

# IMMI



## Revisions & Amendments



# IMMI 2009

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# 1 IMMI 2009 – The Calculation Control Center and other New Features

## 1.1 General Information

### Version name

The first new feature that catches the eye is the version name. We decided to adopt a new procedure here: from now, the version name is always tied to the current date. The former numbering was rather arbitrary. The discussion whether the next version should be called X.3.7 or X.4.0 was onerous for us, and the result not very meaningful for the customer.

### Development targets

In recent years, noise mapping pursuant to the EU directive was of primary importance for many of our customers. The IMMI development also reflected this priority. Some of the new functions intended in a first step to make the calculation of big projects possible at all, followed by a reduction of editing time as a second step.

Last year, we defined other development targets.

Our special focus was on the **optimized editing of smaller projects**. A lot of thought went into this. We took up users' suggestions, developed new concepts and abandoned them again.

The final result of our endeavors is a concept and central component in IMMI; our marketing department named it "**Calculation Control Center**" or CCC.

From the point of view of program engineering, the **Calculation Control Center** is a dialogue that combines all the actions involved in the execution of calculations and editing of calculation results. Furthermore, all these actions have been thoroughly re-designed.

The former "Calculate" menu still exists but is now only used to call up control functions and start the new dialog. The "Grid" menu is no longer to be found in the main menu but integrated in the CCC menus.

With the implementation of the new concept, we reached several targets:

- **Centralization of different calculation types**  
The different calculation types "Calculate receiver points", "Calculate

façades" and "Calculate grid" are treated as uniformly as possible to make the program even easier to use, also for those customers who are not yet very familiar with it.

- **Faster editing**

The centralization of all functions involved in the execution of a calculation significantly reduces the number of necessary key operations or mouse clicks.

- **Extended job lists, faster availability of results**

Linking the “normal” (single) calculation to a job list that optionally runs parallel to the calculation has many advantages:

- several jobs may be calculated without interruption, also using different calculation types
- jobs for calculating several variants (not only in point calculation) may be generated in one single step
- editing calculations without having to re-load them explicitly
- archiving and documentation options
- with a mouse click, results from the calculation of several variants can be shown directly next to each other
- get a quick, direct overview of calculation results in a simple “Express list”.

- **Extension of the information basis**

The Long lists been redesigned completely. Backed up by a database, they now provide much more information.

- The data has been prepared to ensure that it can be taken over into Excel in a meaningful arrangement.
- IMMI permits flexible output of the lists.

Users may select the columns they want to see, arrange them to their taste, save them as layout and reuse them later.

- **Fast, direct access to calculation results from anywhere**

This should be good news for power users!

Some concrete options:

- Click the name of a reception point in the Short list: now, chose whether you want to see the respective element dialogue, the Mid-size list or the Long list
- In the Mid-size list:  
Click on the name of a sound source: Select
  - display of the element dialogue, or

- display of the section from the Long list, or
- graphic display of the profile under the sound beam between source and reception point!
- This is also available in the Map if point results are shown there:  
Click on a reception point: Select between indication of element dialogue, Short, Mid size, or Long list - including all configuration options of the lists.

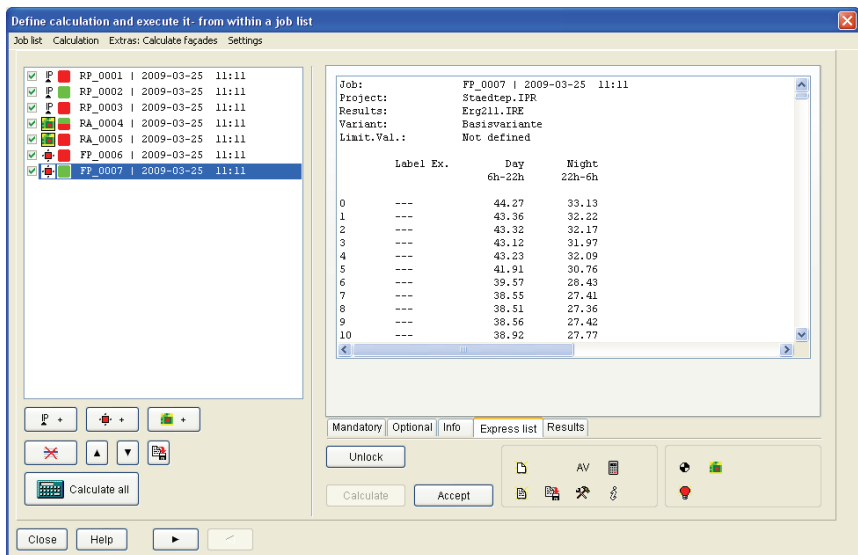
## 1.2 The Dual Format of the Calculation Dialogue

To provide the best possible support for different working methods and project requirements, the calculation dialogue has two formats. To switch formats, you need one single command.

### Dialogue with job list

When extended and folded open, the dialogue has two main windows:

The list of calculation jobs - called “jobs” in the following – is shown in the left window.



The right window contains several pages of dialogue for defining point, façade, and grid calculation and for editing calculation results.

In both formats, the dialogue has a main menu. Its extent adapts to the respective situation so that you can call up functions either via the menu or via checkboxes, which is usually the faster alternative. A submenu for the job list comprises additional functions. This submenu is enabled by clicking the right mouse key in the list area.

The figure shows a concrete example:

The job list comprises 3 receiver calculations, 1 façade calculation, and one grid calculation.

The façade calculation is already completed (shown in green button).

The cursor is on the first receiver calculation, the data of which is shown in the window on the right:

Job name and result file are created automatically. We recommend that the user overwrites the specified job and result file names with individual designations.



### **Calculation results are generally saved – at least temporarily!**

If the suggested name for the file with the calculation results is not changed, the data will be saved to a temporary directory. In this case, its status is not “Saved” but “Saved temporarily”. Unless you save these results to a regular directory when prompted, they will be deleted when you quit the IMMI program.


But for the duration of your current session, they remain intact and readily accessible!

### **Dialogue without job list**

In the reduced format intended for single calculations, the window for the job list is not shown. Instead, use the 3 checkboxes vertically arranged in the left margin to select the desired calculation type.

Switch between the formats with the help of the checkboxes  (Reduce dialogue) and  (Extend dialogue) or the respective functions of the “Job list” menu.

## **1.3 The Job List Dialogue**

Start this format with the command “Calculation Control Center (CCC)...” in the “Calculate” menu of the IMMI main menu, or by clicking the  icon in the tool bar of the main menu.

When called up for the first time in an IMMI session, the job list is empty. As you had no chance yet to set the planned calculation type, the area on the right is empty as well.

Proceed as follows to add some data to these areas:

- Call up one of the functions New job: Receiver calculation, New job: Calculate façades or New job: Calculate grids from the “Job list” menu – or click on the respective tool buttons



- With the right mouse key, click into the window for the Job list and open the local menu. Select the function “Load list” and load a Job list that was saved at an earlier date.

If you are creating a new job or have loaded a job list, the appearance of the dialogue will change. See chapter 1.2 for a respective illustration.



A new job has been entered in the Job list.

The preliminary name is made up from various pieces of information:

- an abbreviation for the calculation type (FP for façade calculation),
- a consecutive number, and
- the time of generation.

In the Job list, each entry is preceded by a checkbox (column 1) for selecting or deselecting the entry. This specifies which jobs from the Job list are to be calculated.

The second column has an icon that indicates the type of calculation, as does the abbreviation FP.

On the right-hand side, the dialogue assigned to a façade calculation is displayed now.

Please note the register at the bottom that shows the different pages of the dialogue.

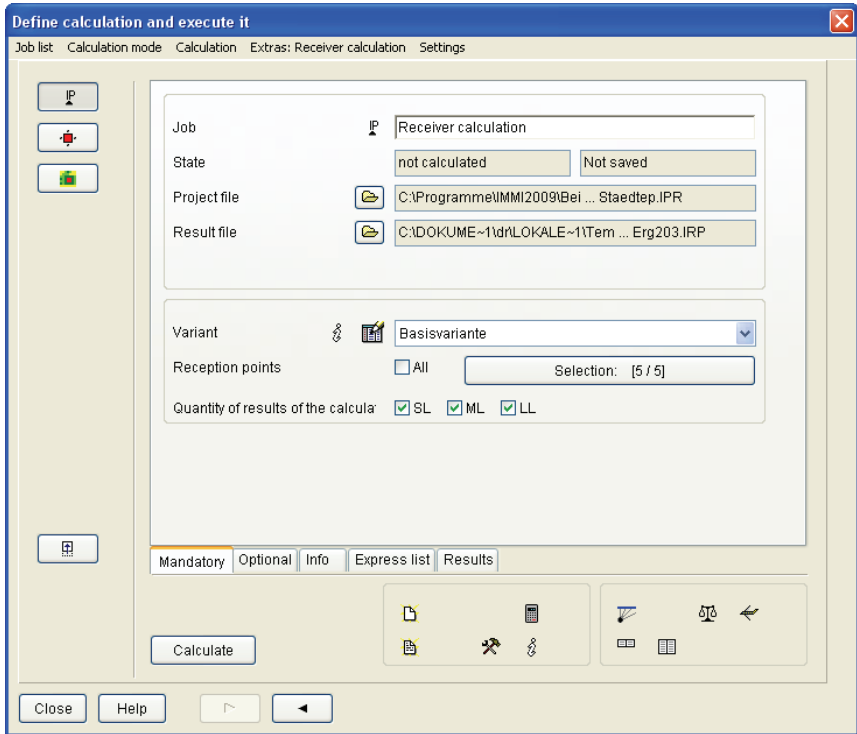
Now, the menu at the upper margin has become much more extended. Now, it includes the submenus “Calculate”, “Extras”, and “Settings” in addition the submenu “Job list”.

## **1.4 The Reduced Format for Single Calculation without Job List**

Start this format with the command “Single point calculation”, “Calculate façades” or “Calculate grid” in the submenu “Calculate” of the IMMI main menu, or click on the respective tool buttons.

Alternatively, reduce the extended dialogue to go to this window.

Depending on how you called up the dialogue, one of the three calculation types is already enabled.



## 1.5 Working with the Job List

In the following situations, you need to work with the Job list:

- you want to define and collect a series of calculations to have them processed overnight or over the weekend without any further intervention required from your side;
- you want to execute a calculation with identical settings for various variants with a minimum of effort;
- you want to execute any mix of point, façade, and grid calculations with identical settings.

But also in other cases, it makes sense to work with the Job list:

- The Job list not only collects jobs for calculation but also holds all information on jobs calculated at an earlier date.

As this information is saved and can be re-loaded, it is useable beyond the end of an IMMI session.

It is comparable to the features experienced IMMI users know from the earlier Grid manager and the registration of grids.

Simply click on an entry in the grid list to load and display the respective project with a selection option for the appropriate variant and, if applicable, the existing calculation result.

In the submenu “Settings”, specify whether a prompt should be shown before projects and calculation results are loaded.

We recommend that you enable this checkbox if you deal with very large projects or grids, so that an accidental click on a job will not result in prolonged waiting periods or aborted loading processes.

## **1.6 Working without the Job List**

When you work without the Job list, it will be hidden. One of the calculation types is enabled. You see this firstly from the fact that an input dialogue is displayed, and secondly that one of the checkboxes in the left margin for selecting the calculation type is enabled.

To understand the behavior of the dialogue in this operating mode, it is helpful to be aware of some implementation details.

At each program start, IMMI formally generates two job lists: the first individual list is empty for a start. It will be used in the extended format.

The second list has three entries from the beginning which contain standard parameters for each type of calculation. During processing without Job list, this standard list is managed in the background. Depending on the selected type of calculation, one of the 3 standard entries is visible.

When you switch between dialog formats, the individual list and the standard list are exchanged while their contents remain the same.

The function <Calculation type | Copy to Job list> is an interesting tool. It can also be called by clicking the checkbox

This function, which is only available when working without a Job list, adds the recently edited standard job to the end of the individual Job list.

## 1.7 Working without CCC (as in Previous IMMI Versions)

Pollution calculations have not yet been integrated into the concept of the Calculation Control Center.

Thus, the traditional operation, also for regular noise calculations, will still be available for a transitional period. When pollutant calculation is selected, the program switches automatically. For other noise calculations, use the tool bar of the program. See the picture below.

There is a checkbox at the right margin to enable or disable the Calculation Control Center function.



## 1.8 The New Delivery Concept

From IMMI version 2009, we have redrafted our delivery concept. Before, we used to create an individual program file and burn an individual CD for each customer.

Now, all customers receive an identical program file "IMMI.EXE". It is adapted to each customer's specific requirements by an individual license file "OPTIONS.DAT". This coded file that can only be read with your specific hard key comprises all information required to identify the customer and to use your hard key and equipment. It also specifies whether IMMI will be started as a full version or with restricted options as a calculation client.

If the "OPTIONS.DAT" file is not found in the IMMI installation directory, IMMI will run in demo version after showing a message to that effect. In demo version, all element libraries and options are available, but there are other restrictions: calculation results are falsified, saved projects cannot be read by full versions, import and export functions only work for every third to fifth object.

The new delivery concept has many advantages for both sides, and almost no setbacks.

The only disadvantage for the customer is that during the IMMI installation, you will need to copy the Options file to your IMMI installation directory. The delivery of IMMI 2009 comprises a new leaflet "IMMI – Installation Instructions" with a detailed explanation.

But you will enjoy a number of advantages:

- As a registered IMMI customer, you will be able during your service period to download revised or updated IMMI versions from our homepage. Several updates will be available per year.
- When you buy new element libraries or options, or upgrade your version, we will send you just a small file - usually by email; this is your new "OPTIONS.DAT". Simply copy it to your IMMI installation directory, and your new program extension is ready for operation.
- In the program information ("Help → Info") you see the expiry date for your access rights to IMMI license updates. To extend your service period, simply enter an eight-digit enabling code in IMMI for immediate access to new program versions.

We as producers likewise benefit from this new delivery concept. We save time and effort so that we can create updates faster. You will receive modifications to directives, program extensions, and error corrections sooner.

## 2 Basic Program and Noise Calculations

### 2.1 New Features

#### Calculation Control Center

See chapter 1.

#### Segmented receiver calculations: New!

The segmented calculation traditionally available for grid and façade calculations now also exists for receiver calculations. This means that an extensive calculation can be automatically segmented and divided between several computers.



Irrespective of the desired calculation type, the function for Segmented calculation is now called up via the menu <Calculate | AUDINOM (Segmented calculation) | Segmentation>.

Then, create a job either through the <Jobs> menu with “New job: Receiver calculation” or with the corresponding icon.

#### Hot Spot analysis

Various functions for Hot Spot analysis have now been implemented in IMMI in the frame of façade calculation.

There are the following methods:

- Noise-inhabitants-equivalents
- Noise ratio procedure pursuant to Bönninghausen/Popp
- Prioritization P, Bavaria
- Little Annoyed, Annoyed, Highly Annoyed

Basically, the procedure takes the following steps:

- Execution of a façade calculation.  
Each building must be assigned a number of inhabitants.
- Selection of a calculation area (grid).
- Selection of a cell to calculate the load for the cell inhabitants: circle or square of any size, for example 1 acre.
- Selection of the method for definition of the noise load and the desired limit/target values for the respective period
- Then, IMMI executes the following actions for every grid point:
  - forming a cell centered around this grid point
  - collecting all calculated façade points within the cell
  - totaling the load value according to the selected method
  - assigning the total to the grid

In the end, you will have a grid with various layers for day, night,  $L_{DEN}$  (depending on your selection) displaying the amount of noise load for each grid point. Optionally, a layer can be created that only documents the distribution of the inhabitants.

**Parameters for hot-spot analysis**

Method: LEG - population equivalence

Row:  Circle  Square

Area /m²: 10000,0 (r = 56.4m)

Day (6h-22h) Individual confirmation of insertion: 0,0

Night (22h-6h) 0,0

Additional layer: inhabitants/row

Calculation area: Detailraster

OK Cancel Help

### Extension of the Short lists

The Short lists have been extended:

- additional columns are available
- with a flexible layout
- sortable by element key and element name.  
This is useful for example if the order has become mixed up following segmented calculation.

Requirement: A point calculation with elements of the IPKT type must exist, and the respective project file must be loaded.

### New Long list

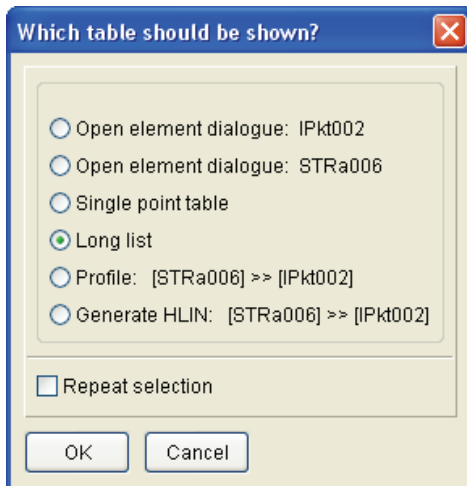
The Long lists have undergone a thorough redesign.

Now, they are generated on request out of a database. They have the following properties:

- More details
- Configurable layout
- Suitable for evaluation by Excel
- They can be shown directly for single reception points
- They can be evaluated through special filters, e.g. ‘Evaluate only direct sound, omit reflections’, or ‘Consider road traffic noise’, etc.
- They can be shown for any period of time.

### Show profiles and other information from the Mid-size list

When a “Mid-size list” is displayed following a point calculation, double-click on the name of a sound source (e.g. EZQi025); the program shows a selection of outputs/actions:



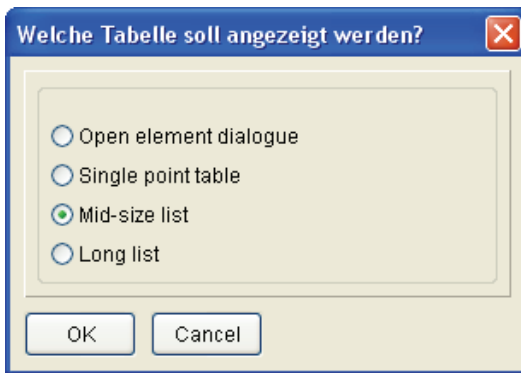
A new feature is included here: now, a profile between sound source and reception point can be indicated. If the source is a line source, you will be prompted to identify the line section whose center is to be the starting point of the profile.



Depending on whether you double-clicked the name of a sound source or a reception point, a different section will be shown when “Long list” is selected. In the first case, the list will be shown by section only for the sound source and the reception point automatically assigned to it, and in the second case for all sources of the reception point.

### Section of the Long list from a map

Following a point calculation, double-click in the map on one of the colored reception points to see a similar selection:



### Double-click on a building element after façade calculation to see a corresponding table.

Following a façade calculation, double-click on the outline of a colored building to see the table “Reception points at buildings”.

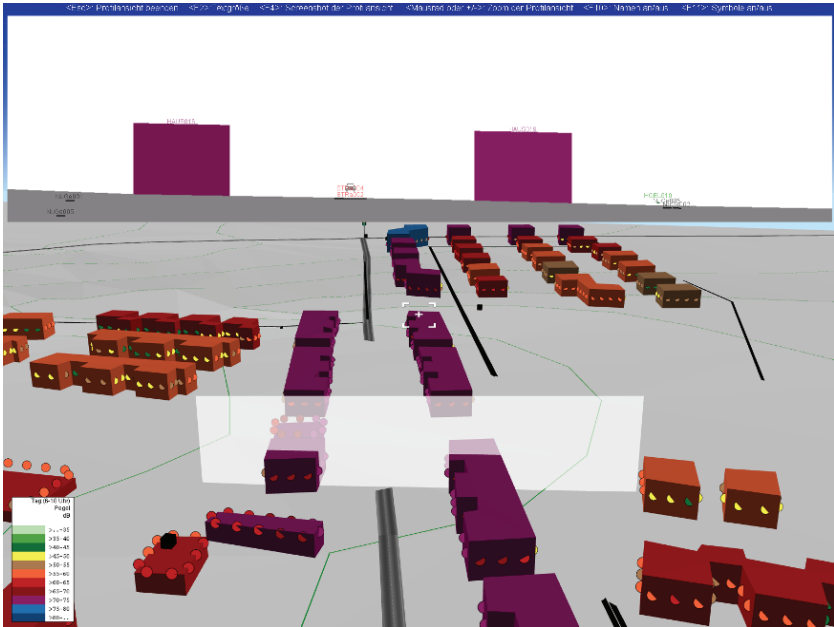
The message “Double-click to show table” highlighted in yellow in the info bar indicates that the mouse cursor is in the right place for this action.

### New 3D Viewer

The 3D viewer has been extended considerably.

Especially the new function for indication of a profile is a true highlight.

To see the profile, press function key F6.



The main window is broken up into 2 parts:

- Top: display of the contents of the profile
- Bottom: a white semi-transparent rectangle appears in the map. It shows the profile displayed on top.

This is a real-time display: while you move around the map, the display in the top part of the window will update constantly.

*Moving the rectangular in the bottom part*

- Forward/backward: via the arrow keys of the keyboard.
- Left/right: via the mouse.
- Changing the profile size: via the + and - keys on the keyboard, or via the mouse wheel.

### *Indication of the profile in the top part of the window*

- **Elements, element names and symbols:** The legend is indicated directly above the element. The profile element and the font have the same colour attributes as in the IMMI map. To avoid overlapping of the legends, they are offset slightly. Symbols are used to illustrate the position of street and railway sources in the profile. The symbols are simplified pictograms of a car and a train.
- **Grey area:** The grey bottom area corresponds to the height profile.

### *Functions of the profile in the top part of the window*

- **ESC key:** quits the profile view.
- **F2:** changes the font. This is useful for large screens and high resolution, and for presentations via projector.
- **F4:** Press F4 to take a screen shot of the profile (the top 2D profile view). The screenshots are saved to the Screenshots folder.
- **F10:** F10 activates and deactivates legends in the profile.
- **F11:** F11 activates and deactivates the symbols.

Note: The profile can also be called up via the main menu.

Furthermore, the profile can be activated and deactivated via the F6 key during the automatic following of line elements.

Other extensions of the 3D viewer:

- Press F7 to reverse the flight direction when following line and area sources.
- Up to 25 waypoints may be set in a project. The local menu (right mouse key) has been extended to include a symbol for selecting the waypoints to be addressed. Waypoints remain intact after you leave the 3D Viewer; you can use them again after a session in IMMI when you work on the same project once more in the 3D Viewer.

### **Elements dialogue**

The elements dialogue, the general section applicable for all element types, has been supplemented by two checkboxes that allow for direct editing of the global element group list and the list with the drawing attributes. You do not need to proceed via the main menu.

### **Thematic maps**

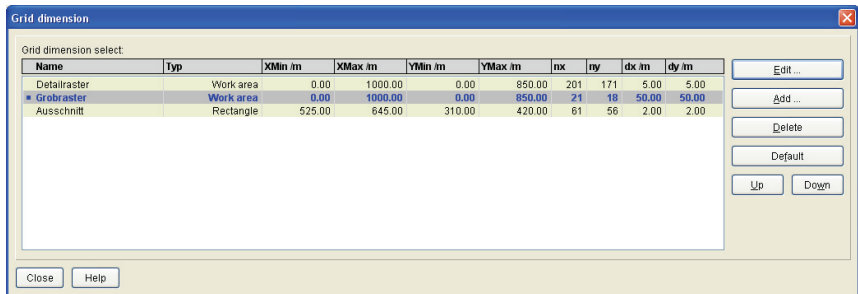
Now, also thematic maps as e.g. the representation of building heights or source maps may be shown in the 3D Viewer.

## Drawing attributes


Now, the special attribute “Road” is also available for the list of additional attributes. It can be used for example to show roads in different colors.

## Redesigned layout of lists, for example element groups, variants etc.

The layout of lists for the management of information like element groups, variants, grid definitions, map clipping lists, reference spectrums etc. has been redesigned. In many instances, additional information beyond the name of the entry is shown directly in the list.



## Lists for element groups and variants

In the lists for management of element groups and variants, you can now generate a note for each entry in the “Edit” dialogue which is also documented in the list of input data. The note on the variant can be viewed in the calculation dialogue by clicking on the  button.

## ArcGIS Import: Buildings with courtyards

Now, IMMI is able to correctly import elements with nested ring-shaped structures (e.g. buildings with courtyards). Before, only the outlines were imported but the “empty” areas were not cut out.

## ArcGIS export: Façade calculation

The export of the results of a façade calculation now also comprises information about the assigned building (residential use, number of inhabitants, number of inhabitants assigned to a façade point, etc.)

When exporting BUILDING elements, the following fields are exported in addition:

LMIN=minimum level, LMAX= maximum level, LM\_AR= arithmetic mean, LM\_EN= energetic average, QUIET= quiet façade.

### The “Processing” function for the results of façade calculations

This module has been redrafted and supplemented.

The new features concern in particular the function “Melt R1, R2”.

Melt R1, R2: New version:

Internal operator	Selection text	Explanation
eopImmer	R1 = {R1,R2}. With duplicates	All points of R2 are attached to R1, even if they are already comprised in R1 with identical or different values.
eopzR1Dom	R1 = {R1,R2}. Without dupl. w(R1) dominates	Points of R2 are attached to R1 if they are not yet comprised in R1. In case of common points, the values of R1 dominate: If w(R1) is calculated, the value is retained, otherwise w(R2) is applied.
eopzR2Dom	R1 = {R1,R2}. Without dupl. w(R2) dominates	Points of R2 are attached to R1 if they are not yet comprised in R1. In case of common points, the values of R2 dominate: If w(R2) is calculated, this value is applied, otherwise w(R1) is retained.
eopzMaxDom	R1 = {R1,R2}. Without dupl. Max(R1,r2) dominates	Points of R2 are attached to R1 if they are not yet comprised in R1. In case of common points, the maximum of w(R1), w(R2) is applied.
eopzEAdd	R1 = {R1,R2}. Without dupl. Energ. addition	Points of R2 are attached to R1 if they are not yet comprised in R1. In case of common points, the energetic total of w(R1), w(R2) is applied.

### Saving settings (INI files)

Now, program settings are saved to a folder provided by Microsoft specifically for application data. The name of this folder depends on the version of your operating system.

For Windows XP, the name is

C:\Einstellungen\

To see this information in IMMI, go to <Help | System info>.

You can overwrite this automatic assignment if you wish. To do so, generate a link to the IMMI.EXE file. Under ‘Properties’ in the line “Target”, add /APPDATA=<aDirectory> : behind the program name.

When loading the INI file, the program first checks whether a folder is specified in the command line. Then it searches in the “Application data” directory, then in the local temp. directory (used by IMMI 6.3.1), then in C:\Windows. Earlier IMMI versions used to save data to this folder.

### **Rating**

Italian rating directives require that an adjustment be made for sound emissions with a significant proportion of low-frequency emissions. Now, it is possible to make this adjustment in IMMI (dialogue for defining the parameters of a rating directive). Similar to other adjustments implemented before, a maximum limit may be set for this adjustment. Furthermore, the total adjustment may be limited by reason of tonal components, informative components, and low-frequency components.

### **Google Earth™ : Meridian convergence**

When a background bitmap is imported from Google Earth™, IMMI will now automatically calculate the meridian convergence for each north arrow in the project and enter it in the respective IMMI element. For projects extending over a large geographical area, the meridian convergence may well vary significantly.

### **Emission databases**

The reference databases in IMMI have been extended. Now, the external databases comprise the following databases:

1. VDI 3770 - Characteristic noise emission values of sound sources - Facilities for recreational and sporting activities
2. Hessian Agency for the Environment and Geology (HLUG), Journal no. 2 - KRÄMER, E., LEIKER, H. & WILMS, U.: Technical report on examination of noise emissions of construction machines 2004
3. HLUG, Journal no. 3 - LENKEWITZ, K. & MÜLLER, J.: Technical report on examination of noise emissions of trucks on the factory premises of forwarders, warehouses, shipping companies, and convenience stores, as well as of other typical noises in particular of convenience stores.
4. Saxon study of noise emissions of recreational activities. Guideline for prognosis and rating of noise loads by events and recreational facilities.
5. Free State of Saxony. Agency for the Environment and Geology. April 2006.

6. ÖAL 33 - Acoustic technical principles for the establishment of pubs, clubs and discotheques
7. forum schall - Emission data catalogue
8. DEFRA - UPDATE OF NOISE DATABASE FOR PREDICTION OF NOISE ON CONSTRUCTION AND OPEN SITES

### **RLS-90-Road: New road surface**

For roads pursuant to RLS-90, a new road surface has been added in accordance with the “General circular letter road construction no. 5/2006”: Concretes according to ZTV Beton-StB 01 with exposed aggregate concrete surface  $D_{stro} = 2.0 \text{ dB(A)}$

### **SonRoad (new elements library – to be purchased separately)**

In Switzerland, road traffic noise can now optionally be calculated with the directive SonRoad. Compared to the former model StL86, it offers more detailed source descriptions. The Swiss Federal Agency for the Environment, Forests and Agriculture (BUWAL) and the software providers agree that SonRoad supplies the source model, but that the immission calculation is to be executed in accordance with the international directive ISO 9613-2.

For more information on SonRoad, please see the following document released by the Swiss Federal Agency for the Environment (BAFU):

<http://www.bafu.admin.ch/publikationen/publikation/00530/index.html?lang=de>

### **Manuals**

All available manuals and Tutorials for IMMI 2009 are comprised in the IMMI installation folder “IMMI2009” in the subfolder “Manuals\_ENG“

### **Customer Login**

On our website [www.woelfel.de](http://www.woelfel.de), a new area has been provided for our customers. Here, you will find news about the program, updates, manuals, and much more.



We created an account for each IMMI customer whose email address is in our customer database.

To access your account, enter your user name and password. Your email address registered in our system is preset as your user name. The preset password is the first part of your email address, i.e. the text before the @ sign. After the first login, you can change your password.

Example:

User name (= email address): [m.mustermann@ingenieurbuero.de](mailto:m.mustermann@ingenieurbuero.de)

Password: [m.mustermann](#)

You'll find your user name and password on your delivery note.

If no access has been generated for you, or if you need another access for an employee, please contact Ms Reiche at our premises.



## 2.2 Modifications

### Dialogue <Project | Properties>, tab "Terrain model"

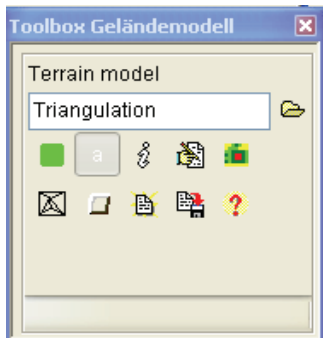
The tab "Terrain model" is no longer available in the <Project | Properties> dialogue.

The old version used this tab to set the type of terrain model: "Triangulation" or "DTM grid". Now, all functions in respect of terrain are controlled from the "Terrain" toolbox.

Proceed as follows:

- Enable the "Terrain" toolbox by clicking the  button in the tool bar.
- Click the  button in the toolbox to open the dialogue.





### **Thematic map “Height of buildings”**

This now includes a scale optimized specifically for this application.

### **Sorting elements**

When sorting elements by height, you can now choose between z(relative) or z(absolute).

### **Spectrum databases**

The dialogues for editing spectrum databases have been made much clearer. Irritating modal warning windows have been integrated into a memo field in the dialogue.

The new version also shows values for “spectrums” consisting only of levels A.

### **Vertical grid**

Now, the vertical grid also represents the bent part of a cantilevered barrier [ALSW element] in section.

### **Export of element data to ArcGIS**

The output of element data has been made complete.

### **List of input data**

The list of input data has been made complete, for example for the elements BUILDING, sound sources pursuant to RVS, and Study on parking noise.

### **Global coordinate systems**

Before, the map grid was not adjusted to global coordinate systems. This has been corrected.

**RVS 04.02.11**

With immission calculations according to the EU directive (Austria), a meteorological compensation was applied in non-downwind situations. Pursuant to an agreement with the Austrian authorities, the new IMMI version no longer applies this compensation.

**2.3 Corrections****Calculation of cantilevered barrier [ALSW element].**

In some cases, the calculation of the noise level above the bent part was not correct. This has been remedied.

**Calculation of bridges**

When calculating bridges, the following problem used to occur in some cases: Subsequent calculation showed slightly different results.

This concerned the part of the calculation that specifies the attenuation due to vertical sound screening on bridges in situations where reception points **and** sources **are not located on the bridge** and the sound screens are calculated as flying obstacles.

In this calculation, the potential diffracting edges were not initialized correctly. For this reason, a renewed calculation would sometimes show different results.

**Frequency-dependent mid-sized lists for third calculations**

When frequency-dependent calculations were performed in thirds and when sources were involved that were defined only with overall levels A, the ratio of these calculations in the frequency-dependent mid-size list was erroneously not entered in the 500 Hz column but in another one.

However, this only compromised the displayed list, not the calculation result.

**Saving and loading collections**

After deletion of numerous elements from collections and subsequent saving of the collection, errors occurred infrequently when the collection was loaded once again. This error has been remedied.

**Problems when loading projects**

In isolated cases, problems occurred during project loading.

Analysis showed that the function <Project | Input help | Delete elements> was at fault. When the setting “Elements on border: do not delete, clip lines” was enabled, the data structure was not set correctly for rail elements. This error has been remedied.

**Indoor level module**

Deleting a building in indoor level mode could result in destruction of the spectrum assignment under certain circumstances. This error has been corrected.

**Google Earth™**

The import of bitmaps from Google Earth™ did not work under the Windows operating system Vista. IMMI has been adjusted to remedy this problem.

### 3 AzB 2008

In late 2008, the new AzB 2008 came into force.

Compared to the version which had been the basis of IMMI implementation version 6.3, there were a number of changes that needed to be taken into consideration for modeling. The following modifications and/or amendments have been made in IMMI:

- Some terms of the old AzB have been changed. The term ‘Identification time’ is replaced by ‘Assessment time’, and ‘airplane’ by ‘aircraft’. This change of terms has been taken over in IMMI. The old terms are only used for calculations pursuant to AzB 1975 and AzB-L (VBUF).
- In the macro for segmentation of landing distances, line sources used to be generated up to the roll off point. According to a resolution of the German Federal States, landing distances now terminate at the end of the delay segment  $S_V$  that is specified in the class definition of the respective aircraft class. This means that the end of the flight route depends on the class of the aircraft. Nevertheless, it is still possible to model landing distances with several aircraft classes. IMMI has been updated to include the required modifications.
- As a result of the resolution by the Federal States, taxiways are no longer calculated from the roll off point but already from the end of the delay segment. Accordingly, the DES in the IMMI project needs reworking for these objects: The first section to be entered is the distance between the end of the delay segment and the roll off point. For this reason, only aircraft classes with identical delay segments may be grouped together in one taxiway element. Taxiways with different delay segments must be split into several elements. IMMI has been updated to include the required modifications.
- The aircraft groups database was extended by the aircraft classes described in AzB 2008. Contrary to older versions, these databases are installed in the course of IMMI installation even if a database already exists in the IMMI main directory. For this reason, we recommend that you select a new installation folder for IMMI. The (new) presetting for this is “c:\Programme\IMMI2009”.
- A new type of element has been introduced: the Auxiliary Power Unit (APU). Corresponding databases of APU classes have been provided internally and externally parallel to the aircraft group databases. AzB 2008

defines the appropriate APU class for each aircraft class. This link has been included in the current aircraft groups databases supplied together with IMMI. Currently, there are 2 APU classes each for take-off and landing. For some aircraft classes (in particular smaller aircraft types), APU is not applicable. For these, an empty entry (“-----”) has been provided for selection. In the dialogue of the APU parameters, the runtime recommended in AzB 2008 is specified. Alternatively, it can be set in the respective element dialogue.

The position of the APU point sources is explicitly stated in the element dialogue. Such an element is representative for all APUs occurring at this position (at the airport, it is identical with the parking areas at the terminal). In the sub-dialogue for the aircraft groups, the involved aircraft groups are listed together with the individual runtime and the total flights during assessment time. The segmentation macro for generating point and line sources automatically calculates from this data the emissions of the single APU classes.

Pursuant to AzB 2008, flight routes with corridor widths  $> 0$  must be split into 15 strips. This triples the calculation time for immission calculation compared to the times required for calculation according to DIN 45684-1. Now, it is additionally possible to select a smaller number of strips to calculate a rough estimate. To this end, the dialogue for the calculation parameters under <Extras | Aircraft noise> contains a combo-box with the following options:  
Generation of flight lanes “... .

- Before, the height of a starting aircraft was defined exclusively from the climbing behavior of the aircraft group in question, and the height  $h_0$  in horizontal flight. But in real life, an airplane - in particular a military aircraft - may deviate greatly from the group specification. For this reason, the flight heights at the end of a route section are specified explicitly with military DES descriptions. The new IMMI now also provides for this option. When the checkbox “Explicit height” is enabled in the DES dialogue, an additional column is displayed in the input field in which the heights are modeled. This checkbox is effective also with calculations according to DIN 45684-1, AzB 1975 and AzB-L (VBUF).
- For immission calculations according to AzB 2008 and DIN 45684-1, the requirement has been eased that (with the exception of the last two sections) straight sections must be separated from curved sections. Now, several straight sections may directly succeed one another. This is required when the corridor width does not vary linearly with the total straight section. Also when the height is explicit specified, it is sometimes necessary to have several straight sections succeed each other.

Note 1: In general, flight noise projects modeled with IMMI are compatible with all implemented flight noise directives. But AzB 1975 and AzB-L (VBUF) still specify that straight sections must not be directly succeeded by another straight section.

Note 2: The specification that a curved section must never be directly succeeded by another curved section is still valid.

- In earlier versions of the new AzB, the solid angle measure  $D_{\Omega} = 3$  was used. The final version, however, uses the formula (40). This change has been taken over in IMMI.
- Maximum level statistics are based on the class width of each aircraft class. In general, this is 3 dB. In special cases where an individual aircraft type is described in an aircraft class of its own, class width 0 would apply. This is now also feasible in the new IMMI.
- Airport traffic circuits may also be flown by helicopters (e.g. with the new AzB test airport). But up to now it was not possible to describe an additional level for the airport traffic circuit in the class description of helicopters. This function has been supplemented.
- In the description of aircraft groups, AzB uses a parameter "X" that - depending on the height in horizontal flight and the climbing behavior and/or approach angle - describes the one-dimensional position of  $\sigma'$ . The value for X is calculated in dependence on a combo-box selection in the dialogue. Two new entries have been added to IMMI to allow for description of hovering segments of helicopters.
- Sigma rule  
According to chapter 3.3 of AzB 2008, a markup of  $3 \cdot \sigma$  ( $\sigma$ : standard deviation) must be applied to the calculated immission level to compensate for statistical uncertainty. This is based on a statistical analysis of the runway-specific operating directions of 6 to 10 reference years.

As so-called post processing, the IMMI implementation is performed after single point or grid calculation. To this end, first execute for the respective study year (by means of the variant concept) a separate individual propagation calculation for each operating direction and save the results. To calculate sigma, enable the Calculation Control Center (CCC). In the "Calculate" menu, call up the function "Reception points..." (Single point calculation) or "Calculate grid...". When CCC is disabled, these functions are to be found under <Grid | Processing>. There, start the dialogue for the sigma rule in the submenu "Extras: Reception points" or "Extras: Calculate grid" by clicking on the respective buttons with the airplane icon.

For each runway-specific operating direction (a runway usually has 4 operating directions) and for each daytime, enter the percentage of runway use for each reference year and for the study year. Furthermore, select the result file of the single point or grid calculation for each operating direction. Within this dialogue, these parameters can be saved to a file or loaded from it.

As soon as the dialogue is confirmed with “OK”, IMMI calculates the standard deviation for each reception or grid point, separately for each time of day. Then, all reception point result lists or grids are added up energetically and marked up with  $3 \cdot \sigma$ . The result of the operation is shown in the active reception point results list, or the active grid. These should then be saved to a result file.

Note 1: The operating direction of an airport traffic circuit is the starting direction.

Note 2: Helicopter routes and APUs are not used as a basis for calculation of the standard deviation. Their share in the total immission is separately added energetically to the immission level marked up by  $3 \cdot \sigma$ .

- The segmentation algorithm of AzB 2008 is an approximate equivalent of that of DIN 45684-1. To increase the accuracy of emission and immission calculations, some refinements have been implemented. As these refinements will be included in the revision of DIN 45684-1, IMMI also uses them for calculations according to Din 45684-1:
  - In addition to the historical criterion for segment subdivision, i.e. that the length-related sound power level may vary by not more than 1 dB within one segment, the segments are now also subdivided when the additional level varies by more than 1 dB. This is of special importance for calculations of maximum level.
  - In chapter 4.4.2 of DIN 45684-1, the directivity measure was described irrespective of the directivity characteristics of the individual aircraft classes. Pursuant to chapter 7.2.2. of AzB 2008, the directivity measure is calculated on a class-dependent basis by means of 3 frequency-dependent direction factors  $R_n \{a_1, a_2, a_3\}$ . These are already included in the Aircraft groups database.
  - DIN 45684-1 likewise permits in the DES a succession of any number of straight sections (see above).
  - Parameters introduced in AzB 2008 (intermediate approach segment, delay segment, hovering segments) are now likewise integrated in all other air traffic noise directives.

Note 1: The new element types Taxiway and Auxiliary Power Units have been implemented exclusively for calculation of air traffic noise pursuant to AzB 2008.

Note 2: The sigma rule is exclusively available for air traffic noise calculation according to AzB 2008.



## 4 Pollution Calculations

### Road traffic emission factors

Outside of the “HBEFA” option, only approximate values for road traffic emissions could be taken into consideration by selecting ‘Gas types “acc. to Copert”’ (Calculation parameters → Pollutants → Gas types). With this checkbox set on “Freely definable”, it is now possible to specify emission factors for passenger cars and trucks for each gas type in dependence on the speed (20 km/h, 30 km/h, 50 km/h, 80 km/h). With other speeds, the values are interpolated. For velocities under 20 km/h and above 80 km/h, the respective limit values are used.

The emission factors are saved to the project file. You can use the clipboard (popup menu via right mouse key) for data exchange with other programs or IMMI projects.

### AUSTAL2000

A new AUSTAL2000 version was issued on 3 November 2008. Among other new features, it includes the assessed odor hour frequencies pursuant to the new GIRL directive. IMMI was updated accordingly so that "odor 040", "odor 050", "odor 060", "odor 075", "odor 100" and "odor 150" are available as new gas types. We refer to the AUSTAL200 documentation, also in respect of the special features of the regulations in Baden-Württemberg.

### AUSTAL2000

- The new AUSTAL2000 version also supports the UTM coordinate system. This has been taken over in IMMI.
- Extended source geometry  
AUSTAL2000 also takes into account emissions from volume sources. Even if IMMI does not directly use this source type, such volume sources can now be modeled and transferred to AUSTAL2000. Proceed as follows:
  - Assign a third dimension to horizontal area sources. To do so, enable the checkbox “... volume source” in the input dialogue of these sources. An input field appears into which you enter the height of the volume source.
  - Apply a dimension to the point sources. To do so, enable the checkbox “... is an extended source” in the input dialogue. Now, specify the horizontal (x and y component) and vertical dimension in the appropriate input fields. Another parameter is provided to account for a potential turning angle between the x direction of the source and the x axis in the IMMI coordinate system.

Note: If you assign only a vertical dimension to a point source (both horizontal dimension are set to 0), IMMI will export a corresponding vertical line source to AUSTAL2000. If the horizontal dimension in direction of x is set greater 0, IMMI will export this source as a vertical area source, taking into account the turning angle around the vertical axis.

- Now, in dependence in the variant, the building can also be exported to a grid file. In this way, transfer of non-cuboid building shapes to AUSTAL2000 is possible.
- The anemometer position specified in the calculation parameters is now indicated in the map by means of a symbol element. When the position of this symbol is changed (by moving it in the map or the element dialog), the entry in the calculation parameters is adjusted automatically.
- The Joker gas (old name “xx”) can now be assigned any other name in the calculation parameters.
- AUSTAL2000 (error correction)  
When various source types (point source, line source, area source) were mixed up in time-dependent calculations, emissions were sometimes not assigned to the appropriate gas types. This error has been corrected.

### **Gauß-Model**

- Now, a link to the KTBL-Großvieheinheitenrechner 2.1 (livestock unit calculator) (<http://daten.ktbl.de/gvrechner/navigation.do?selectedAction=GV-Home#start>) has been integrated in the dialog for plant-related odor emission of odor sources. This simplifies modeling of odor emissions.
- The concept of the action radius, known from sound propagation, has now been taken over for pollutant sources. In addition to the range limitation already implemented in the dialogue for the calculation parameters by means of the quotient “Max. range/source height”, it is now possible to specify a maximum action radius individually for each pollutant source.

### **Meteorology import (pollutants)**

In the old version, import of meteorological time series was only possible if they had the current DWD format. As requested by our customers, it is now also possible to import meteorological time series in the old DWD format.

### **Meteorology import (Germany, Austria):**

It is now possible to use the clipboard for meteorology imports.



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