

Reference Spring Cantilever Calibration Technique

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In this calibration method, the spring constant of the unknown spring is calibrated by pressing it against a very stiff surface and then against a reference spring of known and lesser compliance. The spring constant of the cantilever under test is then calculated using

$$K_{unknown} = K_{std} \left(\frac{InvOLS_{std}}{InvOLS_{unknown}} - 1 \right).$$

In the above equation, $InvOLS_{unknown}$ is the inverse Optical lever Sensitivity (with units of nm/Volt) for the cantilever under test measured on a very stiff surface and $InvOLS_{std}$ is the same quantity measured on a compliant surface with spring constant k_{std} .

Typically, we expect uncertainties in this method of 20% or greater. Sources of error include positioning the tip of the cantilever under test at the proper position on the reference lever or spring and surface contamination of either the test, reference spring or very stiff surface. We are currently involved in a project to compare this calibration method with others and will publish the results once they have been analyzed.

References

A. Torii et al., Meas. Sci. and Tech. 7, 179 (1996).