

Headlamp Safety Performance Rating Software Manual

Overview

For the beginning of the testing phase the Software ships as an executable file named *hspr_VX.Y.exe* (X.Y = Version number). The source code is available at <https://github.com/HSPR-Software/HSPR>. The Software is built and tested on the latest Windows 10 Pro Version with the Version 20H2.

All computations are based on the GTB Recommended Practice.

Instruction for using the HSPR software

After starting the software, you will see the window as shown in Figure 1, the user interface. Next, a step-by-step guide to using the software based on Figure 1 is provided.

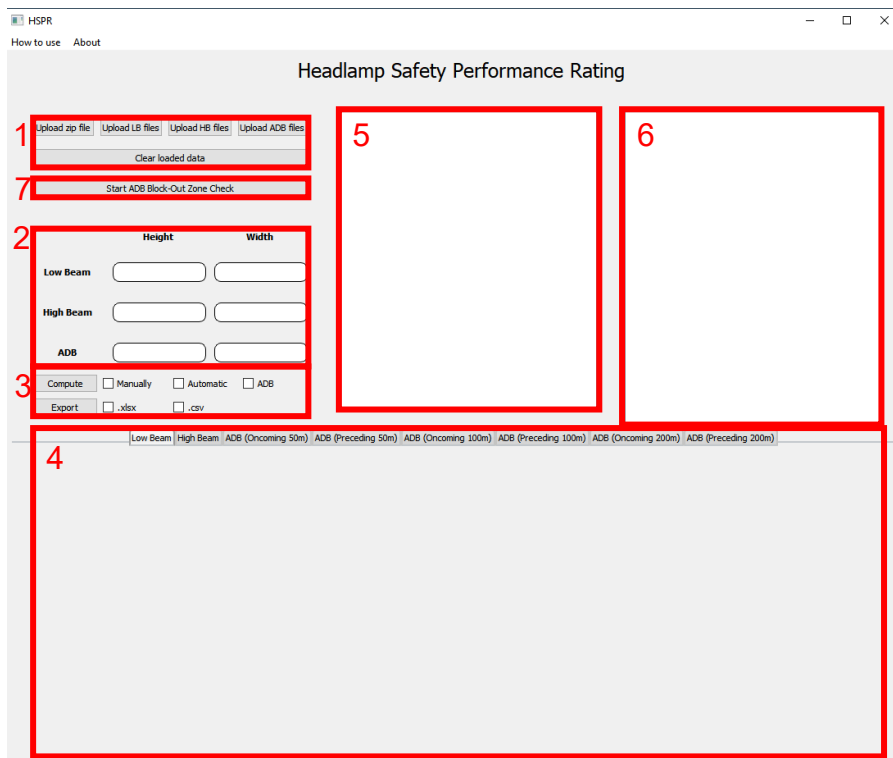


Figure 1 HSPR Software User interface

1 Import data

The software uses as a basis for the calculation a .zip file that contains the IES files of the individual light functions. The Folder structure inside the .zip file is defined as followed:

- LB This folder contains the low beam light distributions.
 - LB_LH.ies This file contains the light intensity distribution for the left low beam module.
 - LB_RH.ies This file contains the light intensity distribution for the right low beam module.
- HB This folder contains the high beam light distributions.
 - HB_LH.ies This file contains the light intensity distribution for the left high beam module.
 - HB_RH.ies This file contains the light distribution for the right high beam module.

- ADB This folder contains 12 IES files in total. Of these, six distributions belong to the left headlamp and six distributions to the right. The naming is defined according to *LinieX_LH.ies* for the left headlamp and *LinieX_RH.ies* for the right headlamp. The definition of each line can be found in the GTB Recommended Practice.

If you have a system with a manually or an automatically operated HB the zip-file only needs to contain the LB and HB folder. For an ADB-headlamp system all three folders are necessary. By pressing "Upload zip file" you can choose a headlamp system which you want to evaluate, simply by selecting the corresponding zip-file. If the system is uploaded, it's indicated by the filepath showing up below the "upload zip file" button".

Alternatively, you can import the .ies files individually. To do this, open a separate window using the "Upload LB files", "Upload HB files" or "Upload ADB files" buttons. In these windows, you can import the required .ies files using "Browse..." or drag & drop and click the "Confirm" button to complete the import.

2 Input parameters for the installation height and width

The mounting parameters of the individual light functions must be entered here. The height is measured from the road surface and the width is defined as the distance of the light functions between the left and right headlamp. The unit is given in meters. Please use a decimal point "." as a separator.

3 Compute Results

Before the calculation, it must be indicated by checking the corresponding box whether the HB is operated manually, automatically or as an ADB. By pressing "Compute" the evaluation of the headlamp system starts, which can also be seen by the evaluation results starting to pop up in the terminal window. When the evaluation is finished (shown by pop-up window) the "visualization of the results" (4) the "overall results" (5) and the "detailed results" (6) will be displayed in the User Interface like shown in Figure 2. Using the Export Button, the results can be saved as .csv or.xlsx file.

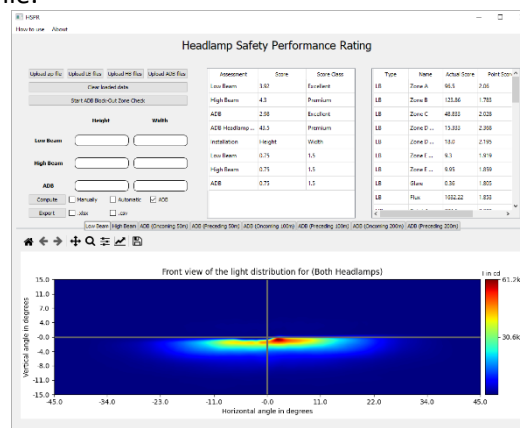
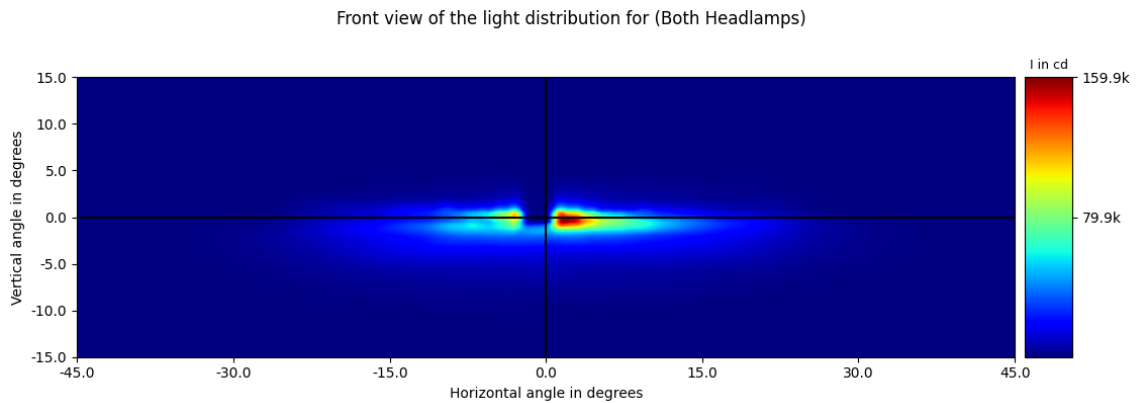


Figure 2 User Interface of the HSPR software after completion of the calculation.

4 Visualization of the results

In the lower part of the software there are different possibilities to visualize the results. The plots show the addition of the individual light distributions for the left and right headlamp on a sphere centered on the vehicle axis. For the ADB plots the radius of the sphere is equal to the distance of the oncoming or preceding vehicle. For the LB and HB distribution a radius of

1000m is chosen to avoid displaying the parallax-effect of both headlamps. Using the save button above the plots it is possible to export and save the visualizations as file. Figure 3 shows an example of the visualization of the ADB light distribution in case of 200m oncoming traffic.



5 Overall Results

This field displays the total score for the evaluated system. The first three rows show the results for the individual lighting functions (LB, HB and ADB) and the last row shows the overall headlamp rating. The rating is displayed as a numerical value (score) along with the corresponding rating (score class). The mounting positions of the individual modules (LB, HB, ADB) are also displayed in this area.

6 Detailed Results

This field displays the intermediate results for the calculation of the total score. The exact definition of the values can be found in the GTB Recommended Practice.

Before a new calculation, please delete the previously read data by clicking on "Clear loaded data".

7 ADB Block-Out Zone Check

With the software version 2.1, an ADB Block-Out Zone Check is introduced, which checks if the shadows for the ADB systems are set correctly in the different situations. To start this check, click on the button "Start ADB Block-Out Zone Check" after loading the ADB files and inputting the mounting position for the ADB module into the software. After the calculation, as shown in Figure 4, a new window opens with the calculated maximum light intensities in the respective light distributions and the maximum light intensities allowed for the left and right headlights. If the fields are highlighted in green, the requirements are met. A red background color indicates that the calculated maximum luminous intensity exceeds the permissible value.

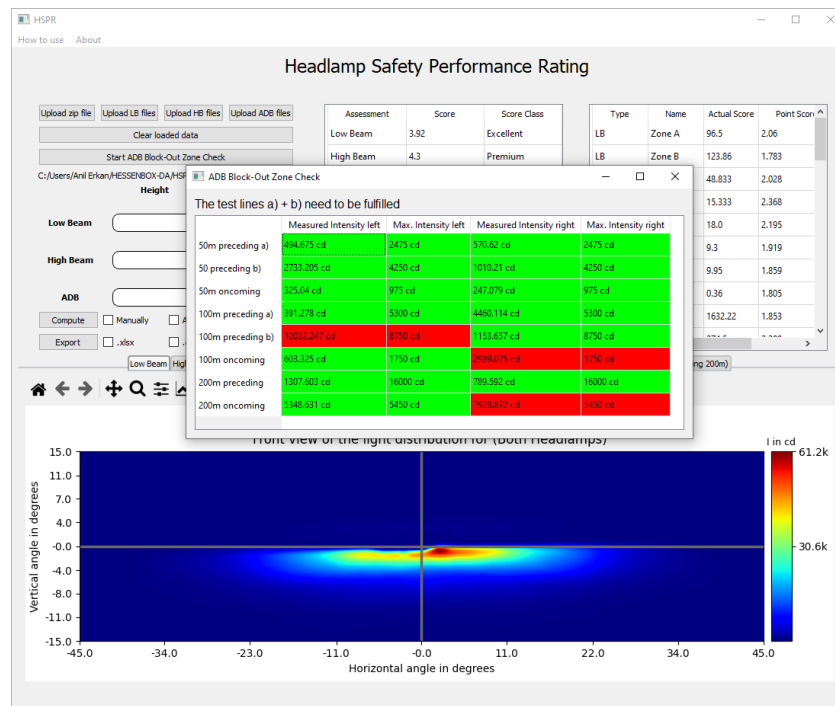


Figure 4 Result of the ADB Block-Out Zone Check.

IES File Format

The resolution of the IES files must be according to the GTB Recommended Practice (<https://www.gtb-lighting.org/wp-content/uploads/2022/07/GTB-Recommended-Practice-for-HSPR.pdf>).

The software has also been tested with other resolutions, but we cannot guarantee the correctness of the results.

An example headlight system is distributed along with the software for better orientation and as a baseline.

Contact

For questions and suggestions, we are gladly available and work continuously on the improvement of the software. You can reach us at the following e-mail address.

E-Mail: hspir-software@lichttechnik.tu-darmstadt.de

Change Log

Here changes in the software as well as in this software manual are documented together with the version number.

Version 1.1:

- adding of input parameters (height, width) to the export function
- fix of a problem which occurred with redundant spacing characters in the ies files

Version 2.0:

- Algorithms update with updated calculation rules (SVP-2021-27)
- Single .ies file upload and possibility to clear loaded data
- Export all results and input parameters
- Pop-up window after finishing calculation
- Include software name and version in filename
- Visibly predefined file format during Export (Excel, CSV)
- Changed position of “How to use” and “About” buttons (buttons in the upper left corner)
- Revision of the manual based on software changes

Version 2.1:

- Included ADB Block-Out Zone Check
- Revision of the manual based on software changes

Version 2.1.1:

- Single IES file upload now supports arbitrary filenames.
- Improved robustness for importing IES files
- Deleted reference to SVP-2021-32 and changed naming from “HSPR recommended practice” to “GTB recommended practice” in the text

FAQ

Frequently asked questions are listed and answered here with each update of the software.

Q.: Why is there an error when reading .ies files?

A.: Various causes can lead to the .ies files not being accepted. The most common causes are extra or missing spaces or line breaks. Please check your .ies files for such formatting.