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Ionic Plasma Screening and Long-Range Electron Correlations in Quasi-One-Dimensional Conductors[1] YURI GARTSTEIN, ANVAR ZAKHIDOV, University of Texas at Dallas — In quasi-one-dimensional systems with the intercalation-type doping, the dynamical response of dopant ions can substantially affect the interplay of density-wave and superconducting instabilities. We study a generic model of the system of Coulombically coupled Luttinger-liquid chains modified by the Coulomb interaction with displacements of dopant ions. Our interest is in the macroscopic, long wave-length, effects of the ionic response. This three-dimensional electron-ion model system is exactly solvable in the forward-scattering channel allowing us to find the resulting system excitations and electron correlations. For a jellium-like ion response, the effect of the bare electron-electron repulsion on the long- range correlations is essentially canceled by the ions with the effective electron-electron interactions now exhibiting regions of shorter-range repulsion and longer-range attraction. This picture is clarified and reproduced within the macroscopic dielectric function framework. If the system also features a non-polarizational interaction with another optical phonon mode, superconducting correlations are developed already due to the forward-scattering only.

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