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Temperature and composition dependence of the magnetically ordered, tetragonal C_4 phase in $Ba_{1-x}Na_xFe_2As_2$ via neutron scattering[1] JARED ALLRED, DANIEL BUGARIS, OMAR CHMAISSEM, STEPHAN ROSENKRANZ, SEVDA AVCI, Argonne National Laboratory, PASCAL MANUEL, DMITRY KHALYAVIN, AZIZ DAOUD-ALADINE, Rutherford Appleton Laboratory, DUCK YOUNG CHUNG, HELMUT CLAUS, MERCOURI KANATZIDIS, RAY OSBORN, Argonne National Laboratory — Until recently, the relationship between orthorhombic/magnetic order and superconductivity was believed well established in the 122 iron arsenide family. This changed when recent observations in the hole doped 122's: $Ba_{1-x}K_xFe_2As_2$ ($0.16 \leq x \leq 0.21$) under pressure and $Ba_{0.76}Na_{0.24}Fe_2As_2$ at ambient pressure exhibit evidence of a new electronic phase being stabilized near the end of the magnetic dome, beginning at higher compositions than the onset of superconductivity . Using combined high-intensity and high-resolution neutron diffraction we have expanded the Na region to multiple compositions $0.24 \leq x \leq 0.28$ all stabilized at ambient pressure. The magnetic and structural properties both differ from the paramagnetic tetragonal phase and the antiferromagnetic orthorhombic phase. The complex relationship between structure, magnetism, and superconductivity in this regime give important insights into the underlying physics.

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