C1.00178 Electronic properties of bilayer graphene ribbons with Bernal stacking in a strong magnetic field†. YUAN-CHENG HUANG, Center for General Education, Kao Yuan University, CHENG-PENG CHANG, Center for General Education, Tainan University of, MING-FA LIN, Department of Physics, National Cheng Kung University — We employ the Peierl coupling tight-binding method to study magneto-electronic properties of bilayer graphene ribbons with Bernal stacking. Because of the interlayer interactions, the magnetic energy bands of a bilayer graphene ribbon are different from those of a monolayer ribbon in the Landau-level energies, the energy spacing, the state degeneracy, and the number of the Landau levels. The low-frequency magneto-absorption spectra reveal the characteristics of the electronic properties. The spectra exhibit denser Landau peaks than those of a monolayer ribbon do. Meanwhile, the transition channels of the Landau peaks are also identified. The selection rule is $\Delta n = \pm 1$.

C1.00179 NEGF Transport Simulation on Pd$_n$-cluster Functionalized CNTs. CHAO CAO, Quantum Theory Project and Department of Physics, University of Florida, ALEXANDER KEMPER, Quantum Theory Project and Department of Physics, YAN HE, Quantum Theory Project, University of Florida, HAI-PING CHENG, Quantum Theory Project and Department of Physics, University of Florida — We have investigated the conductance response of the Pd-cluster functionalized CNTs to hydrogen environment using DFT+NEGF method. Experiments find that the semiconducting CNTs behave very differently from metallic CNTs, and suggest that the semi-conducting ones are good candidates for hydrogen sensors. By comparing the simulation results for the (5,5) metallic and the (8,0) semiconducting CNTs, we are able to reveal the underlying physics behind this phenomena. This work is supported by the DOE grant number DE-FG02-02ER45995. The authors want to thank NERSC, CNMS/ORNL and the University of Florida High Performance Computing Center for providing computational resources and support that have contributed to the research results reported within this paper.

C1.00180 QUANTUM FLUIDS AND SOLIDS

C1.00181 Spin-charge separation in a strongly correlated spin-polarized chain. SHIMUL AKHANJEE, YAROSLAV TSEKOVNYAK, UCLA — We combine the first-quantized path-integral formalism and bosonization to develop a phenomenological theory for spin-charge coupled dynamics in one-dimensional ferromagnetic systems with strong interparticle repulsion, at low temperatures. We assume an effective spin-charge separation and retain the standard Luttinger-liquid plasmon branch, which is explicitly coupled to a Heisenberg ferromagnetic spin-wave texture with a quadratic dispersion. The dynamic spin structure severely suppresses the plasmon peak in the single-particle propagator, in both fermionic and bosonic systems. Our analysis provides an effective theory for the new universality class of one-dimensional ferromagnetic systems, capturing both the trapped spin and propagating spin-wave regimes of the long-time behavior.

C1.00182 Implementation of High Temperature Superconducting Leads in research cryostats. YUKO SHIROYANAGI, Ohio State University, GOKUL GOPALAKRISHNAN, DONGKyun Ko, SANHUN An, Ohio State University, THOMAS GRAMILA, Ohio State University, THOMAS GRAMILA, Ohio State University — With High Temperature Superconducting (HTSC) Magnet Leads are available for use in high current applications, which combined with active cryocoolers, they are typically not used in liquid Helium based research cryostats because of the difficulty of implementation. We have successfully implemented a HTSC lead system for Helium based cryostats, in which the leads provide thermal coupling to the outgoing Helium gas. The increase in the He boiloff rate at full current (110amps) has been measured to be 0.4L/day as compared with the zero current boiloff. An essential element of the design is maintaining a temperature at the warm end of the HTSC leads which is well below the critical temperature. Measurements indicate that this temperature is roughly 55K at 110A. The basic design approach and actual implementation of this novel HTSC lead system, as well as its measurement, are discussed.

C1.00183 QUANTUM INFORMATION, CONCEPTS, AND COMPUTATION I

C1.00184 PT-Symmetric Quantum Evolution and Logic. TOREY SEMI, MARK COFFEY, Colorado School of Mines — There has been much recent interest in PT-symmetric quantum mechanics (QM) as an alternative formulation of quantum theory. We investigate the potential of this formulation for quantum computation and simulation. PT-symmetric QM replaces the usual postulate that a system’s Hamiltonian must be Hermitian. It argues instead that the Hamiltonian can be symmetric with respect to combined parity and time-reversal and, for certain parametric regions, still produce real eigenvalues and maintain unitary time evolution. Besides being of fundamental interest, this approach allows for a fresh perspective on many QM applications. It is known that for one-qubit PT-symmetric systems the evolution time from an initial state to a final state can be made arbitrarily small. We report on applying PT-symmetric Hamiltonians for two-qubit systems to quantum logic.

C1.00185 Two-particle Interferometry with Filtering Operations. S.-S. B. LEE, H.-S. SIM, Korea Advanced Institute of Science and Technology — We generalize the conventional two-particle interferometer by including filtering operations. We find that after appropriate local filtering operations, the concurrence, a two-particle entanglement measure, can be directly obtained from the visibility of the two-particle interference, even for mixed states. This indicates that entanglement is associated with experimentally feasible properties.

C1.00186 Entanglement of magnetic impurities via electron scattering with asymmetric coupling constants. GUILLERMO CORDOURIER-MARURI, ROMEO DE COSS, Cinvestav Unidad Mérida, YASSER OMAR, Technical University of Lisbon — We study the entanglement generated by electron scattering between two fixed magnetic impurities, located in a 1-D quantum wire. The impurities were considered distant and only interact through the spin of a scattered electron. We analyzed the asymmetric case produced by the effect of considering different exchange coupling electron-impurity factor for each impurity. We used the quantum waveguide theory approach to find the probability of electron transmission for each espinorial configuration of the system, taking into account the possible changes in the directions of the impurities and electron spins. We find resonance behavior in the evolution of the probability of electron transmission with respect to the impurities separation. We show results for the cases where the average and the difference of the exchange coupling electron-impurity factor are constant. From the probabilities of electron transmission the entanglement can be maximized changing the initial conditions of the system, like the impurities separation distance and the ratio of the electron-impurity exchange coupling factor.