Abstract:

The sub-picosecond quenching of magnetization has fascinated researchers since its inception almost 20 years ago. However, relatively little is known how the material returns to equilibrium reestablishes the long-range magnetic order. It is generally believed that this process resembles the magnetic phase transition near equilibrium and is characterized by spin fluctuations at many length scales. Here we use time-resolved x-ray magnetic diffraction from LCLS to show that spin fluctuations condense into droplet-like features of ~10nm size that nucleate and grow as time proceeds on the picosecond timescale. These results provide new insight into the non-deterministic nature of optically induced magnetization dynamics in reduced dimensions.