Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Cs vacancy ordering and properties of phase separated $\mathbf{Cs_xFe_{2-y}Se_2}$[1] OMAR CHMAISSEM, K.M. TADDEI, Physics - Northern Illinois University and Materials Science Division - Argonne National Lab, IL, S. ROSENKRANZ, R. OSBORN, H. CLAUS, M. STURZA, D.Y. CHUNG, Materials Science Division - ANL, M.G. KANATZIDIS, Chemistry, Northwestern University, IL, H.B. CAO, Quantum Condensed Matter Division, ORNL, TN — Iron-based selenides are among the most complex and least understood superconductors. At high temperature, a '122'-type structure with random iron vacancies undergoes a complex iron vacancy ordering scheme below ~500K causing the material to phase separate into $A_2Fe_4Se_5$, known as the 245 phase, and a minority A-site deficient and fully iron stoichiometric $A_xFe_2Se_2$ phase (122). At slightly lower temperatures, the material undergoes another transition with the Fe spins of the main '245' phase ordering into an exotic checkerboard-type magnetic structure with a large magnetic moment. The minority 122 phase is reported to either remain nonmagnetic or to become magnetic below ~200K. At temperatures below ~30K, the magnetic material becomes superconducting and the two states appear to coexist. I will present and discuss our recent synthesis and characterization of high quality $Cs_xFe_{2-y}Se_2$ single crystals and bulk samples with various Tc's that form a relatively large superconducting dome. I will discuss our findings of a previously unseen three dimensional cesium vacancy ordering in the low temperature 122 phase in addition to hosting superconductivity.

[1]At ANL, work supported by the US DOE Offiffice of Science, MSED.

Omar Chmaissem
Physics-NIU and MSD-ANL, Illinois

Date submitted: 06 Nov 2015 Electronic form version 1.4