

SYNOPSYS®

**Synopsys REFLET 180S Bench
3D (hemispheric) Scatterometer
BRDF/BTDF**

For 2D/3D scattered light measurements

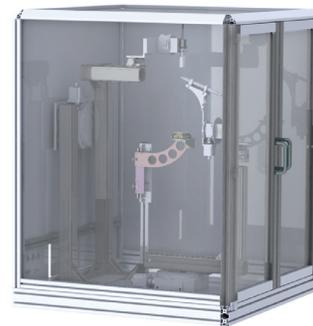


Applications

- Photorealistic rendering: accurate measurement of spectral behaviour
- Optical sensors: medical, industrial, quality control, automotive
- Reflector material characterization for luminaries design
- Reflector material characterization for automotive headlamps design
- Cosmetics characteristics: spectral and specular behaviour
- Roughness controls in production
- Quality control of dust/particules in semiconductor
- LCD Backlighting
- Scattering of transmitting glasses
- Aerospace applications, measurements of black paints, BRDF of mirrors



Synopsys REFLET 180S



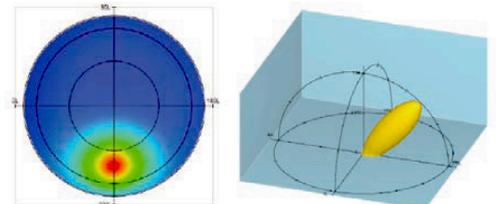
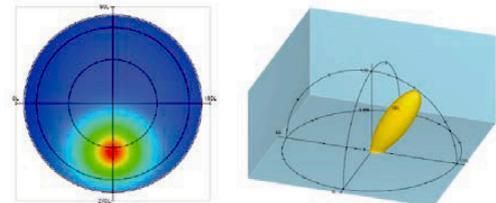
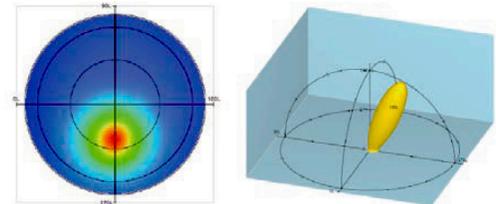
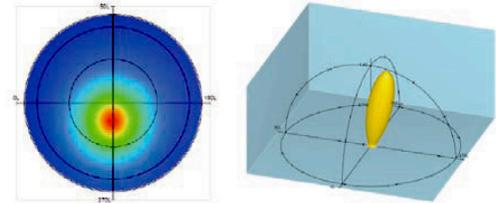
Synopsys REFLET 180S



Complete system delivered in a dark box
(Non contractual photography)

Synopsys REFLET 180S

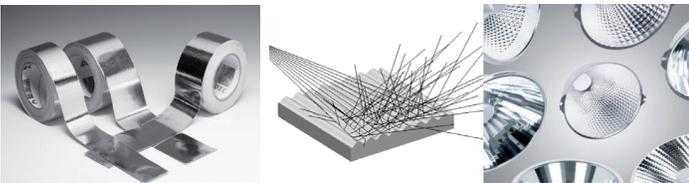
A compact and motorized optical system for scattering characterization of any kind of materials and objects. It allows you to measure, in a fast and easy way, luminous energy distribution or spectral composition contained in the scattering lobes. Consequently, it characterizes surfaces of your examined regions such as roughness, defects as well as types of coatings or paintings... Moreover, the system measures BRDF/BTDF which perfectly represents the way any surface scatters incoming light in 3D space.



3D Scans

Diffuser

The measurements are done in reflection and in transmission. The knowledge of the way light is reflected and transmitted through a diffuser is very important for the use of materials in optical systems.



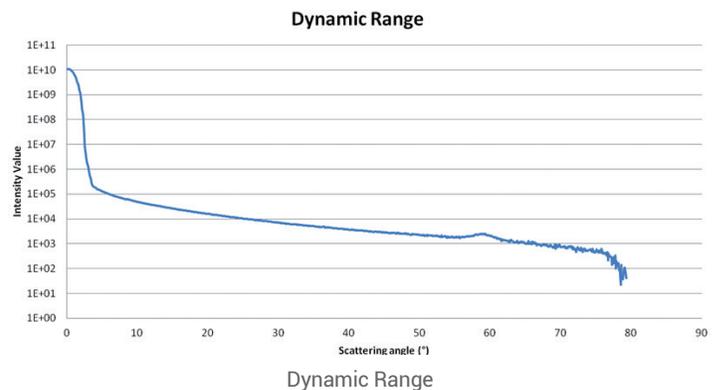
Aluminum

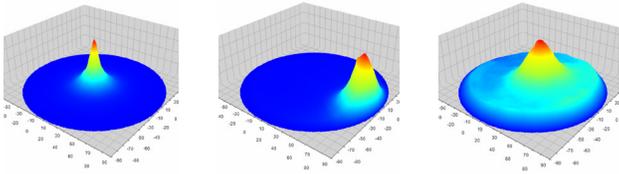
Reflector materials can have quite complex behaviours depending on the plane of incidence. Synopsys REFLET allows accurate measurements in different planes of incidence (examples: anisotropic material, polarization dependence...).



Polished optics

Specular surfaces (mirrors), transparent surfaces (glasses, lenses, crystals) have sometimes a very low scattering such as 10^{-9} sr $^{-1}$. Those surfaces are very difficult to measure without a high dynamic detection system. Synopsys REFLET has one which allows measuring BRDF of 10^{-5} sr $^{-1}$.





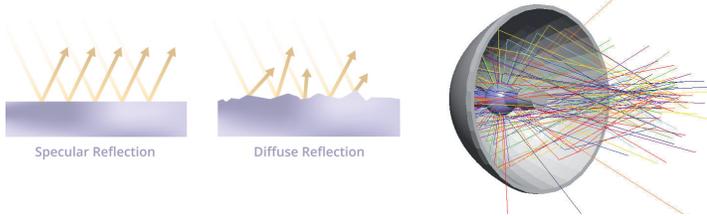
Cosmetics

Cosmetic manufacturers need to compare different chemical mixtures to produce lipsticks or creams. Synopsys REFLET allows the characterization of these types of products on different skins and under different lighting (different spectra).



Black Materials

Mainly used in Aerospace applications, black materials and coatings are also difficult to measure without a powerful instrument. Those materials need to have a very low BRDF because they absorb a big amount of light: less than 1% of reflection. Synopsys REFLET supports such BSDF level thanks to its high dynamic detection.



Illumination Design Software

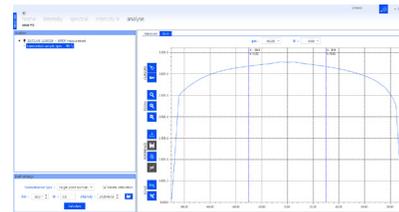
Illumination design software require accurate data to provide accurate simulations. Synopsys REFLET provides 2D/3D BRDF or BTDF files which can be imported in TRACEPRO, ASAP, LightTools, LucidShape, Photopia or SPEOS.



Realistic Rendering Software

In many industries including Automotive, optical designers need to simulate the closest to the reality in order to provide realistic rendering. Today, our Synopsys REFLET Bench allows you to perform the light characterization of headlamps, tail lamps and dashboards. It will also provide you with scattering measurement data to import into your optical design software.

Technical Specifications													
Illumination													
Light Box	<ul style="list-style-type: none"> Halogen 100W light box Option: 6-position filter wheel (including R/G/B filters) 												
Spot size on the sample surface	<ul style="list-style-type: none"> Scattering configuration: Manually adjustable from $\varnothing 1$ mm to $\varnothing 13$ mm 												
Beam aperture angle	<ul style="list-style-type: none"> Scattering configuration: Manually adjustable from $\pm 0.15^\circ$ to $\pm 2.26^\circ$ 												
Goniometer	Standard version: <ul style="list-style-type: none"> 0°-180° motorized (REFLECTION & TRANSMISSION) Angular resolution: selectable ($0.01^\circ/0.1^\circ/1^\circ/10^\circ$) Positioning precision: 0.01° 												
Detection													
Integrated-flux Detector	<ul style="list-style-type: none"> Visible channel: 400 - 1000 nm, dynamic 109 Infra Red channel: 900 - 1700 nm, dynamic 106 (option) 												
Spectrograph (option)	<ul style="list-style-type: none"> Useful range: 420 - 900 nm Spectral resolution: selectable (0.6 nm/1 nm/5 nm/10 nm) 												
Optical system	<ul style="list-style-type: none"> Scattering configuration: 3 manually interchangeable optical blocs (2 to be chosen) <table border="1"> <thead> <tr> <th>Optical bloc</th> <th>1</th> <th>2</th> <th>3</th> </tr> </thead> <tbody> <tr> <td>Angular acceptance</td> <td>$\pm 2^\circ$</td> <td>$\pm 1.1^\circ$</td> <td>$\pm 0.04^\circ$</td> </tr> <tr> <td>Observed area size</td> <td>$\varnothing 14$mm</td> <td>$\varnothing 8$mm</td> <td>$\varnothing 6$mm</td> </tr> </tbody> </table>	Optical bloc	1	2	3	Angular acceptance	$\pm 2^\circ$	$\pm 1.1^\circ$	$\pm 0.04^\circ$	Observed area size	$\varnothing 14$ mm	$\varnothing 8$ mm	$\varnothing 6$ mm
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Goniometer	<ul style="list-style-type: none"> θ: -90° to 90° motorized φ: -90° to 90° motorized Angular resolution: selectable ($0.01^\circ/0.1^\circ/1^\circ/10^\circ$) Positioning precision: 0.01° 												
Polarizer/ Analyzer set (option)	<ul style="list-style-type: none"> Rapid insertion 0°- 90° manual rotation 												
Measuring Time													
180°-profile (option)	<ul style="list-style-type: none"> "Integrated flux" mode: 45 s "Spectrograph" mode: 45 s 												
Software													
Exportation	<ul style="list-style-type: none"> Text file (ASTM) BSDF format (imported in commercial software) 												



Synopsys REFLET Software

References

ADC, Alanod, Alcan, Almeco, Automotive-Lighting, AUO, Arcelor, Bourget, Ball Aerospace, BARCO, Chanel, Dupont, Entire, Essilor, Helbling, Hewlett Packard, Loepfe, STMicroelectronics, Procter & Gamble, PSA, University of Darmstadt, University of Madrid, Volkswagen,...Synopsys' DesignWare[®] Foundation IP, Interface IP, Security IP, and Processor IP are optimized for high performance, low latency, and low power, while supporting advanced process technologies from 16-nm to 5-nm FinFET and future process nodes.