Universal Scaling of the order parameter distribution in strongly disordered superconductors A. KAMLAPURE, S.C. GANGULI, TIFR, India, G. LEMARIÉ, D. BUCHELI, L. BENFATTO, J. LORENZANA, C. CASTELLANI, Sapienza University, Rome, Italy, G. SEIBOLD, Institut Für Physik, BTU Cottbus, Germany, P. RAYCHAUDHURI, TIFR, India — We present scanning tunneling spectroscopy measurements on strongly disordered s-wave superconductor, NbN, close to Anderson metal insulator transition. At low temperatures all our samples show superconducting spectra with dip close to zero bias and two coherence peaks after correcting with large V shaped background. Although spectra do not show significant variation in the superconducting energy gap but we see large distribution in the coherence peak heights characteristic to the strength of disorder. We take average value of the coherence peak heights on positive and negative bias as a measure of local order parameter S [1]. We observe that maxima of order parameter distribution (OPD) steadily decrease with increasing disorder. On rescaling with the new scaling variable R_S as logarithm of order parameter normalized to its variance, OPD for all the samples collapse into single curve showing universality of the OPD. In addition OPD is in good agreement with the universal Tracy-Widom distribution in finite dimension. We also identify similar scaling relation of the OPD within two prototype fermionic and bosonic models for disordered superconductors showing an excellent agreement between experiment and theory in the current field.

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A. Kamlapure
TIFR, India

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