TEDDINGTON, UK – A new approach adopted by the **National Physical Laboratory** has led to the design and build of the NPL – IPTM (Interconnect Properties Test Machine), says Dr. Chris Hunt and his team.

It applies defined deformation under precision control to measure materials properties. The apparatus permits materials data to be obtained from solder samples that have volumes and geometries similar to those of real solder joints, and from joints loaded in shear, mirroring the practical situation in the field.

The instrument reportedly can accommodate various solder alloys and surface coatings, and permits direct microscopic examination during the test at temperatures between -55 to 125°C.

A four-point measurement system for resistance monitoring also has been embedded and found to correlate well with structural degradation recorded during fatigue testing of solders, says NPL. The resistance measurement is directly related to the development of a crack; resistance data can be used to predict crack growth rates. The results indicate lifetime can be measured using the load decrease and/or the resistance increase. Measuring these parameters directly, for different solders and conditions, and relating them to real assembly performance, will aid modeling of lifetime prediction for Pb-free solders, says the group.

Although the mechanical behavior of Pb-free joints is known to be different from that of conventional SnPb joints, there is a lack of data suitable for modeling purposes; the need to generate such data to evaluate likely Pb-free solder performance has assumed some urgency, according to NPL.