HOLIGILM 4.4

User manual

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Introduction

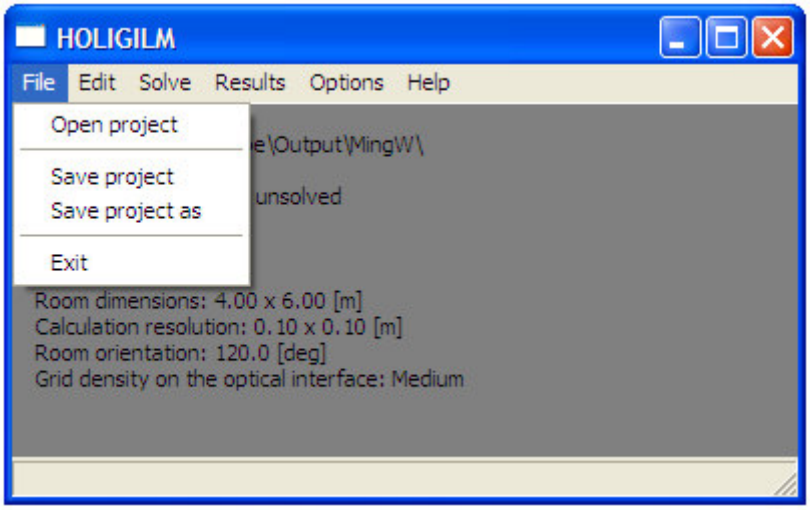
Program HOLIGILM calculates the illumination of a rectangular room using optical tubes as light sources. Thanks to the sofisticated methods (e.g. analytical solutions) used, it is very fast.

1. Installing the program

Download the setup-program (full version) from http://www.holigilm.info. Start downloaded setup-program and follow the instructions. You needn't have administrator privileges to install and run the HOLIGILM program. The HOLIGILM-shortcut will appear on your desktop after the successful installation. HOLIGILM should run on Microsoft Windows 98, 2000, XP, Vista or later.

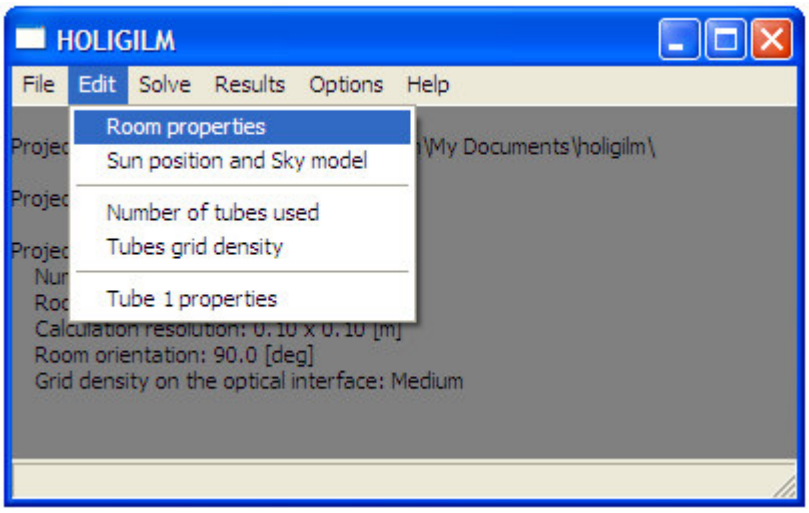
2. Choosing the project name (= folder name)

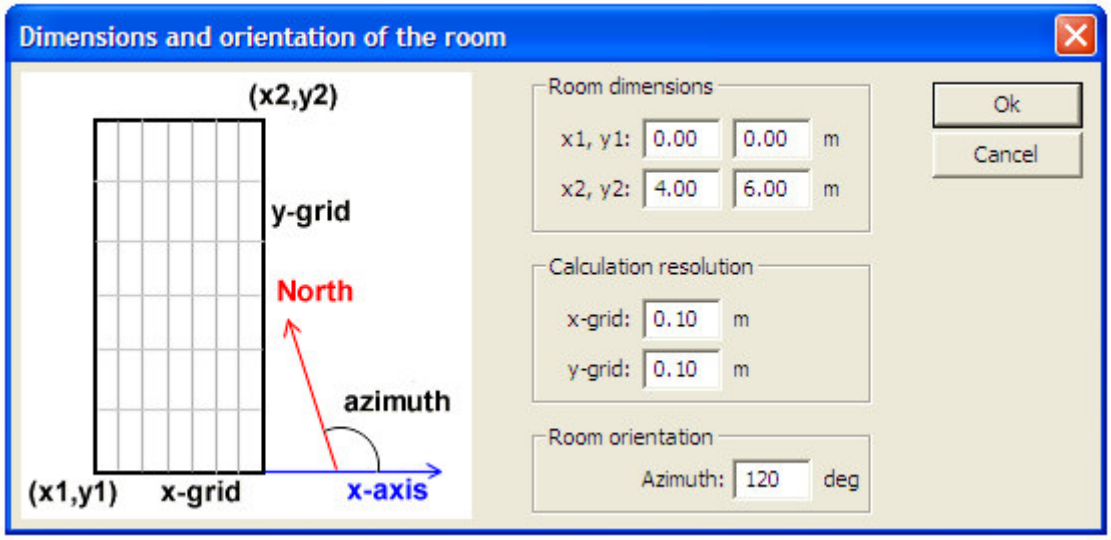
After the program was started, use 'File/Save project as' menu to select a directory, where all the project files (room- and tubes- properties, outputs etc.) have to be saved. If the folder doesn't exist yet, you can create it using 'Make New Folder' button.
You can also use 'File/Open project' menu to select a directory, where a project (eventually solved) was saved earlier.
We have to mention here that the filenames of all projects and their results are always the same. So you have to choose a unique directory name for each project. Saving a project overwrites project and result data in selected project directory.



3. Setting-up the room dimension and orientation

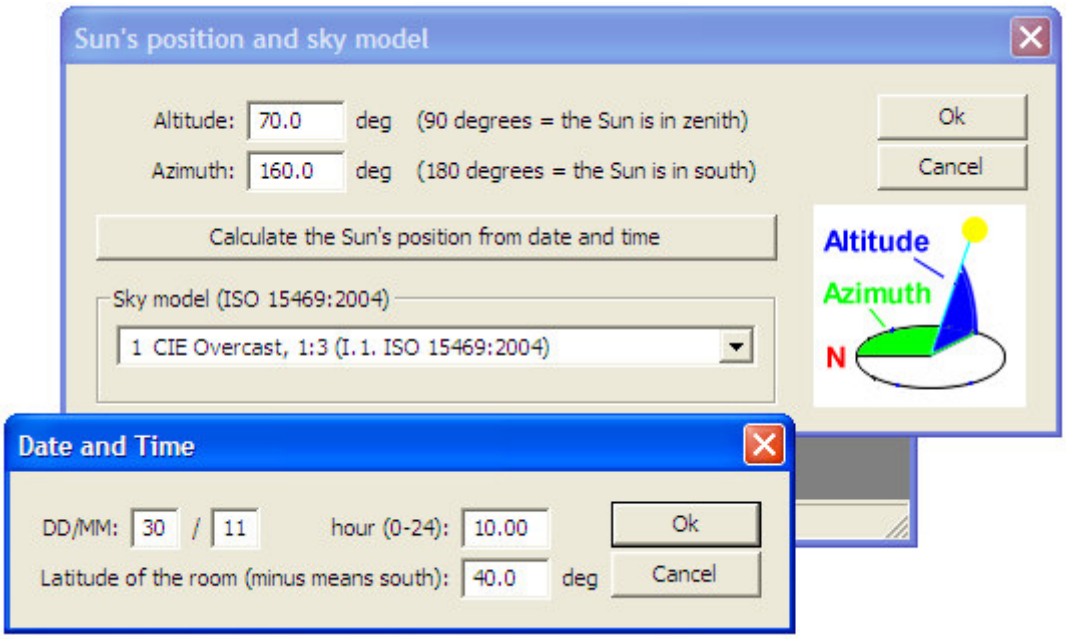
In the 'Edit/Room properties' menu you have to set the dimensions of a rectangular room and its orientation according to the north. You can also eventually change grid (density of points where the illumination is calculated).





4. Setting-up the Sun position and the sky model

In the 'Edit/Sun position' you can set the position of the Sun on the sky. You have two ways how to do that.
One possibility is to set directly two angles: altitude and azimuth. Another possibility is to use 'Calculate the Sun's position from date and time'-button and in a new window to choose day and month together with the latitude of the room. The fraction of hour has to be entered in decimal format – 10.50 (half past ten) means 10:30. After the confirmation of entered data the altitude and the azimuth of the Sun is calculated.
In the 'Sun position'-menu you can also choose one of the five sky models e.g. “CIE Overcast, 1:3“ (according to ISO 15469:2004). Up to 16 models are ready to be used – please contact authors to allow all 16 sky models.

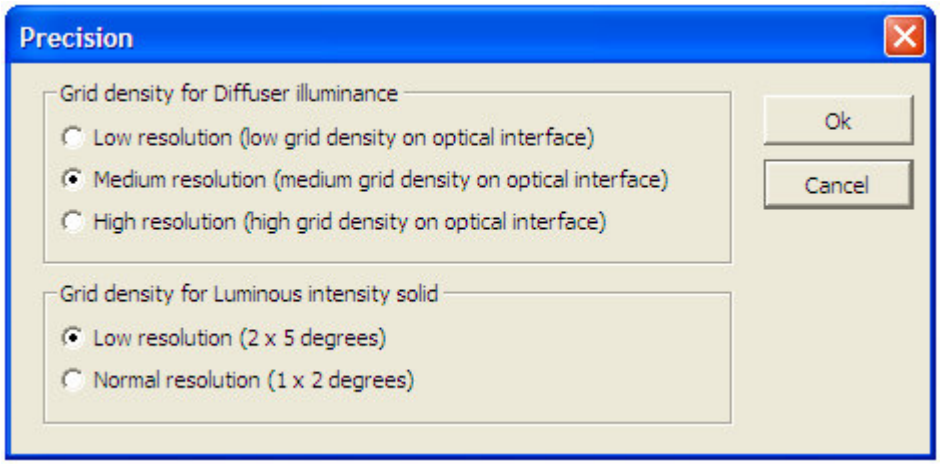


5. Choosing the number of tubes used

Use 'Edit/Number of tubes used' to set the number of light tubes used for the illumination of the room.

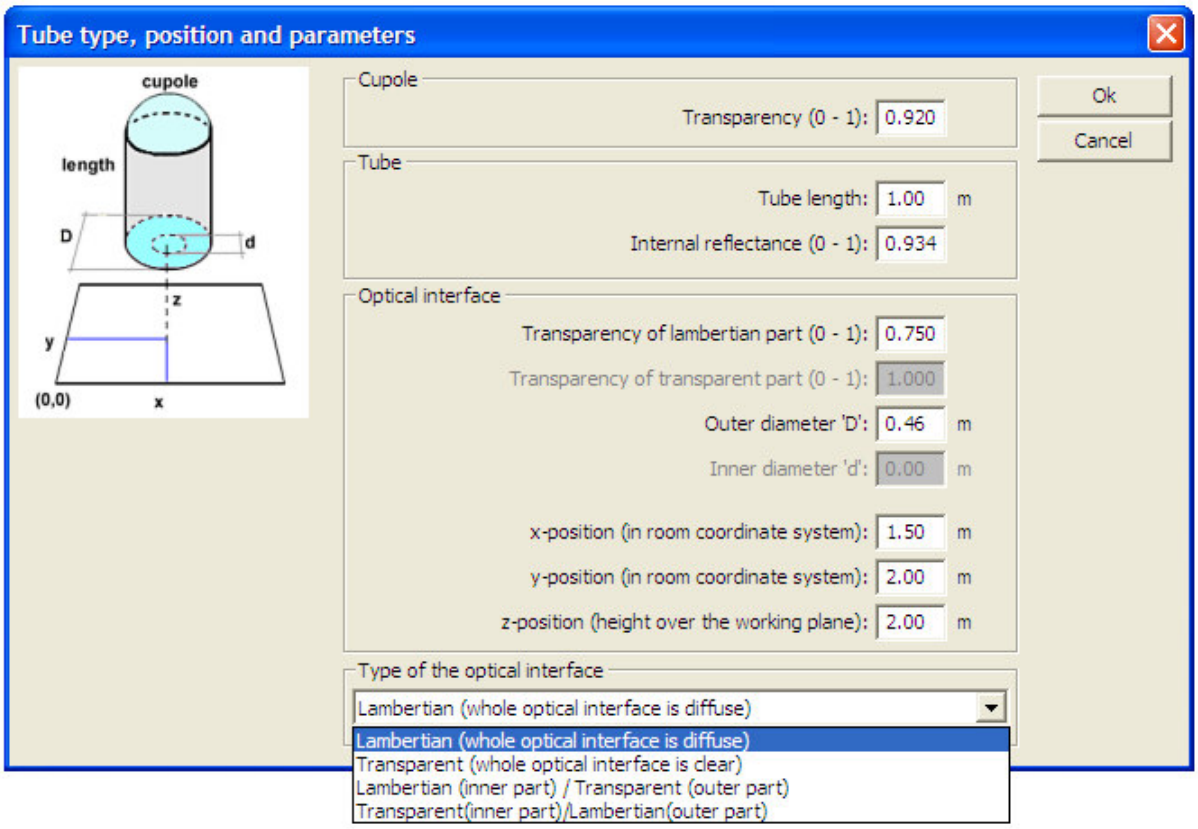
6. Setting-up tubes grid / radiative pattern density

The 'Edit/Tubes grid density'-menu allows you to select the resolution of the calculated illumination below the optical interface of tubes and of the calculated radiative pattern. Be aware that high grid/pattern densities dramatically influences the time of calculation and the time needed to display your results. The calculated workplane illumination using medium-dense grid is usually precise enough and it is no need to select high-dense grid (and long calculations).



7. Setting-up the parameters of tubes and their positions

The 'Edit/Tube N properties' menu allows you to specify the position and physical properties of the selected tube.

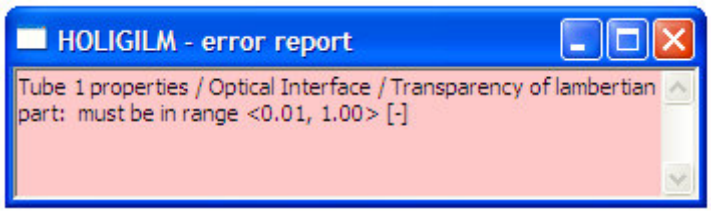


You can set the transparency of the cupole, the length of the tube and its internal reflectance, the transparency of the lambertian/transparent part of the optical interface on the bottom of the tube, its outer diameter and eventually its inner diameter (if applicable, see types of interfaces below). You can also set the x,y,z-position of the optical interface in the room.
Four types of optical interfaces are currently implemented:

- Lambertian (uses diffuse glass for example)
- Transparent (uses transparent glass or no glass for example)
- Lambertian / Transparent (inner part is lambertian and outer part is transparent)
- Transparent / Lambertian (inner part is transparent and outer part is lambertian).

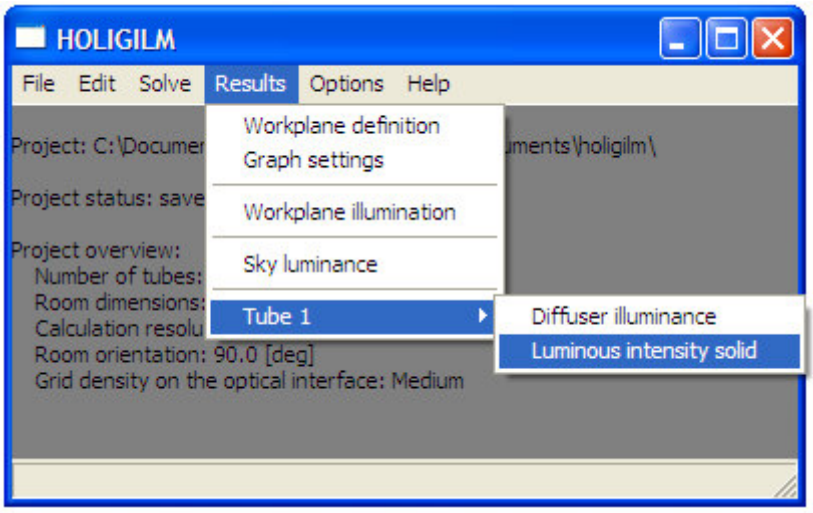
8. Starting the calculation

Select menu item 'Solve/Save and solve project'. The project parameters are saved and all the selected parameters are checked for their physical and logical correctness (i.e. overlapping tubes, Sun below horizont etc). If any problem is detected, corresponding errormessage is displayed. The errormessage contains a detailed description of the problem and also the information about 'menu item'/'parameter name' where the problem was located. After the successful calculation the 'Results' menu items are enabled.



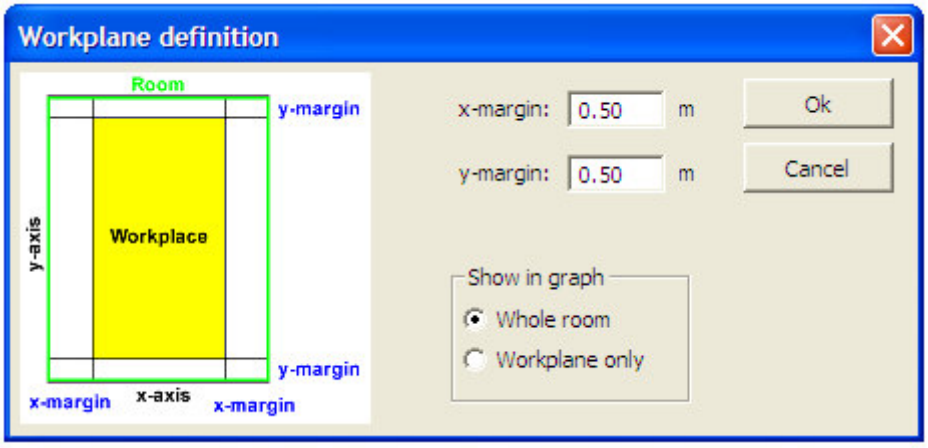
9. Displaying the results

For detailed information about working with graphs select the 'Help / Optimizing of graphs' – menu item.



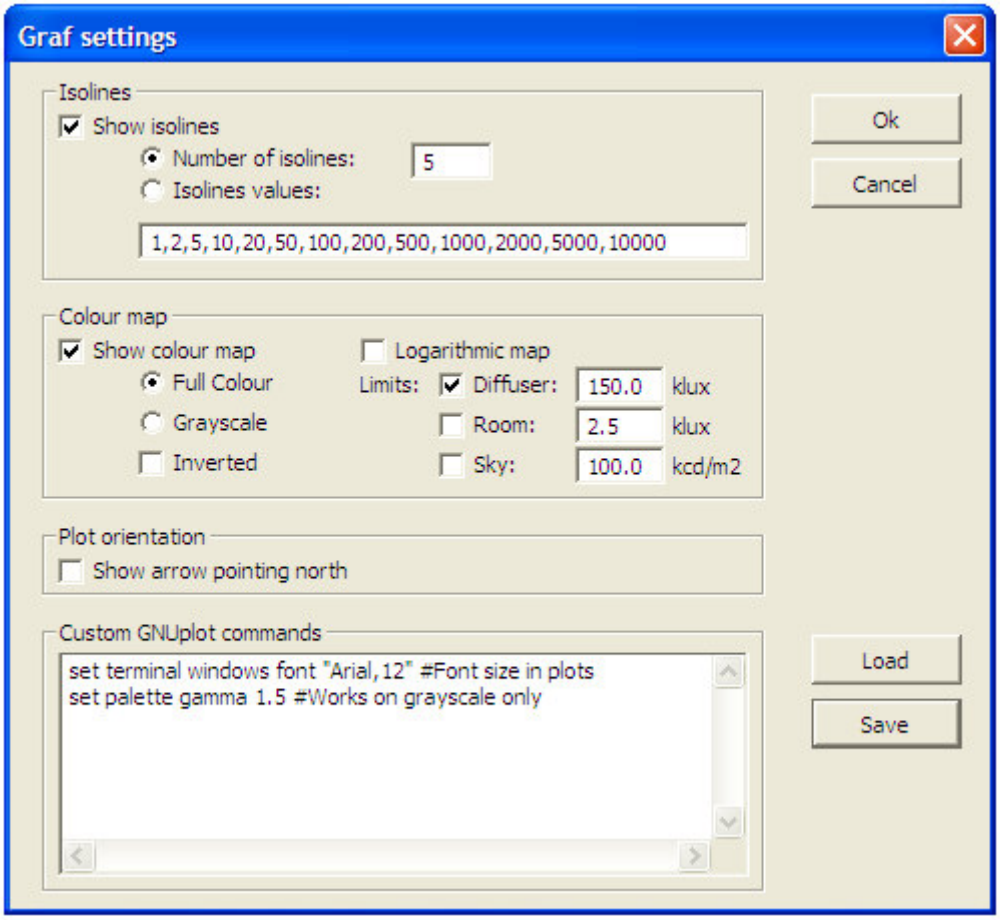
A. Workplane definition

Menu 'Results/Workplane definition' allows you to set the working plane (rectangular area smaller than the room). The calculated illumination data are displayed for this workplane only. It is on your choice, if the border of the whole room has to be displayed in plots or not.



B. Graph settings

You can modify plots produced by the HOLIGILM program (more exactly by the GNUplot program which is used for the data visualisation) using 'Results/Graph settings' menu. There are two basic types of plots generated, 'isolines' and 'map', which can be combined.



You can tell to the program exactly, which isolines values have to be used, or you can specify only the number of isolines displayed (it is only a guess, number of really displayed isolines depends on current illumination data).

You can switch between full-colour map or grayscale map. Sometimes is useful to display inverted palette (white = no illumination) for printing – you can select also this option.

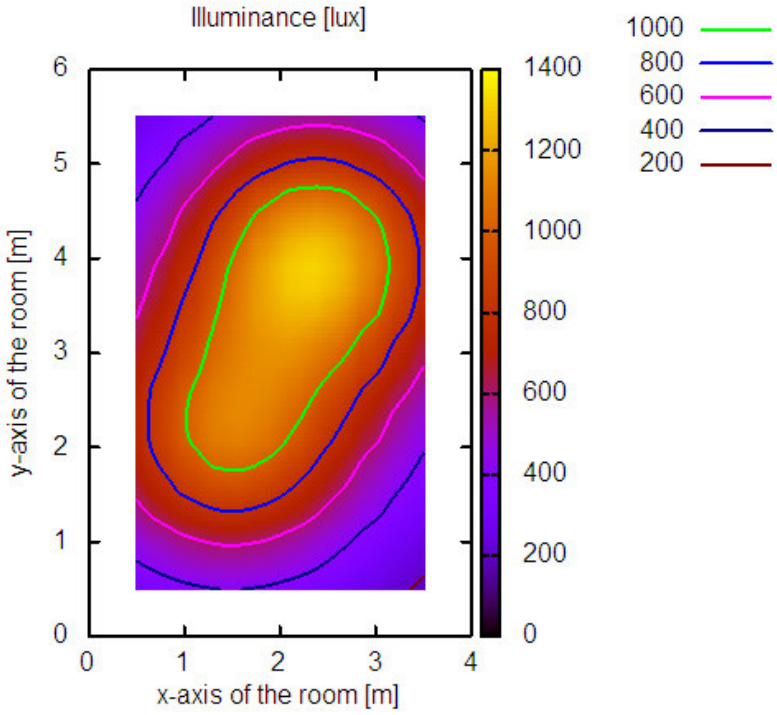
In the case that your illumination data contains simultaneously very high and very low values, you can address the program to show logarithms of the illumination. You can even set the upper-limit of displayed illumination data for each plot type – it can be useful in case of “hot-spots” presence.

An arrow pointing to the North can be added to the plots. It can help by the finding the proper orientation of plots according to the Earth.

If you are not happy with the plots obtained, you can modify them by two ways. The first possibility is to use GNUplot's Options-menu, which can be accessed by clicking the GNUplot's window in the top left corner (after the plot is displayed). In the GNUplot's menu you can switch between Colour- a Black&White- mode and you can also modify the isolines. The second possibility is to write your own GNUplot commands in 'Results/Graph options' dialog, which override the default commands. In the figure above you can find how to change the font size and type in plots. Feel free to change the values. See ‘Help/Optimizing of graphs’ menu item for details.

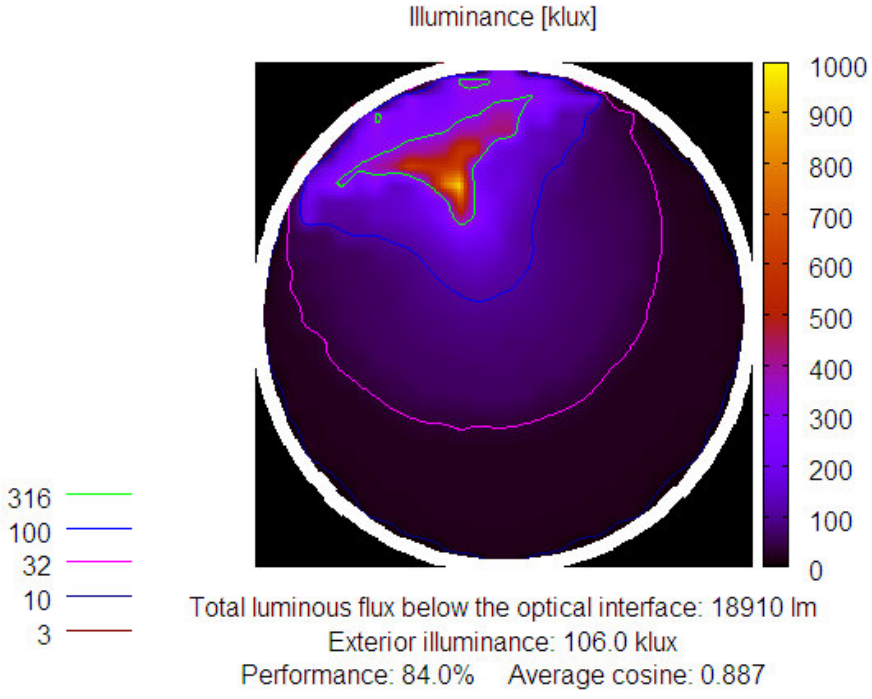
C. Workplane illumination

This plot shows the illumination of the workplane, which is probably the most useful output of the HOLIGILM program.



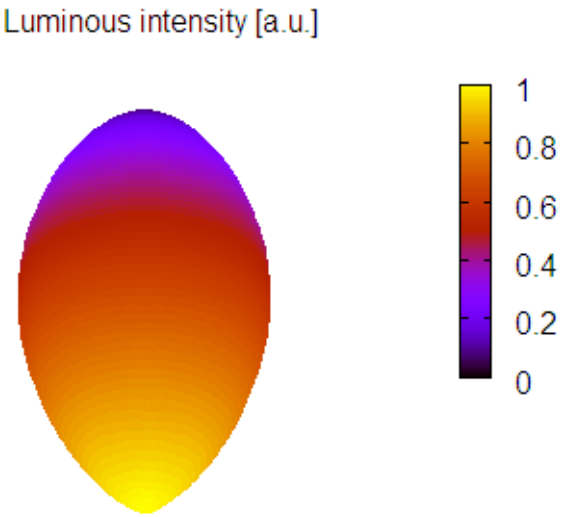
D. Tube illumination

This plot shows the illumination below the optical interface of the selected tube. Very interesting are probably: 1. the total luminous flux produced by the tube, 2. the performance of the tube (which part of the incoming light is delivered to the room) and 3. Asymmetry of the luminance pattern (average cosine value), which all are listed in the figure.



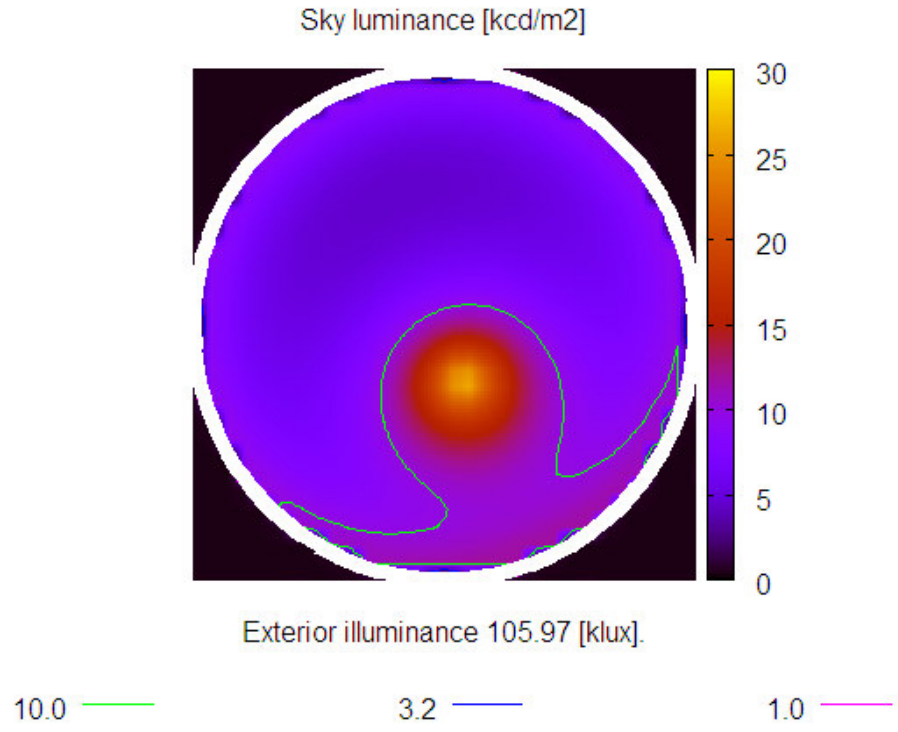
E. Luminous intensity solid

This plot shows the radiative pattern of the selected tube in relative units (normalized to the luminous intensity in the direction of tube axis). In the case the logarithmic scale is selected (see Section 9B), relative values according to the lowest found are displayed.



F. Sky luminance

This plot shows the sky luminance function. The Sun is excluded from this plot to avoid extremely high luminance values from displayed data.



G. Production of quality graphs

For detailed information about working with graphs select the 'Help / Optimizing of graphs' – menu item.

To save your graphs for later use in publications, you have two possibilities:
The first one is to use the GNUplot's menu 'Options/Copy to clipboard'. The graph is then placed into the clipboard and can be pasted (usually using Edit/Paste menu or Ctrl+V shortcut) into any Windows program such as Microsoft Word or Adobe Photoshop, were the plot can be further postprocessed and saved.
The second possibility is to write a copy of the graph directly into the file in one of commonly used formats, such as Graphic Interchange Format (GIF), Portable Network Graphic format (PNG), Windows Metafile format (WMF) or Encapsuled Postscript format (EPS). HOLIGILM uses the GNUplot's capability to write such files, so this export feature is implemented by 'Custom GNUplot commands' in 'Results/Graph settings' menu. You can load any from prepared export command-files. The names of files are self-explaining. 'GIF_FullColour.gpt' produces full-coloured picture in GIF-format, 'EPS_Grayscale_Dashed.gpt' produces grayscale picture with dashed lines in EPS-format and so on.
Please feel free to modify these GNUplot commands and change the filename, picture resolution, linewidth or font type and size, if needed. You can also save your modified commands and use them in the future.
Figures produced by HOLIGILM program can be later postprocessed in suitable graphic programs, such as GIMP or Adobe Photoshop.

H. Using the calculated illumination data

Besides displaying the illumination plots, original calculated data are also available. During solving the problem, following data files are written into the project folder:

- **wrkpl_v4.dat** – illumination of the room
- **tube1_v4.dat – tube10_v4.dat** – illumination below the optical interface of tubes
- **ptrn1_v4.dat – ptrn10_v4.dat** – radiative pattern of tubes
- **luminance.dat** – sky luminance function.

All above mentioned data files are standard text files, where calculated data are stored in readable format (you can view them in any text editor i.e. Notepad) and can be imported into many data-processing programs, i.e. MS EXCEL, Mathematica or Origin. Each data file contains a header, where all parameters (room dimensions, the position of the Sun, parameters of tubes used, calculated total luminous flux below the optical interface, calculated exterior illuminance, …) are stored and can be checked in the future.

10. Setting-up other options

A. Setting-up the font size and size of dialogs

You can change the default font type and font size using 'Option/Font' menu, if needed. The size of the dialog windows is automatically adjusted proportionally to the selected font size.
In the case that your system uses larger default font, texts in dialogs (such as 'Edit/Tube properties') can overlap with entry fields. The solution is to increase slightly the 'zoom'-parameter in the 'Options/Zoom' menu. This parameter controls the size of dialog windows.

B. Setting-up the display aspect ratio

If you are using wide display, the circles in plots displayed on the screen are widened to ellipses. It is very simple way how to correct this. Firstly, change the width and high of the plot window using your mouse to achieve undeformed plot. Then use Gnuplot's menu

'Options/Update...wgnuplot.ini' (this menu can be accessed by clicking the left top corner of the GNUplot's window). GNUplot will remember your settings and will use them in the future.

11. Using the Help

Using Help menu you can display this text, detailed information about working with plots, GNUplot's help or basic information about the program-version and about authors.

12. License

HOLIGILM is freeware. We wrote it with the hope that it will be useful for you. You can use the program free of charge and without time limitations. By installing and using the program you agree with the license below. If you don't agree with the license, please, don't use the program.

If you find the program useful and you will publish results based on HOLIGILM calculations, we ask you to refer our paper(s) mentioned on the web page http://www.holigilm.info in the 'Contact' section.

We will be grateful for any recommendations and tips concerning the program.

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