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Temperature and density controlled measurements of a non-universal Efimov state in ^{39}K MICHAEL VAN DE GRAAFF, XIN XIE, ROMAN CHAPURIN, NOAH SCHLOSSBERGER, JARED POPOWSKI, JOSE D'INCAO, JILA, National Institutes of Standards and Technology, Department of Physics University of Colorado, Boulder, PAUL JULIENNE, JQI, National Institutes of Standards and Technology, University of Maryland, College Park, JUN YE, ERIC CORNELL, JILA, National Institutes of Standards and Technology, Department of Physics University of Colorado, Boulder — We perform measurements of the absolute location of the Efimov ground state a_- near a Feshbach resonance in ^{39}K. The peak location is measured by loss spectroscopy in low density clouds for temperatures from 20-500nk. The effects of temperature saturation on the resonance peak location a_- and width η are characterized and demonstrate that the peak emerges more clearly at lower temperatures, consistent with finite temperature theory. This is in contrast to a recent similar study[1]which showed the resonance to be shifted and surpressed at lower temperatures. Only at higher densities nearer to degeneracy do we observe the anamolous effects described by[1]. An accurate scattering length map derived from the precise measurement of the accompanying Feshbach resonance permits the determination of $a_-/r_{vdW} = 14.19(16)$, significantly deviating from the value 9.73 predicted by van der Waals universality. We further characterize the effects of the trimer state for positive scattering lengths by measuring both the atom-dimer decay rate and the three-body recombination rate for free atoms.

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