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Experimental evidence suggests that FeSe is close to a magnetic instability, and recent scanning tunneling microscopy (STM) measurements on FeSe multilayer films have revealed stripe order locally pinned near defect sites. Motivated by these findings, we perform a theoretical study of locally induced magnetic order near nonmagnetic impurities in a model relevant for FeSe. We find that relatively weak repulsive impurities indeed are capable of generating short-range magnetism, and we explain the driving mechanism for the local order by resonant eg-orbital impurity states. In addition, we investigate the importance of orbital-selective self-energy effects relevant for Hund's metals, and show how the structure of the induced magnetization cloud gets modified by orbital selectivity. Finally, we make a concrete connection to STM measurements of iron-based superconductors by symmetry arguments of the induced magnetic order, and the basic properties of the Fe Wannier functions relevant for tunneling spectroscopy.

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