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Pairing properties from random distribution of single-particle energy levels[1] MD ABDULLAH AL MAMUN, MADAPPA PRAKASH, Department of Physics and Astronomy, Ohio University, Athens, Ohio 45701, USA — Exploiting the similarity between the bunched single-particle (sp) energy levels of nuclei and of random distributions around the Fermi surface, pairing properties of the latter are calculated to establish statistically-based bounds on the basic characteristics of the pairing phenomenon. While the ratio of the critical temperature T_c to the zero-temperature pairing gap is close to its BCS Fermi gas value, the ratio of the superfluid to the normal phase specific heats at T_c differs significantly from its Fermi gas counterpart. The scatter around the mean value for the discontinuity in the specific heat at T_c is largest when a couple of sp levels lie closely on either side of the Fermi surface, but other levels are far away from it. To the extent that the sp levels of the random spacing model resemble those of nuclei which exhibit considerable dependence on choices of the energy density functionals and pairing schemes used, our results indicate the variation to be expected in the basic characteristics of the pairing phenomenon in nuclei.These results can help to promote further nuclear level density measurements to pin down the critical temperature for the pairing phase transition of nucleons in nuclei, and to perform sensitivity tests in astrophysical setting.

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