

## Appearance Measurement Solutions

Delivering calibration and technical support for appearance measurement and development of instrumentation for a diverse range of industries including packaging, construction, manufacturing, security, design and media, coatings and paints, personal healthcare and materials testing.

NPL offers a wide range of measurement solutions and calibration artefacts to support your innovation and quality control in these rapidly advancing markets. These include measurements of properties such as colour, gloss, haze and refractive index, together with consultancy services for visually-complex materials, such as those exhibiting texture, pattern, pearlescence or changes of colour with angle, ('gonio-apparent materials').

NPL can provide customer specific research and technical consultancy to develop measurement solutions or characterise products during development. We offer extensive experience in working with industry and academic partners on collaborative research projects and the development of international standards.

**Accurate measurement supported by reliable measurement standards is essential for maintaining and growing the commercial success of appearance characterisation systems. Industrial competitiveness is supported through using NPL reference standards to calibrate your instrumentation to demonstrate compliance with product specifications and international standards.**

**NPL's support for the Optical Technology sector includes a comprehensive range of calibration and measurement solutions for all types of surface appearance measurement, and artefacts to calibrate test instrumentation. This world leading position ensures the NPL is best placed to meet customers aspirations in appearance metrology applications.**

## Colour

The colour of a surface can be represented by its spectral reflectance or transmittance or in terms of colorimetric values such as (but not limited to)  $x$ ,  $y$ ,  $u'$ ,  $v'$ ,  $L^*$ ,  $a^*$ ,  $b^*$ . These can be calculated for CIE 2° and 10° Standard Observers and CIE Standard Illuminants A, C, D50 and D65. A calibrated spectrophotometer makes traceable colour measurements (380 nm to 780 nm), in various geometries. Services for transmissive materials are also available.

## Gloss

NPL offers a competitive gloss calibration and artefact service coupled with expert consultancy. All standards are measured according to ISO 2813 (1994) and ASTM D523 (1989) for gloss at 20°, 60° and 85°. Measurements are directly traceable to the National Reference Reflectometer, which is validated by intercomparison of gloss measurements between NPL, BAM (Germany) and NRC (Canada).

## Gonio-apparent materials

Gonio-apparent materials (e.g. metallic paint finishes, lustre pigments and interferometric coatings) exhibit significant visual appearance changes depending on the angle at which they are illuminated or viewed. NPL offers a range of consultancy services, including full hemispherical multi-angular (0.5° steps) and multi-spectral (380 nm to 780 nm) measurements of flat surfaces.

## Haze

Measurements of haze for any flat or pseudo-flat transmitting object. Measurements are performed on the NPL Reference Hazemeter used in accordance with BS 2782. The measurements are made with sources approximating CIE Illuminant A and C and a detector approximating the  $V(\lambda)$  photopic responsivity function.

## Refractive index of bulk materials

Refractive index is a bespoke measurement service, tailored to individual customer requirements through technical discussion. We can offer refractive index measurements of bulk solid, gel and liquid materials at a range of discrete wavelengths from 404.6 nm to 1014 nm and over a continuous range of wavelengths from 1270 nm to 1640 nm.

## Texture and pattern

NPL offers a suite of texture and pattern analysis algorithms facilitating a comprehensive description of the spatial variation over a surface. Statistical learning and pattern recognition techniques allow classification of measured materials into categories according to certain tolerance criteria, which are tailored to specific customer requirements. Multi-angular and multi-spectral measurements, provide full spatial and spectral characterisation of a textured surface.

Contact details	Further information
<p><b>National Physical Laboratory</b>  <b>Hampton Road</b>  <b>Teddington</b>  <b>Middlesex</b>  <b>United Kingdom</b>  <b>TW11 0LW</b></p> <p><b>NPL helpline: 020 8943 6880</b>  <b>NPL helpline fax: 020 8614 0446</b>  <b>E-mail: <a href="mailto:enquiry@npl.co.uk">enquiry@npl.co.uk</a></b>  <b>Website: <a href="http://www.npl.co.uk">www.npl.co.uk</a></b></p>	<p><b>For more information go to our website</b>  <b><a href="http://www.npl.co.uk/optical-radiation-photonics">www.npl.co.uk/optical-radiation-photonics</a></b></p>