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Evolution of spin wave excitations in $Sr_2FeSi_2O_7$ under an external magnetic field KAZUKI IIDA, JOOSEOP LEE, NAOYUKI KATAYAMA, SUNGDAE JI, ISRAEL KLICH, SEUNGHUN LEE, University of Virginia, DUC LE, Helmholtz Zentrum, SUNG CHANG, NIST Center for Neutron Research, TAEHWAN JANG, YOONHEE JEONG, Pohang University of Science and Technology, SANGWOOK CHEONG, Rutgers University, UNIVERSITY OF VIRGINIA TEAM, HELMHOLTZ ZENTRUM COLLABORATION, NIST CENTER FOR NEUTRON RESEARCH COLLABORATION, POHANG UNIVERSITY OF SCIENCE AND TECHNOLOGY COLLABORATION, RUTGERS UNIVERSITY COLLABORATION — Evolution of static and dynamic spin correlations in a new multiferroics material $Sr_2FeSi_2O_7$ under an external magnetic field was investigated by elastic and inelastic neutron scattering techniques. An external magnetic field up to $B = 14$ Tesla induces four different magnetic and ferroelectric phases in $Sr_2FeSi_2O_7$. The static magneto-electric coupling can be understood as the spin-dependent metal-ligand hybridization proposed for a related material $Ba_2CoGe_2O_7$. By analyzing the inelastic neutron scattering data obtained from a single crystal of $Sr_2FeSi_2O_7$ without field, we have determined the effective spin Hamiltonian in this material that includes isotropic nearest neighbor exchange interaction in the two-dimensional Fe square plane and easy plane single ionic anisotropies. The spin wave excitations show interesting changes as upon ramping up the system enters the field-induced phases for $B > 6.5$ Tesla, which will also be discussed.

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