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Nodeless d-wave Superconductivity and spin resonance in iron-selenide superconductors A.V. BALATSKY, TANMOY DAS, LANL — Iron-selenide based layered compounds have been realized to be high-transition temperature superconductor in December, 2010. The superconductivity is tuned by varying number of iron vacancies in the crystal. This unique tunability of the high-temperature superconducting properties has reinforces the debate of universal properties in Fe based superconductors. Experiments and band structure calculations have shown that the electronic and magnetic structures of these compounds are significantly different from other iron-based superconductors. This fact leads us to propose that the superconducting state is nodeless d-wave pairing which is still driven by magnetic interactions. Nodeless gap leads to the fully gapped quasiparticle spectrum. Sign-changing gap lends itself naturally to the sharp feature in neutron scattering spectrum, the so called spin resonance. We predict the upward "horseshoe" dispersion of the spin resonance, in a sharp contrast with the "hourglass" dispersion in high_Tc oxides where similar spin resonance is ubiquitously seen. In conclusion, despite iron-selenide systems exhibit very different observables, we show that the underlying pairing mechanism is driven by similar spin-fluctuation instabilities as in other high-temperature superconductors.

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