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Resonance peak of neutron scattering in iron-based superconductors SEIICHIRO ONARI, Department of Applied Physics, Naogya University, YUSUKE OHNO, MASAHISA TSUCHIIZU, HIROSHI KONTANI, Department of Physics, Naogya University — Recently, nematic electronic states had been discovered in various strongly correlated metals such as iron-based superconductors, $Sr_3Ru_2O_7$ and heavy fermions. These phenomena originate from the electron-electron correlation, since the lattice distortions are very small. Interestingly, many of these materials exhibit unconventional superconductivity, suggesting that the fluctuations of the nematic order parameter would cause the superconductivity. The origin of the nematic states had been unsolved since they cannot be explained by the mean-field approximation. Here, we study this issue beyond the mean-field approximation. We calculate the vertex correction (VC) for the irreducible susceptibility in various multiorbital Hubbard models, and derive the spin and orbital fluctuations self-consistently [1,2]. Near the magnetic quantum critical point, it is found that strong ferro- and antiferro-orbital fluctuations are induced by the VC in both iron-based superconductors and $Sr_3Ru_2O_7$. The divergence of the ferro-orbital fluctuations presents the orbital nematic state in these materials. [1] S. Onari and H. Kontani, Phys. Rev. Lett. 109, 137001 (2012). [2] Y. Ohno, M. Tsuchiizu, S. Onari, and H. Kontani, arXiv:1209.3629.

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