Wölfel

IMMI

Noise Mapping & Noise Prediction

YOUR tool for noise mapping and air dispersion modelling

General Program Features

IMMI is a leading, field-proven software solution for environmental pollution mapping, integrating outdoors sound propagation (road traffic, railway, industrial and recreational noise), air dispersion modelling (gases, dust, odours) and interfaces to CAD and GIS packages.

For more than 20 years, IMMI has been – and will continuously be – developed for the professional acoustician working either with a consulting engineering company, a public administration or the acoustic section of an industrial outfit.

- Project-orientated graphical Windows 64-bit environment with GIS functionality – IMMI is a vertical GIS including special features for noise and air pollution mapping
- Full 3D GIS including support for z-coordinates of both development and terrain and powerful 3D viewer.
- GIS data input and management by using either relative or absolute coordinates. IMMI provides a GIS environment. Use either mouse, keyboard, digitising tablet or IMMI's multiple import functions for 2D/3D project data from ArcGIS™ shape files, MapInfo MID/MIF, DXF text or bitmap formats.
- Background: import of geo-referenced aerial photographs from GoogleEarth®/GoogleMaps® + support for more than 30 different bitmap formats for scanned maps and functions to fit the map to orthogonal, metric coordinate systems.
- Support for UTM and all major national European orthogonal, metric coordinate systems – continuously being expanded. Conversion between coordinate systems covering the same area. Projects can still be entered in relative coordinates.
- GIS management and coupling of vector and raster data: vector data for site map/scheme and raster for all result grids (noise maps, maps of air pollution concentration fields, map of the digital terrain model etc.).
- Annotation and illustration of site maps: legends, scale bars, photographs, labels and text fields, cartographic symbols etc.

Calculation of grids and façades

- Documentation of results and input data in interactive lists/tables offering search/sort functions, and export to HTML/RTF/EXCEL™/text.
- Export of all raster data (numeric cell values or coloured/gray-scale geo-referenced pollution maps either with contours or filled contours and their associated colour legend) to either geo-referenced ArcGIS float files, geo-referenced ArcGIS contour shapes or to geo-referenced bitmap world files and to geo-referenced text files.

Noise propagation calculation methods: railway noise

RMR-SRM II-1996 (EU Interim Method) and national methods:

CRN (UK) · XP S 31-133 (France) · RMR-SRM II (Netherlands) · TemaNord 1996:524 (Nordic) · SEMIBEL (Switzerland) · ONR 305011(Austria), SCHALL 03 (Germany) · MSZ 15036 (Hungary)

- Full set of GIS/database function: zoom/unzoom, undo/redo, block functions to edit attributes of multiple elements simultaneously, coordinate transformation, simplification of elements, fit element to terrain/terrain to element, transform absolute altitude to relative height or vice-versa, search for element, set map scale, vertical profiles etc.
- Pollution maps: horizontal and vertical maps including user-specified mesh size and height above the ground (or absolute), noise maps, air pollution maps, maps disclosing the spatial attribution of limit values, maps disclosing the exceeding of a limit value, maps disclosing the differrence with a different planning scenario etc.
- Thematic maps: selection of thematic layers such as height contour/altitude maps, building height maps, population density maps, emission maps for different source types etc.
- Further functionalities include but are not limited to: scenario management and assessment, efficiency settings for calculations, emission/transmission loss/meteorology data bases, automatic backup functions, multi-lingual user interface (English, French, Dutch, Italian, Hungarian, Turkish, Polish, Czech, German) …

Large-scale mapping, distributed processing and multi-core support

- Due to its modular design, powerful calculation kernel and full set of GIS functions, IMMI easily covers all applications from the very small to the very largest. IMMI is fast and efficient in working with large-scale projects.
- Large projects are both handled and edited fast and efficiently. A series of efficiency settings leaves the user in full control of accuracy versus calculation speed. Analyses tools help optimize the settings and AUDINOM distributed calculation grants access to the power of all computers in your network.
- The power of modern multi-core computers can be used very effectively employing IMMI Premium or IMMI Plus by working on a project interactively while a number of IMMI calculations is running in the background only depending on your hardware power.
- AUDINOM distributed calculation of large-scale projects on networked multi-core and/or single core computers: fast calculation without any compromise when it comes to accuracy.
- With AUDINOM you are able to use wasted power of computers on your network that are not used during the night, on the weekends or on holidays etc. The calculation client to be installes is easy to handle. The high level of automation guarantees that your colleagues can start a calculation without any knowledge of IMMI or noise mapping.
- If your maps are bigger than available RAM, IMMI silently takes care of this in the background using its own swapping technology in order to leave you operational in calculation, loading, exporting or mathematically/statistically evaluating noise maps.

Noise propagation calculation methods: road noise

XP S 31-133/NMPB+Guide du Bruit (EU Interim Method) and national methods:

CRTN (UK) · XP S 31-133 (France) · RMW-SRMII (Netherlands) · TemaNord 1996:525 (Nordic) · emission models from StL-86 and SONROAD (Switzerland) · RVS 04.02.11 (Austria) · RLS-90 (Germany) · MSZ 15036 (Hungary)

Quality assurance and plausibility tests

- IMMI is fully compliant with DIN 45687 “Acoustics — Software products for the calculation of the sound propagation outdoors — Quality requirements and test conditions“.
- Thematic maps to visualize and control input data: building height map, terrain level height map, population density map, inhabitants per building, building use map, land-use map, noise emission maps for different source types etc.
- Powerful 3D-Viewer with flight paths, video recording/playback, waypoints, movable and scalable vertical profile view, screenshots and marking of elements for editing.
- Forecast of uncertainty of the use of user-defined combinations of efficiency settings.
- QA manager to run calculations on documented test cases and compare calculated results to known good results.
- Automatic plausibility tests prior to starting a calculation.
- Input help functions: check whether line elements (roads, railway lines, …) stick to terrain or vice-versa, put bridge elements on top of terrain and source lines on top of bridge platforms, search for geometric conflicts and self-inter-secting elements, repair conflicts/self-intersections etc.
- Graphical visualisation of the segmentation of line and area sources and of the paths to a given receiver point.

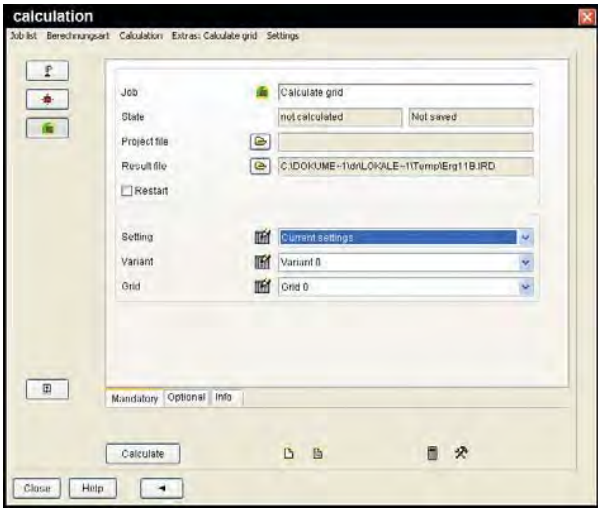
Calculation of air-dispersion and noise levels compliant with official calculation methods

IMMI is a noise prediction and mapping package for outdoors propagation of noise. Furthermore, IMMI is a software for air-pollution modelling calculating the dispersion of air-pollutants in both small-scale permitting schemes and large-scale mapping applications. At the very core of IMMI are the calculation methods:
Two calculating methods form the basis of IMMI for both noise and air-pollution, IMMI takes special pride in producing calculations that are fully compliant with the rules of the official national or international calculation methods. The coupling of noise propagation and air-dispersion modelling in a single program is thus more than a buzzword: with IMMI it becomes reality!

With IMMI you are operational right from the start: the base module already contains both a general noise prediction method and a general-purpose Gaussian air-dispersion model. Further calculation methods can be added in form of “libraries”. Each library implements a calculation method published by an official body. The methods programmed in IMMI are laid down in national or European legislation, in standards issued by national or international standardisation bodies (e.g. ISO, BS, DIN, NF, EN, …) or in guidelines from professional or industrial associations (e.g. VDI, ISO …).

Feel free to contact us for further information on available calculation methods whether for air-dispersion modelling or noise mapping!

Calculation Control Centre (CCC)



Calculation Control Centre

- Central management of all calculations at individual receiver points, grid points (noise map) or façade receivers.
- Uniform, powerful and easy to use.
- Task lists for all receiver types (individual, grid, façade): calculate all your variants in one go or have the computer do the calculations over night.
- Integrated management and registration of calculated results.
- Full documentation of calculation settings.
- Powerful management of variants to study planning scenarios.
- New lists with expanded sets of features.

Special features to analyse and assess results

With more than 20 years of existence in the market and over a thousand licenses sold worldwide, IMMI is a field-proven software. As a practical tool it unburdens the user from routine tasks, leaving his head clear and provides support for analysis and planning. IMMI is a vertical GIS optimized for environmental noise and air-pollution modelling. In addition to GIS functions, IMMI offers a full set of functions to effectively assess, analyse and manage noise levels and air pollution concentrations. Correlation with non-pollutant data in a three-dimensional mapping space is possible (think of exposure calculations). Analyses and assessment of noise levels and pollutant concentrations open the path to effective action planning.

- Source types: point, line and area sources for road traffic noise, railway traffic noise, air traffic noise and industrial/recreational noise.
- Receiver types: isolated single receivers, grids of receivers (horizontal or vertical noise maps), façade receivers.
- Types of levels (depending on calculation method):
  - Input: A-weighted overall sum levels, linear and A-weighted octave or third-octave bands.
  - Output: average sound level, rating level and peak level; sum levels: A-weighted, frequency-dependent levels, linear, A- or C-weighting (industrial/recreational noise).
- Propagation path: 3D analytical geometry to identify all paths and all effects such as geometric divergence, atmospheric absorption, distance attenuation, insertion loss/screening effect, ground effect, reflection (no, single or multiple up to order 25), meteorological correction depending on the calculation method.
- Special elements: road tunnel, barrier with cantilever, bridge w/o noise barriers, ground effect, vegetation.

Noise map in IMMI

Noise maps

- Horizontal or vertical maps with user-defined shape (must not be rectangular), dimensions (covering all or single parts of the project), mesh size (equi-distance between points), and calculation height (relative or absolute).
- Colour codes: ISO 1996-2 (1987), DIN 18005-2, NF S 31-130, UNI 9884, ÖAL 36 + user-definable ones.
- Special assessments: land-use planning PPG 24/ PAN 56 (England/Scotland), DIN 4109 building isolation classes.
- Special maps: map disclosing the exceeding of a limit value, difference maps, energetic and arithmetic addition and subtraction of noise maps.

Rating methods

- L_{den} compliant with Directive 2002/49/EC and national transpositions.
- Pre-programmed national rating methods from Switzerland and Germany.
- User-definable rating methods.

Assessments

- Noise exposure: number of people, dwellings or areas exposed to certain noise levels.
- Grid statistics: maximum and minimum level, standard deviation.
- Mathematical and logical links: arithmetic and energetic addition and subtraction, positive or negative offset, interpolation, insertion of grid points, assembling partial grids.

Action planning

- Calculation of planning indicators combining noise levels and the number of people exposed to individual noise level bands.
- Several different indicators are available.
- Identify hot-spots: concentrate planning efforts and investments on areas where the combination of noise levels and the number of people exposed is particularly high.
- Coloured thematic maps enhance visual analysis of the situation.

Industrial noise

Industrial noise

Noise propagation calculation methods: Industrial noise

ISO 9613-2 (EU Interim Method) and national methods:

Nordic Standard (Nordic) · VDI 2714/2720/2571 (Germany) · ISO 9613-1 & 9613-2 (International) · BS5228 (UK) · MSZ 15036 (Hungary)

- Databases of noise spectra and transmission loss/ absorption spectra.
- Indoor noise levels: Sabine formula spread-sheet, higher- order reflections up to 25th order.
- Transmission of noise from indoor sources to outdoor radiation of building walls, including openings.
- Transmission through noise screens in industrial applications.
- Linear, A- and C- weighting of results + graphical bar graph presentation of spectral noise levels.
- List of all sources incl. their sound power level and the energetic sum of all sound power levels.
- Screening effect of terrain is taken into account in all circumstances by using triangulated interpolated networks (TIN) to describe the digital terrain model.
- Interactive noise-quota attribution – interactive-rating of noise sources.

- Barrier optimization.
- Import of measured spectra from text files or clipboards.
- Source types: point, line and area sources for road traffic and industrial sources.
- Receiver types: isolated single receivers, grids of receivers (horizontal or vertical pollution maps), façade receivers.
- Types of pollutants (depending on the calculation method):
  - Input: gaseous, particles/dust, odoriferous gazes; volume emissions are either calculated or user-defined.
  - Output: mass concentration, concentration fields, odour units, percentage of time of exposure to odours.
- Dispersion path: 3D analytical geometry to identify all paths and all effects such as advection by wind, diffusion inside the plume, gravitation of particles, atmospheric stability etc. depending on the calculation method.
- Special elements: overall effect of development on propagation of gas and dust (loss in plume and local increase in proportional concentration or travel distance).

Pollution maps

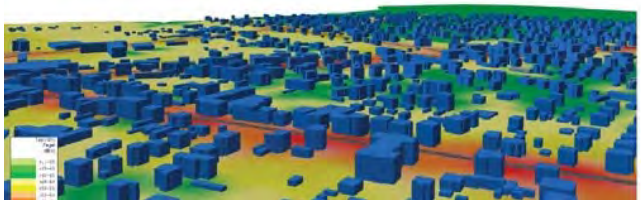
Noise propagation calculation methods: Air pollution:

VDI 3945-3 · ÖNORM M 9440 · TA Lärm
DIN 1886, Annex C

- Horizontal or vertical (only Gaussian models) maps with user-defined shape (must not be rectangular), dimensions (all or parts of the project), mesh size (equidistance between points), and calculation height (relative or absolute).
- Colour codes: user-defined.
- Special maps: map disclosing the exceeding of a limit value, difference maps between study scenarios, energetic and arithmetic addition and subtraction of noise maps.
- Emission models for road traffic noise, gaseous and particulate emissions.
- Emission models for livestock odour emissions (only Gaussian models).
- Choose between Gaussian, Canyon-Plume-Box and Lagrangian models.

Directive 2002/49/EC and strategic noise mapping

- Simultaneous calculation of L_{den}, L_{night}, L_{day} and $L_{evening}$.
- L_{den} rating method: predefined in compliance with 2002/49/EC and national transpositions + user-adaptable.
- Support for meteorological correction to determine long-term levels according to ISO 1996-2:1987 (where required).
- Adapted Interim Computation Methods for strategic Noise Mapping in accordance with “COMMISSION RECOMMENDATION of 6 August, 2003 concerning the guidelines on the revised interim computation methods for industrial noise, aircraft noise, road traffic noise and railway noise, and related emission data”.
- Strategic noise maps:
  - L_{den}, L_{night}, $L_{evening}$, L_{day} of either of the following: an existing, a previous or a predicted noise situation,
  - map of the exceeding of a limit value,
  - graphical plots, numerical data in tables, numerical data in electronic form.
- Noise exposure: number of people, dwellings, land area and schools/hospitals exposed to noise level bands specified in Annex VI of Directive 2002/49/EC.
- Façade level calculation to determine most exposed and most quiet façade.
- Graphical presentation of noise exposure helps to identify hot spots.



Noise mapping with IMMI

Map in IMMI

- UK: CRTN adaptations according to the updated TRL publication, method 3.
- Calculation height for single receivers and grids: 4 m, 1.5 m or any other height for special purposes.
- AUDINOM distributed calculation on networked multicore and single core computers.
- Action planning.

Large-scale noise and air-pollution maps

IMMI has been successfully used in strategic noise mapping to produce some of the largest noise maps ever. In the process of producing these maps, IMMI was enhanced to make the editing, handling, management and calculation of large-scale projects fast and efficient. City or regional air-pollution mapping is a requirement of the EU air quality directive.

Special features for large-scale projects include:

- Fast opening and saving of large project files.
- Unlimited number of sources, unlimited number of receivers and unlimited number of terrain level data with AUDINOM distributed calculation.
- Support for multi-core computers: start up as many IMMI calculation clients as CPU cores are available on a single computer.
- Result files may exceed the amount of RAM installed on your computer: IMMI uses swapping techniques to enable both calculation and statistical evaluation of such huge grids.
- Terrain level data:
  - Special algorithms to compress data while retaining important edges with a user-controlled spatial variation in uncertainty.
  - Coupling of terrain level contours with altitude points from a variety of sources.
  - Unlimited number of terrain level data with AUDINOM distributed calculation.
  - Strong import/export facilities to GIS world, especially ESRI™ ArcGIS.

Air traffic noise modelling

Noise propagation calculation methods:
Aircraft noise

ECAC.CEAC Doc. 29 1997 + Segmentation (EU Interim Method) and national methods:

ÖAL 24 (Austria) · AzB (Germany) · DIN 45684

Air traffic noise modelling is a complex topic. In fact, the emission level of the noise sources changes in space and time depending on the trust settings of the starting/landing aircraft. IMMI automatically calculates these changes and uses the latest segmentation techniques to produce a swift description of the three-dimensional noise source.

- Calculation methods: EU interim computation method for strategic noise mapping ECAC.CEAC Doc 29 (1997) + segmentation technique and national methods for Hungary, Austria, and Germany.
- Calculation of L_{den} indicators.
- Calculation of statistical indicators: LA_{max}, Number Above Threshold (NAT) with user defined threshold, Griefahn night-time wake-up indicator, etc.
- Façade level calculation.
- Distributed calculation with AUDINOM technology.
- Grid, single point and façade level calculation.
- German/Austrian/Hungarian noise emission database (compliant with Recommendation 2003/613/EC).

- German DIN 45684 takes both – screening effect and reflections into account – which is highly interesting for studies of airfields in densely developed areas.
- Corridor width to take lateral dispersion of aircraft flying the same flight route into account.
- Vertical dispersion is coded into noise emission classes taking maximum take-off weight, number and type of engines etc into account.

Packages and language support

IMMI is available in any of the three following packages, each of which carries a different price tag and more or less of the features described in this brochure. Please ask for a more detailed description and our current pricing.

IMMI Standard with its amazing price-/performance ratio is a comfortable entry into the world of noise mapping. It features a vast set of functions covering aspects of noise prediction and small-scale noise mapping. Typical features include: up to 99800 diffracting edges, support for digitising tablet, DXF export/import, advanced functions (build a house, construction of openings, co-ordinate transformation ...), enhanced 3D-Viewer, calculation of L_{den}/L_{night}, projection algorithm for line and area sources, rating methods, plausibility tests, single point calculation, grid calculation, background bitmaps (30+ formats).

IMMI Plus is a good choice for the acoustic expert concentrating on noise mapping of industrial sites, and all other types of sites of medium-scale spatial extent. IMMI Plus offers advanced features to model, calculate, analyse and present noise mapping projects. Typical features include up to 499000 diffracting edges, support for digitising tablet, DXF import, advanced functions (build a house, construction of openings, co-ordinate transformation,...), enhanced 3D-Viewer, calculation of L_{den}/L_{night}, multiple reflections, reference databases, indoor noise levels (Sabine), optimisation of barriers, expanded grid functions (compare, analyse, import/export, conflict maps), forecast of grid calculation time and accuracy, task list, project manager, noise quota attribution, projection algorithm for line and area sources, rating methods, plausibility tests, single point calculation, grid calculation, background bitmaps (30+ formats), up to 400.000 points in a digital terrain model.

IMMI Premium is the ultimate professional tool for noise prediction and large-scale noise mapping with an exceptional price-/performance ratio.

IMMI Premium features a complete set of functions to handle huge amounts of data in large-scale mapping projects. IMMI Premium comes with AUDINOM distributed processing technology. The pair has no limitations on the number of elements, sources, obstacles or terrain level points.
IMMI Premium is ideally equipped to meet the requirements of strategic noise mapping, façade level and exposure calculation as defined in Directive 002/49/EC. IMMI Premium is the advanced modelling tool for large scale and complex noise mapping of road traffic, railway traffic, industry traffic, aircraft noise mapping and city noise mapping applications.

Typical features include everything listed in the two packages above and many more: fast calculation using optimized algorithms and efficiency techniques, unlimited number of obstacles (barriers, buildings, reflecting surfaces) and non-active element, unlimited sources of each source type (unlimited number of component point sources), 3D-viewer, horizontal and vertical noise maps, façade levels with user-specified height and distance between points, grid analysis and combination (add or, subtract, arithmetically and energetically), support for a plethora of bitmap formats for the modelling of a project site and export of results such as BMP, JPG, TIF, etc. + export of results in geo-referenced world-file bitmaps, data import/export formats: DXF, ASCII, RTF, EXCEL and others, export of results to WORD, EXCEL, graphics formats, support for digitising tablets and scanners, user-definable rating methods + EU L_{den}, special features: noise quota attribution, Sabine indoor levels, user-defined databases, and many more.

The IMMI user-interface is available in a variety of languages: English, French, German, Italian, Dutch, Hungarian, Czech and more to come.
The IMMI help system and manuals are available in English and German.

3D-viewer

Technical Data

Hardware requirements

- 32- or 64-bit single or multi-core processors.
- Operating system Windows XP, VISTA or 7.
- RAM min. 512 MB, at least double for large-scale/ strategic noise mapping (the more, the better).
- 3D graphics accelerator card with full support of DirectX.
- 300 MB of free space for installation + space needed for projects.
- Keyboard and mouse.

Part list of a typical delivery

- USB hardkey.
- 600 pages reference manual + tutorial text for noise mapping and air pollution (on the CD-ROM).
- Set of IMMI installation CD-ROM.
- Service period of 12 months incl. free hotline support and update delivery (depends on availability).

Interfaces/Compatibility

- CAD applications: DXF.
- Text file format (ASCII).
- Spreadsheets (via Clipboard) and RTF file format for Windows word processors.
- ESRI ArcGIS Shape File Format.
- MapInfo MID/MIF file format.
- AUSTAL2000 native data formats.
- Support of more than 30 different graphics formats.

Customer login on Wölfel Web pages:

- IMMI Updates - exclusive downloads for customers.
- Fast and easy upgrades: the set of available features of your IMMI license is commanded by a control file that can be made available on the spot.
- Current and most up-to-date information is exclusively accessible to customers.
- English web-page address: **http://www.woelfel.de/en**

User Login

Target groups

- Consulting engineering companies
- Study and planning bureaus
- Public authorities
- Environmental protection departments of industrial companies
- Research centres
- Institutes for higher technical/scientific education (universities, technical colleges etc.)

Application fields

- Regulatory modelling applications
- Permitting
- Planning
- Action Planning
- EU Strategic Noise Mapping
- EU Air Pollution Mapping
- City Noise Mapping
- Environmental Impact Assessments (EIA)
- Research and development