson-Schrödinger self-consistent calculation, we determine all the intra- and inter-subband Rashba $(\alpha_1, \alpha_2, \eta)$ and Dresselhaus $(\beta_1, \beta_2, \Gamma)$ coupling strengths. For relatively narrow wells with only one subband occupied, our results are consistent with the data of Koralek *et al.* [Nature **48**, 610 (2009)], i.e., the Rashba coupling α_1 is essentially independent of w in contrast to the decreasing linear Dresselhaus coefficient β_1. When we widen the well so that the second subband can also be populated, we observe that α_2 decreases and α_1 increases, both almost linearly with w. Interestingly, we find that in the parameter range studied (i.e., very asymmetric wells) α_2 can attain zero and change its sign, while α_1 is always positive. In this double-occupancy regime of w's, β_1 is mostly constant and β_2 decreases with w (similarly to β_1 for the single-occupancy regime). On the other hand, the intersubband Rashba coupling strength η decreases with w while the intersubband Dresselhaus Γ remains almost constant. We also determine the persistent-spin-helix symmetry points, at which the Rashba and the renormalized (due to cubic corrections) linear Dresselhaus couplings in each subband are equal, as a function of the well width and doping asymmetry. Our results should stimulate experiments probing SO couplings in multi-subband wells.

[5] *Sothmann B.*
Electronic waiting-time distribution of a quantum-dot spin valve.
Phys. Rev. B **90**, 155315 (2014).
We discuss the electronic waiting-time distribution of a quantum-dot spin valve, i.e. a single-level quantum dot coupled to two ferromagnetic electrodes with magnetizations that can point in arbitrary directions. We demonstrate that the rich transport physics of this setup such as dynamical channel blockade and spin precession in an interaction-driven exchange field shows up in the waiting-time distribution and analyze the conditions necessary to observe the various effects.

[6] *Zhou H., Thingna J., Wang J.S., and Li B.*
Thermoelectric transport through a quantum nanoelectromechanical system and its backaction.
arXiv:1410.6563 [cond-mat.mes-hall] (2014).
We present a comprehensive study of thermoelectric transport properties of a quantum nanoelectromechanical system (NEMS) described by a single-electron-transistor (SET) coupled to a quantum nanomechanical resonator (NR). The effects of a quantum NR on the electronic current are investigated with special emphasis on how the SET-NR coupling strength plays a role in such a NEMS. We find that the SET-NR coupling is not only able to suppress or enhance the thermoelectric current but can also switch its direction. The effect of the NR on the thermoelectric coefficients of the SET are studied and we find that even a small SET-NR coupling could dramatically suppress the figure of merits ZT. Lastly, we investigate the backaction of electronic current on the NR and possible routes of heating or cooling the NR are discussed. We find that by appropriately tuning the gate voltage the backaction can be eliminated, which could find possible applications to enhance the sensitivity of detection devices.

[7] *Ohm C. and Hassler F.*
Microwave readout of Majorana qubits.
arXiv:1410.5445 [cond-mat.mes-hall] (2014).
Majorana qubits offer a promising way to store and manipulate quantum information by encoding it into the state of Majorana zero modes. As the information is stored in a topological property of the system, local noise cannot lead to decoherence. Manipulation of the information is achieved by braiding the zero modes. The measurement however is challenging as the information is well hidden and thus inherently hard to access. Here, we discuss a setup for measuring the state of a Majorana qubit by employing standard tools of microwave engineering. The basic physical effect which we employ is the fact that a voltage-biased Josephson junction hosting Majorana fermions allows photons to be emitted and absorbed at half the Josephson frequency. We show that in the dispersive regime our setup allows to perform a quantum non-demolition measurement and to reach the quantum limit. An appealing feature of our setup is that the interaction of the Majorana qubit with the measurement device can be turned on and off at will by changing the dc bias of the junction.

[8] *Maier F., Meng T., and Loss D.*
Strongly interacting holes in Ge/Si nanowires.
Phys. Rev. B **90**, 155437 (Oct 2014).
We consider holes confined to Ge/Si core/shell nanowires subject to strong Rashba spin-orbit interaction and screened Coulomb interaction. Such wires can, for instance, serve as host systems for Majorana bound states. Starting from a microscopic model, we find that the Coulomb interaction strongly influences the properties of experimentally realistic wires. To show this, a Luttinger liquid description is derived based on a renormalization group analysis. This description in turn allows us to calculate the scaling exponents of various correlation functions as a function of the microscopic system parameters. It furthermore permits us to investigate the effect of Coulomb interaction on a small magnetic field, which opens a strongly anisotropic partial gap.