DESCRIPTION

Mini-Diff is a range of 3D Hemispherical Scattering Measurement instruments, camera based, to characterize scattering surfaces. It provides BRDF, BTDF and TIS measurements for Red, Green and Blue colors (RGB) or in the near Infra Red. The hemispherical scattered intensity is imaged at once on a camera. It also delivers the color data in reflection or transmission.

**Mini-Diff V2** is our portable version and allows, in a fast and easy way, to measure luminous energy distribution, and consequently characterizes surfaces.

The incident light is provided by 4 collimated LEDs set up at 0°, 20°, 40° and 60° incident angles for Reflective and Transmissive measurements.

**Mini-Diff VPro** is our laboratory version of the Mini-Diff. Incident angles can be chosen from 0° to 60° for Reflective and Transmissive measurements. The instrument has AR coated lenses and a dark box to remove stray light. The system includes a better CMOS sensor temperature controlled improving measurement stability.

The results (relative scattered intensity and BRDF/BTDF) can be saved in text formats, or can be exported to optical software format.

APPLICATIONS

- Reflector/Diffuser material characterization for automotive design
- Photorealistic rendering: accurate measurement of diffusing behavior
- Cosmetics characteristics
- Roughness controls in production
- LCD Backlighting: BEF, DBEF inspection, diffusing films
- Diffuser / Display Quality Control
- Material characterization for many incident angles
Reflective Materials

Mini-Diff instruments give a quick measurement of the BRDF for several incident angles and 3 colors.

- After a 2-step calibration (one step with a black standard to cancel the stray light and one step with a Lambertian standard to calibrate the response of the camera), it is possible to measure:
  - Reflectors
  - Paints
  - Diffusing material
  - Sockets
  - Optical mounts and more...

- The measured relative scattered intensity can be saved in text files, slices files, mesh format, BSDF format, ABg (Harvey Shack) and Gaussian/Lambertian model.

- The TIS measurements (Total Intensity Scattered) is estimated by the Mini-Diff V2 software. This feature allows for example comparing directly the efficiency of the diffusers.

- Mini-Diff V2 software also allows taking into account anisotropic material measurement and is capable to generate directly the right file for illumination software.

Example: Reflecto Alanod Miro5

Reflecto material can have quite complex behavior depending on the incident plane. Mini-Diff series allow to capture scattering for angles of incidence, parallel and perpendicular to stripes (anisotropic material).
Transmissive Materials

- Mini-Diff products allow a quick measurement of the BTDF for several incident angles.

- One external part “transmission module” can be supplied with the Mini-Diff V2 as an option, but is included in MiniDiff VPro. It includes collimated LEDs on a large area (diam 10 mm) in order to be insensitive to the sample placement.

- After a 1-step calibration using one Lambertian transmissive standard (supplied), it is possible to measure diffusing materials:
  - Opal glass
  - Diffusing plastics
  - BEF (Brightness Enhanced Film)
  - Beam Shaper (Diffractive optics)

Reflective and Transmissive Materials

Mini-Diff devices enable to measure BRDF and BTDF on one diffuser (front and back side measurement) and it can then build a BSDF file ready to use in illumination software.

Color Measurements

Mini-Diff have RGB light sources used for BRDF and BTDF and allows BSDF measurement for each color. It can give a global color estimation in CIE L*a*b* space using the TIS estimation. You can look at the RGB 3D BSDF from the Mini-Diff software.
# Calibration and accuracy

Mini-Diff are supplied with 3 calibration standard samples:
- One Black standard
- One Reflective Lambertian Standard
- One Transmissive Lambertian Standard

## Technical Specifications

<table>
<thead>
<tr>
<th>Instrument</th>
<th>Mini-Diff V2</th>
<th>Mini-Diff V2 IR</th>
<th>Mini-Diff VPro</th>
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</thead>
</table>
| **Sources** | - Red: 630nm [Δλ=25nm]  
- Green: 525nm [Δλ=35nm]  
- Green: 525nm [Δλ=35nm]  
- Blue: 465nm [Δλ=25nm] |
| **Camera** | - 1000*1000 pixels | - 1000*1000 pixels | - 2048*1088 pixels |
| **Angle of Incidence for Reflection and Transmission** | - 4 Incident angles: 0°; 20°; 40°; 60° | - 4 Incident angles: 0°; 20°; 40°; 60° | - Tunable Incident angles: 0° to 60° with a step of 1° |
| **Spot size on the sample surface / Measured Area** | - 1 mm diameter | - 1 mm diameter | - 1 mm diameter |
| **Field of view** | - +/-75° (150° total) | - +/-75° (150° total) | - +/-75° (150° total) |
| **Calibration** | Reflection: 20 Seconds  
Transmission: 10 Seconds | Reflection: 20 Seconds  
Transmission: 10 Seconds | Reflection: 1 Minute  
Transmission: 30 Seconds |
| **Measurement (for 1 AOI)** | Reflection: 10 Seconds  
Transmission: 10 Seconds | Reflection: 10 Seconds  
Transmission: 10 Seconds | Reflection: 25 Seconds  
Transmission: 25 Seconds |
| **Results** | Dynamic Range: $10^5$  
Angular Resolution: 1°  
Accuracy: < 5%  
Repeatability: < 2%  
Stability: 30 Minutes | Dynamic Range: $10^4$  
Angular Resolution: 1°  
Accuracy: < 5%  
Repeatability: < 2%  
Stability: 30 Minutes | Dynamic Range: $10^6$ BTDF / $10^5$ BRDF  
Angular Resolution: 0.5°  
Accuracy: < 2%  
Repeatability: < 2%  
Stability: 10 Hours |
| **Data Exportation** | Text file (ASTM format)  
BSDF format (imported in commercial software)  
Fit to Gaussian / Lambertian format  
Exportation to native format: LightTools, Zemax, TracePro, OptiWorks, Relux and more… | Mesh file  
Fit to ABg | Slice files (IES type) |

*These specifications are not contractual and can be changed without notice.*