Effect of $^3$He impurity on the supersolid transition of $^4$He E. KIM, Korea Advanced Institute of Science and Technology, J. S. XIA, University of Florida, J. T. WEST, X. LIN, M. H. W. CHAN, The Pennsylvania State University — The supersolid phase of $^4$He was reported by a series of torsional oscillator experiments [1]. One of the most striking features of the supersolid transition is the intriguing $^3$He impurity effect. The addition of an extremely small amount of $^3$He impurity broadens the transition and enhances the transition temperature $T_c$. This effect is very different from that in helium film and that in ‘bulk’ superfluid helium. We have studied the influence of $^3$He impurity on the supersolid transition systematically by progressively diluting isotopically-pure $^4$He ($^3$He impurity less than 2ppb) with $^3$He. The transition temperature is monotonically enhanced with increasing $^3$He concentration and the supersolid fraction shows a broad maximum around 0.2 ppm. [1] E. Kim and M. H. W. Chan, Science 305, 1941 (2004); Nature 425, 227 (2004); J. Low Temp. Phys. 138, 859 (2005); Phys. Rev. Lett. 97, 115302 (2006).