

REFLET introduction

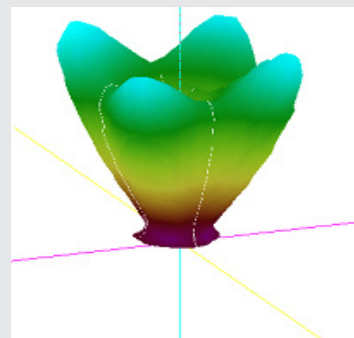
“REFLET” is a goniospectrophotometer for measuring back-scattering and forward scattering from diffusing samples or specular surfaces.

A goniophotometer is an instrument for measuring light scattering in the visible spectral band, through a photopic filter $V(\lambda)$ or in the near infrared range.

Characterization of backscattering lobes (angular reflectance) and forward scattering lobes (angular transmittance) of samples reveals the optical properties of materials and serves as a useful tool in industrial and scientific research of light scattering and light emission mechanisms and of surface properties (texture, roughness, polish quality...).

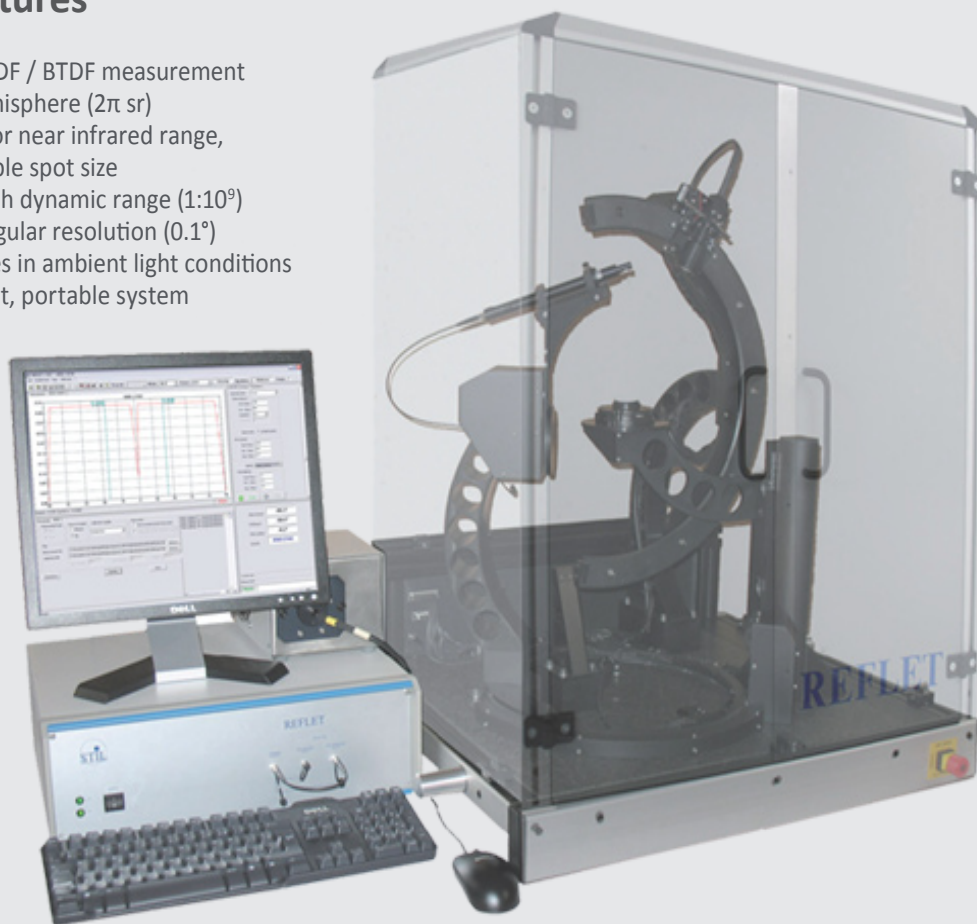
Goniophotometry is fundamental to the understanding of visual perception of objects: in our daily experience the observer, the objects and the natural lighting (sun) are always in motion, so that illumination and observation angles are constantly varying. CAD/CAM Software uses data based on goniophotometric measurements for providing a realistic representation of complex scenes.

The spectrograph option allows analysis of the scattered light; at each angular configuration they provide an entire spectrum, so that the reflectance (or transmittance) of the sample can be measured independently at each individual wavelength. Gonio-colorimetry is fundamental to study effect materials (automotive painting, fabrics).



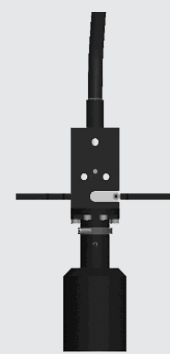
Features

- Real BRDF / BTDF measurement
- Full hemisphere (2π sr)
- Visible or near infrared range,
- Selectable spot size
- Very high dynamic range ($1:10^9$)
- High angular resolution (0.1°)
- Operates in ambient light conditions
- Compact, portable system



REFLET technical specifications

| Model | REFLET-90 | REFLET-180 | | | | | | | | | | | | |
|---------------------------------|--|---|--------------------|---|---|---|--------------------|---------------|-----------------|------------------|--------------------|---------------------|--------------------|--------------------|
| ILLUMINATION | | | | | | | | | | | | | | |
| Light Box | Halogen 100W bulb Option: 6-positions filter wheel (color & ND filters) | | | | | | | | | | | | | |
| Spot size on the sample surface | Manually adjustable from $\varnothing 1$ mm to $\varnothing 13$ mm | | | | | | | | | | | | | |
| Illuminance on the sample | Manually selectable from 100 lux to 25000 lux | | | | | | | | | | | | | |
| Goniometer | REFLECTION MODE - 0°-90° motorized - Angular resolution: 0.1° - Positioning precision: 0.5° TRANSMISSION MODE - Fixed, $\theta = 180^\circ$ | REFLECTION MODE - 0°-180° motorized - Angular resolution: 0.1° - Positioning precision: 0.3° TRANSMISSION MODE - 0°-180° motorized | | | | | | | | | | | | |
| DETECTION | | | | | | | | | | | | | | |
| Integrated-flux Detector | Very High Dynamic range (10^3) | | | | | | | | | | | | | |
| Spectrometer | Useful range: 400-900 nm Spectral resolution : selectable (0.6, 1, 5 or 10 nm) | | | | | | | | | | | | | |
| Optical system | 3 manually interchangeable optical blocs: <table border="1" style="width: 100%; border-collapse: collapse;"> <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 |
| 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 | | | | | | | | | | | |
| Goniometer | θ : -90° to 90° motorized ϕ : -90° to 90° motorized Angular resolution: selectable (0.1° 1°) Positioning precision: 0.5° | | | | | | | | | | | | | |
| Polarizer/Analyzer set (option) | Rapid insertion 0°-90° manual rotation | | | | | | | | | | | | | |
| MEASURING TIME | | | | | | | | | | | | | | |
| 180° θ -profile | "Integrated flux" mode: 30 s "Spectrometer" mode: 10 s | | | | | | | | | | | | | |



REFLET optical head

Applications

- Optical surface characterization:
 - Reflectors for luminaries
 - Automotive headlights reflectors
 - Scattering losses of lenses
- Light source characterization:
 - LCD backlighting
- Visual appearance:
 - Database for realistic rendering software
- Paints and inks:
 - automotive metal paints
 - angular-effect colored inks
 - Countertyping
- Security:
 - Watermarking
- Surface characterization of:
 - metals, powders, paper, ceramics, plastic automotive angular-effect colored inks

DIAMOND introduction

DIAMOND is a goniophotometer with an optical system specially designed for measuring light scattering from specular surfaces.

| Model | DIAMOND-90 | DIAMOND-180 |
|----------------------------------|--|---|
| ILLUMINATION | | |
| Light Box | Halogen 100W bulb Option: 6-positions filter wheel (color & ND filters) | |
| Spot size on the sample surface | Manually selectable $\varnothing 0.5$ mm, $\varnothing 1$ mm or $\varnothing 1.9$ mm | |
| Beam angle | Manually selectable $\pm 0.09^\circ$, $\pm 0.18^\circ$, $\pm 0.35^\circ$ or $\pm 0.5^\circ$ | |
| Goniometer | REFLECTION MODE - 0° - 90° motorized - Angular resolution: 0.1° - Positioning precision: 0.5° TRANSMISSION MODE - Fixed, $\theta = 180^\circ$ | REFLECTION MODE - 0° - 180° motorized - Angular resolution: 0.1° - Positioning precision: 0.3° TRANSMISSION MODE - 0° - 180° motorized |
| DETECTION | | |
| Integrated-flux Detector | Very High Dynamic range (10^3) | |
| Observed area size on the sample | Manually selectable $\varnothing 0.5$ mm, $\varnothing 1$ mm or $\varnothing 1.9$ mm | |
| Beam angle | Manually selectable $\pm 0.09^\circ$, $\pm 0.18^\circ$, $\pm 0.35^\circ$ or $\pm 0.5^\circ$ | |
| Goniometer | θ : -90° to 90° motorized ϕ : -90° to 90° motorized Angular resolution: selectable (0.1° - 1°) Positioning precision: 0.5° | |
| Polarizer/Analyzer set (option) | Rapid insertion 0° - 90° manual rotation | |
| MEASURING TIME | | |
| Measuring time of one meridian | 30s (one 180° full-precision θ -profile) | |



DIAMOND optical head

Applications

Application domains of residual scattering measurement are quite diversified and include ophthalmic optics, semiconductor, space industries :

- Control of polish / superpolish quality of mirrors and lenses
- Control of optical glass quality
- Control of polished semiconductor surfaces (bare wafers, masks):
 - surface quality
 - presence of dust grains
- Measurement of scattering losses

REFLET & DIAMOND Goniophotometers



Options

- Detection in the near infrared range, intensity mode (0.9 - 1.7 μm)
- Detection in the near infrared range, spectral mode (1 - 1.7 μm)
- Filter wheel (color and ND filters)
- Sample holder with adjustable tilt plate
- Polarizer/analyser set (easy mounting)



SENSORS

3D SYSTEMS

SPECTRO
COLORIMETERS

PHOTOMETERS
GONIO

OPTICAL
COMPONENTS