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Diffuse neutron scattering of $Dy_2Ti_2O_7$ revisited MIKAEL TWENGSTRÖM, KTH, Sweden, MARTIN RUMINY, PSI, Switzerland, JUAN CARLOS ANDRESEN, KTH, Sweden, MAREK BARTKOWIAK, PSI, Switzerland, SEAN GIBLIN, Cardiff University, UK, STEVEN T. BRAMWELL, UCL, UK, MICHEL J. P. GINGRAS, University of Waterloo & CIFAR, Canada, TOM FENNELL, PSI, Switzerland, PATRIK HENELIUS, KTH, Sweden — Neutron scattering is a sensitive probe of correlations in condensed matter physics, and measurements of spin correlations by diffuse neutron scattering is one of the foremost methods of constraining the Hamiltonian of spin ice materials such as $Dy_2Ti_2O_7$. Recent investigations of spin ices have highlighted the possibility of very slow equilibration at low temperature and/or structural defects in samples, effects which were not taken into account in the original parametrizations of the Hamiltonian. Hence, we have in this study performed a new set of diffuse magnetic neutron scattering experiments on an oxygen-annealed single crystal of the spin ice $^{162}Dy_2Ti_2O_7$. Compensation coils and an in-situ AC-susceptometer were used to control the zero magnetic field at the sample position as well as determining the thermal equilibrium of the magnetic spins respectively. In addition, we performed large–scale Monte Carlo simulations as to make a statistical fit of the dipolar spin ice model to the measured structure factor in the temperature range [0.65, 2] K, where the spin ice physics starts to develop. This will enable a most carefully controlled determination of the Hamiltonian of $Dy_2Ti_2O_7$.

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