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Perfect Metal Phases of One-Dimensional and Anisotropic Higher-Dimensional Systems EUGENIU PLAMADEALA, Univ of California - Santa Barbara, MICHAEL MULLIGAN, Stanford University, CHETAN NAYAK, Univ of California - Santa Barbara, Microsoft Station Q — We show that a 1D quantum wire with 23 channels of interacting fermions has a perfect metal phase in which all weak perturbations that could destabilize this phase are irrelevant. Consequently, weak disorder does not localize it, a weak periodic potential does not open a gap, and contact with a superconductor also fails to open a gap. Similar phases occur for $N \geq 24$ channels of fermions, except for $N = 25$, and for $8k$ channels of interacting bosons, with $k \geq 3$. Arrays of perfect metallic wires form higher-dimensional fermionic or bosonic perfect metals, albeit highly-anisotropic ones.

Eugeniu Plamadeala
Univ of California - Santa Barbara

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