SINGLE TUNNEL JUNCTION THERMOMETRY

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The Single Junction Thermometer (SJT) is presented and the concept of primary thermometry based on a four probe measurement of a single tunnel junction embedded within long arrays of junctions is described. We show that the errors of an SJT can be controlled, and random sample specific errors can be avoided. Since this method relates temperature directly to Boltzmann constant, which will form the basis of the definition of temperature and realization of official temperature scales in the future, the SJT may prove useful in realizing the new temperature scale.

Figure 1: (a) Schematic of SJT, a single tunnel junction embedded in four arrays of tunnel junctions. (b) Typical conductance curve of a SJT or a CBT. (c) Halfwidth and normalised conductance as a function of environment resistance R for chains with N= 2,3,4,8,16 (counting from top to bottom in the topmost plot) junctions. (d) Halfwidth and normalized conductance for a single tunnel junction as a function of R.