iMMI

New Version – 2022

Wölfel

What's New in IMMI 30

Updated: 3. November 2022

Table of Contents

Preliminary Remark

The 2022 version of IMMI 30 was created and tested with great care. It meets the official test requirements according to RLS-90, Schall 03, RVS 04.02.11, ISO TR 17534-3 and -4, Directive (EU) 2015/996 (BUB, BUF and BEB), and other regulations.

Nevertheless, the following must be pointed out: Regulations such as those mentioned above are never so strictly formulated that there is no room for interpretation. The further development of a program such as IMMI cannot take place without the possibility of changing calculation results in certain situations and combinations of parameters within this scope.

We therefore recommend following the principle: One project - one program version. We cannot guarantee that exactly the same calculation results will be reproduced in a later recalculation of the project with a newer program version.

Therefore, archiving a project includes archiving the program version of IMMI with which the project was calculated.

1 What's New with IMMI in 2022

1.1 Anniversary Edition IMMI30

To celebrate our 30th anniversary, we decided to release the anniversary edition **IMMI 30**. IMMI 30 is the official name for the 2022 version of IMMI. This version starts with a corresponding start dialog, accompanied by a birthday jingle. If you want to know more about the history and technical innovations of IMMI in the last 30 years, please visit our website: https://www.immi.eu/en/30-years.html .

The anniversary edition also marks the completion of the program interface redesign on all dialog levels.

1.2 New Element library sonROAD18

The element library sonROAD-18 refers to the regulation:

- sonROAD18 – Calculation model for road noise, Empa no. 5214.010948, 2018-07-09
- and further documents such as
- sonROAD18 – further development and additions, Empa no. 5214.019298. 5214.023513, 2020-11-30.
- Road noise calculation model sonROAD18 – Preparation of input data and dispersion calculation, FOEN, 2021 | Umwelt-Wissen Lärm
- Noise Abatement Ordinance (LSV), 814.41, as of July 1, 2021.

The following elements are available:

- SR18: Road traffic according to sonROAD-18
- TUSR: Tunnel according to sonROAD-18

Test Items: The correct calculation according to this set of rules is validated by fulfilling the following test tasks:

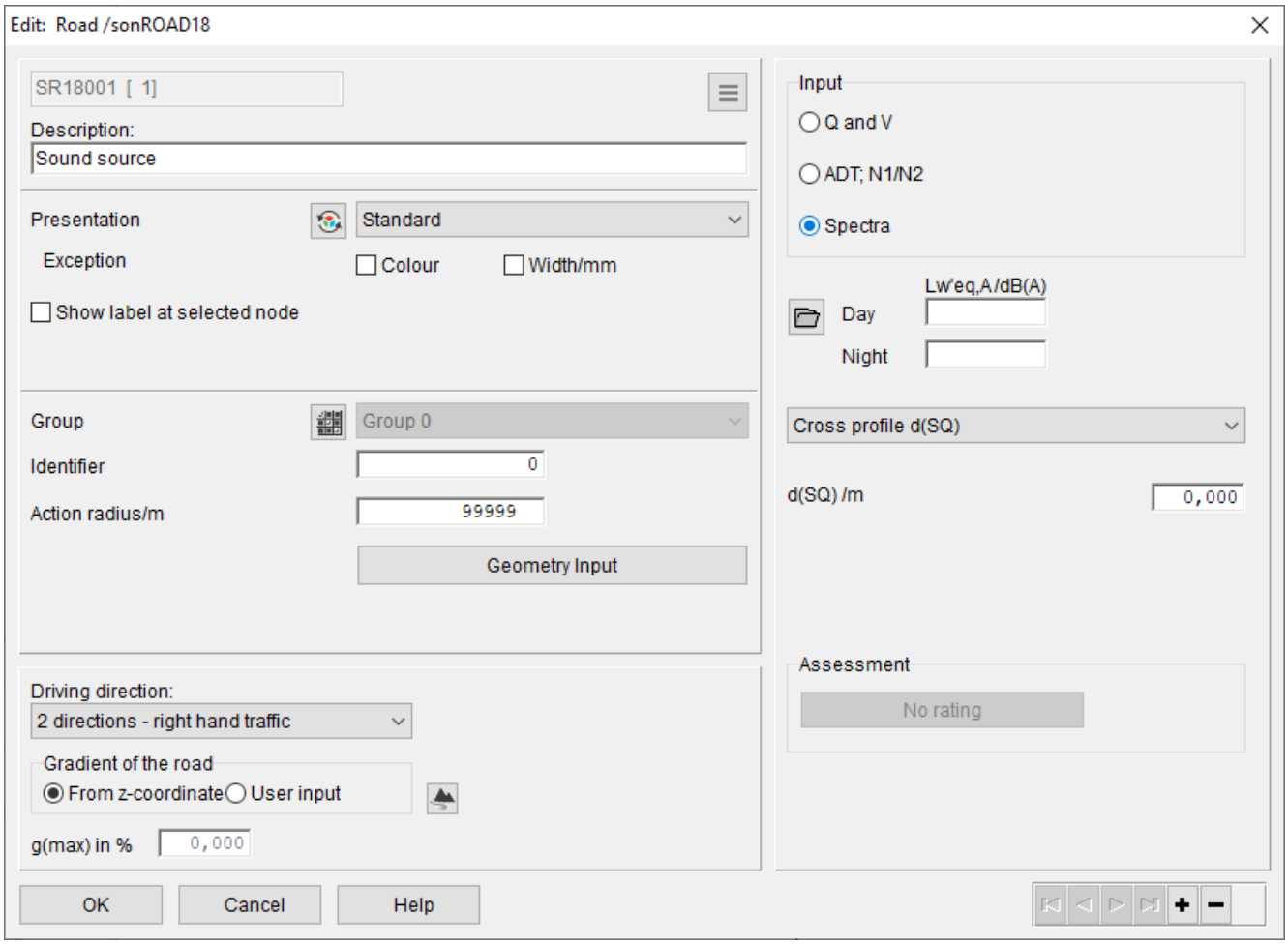
- Test items including dispersion calculation 1 to 6 from "sonROAD18 – Further development and supplements". Published on https://www.bafu.admin.ch/bafu/de/home/themen/laerm/fachinformationen/laermermittlung-und-beurteilung/ermittlung-und-beurteilung-von-strassenverkehrslaerm/ermittlung-und-beurteilung-von-strassenverkehrslaerm-emissionen.html

The declaration of conformity can be found in the internal customer area of our website under *News*.

Note: EMPA provides a web tool that can be used to perform emission calculations according to sonROAD.

Input dialogue SR18 – Road noise according sonROAD-18

In addition to the standard input fields the dialog box also provides specific fields:



- Input: The type of input is determined depending on the emission information available for the road to be modeled
  - Q and V: The input parameters are the number of vehicles per hour and the speed for the different vehicle classes.
  - ADT, N1/N2: This input parameter stands for the average daily traffic volume ADT or the values for N1 and N2. The relevant hourly traffic volumes Q are determined according to the selected traffic volume distribution and the distribution key according to sonROAD-18 for the affected vehicle classes.
  - Spectra: Direct input of the length-related sound power level spectrum.

- Lw'eq,A in dB(A): For the applicable assessment areas or emission variants (e.g. "day", "night"), the length-related sound power level is displayed as a calculated value if the input type is Q and V, ADT, or spectra.

  The associated parameters are entered in a subordinate dialog box, which is opened by clicking the – button. If the values are the same for different periods, they can be copied with "Drag&Drop".
- Standard cross-profile – d(SQ) in m: The following settings can be selected in the cross-section combo box
  - Cross-profile d(SQ): Here, d(SQ) /m can be set directly.
  - Cross-section profile – extended: The position of the emission line, lane width, and, if necessary, the width of a center strip can be specified separately for the left and right sides. The emission proportions must add up to 1.0.

    D(SQ) /m left/right here is the distance of the emission band from the digitized road axis.
    The lane width is calculated without a center strip.
    So the left edge results as lane width (left) + center strip width (left), same for the right side.
    The width data are evaluated for representation in the map content.
- Gradient of the road: Depending on the road's gradient, the regulation provides surcharges to the emission level. Gradients are taken into account in sonROAD-18 with signs so that the direction of travel of all lanes is essential. When defining the gradient, there are two options to choose from:
  - From z-coordinates: The gradient of the road is automatically calculated from the z-coordinates of the element nodes for each section. The gradient for the steepest road section and the corresponding surcharge are displayed in two calculated fields, which are locked for input.
  - A possible problem should be pointed out here: When entering data for very short road sections, small discontinuities in the z-coordinates can lead to steep local gradients, which would act like additional point sources in the calculation. Since such modeling errors are difficult to detect, the slope is regularly checked in the formal review of the project data. The maximum calculated slope and the surcharge are displayed in the fields below g(max) in % and DStg in dB.
  - According to input: For special cases, the gradient for the entire road can be specified directly. The gradient calculated from the z-coordinates is then ignored.
- Note: The limitation of the gradient to a specified absolute value has the following background:
- The formula for calculating the gradient surcharge according to sonROAD-18 does not indicate an upper limit. This means that inaccuracies in the input of the z-coordinates of the road or the terrain model when using relative road coordinates can easily lead to unrealistically high gradient surcharges. This influences calculation results even if only a very short road section with relatively small differences in the z-coordinates is affected. The specification of a limit prevents such phantom gradients.

Note: IMMI will notify you if the slope exceeds 15% (default). This value can be changed under Settings | Environment | Others.

Input dialogue of ADT, N1/N2 or Q and v

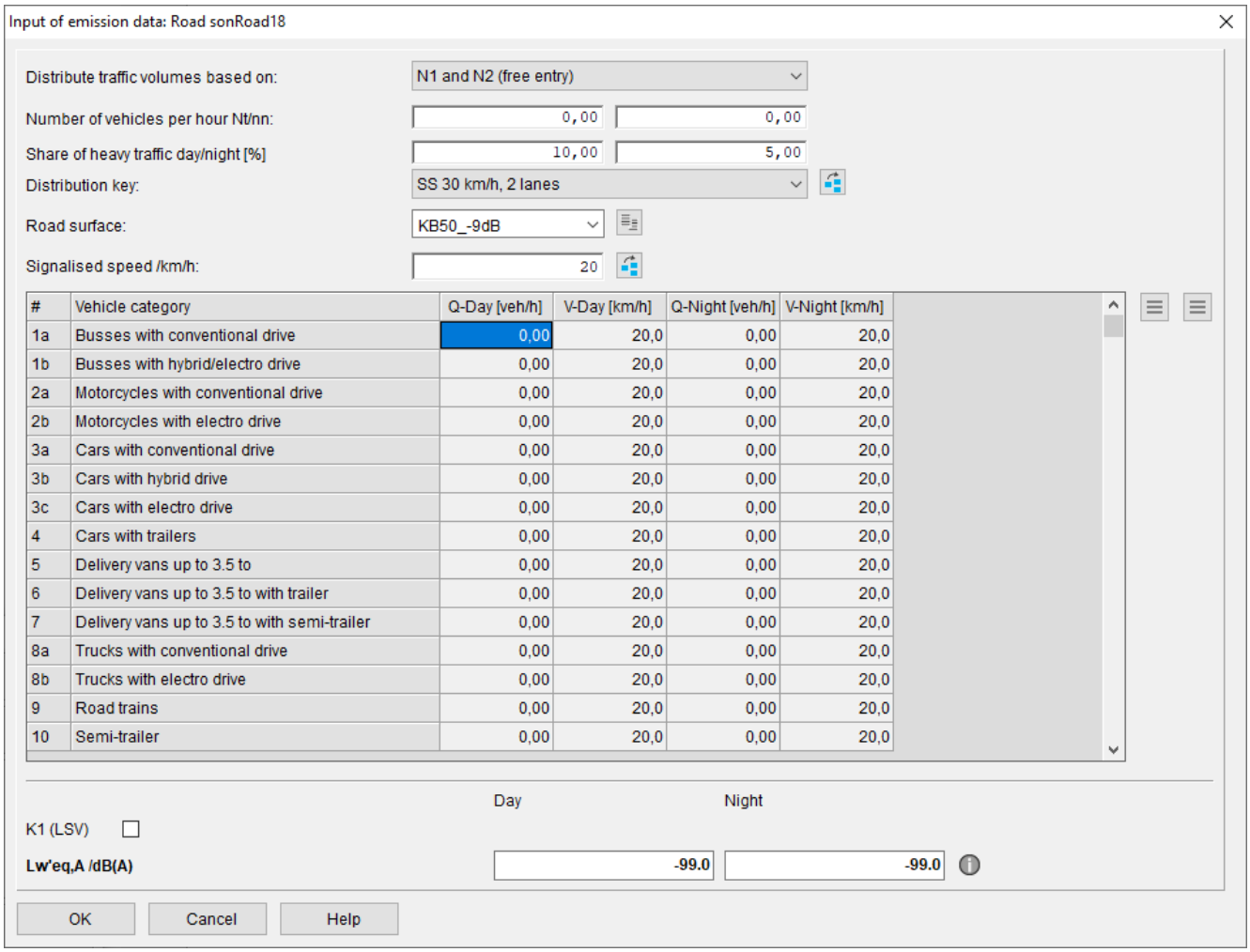
In sonROAD-18 you have 34 vehicle categories:

1a – Busses with conventional drive

1b – Busses with hybrid/electro drive

2a – Motorcycles with conventional drive

…



- Distribute traffic volumes based on: Selection of distribution type: DTV or N1 and N2 (according to LSV) or N1 and N2 (free entry). In addition, the following fields must be filled.
  - ADT in KfZ/day: Average daily traffic density per day (=24h). After leaving the input field, the Q-columns are also filled. The settings for distribution keys are also taken into account.
  - N1 and N2 (according to LSV) or N1 and N2 (free entry): The number of vehicles (N) and the percentage of heavy traffic (pN/%) for day and night must be entered here.
- Distribution key: Selection of the distribution key from the sonROAD18 list. Depending on the selection, the parameters Q of the individual vehicle classes are calculated. If the selection field is changed, the Q columns are also reassigned.
- Road surface: Selection of the road surface from a list. Depending on the selection, this is used for the emission.
- Signalized speed /km/h: Entering the signalized speed
- The Set v button can be used to set the speed either according to the input of the signalized speed or according to the distribution key.
- Q-day/-night in Fz/h: Columns with the determined vehicles per hour for the assessment periods and the vehicle classes. *
- V-day/-night in km/h: Columns with the determined maximum permissible speeds for the assessment periods and the vehicle classes.
- K1 (LSV): This button can be used to include the level correction K1 for motor vehicle noise according to the Noise Abatement Ordinance (LSV). The determined level corrections are also shown individually for each assessment period.

- Lw' in dB(A): Length-related sound power level

* For explanation:
When entering DTV and distribute traffic volumes using: DTV, the Q-values are distributed using Table 4.2 of the EMPA report sonRoad18 - Further developments and additions.
When entering DTV and traffic volume distribution based on: N1 and N2, the Q-values are first divided into N1 and N2 according to the LSV (814.41, as of 1.7.2021), section 33 and then distributed to the individual vehicle classes according to table 4.3 of the EMPA report sonRoad18 - Further developments and additions. The distribution in N1 and N2 is based on Table 4.1 of the aforementioned report.

Via the i-button, detailed lists of intermediate and total results can be generated.

TUSR – Tunnel according sonROAD-18

Detailed information on the tunnel can be found in the chapter TUNb - Tunnel in the IMMI-Online Help.

The new element library, sonRoad18, is purchasable for existing IMMI versions.

1.3 Updates for the element library CNOSSOS-EU resp. BUB, BEB and BUF (Germany)

In the current version described innovations, additions, extensions and changes of the

COMMISSION DELEGATED DIRECTIVE (EU) 2021/1226 of 21 December 2020 amending, for the purposes of adapting to scientific and technical progress, Annex II to Directive 2002/49/EC of the European Parliament and of the Council as regards common noise assessment methods

and the

COMMISSION DIRECTIVE (EU) 2020/367 of 4 March 2020 amending Annex III to Directive 2002/49/EC of the European Parliament and of the Council as regards the establishment of assessment methods for harmful effects of environmental noise

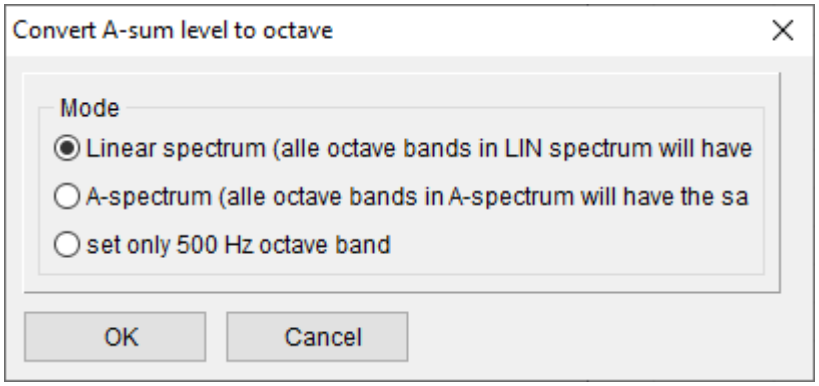
are implemented in IMMI.

Numerous optimizations have been implemented for this purpose, which are listed in the sections below.

1.3.1 Conversion of ISO 9613 industrial sources to CNOSSOS-EU industrial sources

Industrial sources according to ISO 9613 often only address the A-sum level and not the octave spectrum. However, the dispersion calculation according to CNOSSOS-EU requires octave spectra. When converting ISO 9613 sources to CNOSSOS-EU industrial sources, it is now possible to specify how an A-sum level is to be converted to an octave spectrum.

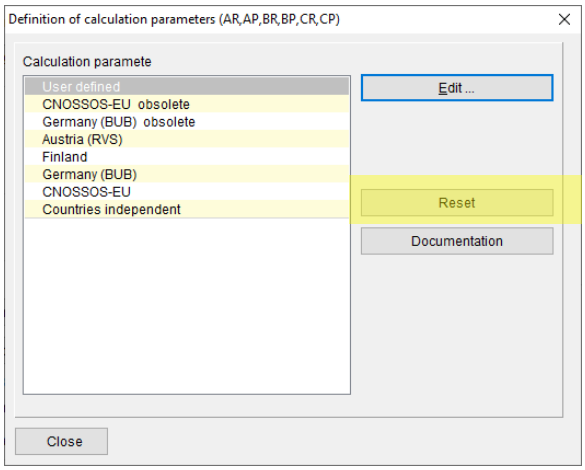
The following options are available:



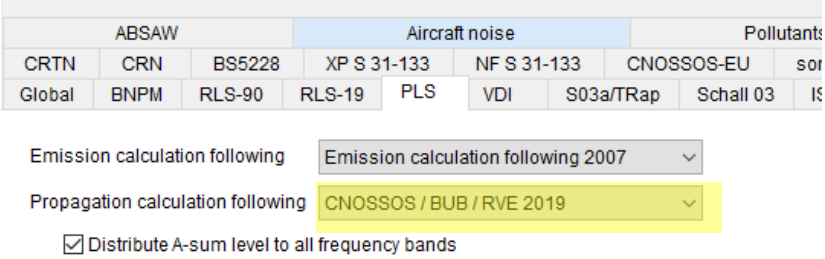
- Linear spectrum: The A-sum level is distributed to an octave-LIN type spectrum in such a way that in the linear spectrum all octave bands get the same level and the A-sum level of this spectrum corresponds to that of the generated spectrum.
- A-spectrum: The A-sum level is distributed across an octave-A type spectrum in such a way that in the A-weighted spectrum all octave bands get the same level and the A-sum level of this spectrum is equal to that of the output spectrum.
- Occupy only 500 Hz octave: The A-sum level plus the amount of A-weighting at 500 Hz (3.2 dB) are inserted into the 500 Hz octave band.

1.3.2 New features for roads according to CNOSSOS-EU or BUB, BEB, BUF (Germany)

- The parameters AR, AP, BR, BP and CR, CP required for the CNOSSOS-EU road calculation are now accessible to the user again via the program. You can change these parameters, but you should do this only in well-founded exceptional cases or for research purposes.
- CNOSSOS Road: The parameters AR, AP BR, BP CR CP are stored in the project. These parameters can now be changed. (see previous point). With a reset button you can return to the original parameters from the regulation again.



- BUB: DTV and share of heavy traffic. When calculating the number of vehicles from the DTV, the share of heavy traffic SV24 can now be specified as a percentage. Depending on this value, the values for light, medium and heavy vehicles are calculated. (See also: LAI notes on noise mapping, Third update in the version of 27.01.2022).
- Calculation of the parking lot noise study according to CNOSSOS-EU. The PLS outputs an A-sum level for the emission of a parking lot. This A-sum level was used in the frequency-dependent calculation according to CNOSSOS-EU for each of the octave bands. However, this is rarely useful. Now it can be selected whether the sum level of the PLS is to be distributed to a spectrum, so that the A-sum level of this spectrum corresponds again to the A-sum level of the PLS. Alternatively, the A-level according to PLS can still be set in each of the octave bands.



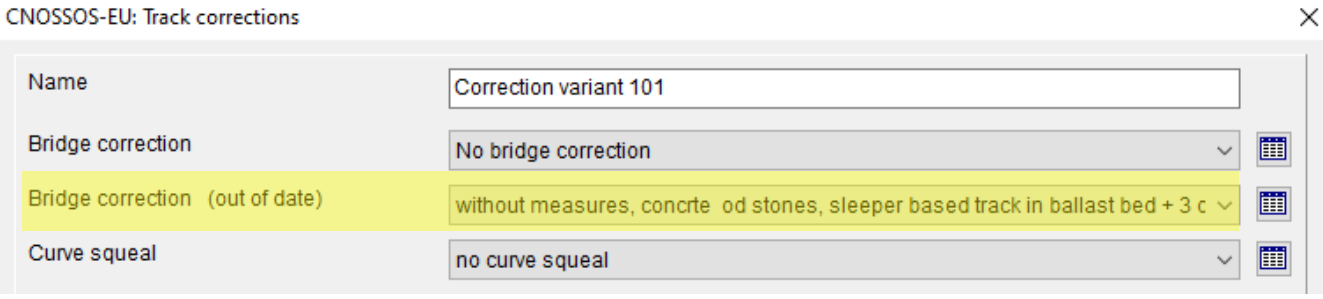
1.3.3 Innovations for rail according to CNOSSOS-EU resp. BUB, BEB, BUF (Germany)

- Database implemented for rail vehicles from Spain, according to the publication:

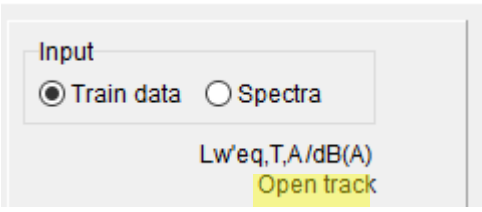
  Guide for the application of the CNOSSOS-EU method in the modeling of noise produced by railway traffic in ADIF and ADIF AV infrastructures

  1ST EDITION: JANUARY 2022

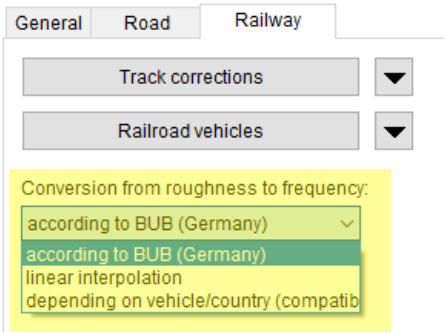
- Bridge surcharge: CNOSSOS-EU 2021/1226 redefined the bridge surcharge for rail vehicles. However, since suitable bridge transfer functions are not yet available for many bridges, the old, simpler bridge surcharge can be used again. It should be noted that only the old OR the new bridge surcharge can be used. A simultaneous use of the old and the new bridge surcharge does not make sense.



- Display of the emission of a CNOSSOS-EU rail element. The emission of a CNOSSOS-EU rail element depends essentially also on the distance surcharges. To take this into account, in the dialog of the rail element the emission is calculated using the line surcharge, which is specified between the first and the second node. If other surcharges are assigned to further sections of the track geometry, the displayed emission is only a rough indication of the emission of the element. The name of the surcharge used for calculation is displayed in the dialog box.



- CNOSSOS rail: For the conversion of ripples into frequencies, the user can now choose from different algorithms.



  - Calculation according to BUB 2021
  - Calculation by linear interpolation
  - As before (here the vehicle decided how to convert. Vehicles according to BUB used the BUB procedure, all others used linear interpolation. For compatibility, this mode still exists.

- Conversion of Schall03 rail vehicles to BUB (CNOSSOS-EU) rail vehicles: The Schall03 rail elements and streetcar elements can be converted including the train data to the BUB (CNOSSOS-EU) rail elements via Change element type.

  Currently, the transfer is performed according to the following table:

Schall 03 - Kategorie	BUB (CNOSSOS-EU) - Kategorie
Kat001 – 1	86 – BUB 3a
Kat002 – 1	88 – BUB 4a
Kat002 – 2	87 – BUB 4
Kat003 – 1	84 – BUB 2a
Kat003 – 2	84
Kat003 – 3	84
Kat004 – 1	82 – BUB 1a
Kat004 – 2	81 – BUB 1
Kat005 – 1	91 – BUB 6
Kat005 – 2	91
Kat006 – 1	89 – BUB 5 – 6 Achsen
Kat006 – 2	89 – BUB 5 – 4 Achsen
Kat006 – 3	89 – BUB 5 – 8 Achsen
Kat006 – 4	89 – BUB 5 – 10 Achsen
Kat006 – 5	89 – BUB 5 – 12 Achsen
Kat007 – 1	97 – BUB 9a
Kat007 – 2	96 – BUB 9
Kat008 – 1	95 – BUB 8a
Kat009 – 1	93 – BUB 7a
Kat009 – 2	92 – BUB 7
Kat010 – 1	99 – BUB 10a
Kat010 – 2	100 – BUB 10b
Kat010 – 3	98 – BUB 10
Kat010 – 4	98
Kat010 – 5	99
Kat010 – 6	99
Kat010 – 7	98
Kat021 – 1	101 – BUB 11
Kat022 – 1	102 – BUB 12
Kat023 – 1	103 – BUB 13
Kat024 – 1	101

  If this default assignment key needs to be adjusted, it can be done via the IMMI.ini file. In the section S03NachSchCnos the links can be adapted.

- Conversion of BUB (CNOSSOS-EU) tram/rail elements to Schall03: The BUB (CNOSSOS-EU) rail elements "Rail / CNOSSOS-EU" can now also be converted including the train data to the Schall03rail elements "Rail / Schall03" and "Tram / Schall03" ("Change element type").

Currently, the transfer is performed according to the following table:

BUB (CNOSSOS-EU) - Kategorie	Schall 03 – Kategorie
81 – BUB 1	Kat004 – 2
82 – BUB 1a	Kat004 – 1
83 – BUB 2	Kat003 – 1
84 – BUB 2a	Kat003 – 1
85 – BUB 3	Kat001 – 1
86 – BUB 3a	Kat001 – 1
87 – BUB 4	Kat002 – 2
88 – BUB 4a	Kat002 – 1
89 – BUB 5 – 4 Achsen	Kat006 – 2
89 – BUB 5 – 6 Achsen	Kat006 – 1
89 – BUB 5 – 8 Achsen	Kat006 – 3
89 – BUB 5 – 10 Achsen	Kat006 – 4
89 – BUB 5 – 12 Achsen	Kat006 – 5
90 – BUB 5a	Kat006 – 5
91 – BUB 6	Kat005 – 1
92 – BUB 7	Kat009 – 2
93 – BUB 7a	Kat009 – 1
94 – BUB 8	Kat008 – 1
95 – BUB 8a	Kat008 – 1
96 – BUB 9	Kat007 – 2
97 – BUB 9a	Kat007 – 1
98 – BUB 10	Kat010 – 3
99 – BUB 10a	Kat010 – 1
100 – BUB 10b	Kat010 – 2
101 – BUB 11	Kat021 – 1
102 – BUB 12	Kat022 – 1
103 – BUB 13	Kat023 – 1

If this default assignment key needs to be adjusted, this can be done via the IMMI.ini file. In the section "SchCnosNachS03s" the links for the streetcars can be adjusted. In the section "SchCnosNachS03n" the links for the trains can be adjusted.

1.3.4 Further innovations and optimizations of the element library CNOSSOS-EU resp. BUB, BEB, BUF (Germany)

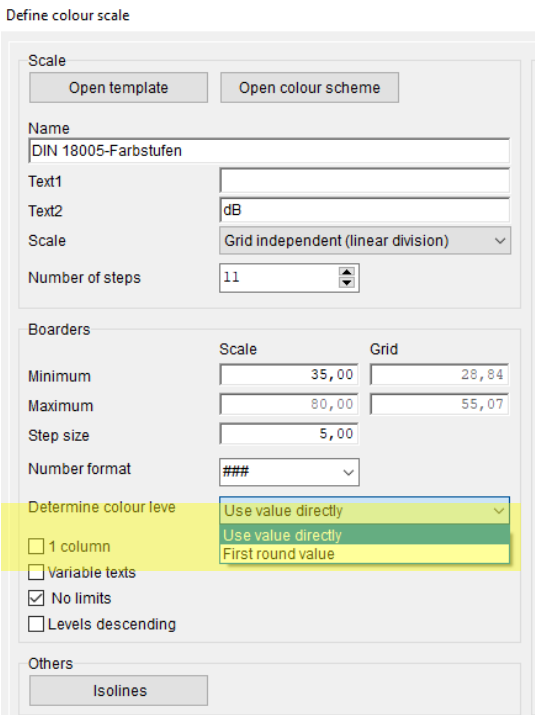
- Adaptation of text of the statistics tables for the façade calculation: The text of the statistics method "C: Load according to CNOSSOS 2021" has been renamed to "C: Load according to median".

  In the statistics tables, the texts were renamed as follows:

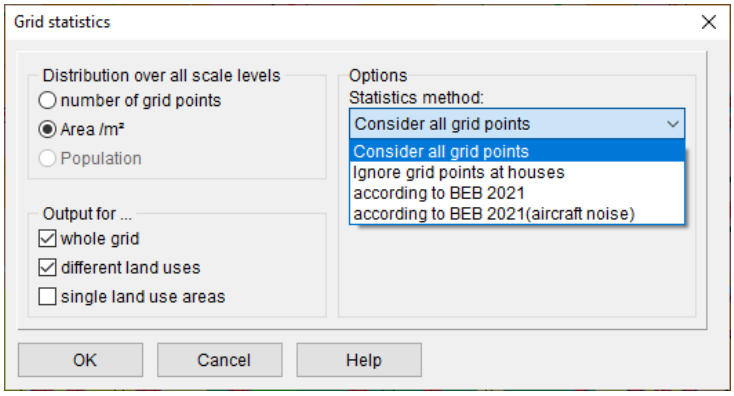
  - "Method END - highest loaded façade is decisive."
    → "A: All dwellers at highest façade-level /END 2002/49/EG)"
  - "Method VBEB - dwellers are distributed proportionally to the façades."
    → "B: Distribute dweller to all façade levels (VBEB)"
  - "Method CNOSSOS 2021 – dwellers are distributed proportionally to the façades."
    → "C: Distribute dweller to upper half of the median of the façade levels (BEB, EU regulation 2021(1226, CNOSSOS-EU)"

- The definition of the color scale has been extended. If the corresponding color is to be determined from a level value, it is now possible to select:

  - Use the level value directly to determine the color.
  - Round the level value according to BEB 2021 and use the rounded value to determine the color

- 

- Sound absorption coefficients of noise barriers according to "LAI Notes on Noise Mapping, Third Version of 01/27/2022, Table 9." have been added. These values can be found in the spectra database "LAI_2022.IRK", which is included in the delivery.
- Grid statistics: Three new functions have been added for the grid statistics.



  - Ignore grid points in houses: Grid points that are located inside a house are not included in the statistics.
  - According to BEB 2021: Grid points that are located inside buildings and for which no calculation of the levels is carried out are assigned the lowest level of the adjacent grid points when determining the area shares.
  - According to BEB 2021 (aircraft noise): Noise mapping according to BUF – Exposure analysis according to BEB: Is now integrated in grid calculus. Important: The following setting must be selected as location parameter: Location of IP according to BEB (2021). Note: In case of complex building geometries, the building center of gravity may be outside the base area. In this case, no analysis could be performed so far. Now, for such cases, the option (Settings | Environment | Calculation dialog) has been added to force the location of the centroid in the building. This function only takes effect if the center of gravity is outside the building. Otherwise, the center of gravity remains unchanged.

1.4 Element library photovoltaics

The element library photovoltaics for the calculation of the glare effect of photovoltaic systems is now also available in the English version of IMMI. The IMMI online help for this has also been fully completed and translated into English. To learn more about the calculation of the glare effect of photovoltaic systems, we recommend watching the recording of the corresponding webinar, which can be accessed via the following link:

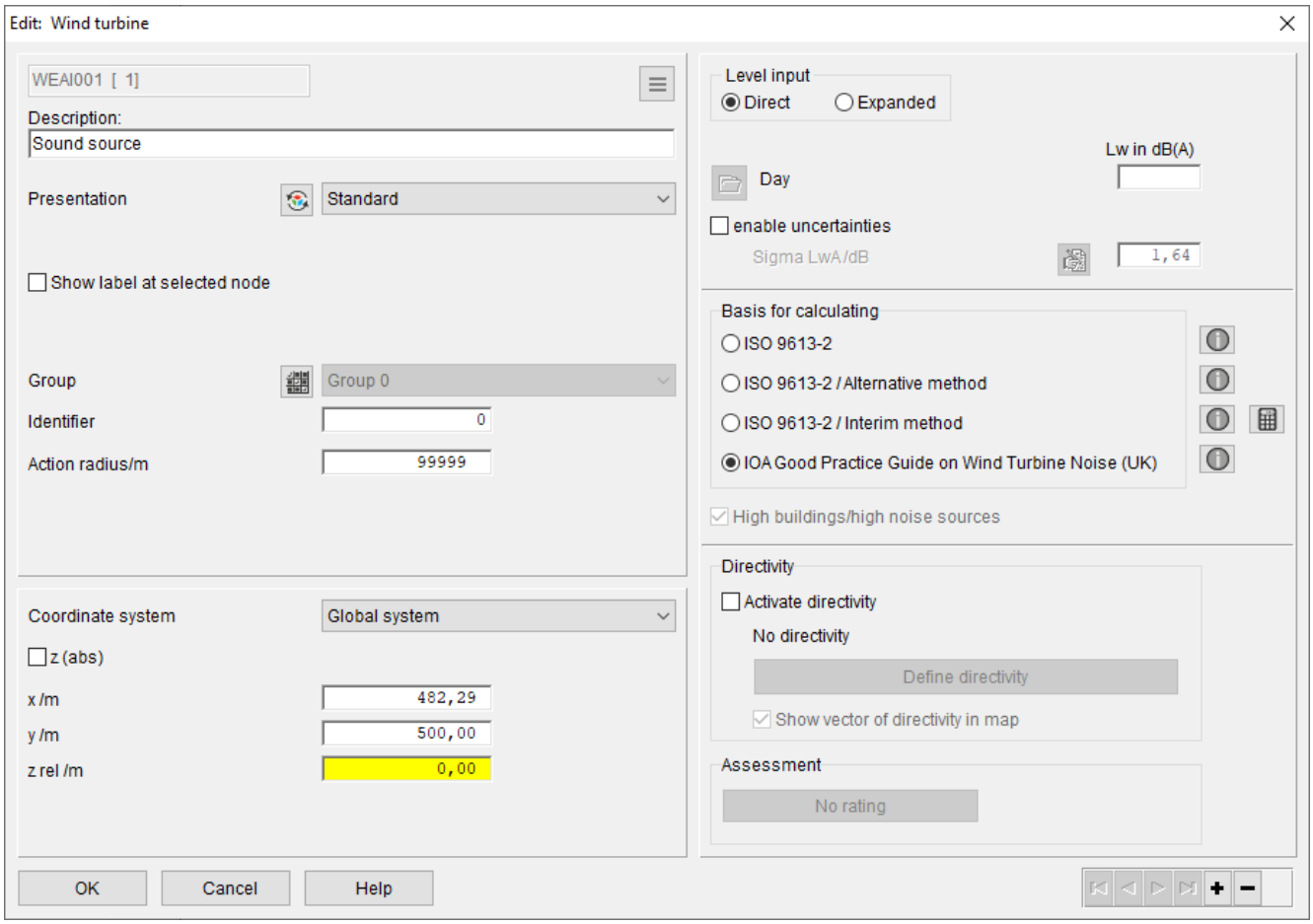
https://attendee.gotowebinar.com/recording/2181234674664457485.

1.5 Wind turbines - regulatory framework for Great Britain

For wind turbines, the procedure according to

A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise from the Institute of Acoustics, United Kingdom of May 2013.

was supplemented. The requirements in section 4.3 of the guide were implemented. In the element of the wind turbine (element library ISO 9613-2), the selection option IOA Good Practice Guide on Wind Turbine Noise (UK) was added under Calculation Basis.



The basis for this calculation method is ISO 9613-2 using octave spectra.

When selecting this method, the following auxiliary conditions are taken into account, which are also displayed via the i-buuton:

- Calculation in octaves
- G=0 or G=0.5

- Cmet =0 dB
- Obstacle effect max. 2dB
- With concave terrain, the immission level increases by 1.5 dB (with G = 0) or 3 dB (with G = 0.5).

1.6 What's New in IMMI since IMMI 2021

1.6.1 New element library for Austria: CNOSSOS-AT for calculation of aircraft noise

On October 15, 2021, the new Austrian code for the calculation of aircraft noise "CNOSSOS-AT - Lärmbewertungsmethoden für den Bereich Fluglärm" (Noise assessment methods for aircraft noise) was published.

This set of rules describes "the procedure for the Austrian implementation of the amendments to Annex II of EU Directive 2002/49/EC with regard to common noise assessment methods for adaptation to scientific and technical progress".

Beyond this scope, this set of rules is also to be used in Austria for approval procedures and investigations to which the AzB 2008 was previously applied. For this reason, the calculation of NAT was additionally integrated here.

This set of rules was implemented in IMMI and is available as a new element library.

Parallel to the creation of this set of rules, a test airfield was also designed. This test airfield corresponds in large parts to the test airfield of the BUF, but the changed atmospheric conditions had to be taken into account and additionally NAT calculations were checked. For 20 selected receiver points these quantities had to be determined: SEL, LD, LN, NAT. In each case, a tolerance of 0.5 dB or 0.5 (NAT) was to be observed. However, maximum deviations of 0.1 dB or 0.1 (NAT) were aimed for. IMMI meets the stricter condition at all receptor points and thus successfully completed the verification procedure.

1.6.2 New macro: Creating high voltage power lines

In order to model noise ("crackling") from corona discharges on high voltage power lines, an auxiliary generation tool is now provided. With this tool the power lines can be modeled as line sound sources. The course of the catenary lines is thereby automatically generated.

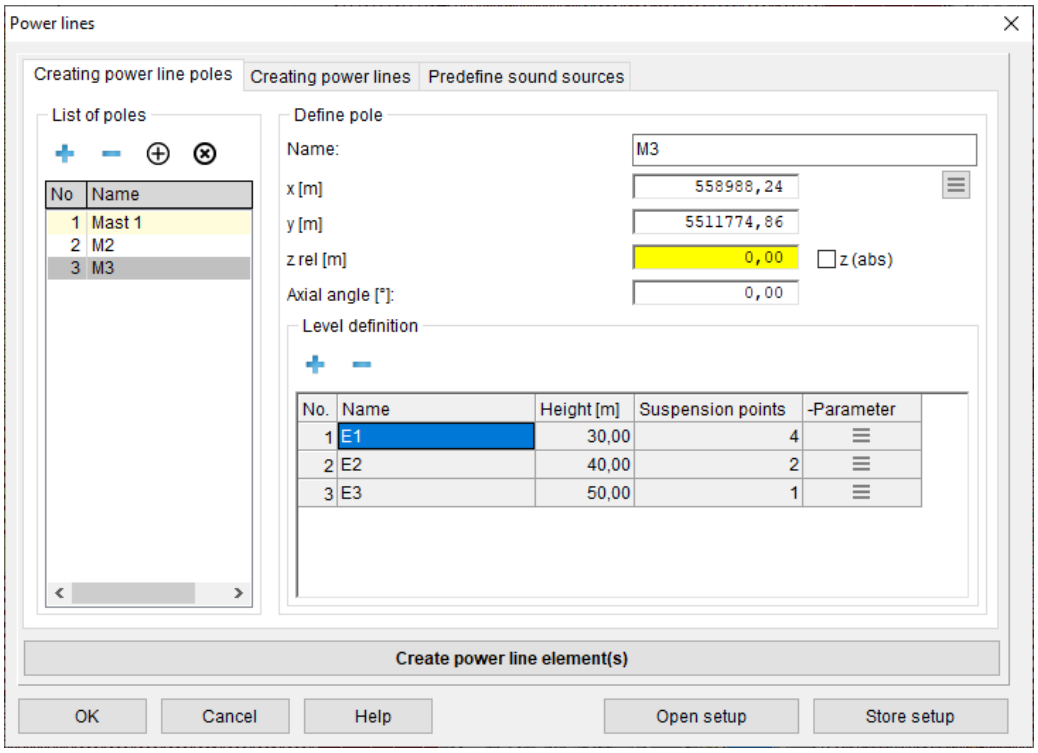
Access the dialog box Power lines via the menu Extras| Generate high voltage power lines. Using this dialog box, electric pols can be generated and the desired high-voltage power lines between the individual poles can be generated and specified. The line sound sources are therefore directly recorded in the site plan and directly available for calculations.

Procedere:

1) Creating power line poles
2) Creating power lines
3) Describing sound sources
4) Create power line element(s)

Tab: Creating power line poles

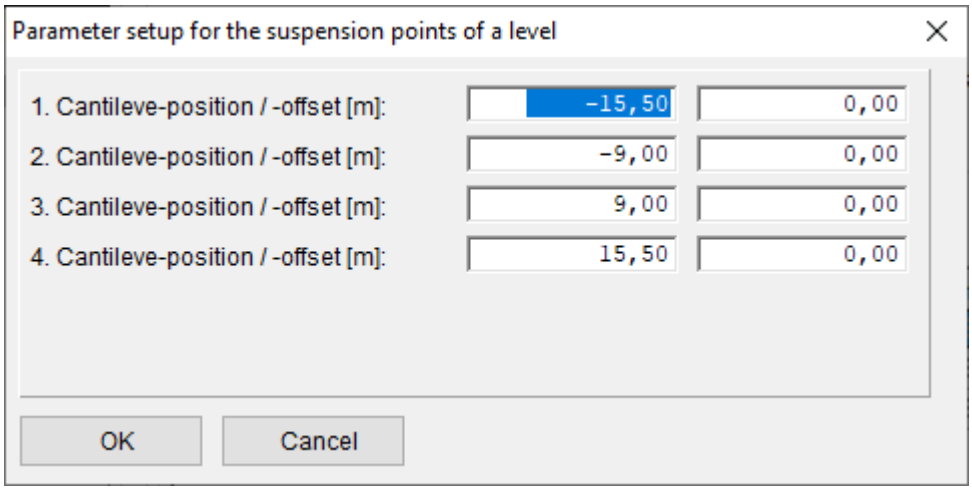
The tab Creating power line poles is used to specify the individual electric poles for the high-voltage power lines. The pole list is to the left.



- The **Add pole** and **Remove last pole** buttons can be used to expand or reduce the pole list. Add further specifications to individual poles under the section Define pole on the right side.
- **Add Remove:** The *Add pole* and *Remove current pole* buttons can be used to insert a pole into the list or remove it from the list.
- A **name** is assigned to each individual pylon via the Name input field.
- Use the input fields **x [m], y [m] and z rel [m]** and the button z (abs), to specify the location of the poles with a coordinate.

Note: The x and y coordinates of a pole can be copied from the map using the popup menu (right mouse button) in the site plan and the Copy coordinates to clipboard function. In the map, move the mouse to the desired location and press the right mouse button.

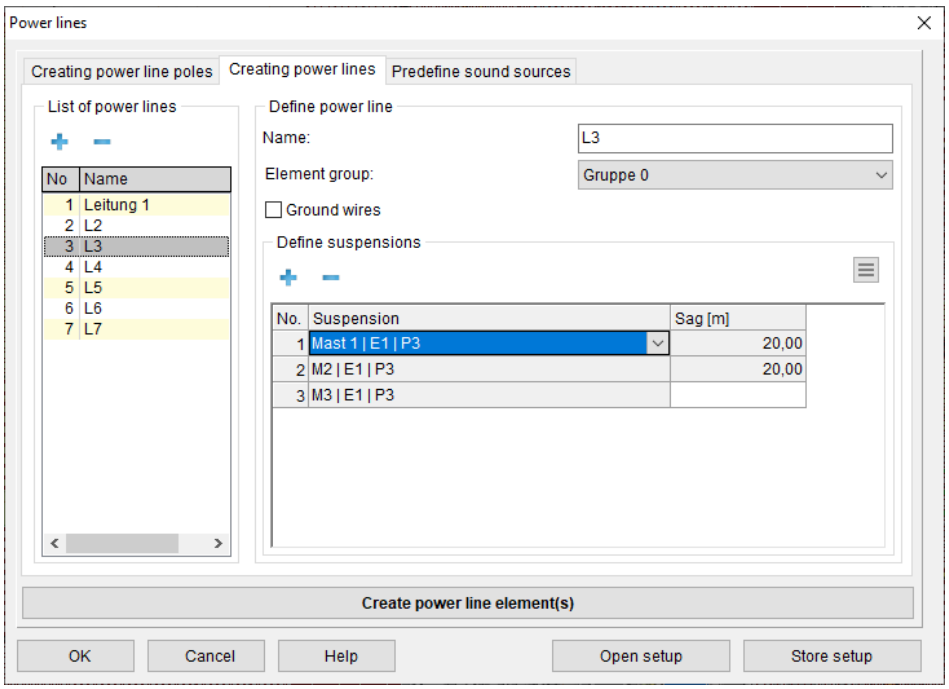
- **Transfer values**: Use the *Other functions* button to apply the following input help functions: Apply levels from predecessor: Here the complete specification of the levels of the predecessor pole is applied to the selected pole. Paste coordinates from clipboard: If the map function Copy coordinates to clipboard has been executed, these coordinates can be transferred to the selected pole with this button.
- The **Axial angle** input field can be used to enter a correction angle counterclockwise. The basic alignment of the poles is automatic, i.e. the current pole is aligned with the next pole and the last pole is aligned with the pole before last. This basic alignment can then be corrected/adjusted via the axis angle.
- The individual levels of the crossarms of the current pole are specified via the **Level definition** input area.
- **Button: Plus Minus**: With the buttons **Add Level** and **Remove Last level** the level list can be extended or reduced again. Each level is specified with the name, the height, the number of suspension points and the suspension point contact point and offset. The **Name** column can be used to specify a name for each level. The **Height [m]** column can be used to assign a height in meters to each level. The Suspension points column is used to specify the number of suspension points for each level. A maximum of 6 suspension points can be assigned per level. The Suspension parameters column provides a further dialog box Parameter setup for the suspension points of a level.



In the Parameter setup for the suspension points of a level dialog box, the cantileve position and offset in meters must be entered for each suspension point of each level. The distance in meters from the center of the pole to the cantileve position is defined via the input field Cantileve position. Negative values are used for cantileve position on the left arm (looking from the current pole in the direction of the next pole) and positive values for the Cantileve position on the right arm. The input field Cantileve position offset defines the distance in meters from the level to the actual Cantileve position with the suspended power line. If the offset is populated with the value zero, the suspension point is defined directly at level height.

Tab: Creating power lines

The tab Creating power lines is used to define the individual high-voltage power lines between the poles. Note: When specifying power lines, in order to be able to add suspensions, poles must be created first (tab: Creating power line poles)!



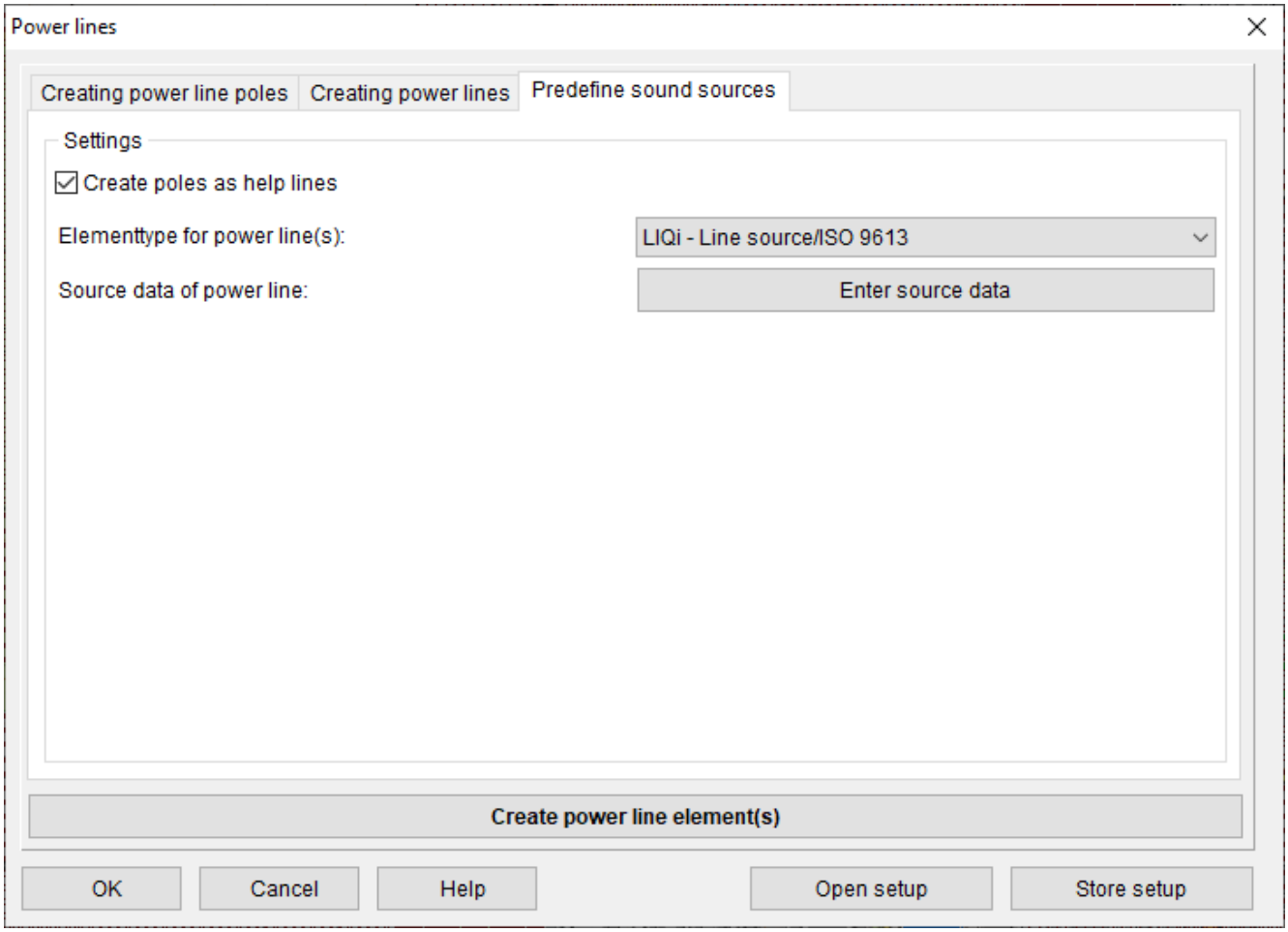
The List of power lines is displayed on the left side. Each individual power line can be routed over several poles, just as the real power lines are routed from pole to pole.

- Button PlusMinus: Use the Add power line and Remove last power line buttons to expand or reduce the power line list. Further specifications to individual power lines can be added under the section Define power lines on the right-hand side of the tab. On the right side of the tab, under Define power lines, each individual power line and its physical course is defined.

- A name is assigned to each individual line via the **Name** input field. This name is then also assigned to the IMMI element when the element is being created.
- The drop-down menu **Element group** is used to assign an element group to each individual power line.
- The button **Power line centerline** can be used to designate a line as a centerline, the so-called ground wire. Such a line centerline is generated as an auxiliary line. Only one power line can be defined as a centerline at a time!
- The Define suspensions area is used to specify the physical course of the power lines over the individual poles.
- **Button: Plus Minus**: The suspension list can be expanded or reduced again using the **Add suspension** and **Remove last suspension** buttons.
- **Button: Transfer values**: To access the **Automatically preset suspensions via first entry** input help function, use the popup menu button. This allows for the pre-setting of the values in the Suspension column with the first entry, which are then automatically applied to the following entries. This avoids the time-consuming one-by-one specification of suspensions.
- The column **Suspension** is selected via a drop-down menu, which lists the pylon, the level and the suspension point. Pylon name, level and suspension point are listed with the separator "|" in between (e.g.: "Pylon 1 | Level 1 | P1").
- The column **Sag [m]** defines the sag between the current suspension point and the next one. For this reason, the last suspension point does not have a Sag input field. Auf der linken Seite wird die Leitungs-Liste angezeigt. Jede einzelne Leitung kann über mehrere Maste geführt werden, wie auch die realen Leitungen von Mast zu Mast geführt werden.

Tab: Predefine sound sources

This tab provides additional parameters for creating power line elements.



- The Create poles as help lines check box can be used to generate the poles that are used to define the power lines as help lines. This makes it easier to visualize the course of the power line.
- The element type for the power line elements is selected via the Element type of power line(s) drop-down menu. The element type LIQi - Line-SQ /ISO 9613 is suggested as the default value.
- Via the button Enter source data the source data of the power line(s) for the selected element type can be initiated. That is to say e.g. the emission values can already be filled in when creating the elements.

Note: The source data are not saved with the configuration file of the dialog box and must therefore always be reset after reopening the dialog box.

Button Create power line element(s)

Via the button every single power line from the power line list is generated as a sound source element and included in the project. The following points are processed:

- Each individual power line in the power line list is created as a separate element in the current project.
- If the function Create poles as help lines is active, each pole, which was selected with the specification of the suspensions, will be generated via help lines.
- A preset element type is created and source data is applied.
- The individual suspension points are determined geometrically via pole, axis angle, level, height, cantileve point and offset.
- The catenary line between two neighboring suspension points is determined via the sag and generated with 16 support points.
- Open and save setup: Using these buttons, all settings of the dialog box can be saved as a configuration settings file and reopened at a later time.

Das Leistungsmerkmal Hochspannungsleitungen generieren ist als Option zum bestehenden IMMI-Version erwerbbar.

1.6.3 Quick change of variant and result layer

A frequently used function is the change of the variant displayed in the site plan. Now the variant can also be changed via the popup menu of the site plan axes. The variants can be changed even faster with the <F7> key. Pressing this key displays the next variant. (<F7> changes to the next variant, <Shift F7> to the previous one).

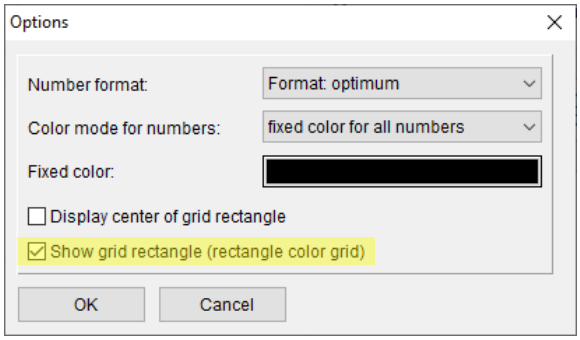
Once a result has been loaded, the desired layer can also be added using the popup menu of the site plan. Shifts can be changed even faster with the <F6> key. By pressing this key, the next variant is displayed. (<F6> changes to the next layer, <Shift F6> to the previous one).

Note: If a *no result* is loaded, the variant can be changed, but not the result layers. Conversely, if a calculation result is loaded, the layers can be changed, but not the variant.

2 Optimizations in IMMI 2022

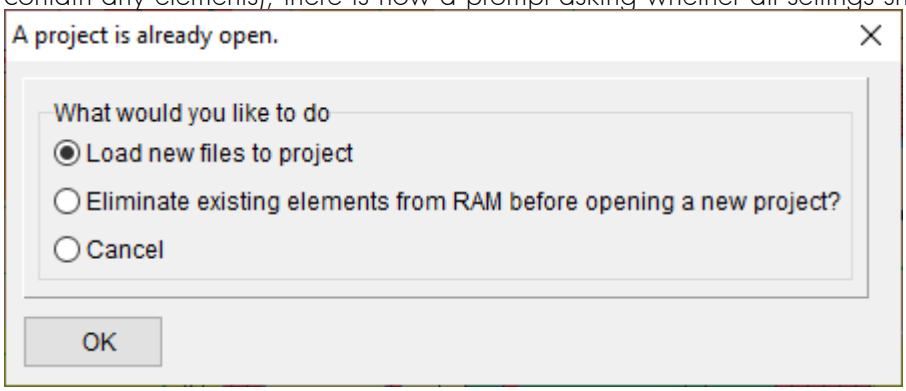
- ArcGIS (Shape)-Export: Rail element SRM II: For the rail element SRM II the values LE in dB(A) (LE_1/_2/_3), the substructure (TC_UB_ID) and the track (TC_TRCK_ID) are now exported as well.
- ArcGIS (Shape) Export: Track element Schall03: The following values for the selection of track surcharges are now exported as well:
  Constant for geometry sections: TC_CONST
  Selection ID from the surcharge list: TC_V_IND
- ArcGIS (Shape) Export - Road element sonROAD18: All 34 vehicle categories are exported now. (Q and V values)
- City GML file (XML) Import: Address transfer (street and house number) is now also supported for partial houses during import. If houses in a cityGML file have been split into parts ("consistsOfBuildingPart"), these can now also be included in the element name with the street and house number information. Several identical building parts will then have one and the same address.

  The address recognition when importing cityGML files has been fundamentally optimized and can now also recognize addresses that do not quite comply with the official format.
- When drawing a color grid in "not interpolated" mode, a black frame can now be drawn around a grid box.



- List of Cnossos rail vehicles. Here the column "Source" was added. This column lists the guideline or publication from which the vehicles are taken.
- From now on only the icon style "cool style 2018" is supported. The selection of different styles is now no longer possible.
- QSI files Import/Export:
  - Tram/Schall03: Tram/Schall03 elements can now be used for a QSI import/export. The format was taken over from the current element Train/Schall03.
  - Tram and train – Schall03:
    The surcharge of the first track section is now also taken into account for a QSI import/export. (TRACK_KEY)
    The parameters of the general track surcharges (constant for geometry sections and surcharge selection) are now also considered for a QSI import/export. (TC_CONST, TC_V_IND)
    The values Lw' for day, evening and night are now also considered for a QSI import/export. (LME_D, LME_E, LME_N)
- Segmented calculation: The whole dialog for the settings of the segmented calculation has been slightly revised. Newly added is the possibility to draw the whole site plan or only the calculation area.

- Before importing data (e.g. Shape, QSI, etc.) into an EMPTY project (a project is empty if it does not contain any elements), there is now a prompt asking whether all settings should be reset or retained.



- Display of the reflection share in the list of reflection shares: The fractions of 2nd and higher order reflections can now be listed in two different ways:
  - Display individually
  - Display summed up

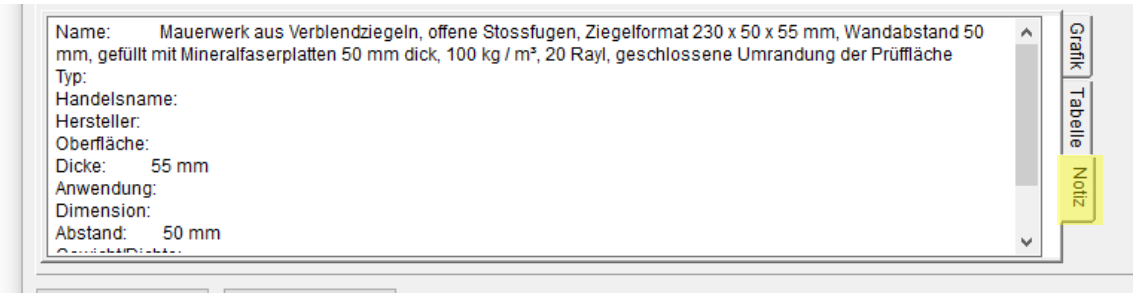
List - Part 1		Point calculation			Separation of partial reflection						
Noise prediction		Rating following: Lden									
Mit Umgehung		Setting: Reference setting: RLS-19									
		Day (12h)					Evening (4h)				
		Direct	1st order	> 1st orde	Total	Delta 2...	Direct	1st order	> 1st orde	Total	Delta 2...
		/dB	/dB	/dB	/dB	/dB	/dB	/dB	/dB	/dB	/dB
IPkt001	IP1	60	63	59	66	2	60	63	59	66	2
IPkt002	IP2	60	55	48	62	1	60	55	48	62	1
IPkt003	IP3	67	62	20	68	1	67	62	20	68	1
IPkt004	IP4	59	60	51	63	1	59	60	51	63	1
IPkt005	IP5	72	69	59	74	1	72	69	59	74	1

Table: Reflection components are shown individually

List - Part 1		Point calculation			Separation of partial reflection						
Noise prediction		Rating following: Lden									
Mit Umgehung		Setting: Reference setting: RLS-19									
		Day (12h)					Evening (4h)				
		Lrefl 0	Lrefl 0+1	Lr,A	delta 1	delta 2	Lrefl 0	Lrefl 0+1	Lr,A	delta 1	delta 2
		/dB	/dB	/dB	/dB	/dB	/dB	/dB	/dB	/dB	/dB
IPkt001	IP1	60	65	66	5	2	60	65	66	5	2
IPkt002	IP2	60	61	62	2	1	60	61	62	2	1
IPkt003	IP3	67	68	68	2	1	67	68	68	2	1
IPkt004	IP4	59	62	63	4	1	59	62	63	4	1
IPkt005	IP5	72	73	74	2	1	72	73	74	2	1

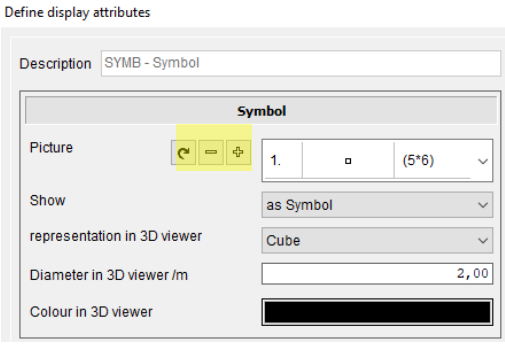
Table: direct sound, direct sound + 1st order reflection component, and direct sound + 1st order + higher orders added up

- In the dialogs of the spectra databases, the note for the spectrum can now also be displayed directly.

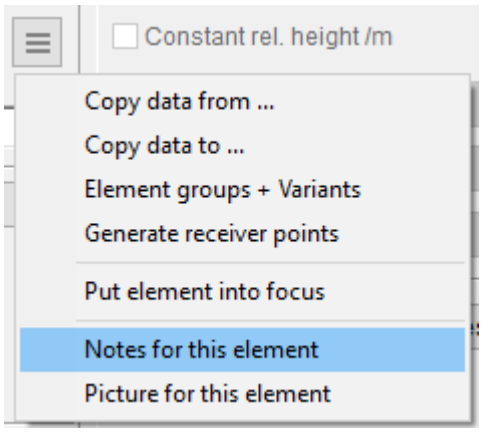


- CNOSSOS distance surcharges. The always existing entry "Free Distance" can now also be edited (but not deleted).
- For the "Track" element (independent of the library), another display mode can now be selected. Selection: "Railroad new" in the dialog of the character attributes.

- New macro function for a usage area: If buildings are located within a usage area, a number of inhabitants can be distributed to these buildings according to the volumes of the individual buildings.
- Element representation for point elements. When a project is loaded, the possible symbols that can be used to represent a point-shaped element in the site plan are also loaded. Symbols, which a newer IMMI version brings along, are not offered then for the selection. This can now be achieved by adding the standard symbols of the current IMMI version to the list of symbols. User defined symbols will be lost though.



- Construction aids are now also displayed in the measuring mode  .
- All element dialogs now have a menu button. This is located on the right edge of the left half of the dialog boxes.



The functions "Note for this element" and "Picture for this element" can now be accessed via this menu button.

- Calculation of contour surfaces: The dialog has been made a bit clearer. The progress bar has been integrated into the dialog, a separate dialog showing the progress of the calculation has been omitted.
- Room acoustics, sound particle count. Up to now, the required number of sound particles was estimated using the volume of the room. For larger halls, however, the number of particles was estimated too large, which led to unnecessarily long calculation times. Now the number of particles is limited to 360*180=64800.
  In addition, an upper limit for the number of sound particles can also be specified by the user via Settings/Environment/Calculation.
- The "Calculation/AUDINOM" function is no longer supported. Use the functions for this purpose:
  - Multicore
  - ACR and
  - Segmented calculation

  All these functions can be combined with each other.

3 Corrections in IMMI 2022

- BUF – Segmentation: If the segmentation of a flight route on the runway is not possible, the current aircraft class of this flight route was skipped so far. Now the segmentation of the flight route will be performed even if there are no contributions from the taxiway.
- RLS-19 – Import/Set of "Maximum allowed speed for motorcycles in km/h...": The maximum allowed speed for motorcycles in km/h was limited to 100 km/h when importing or setting via block function. This error has been corrected.

3.1 Corrections since IMMI 2021

- Negative detour display: The "Negative detour for terrain grid" display was no longer accessible. The last setting made was evaluated correctly during the calculation, but could not be changed by the user. The switch can now be selected again.
- Reflections on house roof: In the case of reflections on the gable ends of house roofs, it could happen that the reflecting side – always the outward-facing gable end – was not correctly set. As a result, incorrect reflections were sometimes calculated on the house roof. This has now been corrected.
- Segmented grid calculation: If a grid was calculated in segments that were not defined over the entire site plan, the overhang around the area to be calculated was calculated too small at the left, right, upper and lower edges of the grid. This could cause discontinuities in the grid map. This problem is now fixed.
- Line sources in the long list: When displaying the results of line sources in the long list, they were not numbered correctly. The display of the results was correct, only the sequence number of the section was wrong. The display is now correct.
- Display of element name: If the name of an element was displayed parallel to a geometry section, in some cases the position of the name was not calculated correctly. The name was then not in the desired position. This has now been corrected.
- Library Nordic Road: The calculation of the distance dimension LAV when using LAFMax was not correct. Now the correct value is used.
- Lists: When saving an entry in a list and then loading it back into another project, it could happen that the assignment key that uniquely identifies an entry was assigned more than once. As a result, a unique assignment of the list entry was no longer possible. This can now no longer happen.
- SRM II: Road surface: The list of road surfaces can be extended by the user. In the element dialog box of the roads these new entries can also be selected. However, when using the block function, only the hardwired road pavements were selectable. This has now been corrected.
- Sound sources at the house: Here it could come to incorrect assignments of the element key. When calculating, an error message was then output that element keys were duplicated. This problem has been fixed.
- Color scale button: In the toolbox, the color scale button was not displayed in some situations. This button now works again.
- In the geometry dialog box of point-shaped elements (e.g. receiver point, point sound sources) a drop-down menu for selecting a coordinate system was displayed. However, this option was no longer supported. This drop-down menu is now no longer visible.
- CNOSSOS-EU: Railway vehicles: If a parameter selection was changed for a user-defined CNOSSOS railway vehicle, these changes were not applied to the vehicles that had already been assigned to a train. In order for the change to take effect for such vehicles, it was previously necessary to remove the vehicle from the train and add it again. This is now no longer necessary. As soon as a parameter is changed, this change is immediately applied to all vehicles.

- CNOSSOS-EU: Line surcharges for railway elements: The assignment of line surcharges to the geometry of a CNOSSOS railway element was incorrectly saved in such a way that when line surcharges were reordered in the surcharge list, the surcharges in the rail element were changed. As long as the order of the surcharges in the surcharge list was not changed, no problem occurred. This error is now corrected.
- CNOSSOS-EU: The reflection criterion, which prevents reflections from occurring on reflectors that are too small, is now activated.
- Element group list: Deleting an element group could cause a crash. The problem has been fixed.
- Room acoustics module: If a figure is close to a wall, the absorbing effect of the side facing the wall is not considered. In some cases this situation was not correctly detected and the side was still added to the total absorption of the room.
- The file: CnossosRailRoad.txt is no longer needed in the current version.
- Calculation JDTV (Austria): For the road type "Gathering and residential roads" KL=0.099 was used for the parameter. However, the correct value is KL=0.0099. The value has been corrected.
- Sound sources at the house: The function caused problems if a license did not contain the option "ISO 9613". Especially the use of non-frequency dependent area sound sources caused crashes. This is now fixed.
- Sound sources at the house: The function caused problems if a license did not contain the option "ISO 9613". In particular, the use of non-frequency-dependent area sound sources led to crashes. This is now fixed.

  To use this function, there must be at least one library that provides frequency-dependent area sound sources.
- Bridge Element: If a project contained one or more bridge elements, it could cause crashes at the end of the program. This was annoying, even if no data loss was to be feared. This problem has been fixed.
- Special colour for individual elements: If a special colour was set for a single area element (e.g. house, area source), the fill mode was erroneously set to "completely filled". This overwrote the fill pattern that had been set. Now the fill pattern is left unchanged. Only the border colour will be adjusted. If a fill pattern consisting of lines is used, the colour of these lines will also be adjusted to the input.
- RLS-19: Transverse profile: If the extended transverse profile was activated for RLS-19 roads, the parameters of the right side were also taken for the left side of the road. The transverse profile was therefore always symmetrical. This has now been corrected.
- RLS-19 - Reflection criterion: In the current meeting of the "Expert Group Quality Assurance in Sound Propagation (ExQS)", a working group of the NALS Advisory Board Special Committee (NA 001 BR-02 SO), the implementation of the reflection criterion of RLS-19 (Section 3.6) was addressed. It was noted that an additional test task to check the implementation of the criterion for the (as yet unpublished) DIN/TR 8999-1 is required, which should in particular close the interpretation gaps when second-order reflections are taken into account. Together with the other software manufacturers and on the basis of the agreements reached, IMMI has already changed and adapted the implementation of the reflection criterion of RLS-19 in the current update before the publication of this official test task. This may - in some cases - lead to deviations in the results compared to previous versions. We therefore recommend all IMMI users to use only IMMI version 2021 Update 01 for calculations according to RLS-19 with immediate effect. All customers who have RLS-19 in their licence have been informed in advance by e-mail.

- RLS19: Input DTV, speeds, switch v! not activated: When entering the speed for passenger cars for the respective assessment period, the entered speed was transferred to the vehicle categories light and heavy trucks. Depending on the road category, a manual adjustment of the speed for light and heavy trucks must be carried out according to RLS-19. If this did not happen - in individual cases - an incorrect speed was calculated. However, this was also evident from the list of input data.

  Input M,p, speed, switch v! set: For the input of speeds per vehicle class, the entered speed for light and heavy trucks could be overwritten when the dialogue was opened again for speeds >90 km/h for passenger cars. However, this was directly visible in the dialogue.

  The button v! was removed in update 01 and replaced by an i-button, which provides information on which speed is to be used for light and heavy trucks according to the specifications of RLS-19.

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- Messungen der Schallemissionen von Windenergieanlagen
- universelle Mess-Systeme für Schall und Erschütterungen
- Lärmschutzgutachten und Schadstoffprognosen
- dynamische Insassen-Simulationen im Automobil und im Flugzeug
- und viele weitere branchenspezifische Wölfel-Lösungen …

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