

Blender

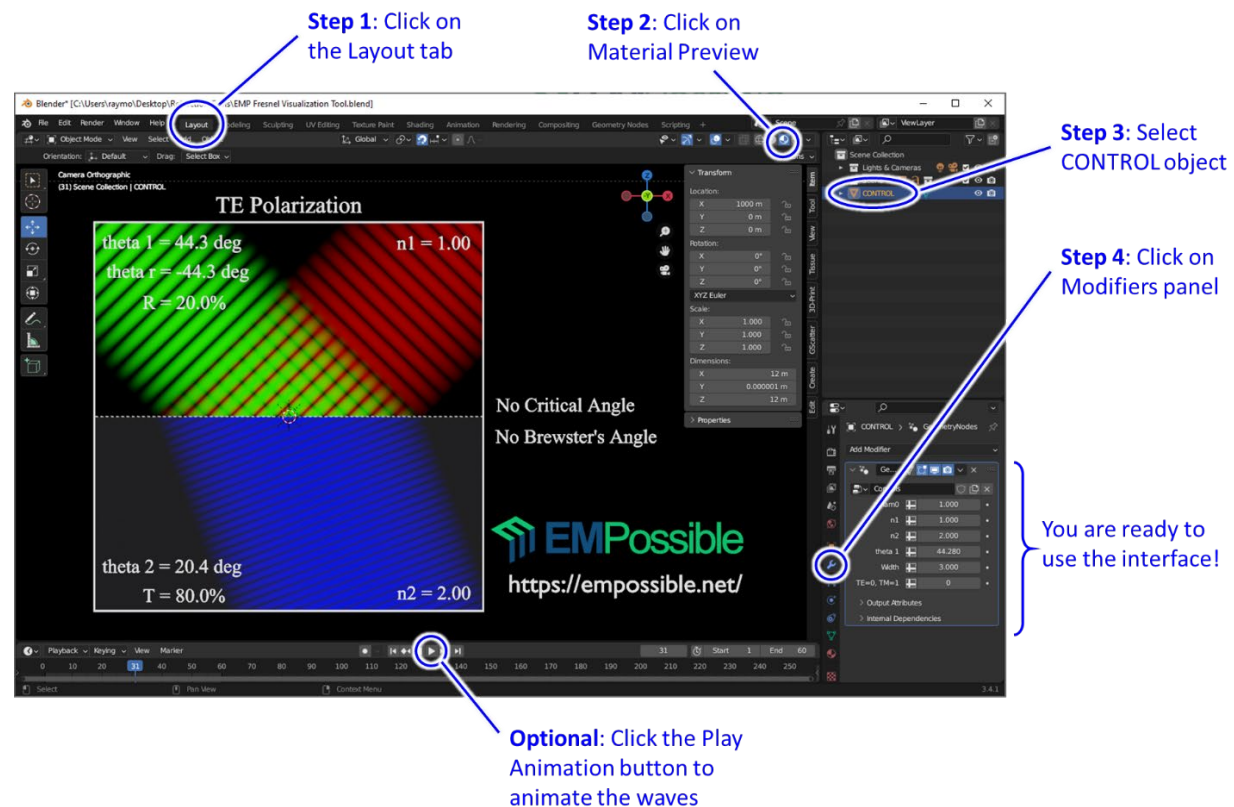
Blender is an open-source 3D computer graphics tool that is excellent for scientific visualization. The Fresnel equation visualization tool was developed in Blender 3.4.1. You can download Blender from blender.org. Use of the Fresnel visualization tool requires only basic knowledge of using Blender and the Blender interface.

How to Get the Fresnel Visualization Tool

Download the Fresnel visualization tool from [EMPossible.net](https://empossible.net). It is kept as a resource in the [Electromagnetic Field Theory Course](https://empossible.net). Scroll to the very bottom of the course website and you will see an accordion menu containing the tool and these instructions.

Direct download link: <https://empossible.net/wp-content/uploads/2023/02/Fresnel-Visualization-Tool.zip>

Quick Start Instructions



Step 1: Click on the Layout tab

Step 2: Click on Material Preview

Step 3: Select CONTROL object

Step 4: Click on Modifiers panel

Optional: Click the Play Animation button to animate the waves

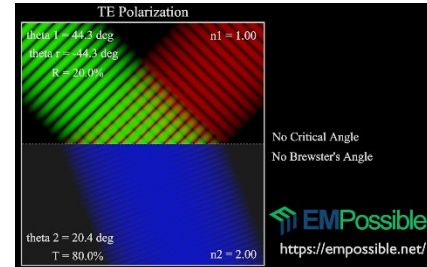
You are ready to use the interface!

Information Displayed

The Fresnel visualization tool shows the incident wave, reflected wave, and transmitted wave and displays additional information about the polarization selected, angles, reflectance, and transmittance. The title of the display indicates what polarization is being calculated and visualized. Inside the window, the incident wave is shown in green, the reflected wave is shown in red, and the transmitted wave is shown in blue. The

directions of the waves becomes obvious when animated. When the transmitted wave is cutoff (total internal reflection), an evanescent wave is displayed in the second medium. White text inside of the display shows the angles of the waves, refractive index of the mediums, reflectance R , and transmittance T . If a critical angle or Brewster's angle exists for the chosen refractive indices, those are displayed on the far right.

Capturing Images – To capture an image for inclusion in a presentation, publication, poster, etc., select “Render Image” in the Render dropdown menu at the upper-left of the Blender window, or just press F12 in Blender. When a new window appears with your image, save the image in the Image dropdown menu.



Videos – It is also possible to render a video. To do this, select “Render Animation” in the Render dropdown menu at the upper-left of the Blender window. The movie will be placed in the tmp folder on your C drive.

Control Fields

λ_{m0} – This field controls the free space wavelength. It is entirely cosmetic because wavelength does appear in Snell's law or the Fresnel equations.

$n1$ – This field controls the refractive index of the top medium where the incident wave is applied and where the reflected wave resides.

$n2$ – This field controls the refractive index of the bottom medium where the transmitted wave resides.

θ_1 – This field controls the angle of incidence. The angle of reflection and angle of transmission is calculated from this angle and displayed in the view.

Width – This field controls the width of the beam. It is entirely cosmetic.

TE=0, TM=1 – This field selects whether it is the TE or TM polarization that is calculated and displayed in the interface. When set to 0 the TE polarization is displayed. When set to 1 the TM polarization is displayed.

Play (or spacebar) – It is possible to animate the fields by pressing the Play Animation button or by pressing the spacebar on the keyboard. To stop the animation, simply click the stop button or press the spacebar a second time.