

Understanding TMG Radiation

The articles in this section attempt to give a deeper understanding of how TMG models radiation. The following topics give an overview of the articles in the section.

Black Body View Factor Calculation

TMG calculates radiation in enclosures. Within an enclosure, TMG computes the view or partial view between each element and all other elements. This reflects the amount of radiative energy a particular element will be able to exchange with the other elements of the enclosure. This view or partial view an element has of other elements is called a *black body view factor*.

Black body view factors are used to calculate IR (*infrared spectrum*) radiative exchanges between elements. If a solar spectrum source has been defined in the model, black body view factors are also needed to calculate diffuse solar spectrum reflection and adjust the solar heat loads accordingly.

Shadowing Checks

When calculating *black body view factors* between two elements, TMG must determine whether the view is unobstructed, partially obstructed or completely obstructed. This process of assessing the view between two elements is called *shadowing checks*.

Radiative Coupling Calculation

Two radiation calculation methods are available in TMG.

Oppenheim's uses a radiosity approach to calculate radiative heat transfer. Gebhardt's method calculates radiative conductances based on the gray-body view factors.

Solar Spectrum View Factor Calculation

Three different TMG entities require the calculation of solar spectrum heat loads: *Orbit/Attitude Modeling*, *Diurnal Solar Heating* and *Radiative Heating*. To calculate the heat loads on the elements, TMG determines which elements have a direct view to the sources of heat flux.

TMG performs *shadowing checks* to calculate the *solar view factors* of elements that have their view of the solar spectrum source shadowed by intervening elements. As for the black body view factors, the Nusselt Sphere technique is used to calculate partial view to the solar source.

In computing solar view factors, TMG automatically uses ray-tracing to model transmission and specular reflection.

Ray Tracing

Ray-tracing for elements with a direct solar view is automatically performed. Ray Tracing for diffuse solar reflection and IR flux is performed only if the *Ray Trace to Enhance Specular/Transparent Accuracy* option is toggled *ON* on the *Radiation Request* form.

Material properties and special feature like refraction are discussed.

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