Predefined Diffuser Scatter Models in ASAP

Diffuser sheet scatter models in ASAP® are predefined models. They are accessible from the ASAP Quick Start toolbar on the Scatter page in the Other folder. While diffuser sheets cannot be dragged and dropped onto the ASAP Object Tree as other ASAP scatter models, all scatter models can be dragged and dropped onto the ASAP Editor or Builder windows.

Diffuser sheets commonly have a glossy and non-glossy side. Light incident on the glossy side will generally scatter differently compared to light incident on the non-glossy side. This behavior is shown in the following diagrams.

If BSDF(T, A) and BSDF(T, B) denote transmitted scatter for light incident on the non-glossy and glossy sides, respectively, then in general BSDF(T, A) ≠ BSDF(T, B). Likewise, BSDF(R, A) ≠ BSDF(R, B), where the R denotes reflected scatter.

These types of diffuser sheets are described with four scatter models as follows:

1. Reflective scatter when light is incident on the glossy side of diffuser sheet.
2. Reflective scatter when light is incident on the non-glossy side of diffuser sheet.
3. Transmissive scatter when light is incident on the glossy side of diffuser sheet.
4. Transmissive scatter when light is incident on the non-glossy side of diffuser sheet.

During a raytrace, ASAP uses the same optical properties regardless of which side of the surface is illuminated. This presents a problem for the type of component described above.

One solution to is to split the diffuser into two sheets separated by air, and use the SEARCH option in conjunction with dummy surfaces, as shown in Figure 1.
Define dummy planes and use SEARCH option to specify ray paths

<table>
<thead>
<tr>
<th>1</th>
<th>OBJ 1: Dummy Plane INTERFACE 0 1 AIR AIR</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>OBJ 2: Case A Properties SCATTER MODELS BSDF(R,A) BSDF(T,A)</td>
</tr>
<tr>
<td>3</td>
<td>OBJ 3: Case B Properties SCATTER MODELS BSDF(R,B) BSDF(T,B)</td>
</tr>
<tr>
<td>4</td>
<td>OBJ 4: Dummy Plane INTERFACE 0 1 AIR AIR</td>
</tr>
</tbody>
</table>

SEARCH

\[
\begin{align*}
1 & \rightarrow 2 \\
4 & \rightarrow 3 \\
3 & \rightarrow 1 \\
4 & \rightarrow 2 \\
\end{align*}
\]

Figure 1. Using the SEARCH option with DUMMY surfaces

According to the SEARCH schema, rays incident from above will interact with and scatter at OBJECT 2, but cannot interact with OBJECT 3. Likewise, rays incident below scatter at OBJECT 3, and cannot interact with OBJECT 2.

The first command syntax in Figure 1 indicates that rays on OBJECT 2 can “see” only OBJECTS 1 through 4 in steps of 3; that is, only objects 1 and 4.

All four objects should have the same shape. The distance between objects should be set so as to not interfere with other model geometry. The distance can be made arbitrarily small, keeping in mind usage of double precision data in ASAP. Of course, the user should confirm proper operation before proceeding with long raytraces.

This procedure requires extra work on the part of user, and as always when using the SEARCH option, it should only be used with caution. If the OBJECT numbers are changed, for instance after editing the geometrical model, then the SEARCH schema also needs to be updated.

The example file, DIFFSHEET.INR shows the script syntax. Note that this is just an example. The scatter models and the object numbers must be changed according to the user’s model. ASAP HTML Help explains the SEARCH command syntax.

CAUTION

SEARCH should be used with caution since it directs ASAP to change temporarily from the default non-sequential raytracing to sequential raytracing.
**SYSTEM NEW**
**RESET**

```

******************************************************************************
!! POC LS30 DIFFUSER SHEET
MODEL !! REFLECTIVE DIFFUSE SIDE
BINOMIAL 1 6 PLOT 5 30 70 'POC LS30 RD'
  -1.159  0.361E-01 -2.527  .2571  4.543  -1.657  -3.881 ,
  1.744  -6.808  -4.477  10.92  -2.925  -2.753  0.7497
RETURN

MODEL !! REFLECTIVE GLOSSY SIDE
HARVEY 12.5500  2.4500  5.00E-3
HARVEY 0.6040  0.2310  7.15E-6
SUM .1 .2 PLOT 5 30 70 'POC LS30 RG'
RETURN

MODEL !! TRANSMISSIVE DIFFUSE SIDE
BINOMIAL 1 6 PLOT 0 30 70 'POC LS30 TD'
  0.5858  -1.753  4.814  -26.69  34.94  -15.41  1.755 ,
  -0.8584  -1.789  19.98  -49.15  58.52  -30.55  5.847
RETURN

MODEL !! TRANSMISSIVE GLOSSY SIDE
BINOMIAL 1 4 PLOT 0 30 70 'POC LS30 TG'
  0.3223  1.497  -4.02  15.20  -4.501  -0.6775  2.523 ,
  -4.821  7.447  -2.916
RETURN

******************************************************************************
```
The material used in the creation of model POC LSD30, which is referenced in the above example, was provided by Samsung.