

For 2D/3D scattered light measurements.  
A compact motorized optical system for scattering characterization of any kind of material.

## 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

## REFERENCES

**ADC, Alanod, Alcan, Almeco, Automotive-Lighting, AUO, Arcelor, Bourget, Ball Aerospace, BARCO, Chanel, Dupont, Entire, Essilor, Helbling, Hewlett Packard, Loeffe, STMicroelectronics, Procter & Gamble, PSA, University of Darmstadt, University of Madrid, Volkswagen,...**

REFLET 180S

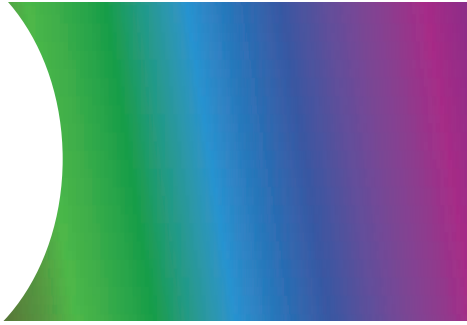


REFLET 180S

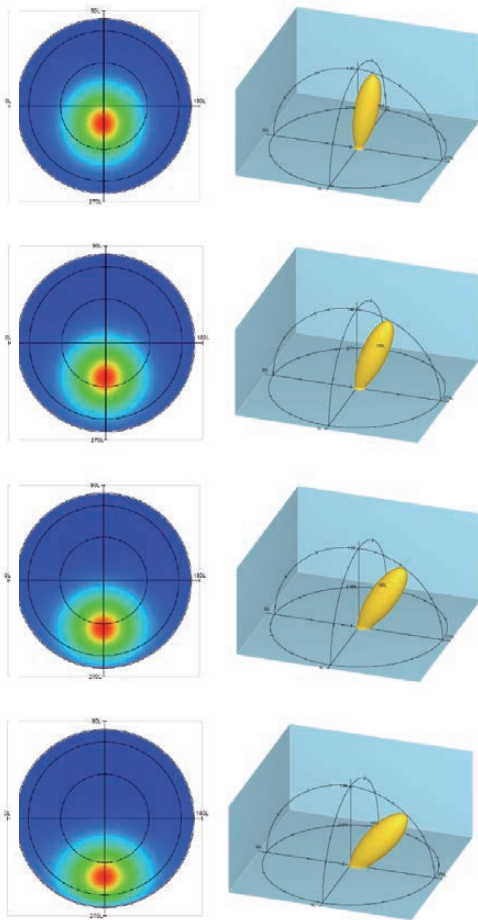


Complete system delivered in a dark box  
*(Non contractual photography)*



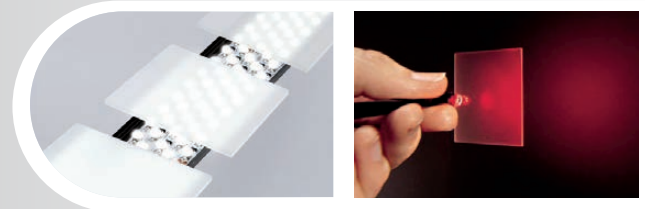
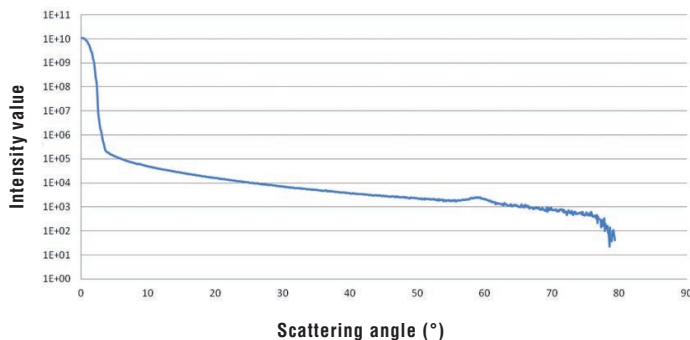


**REFLET** : a compact and motorized optical system for **scattering characterization** of any kind of materials and objects. It allows you to measure, in a **fast and easy way**, luminous energy distribution or spectral composition contained in the scattering lobes. Consequently, it **characterizes 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.



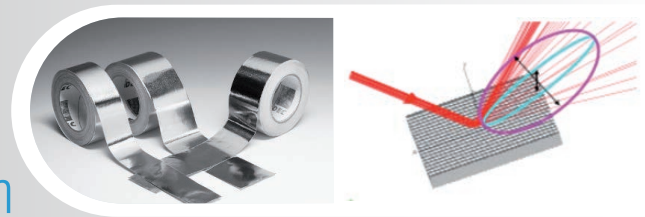
**3D Scans**

**Dynamic Range**



## 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.

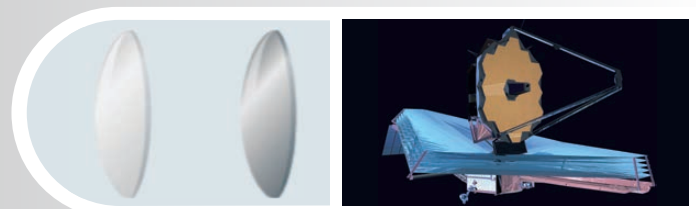


## Aluminum



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

## Polish optics

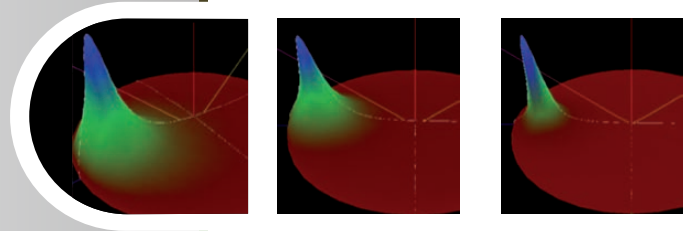


Specular surfaces (mirrors), transparent surfaces (glasses, lenses, crystals) have sometimes a very low scattering such as  $10^{-9} \text{ sr}^{-1}$ . Those surfaces are very difficult to measure without a high dynamic detection system. REFLET has one which allows measuring BRDF of  $10^{-5} \text{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



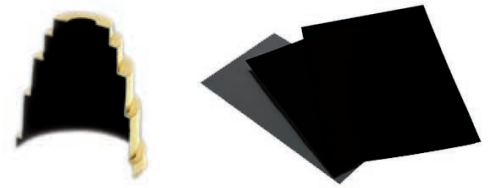
## Cosmetics

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



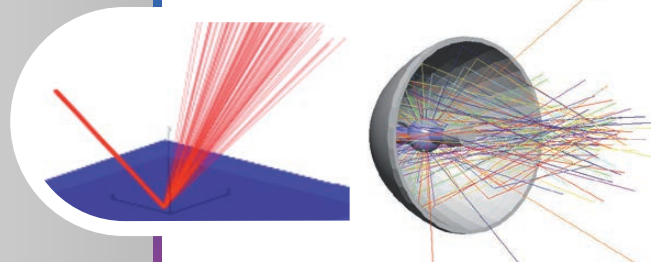
## Black materials

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. REFLET supports such BSDF level thanks to its high dynamic detection.



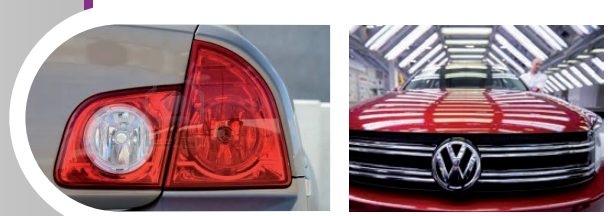
## Illumination design software

Illumination design software require accurate data to provide accurate simulations. 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 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
  - Halogen 100W light box
  - Option: 6-position filter wheel (including R/G/B filters)
- Spot size on the sample surface
  - Scattering configuration: Manually adjustable from  $\varnothing 1$  mm to  $\varnothing 13$  mm
- Beam aperture angle
  - Scattering configuration: Manually adjustable from  $\pm 0.15^\circ$  to  $\pm 2.26^\circ$
- Goniometer
  - **Standard Version:**
    - $0^\circ$ - $180^\circ$  motorized (REFLECTION & TRANSMISSION)
    - Angular resolution: selectable ( $0.01^\circ/0.1^\circ/1^\circ/10^\circ$ )
    - Positioning precision:  $0.01^\circ$



## DETECTION

- Integrated-flux Detector
  - Visible channel: 400 - 1000 nm, dynamic  $10^9$
  - Infra Red channel: 900 - 1700 nm, dynamic  $10^6$  (option)
- Spectrograph (option)
  - Useful range: 420 - 900 nm
  - Spectral resolution: selectable (0.6 nm/1 nm/5 nm/10 nm)
- Optical system
  - Scattering configuration:
    - 3 manually interchangeable optical blocs (2 to be chosen)

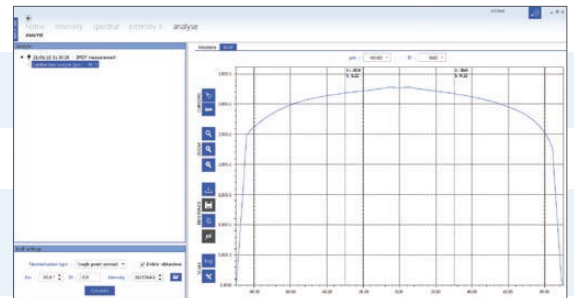
Optical bloc	1	2	3
Angular acceptance	$\pm 2^\circ$	$\pm 1.1^\circ$	$\pm 0.8^\circ$
Observed area size	$\varnothing 14$ mm	$\varnothing 8$ mm	$\varnothing 6$ mm
- Goniometer
  - $\theta$ :  $-90^\circ$  to  $90^\circ$  motorized
  - $\varphi$ :  $-90^\circ$  to  $90^\circ$  motorized
  - Angular resolution: selectable ( $0.01^\circ/0.1^\circ/1^\circ/10^\circ$ )
  - Positioning precision:  $0.01^\circ$
- Polarizer/Analyzer set (option)
  - Rapid insertion
  - $0^\circ$ -  $90^\circ$  manual rotation

## MEASURING TIME

- $180^\circ$  - profile (option)
  - "Integrated flux" mode: 45 s
  - "Spectrograph" mode: 45 s

## SOFTWARE

- Exportation
  - Text file (ASTM)
  - BSDF format (imported in commercial software)



REFLET Software

