Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Relaxation and self-diffusion of supercooled liquids derived from picosecond timescale dynamics MARCUS CICERONE, MIAOCHAN ZHI, BRANDON BLAKELY, MADHUSUDAN TYAGI, NIST — We use neutron scattering and nonlinear optical measurements to investigate ps-ns timescale dynamics in liquid, supercooled liquid, and glassy states. The experimental observables show evidence of dynamic heterogeneity on this timescale that supports a facilitated dynamics picture. We obtain a direct measure of the concentration of molecular excitations, or mobile regions, as a function of time and temperature. Using a model [1] broadly consistent with that proposed by Chandler and co-workers [2], we are able to quantitatively predict self-diffusion rates and Stokes Einstein violation deep in the supercooled regime directly from ps timescale and Angstrom - nanometer length scale measurements for all systems we have investigated. The model we employ also provides a clear physical mechanism for the Johari-Goldstein relaxation process. [1] M.T. Cicerone, Q. Zhong M. Tyagi, PRL 113 117801 (2014). [2] J. P. Garrahan D. Chandler, Coarse-grained microscopic model of glass formers, PNAS 100, 9710 (2003).

Marcus Cicerone
NIST

Date submitted: 05 Oct 2015 Electronic form version 1.4