

# Irradiance Map GI

This page gives an overview of the Irradiance map process. For information on how to use an irradiance map in a scene, please see the [Irradiance map settings](#) page.

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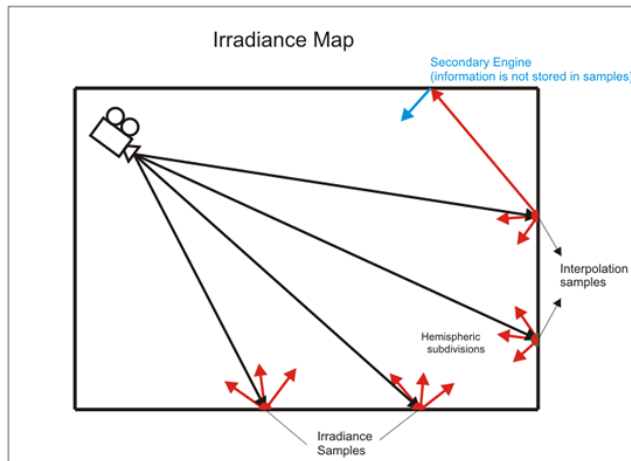
## Overview

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Irradiance is a function defined for any point in the 3D space, representing the light arriving at a point and all the directions from which the light arrives. The irradiance map GI method creates a map of this lighting. [Irradiance map settings](#) are under the GI tab in the Render Settings window.

In general, irradiance is different at every point, and can represent a large amount of information. However, there are two useful restrictions that can be made when using irradiance for rendering. The first is the restriction of looking only at surface irradiance, which is the irradiance arriving at points which lie on the surface of objects in the scene. This is a natural restriction since we are usually interested in the illumination of objects in the scene, and objects are usually defined by their surfaces. The second restriction is that for diffuse surface irradiance (the total amount of light arriving at a given surface point) we can disregard the direction from which the light comes.

In more simple terms, one can think of the diffuse surface irradiance as being the visible color of a surface, if we assume that its material is purely white and diffuse.



In V-Ray, the term irradiance map refers to a method of efficiently computing the diffuse surface irradiance for objects in the scene. Since not all parts of the scene have the same detail in indirect illumination, it makes sense to compute GI more accurately in the important parts (e.g. where objects are close to each other, or in places with sharp GI shadows), and less accurately in large, uniformly lit areas. The irradiance map is therefore built adaptively. This is done by rendering the image several times (each rendering is called a pass) with the rendering resolution being doubled with each pass. The idea is to start with a low resolution (say a quarter of the resolution of the final image) and work up to the final image resolution.

The irradiance map is in fact a collection of points in 3D space (a point cloud) along with the computed indirect illumination at those points. When an object is hit during a GI pass, V-Ray looks into the irradiance map to see if there are any points similar in position and orientation to the current one. From those already computed points, V-Ray can extract various information (i.e. if there are any objects close by, how fast the indirect illumination is varying etc). Based on that information, V-Ray decides if the indirect illumination for the current point can be adequately interpolated from the points already in the irradiance map, or not. If not, the indirect illumination for the current point is computed, and that point is stored in the irradiance map. During the actual rendering, V-Ray uses a sophisticated interpolation method to derive an approximation of the irradiance for all surfaces in the scene.

The diagram above shows the way the Irradiance map is generated. The **Irradiance map** method can only be selected as the **Engine** for **Primary bounces**; it is not available for **Secondary bounces**. Since the method is view-dependent, the first rays (the black lines in the diagram) are traced from the camera into the scene in order to determine the placement of the irradiance samples. Once this is done, GI rays (red) are traced from the samples into the scene in order to determine the illumination coming from the environment. The number of traced rays is determined by the **Subdivs** parameter. The irradiance map only traces one bounce of light. All additional bounces (blue) are traced by the secondary engine. The irradiance map is created on several passes - each pass adding more samples where this is needed. During rendering, for each rendered point, V-Ray takes several samples from the already complete irradiance map and interpolates between them in order to create a smooth GI solution. The number of samples taken is determined by the **Interp. samples** parameter.

## Notes

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- For more information about parameters and settings for Irradiance Map GI, please see the [Irradiance Map Settings](#) page under the [Render Settings | GI tab](#) section.